



BALANCING MILITARY TRAINING WITH ENVIRONMENTAL STEWARDSHIP

By Ms. Sara Leach

Photo courtesy: Dr. Steve Larson, ERDC Environmental Laboratory

Testing and training ranges are key elements in maintaining the capability and readiness of US military forces. Currently, the level of knowledge on the nature and extent of contamination and residues from live-fire training exercises on military ranges is not adequate to ensure sound management of these ranges. However, knowledge is being greatly expanded as the US Army Engineer Research and Development Center (ERDC) explores an array of topics such as groundwater contamination, low-order detonation, soil remediation, range management tools, and other ecological effects on training ranges.

Even though small research studies on training ranges have been performed at ERDC since 1998, research began in earnest in 2001 when the Massachusetts Military Reservation closed due to groundwater contamination. The research—

- Examined chemical processes from the micro- to macroscale.
- Determined transformation products following the alkaline destruction of explosives and propellant residue.
- Evaluated the transformation of products following alkaline destruction.
- Integrated a research program that utilized site characterization methodologies.
- Developed the best management practice to ensure continued operation of the nation's training and testing ranges.
- Included international collaboration.

The research developed technologies or advanced knowledge on various topics from molecular-level interactions to large-scale field evaluation methods. This approach emphasized the delivery of a useful product for the Army and the Department of Defense (DOD).

Live weapons and ammunition are necessary to create a realistic environment for soldiers during small arms training. The goal for research on small arms firing range soil remediation was to balance the need for this essential training with environmental stewardship. The team is developing ways to



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Lead concentration in runoff water is above state limits at this M60 machine gun range.



In situ soil stabilization is being studied as a possible remedy for the lead concentration in the runoff water at this M16 rifle range.

reduce the cost of range soil remediation, eliminate migration of heavy metals from small arms ranges, and prevent toxic metals from traveling through the soil below ranges to the underlying groundwater. ERDC is developing low-cost, low-maintenance techniques to keep small arms ranges open and limit the life-cycle costs associated with the operation.

As part of the Strategic Environmental Research and Development Program, firing range research began to provide DOD with techniques to assess the potential for groundwater contamination from constituent residues of high explosives. Detecting where the contamination was coming from and what could be done about it were the primary concerns.

One aspect of this research includes determining how much chemical residue remains after the explosion of ordnance—to include trinitrotoluene (TNT), cyclotrimethylene trinitramine (RDX), and high-melting explosive (HMX). Sampling snow after a detonation has been effective in determining residue. Residue on a soil surface can't be seen, but residue on a snow surface looks like a darkened soot footprint. Snow is collected, melted, and analyzed for residue.

A “blow-in-place” method for demolition of unexploded ordnance (UXO) on training ranges has allowed characterization of the associated residues. Secondary charges, to limit the amount of residue, are being explored. The amount of high-explosives residue associated with munitions that fail to detonate completely is also being explored. These residues can become a source of groundwater contamination.

Since 2000, more than 20 ranges across the United States and Canada have been studied. With these studies, data gaps have been filled and characterization guidance and protocols

are expected to be provided to installations by the end of 2005. ERDC's firing range research is providing a direct benefit to the Army by keeping training ranges open and sustaining military readiness, while also offering proactive solutions that reduce environmental harm. The research is also providing technologies that US Army Corps of Engineers districts and divisions can use to satisfy the needs of their installation clients. Since arms training is not unique to the Army, other services can also benefit from the research completed and ongoing at ERDC.



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