

The Corps

Environment

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Bostick shares thoughts, challenges

By Candice Walters

Headquarters, U.S. Army Corps of Engineers

Lt. Gen. Thomas P. Bostick became the 53rd Army Chief of Engineers and commanding general of the U.S. Army Corps of Engineers on May 22, 2012. As the USACE commanding general, he is responsible for more than 36,500 civilian employees and 600 military personnel. As the United States prepares to mark the 43rd anniversary of Earth Day on April 22, we asked Lt. Gen. Bostick to discuss USACE's sustainability and environmental missions.

Sir, when you hear the words "environment," "sustainability" and "USACE," what comes to your mind?

I always say that USACE is the nation's engineer, so it makes sense to say that USACE is also the nation's environmental engineer, providing sustainable engineering solutions for the nation's environmental challenges.

Not long after I came on board, I was in Colorado and met with some of our team from the Northwestern Division. We spent an hour trying to define "sustainability." Initially, I found it challenging to describe and I found different views of what sustainability meant. However, I think that sustainability is an umbrella concept that encompasses energy, climate change and the environment in order to ensure that what we do today doesn't negatively impact tomorrow. Sustainability is part of everything we do, as embodied by our Environmental Operating Principles.

What do you think is the number one challenge facing USACE's environmental programs right now?

Probably the biggest challenge is trying to balance sustainability with our infrastructure and economic requirements. We need to determine how we do this as a nation. We have limited resources. We must do both. For me, that's the challenge, and as leaders, we must execute both our sustainability and infrastructure requirements in parallel – we cannot have one without the other and if we focus on only one, then we're not doing our jobs.

The first Chief's Report I signed was for the Louisiana Coastal Area's Barataria Basin Barrier Shoreline Study, where we are restoring 2,839 acres of dune and marsh habitat. While the \$14.6 billion Hurricane and Storm Damage Risk Reduction System in New Orleans is very valuable, ecosystem restoration is one of the first lines of defense. The Barataria Basin will not only maintain and increase habitat for threatened and

endangered species but help with hurricane protection risk reduction. It takes structural and non-structural features and natural coastal wetland buffers to reduce risks. Tying sustainability and infrastructure together makes sense and serves everyone.

In the short-term, of course, our challenge will be to execute our programs efficiently and effectively in a budget-constrained environment. In the long-term, we must make sure we are maintaining the technical competencies that have made USACE the nation's environmental engineer.

The other challenge is that as the country focuses on tomorrow, next week and next year, we must realize that changes in energy, climate and the environment today will have dramatic impacts over many years. Sea-level rise next year might not be of major concern, but 50 to 100 years from now, it could be significant. We cannot be short-sighted. We must fund and fix it today, to the appropriate standard for many years to come, so we're not mortgaging our future and our children's future.

Where do you see environment and sustainability fitting into the four Campaign Plan goals of Support the Warfighter, Transform Civil Works, Reduce Disaster Risks and Prepare for Tomorrow?

Taking care of the environment and incorporating the Environmental Operating Principles into our work are part of all of the Campaign Plan goals – they are inherent to the plan.

Support the Warfighter – We have been reducing the Army's energy requirements on contingency bases overseas, reducing the need for vulnerable fuel convoys and thus, lowering risks to the warfighter. The 249th Engineer Battalion (Prime Power) has installed initial power plant and electrical distribution at sites across Afghanistan resulting in an estimated savings of more than \$195 million in fuel annually and the removal of more than 12,000 fuel trucks from the road each year. When the warfighters return home, they come back to installations like Fort Carson where there are renewable and reliable energy sources, LEED (Leadership in Energy and Environmental Design) Gold and Silver buildings and sustainable housing communities for their families.

Transform Civil Works – We have been working hard to ensure that we are complying with environmental regulatory processes while trying to reduce the amount of planning time for our projects.

We manage almost 12 million acres of public lands and waters in 43

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Mike Sanders (left), director of television for Southeast High School in Bradenton, Fla., assists students Chelsie Sloan (at computer) and Farah Britto (right) while filming the fire station scene for the UXO Safety newscast. (Courtesy photo)

Student video stresses UXO safety

By Tracy Robillard

Savannah District

Thanks to a partnership with Southeast High School in Bradenton, Fla., the U.S. Army Corps of Engineers, Savannah District is helping kids spread the word about unexploded ordnance (UXO) safety.

Southeast High School's video production team developed a 12-minute newscast about the dangers of unexploded bombs and munitions found in the ground. The newscast tells the story of a group of teenagers who find a hidden mortar shell while hanging out in a grassy field.

Using the three "Rs"—Recognize, Retreat, Report—the video provides educational messaging for an age-appropriate audience that is easy to remember. Their newscast will be played in elementary schools across the country to warn kids of the dangers of UXO.

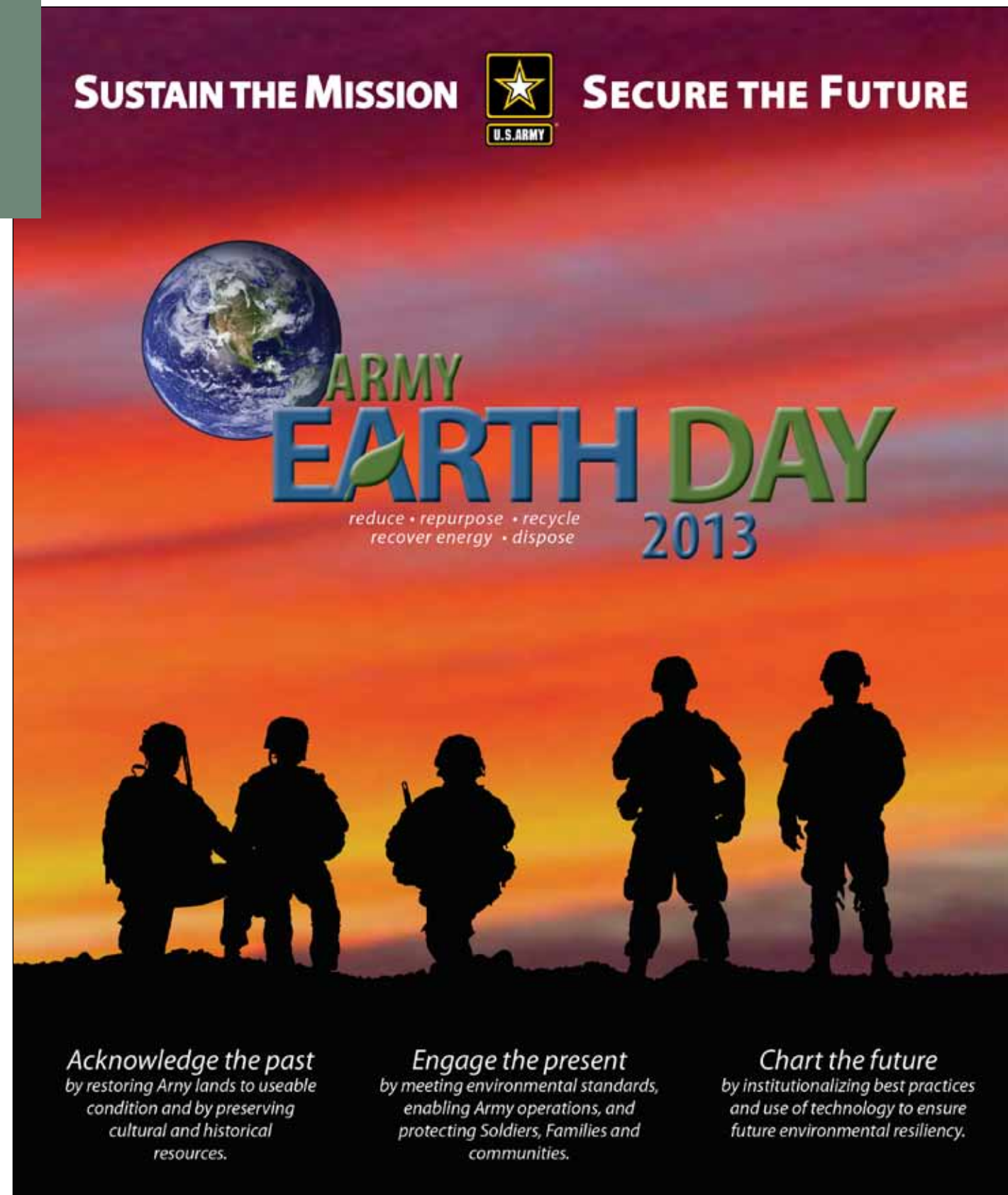
The Corps funded the production as part of its Formerly Used Defense Sites (FUDS) program, which manages the cleanup of munitions and UXO in areas that were once used by the Defense Department. The Savannah District oversees an \$8.6 million FUDS program in six southeast states. As part of this mission, the Corps provides public outreach and education on the dangers of FUDS.

"We partnered with USA Environmental, Inc. and GSL Solutions to develop the story board and script for the video," said Julie Hiscox, FUDS project manager with the Corps' Savannah District. "We coordinated with Army staff members who are routinely involved in

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This year's U.S. Army Earth Day poster is designed to educate viewers by illustrating how the Army acknowledges the past by remediating Army lands and protecting and preserving cultural and historical resources; engaging the present by meeting environmental standards, enabling Army operations and protecting Soldiers, civilians and families; and charting the future by institutionalizing best practices and using technology to ensure future environmental resiliency. (Illustration by the U.S. Army Environmental Command)



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**Whenever possible, please enjoy
The Corps Environment
without using paper.**



Science to solutions

Environmental Laboratory leverages capabilities for customers

By Beth Fleming,
Environmental Laboratory Director
*U.S. Army Engineer Research
and Development Center*

At the U.S. Army Engineer Research and Development Center's Environmental Laboratory in Vicksburg, Miss., our customer-focused science and technology solutions offer world-class expertise and experience in technology development, from basic research to field implementation.

More than 200 engineers, scientists, technicians and support personnel perform these exciting projects in EL's new state-of-the-art headquarters, where our team members excel in meeting the environmental challenges of the Department of Defense and the nation in the 21st century. Featuring recycled materials and a 28 percent reduction in energy usage, our new building qualified for certification by the U.S. Green Building Council.

Within this eco-friendly work space, our scientists and engineers solve problems involving ecosystem restoration, performance monitoring and adaptive management, water quality, sediments, invasive and endangered species, ecological modeling and forecasting, systems biology, risk and decision science, cleanup and remediation. We address a wide array of scientific and technological issues ranging from genetics to landscapes and molecular ecology to human dimensions.

Our teams value our partners, and our goal is to know our customers and help them succeed. As part of the Army, we

have detailed understanding of U.S. Army Corps of Engineers districts, divisions and installations and their responsibilities and missions. Through our national and international partnerships and collaborations with federal, state and private industry partners and more than 80 universities, we tackle any issue that impacts the environment. We accomplish this by partnering with experts in the six additional ERDC laboratories, three in Vicksburg, and one each in Hanover, N.H., Champaign, Ill., and Alexandria, Va.

We leverage expertise across disciplines, programs, and geographical boundaries to address our nation's most pressing needs and requirements. Our work in the area of climate change assessment and risk management provides an example of our "trans-boundary" approach to solution development.

Civil works and military projects and programs have the potential to be impacted by variability in climate as well as long-term trends in climate. Increased severity and frequency of extremes in temperature, precipitation and storms could affect coastal and inland infrastructure and natural resources through greater risk of flooding and storm damage.

Threats to interior lands and aquatic resources due to hydrologic extremes, like too much or too little water, pose potential challenges to civil works infrastructure,

ecosystems, both threatened and endangered species and invasive species, and water supply. ERDC is researching the extent of these impacts and developing solutions for the Corps to incorporate in near- and long-term planning, project execution and resource management.

In support of DoD's Strategic Environmental Research and Development Program, a technical evaluation process was developed for performing a quantitative systems-scale risk assessment. The developed process was demonstrated to identify adaptive capacity and tipping points for infrastructure at Norfolk Naval Station. The project evaluated mission performance under the combined conditions of sea level rise, from 0 to 2 meters in 0.5 meter increments, and coastal storms.

A combination of scientific and engineering models was used to translate the coastal storm stressors onto networked assets with assigned damage state fragility functions to characterize changes in impairments for each sea level rise scenario. The value of this approach is significant for defensibly identifying the scope, sequence and timing of installation management actions that should be taken for most effectively and efficiently reducing risks of loss to mission support over the course of life cycle planning horizons.

A screening level assessment of vegetation shifts, or biome shifts, on

DoD installations in the continental U.S. is currently in development based on a range of climate change scenarios. The GIS-based program will allow for natural resource and contaminant management personnel to assess their site for risk of impact due to significant biome shifts utilizing differing climate change scenarios. When complete, this tool will be linked with Army Mapper to provide a tool for use in long-range planning. A current research project being demonstrated at Fort Stewart, Ga., combines regional climate, hydrologic, and ecological modeling to assess vulnerabilities and risks to built infrastructure and natural resources, in this case, threatened and endangered species.

Our unique facilities support the full lifecycle of new and emerging materials, maximizing the long-term contributions to readiness and operational success needed by Soldiers. Lime technology applied for reduction of explosives at Redstone Arsenal, Ala., allowed uninterrupted training activities and received an Army R&D achievement award for the innovative and yet simple solution our team developed. With our customers, we tailor our solutions to the level of complexity of the problem.

In addition to our research and technology development activities, EL leads technical support programs that provide

services ranging from direct assistance to training. In a typical year, we respond, with our partners, to more than 100 support requests from USACE divisions and districts, providing expertise, tools, technical reports and other materials to aid those facing complex environmental challenges.

The Dredging Operations Technical Support program provides direct environmental and engineering technical support to USACE and its partners on issues such as sediment transport, environmental windows and contaminated sediments. The Water Operations Technical Support program provides support to decisions regarding environmental and water quality operational studies. The Wetlands Regulatory Assistance Program provides technical support to the Corps' Regulatory business and the Recreation Management Support Program supports recreation through management studies, assistance and information exchange through the Natural Resources Management Gateway.

Our research direction is informed by the needs and requirements of Soldiers and water resources managers and the challenges we face together, today and tomorrow. Our passion is providing those science and technology solutions to provide national and international value.



Beth Fleming

ENVIROPOINTS

District moves to new, 'green' facility

By Tanya King
Seattle District

After waiting more than three years, those working in the U.S. Army Corps of Engineers, Seattle District, Federal Center South location finally moved into their new building at the end of 2012.

The U.S. General Services Administration owns what has been nicknamed the "Oxbow Building," which sits on a former superfund site and once housed a World War II bomb factory.

The 209,000 square-foot building is a model for green buildings and is anticipated to be among the top 1 percent in the country for energy performance. It's one of the first in the region to combine the use of geothermal heating and cooling systems with structural piles.

Nearly 200,000 board-feet of timber were salvaged from the old warehouse, which can be seen throughout the atrium, known as "The Commons."

Beneath the courtyard space facing the Duwamish River, a 25,000-gallon cistern provides storage and treatment for rainwater collected from the roof that is reused for irrigation, toilets and a rooftop cooling tower.

It is projected 430,000 gallons of water will be harvested annually, resulting in drastic reductions in water usage compared to a similarly sized building, and energy use is also expected to be at about one third that of a similar non-green building, putting it on track to achieve an ENERGY STAR score of 100.

"There have been several studies over the years that show that the operating and employee costs of a building over a 25-year cycle are 90 percent of the costs, compared with the initial construction, which would be 10 percent," said Rick Thomas, GSA project manager.

GSA used \$72 million of American Reinvestment and Recovery Act funding to pursue aggressive energy performance targets as part of a larger effort to modernize the nation's infrastructure, reduce the federal government's consumption of energy and water, and increase the use of clean and renewable power.

"GSA's job is to provide efficient and effective workplace solutions for federal agencies in the best interest of the taxpayer. This building saves money by reducing energy costs and helps the Corps of Engineers do its job better on behalf of the citizens," said George Northcroft, GSA Regional Administrator for the Northwest/Arctic Region. "And the project has had a positive impact on the local economy, employing more than 150 workers on site over the last 24 months and contracting more than \$27 million to local small businesses."



Col. Bruce Estok, U.S. Army Corps of Engineers, Seattle District commander, addresses employees in a ceremony at the Oxbow Building to celebrate its completion. (Photo by Rob Nevitt)

Portland-based ZGF Architects and Seattle-based Sellen Construction partnered on the design-build contract to create an open atmosphere.

"We had an ambitious energy performance target," said Dan Simpson, ZGF Architects principal. "We were challenged to just meet the targets in the best way possible."

The building is expected to attain a Leadership in Energy and Environmental Design (LEED) Gold certification from the U.S. Green Building Council. Other green features of the new building include extensive use of natural daylight, changing the existing landscape into low impact sustainable green space, using geothermal energy wells that extend 150 feet below ground and loop water for cooling and heating, using thermal storage to retain cold-energy for future use in the chilled beams to cool the office space, and an energy-efficient HVAC system using under-floor air distribution.

"Building a home for the Corps of Engineers, an agency dedicated to designing, engineering and construction, is a tall order," said Col. Bruce Estok, Seattle District commander. "We are an exacting customer that knows the business. GSA, ZGF, and Sellen delivered a building that far exceeds our expectation. Our employees are excited about the positive effects it will have on our ability to serve the nation and the Northwest."

Students

Continued from Page 1

military munitions to ensure our message was consistent with the national safety message."

USA Environmental, based in Oldsmar, Fla., has served as the Corps' prime contractor at five FUDS during the past several years. The company specializes in ordnance investigation and removal. GSL Solutions is a Tampa-based company which focuses on website design and content management services.

"Both companies provided their unique expertise to develop a script that was technically accurate, while presenting the information in a manner that would be interesting to children," Hiscox said.

The team looked for a school in the Tampa area that had the ability to produce a high-quality video as a school project, Hiscox said. Southeast High School's TV Production Department was uniquely suited to create the video while supporting class requirements and skills they were studying.

"It's incredible that a high school has been given the opportunity to work with the federal government," said Southeast TV Director Mike Sanders.

Sanders said that before starting the production, the students and staff had no idea that the Corps of Engineers was involved in UXO clean up at formerly-used military sites.

"At first, we didn't know much about it, but as it turns out, here in Florida we have military training grounds that have been turned over to the public and they are still finding munitions," Sanders said. "So this project was very valuable in communicating an important safety message to the public."

Sanders directed and filmed the newscast. The school's theater teacher Jason Schiessl played the part of a TV news anchor, and yearbook adviser Randy Funderburke portrayed the Fire Marshall. Southeast graduates Farah Britto and Chelsie Sloan produced and edited the newscast.

The school officially debuted the newscast on Dec. 13, 2012, drawing media attention from several news outlets in the Bradenton area.

"The partnership with the Corps of Engineers and GSL Solutions has been a phenomenal experience," Sanders said. "The entire school district is just thrilled with the final results and the partnership."

In addition to the newscast, the Corps of Engineers, USA Environmental and GSL Solutions collaborated to develop the UXO Safety Hub, a website with interactive games and learning tools for children. The UXO Safety Hub includes an interactive story book application for mobile devices.

Lab offers net-zero planning tool

By Martin J. Savoie, Technical Director, Installations
U.S. Army Engineer Research and Development Center
Construction Engineering Research Laboratory

An important sustainability goal for the Army is to achieve net zero energy, water and waste, which presents a complex set of challenges. Managers must make strategic decisions about approaches and technologies to use, requiring an integrated analysis at the community level that also considers the economics for each proposed course of action.

From an operational perspective, a sustainable, self-sufficient military installation can ensure against interruptions to the mission in the event of a natural disaster or terrorist attack on the infrastructure. Other benefits of sustainability include limiting reliance on foreign oil, reducing greenhouse gases and ensuring environmental stewardship to sustain installations for future generations.

The U.S. Army Engineer Research and Development Center's Construction Engineering Research Laboratory conducts research and development addressing all facets of sustainability. Leveraging expertise from other government stakeholders, academia and industry, CERL is developing products that will help installations meet sustainability requirements while improving Soldiers' quality of life.

A new planning tool launched last year is the Net Zero Installation Energy (NZI-E) virtual test bed for energy analysis that generates optimal, life-cycle effective system configurations.

NZI-E analyzes energy generation, reuse and conservation strategies using non-linear network energy models and clustering algorithms for identifying and configuring facilities with complementary energy consumption profiles. Net Zero Installation Energy Waste and Water (NZI-EW2) builds on the NZI-E framework to support installation master planning for energy, water and waste through an integrated modeling capability for resource optimization.

To run NZI-E, an installation only needs to input information that already exists: geographic information system maps to show building types and uses; weather data; economic factors, like utility rate structures, equipment installation and maintenance costs; fuel prices; and documentation for existing equipment. Once the data and facilities have been added to the program, baseline energy intensity and potential Energy Efficiency Measure (EEM) packages are simulated. Cost/Energy curves and Savings-to-Invest-

ment ratios (SIRs) are generated for EEM packages. Optimal EEMs are suggested for each building type and load profiles are produced to pass to the next step for cluster analysis.

After the tool optimizes all facilities, the user can identify clusters of buildings suitable for district energy solutions. NZI-E then produces potential cluster equipment packages based on the installation and region. It also generates alternative equipment configurations including centralized and decentralized options. The tool then determines and optimizes equipment and pipe sizes (electric, thermal, hydraulic) and performs economic simulations. It also calculates SIRs for clusters and EEMs.

The result is an integrated demand reduction and supply solution that provides the sizing along with initial and operating costs of every piece of equipment in the lowest cost solution. In addition, installations receive a prioritized list of projects with suggested phasing plans.

The air tightness of a building enclosure or envelope is a major factor in the building's overall energy consumption. Energy required to heat, cool and control humidity increases significantly due to convection and uncontrolled air transfer.

It is well known that an intact, continuous air barrier can reduce a building's energy consumption by up to 45 percent, usually at little or no extra cost to a construction or renovation project. However, the lack of accurate simulation inputs for dynamic response material properties and complex multi-dimensional heat transfer in building envelopes precludes a high

degree of confidence for implementing mitigation strategies.

A multi-disciplinary team at CERL is addressing these issues. During 2012, the team developed an initial set of two- and three-dimensional heat transfer models for each of the most abundant thermal bridge types found in Army facilities. The models were constructed using HEAT3 software based on previous thermography surveys at Fort Carson, Colo. (to estimate high heat loss locations) and building detail drawings (wall cross sections, floor plans, window and door framing details, etc.)

Currently, these model scenarios are on a generic level that take into account standardized Army facility building details to develop a catalog of thermal bridges. The catalog development is in progress and will contain generic Army facility sections having thermal bridge data such as thermally relevant component dimensions/material properties, temperature contour profile with respective psi-value, and guidelines recommending best practices to avoid occurrence of thermal bridging problems.



Continuous air barriers like this one being installed can save up to 45 percent on energy costs. (Courtesy photo)

Impact of tree theft

By Robert Burick, Natural Resources Specialist
Rock Island District

A total of 35 mature black walnut trees were stolen from government lands between January and March last year, and a multi-agency investigation resulted in the arrest of the suspect who plead guilty in January.

Twenty-five of these trees, totaling \$35,000 in timber value, were removed from property managed by Saylorville Lake, Iowa, a U.S. Army Corps of Engineers multi-purpose reservoir on the Des Moines River. The additional trees were taken from the Neal Smith National Wildlife Refuge and Lake Red Rock.

The case was initiated with a report of cut trees by the Iowa Department of Natural Resources Park Manager more than a year ago. What followed was an intensive investigation of the river corridor for more cut sites.

Once multiple cut sites were found, actions were taken to conduct surveillance of the area. Evidence was collected and expert foresters were brought in from the state and the U.S. Forest Service.

The investigation resulted in the arrest of Randall Todd Walker of Des Moines, Iowa, who later plead guilty and is in custody, awaiting sentencing May 9, according to the U.S. Department of Justice.

Multiple agencies contributed to this case including the Iowa Department of Natural Resources, Polk County Conservation, U.S. Fish and Wildlife Service, U.S. Forest Service, Polk County Sheriff's Office and the U.S. Army Corps of Engineers.

All of the trees taken were mature, high quality black walnuts. These trees are the most valuable species in the lowland hardwood ecosystem but have a limited growing area, only able to establish on higher benches throughout the forested wetland. Many other trees were also damaged as a result of felling the large trees in a dense, established forest canopy and from the suspect cutting a path for his truck to get the logs. The selective removal of the highest quality timber removed the seed source and superior genetics from the ecosystem. This severely impacts the ability to regenerate and stifles future timber production in the area.

These trees were located within the Ding Darling Greenway, a globally significant birding area designated by the American Bird Conservancy because of its location along a major flyway for migratory waterfowl and neo-tropical songbirds. The area also has significant value as an urban greenway in the form of pollution control, carbon storage and heat reduction. Since a majority of Iowa is controlled by private landowners, trees of this magnitude only exist on small portions of public lands and represent a unique timeline that has now been destroyed.

Snake behavior in warming climate studied

By Dana Finney

U.S. Army Engineer Research and Development Center

Future sustainability of training ranges on Army installations could be affected if increasingly warm temperatures due to climate change alter the regional ecosystem.

Global climate change is influencing the distribution and abundance of many species, and U.S. Army researchers are participating in studies to identify potential impacts among different species within their ecosystems to revise environmental management strategies if necessary.

In one recently published study, research to determine effects of warming temperatures on rat snakes (*Pantherophis obsoletus*) reveals that the reptile may actually benefit, rather than being stressed in the ways predicted for many other species.

Scientists from the U.S. Army Engineer Research and Development Center teamed with experts at the University of Illinois (Urbana-Champaign); Fort Hood, Texas; and other partners to design a 10-year study using data collected from the snake in three distinct geographic regions: Canada, Illinois and Texas.

The rat snake is an ectotherm, or cold-blooded, creature whose internal temperature mostly depends on its habitat's external temperature, as opposed to endotherms, or "warm-blooded" species like humans, whose internal metabolic processes produce body heat. The snake can help control its internal temperature through different behaviors, such as hibernating in winter, spreading out in the sun for warmth or seeking cooler, shady areas, or switching between night and day foraging.

Fort Hood was interested in research on snake behavior because rat snake predation is the major cause of reproductive failure for two species of endangered birds at the fort — the golden-cheeked warbler and black-capped vireo. Officials are looking for new management strategies that could decrease nest predation and are participating in research designed to better understand the relationship between snake activity and nest predation risk.

The data collected during the course of this work was then combined with similar data, collected across a 1500 km latitudinal gradient, to predict

effects of climate change.

"Because the rat snake populates a broad area representing different temperature ranges, we were able to use these conditions as a 'surrogate' climate change model," said Jinelle Sperry, researcher at ERDC's Construction Engineering Research Laboratory. "This allowed us to compare the snake's ability to regulate body temperature through behavior changes."

In warmer climates like those at Fort Hood, these behavioral changes can have other ecological consequences.



Ratsnakes captured at Fort Hood, Texas, and sites in Illinois and Canada were implanted with temperature sensitive radio transmitters to collect data on their thermoregulation patterns. (Courtesy photo)

"In cooler weather, when the snake hunts during the daytime, it usually only eats the eggs or hatchlings," Sperry said. "When the adult birds spot a ratsnake during daylight, they set up a ruckus to attract attention of snake predators, such as hawks. But at night, a ratsnake can make a stealth attack on the nest, often killing the incubating or brooding female in addition to her young, at even greater loss to the bird population."

"The environmental repercussions could be significant if you start eliminating adult females from a population, particularly an endangered species," said Patrick Weatherhead, University of Illinois (Urbana-Champaign). "The loss of females for native birds will have a big demographic effect on bird populations."

Thermoregulation data for the rat snakes came from earlier studies in which a total of 143 snakes were captured in the three geographic regions. The team surgically implanted tiny temperature-sensitive transmitters into the snakes, released them back into their habitats and collected the data as pulse rates using hand-held radio-telemetry.

Results showed that the snakes' behavior was surprisingly similar within all three temperature regions. Similar seasonal activity patterns across all three sites would suggest that warming temperatures would likely lead to an increase in nocturnal activity, as opposed to alterations in monthly activity.

In collaboration with Fort Hood Natural Resource personnel, ERDC researchers are examining habitat manipulation strategies, such as brush pile management, that may reduce the likelihood that snakes will encounter birds' nests.

Workshop now online

By James Campbell

U.S. Army Engineering and Support Center, Huntsville

Military munitions experts, regulators, government contractors and various stakeholders are meeting online this year to share lessons learned and best practices in their complex field, rather than traveling to Huntsville, Ala., for their annual training workshop.

"The webinar series is being developed and executed as a cost effective means of sharing information on technologies, policies and lessons learned across the military munitions support services community," said Dwayne Ford, a civil engineer with the Environmental and Munitions Center of Expertise (EM CX).

The topics are determined based on feedback from workshop participants and topics of interest to the broader community, Ford said. The March webinar focused on hazard assessment and was attended by approximately 245 people.

In 2012, the decision was made not to fund the workshop after a call for abstracts and presentations had been announced. As it became clear that funding would not be available for future workshops, the decision to launch monthly online training began, said Christopher Evans, special assistant for Military Munitions Support Services, Headquarters U.S. Army Corps of Engineers.

"This is the next best thing we can do. We have to keep sharing information and knowledge with the munitions community and our stakeholders," Evans said.

The benefits of the technical training don't just apply to those charged with the task of remediating sites where military munitions were used.

"I believe it is very beneficial to all parties to hold joint training sessions and work through lessons learned and emerging technologies," said Doug Maddox, munitions lead from the U.S. Environmental Protection Agency's Federal Facilities Restoration and Reuse Office. "This allows more resources to be applied directly to site cleanup and avoid unnecessary delays."

"In the current climate of tighter budgets, we appreciate the Army's willingness to open the training sessions to stakeholders and regulators," said Maddox. The EPA has been a participant in the workshops since 2003.

"At the physical conference, people had to pick and choose what breakout sessions to attend, but since this is both online and recorded, we'll reach more people," said Bill Veith, Unexploded Ordnance Safety Specialist with the EM CX.

The EM CX, which sponsors the workshops and organizes content, has opened registration requests for upcoming workshops on the EPA's Contaminated Site Cleanup Information website, www.clu-in.org.

University students learn from beneficial use site

By **Sandra Arnold**
Galveston District

U.S. Army Corps of Engineers Galveston District's Regional Environmental Specialist Janelle Stokes couldn't have been more pleased when she learned she would be presenting an overview of the district's Beneficial Use Program to a group of visiting Louisiana State University students who are just as interested in dirt as she is and on their way to becoming the next leaders in the field of landscape architecture.

"There are a lot of design challenges and engineering requirements associated with the placement of dredged material," said Stokes. "One of the biggest difficulties is getting the elevation right so vegetation and marsh habitat can flourish. There is a tidal range of about 1.5 feet in the areas where we place material, which doesn't leave a lot of room for error."

The LSU students, enrolled in the Robert Reich School of Landscape Architecture, traveled to Galveston to visit one of the district's beneficial use sites known as the Corps Woods, to get a better understanding of infrastructure sustainability issues, remediation and green infrastructure design in landscapes associated with maritime commerce such as the district's Beneficial Use Program.

"Within the context of the Houston Ship Channel and Galveston Bay, the students have been looking at a broad range of sustainability issues," said Rob Holmes, visiting faculty from Louisiana State University's Robert Reich School of Landscape Architecture. "The beneficial use of dredged materials is one aspect of that range. Other issues include coastal erosion, storm surge, flooding, sea level rise, subsidence, toxicity and contamination from industrial activities (particularly the petrochemical industry), non-industrial economies (fishing, shrimping, oysters) and coastal habitats."

Project Manager Byron Williams, USACE Galveston District, provided students with an overview of the district's Beneficial Use Program and discussed the environmental requirements associated with using dredged material for projects.

"Annually, the Galveston District dredges approximately 30 to 40 million cubic yards of material," Williams said. "While undertaking its mission of keeping America's waterways navigable, the Corps is often able to turn dredged material into an added benefit for homeowners, tourists and businesses by employing environmentally and economically responsible methods to use the materials to improve eroded coastlines and re-nourish beaches."

LSU student Prentiss Darden, a second-year student in the Master of Landscape Architecture Program, was interested in seeing the district's projects up close for a variety of reasons.

"In visiting the dredged materials site, we were able to see it within its context to experience the scale of it in relation to the surrounding landscape and understanding how it is built over time," Darden said. "Additionally, we gained a better understanding of dredged material sites that we otherwise

would not have achieved through analysis of satellite photos and Internet research."

The students were provided a tour of the heavily wooded strip of land on the island's East End, which is part of the district's beneficial use site that was developed using dredged material extracted from the Houston Ship Channel. The site quickly became a pristine habitat for wildlife and serves as a model for responsible ways to use dredge materials to improve eroded coastlines through marsh restoration.

"One of the big issues that I've seen in relationship to dredging is a transition from viewing dredged material as a waste product toward viewing dredged material as a resource," Holmes said. "Part of this transition has come as a result of recognizing the ecological and aesthetic value of flora and fauna that take root on dredged material sites."

Williams explained that the district has partnership initiatives with other federal and state agencies, non-governmental organizations and academic institutions to find innovative solutions to challenges that affect everyone – sustainability, climate change, endangered species, environmental cleanup and ecosystem restoration, then acknowledged the importance of the students' studies and future careers in architectural landscape.

"In your career as a landscape architect, you will most likely work with agencies such as the U.S. Army Corps of Engineers to find solutions to restoring ecosystem structure and processes as well as be tasked with managing projects in a sustainable manner to leave the smallest footprint behind," Williams said.

According to Holmes there is a growing recognition that natural and human processes exist not in opposition, but in relationship with one another and therefore it is imperative that future leaders in this industry find a balance between development and the environment.

"These realizations are key to our current studio project, which is particularly concerned with the potential role of landscape architects in



Visiting Louisiana State University students, enrolled in the Robert Reich School of Landscape Architecture, watch a heavy equipment operator work to construct dewatering ditches at the San Jacinto Placement Area to allow for the outflow of excess water and increase the dredging placement area's capacity to hold more dredge material. (Courtesy photo)

active industrial, infrastructural and logistical systems — places where natural systems cannot be divorced from human inputs, but must make use of and coexist with human activities," Holmes said.

From Galveston, the students will travel to the Port of Houston where they will visit with maritime industry leaders to learn more about active industrial and infrastructure sites that are associated with maritime commerce such as container terminals, refineries, tank farms and dredge disposal areas as well as discuss how designers can contribute to both the improvement of these places and the improvement of their relationships to the cities that they are embedded in, through techniques like envisioning soft, biologically-based infrastructures and contributing to the remediation of pollutants with landscape systems.

The LSU School of Landscape Architecture is known for its rich and extensive off-campus educational opportunities. The school sponsors field trips throughout the year to the northeast, west coast, Florida, Texas and Georgia. Beyond the U.S., the school organizes opportunities for students to travel, study and work in Mexico, Asia and Europe.

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states, an area equivalent to the size of Vermont and New Hampshire combined. We continue to focus restoration efforts on the five ecosystems of national concern – the Everglades, the Chesapeake Bay, Gulf Coast, California Bay Delta and the Great Lakes.

We're also reducing power consumption at many of our recreation areas, looking to install solar power arrays and seeing what opportunities might exist for wind turbines. We're using biofuel in some of our vessels to reduce our dependence on foreign oil as well as striving to reduce our vehicle fleet.

Reduce Disaster Risks – This is an area where climate change has been very much in the news and in our minds – we have been working very hard during the past few years to make our projects more resilient and adaptable and making changes to our sea-level rise

guidance. Having put the comprehensive risk reduction system into place around New Orleans, combating the floods along the Mississippi River in 2011 and dealing with Hurricane Sandy this past fall — these all demonstrate why we need to be aware of changing climate and ensuring that our projects can withstand those changes to help reduce disaster risks. We have a strong partnership and collaboration with other federal science agencies as well as international and non-government groups all looking at climate change impacts and how we can share our knowledge and expertise.

Prepare for Tomorrow – By focusing a great deal of our time and energy on touting the opportunities available in Science, Technology, Engineering and Mathematics fields for our young people, we can help ensure that we will have the qualified workforce we need to tackle future environmental and sustainability

challenges. STEM-focused activities introduce students to the exciting fields available and the work we do in these fields – something always good to focus on during April when we celebrate Earth Day.

Our park rangers play a vital role in this as they are on the front lines of environmental outreach, teaching students and visitors to the parks about being good stewards of the environment and how important it is to ensure that our actions are sustainable and not harmful to the environment in which we all live.

It goes without saying that our research and development efforts are leading the way not only for the Army, but the Department of Defense. Our labs are supporting the warfighters by ensuring that their training lands are sustainable as well as finding ways to help combat invasive species that threaten not only our waterways but many of the habitants of threatened and endangered species under our care.

One area that I have been stressing is the need for strategic engagement, bringing all of our partners to the table to balance the competing needs. Collaboration is key. The challenges we face are entirely too complex for one agency to try to handle on its own – we all must work together.

Recognizing the fiscal uncertainty facing all Federal agencies, today and in the future, what is the primary message on energy and sustainability that USACE senior leaders need to communicate?

This is an important message not only for the people who are our “boots on the ground” at Civil Works and other Corps-owned facilities, but all USACE employees.

Now is not the time to back away from our energy and sustainability programs. In times of fiscal uncertainty, it is even more important that we make smart investments for the future, save taxpayer dollars, and work in collaboration with other federal agencies and our partners.

When we work to reduce our energy dependence, increase energy efficiency and adopt renewable and alternative energy sources at both our facilities and those we build for others, we are doing what is needed to be sustainable. We need to confirm the LEED successes that we have made in construction are resulting in the type of successes expected in the future. We need to follow up with metrics so we can know that the energy-saving initiatives that we are undertaking are actually saving energy. We need to check the systems, perform the metering, confirm that the initiatives are

actually achieving the energy-savings claimed. I am committed to following up on these metrics.

We must lead by example. When I hear our commanders talk about all that is being done to be sustainable, I am encouraged and impressed. They all talk about what steps they are taking to be more sustainable, how they are building LEED Silver and Gold buildings, it's clear that they have made the cultural shift already. Now it's not as much about convincing people to embrace the sustainability culture, but how we resource it. That's the challenging part.

Our approach does not have to be complex. We need to look for steps to take that are simple and that we can execute. Every USACE employee has a role – turning off lights and televisions, or even better installing automatic sensors that turn off the lights when you leave the room, teleconferences instead of attending meetings outside your office, recycling, looking to change the fuel we use in our Corps-owned vehicles — it all adds up.

It seems that the concept of sustainability requires our workforce to gain a broader understanding of how systems work and apply new skill sets to solve the problems of our customer and the nation. What is needed to create this new generation of “solutioneers”?

“Solutioneers” is a great word choice because that's exactly what USACE must continue to be — problem solvers. Engineers have always been known as problem solvers, and now we need to recognize that it may take different skills — or different applications of our skills — to deliver sustainable solutions for our stakeholders. We expect that sustainable practices — those that take into account the connections between environmental, economic and social needs — will become increasingly more important, and our USACE professionals will need to continue to be systems thinkers and solutioneers.

In addition to providing technical solutions, our engineers will need to advise others on where and how to invest in sustainability in a constrained resource environment, in other words, help our customers and stakeholders make “the business case” for sustainability.

We're not the only agency that sees this evolving in the future. Both the American Society for Civil Engineers and the Construction Management Association of America have identified the need for

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Dan Kimball, superintendent of Everglades National Park, provides Lt. Gen. Thomas P. Bostick, U.S. Army Corps of Engineers commanding general, with an overview of the benefits of the Tamiami Trail Bridge Modification Project Oct. 10. (USACE Photo)

engineers of the future to apply these “softer” skills to deliver solutions. We’re reading and watching what these organizations and others are saying about it, and exploring ways to incorporate best practices, as well as further develop these skills in our workforce.

One way we’re doing this is through more focus on STEM -- encouraging our youth to embrace the fields of Science, Technology, Engineering and Mathematics will ensure that we have the qualified workforce of the future. We need to continue to reach out and encourage young aspiring engineers who are interested in the environment to continue to pursue that interest. It’s important to develop a pipeline between us and the young men and young women who are passionate about the environmental and sustainability fields.

How can we make our environmental programs more efficient and effective?

This is an area that we need to discuss across Department of the Army, Department of Defense and across Federal Agencies. Our environmental community has spent much of the past year doing a comprehensive review of its Hazardous, Toxic and Radioactive Waste/ Military Munitions/Environmental Quality programs. The resulting Environmental Services Transformation Report, which is expected to be finalized in the near future, praises the programs for effectively accomplishing their missions, but does identify ways to improve scalability, flexibility and efficiency, notably through strengthening regional-based environmental program management and planning.

Given the fiscal constraints facing us now, one key issue to focus on might be the overlap and redundancy in environmental efforts. One of the questions that I have been asking is whether there are other environmental related areas within the Army where it makes sense for USACE to partner more effectively. I am committed to working with other Army commands to address those areas of overlap and redundancy. However, there are efficiencies that could likely be gained across the federal government.

In 2002, Lt. Gen. Robert Flowers challenged USACE employees to look at their work “through the lens of our Environmental Operating Principles,” the same principles that were reinvigorated and released by you last summer. Do you think USACE

employees have been and are doing that today?

USACE employees have incorporated the Environmental Operating Principles to some degree in much of their work during the past decade since they were originally introduced in 2002.

We are making good progress. In fact, I have received great feedback from the Environmental Advisory Board (for the Chief of Engineers) on how we are implementing the revised principles. The members have been reviewing our progress in that area and believe that the principles are really taking root at the district levels. That is good news.

In February, members of the Environmental Advisory Board visited three civil works projects in Arizona (Rio Salado, Tres Rios and Indian Bend Wash) that embody the principles in action – in fact, all three have won environmental design awards. All of these projects define our sustainability goals beyond those found in Executive Order 13514, which spelled out federal agency targets for reducing greenhouse gases and how the federal government would become more sustainable. They demonstrate how we had already been putting our “green ethics” into action.

Other examples abound:

- Controlling the movement of invasive species between the Mississippi and Great Lakes basins and in other locations;
- Achieving Leadership in Energy and Environmental Design certification on our MILCON projects;
- Helping the Army implement 17 Net Zero pilot tests that will help installations consume only as much energy or water as they produce on site.
- Working with the Army to achieve Net Zero
- Installing the largest solar array system at White Sands Missile Range; and,
- 249th Engineering Battalion (Prime Power) Soldiers installing power plant and electrical distribution systems at sites across Afghanistan, saving more than \$195 million in fuel annually and removing more than 12,000 fuel trucks from the road. Just to name a few.

Speaking of the Environmental Advisory Board, how do you see the EAB helping you and USACE reach its sustainability goals?

The EAB plays a critical role in providing me and



Katherine Hammack, assistant secretary of the Army for Installations, Energy and Environment, and Lt. Gen. Thomas P. Bostick, U.S. Army Corps of Engineers commanding general, answer media questions after announcing a request for industry proposals for contracts will provide alternative energy at Army installations Aug. 7. (Photo by Dennis Bohannon)

other USACE staff members with expert, independent guidance on a variety of issues facing the Corps of Engineers and the nation. It’s an asset that we need to turn to more often especially in these challenging times when we are trying to determine where best to focus our limited resources in the environmental arena.

Created by Chief of Engineers Lt. Gen. Frederick J. Clarke in 1970, the EAB’s purpose was to provide the Chief with outside, expert and independent advice on environmental issues facing USACE at a time when USACE was viewed as being more concerned about building up infrastructure than anything else – not exactly true since we do what the nation wants us to, but certainly the perception.

Throughout the years, the five – to 10-member board has served USACE well and continues to do so. The members of the board help to keep all of us honest by conveying the desires of the American people, and making sure that we do just that.

Let me give you an example. At the time the board was formed, the Kissimmee River in Florida was free flowing, but the nation asked us to straighten out the bends and make it flow straighter. Now, after impacting habitat, we’re being asked to put those bends back in and bring it back to its natural state. It’s all part of the balance that I talked about earlier.

I have asked the board to help me lay out a one-to two-year workplan to identify environmental areas and issues where the board can help us. We want to determine the best way to use the great resources we have in the EAB.

Last year the board was instrumental in helping to rewrite and reinvigorate our Environmental Operating Principles, something the members felt very strongly about. I was glad they could provide the impetus to make that reinvigoration happen, and as I said earlier, they are watching to see how the principles are being put into practice.

People and projects

Environmental Advisory Board meets Commanding General, tours district sites

By Daniel J. Calderón
Los Angeles District

The U.S. Army Corps of Engineers Los Angeles District's Arizona-Nevada Area Office hosted members of the Chief of Engineers Environmental Advisory Board and Lt. Gen. Thomas Bostick, U.S. Army Corps of Engineers commanding general, during a three-day visit to the Phoenix area Feb. 13-15.

"My visit here had two main components," Bostick said. "One, I met with the EAB. They do great work for the Corps of Engineers and for the nation by providing sound guidance in how we can be better stewards of the environment and of the taxpayers' dollars. Two, I wanted to make sure I took the time to meet the great folks in the office here."

None of the EAB members are members of the Corps of Engineers. The Board was created by the Chief of Engineers, Lieutenant General Frederick J. Clarke in 1970, to give outside, expert and independent advice on environmental issues facing the Corps of Engineers. Throughout its history, the Board has served the Corps as a vehicle of communication to reach out and build partnerships, understandings and cooperation with the environmental community and public at large.

"I know you're all experts in your respective fields and I'm excited to have you all here," said Col. Mark Toy, Los Angeles District commander, as he greeted the EAB members. "My goal here is to brief you on what we do. But, I'm ready to listen and learn from what you have to say during our time together."

Toy briefed the board members on the LA District's mission and discussed the projects in the area they were going to see during their visit. He also talked about his philosophy for leadership and how that applies to a mostly-civilian organization like USACE.

"We focus on people here," he said in reference to his People-Training-Facilities triangle hierarchy. "We, in the Corps of Engineers, are part of such a distinguished organization because of the quality civilians we have working for us. In my experience, the better bosses I've had are the ones who I really wanted to work with because I knew they cared about me. I try to foster an

atmosphere where employees really love doing their job and they are happy to come to work."

The first stop for the EAB was the Rio Salado Habitat Restoration Area. The Corps of Engineers became involved with the project in the 1990s when the City of Phoenix requested a restoration study of the Salt River. The Corps worked with Phoenix to revitalize the river corridor. Today, the area hosts more than 200 species of migratory birds and has an array of recreational options for residents and visitors.

"The project is designed to handle 30,000 CFS, which is the 1 percent chance of any rain event in any year," said Nancy Ryan, a project management coordinator with the City of Tempe. "Before this project was constructed, we had a utility corridor, gravel quarries and a dumping ground here in the riverbed. We think we've created a great amenity not only for the people of Tempe, but for the residents and visitors in the greater Phoenix area."

The 600-acre project is just one in the formerly ignored riverbed. Ryan and others painted a verbal picture of a blighted habitat fit for only the meanest grasses and flyovers by birds seeking adequate way stations during their journeys. Now, however, that picture has changed.

"This project is a testament to what is possible when someone takes a great idea and several organizations put the effort into it to make it a reality," said Cathy Wise, director of Education for the Nina Mason Pulliam Rio Salado Audubon Center. "The Army Corps of Engineers has been a wonderful partner throughout this project. They have really stepped up to rehabilitate this area. More than 150 species of birds have been sighted here."

The EAB members visited other sites along the Rio Salado during their first day in Phoenix. The next morning, they met for a trip to the Tres Rios Ecosystem Restoration project in Phoenix's West Valley. The most visible portion of the project uses highly treated effluent from the 91st Avenue Wastewater Treatment Plant to create nearly 500 acres of wetland.

"We've been effectively operating this site since



Members of the U.S. Army Corps of Engineers Environmental Advisory Board and USACE officials take the opportunity to see the location of what archaeologists think might be a large community building at the site of an archeological excavation containing human dwellings dating back to 3,000 BC and representing a "seminal period," according to archaeologists conducting the excavation, in human development during their visit to Luke Air Force Base Feb. 14. (Photos by Daniel J. Calderón)

2010," said Bob Upham, Tres Rios project manager for the City of Phoenix. "The water here meets all EPA standards. We polish the effluent here in the wetlands to make it more palatable for the river environment."

Upham said the 84-inch diameter pipes deliver 35-40 million gallons a day to the constructed wetlands. Once it enters the habitat, the water meanders through the various ponds for its "polishing." It picks up organic

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nutrients and loses the “scrubbed” feel of treated water. At the end of its 96-hour journey, the water goes straight into the Salt River. More than 200 different types of birds have been spotted at the wetlands habitat, including bald eagles.

The project also consists of a flood protection levee and extends for several miles along the Salt River. In an emergency, the site can handle approximately 300 million gallons of water per day to mitigate flood damage. The various stages of the project have received numerous awards from organizations like the Valley Forward Foundation and USACE Chief of Engineers. Phase II of the project earned the USACE Award of Excellence for Environmental Design and local USACE team members received the plaque in a ceremony in November 2012.

“The Army Corps [of Engineers] does so much for the country and we certainly appreciate it,” said Phoenix Mayor Greg Stanton during the November ceremony. “We are certainly ahead of our time with this project.”

“We chose Rio Salado and Tres Rios because we wanted to show [the EAB] some large-scale river ecosystem restoration projects in our region,” said Mike Ternak, the Sustainable Engineering Program Manager for South Pacific Division. Ternak is based in Phoenix. “And, at their last meeting, they wanted to get a sample of how the Corps supports military customers in their sustainability program. That’s why we took them to Luke Air Force Base.”

The EAB visited the base following its visit to Tres Rios. There, the group met with Lt. Col. Chad Bondurant, the commander of 56th Civil Engineer Squadron, 56th Fighter Wing, and members of his staff. They had the chance to view the work the LA District is doing on the base in preparation for the arrival of the F-35 Joint Strike Fighter. The team also had the chance to visit the site of an archeological excavation on the base.

The excavation came about when the base was planning to put in a solar array. Shortly after beginning the study on the site, the Luke team discovered a site they said is of great significance to Arizona and the nation. The site, according to archaeologists, contains human dwellings dating back to 3,000 BC. Archaeologists say the area shows signs of the

shift from a hunter-gatherer society to one based in agriculture and represents a “seminal period” in human development.

“I know you have all seen some pretty amazing projects during your tours,” Toy said as the EAB members returned to the Area Office for their working meeting on Valentine’s Day. “I want to thank you for coming, for taking your time and I’m glad you were able to get a better understanding of just how much these folks out here in Arizona do for the Corps and for the country.”

The next morning, the board participated in a public meeting with Bostick at the Federal Courthouse in Phoenix. The board members gave Bostick their findings from the previous meeting and discussed their opinions of the projects in the Phoenix Area.

The board also listened to presentations on the partnership between the Corps of Engineers and The Nature Conservancy; the Corps’ Sustainable Rivers Project with special emphasis on the Alamo Dam-Bill Williams River partnership; and on Sustainable Infrastructure for Military Customers.

“It was a very instructive two days,” said Dr. James Kundell, professor emeritus and retired director of the Environmental Policy Program at the University of Georgia’s Institute of Government. Kundell is the EAB Chairperson.

“Seeing the Tres Rios project was very important and seeing the projects at Luke Air Force Base was a new experience for us. I know Corps Districts are very different from each other and that when we were coming, we should prepare for this to be different from any other district we had been to before,” Kundell said.

Ternak said the board members were very impressed with Toy for taking the time to brief them personally on the mission. Kundell and the members of the EAB discussed the importance of the aquatic ecosystem restoration projects they toured and heaped praise upon the staff for its hospitality. Following the meeting, Bostick toured the Arizona-Nevada Area Office and spoke with district employees there. He discussed possible changes in the Corps’ future and talked about how the possibility of the sequester would affect employees. Bostick also had high praise for the team members in the Arizona-Nevada Area Office.

“This office is considered the model for how we can update the structure of Corps offices so we can make



Members of the U.S. Army Corps of Engineers Environmental Advisory Board prepare for a Feb. 15 public meeting. Topics covered included Sustainable Infrastructure for Military Customers, the partnership between the Corps and The Nature Conservancy and the Sustainable Rivers Project with special emphasis on the Alamo Dam-Bill Williams River partnership.

better use of our resources so we can be as successful as you are here in Arizona. I was delighted to meet with the EAB and hear how glad they were to have seen the projects here. The EAB members were over-the-moon in their praise of the Arizona team’s work and their support during the visit.”

Ternak said the visit was a complete success. He said the time the EAB members spent at the local projects indicates a high level of investment.

“It first shows they have an interest in our region and the ecosystem restoration projects here,” he said. “I’m glad we were able to show them how our unique issues and challenges and solutions we are providing here in our region. They operate at the highest levels of our organization, so a visit like this can help them get a better understanding when they brief Headquarters. It will better inform the recommendations they make to the Corps.”

Bostick’s plans to visit the Tres Rios Ecosystem Restoration Project were canceled, for now.

“I’ve got to find a way to come back here to see that project,” he said. “Each of the board members had a lot to say about it.”

Engineering With Nature

**By Burton Suedel,
Research Biologist**

*U.S. Army Engineer Research and
Development Center*

Engineering With Nature as a U.S. Army Corps of Engineers Civil Works initiative can create surprising outcomes when construction, operations or infrastructure repair projects can be modified for additional benefits.

For example, while repairing a Cleveland Harbor breakwater structure, the Buffalo District put EWN into practice with the placement of toe blocks designed with outer-face ridges which now serve as habitat for aquatic species.

Designed to be used in engineering an operating project's development, EWN seeks to support more sustainable practices, projects and outcomes.

"By taking this approach we can align natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaborative processes," said Senior Research Scientist Todd S. Bridges with the U.S. Army Engineer Research and Development Center.

"The USACE Civil Works Strategic Plan, along with other plans and directives, establishes the need for evolving our approach to engineering and operating infrastructure," Bridges said.

Advancing our practices will involve identifying the practical actions that can be taken to better align and integrate engineering and natural systems to produce more socially acceptable, economically viable and environmentally sustainable projects."

ERDC has held more than 10 workshops during the last three years with input from more than 200 participants throughout the Corps, other federal agencies, stakeholders and partners to define EWN opportunities.

Bridges cited several positive examples of what can be achieved through the application of EWN concepts and practices, including the St. Louis District's chevron shaped river training structures that enhance fisheries habitat in the Mississippi River; an offshore reef constructed of rock dredged from the Cape Fear River by the Wilmington District; use of sediment from a Jacksonville District navigation project to construct a near shore berm that nourishes a beach in Fort Myers, Fla.; and the modeling of fish behavior to inform the design of fish passage structures on a dam by Portland District, among many others.

Bridges and contributors from ERDC's Environmental Laboratory, Researchers Tom Fredette and Burton Suedel, identify essential ingredients of the EWN approach to mission execution as:

- Using science and engineering to produce operational efficiencies supporting sustainable delivery of project benefits.
- Using natural processes to maximum benefit, thereby reducing demands on limited resources, minimizing the environmental footprint of project and enhancing the quality of project benefits.
- Broadening and extending the base of benefits provided by projects to include substantiated economic, social and environmental benefits.
- Applying science-based collaborative processes to organize and focus interests, stakeholders and partners to reduce social friction, resistance and project delays while producing more broadly acceptable projects.

The researchers shared opportunities to pursue projects with these attributes within the Corps' mission, including strategic placement of sediments; use of natural features that reduce navigation channel infilling; enhancing the habitat value of



Chevrons like these in the Mississippi River, are a type of river training structure and an example of the Engineering With Nature concept. They are constructed parallel to the river's flow and use the energy of the river to redistribute flow and sediment. (Courtesy photo)

infrastructure; the use of wetlands and other features to enhance coastal protection and resilience.

Within the EWN initiative, current activities include developing a website dedicated to projects and activities, documenting projects that exemplify the approach in a geography-based mapper, targeting research and development to advance the practice, and communicating across the technical community with Corps partners and stakeholders.

Environmental Operating Principles

Not just Earth Day, every day

- **Foster sustainability as a way of life throughout the organization.**
- **Proactively consider environmental consequences of all Corps activities and act accordingly.**
- **Create mutually supporting economic and environmentally sustainable solutions.**
- **Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps, which may impact human and natural environments.**
- **Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.**
- **Leverage scientific, economic and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner.**
- **Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.**