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INSIDE THIS ISSUE

2

New Plants Improve
Range Sustainability

3

SERDP Invests in
New TES Efforts

4

SERDP and ESTCP Sponsor
Molecular Biological
Tools Workshop

5

ESTCP Initiates Wide Area
Assessment Program

7

Technology Transfer Efforts
Making News

9

Five Distinguished Members
Join SERDP SAB

11

Program Notes

12

Calendar



SERDP
Strategic Environmental Research
and Development Program



INFORMATION B • U • L • L • E • T • I • N

UXO Technology Transfer Promoted at Collaborative Workshop Hosted by ESTCP and NAOC

Unexploded ordnance (UXO) detection, site characterization, and remediation technologies are rapidly maturing and are ready for field use. ESTCP and the National Association of Ordnance Contractors (NAOC) hosted a workshop in Aberdeen, Maryland, July 20-21, 2005, to demonstrate practical applications of these technologies and facilitate technology transfer among government project managers, regulators, and ordnance contractors. Members of the press were also in attendance, and the event was featured in the *Baltimore Sun*.

The 2-day workshop opened with a series of presentations on geophysics and UXO discrimination. Case studies of technology applications in the field highlighted handheld, vehicular, and airborne system successes as well as data processing and software tool achievements. Successes include use of a chi-squared data processing technique on EM61 Mk2 sensor data collected at the Former Camp Croft, South Carolina, where soils with magnetic properties interfere with data processing. This technique reduced the number of targets requiring further investigation from 8,000 anomalies to 1,600 anomalies, representing roughly an 80% reduction.

After a brief introduction by Mr. George Robitaille of the Army Environmental Center on the SERDP and ESTCP supported Standardized UXO Test Sites at the Aberdeen Proving Ground (APG), participants had a unique opportunity to partake in a series of outdoor demonstrations.

Nearly 150 attendees toured eight stations displaying man-portable, vehicular, and airborne platforms with various configurations of electromagnetic induction (EMI) and magnetic sensors, as well as navigation systems that support UXO detection and discrimination. The outdoor portion of the workshop provided attendees an excellent venue for closely viewing the technologies and interacting with the technology developers. Participants also toured the recently opened shallow water Standardized Test Site at APG and observed a demonstration of a promising marine UXO detection system.



Workshop participants interact with developers of the Multi-Sensor Towed Array Detection System (MTADS) for UXO detection.

Indoors, attendees viewed demonstrations of software that discriminates UXO from non-UXO items and project management tools, as well as technical presentations on innovative UXO detection sensors and remediation systems. The software tools range from large-scale statistical techniques to support detection, delineation, density estimation, and mapping of unknown target areas to tools that analyze specific properties of anomalies—including size, depth,

S • U • C • C • E • S • S S T O R I E S

SERDP-funded research and development efforts and ESTCP-funded demonstration and validation activities continue to provide a rapidly increasing number of outstanding technical and environmental advances. These developments are highly important and relevant to the Department of Defense (DoD), Department of Energy (DOE), Environmental Protection Agency (EPA), and many other user communities.



S U C C E S S O R Y

Plants Stand Up to Tanks

Tracked and wheeled vehicles ranging in weight from a half-ton to nearly 70 tons have destructive and direct impacts on vegetation. They can tear plants and compress soils, resulting in injured or destroyed plants and no soil cover for sediment control. This may, in turn, lead to soil erosion, runoff of sediment into streams and lakes, loss of training realism through denuded vegetation, and reduced ability to support future testing and training activities. Consequently, plants resistant to this wear and tear are needed to mitigate environmental impacts and support the sustainability of ranges for military training.

To address the relationship between military training and plant resistance to mechanical injury, SERDP and ESTCP have been investing in fundamental research and field demonstrations led by Mr. Antonio Palazzo from the Cold Regions Research and Engineering Laboratory (CRREL) of the U.S. Army Corps of Engineers Engineer Research and Development Center (ERDC). Before these efforts, there was little or no research on the genetics or resiliency of low-maintenance rangeland plants and relatively few options for restoring military training ranges.

Under a SERDP-funded project completed in fiscal year 2003, *Identify*



In support of range sustainability, researchers are developing new plants and seeding methods capable of withstanding military training with heavy equipment such as tanks.

Resilient Plant Characteristics and Development of a Wear Resistant Plant Cultivar for Use on Military Training Lands (SI-1103), researchers at CRREL developed new cultivars and germplasms of native and introduced grasses that establish rapidly, compete with invasive weeds, and are resistant to land disturbances caused by military training activities. These plants were developed by improving the native and introduced grasses already growing on military ranges in the western United States. Germplasms serve as bearers of heredity, are fundamentally independent of other cells, and provide a basis for improving the genetic traits of a plant species. Two grasses capable of cultivation and three grass germplasms have been registered and released via publications in *Crop Science*. The release of eight additional germplasms is anticipated.

Even with improved establishment rates, researchers recognized that the new germplasms would not always be able to compete with the aggressive establishment of annual invasive plant species. To find better ways to establish native plants, researchers at CRREL

developed the concept of “ecological bridges.” In this innovative work, researchers investigated root growth and establishment relationships among various species and, from this knowledge, selected seed mixes of rapidly establishing introduced grasses and desired native grasses. When properly selected, the introduced grasses will quickly protect the soil and create an environment in which the native grasses would gradually establish and dominate the seeded stand. This use of introduced species as a short-term “ecological bridge” in establishing healthy native stands should ultimately lead to a decreased need for introduced species to provide protection for soil and wind erosion in military training areas. Seeding methods have proven successful on eastern (Fort Drum, New York) and western (Fort Carson, Colorado) ranges.

These new germplasms and seeding methods developed with SERDP support now have transitioned to ESTCP for further demonstration and validation at military training ranges in support of their widespread use on DoD and other federal lands. Through the ESTCP project *Implementation and Commercialization of New Germplasms for Use on Military Ranges (SI-0401)*, researchers at CRREL are investigating the release of cultivars, initiating seed contracts, and developing a planting guide for military facilities in the high plains, high deserts, and intermountain West. Current efforts also focus on commercializing the improved seeds and making sufficient quantities

See RESILIENT PLANTS, page 6

SERDP Diversifies Threatened and Endangered Species Efforts

The Department of Defense utilizes nearly 30 million acres of land and thousands of square miles of air and sea space to conduct missions vital to national security. These lands, air, and sea space also provide habitat for a great diversity of plants and animals, some of which are found only within DoD stewardship. This creates a significant challenge for DoD: how to effectively use lands, air, and sea for military training missions while simultaneously managing and conserving species protected by the Endangered Species Act and those at risk of needing such protection. In addition to its ongoing research projects, SERDP is investing in several new efforts to improve understanding of threatened and endangered species (TES) issues and to assess how research can respond to this challenge most effectively.

TES Document and Data Repository

Many valuable technical reports resulting from research and monitoring efforts at DoD installations exist only on bookshelves. To improve access to this “gray” literature, SERDP and the Army’s Engineer Research and Development Center (ERDC), have partnered to develop a Document and Data Repository for TES of military interest.

The goal of this joint effort is to centralize existing but unpublished information, thereby making it more accessible to researchers, land managers, policy makers, and others. SERDP and ERDC have collaborated with the U.S. Geological Survey’s National Biological Information Infrastructure (NBII), which is managing the repository through its web portal system, in an effort to connect DoD’s data with other authoritative TES databases. To date, information for 21 high-priority TES has been included in this online repository.

Access to these documents and data should improve TES management; assist DoD in partnering with other land managers to develop comprehensive, strategic, and proactive approaches to long-term planning efforts for TES and at-risk species; and facilitate the consultation process between military installations and the U.S. Fish and Wildlife Service. *To access the TES Repository, visit <http://my.nbii.gov>.*

INRMP Reviews

Integrated Natural Resources Management Plans (INRMP) are planning documents that allow DoD installations to integrate current and future military land use activities with natural resource management and conservation goals. INRMPs are the primary drivers for land management action at all military installations with significant natural resources. Because of their importance, SERDP has undertaken a review of select installation INRMPs to identify areas where science, technology, and management are needed to improve and refine INRMP implementation. For the pilot phase of this effort, 20 INRMPs were selected using a strategy that ensured representation among services, regions, resource composition, and installation size. To date, INRMPs for five Army installations, one Air Force base, two Navy bases, and three Marine Corps bases have been reviewed.

Basic and applied research needs, demonstration/validation opportunities, and policy and management issues have been identified in the following areas: ecosystem management; whitespace; encroachment; TES status, habitat, and impacts; erosion and sedimentation; wildland fire and forests; and invasive species. Results of the INRMP reviews clearly indicate that installations do have research-related needs embedded within their

INRMPs. A review of Integrated Cultural Resource Management Plans (ICRMP) is under consideration.

TER-S Symposium and Workshop

Given the significant challenges that TES pose to training and mission requirements, it is critical that DoD address these challenges comprehensively and proactively. With this in mind, SERDP, ERDC, and the DoD Legacy Resource Management Program, in partnership with the military Services, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, University of Central Florida, and The Nature Conservancy hosted the *Threatened, Endangered, and At-Risk Species (TER-S) on DoD and Adjacent Lands Symposium and Workshop*. The event’s goals were to evaluate ongoing and recently completed research and monitoring efforts, foster partnerships among stakeholders, and identify additional areas of research needed.

Held in Baltimore, Maryland, June 7-9, 2005, the Symposium and Workshop was the first of its kind in that it brought together nearly 200 diverse stakeholders to discuss TES conservation and research needs on DoD and adjacent lands. Participants included researchers and managers from the above agencies and organizations, as well as the National Park Service, the U.S. Department of Agriculture, and various non-profit organizations, state agencies, universities, and private consulting firms.

The event consisted of two plenary sessions, a comprehensive technical program, and a concluding workshop. All five distinguished plenary speakers highlighted the central role of partnerships for ongoing and future TES initiatives. Technical sessions included the following: *Planning and Mitigation; Habitat Modeling and Assessment; Invasive Species: Red Imported Fire Ants; Inventory and Monitoring; Habitat Management and Manipulation;*

See TES EFFORTS, page 6

Molecular Biological Tools Workshop Provides Framework for Future SERDP and ESTCP Investments

Advances in molecular biology have had a profound effect on the understanding of biological remedial processes and are used extensively in the research community; however, use of molecular biological tools (MBT) in the operational cleanup community is limited at present. MBTs target biomarkers (e.g., specific nucleic acid sequences, peptides, proteins, lipids) to provide information about organisms and processes relevant to the assessment and/or remediation of contaminants in the environment or other engineered systems. In August 2005, SERDP and ESTCP sponsored a 2-day workshop attended by 50 experts to determine the research, development, test, and evaluation (RDT&E) needs for MBTs with the potential to improve the design, implementation, field performance, and monitoring of remediation technologies at DoD field sites.

The state of the science and technology of MBTs with applicability to environmental cleanup was explored in a series of background papers, highlighting current tools and techniques, future applications, and the

field perspective. The operational usage of such tools then was assessed in overview presentations by SERDP/ESTCP, the Services, DOE, and EPA as well as during follow-on group discussions. Technical barriers to field implementation identified at this workshop include insufficient knowledge of key biomarkers, limited ability to develop degradation rate information, limited understanding of microbial community interactions, and limited availability of bioinformatics resources. Other barriers include subsurface sampling difficulties, limited decision-making impact, insufficient confidence in results, and limited commercial interest.

To support future implementation of MBTs at DoD contaminated sites, attendees identified and prioritized research, demonstration, and technology transfer needs. Critical research needs include sampling techniques, identification of additional biomarkers, correlation of detection or quantification of biomarkers with degradation rates, and understanding of microbial interactions. Other research needs focus on sampling/analysis methods and systems biology

approaches. Critical demonstrations needed include standardization and validation of methods used to extract biomarkers and application of tools across multiple field sites for chlorinated ethenes. Additional demonstrations will focus on incorporating MBT data into models that demonstrate and, more importantly, predict bioremediation performance or failure in the field. Technology transfer needs identified included web-based resources for sharing information and data as well as education, guidance, and standardization of approaches among stakeholders.

The result of this workshop is a strategic plan to guide SERDP and ESTCP investments in MBTs over the next 5 to 10 years, with the goal of improving environmental restoration at the more than 9,000 contaminated sites on former and current DoD installations.

For more information, please refer to the Final Report now available in the SERDP and ESTCP Online Library at <http://docs.serdp-estcp.org> using MBT Workshop as the Search Phrase. ♦

TECHNOLOGY TRANSFER, from page 1

and shape—that aid discrimination. Touring the demonstrations in small groups facilitated attendee interactions with presenters to assess feasibility of using a specific technology at a particular field site.

The workshop culminated with a panel discussion by representatives from the Navy, Army, U.S. Environmental Protection Agency, Colorado Department of Public Health and the Environment, SERDP/ESTCP, and NAOC that provided a stimulating forum for participants to exchange information. The diverse background of the workshop attendees generated an

array of opinions focused on the practical applications of the rapidly maturing detection and discrimination technologies for meeting DoD's challenging UXO problems.

The ESTCP/NAOC workshop promoted information exchange and interaction between many groups working on UXO cleanup sites, heightening awareness of technologies soon ready for field use. The workshop should also further transition appropriate technologies to implementation on UXO site remediation projects. DoD has thousands of former ranges

representing more than 10 million acres as well as active sites that require UXO cleanup, and new technologies such as those presented at this workshop will drastically reduce the cost of managing these UXO-contaminated lands.

For additional information about the ESTCP/NAOC Workshop, please contact Dr. Anne Andrews, the SERDP/ESTCP Munitions Management Program Manager, at (703) 696-2127 or via e-mail at anne.andrews@osd.mil or Mr. John Allan, the NAOC Technology Committee Chairperson, at (434) 978-3187 or jallan@naecageophysics.com. ♦

ESTCP Launches UXO Wide Area Assessment Program

The Defense Science Board has estimated that there are 1,400 sites on approximately 10 million acres suspected of containing unexploded ordnance (UXO). Typical sites encompass thousands of acres, with many exceeding 10,000 acres. A comprehensive wide area assessment (WAA) program can have an immediate impact on the UXO remediation problem. By some estimates, up to 80% of the 10 million acres are, in fact, free of UXO. A technology that can accurately delineate the areas on each site that are and, more importantly, are not contaminated would lead to an immediate reduction by 80% of the area that must be carefully examined and cleaned. ESTCP recently

initiated a program to demonstrate the effectiveness of various technologies, either alone or in combination, as tools for wide area assessment at DoD sites.

Through ESTCP's WAA program, six projects recently have been awarded funding to demonstrate ground-based vehicular surveys, low altitude and high altitude airborne data collection technologies, and statistical and geographic information system (GIS) tools for data analysis. The data collection technologies range in ability from detecting individual ordnance items to identifying surface features (i.e., craters, surface metal) that would indicate the presence of a bombing target. Three

demonstration sites have been selected, including Borrego Maneuver Area in northeastern San Diego County, California; the Pueblo Precision Bombing Range in Otero County, Colorado; and the Kirtland Precision Bombing Ranges in Bernalillo County, New Mexico. ESTCP also has assembled a WAA Advisory Panel composed of federal and state regulators to provide input on data collection and data validation plans generated by these projects, which will ultimately provide support for future land action decisions.

Brief descriptions of these newly funded projects follow. Additional information can be found at www.estcp.org under the *Technologies link*.

Selected New UXO Projects

Simultaneous Magnetometer and EM61 Mk2 Vehicle-Towed Array for Wide Area Assessment (MM-0531)

Principal Investigator: Robert Siegel/GEO-CENTERS, Inc.

The objective of this project is to use the Vehicular Simultaneous Electromagnetic Induction and Magnetometer System (VSEMS), formerly known as the simultaneous multisensor Surface Towed Ordnance Location System (STOLS), to collect magnetometer and EM61 digital geophysical mapping (DGM) data on preplanned traverses to refine bombing target locations, extents, and edges in support of WAA. Acquiring magnetometer and EM61 data simultaneously should result in a 50% cost reduction in geophysical data collection efforts as compared to towed array technologies that use magnetometers and EM61 systems sequentially.

Wide Area UXO Contamination Evaluation by Transect Magnetometer Surveys (MM-0533)

Principal Investigator: Daniel Steinhurst/Nova Research, Inc.

This project will collect full-field magnetometer data by transects with the Multi-Sensor Towed Array Detection System (MTADS) to support the rapid delineation of UXO-contaminated sites such as impact areas and bombing targets. Automated routines will be used to rapidly extract the locations and magnitudes of detected anomalies from the data. This technique will help identify a fraction of the site as not contaminated with UXO at a statistically defensible level of confidence.

High-Density LiDAR and Orthophotography in UXO Wide Area Assessment (MM-0534)

Principal Investigator: Thomas Tomczyk/URS Corporation

This project will utilize Light Detection and Ranging (LiDAR) and high-resolution orthophotography to (1) identify and classify UXO/Munitions and Explosives of Concern (MEC)-related features on the ground surface (e.g., craters, burial trenches, vehicle tracks, target debris) and (2) identify and delineate boundaries of munitions response sites. LiDAR and high-resolution orthophotography can be used effectively to collect data to augment conceptual site models and to perform footprint reduction with consequent cost savings.

Innovative Multi-Sensor Airborne Wide Area Assessment of UXO Sites (MM-0535)

Principal Investigator: Jack Foley/Sky Research, Inc.

The objective of this project is to use multiple sensors to exploit the specialized phenomenology of UXO detection and the well-defined characterization tools that detect and classify surface features related to UXO contamination. A combination of LiDAR and Very Large Scale Orthophotography (VLSO), Hyperspectral Imagery (HSI), and Helicopter MTADS Magnetometry (HeliMag) technologies will be utilized in the multi-site demonstration to delineate target edges, label portions of the site as uncontaminated, and make available information to support enhanced planning and risk assessment.

Innovative GIS and Information Technologies Supporting Wide Area Assessment of UXO Sites (MM-0537)

Principal Investigator: Jack Foley/Sky Research, Inc.

This project will provide GIS support to all of the sensor technology demonstrators at the three selected wide area assessment demonstration sites. The objectives are to (1) provide information technology and GIS tools needed to manage multiple, large complex data sets and (2) demonstrate the central importance of Enterprise GIS in the successful and efficient implementation of WAA. For future production-level WAA on munitions response sites, the integration of sensor technology results with base-mapping and archival information represents a major cost benefit to the overall remediation project.

Visual Sample Plan: Demonstration and Performance Assessment of Statistical Methods for UXO Characterization (MM-0325)

Principal Investigator: Brent Pulsipher/Pacific Northwest National Laboratory

Once a target area is identified, statistical sampling and analysis methods are needed to map the area in support of remediation and verification activities. Statistical tools that are deployed via the Visual Sample Plan (VSP) software have been developed under SERDP to support detection, delineation, density estimation, and mapping of unknown target areas where UXO are most likely. This is an ongoing ESTCP project that will apply these tools to the WAA demonstration data.

RESILIENT PLANTS, from page 2

available to land managers for use on military training ranges. Comparative field evaluations of the SERDP-select germplasms with existing cultivars of the same species (monocultures), as well as the newly developed seed mixtures (ecological-bridge) compared to standard military mixtures are under way at Camp Guernsey, Wyoming, and Yakima Training Center (YTC), Washington. Additional demonstrations at Dugway Proving Ground in Utah are planned.

Twice in two locations, the SERDP-select germplasm (slender wheatgrass) has clearly outperformed the standard cultivar, *Pryor*. Eighteen months after planting at YTC, the SERDP slender wheatgrass had 69% stand, while *Pryor* had 48%. Two months after planting at Camp Guernsey, the SERDP slender wheatgrass was 80% stand and *Pryor* was 35%. Percentage stand (i.e., the amount of desired species present) is determined by visual estimates when plants are less than 1 year old as well as plant counts in three areas per plot. Because the SERDP-select germplasm is establishing better, its ability to thwart invasions of weeds is improved, likely as a result of longer roots. In greenhouse root studies, SERDP

slender wheatgrass had longer average total root length after 5, 10, and 14 days, with 16 cm average root length at 14 days versus 8 cm for *Pryor*. The longer average root length data supports observations at the two locations.

Under Mr. Palazzo's leadership, plant-breeding research with SERDP support has led to ESTCP demonstrations of new, ecologically compatible plant types and seed mixtures, as well as an improved understanding of the effects of training on soil compaction, plant injury, and regrowth. These demonstrations in turn are supporting commercialization and implementation of the new plant materials and seeding methods on military training ranges. CRREL has completed an agreement with the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service, Aberdeen Plant Materials Center, in Idaho to produce seed for demonstration purposes at military facilities at no charge. They will produce more than 2,000 pounds of seed of three SERDP-select germplasms over a 2-year period. Two agreements are being developed between USDA-Logan and the U.S. Army Corps of Engineers for release of the germplasms.

Forty-two DoD installations encompassing more than 1.3 million acres of Army, National Guard Bureau, and Air Force land are amenable to the new plant materials. The SERDP-select natives can be used in areas where natives are now sown and, because of their better establishment rate, also may be used alone or in mixtures where introduced species are now sown. There are no additional costs associated with use of the new plant materials and seeding methods. Using the guidance developed at CRREL, military land managers will be able to seed less frequently due to increased establishment rates and better resiliency, limit consideration of other methods for controlling invasive weeds, arrange training schedules effectively, and reduce cost and time requirements for maintaining military training sites.

Additional information is available at <http://www.crrel.usace.army.mil/es/research/ breeding.htm> or by contacting Mr. Antonio Palazzo, U.S. Army Corps of Engineers ERDC-CRREL, Hanover, New Hampshire, at (603) 646-4374 or via e-mail at antonio.j.palazzo@erdc.usace.army.mil. ♦

TES EFFORTS, from page 3

Impact Assessment; and Species and Habitat Conservation. At the workshop, symposium session chairs and other selected invitees convened to identify current gaps relevant to TER-S and associated habitats, as well as to outline a path forward to address these gaps. Overarching recommendations from the event included the need for basic species information, proactive conservation efforts for species at risk and invasive species, peer-reviewed data standards and monitoring protocols, predictive models to support management decisions, protection of endangered ecosystems rather than

individual species, and information sharing among stakeholders.

Participant response to the Symposium and Workshop was overwhelmingly positive. Many participants established new partnerships through which they can work to better integrate research, management, and collaborative initiatives to benefit TES and at-risk species. Participants gained new appreciation for what others are doing in the field of TES research, thereby fostering excellent synergies. Many attendees expressed their desire to continue the momentum gained at

this event. *Additional information about the TER-S Symposium and Workshop is available at www.serdp.org/tesworkshop.*

Through these and other efforts, SERDP is developing a more cohesive and management-driven TES research agenda that directly supports the military mission. As current partnerships develop and existing partnerships strengthen, future TES research and monitoring efforts will continue to satisfy the need for coordination among various stakeholders, thereby helping maintain the sustainability of military testing and training ranges. ♦

GAO Commends SERDP and ESTCP Initiatives in Support of Groundwater Remediation at DoD Sites

The Department of Defense has identified nearly 6,000 sites at its facilities that require groundwater remediation and has invested \$20 billion over the past 10 years to cleanup these sites. In the past, DoD primarily used pump-and-treat technologies to contain or eliminate contaminants in groundwater. Long cleanup times and high costs, however, often make these technologies expensive and ineffective for groundwater remediation. SERDP and ESTCP have been at the forefront of DoD's efforts to develop new and innovative approaches to address this significant issue.

A recent Government Accountability Office (GAO) report described groundwater remediation technologies that DoD is currently using or field-testing, examined whether any new groundwater remediation technologies are being used or developed outside the Department, and investigated the extent to which DoD is researching and developing new approaches to groundwater remediation. The report found that DoD has implemented or field-tested all of the 15 types of generally accepted technologies currently available to remediate contaminated groundwater. GAO did not identify any alternative groundwater remediation technologies being used or developed outside DoD that the Department has not considered or used. Further, it found that DoD is actively involved in researching and testing new approaches to groundwater remediation, largely through efforts to develop and promote the acceptance of innovative groundwater remediation technologies.

The GAO report specifically noted SERDP and ESTCP's contribution to the development of innovative groundwater remediation technologies needed by DoD, from basic research through advanced field-testing and validation. Information on these groundwater remediation projects is available at www.serdp.org under *Research Projects* and www.estcp.org under *Technologies*. A full copy of the GAO report is available at <http://www.gao.gov/new.items/d05666.pdf>.

HVOF Thermal Spray Technology Successfully Demonstrated and Currently in Use

To reduce DoD's dependence on chromium electroplating, ESTCP sponsored the Naval Research Laboratory to conduct a demonstration/validation of the High Velocity Oxygen Fuel (HVOF) thermal spray technology for the replacement of chromium electroplating on DoD aircraft landing gear. The HVOF coating selected was 83% tungsten carbide in a 17% cobalt matrix (WC/17Co). Researchers initially focused on qualification of the WC/Co coatings on land-based aircraft. Materials testing and a full-scale rig test conducted by Lockheed Martin on a P3 landing gear with WC/Co-coated piston and axle journals resulted in NAVAIR issuing approval for production application of the HVOF coatings on P3 landing gear components. Subsequently, to address carrier-based aircraft, an EA-6B Prowler Main Landing Gear (MLG) Strut Assembly was coated with HVOF WC/Co at a vendor shop under the supervision of the Naval Air Depot (NADEP) Jacksonville. After NAVAIR issued a flight clearance on December 10, 2003, NADEP Jacksonville installed the MLG Strut Assembly with the WC/Co coatings on an EA-6B that was deployed for service onboard the USS *Carl Vinson*. The aircraft made its first carrier-based landing on September 14, 2004, and as of July 2005, the aircraft had successfully completed approximately 300 landings, including approximately 200 catapult launches and 200 arrest landings on board the USS *Carl Vinson*. Visual inspection has indicated no damage or degradation of the HVOF coating.

NADEP Jacksonville currently has two full-production HVOF systems. In addition to the anticipated implementation of HVOF on landing gear, the depot plans to implement HVOF technology on several engine components, and this will have an impact on the use of chrome-plating tanks at the facility. The depot was recently able to close three chrome-plating tanks permanently. These three tanks represent 6,000 gallons of chromic acid solution and an associated hazardous waste stream that have been eliminated from NADEP Jacksonville production operations. *Additional information about this project is available at <http://www.estcp.org/projects/pollution/PP-9608.cfm>.*

ESTCP Air Monitoring Technology Used at U.S. Open Golf Tournament

As a precautionary measure, the North Carolina State Bureau of Investigation (SBI) requested that the North Carolina Division of Air Quality (DAQ) conduct ambient air monitoring during the U.S. Open Golf Tournament held in Pinehurst, North Carolina, June 12-19. The purpose was to provide early warning of any toxic air release in order to protect 50,000 fans. The DAQ worked with the SBI and U.S. Golf Association officials to monitor the ambient air using various single point chemical analyzers, on-site gas chromatography/mass spectroscopy systems, and path-integrated optical remote sensing using Open Path Fourier Transform Infrared (OP-FTIR) spectroscopy. This technology was originally demonstrated with ESTCP funding under the project *Optical Remote Sensing Method to Determine Strength of Nonpoint Sources* (SI-0214). The ESTCP project demonstrated standardized nonpoint source measurement methods based on path-integrated optical remote sensing (PI-ORS) and computed tomography, developed by ARCADIS in Research Triangle Park, North Carolina for the DoD. The North Carolina DAQ recently purchased this technology.

The DAQ used the OP-FTIR technology to monitor for toxic airborne chemicals along a strategically selected section of the perimeter at the tournament site. The ambient air was monitored for 40 compounds in near real time. Compounds of interest included common industrial chemicals that might be accidentally released, such as ammonia or gasoline vapors, as well as vapor phase chemicals that could be released intentionally as part of a terrorist act, such as chemical warfare agents.

"It was a precaution to ensure that if a chemical release of a terrorist nature occurred, they could have a timely evacuation of people," says Lori Cherry, chief of the DAQ Toxics Protection Branch in Raleigh. The SBI was in charge of security for the golf tournament and requested DAQ's help on behalf of the U.S. Golf Association, which had arranged for air monitoring at previous tournaments. "We basically didn't see anything unusual," Cherry says of the air monitoring, "so, we felt good about that, no problems at all." ♦

Program Development Update

SERDP

Proposals selected in response to the FY 2006 Core and SERDP Exploratory Development (SEED) solicitations were presented to the SERDP Scientific Advisory Board (SAB) for review at its September and October 2005 meetings, and the remaining projects will come before the SAB at its March 2006 meeting. Fifty-four projects were recommended for funding from the Core Solicitation and six projects for the SEED solicitation. On September 26, the SERDP Council met to approve the FY 2006 Program Plan and the FY 2007 investment guidance.

Prior to completion of the FY 2006 Program Plan, the SERDP staff began

developing the FY 2007 Program and released the FY 2007 Core and SERDP SEED solicitations on November 10, 2005. Visit the SERDP web site under the *Funding & Opportunities* link for information and details regarding the FY 2007 Statements of Need and schedule for submission.

ESTCP

As a result of the FY 2005 ESTCP special solicitation seeking perchlorate remediation demonstrations, six perchlorate treatment technologies were selected to remove perchlorate from drinking water in the Inland Empire region of Southern California. The treatment technologies were tested in

laboratory settings and with this effort are being field tested on a large-scale basis.

For FY 2006, the ESTCP Director has selected projects to be funded, and proposal acceptance letters have been sent. Principal Investigators also are being contacted to submit Project Plans and Obligation/Expenditure Plans, as well as to schedule project kickoff conference calls with the appropriate ESTCP Program Manager. These plans must be submitted prior to release of FY 2006 funding.

A solicitation for the FY 2007 Program is planned for release early in January 2006. Watch the ESTCP web site for details and updates on these funding opportunities. ♦

SERDP SPONSORS STUDENT PARTICIPATION AT ESA ANNUAL MEETING

The Ecological Society of America (ESA) held its 90th Annual Meeting, August 7-12 in Montreal, Quebec, Canada. To increase awareness of conservation opportunities involving DoD and to promote future research, SERDP provided fellowships for five promising graduate students to attend the conference. Award-winning students and their paper topics are as follows.

♦ **Ms. Rebecca Anderson, University of Minnesota Duluth**

The use of nonlocal propagules for habitat restoration: a case study of a threatened population of beachgrass in Minnesota.

♦ **Mr. Tim Dickson, University of Kansas**

High seeding rates of native grasses reduce broadleaf forb diversity in a Kansas Conservation Reserve Program (CRP) prairie restoration.



SERDP Executive Director Bradley Smith (right) presents award to University of Kansas student Tim Dickson.

♦ **Ms. Yuanying Peng, University of Toronto**

Soil CO₂ efflux in uneven-aged managed forests: temporal patterns following harvest and effects of edaphic heterogeneity.



Mr. Bradley Smith and ESA Executive Director Katherine McCarter (far left) congratulate award-winning students (from left) Yuanying Peng, Rebecca Anderson, and Lauren Young.

♦ **Ms. Julie Rieder, Utah State University**

*The effect of disturbance on yellow starthistle (*Centaurea solstitialis*) establishment and performance.*

♦ **Ms. Lauren Young, Indiana University**

Native insect herbivory provides resistance to a thistle invasion.



Julie Rieder from Utah State University accepts award from Mr. Bradley Smith (right) and ESA Director of Science Programs Dr. Clifford Duke.

Five New Members Join SERDP's Scientific Advisory Board

SERDP recently welcomed five distinguished members to its Scientific Advisory Board (SAB)—Dr. Sylvia A. Earle, Dr. Perry L. McCarty, Dr. Ellen M. Mihaich, Mr. Jon R. Sandoval, and Dr. Patricia A. Shapley. Current membership stands at 13.

Sylvia A. Earle

Dr. Earle is an oceanographer, explorer, author, lecturer, and consultant. She is the executive director for Marine Programs for Conservation International, Explorer in Residence at the National Geographic Society, a program director for the Harte Research Institute's Gulf of Mexico Studies at Texas A&M University, and founder and chairman of Deep Ocean Exploration and Research, Inc. She previously held positions at leading scientific, geographic, and oceanographic institutions, including the National Oceanic and Atmospheric Administration (NOAA) and the California Academy of Science. Dr. Earle's many awards include *Time* magazine's Hero for the Planet, the Explorers Club Medal and Lowell Thomas Award, the Society of Women Geographers Gold Medal, and the United Nations Global 500 Award. She has led more than 60 expeditions worldwide and lectured in more than 70 countries. The author of more than 130 publications, her published books include the *National Geographic Atlas of the Ocean*, *Wild Ocean*, *Sea Change*, *Exploring the Deep Frontier*, and many others that she coauthored. Dr. Earle holds a Ph.D. in botany from Duke University and 13 honorary degrees.

Perry L. McCarty

Dr. McCarty, Silas H. Palmer Professor Emeritus of Civil and Environmental Engineering at Stanford University, has held academic positions at Stanford for more than 40 years, including 5 years as chairman of the Department of Civil Engineering. He has served as member or chairman of many committees of the National Academies and was previously a member of the SERDP SAB (1997–2002). He was elected a Fellow of the American Academy of Arts and Sciences in 1996, the American Academy of

Microbiology in 1993, and the Association for the Advancement of Science in 1980. His many professional awards include the Clarke Prize for Outstanding Achievement in Water and Science Technology in 1997, the Tyler Prize for Environmental Achievement in 1992, and the Engineering Science Research Award from the Association of Environmental Engineering Professors in 1992, 1983, and 1979. Dr. McCarty holds five patents and is the author of more than 300 publications and coauthor of two textbooks, *Chemistry for Environmental Engineering and Science* (2003) and *Environmental Biotechnology, Principles and Applications* (2001). He holds a Sc.D. in sanitary engineering from the Massachusetts Institute of Technology and an honorary doctorate from the Colorado School of Mines.

Ellen M. Mihaich

Dr. Mihaich is currently a consultant for Environmental and Regulatory Resources, L.L.C., an adjunct professor at Duke University's Nicholas School of the Environment, and, since 1996, manager of Environmental Toxicology for Rhodia Inc. She is president of the Society of Environmental Toxicology and Chemistry (SETAC) and a diplomate of the American Board of Toxicology. Dr. Mihaich has served on technical expert panels on human development for the Interagency Coordinating Committee on the Validation of Alternative Methods (ICCVAM) and has played an active role in the Society of Environmental Toxicology and Chemistry (SETAC) since 1995. In 1997, Dr. Mihaich received Rhone-Poulenc's Silver Orchidée Prix D'Excellence Award. She is the author or coauthor of more than 20 chapters or articles in scientific publications and holds a Ph.D. in integrated toxicology from Duke University's School of Forestry and Environmental Studies.

J.R. Sandoval

Mr. Sandoval, chief of staff for the Idaho Department of Environmental Quality (DEQ), coordinates the activities of the state's main and regional offices to provide

environmental protection services to state citizens. He also directs DEQ's fiscal, human resources, and information resources groups. Because of Mr. Sandoval's commitment to accountability and responsibility in government, his agency benefits from his knowledge of financial management, personnel management, and strategic planning. He strives to make state government responsive to public needs and ensures that DEQ uses technologically sound, cost-effective strategies to protect air and water quality and to store, transport, and dispose of hazardous materials within state boundaries. Mr. Sandoval's long history of public service and community involvement has benefited public and private sector efforts to increase services for environmental protection, education, human rights, and economic development. He holds degrees in vocational education and business administration from the University of Wyoming.

Patricia A. Shapley

Dr. Shapley is director of the Interdisciplinary Science and Technology Program at the University of Illinois where she taught chemistry from 1982–2000. She also is chair of the Organometallic Subdivision of the American Chemical Society's (ACS) Division of Inorganic Chemistry and the U.S. coordinator for the Green Chemistry Group of the World Universities Network (WUN). She is a member of the American Chemical Society, Sigma Xi, Phi Beta Kappa, and Alpha Chi Sigma and has served on many boards, panels, and committees of professional chemistry organizations. In 1988, she organized the Organometallics in Organic Synthesis Symposium with support from the Dow Chemical Company. She held a postdoctoral fellowship at the Université Louis Pasteur, de Strasbourg, France, in 1982 and was awarded a Sloan Foundation fellowship in 1991. Dr. Shapley is the author or coauthor of more than 44 chapters or articles in scientific publications and holds a Ph.D. in chemistry from the Massachusetts Institute of Technology ◆

Recent Additions to the SERDP and ESTCP Online Library

The following new publications are now available in the SERDP & ESTCP Online Library (<http://docs.serdp-estcp.org>). Conduct search by entering project number (e.g., 0034) under Search Phrase.

Environmental Restoration

- Final Report: In-Situ Substrate Addition to Create Reactive Zones for Treatment of Chlorinated Aliphatic Hydrocarbons: Vandenberg Air Force Base (ESTCP ER-9920)
- Final Report: Speciation, Fluxes, and Cycling of Dissolved Copper and Zinc in Estuaries: The Roles of Sediment Exchange and Photochemical Effects (SERDP ER-1157)
- Final Report: Factors Effecting the Fate and Transport of CL-20 in the Vadose Zone and Groundwater (SERDP ER-1255)
- Technical Report: Alternative Causes of Wide-Spread, Low Concentration Perchlorate Impacts to Groundwater (SERDP ER-1429)

Munitions Management

- Cost and Performance Report: Advanced UXO Detection and Discrimination Technologies (ESTCP MM-0034)
- Final Report: Demonstration of Airborne Electromagnetic Systems for Detection and Characterization of Unexploded Ordnance at the Badlands Bombing Range, South Dakota (ESTCP MM-0101)
- Final Report: Three-Dimensional Geophysical Data Collection and Analysis for UXO Discrimination (SERDP MM-1357)
- Final Report: Seismic Imaging of UXO-Contaminated Underwater Sites (SERDP MM-1387)

Sustainable Infrastructure

- Final Report: Exotic Annual Grasses in Western Rangelands: Predicting Resistance & Resilience of Native Ecosystems to Invasion (SERDP SI-1144)
- Final Report: Integrated Control and Assessment of Knapweed and Cheatgrass on DoD Installations (SERDP SI-1145)

- Final Report: Analysis of Desert Shrubs Along First Order Channels on Desert Piedmonts: Possible Indicators of Ecosystem Condition and Historic Variation (SERDP SI-1153)
- Final Report: Acoustic and Visual Monitoring for Marine Mammals at the Southern California Off-Shore Range (SCORE) (SERDP SI-1189)
- Final Report: Characterizing and Quantifying Local and Regional Particulate Matter Emissions from DoD Installations (SERDP SI-1191)

Weapons Systems & Platforms

- Final Report: Demonstration of the Anaerobic Fluidized Bed Reactor for Pinkwater Treatment at the McAlester Army Ammunition Plant (ESTCP WP-0004)
- Final Report: Non-ODC Oxygen Line Cleaning for Use on DoD Weapons Systems (ESTCP WP-9910)
- Final Report: Alternatives to Solvent-Based Ink and Paint Stenciling for Identification Markings (ESTCP WP-9912)
- Final Report: Membrane-Mediated Extraction and Biodegradation of Volatile Organic Compounds From Air (SERDP WP-1105)
- Final Report: Cleaning Verification Monitor Technique Based on Infrared Optical Methods (SERDP WP-1138)
- Final Report: Corrosion Resistant Steels for Structural Applications in Aircraft (SERDP WP-1224)
- Final Report: Novel Approach for Welding Stainless Steel Using Cr-Free Welding Consumables (SERDP WP-1346)
- Final Report: Develop a Low Cost, Safe and Environmentally Benign High Energy and High Rate Reserve Battery (SERDP WP-1360)
- Final Report: New Primary Explosives Development for Medium Caliber Stab Detonators (SERDP WP-1364)

PROGRAM NOTES

S♦E♦R♦D♦P

- ◆ **THE FY 2007 SERDP CORE SOLICITATION AND THE FY 2007 SERDP EXPLORATORY DEVELOPMENT (SEED) SOLICITATION** were released on November 10. Visit the SERDP web site (www.serdp.org under the *Funding & Opportunities* link) for specifics about the Statements of Need and schedule deadlines.
- ◆ **SERDP PROJECT QUARTERLY PROGRESS REPORTS** (i.e., the quarter's technical accomplishments, updated completion dates for milestones, and any concerns regarding technical/financial progress) for the first quarter of government FY 2006 are due by January 15, 2006. For assistance, SERDP Principal Investigators should contact their Program Manager Assistant.

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- ◆ **THE FY 2007 ESTCP SOLICITATION** will be released on or about January 5, 2006. Watch the ESTCP web site (www.estcp.org under the *Opportunities* link) for specifics about the solicitation and schedule deadlines.
- ◆ **ESTCP PROJECT QUARTERLY PROGRESS REPORTS** (i.e., the quarter's technical accomplishments, updated completion dates for milestones and documents, and any concerns regarding technical/financial progress) for the first quarter of government FY 2006 are due by January 15, 2006. For assistance, ESTCP Principal Investigators should contact their Program Manager Assistant.

Congratulations to . . .

SERDP Principal Investigators **Dr. Sonia Thiboutot** and **Dr. Guy Ampleman** of Defence R&D Canada-Valcartier who were selected to receive the prestigious Canadian Public Service Award in the Innovation category for their research on the environmental impacts of military training. In collaboration with Dr. Judy Pennington and Dr. Tom Jenkins from the U.S. Army Corps of Engineers Engineer Research and Development Center, under the SERDP project *Distribution and Fate of Energetics on DoD Test and Training Ranges (ER-1155)*, Dr. Thiboutot and Dr. Ampleman developed techniques and guidance to cost-effectively and efficiently assess the potential for groundwater contamination from residues of high explosives (TNT, PETN, RDX, and HMX) at military testing and training ranges. Management tools to minimize the potential for explosives contamination of groundwater also are now available, reducing current and potential future environmental liabilities. This innovative research has contributed to greater sustainable range use by the military in both the United States and Canada. ◆



STRATEGIC ENVIRONMENTAL RESEARCH
AND DEVELOPMENT PROGRAM (SERDP)
ENVIRONMENTAL SECURITY TECHNOLOGY
CERTIFICATION PROGRAM (ESTCP)

INFORMATION BULLETIN

FALL 2005

NUMBER 25

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F O R S E R D P A N D E S T C P

JANUARY 2006

January 5

Pre-proposals due in response to the SERDP FY 2007 Core Solicitation Broad Agency Announcement

January 5

A Federal Call for Proposals and a Broad Agency Announcement for ESTCP FY 2007 Project Funding to be released on or about this date (www.estcp.org)

January 15

SERDP quarterly progress reports due for the first quarter of government FY 2006

January 15

ESTCP quarterly progress reports due for the first quarter of government FY 2006

FEBRUARY 2006

February 2

Full proposals requested from qualified proposers responding to the SERDP FY 2007 Core Solicitation Broad Agency Announcement

MARCH 2006

March 16

Full proposals due in response to the SERDP FY 2007 **SERDP Exploratory Development (SEED)** Solicitation

March 16

Full proposals due in response to the SERDP FY 2007 Core Solicitation Federal Call and Broad Agency Announcement

March 9

Pre-proposals due in response to the ESTCP FY 2007 Solicitation Broad Agency Announcement

RELATED CONFERENCES & EVENTS

December 6-9

The Sixteenth Annual Cleaner, Safer Industrial Materials & Processes (C.S.I.M.P.) Workshop
San Diego, California

For more information, visit
www.exchange-monitor.com

February 15-17

2nd Annual Smart Coating Conference
Orlando, Florida

For more information, visit
www.emich.edu/public/coatings_research/smartcoatings

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