SERDP & ESTCP Announce 2011 Projects of the Year at Annual Symposium

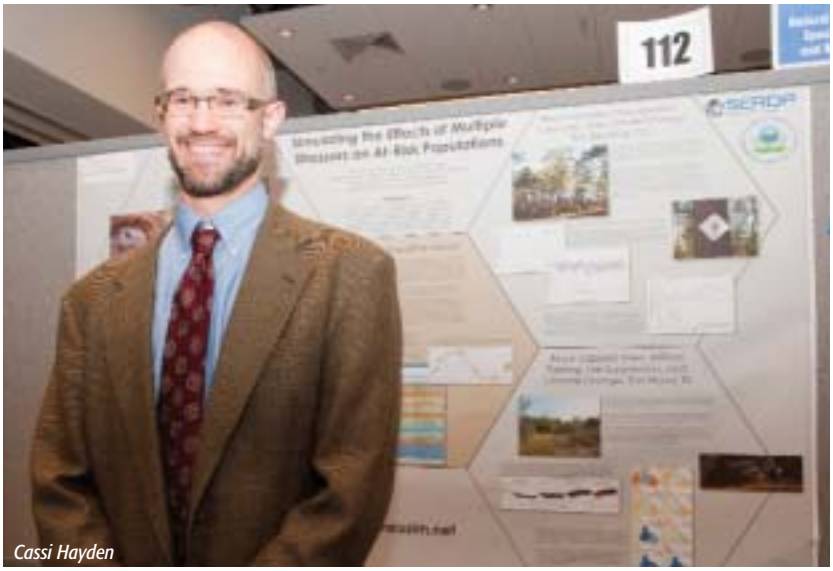
Winners Include Modeling Effort to Help Identify Buried Unexploded Ordnance

FIVE PROJECT-OF-THE-YEAR Awards were presented at the 2011 Partners in Environmental Technology Technical Symposium and Workshop sponsored by the Strategic Environmental Research and Development Program (SERDP) and the Environmental Security Technology Certification Program (ESTCP) 29 November–1 December 2011 in Washington, D.C. The symposium was attended by more than 1,200 environmental professionals from the military, government agencies, academia, private industry, and the regulatory community. The awards honor principal investigators who, through their outstanding efforts, have helped the Department of Defense (DoD) achieve its mission while improving its environmental performance. Award recipients include:

Resource Conservation and Climate Change, SERDP Project of the Year

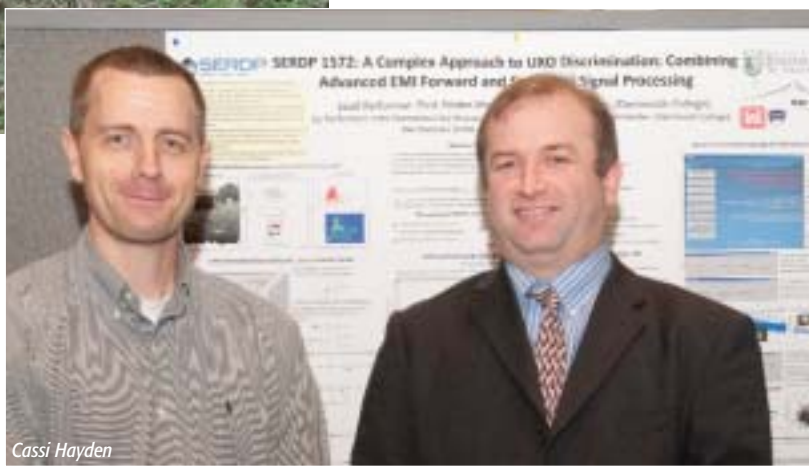
Forecasting the Effects of Multiple, Interacting Stressors on At-Risk Populations—Dr. Joshua Lawler, University of Washington

DoD land managers face the dual responsibility of meeting the national security mission and stewardship responsibilities. DoD is one of the nation's largest federal land managers and is responsible for managing more species at risk per acre than any other federal agency.



Cassi Hayden

Dr. Joshua Lawler, recipient of the SERDP Resource Conservation and Climate Change Project-of-the-Year Award, demonstrated his modeling tool, which helps land managers sustain training activities and meet stewardship responsibilities by simulating responses of at-risk species to multiple, interacting stressors including invasive species, pollution, habitat loss and fragmentation, disease, and climate change.



Cassi Hayden

SERDP Munitions Response Project-of-the-Year Award recipient Dr. Fridon Shubitidze (right) and team member Dr. Ben Barrowes presented sophisticated models that, when applied to advanced sensor data, significantly improve the ability to distinguish UXO from clutter, reducing munitions response costs and accelerating the cleanup process.

If populations decline, both the military's ability to use training ranges and the nation's biologic treasures are put at risk.

At-risk species often face multiple interacting threats or stressors, such as invasive species, pollution, habitat loss and fragmentation, and disease. In the coming years, climate change will be a significant additional stressor. Land managers have traditionally addressed potential environmental stressors one at a time. But, given the complexity and potential interactions of these stressors, that one-at-a-time method is no longer effective.

To improve management of species facing multiple threats, Dr. Lawler and his colleagues have developed a flexible, spatially explicit population model designed to simulate a wide range of species in complex and changing landscapes. They applied this model to three at-risk populations on three military installations—the red-cockaded woodpecker at Fort Benning, Georgia; the desert tortoise at Fort Irwin, California; and the black-capped vireo at Fort Hood, Texas—to investigate the effects of climate change, land-use change, military training, invasive species, and disease. These case studies provide critical insights into the importance of multiple interacting threats.

This research advances the ability to forecast the effects of multiple, interacting stressors and provides a practical modeling tool for DoD land managers. This tool will enhance the military's ability to manage plant and animal populations while sustaining training and other essential activities today and in the future as we learn to adapt to climate change.

Munitions Response, SERDP Project of the Year

Advanced Signal Processing for UXO Discrimination—Dr. Fridon Shubitidze, Dartmouth College and Sky Research, Inc.

DoD's liability for munitions response is estimated in the tens of billions of dollars. With resources constrained, munitions response actions on many sites are forecast to be decades out. One of the most promising technology advances for reducing the cost per site and accelerating the pace of cleanup is in the use of classification to distinguish the buried unexploded ordnance (UXO) from the vast quantity of harmless pieces of metal found on any site, allowing resources to be directed to removing only the UXO.

Recently developed advanced electromagnetic induction sensors record detailed responses from buried targets that have powerful classification potential. The traditional models used to analyze sensor data, however, are unable to exploit all the information available from these sensors.

Dr. Shubitidze and his colleagues developed sophisticated, physically complete models that extract more meaningful parameters from advanced sensor data for classification.

MC Seaman Apprentice Matthew Lawson

Cassi Hayden

The improved understanding of soot formation achieved by SERDP Weapons Systems and Platforms Project-of-the-Year Award recipient Dr. Mel Roquemore (center right) and his team from academia, industry, and government laboratories will enable manufacturers to design and build high-performance engines that emit less pollution.

Their methods are applicable to all currently available advanced electromagnetic sensors and easily extended to others that may be developed. These models have rapidly transitioned to field demonstration. In fact, Dr. Shubitidze and his team demonstrated near perfect classification at the former Camp Butner in North Carolina.

These new models will lead to significant improvements in the ability to distinguish between UXO and harmless objects, particularly on difficult sites. Using classification, substantial cost savings will be realized and available resources can be used to accelerate risk reduction on munitions response sites.

Weapons Systems and Platforms, SERDP Project of the Year

Combustion Science to Reduce Particulate Matter Emissions for Military Platforms—Dr. Mel Roquemore, Air Force Research Laboratory

Soot formation in gas turbine engines is a major concern in the design of modern aircraft propulsion systems. Gas turbine engines are a source of particulate matter emissions, a substantial fraction of which consist of soot particles with diameters of less than 2.5 microns, or PM2.5, that are subject to regulation under the National Ambient Air Quality Standards. The long-term solution is to build DoD's engines of the future in a way that reduces their emissions—a daunting challenge given the complexity involved.

Minimization of emissions from gas turbine engines during initial design is currently not possible. Accurate modeling of soot formation is diffi-

cult due to the complex underlying chemical and physical processes. These processes involve a sequence of gas phase reactions, followed by particle inception, particle-particle interactions, condensation, particle growth, and oxidation. The reactions involve literally hundreds of chemical species and take place in extreme environments of pressure, temperature, and turbulence. This environment is challenging for both modeling and measurements.

Dr. Roquemore led a collaborative team from academia, industry, and government laboratories in advancing the fundamental science relevant to the formation of PM2.5. The team conducted experiments and simulations to understand the chemistry, fluid dynamics, and thermodynamics of particle formation in high-performance engines. Validated detailed soot and full chemical models can be applied, in conjunction with full three-dimensional combustor design codes, to estimate soot and other emissions for gas turbine combustors.

This research represents a critical achievement in the quest to enable jet engine manufacturers to design and build engines that emit less pollution.

SERDP's Environmental Restoration Project of the Year, led by Dr. Paul Johnson (back center), successfully linked laboratory-scale research and modeling studies with an integrated field-scale assessment in a real home next to Hill Air Force Base in developing new methods for accurately and cost-effectively assessing the vapor intrusion pathway.
Cassi Hayden

Environmental Restoration, SERDP Project of the Year

Assessing Vapor Intrusion at Chlorinated Solvent-Impacted Sites–Dr. Paul Johnson, Arizona State University

Military installations and surrounding communities across the nation are affected by groundwater contaminated with chlorinated solvents. In recent years, concerns have grown over the migration of contaminated vapors from these groundwater plumes into people's homes. Vapor intrusion is now often the risk driver for many actions at cleanup sites across DoD.

The risk from vapor intrusion is a complex process that can be influenced by many variables. Accurately predicting exposure is critical to protect human health and make wise use of resources.

Dr. Johnson and colleagues have successfully linked laboratory-scale research and modeling studies with an integrated field-scale assessment in a real home next to Hill Air Force Base to understand and deal with the impacts of real-world issues such as:

- The high temporal and spatial variability that makes assessments so complex
- The uncertain relationship between groundwater concentrations and indoor air
- The impacts of home construction and variable soil gas concentrations
- The large number of other sources of indoor chemicals

This research has generated the knowledge and methods needed to more accurately and cost-effectively assess the groundwater-to-indoor air pathway. This work will improve DoD's ability to protect the health of families living on base and neighbors in the surrounding communities, while saving resources so that they can be effectively used at chlorinated solvent sites across the nation.

ESTCP Project of the Year

Passive Sampling to Support Remediation of Contaminated Sediments–Dr. Philip Gschwend, Massachusetts Institute of Technology

DoD manages hundreds of contaminated sediment sites in bays, harbors, lakes, wetlands, and rivers. Historically, regulators and site managers have assessed these sites by measuring how much of a specific chemical such as

Kelly Magathan

ESTCP Project-of-the-Year Award recipient Dr. Philip Gschwend (right) and his team demonstrated and validated a commercially viable, simple passive sampler that measures the fraction of sediment contamination that poses a risk to ecological receptors and human health. This accurate and robust technique can be cost-effectively employed at virtually all DoD contaminated sediment sites to characterize the risk of contaminants entering the food chain.

polychlorinated biphenyls is present in the sediment. However, total concentrations are poorly correlated with the toxic impacts that need to be addressed. What is needed is a way to easily and cost-effectively measure the fraction of those chemicals at a particular field site that can be taken up by an organism and cause harm.

Dr. Gschwend and his colleagues have demonstrated and validated a commercially viable, simple passive sampler that can measure the fraction of the chemical that is of concern. Developed under SERDP, the passive samplers utilize an inert low-density polyethylene medium to accumulate organic compounds from contaminated sediment beds. The polyethylene concentrations can be converted to contaminant concentrations that are available to the organisms in this environment.

This accurate and robust passive sampling technique can be cost-effectively employed at virtually all DoD contaminated sediment sites to characterize the risk of contaminants entering the food chain. It provides significant savings in manpower, number of days in the field, equipment, and shipping costs as compared to traditional sampling methods. For sites already in the remedial action process, the use of these samplers could significantly reduce the costs of long-term monitoring. Beyond cost reduction, the passive sampling technique can help guide remediation efforts to target the real risk and thus improve the health of the environment at sediment sites across DoD and the nation.

Symposium Presentations & On-Demand Videos Available

Additional information about the 2011 Symposium, including plenary and technical session presentations and short course on-demand videos, is available at http://symposium2011.serdp-estcp.org.

Plans Under Way for 2012 Symposium & Workshop

The 2012 Partners in Environmental Technology Technical Symposium & Workshop is scheduled to be held 27-29 November 2012, in Washington, D.C. The Call for Poster Abstracts will be released by the end of May 2012. Visit http://symposium2012.serdp-estcp.org for the most up-to-date event information. ⚓

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