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June 1992

Abstract

The U.S. Army is successfully blending its military mission with its environmental challenges. The Army's goal is to protect, conserve, and restore the millions of acres of public or leased land under its control. The U.S. Army has a solid record of environmental and natural and cultural resource accomplishments that are often not recognized, both within and outside of the Army. This document provides a sampling of the numerous environmental efforts, programs and projects that are currently in operation or planned throughout all levels of the Army.

Environmental accomplishments have been made in such areas as minimizing hazardous waste, air pollution, water pollution, noise pollution, as well as radon reduction, natural resource management, and pollution prevention related to new weapons. Measures have also been taken in developing telephone help lines, computer programs, and community action/awareness programs to achieve a comprehensive approach to meeting environmental needs. The Army is committed to its current programs and will continue its strategic planning to meet tomorrow's environmental compliance requirements in the face of increasing complexities, regulations, and responsibilities.

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AEPI-WP-292

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Acknowledgments

Researching the Army's successful environmental programs after 16 years of working in the Army environmental program provided Mr. Stine with a welcome break from addressing fires at the Major Army Command (MACOM) Environmental Office.

Mr. Stine is indebted to the U.S. Army Environmental Hygiene Agency (USAEHA), Directorate of Engineering and Housing (DEH), and Headquarters, U.S. Army Forces Command (HQ FORSCOM) Engineer at Fort McPherson, for providing such great assistance in addressing environmental issues over the past 16 years.

The authors would also like to thank Dr. Ravi Jain, Director of the Army Environmental Policy Institute (AEPI), for providing his excellent advice, skills, and resources to accomplish this task. The Information Management Team at the U.S. Army Construction Engineering Research Laboratory (USACERL) provided technical editing. Ms. Barbara Young carefully transcribed and typed the various drafts of this document, and made a crucial difference in bringing this document to publication.

The assistance provided from U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), publisher of the Environmental Update, where several of the success stories were borrowed, is also appreciated. Finally, the innovation and creativity displayed in these stories is reflective of the dedicated workforces found at the installation level. The input from the various installations was invaluable.

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Introduction

The Soviet Union no longer exists.

The U.S. Army has a viable environmental program.

Each of these statements may have seemed unbelievable to many people a few years ago. Nevertheless, both are now true.

The extent to which the Army has developed an environmental program and has succeeded in blending its military mission with its environmental challenges is just now being realized. General Dwight D. Eisenhower once said, "The problem in defense is how far you can go without destroying from within what you are trying to defend from without." The arms race of the past several decades took precedence over concern for a cleaner and safer world. The Army gave highest priority, just as civilian industry, to meeting production goals, and focusing on the business of carrying out its mission. The Army is now committed to protect and conserve our national resource heritage including all natural and cultural resources for current and future generations as an integral part of its military mission.

Secretary of Defense Richard Cheney stated his support for environmental compliance and protection programs in a 1989 memo. His challenge to all services will be met by Army leadership; it will be met by the dedicated Army research laboratories, commands, and agencies; and, it will be met, most importantly, by the installation commanders and the Directorate of Engineering staff that is normally charged with implementing the environmental program at the installation level.

The U.S. Army is rich in tradition. This report, which compiles environmental success stories, demonstrates that a new tradition is emerging—a tradition of Army environmental stewardship—a tradition of Army environmental success.

Why Compile the Army's Environmental Success Stories?

Most Americans are unaware that the Army plays a major role in protecting, conserving, and restoring the more than 20 million acres of public or leased land under its control. Some may even agree with the following excerpt from The Defense Monitor, "The military has

long had its own separate norms of behavior and set of priorities. Respect for the environment has never been one of its virtues. The U.S. military establishment does not have a good record of protecting the environment and has failed to comply with federal and state environmental, health, and safety regulations." (The Defense Monitor, Vol. 28, No. 6, 1989)

This report will, hopefully, go a long way in dispelling this viewpoint and will demonstrate Army environmental virtues. This is not to say that the Army has not made mistakes and does not have environmental problems. What is important is that the Army is working toward establishing an environmental ethic and is actively using its resources to help construct the first line of defense for the environmental heritage of future generations. In the past decade the Army has recognized its environmental problems and has circled the wagons to respond to the challenge. The Army must now realize that the enemy exists both inside and outside that circle. The enemies include pollution, apathy, ignorance, and wasteful use of natural resources. The Army has adequate weapons to conquer these enemies. These weapons include environmental training, awareness, research, funding, and technology. These environmental success stories demonstrate how the Army is using these weapons.

Approach

Mr. Rudy Stine, Headquarters U.S. Army Forces Command (HQFORSCOM), compiled these Army environmental success stories while serving as the first Major Command (MACOM) Fellow at the Army Environmental Policy Institute (AEPI). Mr. Stine requested information from all Army installations in the continental U.S. and from selected Army laboratories, field operating agencies, and the U.S. Army Environmental Hygiene Agency (USAEHA). This document includes only items submitted by the organizations, or found in various Army publications. Success stories actually used were limited to those programs and projects that began after 1986 and to military programs. (The U.S. Army Corps of Engineers (USACE) plans to publish an environmental brochure depicting civil works success stories). Where available, this report includes a point of contact (POC) for the program or project. The input received from

various installations was carefully screened for applicability and uniqueness to include in this report. Many success stories of a routine nature such as increasing staffing, and addressing day-to-day problems were not included. This is not to say that these accomplishments are insignificant; meeting environmental compliance requirements in the face of increasing complexities, regulations, and responsibilities, is a major success in itself. The reader must keep in mind that not all installations are equal. They vary greatly in size, resources, and mission. Some installations have extensive environmental programs and the staffs and resources to support them. On the other hand, many installations spend their limited resources simply trying to achieve and maintain compliance and have little time or money to develop proactive measures.

This document is an initial step in trying to develop a solid source for Army successes in the environmental arena. This document is by no means an exhaustive look at all of the initiatives out in the field. It is anticipated that future AEPI MACOM Fellows will continue to gather information from installations and agencies and will update this document biennially. Appendix C includes a comment form for installations, laboratories, agencies and other Army organizations to submit their good news to AEPI.

Headquarters, Department of the Army

Senior Environmental Leadership Conference (SELC)

The Army demonstrated leadership commitment by establishing the Senior Environmental Leadership Conference (SELC) in 1988. This annual conference promotes the Army's efforts to identify and respond to environmental issues. The third and most recent SELC was held at West Point, New York in the fall of 1991.

Army Environmental Policy Institute (AEPI), Illinois

POC: Ravi Jain, (217) 373-3320

In 1990 the Army established the Army Environmental Policy Institute to provide long-range strategic planning for future environ-

mental requirements. Participants at the first two SELCs identified the need for an environmental institute. Secretary of Defense Richard Cheney underscored the importance of AEPI at the Defense and Environmental Initiative Conference in September 1990. He said the Institute's purpose was to "study ways to deal effectively with current and future challenges." Institute projects are conducted by a small, permanent staff with assistance from academia, industry, and regulatory agencies as well as military major commands and installations. The Institute's current responsibilities are to:

- Anticipate environmental trends
- Assess and analyze future environmental challenges, problems, and opportunities
- Remain abreast of environmental protection technologies
- Provide an annual fellowship to an installation or MACOM
- Expand Army interaction with academia, industry and others
- Integrate environmental science, technology, Army mission and policy issues, and explore all policy options
- Publish an annual report.

Senior Executive Environmental Council (SEEC)

The Senior Executive Environmental Council (SEEC) was chartered in December of 1989. The Council's mission is to focus the Army's attention on environmental issues. The Council addresses key issues concerning coordination and problem solving.

Environmental Strategy

The Army is developing an overall environmental strategy for its environmental program. All Army programs are responsible for implementing the environmental strategy. This strategy forms the basis for the Army's Environmental Program long-term management. Program managers have one year to demonstrate progress in implementing the strategy's goals and objectives. To ensure overall

coordination, the SEEC will brief the Vice Chief of Staff of the Army annually on the strategy's progress. This process will ensure a continuing high-level dialog on strategy formation and implementation.

Army Environmental Budget

Beginning in 1989 environmental requirements were tied into the budget process through the 1383 Report. A Management Decision Package (MDEP) was also established. This tracking mechanism for environmental compliance gives greater visibility to expenditures for environmental compliance activities. This action permitted funding decisions to reflect environmental requirements and to target resources on the highest priority compliance projects. This became part of the Army Environmental Compliance Achievement Program (ECAP) which was developed to focus attention on compliance expenditures. Prior to Fiscal Year (FY) 1991, environmental compliance costs were not separately identified or tracked. ECAP can now provide this information. Environmental funding totalled more than \$591 million dollars for FY90 and more than \$809 million for FY91. These monies are applied to the following activities:

- Environmental compliance
- Environmental military construction
- Base realignment and closure
- Environmental restoration
- Defense environmental restoration account for current and former sites and reimbursement to states for defense environmental restoration activities.

Environmental costs for FY92 are estimated to be \$1.095 billion with similar figures projected for FY93. These funding levels reflect the Army's commitment to complete environmental compliance.

Pollution Prevention in New Weapons Systems

Recently, the Army began using a multidisciplinary team of experts working with individual program executive officers and program managers to reduce hazardous materials in new weapons systems. Substantial thrusts are underway in pollution prevention in major weapons systems acquisition programs and in developing state-of-the-art industrial process technology.

Underground Storage Tank Working Group

Guidance from the Underground Storage Tank (UST) Working Group assists installations in achieving compliance with all applicable UST regulations. On-going actions include:

- A program to upgrade guide specifications for new UST locations
- Developing a guidance manual for remediating UST sites
- Developing the Army 1990 UST Compliance Guide
- An update of the UST inventory data base and the UST Leak Potential Index.

Approximately 60 percent of the Army's 14,000 UST sites, 25 years or older, were brought into compliance through testing and upgrading.

Cultural Resource Protection

There are hundreds of historic sites on defense installations listed on the National Register of Historic Places. These include individual buildings, structures and sites as well as districts, such as the U.S. Military Academy at West Point, New York. The history encompassed in these places spans thousands of years, from the oldest archeological sites, to structures of the atomic age, such as the Trinity Site at White Sands Missile Range in New Mexico. In Monterey, California, the Army now manages land hallowed by the Spanish explorers who landed there in 1602 and who established a presidio and mission on the same site in 1770. Other installations contain historic

places dating back to the early 18th century, including a hacienda designed by the first registered woman architect in California for one of the wealthiest ranges in the United States. Archeological information on defense lands include an ancient temple in Hawaii, the adaptation of man to the change from Lake Mojave to the Mojave Desert, ice age activities in Central Texas, the mound builders of the Mississippi region, the native cultures first contacted by Europeans, as well as with 18th and 19th century settlers and their changing industrial, agricultural, and domestic systems.

To meet the requirements of the National Historic Preservation Act, the Army issued a regulation that delegates responsibility for compliance with the Act to each installation Commanding Officer and requires installations with historic properties to prepare historic preservation plans. These plans include procedures for inventorying the historic and archeological places, evaluating their significance, and determining how the historic places should be treated.

There are a number of other issues the preservation program addresses in addition to the challenges involved in maintaining old building materials and techniques. These include trying to find adaptive uses for historical buildings. Historical hospitals are abandoned for new medical facilities or obsolete stables for new vehicle sheds. For both historical preservation and economic reasons, the Army looks for adaptive uses of these buildings, often making a hospital into the installation headquarters or rehabilitating the stables for machine shops.

There are more than 2000 quarters on Army installations which have been identified as historically significant and are still used for housing families. These quarters are a major contributor to the historical character of the installations and are frequently associated with former military leaders, such as Robert E. Lee, George S. Patton, and Dwight D. Eisenhower.

Environmental Law Division

The Secretary of the Army recently approved a plan to create an Environmental Law Division in the Office of the Judge Advocate General. This is another indication of the steps being taken to improve environmental compliance at Army installations. By establishing this single focus for environmental law matters on the Army staff, the

Army can be more responsive to and avoid problems involving legalities. As part of its job, the new law division will supervise annual installation environmental attorney training.

National Watchable Wildlife Program

In 1990 the Assistant Secretary of the Army for Installation Logistics and Environment (ASA, IL&E) and Acting Assistant Secretary of the Army for Civil Works (CW) signed a Memorandum of Understanding (MOU) to establish the National Watchable Wildlife Program. The Army is working with 11 other federal, state, and private conservation organizations to develop a national network of wildlife observation sites, on 12 million acres of Army land, to see animals in their native habitats. The program will also include educational aids to help school children, naturalists, and the general public observe and learn about U.S. wildlife.

The Radon Reduction Program

The Radon Reduction Program, established by the Department of the Army in March 1988, will be implemented in two phases. The first phase included testing all buildings by September 30, 1991. Corrective actions will be implemented depending upon the radon levels detected, but all mitigation procedures must be completed by September 30, 1997. A priority system was established which included family housing units, billets, day care facilities, hospitals and schools as the first priority category. Overall, approximately 350,000 buildings leased or owned by the Army will be evaluated. The U.S. Army Engineering and Housing Support Center (USAEHSC) at Fort Belvoir, Virginia manages the program. Centrally managing this program has proven to be very efficient and productive.

Hazardous Waste Minimization Program

All major commands develop and maintain Hazardous Waste Minimization (HAZMIN) programs that emphasize recycling, routine audits, source and toxicity reduction, and economic evaluation of HAZMIN alternatives. Most recently, the Army decentralized the funding for hazardous waste disposal. Installations are now respon-

sible for funding their hazardous waste disposal. In addition, the Assistant Secretary of the Army for Research, Development, and Acquisition is conducting a three-part study to identify the opportunities for hazardous waste reduction at the source throughout the material acquisition life cycle.

Hazardous Waste Minimization Incentive Awards

POC: George Carlisle, (703) 696-8078

In 1992, the Army established the Secretary of the Army Hazardous Waste Minimization Incentive Awards Program. This program will provide monetary awards to installations and individuals who develop and/or implement methods for eliminating wastes that pose physical, chemical or health threats to people or the environment. The program offers up to \$10,000 for individuals and up to \$250,000 for installations. Each year MACOMs may nominate up to four individuals and installations or subordinate organizations that have contributed to preventing, reducing or controlling waste, or to on-site treatment to minimize disposal. Awards will be based upon achievements from 1987 through the present. Within each category, 5 to 10 awards will be given, depending on the number and caliber of the nominations received.

Natural Resources Management Program

Responsibly managing the natural resources found on Army lands is essential to maintain the Army's ability to conduct realistic training. Wise natural resource management practices are an inherent part of the Army environmental program. The natural resource management program includes endangered species management, forestry, fish and wildlife management, land management and recreation.

Endangered species exist on 62 Army installations. Some of the last remaining habitat for several species is on Army lands. The Army conducts species studies and protects and manages habitat that these animals need to survive and flourish. Hunting and fishing programs were operational on 94 percent of the Army's continental U.S. installations as FY89.

More than 1.3 million acres of timberlands contain useful training environments as well as vital forest resources and wildlife habitats. Active forest management programs are thriving on 71 Army installations. Among the responsibilities of Army forest managers are maintaining healthy, productive forest stands, managing forest product sales and commercial yields, and monitoring and controlling forest insects and diseases.

Army installation outleasing agricultural lands for crops or grazing increased from 7 percent in 1985 to 87 percent in 1989. The Army takes action to preserve these lands, including preventing or abating water pollution, controlling pests and noxious weeds, protecting cultural resources such as Native American archaeological sites, identifying and protecting biological communities and unique physical features, and consistently practicing good fire prevention techniques.

About 90 major Army installations manage active fish and wildlife programs. Programs include hunting, fishing, and catch-and-release fishing. Fees from these programs have generated more than \$1 million to be used for a variety of fish and wildlife management projects.

Numerous outdoor recreational programs enhance the quality of life on Army installations and within local communities. These programs include off-road vehicle use, hiking, camping, hunting, fishing, picnicking, birdwatching, and volunteer projects.

Commander's Guide to Environmental Management

An updated and revised Commander's Guide to Environmental Management was published in 1990. This guide is designed to provide Commanders information about their environmental responsibilities.

Protecting the Chesapeake Bay

The Department of Defense (DoD) and the Environmental Protection Agency (EPA) entered into an agreement which establishes a policy of coordination and cooperation consistent with the 1987 Chesapeake Bay agreement. DoD made commitments in four major areas: participation, planning, funding, and audits and inspec-

tions. The Army manages more than 212,000 acres within the Bay watershed. Today, 84 percent of this acreage remains undeveloped, preserving the natural environment of the Bay. The Army is committed to defending the Bay from further environmental decline. Army installations are improving water quality, protecting living resources, managing industrial development, and promoting public awareness under a coordinated Army environmental strategy.

Tidewater Interagency Pollution Prevention Program (TIPPP)

In August 1991, the Army signed an MOU to establish a policy of cooperation in the Tidewater Interagency Pollution Prevention Program (TIPPP). The Army joined with the Navy, Air Force, NASA and EPA on this MOU to formalize service and agency roles and responsibilities and establish a framework for implementing pollution prevention projects and initiatives at TIPPP facilities. The TIPPP is intended to develop innovative pollution prevention technologies and facilitate technology transfer among the services and agencies.

Electromagnetic Pulse (EMP) Environmental Documentation

Using the National Environmental Policy Act process in decision-making is illustrated by the environmental analysis prepared for Army electromagnetic pulse (EMP) facilities. DoD uses EMP generators to simulate effects that nuclear explosion pulses may have on electronic and communications equipment. In 1987, Army decision-makers were questioned about how EMP devices affect the environment. Of particular concern were the unknown factors associated with the effects of EMP testing. The Army took a proactive approach to determine the potential environmental effects of EMP, including potential human health and ecological effects. The environmental analysis was comprehensive and included long-term monitoring programs as well as review by agencies or persons with special expertise with EMP and its effects.

Environmental Compliance Achievement Program (ECAP)

Under the Environmental Compliance Achievement Program (ECAP), operating funds are provided to installations to meet and maintain environmental standards and achieve pollution prevention goals. ECAP includes projects and activities related to hazardous waste disposal and minimization, repairs and improvements to meet emission and discharge standards, underground storage tank inspection and repair, groundwater monitoring, environmental documentation, environmental compliance assessments, training, pollution abatement for all media, and other related efforts to achieve and maintain compliance with environmental regulations. More than \$500 million was identified in the FY92 budget to address environmental requirements of the Military Construction Program, National Guard and Reserves, and Active Army.

Environmental Compliance Assessment System (ECAS)

The Army established a new, comprehensive, multimedia environmental compliance assessment (audit) at its facilities beginning in FY92. Headquarters, Department of the Army (HQDA) tasked the U.S. Army Corps of Engineers to develop the Environmental Compliance Assessment System (ECAS) to conduct an assessment of every installation in CONUS and OCONUS (the continental U.S. and overseas) over the next four years. The ECAS program primary goals are to:

- Ensure, through the environmental auditing process, that Army facilities are in compliance with applicable federal, state, and local environmental requirements
- Identify the Army's environmental resource requirements for compliance
- Provide a profile mechanism for measuring progress toward compliance
- Help integrate management of all environmental programs at each echelon.

HQDA has identified the ECAS Program as one of the top priorities in the Environmental Compliance Achievement Program. As such, HQDA has committed more than \$21 million for each of the next several years to fund this program.

Environmental Response and Information Center (ERIC)

The Army Environmental Response and Information Center (ERIC) was established in 1990 to offer senior Army leadership timely updates on the overall status of the environmental program. ERIC includes information on environmental requirement identification, compliance at all installations, and trend analysis to identify systemic problems.

Air Pollution

The Army has contributed significantly to reducing air pollution. A major study to characterize and quantify emissions and residues resulting from open burning or open detonation operations is near completion. A comprehensive assessment of the estimated costs associated with implementing the Clean Air Amendments was completed. Army facilities will expend more than one billion dollars in operating and capital costs to comply with the new statutes. Managing ozone-depleting substances will add to this cost. In addition, the Army has instituted new controls to limit the escape of volatile organic compounds during fuel transfer operations.

Wastewater

New wastewater treatment plants were constructed at Radford Army Ammunition Plant, Virginia; Lake City Army Ammunition Plant, Montana; Fort Bragg, North Carolina; and Fort A.P. Hill, Virginia. At the same time, EHSC conducted a Wastewater Treatment Plant Operator Assistance Program. This program involves site visits to 70 plants, documenting any plant deficiencies, and a two-day training session for operators.

Environmental Training

The Army Logistics Management College (ALMC) at Fort Lee, Virginia provided training to more than 25,000 Army students in the eight environmental protection courses offered in FY90.

Noise Pollution

Noise generated by Army activities is an environmental issue in the United States and in Europe. The Installation Compatible Use Zone (ICUZ) identifies and mitigates present and future noise problems at installations Army-wide. Ninety-one installations have begun the ICUZ program. The Army is also participating in a cooperative, proactive program to reduce encroachment to surrounding communities. The DoD Joint Land Use program provides opportunities for installations and their surrounding communities to work together to address noise pollution. The Office of the Secretary of Defense and the DoD Office of Economic Adjustment provide funds to selected communities to conduct studies to identify methods for reducing military encroachment, including aircraft and artillery noise. The installation or installations involved in the study provide the communities with ICUZ and economic impact data.

The Army is committed to a tri-service approach to noise issues. The following new developments reflect this commitment:

- Noise management training in Europe to include an interactive sound information system
- Adopting the Air Force's NOISEMAP computer program to provide noise contours for land use planning in the vicinity of Army air fields
- Research on how to gather operational data on noisy activities.

The Legacy Program

The Department of Defense Legacy Initiative will determine how conserving irreplaceable biological, cultural, and geophysical

resources can be more effectively integrated with the dynamic requirements of military missions. DoD will give high priority to inventorying, conserving, and restoring biological, cultural, and geophysical resources in a comprehensive, cost effective, state-of-the-art manner, in partnership with federal, state and local agencies, and private groups. To assist with administering the Legacy Initiative, DoD has requested that the Department of the Army provide support for the program's cultural resources component, and to help provide oversight for the biological and geophysical components. Technical assistance in these areas is provided through the Office of the Chief of Engineers by the USAEHSC. Examples of Army participation in the Legacy Resource Management Program follow.

Environmental Interpretive Center, Fort Lewis

This project has a two-fold objective. The Fort Lewis Environmental Interpretive Center was created to increase the awareness of Fort Lewis troops, staff, and visitors regarding environmental values and natural and cultural resources. The second objective is to showcase Fort Lewis and Army environmental accomplishments. Interpretive exhibits currently considered for display at the Center include: biodiversity and succession in the Fort Lewis forest and prairie environment and aboriginal and early historical adaptations near the installation. Fort Lewis environmental initiatives to be emphasized include the recycling and waste minimization program, environmental restoration, and endangered species research. The Interpretive Center will be housed in an existing Fort Lewis museum.

Provide Public Access, Fort Story

Fort Story, a sub-installation of Fort Eustis, Virginia, is an area of great historical significance. Not only did the first permanent English colonists in America land there, but a major sea battle occurred there as well. The Battle of the Capes, in which the French Fleet under DeGrasse defeated the British, assured an American victory in the Revolutionary War. A wooden overlook providing a vista of the Chesapeake Bay as well as displaying historical information, is in the planning stage. The overlook could be incorporated into a trail system to be developed at Fort Story.

WWII Buildings, Fort McCoy and Camp Edwards

Written and photographic documentation of the WWII buildings and cantonment at Fort McCoy in Wisconsin and Camp Edwards in Massachusetts has been prepared in accordance with the standards of the National Park System's Historic American Survey. This material was assembled as part of a DoD study on the history of WWII cantonments, design, and construction. It provides an example of almost every type of mobilization building designed by the Corps of Engineers. Assembling the Fort McCoy and Camp Edwards publication will make the information available to the public for the 50th Anniversary of WWII. It will also increase interest from DoD and others in the complete WWII temporary building history currently being prepared.

Land Restoration, Fort Bragg

Through the Legacy Program, Fort Bragg is restoring land to protect and preserve two, active, red-cockaded woodpecker colonies and their forage area. The project will restore and revegetate Jone's Drop Zone, a 70 acre tract of training land. It will include soil erosion and sediment controls to prevent destroying the endangered bird's colony trees and forage areas situated within Jone's Drop Zone.

U.S. Army Materiel Command (AMC), Alexandria, Virginia

Support Agreement

POC: Paul Rubenstein, (202) 272-8731

In April 1989, the U.S. Army Corps of Engineers (USACE) and the U.S. Army Materiel Command (AMC) entered into a two year trial agreement on cultural and natural resource management planning support. The Corps center of expertise for the agreement is the Southwestern Division, which has provided the program support to the Fort Worth District. Fort Worth has provided award-winning service to AMC's cultural resource management program. As a result,

the AMC Commander has contacted Headquarters U.S. Army Chief of Engineers with a request to extend the support agreement.

Hazardous Waste Minimization Program

POC: Andy Talts, (410) 274-9016

AMC has made significant advances in minimizing the hazardous waste it generates while accomplishing its mission. At the end of calendar year 1990, hazardous waste generation had been reduced by 49.3 percent, despite increased production in maintenance workloads due to Operations Desert Shield/Storm. This significant achievement is presented in a report which reviews the advances AMC has made in minimizing the hazardous waste generation from 1985 through 1989. The report gives an overview of AMC and the HAZMIN initiatives of the AMC Subcommands and each of their 57 installations. The report includes two appendices which provide data on the hazardous waste produced from the various processes at installations and details for each project at each installation including project costs, funding, hazardous waste reduced, and costs savings.

Headquarters Forces Command (HQFORSCOM), Fort McPherson, Georgia

POC: Rudy Stine, (404) 669-7792

Hazardous Waste Minimization Plans

Headquarters Forces Command (HQFORSCOM), working with U.S. Army Construction Engineering Research Laboratory (USACERL), prepared five hazardous waste minimization plans for selected installations. These plans were prepared at installations with varied missions (i.e., medical, light infantry, heavy infantry, helicopter aviation, and administrative missions). Other installations can use these plans as examples based on their particular mission. This approach has saved funds and reduced future efforts required to prepare these plans.

Training Film

HQFORSCOM prepared a film Every Little Bit Hurts that provides basic training to soldiers on how to handle waste acid, waste oil, solvents, and various chemicals typically found in the Army motor pool. The 18 minute film is geared to the soldiers working in and around motor pools or Area Maintenance Support Activity (AMSA) shops dealing with hazardous materials and wastes. The film has been well received and more than 400 copies have been distributed nationwide to Army installations and reserve elements. The film is available at installation Training Aid Support Centers (TASC), video number SAVPIN709223DA.

Environmental Compliance Assessments at Reserve Centers

FORSCOM tasked the 416th Engineer Command to conduct compliance assessments at U.S. Army Reserve (USAR) facilities. To prepare for this mission, each of the 416th facility engineer teams attended a four-day course on assessment procedures. Providing the 416th's personnel with universal training ensured uniform application of the environmental compliance assessment Army Reserve protocol at all USAR facilities, standardized reporting, and achieved consistent results. This tasking builds on the 416th's mission to conduct maintenance and repair surveys and is extremely cost effective.

Army Regulation Summaries

HQFORSCOM hired a contractor to summarize each chapter of Army Regulation 200-1. Each summary is only two to four pages long, making them valuable to managers and operators who work under time constraints. The summaries describe environmental coordinator responsibilities by highlighting important points.

Environmental Awareness Sessions

HQ FORSCOM, using the services of the Army Logistics Management College (ALMC) at Fort Lee, Virginia, conducted environmental awareness sessions for all of its installations. The Post

Commander or Garrison Commander and all major directorates of the installation attended the sessions. The sessions involved one environmentalist from FORSCOM and one environmental instructor from the ALMC going to each installation to make presentations ranging from four to eight hours. The program was very successful and increased installation command staff's environmental awareness including all major directorates having responsibility in the environmental program. The sessions were very cost effective and required only travel costs for the instructor and FORSCOM personnel. Mr. Bill Hamilton, Mr. Jerry Holsinger, and Ms. Susan Thomas are commended for providing such excellent support to HQFORSCOM.

MOU with South Atlantic Division Corps of Engineers

In FY87 FORSCOM initiated an MOU with the South Atlantic Division Corps of Engineers to coordinate Corps of Engineer environmental support for FORSCOM and FORSCOM installations nationwide. Since that time the Corps' support to FORSCOM has increased dramatically as a result of this document. Corps' support included environmental documentation, noise studies, contract support, and miscellaneous emergency environmental response actions. The mechanism provided a quick response, fully using nationwide Corps of Engineer assets. Assistance has been provided from numerous Corps districts with special customer support from the Mobile District.

Recycling Program

FORSCOM is working to develop a recycling program at the forefront of DoD efforts. This will be accomplished by recycling the maximum possible percentage of the solid waste stream. The FORSCOM goals are to reduce and recycle 25 percent of the solid waste stream by 1992, 35 percent by 1994, and 50 percent by the year 2000.

Environmental Operation Center

FORSCOM established an Environmental Operation Center to provide greater support to installation environmental staffs. A help line was made available to installation environmental coordinators

who require quality answers to pressing environmental problems. The help line does not replace the numerous hot lines available, but is a useful tool in finding answers to questions specifically related to things not covered in other telephone assistance lines such as manpower, FORSCOM policies, budget information, and help with environmental reports. Staff at the Operation Center do literature searches, offer on-site assistance, and coordinate with FORSCOM staff, HQDA, USATHAMA, U.S. Army Environmental Hygiene Agency (AEHA), EPA, and other agencies to provide a quality response to questions asked. The center also serves as the notification office of Notices of Violation (NOVs) and maintains monthly compliance profiles for FORSCOM installations as required by Army regulations.

U.S. Army Corps of Engineers

Removing Unexploded Ordnance

POC: Patricia Coffey, Nashville District, (615) 736-5028

The Corps of Engineers through the Defense Environmental Restoration Program designed a plan for removing Unexploded Ordnance (UXO) from South Beach, a popular recreational beach on Martha's Vineyard Island, Massachusetts. Coordination with other agencies and the expertise of the Army and Navy Explosive Ordnance Disposal (EOD) teams provided the information needed to prepare a comprehensive plan for ordnance removal which minimized environmental impacts. The primary dune on South Beach was removed in 1989 to clear UXO from the underlying glacial till material. The dune was then replaced to its original configuration and revegetated with nursery stock of the cape variety American beach grass. Sand fencing and a biodegradable mat were also used to control erosion. A monitoring program, established to track beach grass growth, has shown that after two years the area is returning to normal coverage and the species diversity is increasing. It is expected that by the end of the third year monitored results will show full or nearly full recovery.

Destroying Asbestos-Containing Waste Materials

A two-year Corps project will develop and demonstrate a mobile-plasma arc furnace system for on-site vitrification (to change into glass) of asbestos-containing waste materials. Based on phase one work which successfully demonstrated the ability of a plasma arc furnace to vitrify asbestos waste, a 15 ton per day unit will be developed which would meet all disposal standards and provide a safe and final disposal of asbestos fibers. The system will substantially reduce the cost of asbestos removal and disposal.

U.S. Army Environmental Hygiene Agency (AEHA), Aberdeen Proving Ground, Maryland

Installation Support

POC: John Resta, (410) 671-3652

AEHA receives requests from many installations including Fort Richardson, Tobyhanna Army Depot, Fort Bliss, Indiana Army Ammunition Plant, and Fort Meade to provide sampling, analysis and reporting services. This involves extensive drum sampling to identify and characterize accumulated waste. Once identified, appropriate handling and disposal practices are recommended. Such activities have resulted in considerable cost savings to the government compared to obtaining similar services through a contract.

Support to Louisiana Army Ammunition Plant

POC: John Bauer, (410) 671-2024

AEHA facilitated an agreement between Louisiana Army Ammunition Plant and EPA concerning contaminated soil that has saved the Army \$19 million. The EPA originally required the Army to remove four feet of soil from the site of the former Area P pink water ponds. The installation had already removed the top 2 feet, which contained more than 99 percent of the contamination. Following discussions with AEHA personnel, EPA ruled that further excavation

was not necessary and that this would not compromise the environmental integrity of the installation.

Support to Tobyhanna Army Depot

POC: John Bauer, (410) 671-2024

An EPA contractor identified 47 solid waste management units at Tobyhanna Army Depot and recommended all be investigated. An AEHA study identified only 32 units and suggested that only five required sampling. AEHA negotiated with the commonwealth of Pennsylvania and the EPA to reduce the number of solid waste units requiring investigation. This will bring the Army a potential savings of \$2,400,000, while still providing the appropriate level of environmental protection.

Support to Fort Bragg

POC: Bill Fifty, (410) 671-3554

AEHA developed a comprehensive water quality monitoring program for Fort Bragg, North Carolina to characterize raw/treated water quality to determine actual treatment requirements. These results were used to define the scope of a \$14 million Major Construction Army (MCA) project for renovating the water treatment plant.

Support to Dominican Republic

POC: John Resta, (410) 671-3652

AEHA provided a quick response to the Dominican Republic in evaluating an abandoned armory historically used to manufacture explosives. This project, requested by the State Department, involved identifying and characterizing numerous, antiquated chemicals. Recommendations were made for the safe handling and disposal of these materials.

Risk Assessment, Hamilton Air Force Base

POC: John Resta, (410) 671-3652

A contractor performed a risk assessment on a sanitary landfill at Hamilton Air Force Base and declared inhaling and ingesting fugitive dust contaminated with lead and arsenic posed significant risk. The Corps of Engineers and the Office of the Secretary of the Army for Installations and Logistics requested that AEHA perform an extensive site study. AEHA found that the site posed no significant health risk for current residents of the Air Force Base. Based upon these findings, the contractor submitted a revised remedial investigation report. AEHA recommendations may result in cost savings of \$45 million.

Review of Closure Plan, White Sands Missile Range

A review of a closure plan for a burn pan site at White Sands Missile Range uncovered several significant technical errors which lead the Fort Worth District Corps of Engineers to conclude that the burn pan activities had contaminated the surrounding soil. The Corps of Engineers recommended that 10,000 cubic yards of soil be excavated to attain clean closure. AEHA evaluated the data and found that there was no contamination above background levels and excavation was not required. These conclusions were accepted by the state of New Mexico during the Spring of 1989. Cost savings from this project were estimated to be between \$500,000 and \$1 million.

Weldon Springs Ordnance Works/Twin Island Lakes Resort

POC: John Resta, (410) 671-3652

AEHA assisted the state of Missouri in assessing off-post drinking water wells contaminated with nitroaromatic compounds. Results indicated minimal health risk to the individuals consuming the water. In addition to the risk evaluation, AEHA made recommendations concerning the supply of an alternate drinking water source and how this action should be accomplished.

Review of Feasibility Study, Seneca Army Depot

POC: John Resta, (401) 671-3652

AEHA reviewed the feasibility study for closing burning pads at Seneca Army Depot, New York. Based upon this review, AEHA determined that all of the alternatives presented were overdesigned. They recommended modifying one of the study's alternatives to create the most cost and environmentally efficient method to close the pads. If the agency's alternative is selected it will yield a cost savings of \$7,891,650.

Environmental Baseline Study, Defense Depot

POC: John Resta, (410) 671-3652

AEHA reviewed a proposed construction location for a child care center at Defense Depot, Tracy, California. Results indicated that the risk assessments contained in the Depot studies and groundwater withdrawal and treatment documents did not sufficiently address the risk to occupants of the child care center from volatile organic contaminants. This action saved the Army from building such a center on a contaminated site.

Review of Draft Endangerment Assessment, Iowa Army Ammunition Plant

POC: John Bauer, (410) 6721-2024

AEHA conducted a standard review of the Endangerment Assessment Draft for Iowa Army Ammunition Plant. This review indicated that the authors had used a worse case scenario modeling approach to generate their exposures. This modeling effort contains no supporting analytical data and much of the information/data was unverified, unknown, incorrect or from different compounds and/or environmental circumstances. AEHA recommended a less conservative and more scientifically correct alternative which, if approved, will result in savings approaching \$75 million in remedial costs while still protecting the environment.

Soil Sampling at Johnson Atoll

POC: John Resta, (410) 671-3652

AEHA conducted extensive soil sampling at the Johnson Atoll to determine the potential impacts of the Johnson Atoll Chemical Agent Destruction System on the health and welfare of the people in the surrounding environment. This effort was initiated in response to concerns raised by Greenpeace that the incinerator emissions may have adverse effects on the soil on the atoll. Such assessments will follow most scheduled burn cycles of the Johnson Atoll facility.

Environmental Workshops

POC: John Resta, (410) 671-3652

AEHA personnel successfully conducted a week-long workshop in Reno, Nevada for HQFORSCOM addressing a wide variety of hazardous waste management and operation issues in August of 1991. In addition, several workshops addressing medical waste and hazardous waste generated at health care facilities were developed and presented at sites in Baltimore, Denver, and Fitzsimmons Army Medical Center. The purpose of these workshops was to provide timely guidance instruction to Army workers handling or administering handling of hazardous waste.

Medical Item Disposal Instruction (MIDI) System

POC: John Resta, (410) 671-3652

The Medical Item Disposal Instruction (MIDI) System has provided ready access to disposal/destruction codes and technologies for waste emanating from Army health care facilities. The information in the MIDI System is available to any activity which has received login instructions to E-mail (or received the available microfiche hard copy) and a user's manual to interpret the disposal codes.

Solid Waste Management Units Review

POC: John Bauer, (410) 671-2024

The Army may potentially save \$250 million because of AEHA's work in identifying and evaluating solid waste management units at most major Army installations. AEHA participated in regulatory negotiations in an attempt to assure that only necessary and appropriate field investigations are mandated by regulatory authorities.

Drinking Water

POC: Bill Bojarski, (410) 671-3554

AEHA was the first DoD Agency to develop a technical guide addressing lead and water coolers and water distribution systems for installations. AEHA also developed a technical guide on drinking water regulations to help installation personnel understand compliance with new and emerging drinking water regulations.

Synthetic Organic Chemical Survey

POC: Bill Bojarski, (410) 671-3554

AEHA initiated the Army-wide Synthetic Organic Chemical Survey in 1987 to obtain an organic pollutant scan for more than 700 Army owned or operated drinking water wells. A number of installations have used these survey results to meet certain phases of the EPA monitoring requirements for four organic chemicals.

Air Pollution From Kuwait Oil Fires

POC: Thomas Guinivan, (410) 671-3500

AEHA personnel, based on the Surgeon General's request, developed and conducted an extensive air sampling program (5,000 samples) to determine exposure levels of air pollutants on DoD personnel from the Kuwait oil fires. Data from the air monitoring program will be the basis for an air pathway analysis section of a health risk assessment being prepared by AEHA.

U.S. Army Construction Engineering Research Laboratory (USACERL), Illinois

Geographic Resources Analysis Support System (GRASS)

POC: William D. Goran, (217) 373-6735

Land managers and training planners at Army installations face the complex task of: facilitating optimal training use of available range and maneuver areas, maintaining current lands in a condition suitable for long-term training use, and protecting valuable natural and cultural resources, including forestry, grazing, hunting, and recreation. Land management problems have become more complicated because new, highly sophisticated weapons require larger maneuver and training range areas. The emergence of a technology called Geographic Information Systems (GIS) has allowed data integration from a variety of sources to assist in making environmental management decisions. GIS includes computer systems with tools for collecting, storing, retrieving, analyzing, displaying, and producing maps of spatial (geographic) data.

USACERL developed Geographic Resources Analysis Support System (GRASS), a GIS, to provide management tools to Army environmental planners and land managers. GRASS can be used for analyzing, overlaying and modeling aerial features such as soil types or forested areas. It can also be used to represent linear features such as roads, streams or area edges and can be combined with raster data for display or analysis. Finally, it can be used to represent landmarks or the location of significant sites.

GRASS allows Army environmental planners and land managers to analyze, store, update, model, and display landscape data quickly and easily. GRASS has been installed at dozens of military installations and most Corps districts and laboratories. Copies are available to the general public through several distribution sites.

Integrated Training Area Management (ITAM)

POC: Bob Riggins, (217) 398-5441

Army training lands have historically been stressed by the repeated use of tactical vehicles, which over the years have become

heavier and faster. In some areas land damage was leading to loss of use. In response, USACERL has developed the Integrated Training Area Management (ITAM) Program.

There are six components to ITAM which provide a comprehensive approach to managing lands that are subjected to military training and testing. The six components are:

- Standardized Land Condition Trend Analysis (LCTA) program
- A multimedia environmental awareness program
- Rehabilitation and revegetation technologies
- Structural erosion control technologies for soil containment and runoff control
- Computerized decision support systems for planning and scheduling military and rehabilitation activities
- Integrating the training mission with natural resource requirements.

ITAM implementation is proceeding rapidly among FORSCOM, Training and Doctrine Command (TRADOC), AMC, and Marine Corps installations throughout the world. At the end of FY90, a total of 23 installations had implemented ITAM. A return on investment study for implementing only the rehabilitation aspect of ITAM shows a savings of \$5 to \$27 for every \$1 spent.

Land Condition Trend Analysis (LCTA)

POC: David J. Tazik, (217) 398-5443

The U.S. Army has procedures to inventory and monitor the impact of equipment and personnel on its training lands. Findings show dramatic increases in both man-days of use and number of tactical vehicles within these training areas. However, until recently, the Army did not have standards for inventorying the condition of its training lands, or for monitoring changes in the quality of its natural resources relative to land uses. Lacking such information, new land managers cannot effectively relate past histories of land use to changes in natural resource conditions. LCTA assists land managers

in monitoring natural resources. LCTA provides land managers and administrators with long-term, accurate assessments of changes in vegetative cover and botanical and wildlife composition, as well as estimates of associated soil loss on Army land under varying levels of use. Using this record keeping system will:

- Better distribute training loads on new land
- Reduce the need for expensive land restoration programs
- Take subjectivity out of land management decisions
- Serve as a policy basis for use/non-use decisions for parcels of land
- Help ensure the sustained availability and productivity of Army land
- Provide input for Integrated Natural Resources Management Plans, Environmental Assessments, and Environmental Impact Statements.

Currently, LCTA is being implemented at 40 installations representing FORSCOM, TRADOC, AMC, U.S. Army Pacific, and Army National Guard. It is also in use in several United States Army Europe Training Areas, two Marine Corps bases, and the U.S. Military Academy.

Video Simulation in Training Land Design

POC: Major Thomas Sydelko, (217) 398-5439 and Robert Sullivan, (217) 373-7231

As part of ITAM, USACERL is exploring the possibilities of using video simulation technology as a communication medium for training land managers. Video simulation allows realistic visual simulations of proposed designs to be quickly and inexpensively prepared. The photographic simulations are produced on a relatively inexpensive personal computer work station. Output can be generated as monitor images, TV images, videotape, hard copy, or slides. Video simulation technology allows land managers to realistically and inexpensively simulate how proposed projects will appear before

they are built. The video medium is familiar both to trainers and the public, and provides a convenient and reliable method for getting trainer input. Video simulation technology also is a versatile tool for providing information to the public and generating public involvement in training land design. Research on training land design video simulation was initiated in 1989. A demonstration project simulating various land management actions has been completed at Hohenfels Major Training Area, Germany. Current application projects include simulating training land development at Friedewald Local Training Area, Germany, and Fort Riley, Kansas.

Noise Monitoring and Warning System

POC: Paul Schomer, (217) 373-7229

The Noise Monitoring and Warning System can warn of weather conditions which contribute to the propagation of noise over great distances. Operations can then be delayed while the adverse weather condition passes. These conditions are frequently brief and thus, complaints are prevented and the overall noise level decreased. The monitoring system also identifies the noise source. From studies at one FORSCOM and one AMC installation, it was discovered that approximately 50 percent of noise complaints to the Army were responses to off-post, non-Army sources. The noise monitoring and warning system reduces complaints, mitigates noise, documents compliance, and avoids the problem of the Army being blamed for non-Army generated noise.

Environmental Technical Information System (ETIS)

POC: ETIS Support Center, (217) 333-1369

USACERL developed the Environmental Technical Information System (ETIS) to help environmental staffs meet Army regulations. The subprograms available under ETIS analyze the environmentally-related impacts of DoD programs. The Environmental Impact Computer System (EICS) identifies the potential environmental impact of Army activities. The Computer-Aided Environmental Legislative Data System (CELDS) provides abstracts of pertinent state and federal environmental regulations. The Economic Impact

Forecast System (EIFS) accesses the socio-economic affects of DoD construction or realignment activities. ETIS is an interactive or conversational system. The user inputs data in response to prompts from the computer which enable ETIS to identify and analyze environmental impacts. The ETIS Support Center is operated under contract with the University of Illinois.

Economic Impact Forecast System (EIFS)

When the Army announces a major action affecting one of its installations, such as a base closure, it is required by law to assess the consequences on the surrounding communities. Without quick access to data and analytical techniques, it would be difficult to complete such studies. The Economic Impact Forecast System is an interactive, computer-based system of data and models for conducting economic impact assessment studies. These data are retrievable by geographic area, which permits a high degree of flexibility in defining regions of analysis. A wide variety of regional economic models with unique theoretic capabilities are available to EIFS users. These include updated and improved versions of the standard forecast models that allow for quick and timely comparison of any number of alternative programs and projects. Their ease of use, simple model structure, and limited user-supplied information requirements make the EIFS forecast models ideal for preliminary planning purposes. EIFS has been used successfully for more than a decade to analyze the economic impact of many Army and Air Force realignment actions.

Although oriented to military applications, EIFS has been applied in various non-military regional economic studies including the economic impacts of constructing a major new sports complex, recreation sites, and port improvement. Responsibility for maintaining and supporting EIFS has been transferred to the ETIS Support Center at the University of Illinois, Urbana, Illinois.

Computer-Aided Environmental Legislative Data System (CELDS)

POC: Diane Mann, (217) 373-6741

The number of environmental regulations has grown rapidly since 1969 and these regulations change quite frequently. In response, the environmental planner must have some way to determine:

lations for an activity
lations over a period of time
regulated environmental values.

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Transformer System

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Pollution Engineering Magazine
er System as one of the most
on abatement.

Economic Analysis of Hazardous Waste Minimization Alternatives

POC: Bernie Donahue, (217) 373-6733

USACERL has developed and is demonstrating an economic model for evaluating the lifecycle costs for the Army's most prevalent hazardous waste streams. Several waste streams, including solvents, paint stripping waste, used oil, metal flaking waste, batteries and battery electrolytes, industrial waste, and other general wastes, were analyzed within the model. The economic analysis model evaluates the relative worth of a proposed hazardous waste minimization project over its lifetime. This allows the Army to distinguish between a seemingly low cost practice that may actually cost more over time and an alternative which initially appears more expensive but is more cost effective over the long run. The model also allows the user to evaluate the lifecycle cost of the various techniques used for hazardous waste minimization and to compare them to the lifecycle cost of current operating practices. This results in reduced liabilities and waste disposal costs to the Army. Additionally, the program can be used to project costs and feasibility of other purchases or product substitutions and is not simply limited to hazardous waste. The economic analysis model was completed and field tested in FY90. Since then, it has been transferred to more than 60 Army installations worldwide and has also become available to the public sector.

Asbestos Microscope

POC: Bernie Donahue, (217) 373-6733

One of the prime steps in any asbestos management program is to qualitatively and quantitatively identify asbestos material. The polarized light microscope technique is the most cost-effective, accepted method for asbestos analysis, but laboratory grade instruments are costly and not suitable for field work. In response, USACERL contracted Hygeia, Inc. to develop a field-portable asbestos identification microscope. Hygeia developed a prototype, a user's manual and a series of standard slides for analyzing bulk samples. Six scopes were then produced and field tested at Army installations. The microscope is now being produced commercially by Hygeia, Inc. The

how to use the microscope for the package. The availability of this money in identifying asbestos mate-

g Water Quality Control n Systems

-6743

act Reenactment requires evaluation of distribution systems and its effects on the process if the system must be replaced. The pipe loop system is designed to keep samples in direct contact with the pipe during normal operation. The loop system is operated by plant personnel using off-the-shelf equipment at the water plant or in the distribution system. Samples are easily removed from the pipe and the flow is easily controlled. The pipe loop system is used for many purposes from visually inspecting a pipe material to completely replacing a pipe. The pipe loop system provides a basis for evaluating pipe materials including material selection and the use of treatment chemicals. Internal pipe loop systems has direct benefits for pipe life, aesthetics, and health. One installation saves \$5,000 per year in chemicals and the pipe loop system also can be used to compile a list of pipe material to maintain the extended life of the pipe.

Loop System in optimizing water distribution from plumbing systems was demonstrated at Edgewood Water Treatment Plant, Edgewood, California. A protocol for meeting EPA production water treatment options to be used in household plumbing. Similar systems are in use at Fort Ord, California and Fort

Lewis, Washington. Other lead control demonstrations are being initiated. The USACERL Pipe Loop System will be made commercially available for Army installations through an exclusive licensing agreement.

Centralized Vehicle Wash Facilities

POC: Joseph Matherly, (217) 373-7233

Conventional procedures for cleaning tracked and wheeled Army vehicles are labor intensive, use large amounts of water, and runoff from the cleaning process often pollutes nearby waterways or causes other pollution control problems. The centralized vehicle wash facility and schedule maintenance platform technology developed at CERL uses improved wash equipment and water pressures, wash station layouts which increase productivity and are more responsive to the operating characteristics of the varied fleet of Army tactical vehicles, and wastewater treatment systems which allow water recycling or discharge to the installation sanitary sewer system.

The wash systems have reduced potable water consumption for washing vehicles 90 to 95 percent, and significantly reduced labor required for cleaning vehicles and servicing conventional wash racks. Scheduled maintenance platforms constructed at Fort Lewis and Yakima have proven the concept of using high pressure hot water cleaning systems for cleaning mechanical components in tactical vehicles. This technology has virtually eliminated the need to use cleaning aids such as solvents, fuels, and detergents for major cleaning requirements in vehicle maintenance. When detergents and other cleaning aids are not used, small gravity separators can adequately remove oils, grease and sediment from the greatly reduced wastewater flow before it enters the installation's sanitary sewer system. Users have indicated a 50 percent or greater reduction in manpower required for maintenance cleaning and service activities. Using this system helped avoid significant capital cost expenditures for pollution control facilities.

The USACERL's concept for central wash facilities at installations having heavier soiling conditions was built at two locations in Fort Polk, Louisiana. The facility at Fort Polk is referred to as a "tank bath" design, and it has received greater attention because of the

ge numbers of heavily soiled Army water into which tracked and wheeled vel is adjustable and both the entrance s which troops use to remove the bath as resulted in a significant manpower it is estimated to take less than one one-half hour for wheeled vehicles, even and one half hours for a tracked urs to clean wheel vehicles. Several ave been constructed under the Pro- (PIF) Program. A return on invest- for each facility has generally had years with some as low as one year.

Findings

n housing and public buildings was t of the Army's 270 million square before then and is likely to contain d weather can cause the paint to chip t. In FY90 USACERL conducted luorescence (XRF) device that can and inexpensively than wet chemical o show experimental error within using a comprehensive XRF for lead de. Also in FY90 USACERL com- strategies in preparation for vacuum ique reviews.

Waste Management System for 8th Army

veloped a comprehensive hazardous zation system for the 8th Army in shing detailed guidance and translat- tal regulations into English for Army waste minimization survey was con- were recommended. Computers and g and manage hazardous waste data. uipment was provided along with

training in emergency response to hazardous waste spills. As a result of the USACERL hazardous waste initiative, it is estimated that the 8th Army's hazardous waste generation may drop by as much as 70 percent within three years. This would greatly surpass the Army's specified reduction goal of 50 percent.

Hazardous Waste Minimization in Procurement

USACERL personnel participated in this landmark study conducted for the Office of the Assistant Secretary of the Army for Research, Development and Acquisition. Completed in FY90, the study includes recommendations that would revolutionize systems acquisition by raising the environmental aspects of a proposed system to the same level of priority as other project management drivers.

Hazardous Waste Management Information System (HWMIS)

POC: Lynn Mikulich, (217) 373-6749

Army installations typically have many diverse activities that use hazardous materials (HM) and/or generate hazardous waste (HW). The Hazardous Waste Management Information System (HWMIS) is an integrated computer system designed for environmental engineers at all Army levels. HWMIS allows the Installation Environmental Coordinator to store, update, retrieve, and generate reports on HM/HW from cradle to grave, or from the time an HM enters the post or is generated until it is disposed of as HW or otherwise handled.

USACERL, in cooperation with the Logistics Control Activity (LCA) at the Presidio of San Francisco and the Standard Army Automated Contracting System (SAACONS) Program Manager at Fort Lee, Virginia, has developed a new module to HWMIS. The new module, the Hazardous Materials Identification (HMID) module, will receive data from LCA and SAACONS that identifies HM purchases, the quantities, and the units that receive them. This information will allow the Environmental Coordinator to know what types of HMs are entering the installation, which will be useful in tracking the HM and developing HM/HW minimization plans. An aggregate level HWMIS has been developed to help Major Command and Department of the

Army environmental managers stay informed about HW/HM activities on the installations. HWMIS and HMID also meet the installation's upward reporting requirements to federal, state, local, Department of the Army, and DoD elements. HWMIS will lower manpower requirements in managing HM/HW by providing an automated, user-friendly system for data storage and retrieval as well as reports generation. The data in HWMIS will also be important in helping installations structure a hazardous waste minimization program. HWMIS will be a valuable tool in providing managers with timely, accurate information on HM/HW to help comply with the applicable regulations. Finally, the automated report preparation will save hundreds of man-hours per year at all levels, from the installations to headquarters.

Hazardous Expertise (HAZE) Knowledge-Based System

POC: Cathy Demeroukas, (217) 352-6511

Army Environmental Coordinators are responsible for properly handling and disposing of hazardous materials and wastes. The Hazardous Expertise (HAZE) Knowledge-Base System is an electronic bulletin board being developed that serves as a self-generating database. Environmental personnel at installations can post questions, observations, and tentative solutions on HAZE, and environmental personnel at other installations can respond to the posting with comments and successful techniques for solving the problem. These responses are added to the original posting for review by other HAZE users who may continue to add information.

Current HAZE subjects include disposal methods, labelling questions, good management practices, hazardous minimization, testing and dispensing, spill control, hazardous materials storage, and treating hazardous waste. The system contains listings of experts and environmental personnel at each Air Force and Army Installation. A library for recommended publication and unpublished documents, a listing of meetings and courses which may be of interest, and a section for comments or suggestions on other topic areas is included as well. HAZE aids Army and Air Force environmental personnel from a wide range of geographic locations and levels of command by providing an easy, informal communication medium. HAZE is still under development at USACERL and is an experimental subprogram of ETIS.

Department of Defense Environmental Electronic Bulletin Board System (DEEBBS)

POC: Cal Corbin, 217-352-6511

The Department of Defense Environmental Electronic Bulletin Board System (DEEBBS) is a computer bulletin board that will dramatically improve the timeliness and effectiveness of distributing DoD policy decisions and guidance to the field. System capabilities for users include horizontal data information sharing, feedback, verification, direct data links, and continuous process involvement. DEEBBS will also provide users easy access to important databases, such as CELDS, and technical bulletins. This system will save considerable administrative and user time, as well as wear and tear on the resources typically used to manually access new information. The field-test version was brought on-line at FY90 at the DoD Secretariat and Command level. Preparations are underway to export it to the MACOM and installation levels.

Bioremediation of Oil Spills in Cold Regions

USACERL is working with research with the Army Cold Regions Research Engineering Laboratory (CRREL) and others to develop bioremediation methods for oil spill cleanup. The project was initiated through the Corps' Construction Productivity Advancement Research (CPAR) Program as a result of the Exxon Valdez oil spill in Alaska. Bioremediation may offer a less expensive, more effective alternative to conventional oil spill remediation techniques in cold areas, and should be applicable to Army cleanup projects.

Preserving American History

To promote cultural and natural resource productivity on military installations, USACERL participated in two archeological projects. One project involved rediscovering the site of the Wright Brothers original hangar at what is now Wright-Patterson Air Force Base in Ohio. USACERL also worked on a team at West Point to locate a burial site for historic weapons.

Support for Operation Desert Shield

Water operations and sanitation are extremely vital to the viability of a desert fighting force. The tremendous logistical problems of supplying water to hundreds of thousands of troops in a theatre of operations makes it crucial to employ all available methods of water conservation, reuse, and recycling. USACERL research from three previous Bright Star desert exercises has demonstrated potential water savings of up to 80 percent for field laundries and showers. Overall savings in water could exceed 40 percent. Desert operations immediately require a sanitary latrine unit that can function adequately without an external water supply. USACERL advisors briefed desert shield engineers on units previously demonstrated at Fort Jackson, South Carolina. Benefits include improving sanitary conditions, reducing odor, and preventing environmental contamination.

Cold Regions Research and Engineering Laboratory (CRREL), New Hampshire

Cold Regions Environmental Efforts

POC: Public Affairs Office, (603) 646-4292

The Cold Regions Research and Engineering Laboratory's (CRREL) mission is to gain knowledge of the cold regions through scientific and engineering research and to put that knowledge to work for the Corps of Engineers, the Army, DoD and the nation. Environmental problems are complicated in cold regions by short growing seasons, seasonally frozen soils, and in the far North, the instability of ice-rich permafrost. CRREL's research has concentrated on developing and demonstrating cost effective techniques for revegetating problem sites, both in Alaska and at Army facilities in the northern United States. Managing hazardous waste has been the other focus of CRREL's environmental research. CRREL has been developing methods for determining the extent of contamination, for containing toxic spills, and for cleaning them up. Artificial ground freezing is one technique for quickly containing spills or for soil decontamination.

Protecting water quality in cold regions is also one of the lab's research areas. CRREL conducted an extensive program on using land treatment for renovating municipal wastewater. Its researchers have developed a technique that uses natural freezing and thawing to remove the water from sewage sludge. This inexpensive method is especially suitable in the remote areas of the north, where maintaining standard systems is often difficult.

As in many research areas, remote sensing has been a powerful tool in environmental protection. CRREL researchers have used it to monitor water quality during dredging operations, to determine the distribution of building materials that would be affected by acid precipitation, and to study reservoir bank erosion, among other things.

Eagle River Flats, Alaska Waterfowl Study

After a year-long study, researchers at CRREL and Dartmouth Medical School have determined the cause of high waterfowl mortality at the Army's Eagle River Flats Artillery Range in Alaska. Many of the ducks and swans appear to have died from ingesting white phosphorous particles left from smoke-producing shells fired into the range. Eagle River Flats, a salt marsh wetland in Army artillery range, is on Fort Richardson, 15 miles north of Anchorage, Alaska. Thousands of artillery rounds have been fired into the area since the early 1940s. Beginning in the early 1980s, biologists began observing unusually high mortality rates among waterfowl who feed and nest in the area during spring and fall migrations. Sediments and bird carcasses were examined for pesticides, heavy metals, and other pollutants, but no such contaminants were found. Working on the hypothesis that munitions were causing the waterfowl mortality, researchers began an extensive program for sampling water and sediment on the Flats. The researchers used innovative techniques developed at CRREL for detecting explosives and sediments in water. More than 250 sediment and water samples were collected and analyzed, and the collection sites were precisely located. Water sediment and vegetation were mapped throughout the Flats using GRASS.

White phosphorous is no longer fired over Eagle Flats. Remediation might include covering the phosphorous particles with soil or geotextile fabrics that would make the particles inaccessible to

waterfowl and still allow normal plant growth. Another means of neutralizing the phosphorous would be to add an oxidizing chemical such as hydrogen peroxide, to the salt marsh.

U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), Maryland

Army Environmental Training Master Plan (AETMP)

POC: Susan Thomas, (410) 671-4714

USATHAMA is developing an Army Environmental Training Master Plan (AETMP). The plan will address regulatory requirements and individual environmental awareness issues for all Army personnel from the individual soldier to the senior leadership. Environmental training execution for Table of Distribution and Allowance (TDA) units will be provided by the Army Environmental Training Center (AETC) at either the Corps of Engineers, Huntsville Division or at the College of Environmental Management at the Army Logistics Management College (ALMC). The Army Environmental Training Center will also maintain an Environmental Training Repository to serve as a library for awareness and training materials such as posters, videos, and training courses. The end result of the institutionalized AETMP will be an educated work force with the skills, knowledge, and abilities to accomplish our military mission and ensure compliance with applicable federal, state, and local environmental statutes and regulations.

Energetic Materials Disposal

POC: Captain Kevin Keehan, (410) 671-2427

The Army has significant quantities of waste energetic materials requiring disposal. Some of these waste materials, explosives, and propellants, were generated while manufacturing munitions and explosives. Others are contained in conventional munitions that are obsolete or no longer serviceable. Disposal options for these energetic materials are limited because regulations are restricting current methods such as open burning and open detonation. Incineration is cur-

rently the only viable disposal alternative, but it is costly and does not realize the potential for recovering energy from these energetic wastes. USATHAMA is investigating alternative technologies to safely and effectively utilize the energy content of energetic materials. USATHAMA is currently conducting a pilot scale demonstration to determine the feasibility of using explosives as supplemental fuel at Hawthorne Ammunition Plant, Nevada. During the first phase, a state-of-the-art pilot scale system was constructed for mixing explosives in fuel oil and firing the resulting mixture into an industrial boiler to generate steam. The pilot scale test objectives are to determine how effectively the explosives are destroyed, to characterize the gaseous effluent, to identify operational and safety problems and parameters, and to evaluate the potential for using the technology in full-scale operations in the future.

Initial tests have demonstrated that this technology has the potential to be an effective and safe method to recover energy from waste explosives. Future implementation of this technology could prove to be a cost-effective disposal alternative to incineration which will not only benefit DoD, but also commercial industry. Several commercial corporations are extremely interested in applying this technology to recover the energy from their industrial waste. Supplementing fuels with explosives and propellants may well be the technology needed to not only dispose of these wastes, but to recover the unused energy.

Environmental Information Response Line

The Environmental Information Response Line, operated by USATHAMA, was established to enhance communication mechanisms for environmental information. The Environmental Information Response Line is designed to offer users answers to technical and regulatory environmental questions. The response line is open 24 hours a day. Although questions are received on a recorder, callers receive a response by telephone within 24 hours. The response line telephone number is 1-800-USA-EUHL.

Environmental Update

POC: Catherine Stalcup, (410) 671-2556

In December 1988, USATHAMA published its first issue of Environmental Update. This is the Army's only newspaper focusing entirely on environmental news and issues. The Army decided to publish such a paper because of the emphasis on the increasing number of environmental programs and issues impacting the Army. The newspaper highlights a number of areas such as environmental compliance, legal issues, technology development, installations with progressive environmental programs, and topical items.

Composting Optimization Field Study at Umatilla Army Depot

POC: Captain Kevin Keehan, (410) 671-2427

USATHAMA is conducting a Composting Optimization Field Study at Umatilla Army Depot Activity in Umatilla, Oregon. The study will obtain the necessary data to determine whether, and to what extent, implementing composting is a cost effective alternative to incinerating contaminated soils. Incinerating exposure-contaminated soils is very labor intensive and costly. In situations where immediate remedial actions are required, incineration may be the only solution. In less critical situations, a less costly treatment method such as composting may be acceptable. The Army plans to use composting at Umatilla Army Depot Activity to reduce levels of explosives in the soil of its two former washout lagoons. Final results from the Umatilla field demonstration will provide the data needed for full-scale implementation of composting to successfully remediate the washout lagoon soils to required health based cleanup criteria. Results from this study will allow the Army to achieve success in bioremediating an National Priority List site for the first time.

Installation Restoration Program

The Army created the Installation Restoration Program (IRP) in 1975 to identify, assess, and control existing toxic and hazardous material contamination at both active and former Army sites. The IRP is designed to restore lands damaged through poor past practices. The

Army has completed 1,615 preliminary assessments of Army properties for potential contamination problems. At the end of FY90, preliminary assessment work was complete at all but 12 Army IRP sites and site inspections were complete at 83 percent of the sites. Some 135 sites have been cleaned up and cleanup activities are underway at 1,272 sites. By the end of FY90, preliminary assistance for formerly used defense sites were initiated at more than 3,500 of the 7,000 eligible sites and completed at about 1,200 sites. Remedial investigations and feasibility studies have been initiated at all National Priorities List (NPL) installations.

The largest on-going cleanup operation in DoD involves Rocky Mountain Arsenal. Costs are expected to exceed \$1 billion. The Army is at the forefront of new technologies which enhance the completion of the installation restoration projects. The most current technologies include implementing the Army's Installation Restoration Incineration Program (IRIP) and the ground water extraction and treatment system. In FY92, IRP's major focus will be on the 36 sites on the EPA's NPL and other high priority non-NPL sites. Remedial actions will comprise about 40 percent of the effort in FY92 as program focus intensifies on corrective actions. Restoration activities are required at several of the 78 installations selected for realignment and closure by the Base Realignment and Closure Commission in accordance with public law. A large share of the FY92 funds (71.2 million) will be used for remedial actions at Fort Meade, Maryland, the Army Materials Technology Laboratory, the Presidio of San Francisco, and the Umatilla Depot Activity.

1383 Report

USATHAMA has distributed new computer software, DB1383, that will be used to collect and consolidate data for the Army and submit it to the USEPA. The 1383 report is used to identify projects and costs associated with environmental compliance. The 1383 report also serves as the basis for developing and supporting program and budget requests.

Fort A.P. Hill, Virginia

Contaminated Drum Treatment

The Army has completed on-site treatment of 1,138 drums of soil and material containing herbicide and dioxin. The contamination resulted from residues near a former herbicide storage facility. HQDA, USATHAMA, FORSCOM, USEPA, USAEHA, and state of Virginia officials worked closely together to clean up the site prior to the Boy Scout Jamboree held at Fort A.P. Hill. The operation, performed by several subcontractors, included transporting the drums from a safe storage area on post to the treatment site, shredding the material, applying thermal treatment, decontaminating the storage drums, and transporting the repacked drums to a licensed disposable facility. The cleanup was done on schedule and within funding limitations.

Aberdeen Proving Ground, Maryland

POC: Jim Pottie, (410) 671-3320/4429

Wildlife Management

Aberdeen Proving Ground, Maryland, is located on the Chesapeake Bay and has more than 10,000 acres of tidal and non-tidal wetlands. Aberdeen Proving Ground has been very active in preserving these lands and planting vegetation desirable for waterfowl use. Aberdeen Proving Ground, in cooperation with the Maryland Department of Natural Resources, recently opened a fish passage ladder on the Winter's Run River. This passage opened four additional miles of habitat for anadromous fish on Winter's Run. This is the first passage opened in the state of Maryland.

Bald Eagle Recovery

Recently, Aberdeen Proving Ground conducted its aerial bald eagle survey of the post which is located in the lower Susquehanna River area. Protecting and maintaining habitat has been important to eagle recovery at the Proving Ground. The birds require tall trees and

proximity to water. Aberdeen Proving Ground has several good stands of tall hardwoods in a restricted area which give the eagles an excellent place to roost. The area is relatively undisturbed by people, and Chesapeake Bay provides fish, which is the birds' primary food source. Aberdeen Proving Ground is an ideal site for eagle nesting.

Anniston Army Depot, Alabama

POC: Ron Grant, DSN 571-6350 or (205) 235-6350

Asbestos Abatement Program

An asbestos abatement program was initiated and an installation-wide, total building asbestos survey was conducted by contract. This survey included 413 buildings and approximately 2,000 linear feet of exterior steam lines. Through Corps of Engineer contracts in FY89 and FY90, asbestos removal actions were initiated on 108 buildings at a cost of \$2.89 million. Most friable asbestos was removed as scheduled in 1991.

Management of Point Sources

Anniston Army Depot is now in total compliance with the National Pollution Discharge Elimination System (NPDES) permit. Extensive contractor and depot efforts to discover and solve problems in this area resulted in significant improvements. The effort also reduced water usage and the resultant waste water generation. The most dramatic change occurred in steam cleaning and washrack operations where the volume of wastewater was reduced from 200,000 to less than 100,000 gallons per day. The level of contaminants was also significantly reduced in the remaining wastewater.

Toxic and Hazardous Waste Management

Operations at Anniston produce a variety of hazardous wastes in many forms. Each year the industrial waste water treatment plant generates approximately 2 to 2.5 million pounds of sludge that is classified as hazardous. The Directorate of Maintenance, the Director

of Supply, and Directors of Ammunition Operations generate thousands of 55 gallon drums of hazardous waste each year that are disposed of through the Defense Reutilization and Marketing Office (DRMO). Previously, concentrated cleaning chemicals from vats were disposed of by pumping the liquid into 55 gallon drums, then vacuuming the sludge out of the vat and transferring it into 55 gallon drums. DRMO successfully modified the contract so the contractor now pumps the liquid and sludge from the vats directly into tank trucks for disposal. The use of 55 gallon drums is eliminated, personnel exposure is minimized, and the disposal costs are reduced.

Aluminum Ion Vapor Deposition (AIVD)

In combat vehicle maintenance programs, a significant amount of cadmium and chromium electroplating is required. These electroplating operations generate toxic waste and wastewater which in turn creates a hazardous waste sludge. The Aluminum Ion Vapor Deposition is a unique piece of equipment that is a potential replacement for cadmium plating. The process uses aluminum in lieu of cadmium, is environmentally safe, and produces no hazardous by-products. Anniston Army Depot is the testbed for the AIVD system and initial results indicate that aluminum is an acceptable replacement for cadmium. The Depot began producing aluminum coated engine parts in 1991, with full implementation projected within two years.

Recycling

Anniston Army Depot's metallic recycling program has been operational for several years and generates approximately \$130,000 annually. In FY90, the program was extended to include nonmetallic items. Until recently, the Depot used throw away paper and cloth rags in the industrial operations. These items were used once, discarded, and placed in a landfill. The test program using contractor-provided cloth rags is currently underway. If successful, and a decision is made to implement this program Depot-wide, it could save as much as \$200,000 annually and significantly reduce landfill requirements. Other actions including trying to identify other uses for materials either on or off post, prior to sending items to the landfill. Items such as wooden and cardboard boxes, pallets and eight types of packaging

materials are brought to a central location, sorted, and reissued to Depot activities or marketed off Depot. Wood scraps, which were previously given away or placed in the landfill are now also sold. Scrap polystyrene is shredded to produce styrofoam packing material. Mixed paper is also shredded and used as packing. Since May 1990, over 1000 bags of packing material have been recycled and used on Depot. By not having to procure this material, a cost savings of \$36,000 was realized and more than 3000 cubic yards of material was not placed in the Anniston Army Depot landfill.

Additionally, during FY90 approximately 500 tons of paper products were sold to local recyclers. Anniston has been very successful in reducing the amount of waste landfilled and in generating revenue through its recycling efforts. During the first quarter of FY91, the Depot spent \$41,000 and generated revenues of \$141,000. Of the remaining \$100,000, \$19,000 was used to support morale, welfare, and recreation activities and \$25,000 funded a safety-related project.

Contaminated Soil Remediation

In an effort to begin operating the ammunition deactivation and reclamation furnace, Anniston discovered that the UST holding the furnace fuel was leaking. An AEHA study revealed a large area, approximately 5000 cubic yards of soil, with contamination higher than regulatory levels. Estimates for contract remediation were approximately one million dollars. In lieu of this, Anniston Army Depot pursued in-house, on-site, soil treatment. The soil was treated by utilizing microbes with the appropriate nutrients to bring the contamination levels to regulatory standards. The remediation cost approximately \$27,000, a much more economical solution.

Badger Army Ammunition Plant, Wisconsin

POC: David Fordham, (608) 356-5525

Ground Water Treatment System

The interim remedial measures treatment system at the Badger Army Ammunition Plant propellant burning ground area has been

operating 24 hours a day everyday since June 1990. As of October 31, 1991, the system, built to address ground water contamination consisting of solvents and explosive constituents, had treated 230.5 million gallons of ground water. A major study now underway will determine final measures for a cleanup.

Fort Belvoir, Virginia

Army Chief of Staff Natural Resources Conservation Award

Fort Belvoir won the 1990 Army Chief of Staff Natural Resources Conservation Award, for its efforts in environmental protection and conservation. The installation overcame significant erosion problems from previous training activities and fostered major improvements in Post beautification, forestry, fish and wildlife conservation, recreation and cultural resource management. Special achievements include creating 1,461 acres of wildlife refuges, developing a comprehensive natural resource planning system, creating a computerized environmentally sensitive zone database for evaluating proposed facility sitings, and establishing a highly successful program.

Fort Benning, Georgia

Secretary of the Army Environmental Quality Award

Fort Benning received the 1989 Secretary of the Army Environmental Quality Award. The award annually recognizes the Army installation which has conducted the most outstanding environmental protection and enhancement programs during the past two years. A highlight of their program was establishing a recycling program that went beyond the typical paper and aluminum can recycling program. Fort Benning's program generated more than \$600,000 in 1988 and \$1 million in 1989. The award also recognizes the post's ongoing compliance with state of Georgia and EPA hazardous waste requirements. The installation received no hazardous waste related NOV's during the past 2 years. In addition, the award exemplifies the work

of those responsible for having developed an asbestos abatement database that is recommended for use at other TRADOC installations.

Fort Carson, Colorado

POC: Tom Warren, (719) 579-4828

Secretary of the Army Environmental Quality Award

Ms. Mary Barber, Environmental Chief, Fort Carson, Colorado, was recognized for her environmental contributions and received the 1989 Secretary of the Army Environmental Quality Award in the individual category. The award annually recognizes the Army individual who has demonstrated the most outstanding leadership, management and training in their installation's environmental program. In addition to revising the Fort Carson Environmental Regulations, Ms. Barber was recognized for creating informational seminars, classes, videotapes, and printed materials, designed to increase understanding of operational compliance with applicable environmental regulations. She worked with a university and the park service on producing a videotape on the rock art that is located at Fort Carson and the Pinon Canyon Maneuver Site (PCMS). Fort Carson created a travelling display and booklets to give people an appreciation for the importance of environmental protection.

Air Monitoring Program

POC: Nelson Kelm, (719) 579-2282

The emission of dust, carbon monoxide, air toxics, and many other materials is strictly regulated by the 1990 Clean Air Act Amendments. The Environment, Energy, and Natural Resources Division of Fort Carson's Directorate of Engineering and Housing operates an air quality monitoring network on the Fort Carson reservation and at the Pinon Canyon Maneuver Site. There are eight monitoring sites at each location. The purpose of the monitoring network is to determine what levels of atmospheric contamination (dust and carbon monoxide) are associated with Army activities. Carbon monoxide is monitored to determine how much of the color-

less, tasteless, poisonous gas incoming vehicles generate. The monitoring program is used to document the EPA limits. Data will be used to determine the effectiveness of dust suppression programs currently being initiated by Fort Carson. Fort Carson also provided technical expertise and training for Pueblo Depot personnel to help them meet Colorado's stringent air monitoring requirements as they burn Pershing first and second stage rocket engines taken out of service by the International Nuclear Forces Treaty.

National Wildlife Federation Award

In 1989 Fort Carson was the first military organization ever to receive the National Wildlife Federation's prestigious National Conservation Achievement Award. Fort Carson was sited for its conservation and maintenance of the 137,000 acre post at Colorado Springs and the 244,000 acres at the Pinon Canyon Maneuver Site.

Cultural Resources Success Story

The Pinon Canyon Maneuver Site (PCMS) is a restricted military training area serving the Fourth Infantry Division (mechanized), at Fort Carson. The maneuver site encompasses 380 square miles of semi-arid lands in Southeastern Colorado. Numerous cultural resources are recorded within the PCMS; many are rock art sites. Rock art is a non-renewable resource that is perhaps one of the most fragile of all cultural resources. Because it is found on the surface of rock faces, it is highly vulnerable to vandalism, erosion, and destruction from other agents such as bird nesting and as in the case of the PCMS, from military training activity. In 1987, the University of North Dakota was awarded a contract to evaluate rock art within the PCMS. The work was funded by the Department of the Army, and the Environment, Energy and Natural Resources Division at Fort Carson. The Rocky Mountain Region National Park Service, Denver, Colorado, administered the work through an Inter-Service Support Agreement (ISSA). Work completed and reported thus far includes the results of rock art site evaluations, tested excavations, rock art survey, and detailed analysis of nine sites. A videotape was also produced and titled Rock Art of the Pinon Canyon Maneuver Site.

The studies conducted on the PCMS have led to a significantly greater understanding of rock art types, manufacture, chronology, and interpretation in southeastern Colorado and North America. The studies have also contributed to evaluations of various rock art dating techniques including desert varnish cation-ratio analysis and recording techniques such as aerial photography, tracings, rubbings, and artists drawings.

Based on these studies, Fort Carson is able to document the impacts of training on rock art sites and to develop protection and mitigation strategies accordingly. Soldiers are briefed about the significance of the rock art and other cultural resources at the PCMS prior to all training rotations. Cultural and natural resource conservation and protection requirements are also contained in booklets and maneuver damage cards issued to each soldier before departing for the PCMS.

The videotape produced under this contract is used for continuing education and awareness purposes. It was aired on local public television networks during Historic Preservation Week and was shown on the Fort Carson cable channel. Reports prepared as a result of these studies as well as the videotape have been distributed to other interested parties such as federal agencies involved in cultural resource investigations and colleges and universities located in the region. Copies of the reports are also available through the National Technical Information System (NTIS). Numerous articles regarding this and other cultural resource investigations on the PCMS have appeared in reference journals. The videotape has been made available to the general public through the University of North Dakota. The Fort Carson Command and the Environmental and Natural Resources Division have been recognized by the Army, the scientific community, and the public for contributions made in furthering the understanding of the historical and archeological records in southeastern Colorado and the nation.

Greenback Cutthroat Trout

The Greenback Cutthroat Trout is one of two native salmonoids known to exist within the Arkansas River drainage. The Greenback is the only Arkansas River drainage salmonid that still exists, and fewer than 700 pure Arkansas River drainage cutthroat

trout remained in existence in 1978. Since 1981 Fort Carson's Environment, Energy and Natural Resources Division, in cooperation with the U.S. Fish and Wildlife Service and the Colorado Division of Wildlife, has been proactively involved in a recovery program for this species, which is officially listed as threatened. In 1981 Fort Carson constructed Lytle Spring Reservoir as a broodstock pond for rearing Arkansas River Greenback Cutthroat Trout. Initially, 40 greenbacks from Cascade Creek were transported by U.S. Army helicopter from Cascade Creek, Colorado to Lytle Pond Reservoir, Fort Carson. Eggs and fish obtained from Lytle Spring have been used to establish reproducing populations within national forests. This program has been exceptionally successful in the recovery of this species. Although it is the lowest elevation at which this species exists, the largest Arkansas River Greenback Cutthroat Trout on record was recorded at Fort Carson. Also, Fort Carson now has a limited catch and release program for this species which is sanctioned by the U.S. Fish and Wildlife Service, and provides a unique opportunity for fishermen to legally fish for an endangered species.

In addition to Greenback Cutthroat Trout, 34 Arkansas Darters which are listed as Colorado Threatened Species were introduced. The U.S. Fish and Wildlife Service has stated that the Fort Carson population of the Arkansas Darter is the primary reason it is not listed as a federal threatened species. Both of these programs have demonstrated how military installations can become actively involved in the recovery of threatened or endangered species while not jeopardizing the military training mission.

Fort Chaffee, Arkansas

Cultural Resource Management

The Corps of Engineers Waterways Experiment Station created a geomorphological three-dimensional model to identify prehistoric site distribution within the 72,000 acre garrison. The model was ground-truthed by a series of archeological investigations utilizing soil coring, traditional pedestrian surveys, and aerial photo interpretation.

Archeological investigations have included evaluating hundreds of Euro-American farmsteads, several entire towns, religious meeting grounds, a World War II German prisoner of war camp and hundreds of prehistoric Amerindian sites. These investigations have relied heavily on geological science, computer mapping, and historical documents to supplement traditional archeological methodology.

Historic documentation studies at Fort Chaffee have included interviewing hundreds of individuals, and reviewing thousands of photographs, letters, and journals. Thousands of feet of videotape preserve the recollections of the region's elderly former inhabitants before the garrison was created at the start of World War II. Most recent investigations have centered on writing the history of the garrison which has the second highest number of World War II temporary buildings in the Army. An architectural inventory of these buildings is underway to identify unique buildings in the Department of Defense database. This is in compliance with a Department of Defense programmatic agreement with the National Council of State Historical Preservation Officers and the Presidents Advisory Council for Historic Preservation.

Fort Devens, Massachusetts

POC: Steve Hopkins, (508) 796-3002

Contaminated Soil Recycling

The Fort Devens Directorate of Engineering and Housing has been successful in recycling contaminated soil into asphalt road base. More than 8,000 tons of the contaminated soil has been recycled to date. Asphalt road base has been used to construct parking lots and repave roads on Fort Devens.

Fort Dix, New Jersey

POC: Rod Tozour, (609) 562-5949

Removal of Elevated Water Storage Tank

In May of 1991, the Nassau County Department of Health notified Fort Hamilton that paint chips dislodged by the wind from a water storage tank were covering the neighboring lawns. The deteriorated water tower was located at the U.S. Army Logistical and Support Center, Bellmore Long Island, New York. This situation was unique in that the 150 foot tower had not been used since 1984 and was 20 feet off the property line of private homes in the town of Bellmore. Most of the residents had preschool children, and there was concern over the possibility of lead poisoning if the children ate the paint chips. Within four weeks, a contract package was developed to contain the tower and remove it. Project specifications were more stringent than Housing and Urban Development (HUD) and Occupational Safety and Health Administration (OSHA) requirements. The health and safety of the local residents was the immediate concern, therefore, state of the art specifications for lead abatement were developed. The Nassau County Department of Health assisted in providing area monitoring for the project at no cost to the government. Within 12 weeks, the project was awarded. The National Institute for Occupational Safety and Health (NIOSH)-sponsored Lead Based Paint Hazard Identification and Abatement class offered through the University of Medicine and Dentistry, Piscataway, New Jersey, has included this project as a case study in their lead abatement course.

Fort Drum, New York

Fort Drum Forestry Award

POC: Gary Vander Wyst, (315) 772-5708

Fort Drum earned a regional forestry management award because of its ability to maintain a healthy resource program while carrying out its primary mission of military training. Selected from among approximately three dozen nominations from 21 states, Fort

Drum has received the Outstanding Management Resources Award given by the Northeastern Loggers Association (NELA). NELA found Fort Drum's forestry management program to be productive, unique, and ambitious. Although it has a military mission, Fort Drum also has a forestry management philosophy that is scientifically sound. Over half of Fort Drum's 107,265 acres are under productive management. Selective harvesting through approved methods is accomplished on 3,000 to 4,000 acres per year, yielding sawtimber, pulp, and firewood. The pulp goes to area pulp mills and the sawtimber goes to local sawmills which keeps the money in the local community. According to NELA, the range fire control program, also under the post resource management program, keeps range fire and dollar losses to a minimum.

Training Area Rehabilitation Program (TARP)

POC: Brent Moss, (315) 772-5708

Eight to nine-hundred acres of land used for training at Fort Drum are severely impacted by erosion. Fort Drum established a cooperative agreement with the Soil Conservation Service (SCS) to address the problem. Together they created the Training Area Rehabilitation Program (TARP). The Jefferson County Soil and Water Conservation District also helped get TARP started. Approximately 30 acres of land suffering from wind erosion were set up as the test bed for recovering the rest of the 800 to 900 acres. Trees and grasses were planted to control erosion and, if successful, this will be expanded. TARP is Fort Drum's first step in recovering eroded areas. If successful, the ground will be covered with a soil that will stand up to the rigors of military training.

Fort Eustis, Virginia

Keep America Beautiful Competition

POC: Helen Turner, (804) 878-4123

Fort Eustis received 3rd place in the Keep America Beautiful competition. This is national recognition for the environmental pro-

gram at Fort Eustis. Cited in the award were the installation's recycling center and their participation in Clean the Bay Day, which is an area wide effort to keep Chesapeake Bay clean.

Fitzsimmons Army Medical Center, Colorado

POC: Gilbert Gonzalez, DSN 471-6441 or (303) 361-8724

Solvent Recovery Systems

Fitzsimmons Army Medical Center has purchased solvent recovery systems for formalin, methanol and xylene. The distillation systems cost \$7,000-\$9,000 each and are saving the installation from \$11,000 to \$15,000 each. These systems pay for themselves during their first year in operation. They not only help reduce disposal costs but have also decreased the installation's liabilities.

Fort Gordon, Georgia

POC: Kathy Gazette, (404) 791-2403

Hazardous Materials/Hazardous Waste Tracking

The Environmental and Natural Resources Management Office, Directorate of Installation Support, Fort Gordon, established a Total Quality Management Process Action Team for hazardous material and waste tracking, accountability, responsibility, and handling. This pilot project effort is designed to provide a demonstration model and better way for installations to handle hazardous material and waste procurement, storage, tracking, accountability, inventory, disposal, and regulatory requirements compliance.

Holston Army Ammunition Plant, Tennessee

POC: Shirley Wannetain, (615) 247-9111

Preservation Agreement

The Holston Army Ammunition Plant has formed a partnership with the Tennessee Nature Conservancy to protect and preserve natural resources in the Plant's buffer zone along Bays Mountain. The partnership will strive to preserve resources on about 3,000 acres of land on the mountain's northwest slope. Through federal funding, specialists with Lincoln Memorial University, Harrogate, Tennessee, will identify significant plant and animal species and natural communities. They will then make recommendations for further study based on the collected data and provide recommendations for protecting significant areas. Holston's partner, the Conservancy, is an international, non-profit conservation organization committed to the global preservation of plants, animals, and natural resources that represent the diversity of life.

Fort Hood, Texas

POC: Emmett Gray, (817) 287-8711

Environmental Information System

Fort Hood is one of the Army's first installations to develop a computer-based system to help planners and natural resource managers monitor erosion and land cover degradation. The Environmental Information System uses a geographic information program in conjunction with the Universal Soil Loss Equation to locate and analyze highly erodible areas. Fort Hood uses this method to classify training lands according to their ability to support military training. The classification system has also been used to inventory Fort Hood's current land conditions, to schedule training activities to avoid severely degraded or highly sensitive areas, to group sites of similar capabilities, to schedule land rehabilitation efforts, to help make natural and cultural resource management decisions, and to evaluate proposed new land use.

Fort Huachuca, Arizona

POC: Major Arthur Nagel, (602) 538-2151

Saving the Long-nosed Bat

The endangered Sanborn's long-nosed bat is found on Fort Huachuca. The bats inhabit three caves from May through August and feed on agave plant nectar and pollen. The agave plant is a critical food source to the bats and it takes approximately 30 years to flower. Fort Huachuca is concerned that installation activities could possibly damage the agave. USACERL is helping Fort Huachuca implement the LCTA program to evaluate abundance and rehabilitation of agave and meet environmental compliance requirements under the Endangered Species Act.

Environmental In-process Review

Fort Huachuca recently expanded the Environmental In-process Review into a public forum. The meeting provided a unique opportunity for open dialogue between the installation, the public, the press, state officials, and local environmental groups. Fort Huachuca's test of this expanded forum met with excellent results. The session included a review of known environmental problems and actions being taken to correct them, as well as a windshield tour of several sites where environmental work was being done. The in-process review highlighted the installations' proactive \$5 million program for retaining and maintaining compliance. The outcome of the face-to-face meeting was a turn around in perception and better understanding for both sides. Fort Huachuca's experience illustrates the positive impact that a little extra effort and genuine concern can have on the public and enforcement agencies at all levels.

Cultural Resource

A unique rock art collection of the Apache and the Hohokam Tribes is located on the installation. This collection has been recorded and preserved and the public has access to view it.

Indiana Army Ammunition Plant, Indiana

POC: S. G. Jenkins, (812) 284-7838

Recycling Lead from Scrap Lead Liners

The Indiana Army Ammunition Plant produces bag charges for 155 mm howitzers which have a lead liner to reduce barrel wear on the gun. A research project was developed to determine if there was some avenue for recycling the scrap lead instead of disposing of it at a hazardous waste landfill. From mid-1987 to late 1989, many vendors were contacted to discuss the lead recycling potential. In 1990 Exide Battery Corporation ran a 5,000 pound test sample through its smelting operation and recovered good lead. After a discussion with the Indiana Department of Environmental Management and refining the process for separating scrap liners and scrap cloth, the installation's scrap lead was sent to Exide Battery Corporation in Muncie, Indiana for recycling. In 1991, more than 56,000 pounds of material were shipped for recycling instead of shipped for landfill disposal.

The Ohio River Sweep

In 1990 and 1991, the Ohio River Valley Water Sanitation Commission sponsored a program entitled the Ohio River Sweep. This event used resources from states that bordered the Ohio River and requested that volunteers clean up the shoreline on a designated Saturday in June. Approximately 10 to 15 Indiana Army Ammunition Plant personnel and families participated in the sweep along the Indiana Army Ammunition Plant's banks. Each year for the past two years, approximately 10 tons of refuse have been collected. In addition to the environmental benefits, the program also heightens community awareness.

Fort Irwin, California

POC: Tom DeCosta, (619) 386-3740

Desert Ecosystem Studies

Since 1983, Fort Irwin has worked with USACERL to assess and monitor the Mojave Desert Ecosystem. These studies have focused particular attention on the effects of military training exercises and war-game scenarios on mammal, bird, and reptile communities and habitat structure. This research has identified management strategies and options for mitigating and protecting wildlife and threatened/endangered species, and for enhancing regional biodiversity within a multiple use context. The technologies, methods developed, and research experience gained at Fort Irwin have direct and immediate benefits for conducting research or assessments at other DoD installations in desert or arid ecosystems. Novel strategies will be investigated to mitigate resources in heavily used training ranges. Surveys will be conducted to identify and locate unique or critical ecological communities, and threatened, endangered, or sensitive animal and plant species, including migratory and wintering birds. Novel strategies for surveying bats will be investigated. Nine sensitive species of bats may potentially be residents or migrants at Fort Irwin.

Desert Tortoise at Fort Irwin

The desert tortoise is an endangered species that exists on Fort Irwin, and is being extensively studied to help protect the species. On the installation, five study sites have been selected that represent a gradient of tortoise habitat degradation and population fragmentation. All resident tortoises at these sites will be fitted with passive integrated transponders (PIT) tags for permanent identification. Additionally, 100 tortoises (approximately equal numbers of adult male, adult female, and juveniles) will be fitted with radio telemetry equipment. After initial data is gathered and analyzed, additional tortoises will be fitted with telemetry equipment as more detailed information and larger sample sizes are required. Two experimental tortoise enclosures have been constructed in the southeastern portion

of Fort Irwin. These are currently being used by university researchers to investigate the ecology and behavior of neonatal tortoise hatchlings. This research is going to be expanded to include temperature-dependent sex determination in the desert tortoise and its genetic basis. This research has important applications for developing tortoise relocation and reintroduction strategies. Other university research efforts at the installation include epidemiology, immunology, serology, related pathological biochemistry and nutrition studies. A desert tortoise wildlife habitat model will be developed and integrated with GIS (GRASS) technology. Population, viability models and other models/simulations concerning the conservation biology of the desert tortoise will be investigated to aid in managing and protecting the species while still allowing the installation to maintain its training mission.

Ecology of Desert Rodent Communities

An extensive research program on the structure and dynamics of Fort Irwin's rodent communities will begin in FY92. Kangaroo rats, and possibly other rodents, are keystone species in desert ecosystems, and therefore important residents for ecosystem integrity, resilience, and persistence. The role of predation and competition in determining community structure will be investigated. Rodents will be permanently identified with PIT tags, and radio telemetry will also be used in the research.

Reintroduction of Desert Bighorn Sheep

Desert Bighorn Sheep are planned to be released into the Granite Mountains of Fort Irwin, with the cooperation of the California Fish and Game Department. The purpose is to expand valuable populations and reduce genetic fragmentation. Work has already begun on capturing Bighorn Sheep and efforts using radio telemetry were initiated.

Riparian and Wetland Habitats

A program to restore and enhance Fort Irwin Springs and its riparian habitats is in the planning stages. The program will include

a strategy and goals for increasing landscape biodiversity, providing habitats for threatened/endangered species, and providing foraging and rest sites for migratory birds. Initial plans to restore and enhance deep water, wetland, and riparian habitats at Fort Irwin's waste water treatment facility (sewage pond) are also underway. The potential for creating additional fish and wildlife habitats at this site is also being considered. Significant numbers of migratory birds including a wide variety of song birds, waterfowl, shore-birds, and wading birds, use the pond habitats. There are plans to design and strategically locate water catchment and containment basins to optimize the benefits to both game and non-game wildlife. This may include well drilling, and developing riparian and wetland communities.

Geothermal Energy

The Army, in cooperation with the Navy, is investigating the geothermal potential at the National Training Center (NTC) located at Fort Irwin. Currently the water tables under the immediate area of the post range in temperature from a low of 76 F to a high of 95 F. These temperatures range from a depth of 210 feet to 750 feet below surface. The results of ongoing gravity and magnetic sweeps of the most promising area reflects strong indications of latent heat below these areas. Currently five shallow (500 feet) observation holes are being drilled which will be used to measure the thermal gradient of these areas along with core sample analysis. The Corps of Engineers, NASA, Jet Propulsion Laboratory, Louisiana State University, and various other universities and agencies are providing additional support. These agencies are combining resources to utilize high altitude imagery which overlays multiple band radar images with thermal mapping images which is being used to identify fault lines that are conduits for geothermal energy. Geological dating indicates that the volcanic activity in this area is not recent but that geothermal activity is. Fort Irwin has a goal to produce electricity using this geothermal energy.

Fort Jackson, South Carolina

POC: J. B. Knight, (803) 751-5011

The Asbestos Abatement Program

The Asbestos Abatement Program at Fort Jackson was initiated in 1983 and has removed friable asbestos from all but 25 buildings on the installation. During FY92, a contract will be awarded to remove the asbestos from the remaining buildings. This will make Fort Jackson one of the first installations in the Army to be free of all friable asbestos.

Radon Management

Facility monitoring efforts at Fort Jackson have concluded that there are no radon problems on post. All priority one facilities on Fort Jackson which include schools, barracks, the hospital, family housing, and childcare facilities have been monitored for their radon gas level. The lab results have shown that all radon levels on the installation are below the level that would require further action.

Integrated Training Area Management (ITAM) Program

The ITAM Program at Fort Jackson is currently being implemented to properly manage the training and maneuver area lands. The ITAM Program is a comprehensive, long-term management program that matches training loads with the training lands soils and vegetation capabilities. Deteriorated training areas are rehabilitated to ensure that quality, realistic training lands are available to support the training mission in the future and maintain environmental quality.

Cultural Resource Protection

Archeological surveys have been conducted on approximately 18,500 acres of the Fort Jackson facility to locate, identify and evaluate historic and archeological resources. Several significant archeological sites have been discovered during the surveys. The majority of the significant sites are prehistoric Indian settlements.

Sensitive Species Management

Fort Jackson has a contract with the Nature Conservancy to conduct an installation-wide endangered species survey. Biologists are surveying all accessible areas of the installation for potential federal and state endangered and threatened plant and animal species. The Environmental Division at Fort Jackson has written and implemented the management plan for the only known endangered species on Fort Jackson, the red-cockaded woodpecker. This plan ensures that the endangered bird and its habitat are being managed in accordance with the U.S. Fish and Wildlife Service Recovery Plan.

Fort Knox, Kentucky

POC: Albert Freeland, (502) 624-3629

Customer Assistance Visits

The Fort Knox Directorate of Engineering and Housing Environmental Management Division has developed and implemented a program aimed at preventing environmental problems at the grassroots level. The program focuses on the motor pool areas. Two non-commissioned officers assigned to the environmental management division schedule monthly customer assistance visits to each motor pool and assess vehicle maintenance areas, POL storage, waste oil tanks, flammable sheds, oil water separators, grit traps, grease racks, and waste storage areas. Environmental files are reviewed to ensure soldiers have current bulletins, Standard Operating Procedure (SOP) and plans. A completed checklist with recommendations is provided to the unit. The program, while still in the initial stage of implementation is proving effective in promoting responsible environmental management and increased awareness.

Fort Leavenworth, Kansas

POC: Captain David Pursell, (913) 684-5646

Natural Resource Management

Fort Leavenworth in northeast Kansas is doing its part to preserve natural resources. The wildflower population, bottom lands pecans, and cavity nesters have benefited greatly from Fort Leavenworth's natural resource management program. Multiple use management of natural resources allows Fort Leavenworth to support the military mission and to foster quality of life for Fort residents at the same time. The Fort has a diverse environment and supports more than 200 species of plant and animal life. Due to management practices, prairie grasses are returning to Fort Leavenworth. As more areas are left in their natural state, Fort Leavenworth experts expect to see blue stem and other native grasses return.

Fort Lewis, Washington

POC: Randy Hanna, Autovon 357-5337 or (206) 967-4905

The Fort Lewis Environmental and Natural Resources Division prepared a report dated June 1991 entitled State of the Environment Report at Fort Lewis and its Sub-Installations. This document is a review of the Fort Lewis environmental programs. It is for those individuals within the military community as well as for local, state, and federal agencies associated with Fort Lewis. It also serves as a point of reference and describes many environmental and natural resource initiatives taken by Fort Lewis. The following excerpts were taken from the Fort Lewis report and demonstrate the active program and command support provided to Fort Lewis.

Sensitive Species Management

Northern Spotted Owl

When the northern spotted owl was listed as a threatened species, Fort Lewis had to ensure that its activities would not impact this species or its habitat. Timber stands 60 years and older were

delineated from the 51,000 acres of managed forests on Fort Lewis. Approximately 35,000 acres of timber were classified in this age category. Stands in this age category could exhibit enough habitat characteristics to support northern spotted owls. Fort Lewis wildlife biologists survey the habitat of these stands case-by-case, as they become subject to timber management operations. These surveys determine if the stand is suitable as spotted owl habitat. Stands which may be suitable habitat are exempted from timber harvest activities until more conclusive studies can be conducted. The survey involves crews conducting owl calls on established transits at half mile intervals. All forested areas on Fort Lewis outside the cantonment area will be surveyed in this method. These surveys are scheduled at Fort Lewis during 1991 and 1992 and the area will be resurveyed three to five years later. If spotted owls are present on Fort Lewis, they will be radio-collared and monitored 25 times during each season to determine the home range of the owl. The owls will be monitored for at least six years.

Bald Eagle

Fort Lewis works with the Washington Department of Game to conduct the annual National Wildlife Federation winter bald eagle census. Winter surveys using Army helicopters are made each January to count wintering bald eagles.

Osprey

Osprey and other species use old growth tree snags and spike tops extending above the forest canopy. These, however, are considered a safety hazard to helicopter night training. To reduce a conflict with Fort Lewis' training mission, snag and spike tops considered hazardous are cut at ground level. This practice eliminated an abandoned osprey nest where young successfully fledged for more than 10 years and was causing the loss of potential habitat associated with snags and spike tops. Therefore, Fort Lewis began efforts to compensate for this resource loss. Wildlife personnel now designate controlled numbers of trees by height and location to be killed and left standing to create safe snag habitat. Six osprey-nesting platforms will be built on six different lakes to encourage the birds to use training compatible structures. Other raptors present on Fort Lewis are red-tailed hawks, Cooper's hawks, goshawks, sharp-shinned hawks,

marsh hawks, and kestrels, all of which warrant sensitive management. Forest management practices preserving conditions for raptors include retaining current and potential nesting and perching trees, and protecting buffer zones around nests. Logging activities may also be scheduled around critical periods for eagles and ospreys. The installation provides a food source for wintering eagles through chum salmon enhancement projects conducted in Nisqually River tributaries.

Great Blue Heron

The great blue heron is a bird species with popular public appeal found throughout the year feeding at Fort Lewis marshes. This species is a useful indicator of environmental quality, and has benefited tremendously from wetland reclamation projects conducted on the post. Heron frequently nest in colonies of large platform nests, known as rookeries, constructed in trees. Since 1985, four known rookeries on post have been used. At the time of writing, these rookeries appeared to be abandoned, but it is known that great blue heron sometimes use alternate rookeries. Abandoned rookeries and foraging sites will be monitored by Fort Lewis biologists and any newly located or active rookery sites will be protected from human development. During a 1990 aerial survey, a new heron rookery was discovered where about a dozen of the birds appeared to be nesting.

Western Gray Squirrel

The western gray squirrel is a rare, habitat specific species found mainly near Oregon white oak and Douglas fir stands. This species has been reduced to remnant populations, located primarily on Fort Lewis. Protecting oak groves associated with open coniferous forests on Fort Lewis has assisted in maintaining a viable population.

Game Species Management

Controlled Hunting

Big game, upland game, and waterfowl populations are harvested through controlled hunting on Fort Lewis. Regulated harvests on Fort Lewis maintain populations at or near their carrying capacity, alleviating problems created by density-dependent population con-

tol. Hunters spent 12,900 man days in 1989 hunting blacktail deer, waterfowl, small game, and upland game on Fort Lewis.

Deer Study

A deer nutrition and food habit study was just completed through a contract with Washington State University. The reasons for low fawn survival rate may be discovered through this study.

Wetland Restoration

Washington state is losing between 700 and 2,000 acres of wetlands each year primarily to drainage of urban areas. Fort Lewis, however, undertook a project of wetland reclamation resulting in nearly 700 acres of drained wetlands being reflooded or rehabilitated.

Reed Canary Grass Control

The Cookie Cutter is a 24-foot aluminum boat propelled with two front-mounted, counter-rotating blades. With a capability to dig through peat bogs and cut trees of diameters up to 3 inches, the Cookie Cutter has improved wetlands dramatically. The blades can be raised or lowered to cut invading brush and trees, aquatic vegetation, and dig up mud and peat to depths of 4 feet. Channels mowed through peat bogs have created travel spaces between open water bodies for water fowl, spawning salmon, and canoes. Until 1986, herbicides were occasionally applied to the upland wetland margins during the summer months to control the grass. Successful and feasible long-term reed canary grass control involves starving this plant of light. Wetland tolerant shade trees have been successful for this purpose when planted along streams with defined banks. Cottonwood trees planted along the shores of Muck Creek have been able to shade all emergent areas of the narrow creek and effectively weaken this plant's stronghold on the shoreline.

Waterfowl Habitat Enhancement

Wood Duck

The success of Fort Lewis' wood duck box program has been recognized throughout Washington. Fort Lewis now maintains one

of the largest and most effective wood duck nest box programs within the Department of Defense and has established the largest concentration of breeding wood ducks in western Washington state.

Canada Goose

Introducing Canada goose populations to suitable habitat has been accomplished with transplanting projects. Goslings and adult birds molted out of their flight feathers are captured from areas where their presence is unwelcome, such as golf courses and municipal parks. The geese are transplanted to suitable areas which goslings imprint upon as the first area of flight. Nearly 600 Canada geese have been transplanted to Fort Lewis and productive nest sites have been located at 16 separate wetland areas on Fort Lewis.

Purple Martin Program

Purple martin boxes, which include single houses and apartments, have been deployed throughout Fort Lewis' wetlands. The post's nesting purple martin population has been monitored by volunteers from local Audubon Society chapters. Between 1984 and 1988, Fort Lewis purple martin nesting success increased 312 percent. A banding program targeting birds that had not left the nest was started in 1989.

Stream Rehabilitation

Fort Lewis fish and wildlife biologists have conducted several fishery enhancement projects in cooperation with the U.S. Fish and Wildlife Service and the Washington Department of Fisheries. Stream rehabilitation has involved every Fort Lewis stream with access to marine waters. Fort Lewis developed a technique of laying filter fabric in the stream bed before laying down clean gravel. The fabric permits the water to circulate throughout the watershed while preventing sediment from rising over the gravel. Silt deposition from run-off is minimized using riprap along stream shores. Fort Lewis' technique is now widely used in stream rehabilitation programs throughout Washington state. Fish and their food sources in diverse water habitat need cover for protection from predation. Fort Lewis has created this "hiding cover" by planting cottonwoods along stream shores adding

half logs and boulders to streams, and constructing bank structures. Eggs planted in Fort Lewis streams before rehabilitation had only a 7 percent survival rate. After stream rehabilitation survival rates now average about 90 percent, with some streams having survival rates as high as 97 percent.

Fishery Management

Rainbow Trout

Since 1979 catchable rainbow trout have been purchased from private hatcheries using funds generated through Fort Lewis recycling programs. In 1989 a total of 85,000 trout were stocked in Fort Lewis lakes while 27,000 were stocked in 1990.

Salmon

Another active aspect of Fort Lewis fisheries is the landlocked salmon stocking program. Fishery experiments have been conducted in Fort Lewis lakes, testing specie-specie compatibility and survivability. These test situations have resulted in successful combinations in lakes with no outlet and in screened lakes. Landlocked salmon grow and compete well with yellow perch, helping control perch populations in these lakes.

A significant number of smolt were being eaten by birds feeding at Sequalitchew Lake until the Washington Department of Fisheries and the Army installed net pens in 1988. Young are now raised entirely within these net pens. Before installing the net pens, only 0.5 percent to 2.5 percent of the fingerlings were surviving to return to south Puget Sound for spawning, now 10 percent to 12 percent mature salmon are returning to south Puget Sound each year.

Salmon spawning bed enhancement results in significantly greater numbers of salmon produced, increasing the numbers available to sport and commercial fishermen.

Marine Fishery Enhancement

Fort Lewis' Natural Resource Management Office is responsible for 2.5 miles of Puget Sound shoreline. Working in cooperation with the Washington Department of Natural Resources, Fort Lewis constructed an artificial reef, called Solo Point Reef. Artificial reefs

are built from a variety of discarded materials, such as bathtubs and auto bodies, but rubber tires are relatively less expensive and last much longer in saltwater. Local tire shops donated 40,000 used tires, and volunteers and the Army National Guard helped to make Solo Point Reef possible. Troops and volunteers prepared the donated tires for dumping. Scuba divers bundled the tires together and set them in place on the sandflats. Kelp was transplanted to the area to accelerate organism colonization. Solo Point Reef now provides a stratified substrate for many marine organisms. Several species of rock fish, sea perch, cabezon, starry flounder, wall-eye pollack as well as barnacles, mussels, shrimp, and crab now populate the 2.5 acre reef. The reef is divided into two recreational sections, one half being for scuba divers and the other half for anglers.

Prairie Management

Several large prairies present on Fort Lewis are historical remnants of those that Native Americans maintained through periodic burns to kill saplings sprouting on the loose, highly permeable soils unsuitable for widespread tree growth. These prairies are some of the last in western Washington that still contain a significant number of native plant species.

Western Bluebird Program

The largest concentration of nesting western bluebirds in western Washington currently reside on Fort Lewis prairies, a result of the enhancement projects conducted in all realms of their habitat. The bluebird enhancement project has been based upon an assumption that Fort Lewis prairies are the remaining core areas where western bluebird breed in the Puget Sound area. The project's primary goal is to rebuild the western bluebird population to its former status. Through cooperative efforts between two Audubon Society chapters, bluebird boxes have been placed throughout Fort Lewis and monitored closely by a local program organizer. In 1989, 414 boxes produced 725 fledglings. The overall success of this bluebird box program has become a model for satellite projects within the community, local Audubon groups, and the Washington Department of Game.

Forest Resource Management

Timber Stand Improvements

Operations undertaken to improve the quality, composition, and productivity of primarily young timber stands are referred to as Timber Stand Improvements (TSI). Today the most widely used TSI operation on Fort Lewis is precommercial thinning, conducted in overstocked stands 15 to 20 years old. Precommercial thinnings remove surplus stems from conifer and hardwood stands, enhancing growing conditions and facilitating military foot traffic through the stand. Herbicide application was a common TSI practice to reduce competing brush and tree species in Douglas fir plantations. Aerial herbicide applications have declined in recent years due to the negative side effects of this practice. No chemicals were applied to forested areas in fiscal year 1990 and any future herbicide use on forested areas will be associated with spot applications rather than aerial applications.

Regeneration Cuts

Logging, slash burning, and scarification reduce vegetation and canopy diversity which reduces available habitat for animals specific to mature conifer forests. This effect on the ecosystem has been reduced on Fort Lewis by utilizing several forestry practices largely unused in the private sector. Regeneration cuts retain mature trees and snags to maintain hiding cover and habitat for species requiring large, old trees for a portion of their life cycle. Currently, plans for regeneration cuts which leave more mature trees clustered together are being assembled to better accommodate the needs of military training and wildlife. Old growth timber areas along the Nisqually River and Puget Sound are preserved in scenic corridors.

Forest Openings

Since 1988 Forestry Section timber sales have been surveyed by wildlife personnel. The personnel mark critical habitat to ensure its retention. To increase diversity within homogenous timber plantations, small and scattered forest openings have been created through logging sales conducted primarily for wildlife enhancement. To preserve natural feeding areas and edge habitat for wildlife, some openings are maintained through prescribed burning. Specific shrubs

and trees planted within forests and in natural openings of forested areas have increased heterogeneity.

Cultural Resource Management

Fort Lewis and its subinstallation Yakima Firing Center, lie within the respective ceded lands of the Nisqually and Yakima Indian Nations. Both areas are utilized today by the Native Americans in the pursuit of their traditional lifestyles and treaty rights. Fort Lewis has worked to preserve not only military history in the care of its historic Garrison Area, but also local, state, and federal history in its wealth of both prehistoric and historic archeological sites. Fort Lewis also has the distinction of being the only Continental United States (CONUS) installation to consult and interact with Native Americans over protection of their sacred areas and continued access to Army lands for pursuit of their traditional lifestyles.

Geographical Resources Analysis Support System

At Fort Lewis, GRASS implementation began in 1984. GRASS has become an integral part of the operations of the Fort Lewis Environmental Division. The Geographical Information System at Fort Lewis has made its mark on everything from training planning to natural resource management. Included in that spectrum is environmental documentation, habitat assessment, and cultural resource management. For example, approximately 30 GRASS-produced maps were included in the EIS for the proposed land acquisition at Yakima Firing Center. GRASS has been used as an analytical and illustration tool in several Environmental Assessments (EAs) and land management plans as well. The GIS recently was instrumental in allowing the production of an Environmental Coordination Map for Fort Lewis. Trainers use this map to help direct their activities to areas that will be least impacted by the military mission. Natural resource management such as forestry, threatened/endangered species locations, and habitat assessment and rehabilitation are all being tracked and managed by the GIS. GRASS is used to store and assist in managing the locations and extent of archeological sites, and with the hookup of a relational database, further information on the sites will be stored. Adding a relational database will increase the

power of the GIS in cultural resource management as well. This relational database will also make the GIS more useful in managing hazardous waste and underground storage tanks.

Remote Sensing Applications

To perform long-term environmental monitoring and management for Fort Lewis' subinstallation, Yakima Firing Center, the Environmental Division has turned to a combination of remote sensing and GRASS capabilities. Remote sensing involves acquiring environmental/natural resource data through satellite imagery and aerial photographs. By combining information derived from satellite imagery and aerial photographs with field and historical data from land managers and planners, the current remote sensing and GRASS technologies are being used to assess environmental damage, determine restoration costs, and monitor rehabilitation progress. The remote sensing project is helping Fort Lewis and the military trainers work toward more effectively integrating current and future military needs with environmental concerns. Data obtained through the remote sensing project enables the Environmental Office to assess training damage, and eventually perform event-based monitoring. Data collected will be correlated to military uses to develop a model that can help predict various impacts under various training scenarios and weather conditions. In the future this information will help direct military training activities to different parts of the installation and at appropriate times of the year to minimize training impacts.

Environmental Awareness

Environmental Quality Board

Fort Lewis has developed an Environmental Quality Board (EQB) to increase the environmental awareness of the Fort Lewis Command Group. The EQB is comprised of Senior Corps and Division Staff, Sub-Installation Commanders and Major Subordinate Commanders of I Corps and Fort Lewis. The I Corps Deputy Commanding General currently chairs the EQB. An environmental crest was designed to embody the efforts of the EQB by representing the merge of environmental considerations with the requirements of the military trainers. This crest is now proudly displayed in the Command

Conference room of I Corps Headquarters, along side the crests of all the units or commands on Fort Lewis.

Environmental Education Booth

For the past two years the environmental staff has volunteered to participate in the Armed Forces Day Bedrace. This involves racing in a bed decorated in an environmental theme. Concurrent with the Bedrace festivities has been an Environmental Education Booth, to inform troops and their families. It is hoped that through these programs the Environmental Office will increase the environmental awareness of the Fort Lewis community.

Louisiana Army Ammunition Plant, Louisiana

POC: Doyle Williams, (318) 459-5108

Timber Management

Two Shreveport parishes recently received a total of \$80,000 as part of the state's entitlement from the Louisiana Army Ammunition Plant Forestry Proceeds. The Ammunition Plant harvested the wood in such a way that it brought a profit back to local and federal agencies without harming the environment. The forestry practices are also integrated with fish and wildlife management programs to protect endangered and threatened species on the installation. Federal law passed in 1984 requires that 40 percent of the net proceeds from timber sales on DoD land be distributed to the counties in which the land exists and the remaining 60 percent goes into a DoD reserve account. The counties use the money for roads and schools.

Army Environmental Quality Award

The Louisiana Army Ammunition Plant was runner-up in the Army Environmental Quality Award. The installation was recognized in the Army competition for its hazardous waste minimization program, solid waste reduction, and its emphasis on public involvement, training, and team work in resolving challenges.

McAlester Army Ammunition Plant, Oklahoma

POC: Steven Dunbar, (918) 421-3341

Environmental Accomplishments

The McAlester Army Ammunition Plant has had many major environmental successes in the past five years. Examples include, receiving a new landfill permit, completing an installation-compatible use zone plan, completing radon testing, removing all transformers with regulated polychlorinated biphenyls, and completing a hazardous waste renovation plan. Progress has also been made in areas such as pink water lagoons and closing the previously used sanitary landfill.

Fort McCoy, Wisconsin

POC: Al Balliet, (608) 388-2170

Sludge Spreading Program

The Fort McCoy Environmental Management Office in joint venture with the Natural Resources Management Division and the Buildings and Grounds Division initiated a sludge spreading program which became effective in July 1991. Through this program, Fort McCoy is deleting sludge treated by the wastewater treatment plant from the solid waste disposal contract. Though this is not a hazardous waste item, it is minimizing the Fort McCoy solid waste stream and helping the Natural Resources Division Training Area Restoration Program.

Contaminated Soil Disposal

Fort McCoy Fire Department (Hazardous Materials Team) along with the Buildings and Grounds Division, cleans up approximately 40 fuel related spills each year. Until recently, the only disposal mechanism for the contaminated soil was to go through the Defense Reutilization and Marketing Office. Average costs for this method were more than \$3 per pound. The Environmental Manage-

ment Office at Fort McCoy is initiating a contract with a local asphalt plant that will accept this soil. The cost per pound for disposal is estimated at only \$40 per ton. This will significantly reduce the amount of waste sent to the DRMO.

Fort Meade, Maryland

POC: Paul Robert, (410) 677-3648

Dedication of Fish Ladder

On May 15, 1991 Fort Meade and members of the Maryland Department of Natural Resources and representatives from other state, federal, and local conservation organizations dedicated the completion of a fish ladder on the Little Patuxent River. The facility is the only one in the area with an observation room for research and is an important part of the Chesapeake Bay Program. This was an environmentally funded project at Fort Meade.

Fort Monmouth, New Jersey

POC: Dinkerei Desai, (201) 542-1475

Hazardous Waste Minimization Plan

Fort Monmouth has implemented an aggressive hazardous waste minimization plan. The program provides a multifaceted approach to reducing hazardous waste by substituting non-hazardous materials, changing procedures, and recycling. Fort Monmouth's latest innovation involves recycling antifreeze, estimated to save \$28,000 annually. Recycling hydrocarbon contaminated soil for \$85 per ton instead of the \$2,000 per ton charged by DRMO to dispose of this soil has also resulted in substantial savings.

Solid Waste Management

Fort Monmouth established a solid waste management plan which ensured full compliance with the New Jersey Department of

Environmental Planning Regulations and has become a model for the Department of Defense/Department of the Army installations. The plan includes recycling glass, aluminum, bi-metal, newspapers, corrugated cardboard, and all office paper (white, colored paper, manuals, phone books, folders, etc.) Also, leaves are composted and used for grounds maintenance. These efforts have greatly reduced the annual volume of refuse going to the landfill which has helped offset the large increase in dumping fees.

Fort Ord, California

POC: James Willison, (408) 242-4505

Hazardous Waste Management Program

Fort Ord developed an excellent hazardous waste management program and passed the last two EPA and state compliance inspections with no field violations. Key elements to the program include a hazardous waste management standard operating procedure (SOP), a quarterly training program (750 taught to date), quarterly command inspections, and proper hazardous waste accumulation facilities. Key to the program's success is the high degree of command support at Fort Ord. The hazardous waste management SOP provides a "cookbook" for compliance and has been used as a model for many other installations.

Community Outreach Program

Fort Ord has completed a three-day media/community outreach program designed to inform the public of Fort Ord's environmental program and Superfund cleanup. The program included a presentation about the Superfund program followed by a site tour. Fort Ord has begun to inform the public about its environmental program through significant television and newspaper coverage which has enhanced the public awareness and knowledge of Fort Ord's environmental program.

Habitat Conservation of the San Joaquin Kit Fox

As a result of formal consultation with the U.S. Fish and Wildlife Service, Fort Ord has entered into a cooperative agreement with the conservation organizations to conserve the habitat of the San Joaquin kit fox while they construct a multipurpose range complex.

Picatiny Arsenal, New Jersey

POC: Thomas Solecki, (201) 724-5818

Three-dimensional Installation Restoration

Picatiny Arsenal is the focus of a project that involves a computerized, three-dimensional approach to environmental management. The project addresses one portion of the installation's environmental restoration program. The environmental studies will define the effect past operations and past accepted waste disposal practices have had on the installation. Picatiny is working with USATHAMA, the Corps of Engineers and contractors to develop a ground water model of the trichloroethylene (TCE) contaminated plume on post and will use the information in a remediation design for the plume.

The ground water model being developed actually fuses two types of ground water models; a three-dimensional ground water flow model developed by the U.S. Geological Survey (USGS); and the random walk model which traces the flow path of contaminants. This project has combined these two test models, illustrating an innovative approach to deciphering what lies beneath the land's surface. Picatiny demonstrated a need for the three-dimensional technology because of its complex and interconnected aquifer system. The model utilized a 6-layer approach to simulate the Picatiny aquifer system. Additional data gained from the new ground water model will provide more information about the interconnection between the layers and enable USATHAMA to pinpoint where wells should be installed, how many will be needed, and at what rate water should be pumped from the wells. The Huntsville Corps of Engineers will then use this information to complete the design of the aquifer treatment system. This

model is all the more valuable because it can also be used elsewhere. Data from other installations can be fed into this program and produce a true likeness of the geology and aquifer characteristics at that site. USATHAMA can now create ground water model contours on a personal computer in-house.

Fort Polk, Louisiana

POC: Charles Stagg, (318) 537-6244

Good Land Use Award

The Louisiana Chapter of the Soil and Water Conservation Society gave Fort Polk the Good Land Use Award for 1989. The Good Land Use Award is presented annually to an individual corporation or organization who demonstrates exceptional commitment to environmental awareness to soil and water conservation in Louisiana. The award was presented to Fort Polk on May 31, 1990.

Fort Polk Landfarm

The Fort Polk Landfarm is a treatment process that converts petroleum, oil and lubricant (POL) contaminated materials into a form of topsoil that is used to establish grass cover on the clay cap of the installation landfill. The POL-contaminated materials are derived from vehicle wash sediments and POL-soaked absorbent clay used to collect fuel spills. These materials are stored and moved to the landfarm where they are mixed with dried, digested sewage sludge, spread evenly over the landfarm, and tilled to a depth of six inches. Following a 12-month treatment period (during which moisture and aeration are controlled), a 6 inch layer of topsoil is removed and transported to the adjacent landfill. USACERL is now preparing a technical report on the landfarm facility and operations. USAEHA is conducting a testing program to better define the chemistry of the treatment process.

Environmental Compliance Course

A course designed to instruct selected Fort Polk Commissioned Officers and Non-Commissioned Officers in Environmental Compliance may be adopted Army-wide. The Directorate of the Engineering and Housing Environmental staff provides instruction for the 40-hour course. Topics covered range from handling hazardous materials to recycling, from training around endangered species, to erosion. This course is the most comprehensive in the Army and has attracted a great deal of attention. TRADOC is considering greatly expanding environmental education, possibly based on this Environmental Compliance course. If adopted, such an Army-wide program could possibly become a new military occupational specialty. The Environmental Compliance Course has graduated more than 140 officers and senior non-commissioned officers from Fort Polk, and from activated Army National Guard and Army Reserve Units.

Red River Army Depot, Texas

POC: Renita Foster, (903) 334-4117 or Randy Evans, (903) 334-3133.

Hazardous Waste Tracking

Due to violations issued during Red River Army Depot (RRAD) inspections in 1987 and 1988, an automated system was designed to track hazardous wastes from its origin to the ultimate disposal regardless of location. In October 1989, Ms. Renita Foster, Environmental Specialist from the Environmental Management Division, and Mr. Randy Evans, Computer Analyst from the Information Center, teamed up and began a study to design, develop, and implement the tracking system.

From the summer of 1988 through October 1989, an intermediate fix for an automated system was developed for a limited number of depot workers to use. As a result of steady and concerted efforts from Ms. Foster and Mr. Evans, RRAD's hazardous waste tracking system became mandatory for use by all hazardous waste generators on August 1, 1990.

There are continuous efforts to enhance and upgrade this system. RRAD's tracking system has evolved to become a vital management tool recognized by Depot Systems Command (DESCOM), HQAMC and HQDA. The tracking system requires hazardous waste generators to initialize a container record into the system, document filing actions, and track final notification record for ready pick up. These actions are all menu-driven procedures requiring very minimal keyboard work. The bulk of the system's data entry rests with the Environmental Management Division for pick up, transport, storage, shipping and confirmed disposal of all the Depot waste.

The hazardous waste tracking system provides for data security and integrity through system and procedural security measures. Environmental personnel have full system capability and waste generators are limited to system functions that have only minimal data access.

Presently there are approximately 75 waste generators on sites with continuous on-line access to the system. The system is tracking more than 3,600 containers of hazardous waste in varying stages of the cradle to grave cycle, which equates to more than 900 tons of waste. The Office of the Deputy Chief of Staff for Logistics invited the hazardous waste tracking personnel to demonstrate RRAD's hazardous waste tracking system through a Department of the Army subgroup studying hazardous waste/hazardous materials system alternatives at the Department of the Army level. The RRAD system is being used as a prototype to develop AMC & DA systems to be implemented Army-wide. Time has proven that RRAD's hazardous waste tracking system is a valuable means and manageable tool for tracking the waste generated by the Depot's enormous production facilities and processes. The simplistic nature of the data entry process encourages generator participation. Its design features provide maximum visibility of all hazardous waste movement in the cradle to grave cycle.

Fort Riley, Kansas

Hazardous Waste Initiative

POC: Greg Sinton, (913) 239-2630

A series of minor incidents and a small fuel spill at Marshall Army Air Field convinced Chief Warrant Officer Allen Stern there was a need to develop a comprehensive hazardous waste disposal program. Stern was not appointed on orders as the Squadron Safety Officer and hazardous waste disposal is not his extra duty. He was just a concerned individual who wanted to do something for the installation and for the environment. Stern assigned deadlines for himself to design, construct, and complete a hazardous waste accumulation site and to implement a functional hazardous waste training program at the airfield. His program had to meet three criteria. First, he wanted to build an effective, efficient site, at little or no cost to the unit. Secondly, he wanted the program to be specifically targeted at the hazardous waste produced at Marshall Army Air Field. Finally, the program had to be mission supportive, making it easy for the soldiers to understand the news. Stern spent many hours studying Army regulations regarding hazardous waste and completed selected readings on ecological systems. At the Defense Reutilization Marketing Office, he procured an old five-ton truck bed to serve as a base for his site and several 15-gallon barrels. The barrels were placed inside the truck bed so if a barrel were tipped over, the hazardous spill would be contained in the truck bed. Next, Stern went to the DEH Environmental Office where Mr. Greg Sinton helped him refine the design for the site. The final stop was at the DEH self-help and DEH grounds where William McCashland and Dennis Parker provided Stern with the building supplies: concrete, fencing, lava rock, and gravel. In addition, they provided hours of advice and technical guidance on building the site. After days of study, coordination, and hard work, Stern completed his project. The site passed a DEH inspection, and was certified as a functional hazardous waste accumulation point. After the inspection, Stern put his environmental knowledge to work and conducted hazardous waste training for 90 of the First Squadron, Fourth Cavalry soldiers. The training highlighted safety, legal aspects, and proper conduct for hazardous waste disposal. Chief War-

rant Officer Stern is an example of what one person can do to make the Army a better place to live and work.

Hazardous Materials/Hazardous Waste Amnesty Program

POC: Larry Ness, (913) 239-3962

When Desert Shield began in the fall of 1990, Fort Riley took advantage of troop deployment by initiating an amnesty program for turning in hazardous materials and hazardous waste. The program ran from November 1990 to March 1991. Deploying units on Fort Riley could turn in excess hazardous material and hazardous waste during this five month period without any administrative burden or paper-work. Money was saved and long-term and future problems in dealing with hazardous waste were avoided. The motor pools were cleaned of all excess materials to include hazardous materials and it made the troops more aware of proper storage and housekeeping methods at the motor pools.

Fort Ritchie, Maryland

POC: Alan Wentrcek, (602) 538-6547

Environmental Open House

On May 29, 1991, Fort Ritchie's Environmental Office held an Open House and Briefing Presentation for state environmental officers. Representatives from the Maryland Department of the Environment and Pennsylvania Department of Environmental Resources attended. The purpose of the Open House was to provide information to the state agencies on the Fort Ritchie environmental program and to foster a better relationship with the state agencies. The presentation was a success and the state officials were impressed with Fort Ritchie's environmental program.

Underground Storage Tanks

In March 1991, Fort Ritchie entered into a Compliance Agreement with the state of Maryland to systematically remove 280

underground storage tanks. This program is to be accomplished between FY90 and FY94. This action eliminated the need for leak testing and major upgrade expenses. This UST program saved \$300,000 in leak testing expenses alone.

Rock Island Arsenal, Illinois

POC: Tom Gizicki, (309)782-7855

Paper Recycling at Rock Island Arsenal

Mounds of trash are being turned into piles of cash through paper recycling at Rock Island Arsenal. During FY88, Rock Island Arsenal recycled 514 tons of paper, up from 380 tons in FY85. In addition to cost avoidance, the contractors who take Rock Island's recycled paper pay the Arsenal to haul it away. Recycling benefits the installation and its employees, private contractors, tax payers, and the environment.

Rocky Mountain Arsenal, Colorado

POC: Colonel Eugene Bishop, (303) 289-0140

In the spring of 1989, the U.S. Fish and Wildlife Service established an agreement with the U.S. Army to protect and manage fish and wildlife at the Rocky Mountain Arsenal. Bald eagles, an endangered species, and golden eagles live at the arsenal in the winter. The U.S. Fish and Wildlife Service is studying the eagles and protecting the land at the arsenal where they live. The eagles come to the arsenal because of the large numbers of prairie dogs and small hawks, which are a primary food source for both eagles and hawks. The hawks do most of the hunting, and the eagles take advantage of the hawks, often scaring them away and taking their meal. The U.S. Army and the U.S. Fish and Wildlife Service provide free tours and school programs so that people can learn about the animals. Mule deer and white tailed deer, black tailed prairie dogs, badgers, burrowing owls and great horned owls, ferruginous hawks, and coyotes are just a few of the animals found at the arsenal.

Fort Sam Houston, Texas

POC: Damon Cardenas or Ronald Flores, (512) 221-4930

In-house Asbestos Abatement Team

Fort Sam Houston has a 12-man in-house asbestos abatement team. This team is capable of performing both glove-bag and regulated area removal operations. Equipment is available to perform two regulated area operations concurrently. The team removes approximately 500 cubic yards of asbestos contaminated material in a 12 month period. This effort costs approximately 62 percent of the costs for the non-government contractor additionally used on post. This represents a savings of more than \$200,000 per year. The abatement team has successfully met inspections by both OSHA and the state equivalents of the EPA.

Historic Building Programmatic Agreement

In May 1991, Fort Sam Houston entered into a Programmatic Agreement with various public and historic preservation organizations to develop a plan for managing approximately 900 historic buildings.

Contaminated Dirt Cleanup

Fort Sam Houston, at the time of writing, had saved \$1.6 million by recycling dirt. Instead of being landfilled, petroleum contaminated dirt is heated to 1,600 degrees Fahrenheit to remove pollutants. This thermal soil remediation system can clean 10 tons of soil per hour. After being incinerated, the dirt is tested to ensure compliance with EPA requirements. After cleaning, the soil is sterile, but can be restored with fertilizer and moisture.

Fort Shafter, Hawaii

POC: Radean M. Brown, (808) 656-1052

Wildlife Preservation

Honolulu Engineer District of the Corps of Engineers is conducting a study of thousands of sea birds, migrating water fowl, threatened green sea turtles, and endangered Hawaiian monk seals. The U.S. Fish and Wildlife Service has asked the Corps to help them examine an array of projects that will preserve land and enhance shorelines used by wildlife inhabiting the islets and waters on Tern Island in the French Frigate Shoals. The team will look at habitat restoration and shore protection in this innovative, first of its kind study.

Fort Sheridan, Illinois

Communities adjacent to Fort Sheridan depend on Lake Michigan for their water supply. To ensure the water quality is maintained, the installation developed a comprehensive plan to protect Lake Michigan from contamination in the event of a major oil or hazardous material spill. The plan includes:

- Updating the Spill Prevention, Control and Countermeasure Plan (SPCCP) and the Installation Spill Contingency Plan (ISCP)
- Incorporating Lake County Hazardous Materials (HAZMAT) Regional Response Team 1st Responder resources into the SPCCP and ISCP
- Providing \$100,000 of equipment and supplies, 104 trained HAZMAT 1st Responders.

Fort Sill, Oklahoma

POC: Ron Barnett, (405) 351-2715

Integrated Training Area Management (ITAM)

Fort Sill is the only Army installation which has fielded all phases of the ITAM program. They are the model for ITAM in general and particularly for their renovation work. The program is funded using environmental dollars, as well as funds from the Department of the Army agricultural outleasing account. Money for Fort Sill projects comes from both Fort Sill and USACERL where ITAM was developed. Projected FY92 funding is \$635,000. Fort Sill's 80 training areas are on a 10-year rest rotation. Each year, eight are closed for renovation. Renovation includes road repair/construction, general erosion control, rut levelling, tree planting and grass revegetation. Small portions of renovated areas may be closed longer than one year to allow growth. Wooded areas are the biggest renovation problem. Fort Sill is also working on hardening (gravel roads and pads and tree transplanting) training sites which are used repetitively. Heavy use of these areas greatly reduces damage to other parts of the range.

Asbestos Maintenance and Removal Program

Fort Sill's asbestos program encompasses more than 14 million square feet of real property on the installation plus 52 U.S. Army Reserve Centers in Oklahoma and Arkansas, with one million square feet of space, most of which has Asbestos Containing Material (ACM) in some form. Support for the asbestos program includes a survey team, an abatement team, and an asbestos laboratory. The abatement team addresses ACM identified during the survey process which requires repair or maintenance actions, as determined by risk assessments. Damaged or deteriorated ACM is then repaired, encapsulated, or enclosed to ensure stability until it is removed. Removing ACM is normally done when significant repair/renovations are scheduled for the structure. The availability of these resources have resulted in a significant dollar savings to the installation. The most significant impact, however, is the ability to identify suspect material immediately in reacting to emergencies and priorities. In 1990, the asbestos

program provided surveys for 911 buildings, analyzed 4,880 bulk samples, and 427 air sample cassettes, abated all asbestos in 47 buildings, repaired damaged ACM in 16 buildings, and completed 32 asbestos removal projects which did not involve total structure abatement. Asbestos surveys for the 52 U.S. Army Reserve Centers have been completed. The installation realized a savings of \$492,000, after costs, in fiscal year 1990; actual savings for fiscal year 1991 reached \$585,000. All personnel involved in the asbestos program receive certified training from an approved EPA facility, and annual recertifications as required.

Fort Stewart, Georgia

POC: Tom Houston, (912) 767-2010

Recycling

The Resource Recovery and Recycling Program at Fort Stewart/Hunter Army Air Field has reduced the amount of solid waste generated by the installations. The program has also saved refuse collection costs. Sale of consumer recyclables has generated dollars for the installation, thereby enhancing the quality of life for the soldiers and their families.

Hazardous Waste Training Program

Fort Stewart/Hunter Army Air Field designed and executed a training plan to provide required hazardous waste training to over 1,400 soldiers who were engaged in hazardous waste handling activities as part of their military duties. These efforts corrected a potential violation within a 90 day period.

Tobyhanna Army Depot, Pennsylvania

POC: Joseph Maciejewski, DSN 795-7097

Hazardous Material Spill Response Vehicle

Tobyhanna Army Depot converted a five ton military vehicle to meet the installation's hazardous material response requirements. The vehicle was provided with a utility shelter which was modified by adding air conditioning and lighting, as well as storage compartments, to use it as both a command post and a storage vehicle for hazardous material incidents. The hazardous materials response vehicle is available for containing and neutralizing hazardous chemical situations. Using this vehicle prevented serious events from developing by responding to dangerous conditions in a timely and proper fashion.

Hazardous Waste Minimization

The Tobyhanna Army Depot has reduced hazardous waste by approximately 76 percent since 1985. Tobyhanna Army Depot is considered a large quantity hazardous waste generator and as such, complies with waste minimization requirements set forth in the Resource Conservation and Recovery Act (RCRA) and Army regulations. The Depot has developed a required plan which describes specific steps taken to implement the hazardous waste minimization program. Depot engineering personnel design, procure, and use materials so that the least amount of waste is generated and limits hazardous materials use to the maximum extent practical. In addition, waste monitoring procedures are in effect to reduce waste generation. The 76 percent reduction exceeded higher command hazardous waste minimization goals and resulted in savings of \$1,330,920 in hazardous waste disposal expenses.

Hazardous Materials/Hazardous Waste Tracking System

The Environmental Management Division, in cooperation with the Directorate of Information Management, is developing a system to automate hazardous material and waste tracking from cradle to grave. The system will track hazardous materials from point

of receipt to point of disposal. This will facilitate compliance with federal, state, and Army regulations including the RCRA and the Title III reporting requirements of the Superfund Amendments and Reauthorization Act of 1986. It will make inventory control more efficient, as all organizations on the Depot will be using the system, thereby reducing redundant or unnecessary orders.

Solid Waste Management Program

Tobyhanna Army Depot is reducing solid waste while generating revenue to fund other projects. Tobyhanna Army Depot is in compliance with Army Regulation (AR) 420-47, Solid and Hazardous Waste Management, and the Monroe County Solid Waste Management Program. In addition, Tobyhanna Army Depot complies with AR 200-1, which sets forth policies and instructions for establishing and managing a recycling program. In FY90, the Depot received \$242,976 in proceeds from the sale of recyclable materials. Recycling proceeds are used to finance projects for pollution abatement, energy conservation, occupational safety and health activities as well as morale and welfare activities. Personnel from the installation's Environmental Management Division serve on the Monroe County Solid Waste Management Board as a representative of industry, and participated in developing the county's solid waste management plan.

Proactive Approach to Ground Water Contamination

Being located in the scenic Pocono Mountains of northeastern Pennsylvania has always given Tobyhanna Army Depot a sense of responsibility to the environment. As such, it has always pursued an aggressive policy of preventive environmental management, and has acted expediently wherever problems have arisen. Since the discovery of trichloroethylene (TCE) in several off-post wells in 1986, the Depot has taken a proactive approach in working with local residents and local, state, and federal officials to ensure the safety and well-being of the affected population. At the first sign of trouble, Tobyhanna took the initiative and provided an alternative water source to those residents even before an Army study showed the Depot was the source of the off-post problem.

During the difficult years that followed, the Depot's concern for the approximately 60 affected residents continued. The concern was expressed in such initiatives as frequent communications, evening meetings, and formal visits while water samples were gathered, rapid responses to questions, and conveying the message to everyone that the Depot is both a victim of past practices and a partner in resolving the current problem. This approach reaped benefits in 1990 when critical meetings were held to determine the best method for providing an alternate water source during the project's 10- to 15- year cleanup phase. Due to the excellent credibility built up over the past 3 years, the Army was able to gain overwhelming acceptance for its preferred alternative of extending Depot water lines into off-post residential areas. This action will provide a reliable and safe source of water to the affected residents throughout the remediation process. The Depot's proactive approach to the situation has thus ensured that excellent community relations are maintained and that the negative publicity which has plagued other installations does not become a significant issue in this region.

Natural Resources Program

The Tobyhanna Army Depot maintains a very active natural resources program. The discovery of a pair of osprey (a species currently on the Pennsylvania Endangered Species List) nesting in Tobyhanna's Oakes Swamp, has generated excitement among the Depot community. Several environmental specialists from Tobyhanna have initiated preventative measures to ensure the birds are protected from predators and are not otherwise disturbed. It is hoped that such action will contribute to this rare species proliferating in the Pocono Mountain Region and will ensure that its presence can be enjoyed by future generations.

Protecting the Biosphere

Tobyhanna Army Depot has established programs to eliminate or minimize pollution that damages the air, water, earth, or its inhabitants. Some specific actions include:

- Modifying operational procedures to eliminate or minimize emissions of ozone-depleting substances and recycling these substances to the maximum extent possible
- Exploring and implementing different methods/processes used in the spray painting operations to reduce volatile organic compound emissions
- Providing for adequate wastewater treatment to ensure that the water receiving the treated effluent maintains its quality
- Implementing storm water discharge monitoring programs and eliminating sanitary sewer and storm water sewer system cross connections to further preserve water resources.

Umatilla Army Depot Activity, Oregon

POC: Captain Kevin Keehan, (410) 671-2427

Composting Contaminated Soils

Umatilla Army Depot Activity is the site for a USATHAMA composting optimization field study. Composting is a process by which organic matter is biodegraded using naturally occurring microorganisms. The study will obtain the necessary data for determining whether and to what extent implementing composting is a cost effective alternative to incinerating contaminated soils. In situations where immediate remedial actions are required, incineration may be the only solution. In less critical situations, a less costly method such as composting may be acceptable. The Army plans to use composting at Umatilla Army Depot Activity to reduce explosive levels in the soil of its two former explosive washout lagoons.

Final results from the Umatilla Army Depot Activity field demonstration will provide the data needed for full-scale implementation of composting to successfully remediate the washout lagoon soils to required health-based cleanup criteria. Results in this study will allow the Army to achieve a very visible success in bioremediating an NPL site for the first time.

Fort Wingate Army Depot

POC: Adrian Bond, (505) 488-5411

Fort Wingate Army Depot developed an agreement for protecting archeological sites associated with the Chaco culture during installation closure and disposal. The Army and the New Mexico State Historic Preservation Officer signed the final agreement on July 16, 1991.

Yakima Firing Center, Washington

POC: Eric Andersen, (509) 454-8256

Sensitive Species Management

Sage Grouse

A limited number of resident western sage grouse on Yakima Firing Center (YFC) probably represent the largest remaining population of these birds on federal lands in Washington state. The Army conducted a 2-year study through Battelle Pacific Northwest Laboratories researching the sage grouse on the Firing Center. Extensive helicopter surveys conducted in the spring of 1989 and 1990 located a total of 11 leks, or breeding grounds, existing on YFC. These leks and other critical areas are placed off limits during mating, nesting, and brood rearing periods. Pyrotechnics in critical sage grouse areas have been discontinued to preserve the sagebrush stands vital to this bird. The largest lek located on the Firing Center has been closed to training to protect habitat associated with grouse.

American Kestrel

Yakima Firing Center has enhanced habitat for the American kestrel, a small raptor, by installing artificial nest boxes. The kestrels have responded well to the 24 nestboxes placed throughout the Firing Center. These birds utilize about 50 percent of the boxes annually.

Columbia Milkvetch

The Washington Natural Heritage Program lists the Columbia milkvetch as a threatened plant in Washington state. Helicopter and

ground surveys have been conducted to determine the relative abundance, and geographic and ecologic distribution, of Columbia milkvetch on and near the Firing Center. Most of the known stands of Columbia milkvetch are actually on the Firing Center. Select Columbia milkvetch sites on YFC are completely protected with fence enclosures. These enclosures reduce molestations to study plots and permit objective studies of these plots. The YFC Columbia milkvetch populations have been mapped to designate off-line training areas for tracked vehicles and to limit foot training occurring in these areas.

Game Species Management

Resident and migratory mule deer and Rocky Mountain elk on the Firing Center are managed through seasonal hunts regulated by the Washington Department of Wildlife. Training areas not in use are open to public hunting unless prevented by safety requirements. An average of 22 deer have been harvested per year on YFC over the past seven years.

Riparian Enhancement

Yakima DEH personnel, working with Fort Lewis wildlife personnel, have been involved with several projects aimed at enhancing YFC's riparian zones. The first project attempting to reintroduce vegetation to disturbed riparian areas, involved planting 3,000 shrubs and trees along streams and ponds. A second riparian enhancement project involved constructing barriers around several springs and sections of certain streams to prevent livestock grazing within the enclosed areas. A total of 27 of these enclosures were constructed to permit vegetation to regenerate naturally. Significant differences in vegetation condition and composition between fenced and unfenced areas were noticeable during the first growing season following the project.

Shrub-Steppe Habitat Management

The Firing Center is actively attempting to restock sagebrush on post. The first restoration effort in the fall of 1990, involved

planting 1,500 sagebrush plugs on fire damaged plots at the Firing Center in 4 by 4 foot spacings. Forbs and sagebrush seeds are planted each fall to encourage plant diversity and maintain a vegetative cover on the light soils. Different combinations of plant species are seeded to ensure regrowth in the multiple microclimates present on the topographically diverse Firing Center.

Land Condition Trend Analysis Program

In 1989 USACERL initiated LCTA on YFC. Using SPOT (Satellite Pour L'observation de la Terre, or Satellite for Observing the Earth), satellite imagery digital soil surveys, and GRASS geographic information system, 202 permanent core plots were randomly placed on the Firing Center. The first year of data collection on the Firing Center resulted in a 300 plant species list. Incorporating statistical programs and using GRASS will assist in identifying whether a site is static, declining, or improving. Future program plans include at least two more years of monitoring vegetation at all plots, followed with an evaluation to decide which plots, if any, need to be sampled every year.

Sediment Yield Prediction Model (SYPM)

The Sediment Yield Prediction Model (SYPM) survey was initiated on YFC in 1990. A computer program is used to appraise the ratings and predict the sediment yield for that area. The goal of the SYPM program is to identify areas where erosion control measures will be best used and also to monitor the effectiveness of existing erosion control devices. A range survey has been developed to monitor the condition and annual vegetation production on the Firing Center. The degree to which the range site has been altered is termed the range condition class. Mapping these range sites and their conditions into GRASS began in 1990.

Conclusion

The success of all of these programs shows how the Army is actively using its resources to preserve the environment for future

generations. Environmental training, awareness, research, funding, and technology will continue to be used to compliment the Army's military mission.

Appendix A: Installations with Good News by Major Command

AMC

Aberdeen Proving Ground, MD
Anniston Army Depot, AL
Badger Army Ammunition Plant, WI
Holston Army Ammunition Plant, TN
Indiana Army Ammunition Plant, IN
Louisiana Army Ammunition Plant, LA
McAlester Army Ammunition Plant, OK
Fort Monmouth, NJ
Picatinny Arsenal, NJ
Radford Army Ammunition Plant, VA
Red River Army Depot, TX
Rock Island Arsenal, IL
Rocky Mountain Arsenal, CO
Tobyhanna Army Depot, PA
Umatilla Army Depot Activity, OR
Fort Wingate Army Depot, NM

FORSCOM

Fort A. P. Hill, VA
Fort Carson, CO
Fort Devens, MA
Fort Drum, NY
Fort Hood, TX
Fort Irwin, CA
Fort Lewis, WA
Fort McCoy, WI
Fort Meade, MD
Fort Ord, CA
Fort Polk, LA
Fort Riley, KS
Fort Sam Houston, TX
Fort Sheridan, IL
Fort Stewart, GA
Yakima Firing Center, WA

HSC

Fitzsimmons Medical Center, CO

ISC

Fort Ritchie, MD
Fort Huachuca, AZ

MDW

Fort Belvoir, VA

RPAC

Fort Shafter, HI

TRADOC

Fort Benning, GA
Fort Chaffee, AR
Fort Dix, NJ
Fort Eustis, VA
Fort Gordon, GA
Fort Jackson, SC
Fort Knox, KY
Fort Leavenworth, KS
Fort Sill, OK

Appendix B: Installations With Good News by State

Alabama

Anniston Army Depot
Fort Rucker

Arkansas

Fort Chaffee

Arizona

Fort Huachuca

California

Fort Irwin
Fort Ord

Colorado

Fort Carson
Fitzsimmons Medical Center
Rocky Mountain Arsenal

Georgia

Fort Benning
Fort Gordon
Fort Stewart

Hawaii

Fort Shafter

Illinois

Fort Sheridan
Rock Island Arsenal

Indiana

Indiana Army Ammunition Plant

Kansas

Fort Leavenworth
Fort Riley

Kentucky

Fort Knox

Louisiana

Louisiana Army Ammunition Plant
Fort Polk

Maryland

Aberdeen Proving Ground
Fort Meade
Fort Ritchie

Massachusetts

Fort Devens

New Jersey

Fort Dix
Fort Monmouth
Picatinny Arsenal

New Mexico

Fort Wingate Army Depot

New York

Fort Drum

Oklahoma

McAlester Army Ammunition Plant
Fort Sill

Oregon

Umatilla Army Depot Activity

Pennsylvania

Tobyhanna Army Depot

Appendix B (continued)

South Carolina

Fort Jackson

Tennessee

Holston Army Ammunition Plant

Texas

Fort Hood

Red River Army Depot

Fort Sam Houston

Virginia

Fort A. P. Hill

Fort Belvoir

Fort Eustis

Radford Army Ammunition Plant

Washington

Fort Lewis

Yakima Firing Center

Wisconsin

Badger Army Ammunition Plant

Fort McCoy

Appendix C: Comment Form

To make this document most useful, it is important that the information be updated and supplemented on an ongoing basis. It is anticipated that the resident AEPI MACOM Fellow will continue to gather information and good news from installations, agencies, laboratories and other sources. This document will then be updated biennially to reflect the new material.

Please use this form (attach additional pages if required) to provide your good news, comments, suggestions, etc., for making this document more useful.

Forward all materials to: Kristan Cockerill-Kafka
AEPI
P.O. Box 6569
Champaign, Illinois 61826-6569

Comments: _____

Your Name: _____ Phone: _____

Organization: _____

Acronym Glossary

ACM	Asbestos Containing Material
AEHA	Army Environmental Hygiene Agency
AEPI	Army Environmental Policy Institute
AETC	Army Environmental Training Center
AETMP	Army Environmental Training Master Plan
AIVD	Aluminum Ion Vapor Deposition
ALMC	Army Logistics Management College
AMC	Army Materiel Command
AR	Army Regulation
AMSA	Area Maintenance Support Activity
ASA	Assistant Secretary of the Army
ASA, IL&E	Assistant Secretary of the Army for Installations, Logistics & Environment
CELDS	Computer-Aided Environmental Legislative Data System
CERL	U.S. Army Construction Engineering Research Laboratory
CONUS	Continental United States
CPAR	Construction Productivity Advancement Research
CRREL	Cold Regions Research Engineering Laboratory
CW	Civil Works
DA	Department of the Army
DEEBBS	Department of Defense Environmental Electronic Bulletin Board System
DEH	Directorate of Engineering and Housing
DESCOM	Depot System Command
DOD	Department of Defense
DRMO	Defense Reutilization Marketing Office
EA	Environmental Assessment
ECAP	Environmental Compliance Achievement Program
ECAS	Environmental Compliance Assessment Program
EIS	Environmental Impact Statement
EICS	Environmental Impact Computer System
EIFS	Economic Impact Forecast System
EMP	Electromagnetic Pulse
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency

EQB	Environmental Quality Board
ERIC	Environmental Response and Information Center
ETIS	Environmental Technical Information System
FORSCOM	Forces Command
FY	Fiscal Year
GIS	Geographic Information System
GRASS	Geographic Resource Analysis Support System
HAZE	Hazardous Expertise
HAZMAT	Hazardous Materials (Regional Response Team)
HAZMIN	Hazardous Waste Minimization
HM	Hazardous Material
HMID	Hazardous Material Identification
HQAMC	Headquarters, Army Materiel Command
HQDA	Headquarters, Department of the Army
HQFORSCOM	Headquarters, Forces Command
HUD	Housing and Urban Development
HW	Hazardous Waste
HWMIS	Hazardous Waste Management Information System
ICUZ	Installation Compatible Use Zone
INF	International Nuclear Forces
IRP	Installation Restoration Program
IRIP	Installation Restoration Incineration Program
ISCP	Installation Spill Contingency Plan
ISSA	Inter-Service Support Agreement
ITAM	Integrated Training Area Management Program
LCA	Logistics Control Activity
LCTA	Land Condition Trend Analysis
MACOM	Major Army Command
MCA	Maintenance Contract Army
MDEP	Management Decision Package
MIDI	Medical Item Disposal Instruction
MISC	Miscellaneous Subsystem
MODFLOW	Three-Dimensional Groundwater Flow Model
MOU	Memorandum of Understanding
NELA	Northeastern Logging Association
NEPA	National Environmental Policy Act

NIOSH	National Institute for Occupational Safety and Health
NOV	Notice of Violation
NPL	National Priorities List
NPDES	National Pollution Discharge Elimination System
NTC	National Training Center
NTIS	National Technical Information System
OCONUS	Outside Continental United States
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
PC	Personal Computer
PCB	Polychlorinated Biphenyls
PCMS	Pinon Canyon Maneuver Site
PIF	Productivity Improvement Funding
PIT	Passive Integrated Transponders
POC	Point of Contact
POL	Petroleum, Oils and Lubricants
RAND 3-D	Random Walk Model 3-Dimensional
RCRA	Resource Conservation and Recovery Act
SAACONS	Standard Army Automated Contracting System
SCS	Soil Conservation Service
SEEC	Senior Executive Environmental Council
SELC	Senior Environmental Leadership Conference
SOP	Standard Operating Procedures
SPCCP	Spill Prevention, Control and Countermeasure Plan
SPOT	Satellite Pour L'observation de la Terre (Satellite for Observing the Earth)
SYPM	Sediment Yield Prediction Model
TARP	Training Area Rehabilitation Program
TASC	Training Aid Support Center
TCE	Trichloroethylene
TDA	Table of Distribution and Allowance
THAMA	Toxic and Hazardous Materials Agency
TIPPP	Tidewater Interagency Pollution Prevention Program
TRADOC	Training and Doctrine Command
TSCA	Toxic Substances Control Act
TSI	Timber Stand Improvements

USACE	U.S. Army Corps of Engineers
USAEHA	U.S. Army Environmental Hygiene Agency
USACERL	U.S. Army Construction Engineering Research Laboratory
USAEHSC	U.S. Engineering and Housing Support Center
USAR	U.S. Army Reserve
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USGS	U.S. Geological Survey
UST	Underground Storage Tank
UXO	Unexploded Ordnance
XRF	X-ray Fluorescence Device
YFC	Yakima Firing Center

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