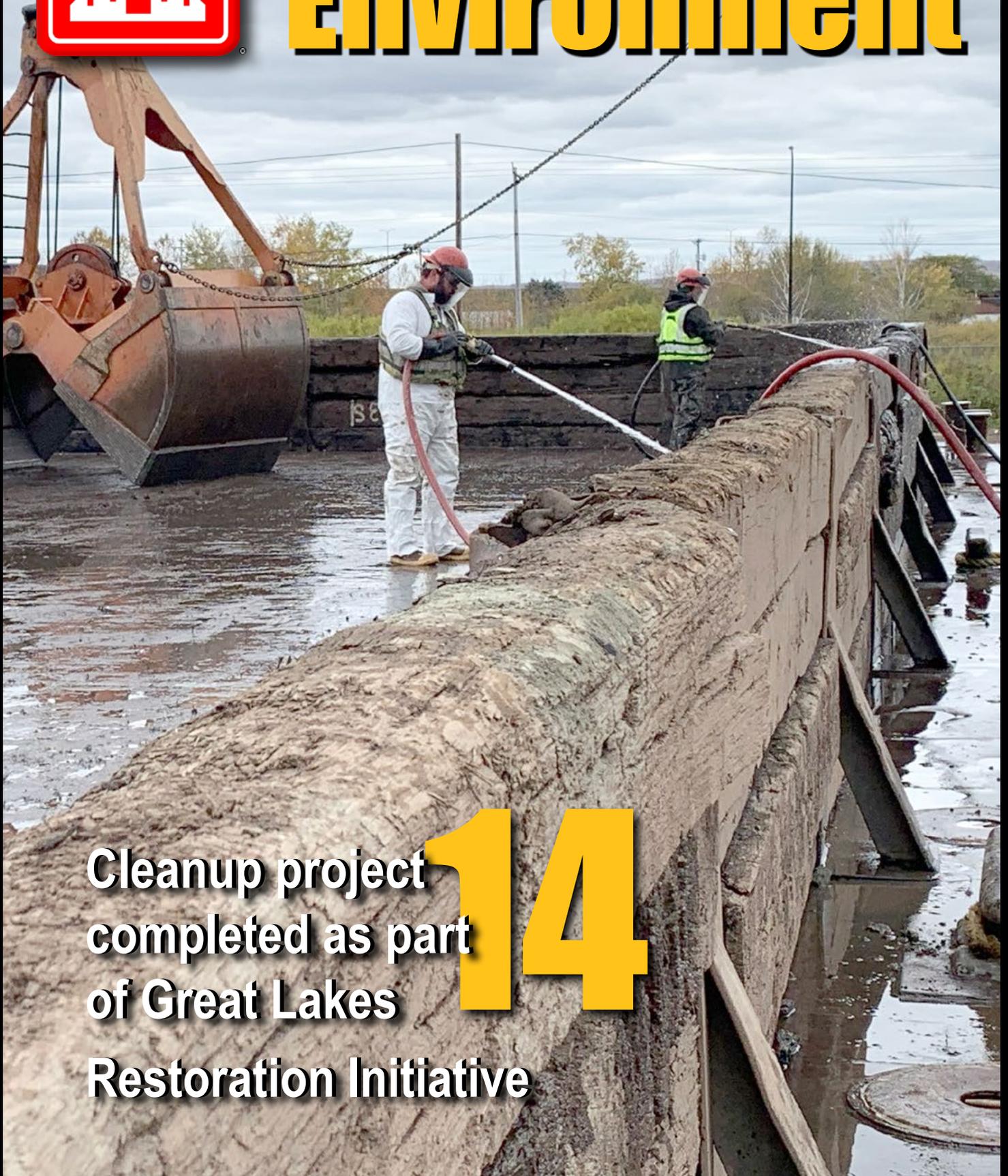




The Corps

Volume 22, Issue 1  
February 2021

# Environment



Cleanup project  
completed as part  
of Great Lakes  
Restoration Initiative

# 14

## Environmental Operating Principle #2

Proactively consider environmental consequences and act accordingly.



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*The Corps Environment's* editorial staff welcomes submissions with an environmental, sustainability or energy focus from USACE and Army units worldwide.

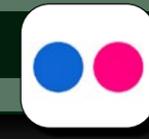
Send articles, photos, events, letters or questions to the editor, at [Corps-Environment-Magazine@usace.army.mil](mailto:Corps-Environment-Magazine@usace.army.mil).

Submission deadlines are indicated in red:

December 15      February  
March 15         May  
June 15           August  
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## Supporting sustainable, resilient water resources infrastructure through research and development

By Dr. Edmond J. Russo, Jr.  
Director, Environmental Laboratory  
U.S. Army Engineer Research and Development  
Center

The U.S. Army Corps of Engineers tackles multifaceted infrastructure challenges for the Army and the nation. Many of those challenges are associated with Civil Works projects across business lines that include navigation, flood risk management, ecosystem restoration, hydropower, recreation, water supply storage and emergency response.

As director of the U.S. Army Engineer Research and Development Center's Environmental Laboratory, I lead a team of research scientists, engineers, technicians and administrative staff who deliver technologically innovative science-based solutions supporting the USACE mission and operations.

Over the decades, from the perspective of serving in several different USACE district and R&D roles, I've witnessed how the practice of water resources management has evolved. Over this time, USACE has embraced the concept that water resources infrastructure is an integral part of the complex natural and socioeconomic systems in which it is embedded.

We take our operating definition of resilience from the USACE Resilience Initiative: "the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions." It follows that a sustainable system must demonstrate resilience to maintain expected conditions and provide associated performance functions through experiences of periodic disturbances over time.

Sustainability results from delivery of projects that meet environmental, social and economic goals through partnered investments over the long term, with a goal of ensuring that today's actions do not negatively impact future generations. If the effects of water resources project development on the social, economic and ecological considerations are not fully considered, the project may not be resilient and sustainable in the long term.

USACE proactively considers the environmental consequences of all activities —

including the potential to impact sustainability and resilience — consequently, USACE civil works has evolved from single-purpose projects in the 1900s to a systems approach that recognizes the need to address multiple objectives.

By looking beyond single-purpose projects, USACE embraced an integrated water resources management (IWRM) paradigm, which is a holistic approach that promotes the cohesive development and management of water, land and related resources with a view towards ensuring sustainability and resilience in regard to public health and safety, economic value, societal needs and environmental objectives.

IWRM is founded on stakeholder partnering and engagement and innovative financing mechanisms. It also uses a wider lens to draw together systems analysis and emerging technologies for watershed-scale planning and implementation. IWRM seeks a balance between performance efficiencies, resilience and sustainability, which involves exploring the trade-offs on incremental investments towards achieving project objectives and balancing the competing needs for water resources.

Practices such as strategic planning and adaptive management advance efforts to achieve IWRM sustainability and resilience. USACE strategic planning involves using science to understand future potential scenario combinations under which existing and future water infrastructure must perform to achieve intended objectives. USACE resilience practices facilitate recoverability of infrastructure following disruptions toward IWRM system sustainability. Applying these concepts synergistically informs planning and implementation decisions for IWRM systems that must continually rebound quickly and wisely after disturbances to achieve long-term performance.

While living on the Texas coast and serving as the deputy district engineer for Planning, Programs and Project Management for USACE Galveston District, I had the opportunity to implement IWRM at the regional level.



Dr. Edmond J. Russo, Jr.  
Director, Environmental  
Laboratory  
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Research and Development  
Center

See **ENVIROPOINTS**, page 5

One of our first priorities was to enhance strategic partnerships by aligning agency values with mutually desired outcomes, such as a vibrant regional and national economy; resilient and sustainable communities; and healthy, diverse and functional ecosystems.

Progress with partners and stakeholders was achieved through regular engagements that included multi-agency participation at the local, state and federal level, with interactive dialogue and working meetings that included non-governmental organizations, industry and academia. In this process, we collectively identified and resolved barriers to progress, through shared understanding and unity of purpose, with matured relationships toward managed expectations.

An important aspect of R&D supporting civil works partner and stakeholder engagement for successful delivery of sustainable and resilient water resources infrastructure is the use of strategic enablers, which include Regional Sediment Management, Engineering With Nature, Natural and Nature-Based

Features and the use of integrated systems as Multiple Lines of Defense.

RSM approaches sediment management from the perspective of whole watersheds and coastal basins — a systems approach to sediment management. It incorporates physical processes and effects of anthropogenic influences and supports stewardship of natural resources in balance with economic development and national security needs.

EWN is an approach that elevates the consideration and use of natural systems and processes where appropriate to produce operational efficiencies, broaden the range of benefits provided by projects and infrastructure, and foster collaboration across perspectives and organizations.

Natural and Nature-Based Features, a subset of the EWN practice, are landscape features that provide engineering functions relevant to flood risk management while producing additional economic, social and environmental benefits. Floodplains, beaches, dunes, forests and wetlands

are all examples of features that nature creates, but these can also be constructed as nature-based features through human engineering.

MLD is an example of an integrated systems approach that involves combining structural, non-structural and NNBF measures to reduce flood and storm damage risks, support social systems and ecosystems, and achieve sustainability and resilience.

On the Texas coast, this ultimately led to an interconnected portfolio of partnered projects that incorporated RSM, EWN, NNBF and MLD concepts and approaches to plan and manage USACE water infrastructure systems. These nested systems effectively interoperate regionally across civil works business lines to deliver a broad spectrum of enduring economic, environmental and social benefits.

I'm excited to share these successes with USACE, ERDC and the EL as we work across the enterprise to create increased value to the nation by delivering sustainable and resilient water resources infrastructure.

## Environmental Operating Principles

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

Learn more about the EOPs at:

[www.usace.army.mil/Environmental-Operating-Principles](http://www.usace.army.mil/Environmental-Operating-Principles)

# USACE project revitalizes economy of New Jersey's largest city

By JoAnne Castagna, Ed.D.  
USACE, New York District

For the first time in 100 years, the residents of Newark, New Jersey, have access to their Passaic River waterfront. This is due in large part to a construction project being performed by the U.S. Army Corps of Engineers, New York District, that's restoring the riverbank with a new bulkhead wall designed to prevent the shoreline from eroding.

"It's interesting that something as simple as a bulkhead can be the kickoff for a riverfront redevelopment project for the city of Newark, becoming a key feature in the revitalization of Newark's downtown," said Jason Shea, project manager, USACE, New York District.

For over a century, the banks of the Passaic River have been abandoned because the shoreline was eroding and the river was filled with trash and plagued with contamination from one of the state's largest toxic waste sites.

The community has been wanting a riverfront park to revitalize the waterfront area, and the work USACE is doing is laying the foundation for their plans.

USACE, in collaboration with the New Jersey Department of Environmental Protection and the city of Newark, is performing The Joseph G. Minish Passaic River Waterfront Park and Historic Area Project.

The project encompasses almost 2 miles and over 30 acres of land along the west bank of the Passaic River between Bridge and Brill streets in Newark, the largest city in the state.

USACE is overseeing the construction of 6,000 feet of new bulkhead along the river, which entails restoring 3,200 feet of riverbank, constructing a 9,200-foot waterfront walkway, and creating landscape using native plants. In addition, it's also establishing park facilities, plazas, walking and bike paths, playgrounds, baseball and soccer fields.

Shea said that revitalization work like this has proven successful in cities, such as San Antonio, Texas; Chicago, Illinois; and Portland, Oregon, just to name a few.

"The Newark waterfront is already starting to show redevelopments where work has been performed and also on the opposite side of the river in Harrison, New Jersey," Shea said. "These developments will have views of the waterfront park, rather than a rundown streambank with a dilapidated bulkhead, trapping trash and debris. It's a great example of how the benefits of this project are extending regionally, outside Newark city limits.

"The park brings a welcoming feel to the area, leading to investments in commercial and residential properties," he added. "It's been great to see this happening over the past two decades in Newark."

The project is expected to be completed in the fall of 2023.

## Career Program transformation to achieve total Army readiness

By Karla Langland  
USACE Headquarters

Greetings from CP-18!

You may have heard through the grapevine that there have been changes to the career program structure, but the good news is that there are no impacts on you, a Career Program 18 (CP-18) employee.

As part of the Civilian Implementation Plan to the Army People Strategy, one initiative was moving all career program staff to one new organization: the Army Civilian Career Management Activity, a subordinate organization to the Civilian Human Resources Agency.

ACCMA has been charged with transforming civilian career management operations to achieve total Army readiness; modernizing the Army's approach to civilian talent management; and delivering centralized program management to direct career fields' execution of enterprise talent management programs. That's a lot of words but

what does it mean for you, the CP-18 employee?

Currently, there are 32 career programs ranging from civilian human resources to cyber security. All Army civilian employees are assigned to one of the career programs based on the duties and responsibilities in the position description.

During this fiscal year, the Army will consolidate the 32 career programs into 11 career fields. There will still be career programs, but the idea is to provide synergy and opportunities for civilian employees in closely related career programs so similar career programs will be grouped into one of 11 career fields.

For example, one career field will be Security and Intelligence. The career programs assigned to the career field are CP-19 (Physical Security); CP-35 (Intelligence); and CP-60 (Foreign Affairs and Strategic Plans).

There are three career fields that will be 'stand-alone.' There will only be one career program in those career fields. One of those career fields is

CP-18. The others are Medical (CP-53) and Contracting (CP-14). That is why I mentioned earlier that there will be minimal changes for the CP-18 population.

For employees in one of the career programs that will be consolidated into a career field, these changes should be transparent to the employee and are designed ultimately to provide more training and developmental opportunities.

There is one significant change and that is how to contact us. Our email address will be changing. We will send an email to all CP-18 employees once this happens.

We look forward to continuing to serve you, the CP-18 employee, regardless of what command we, the CP-18 staff, are assigned to.

If you have any questions about this change or other training and development questions, please drop us a line at: [CP18ProponencyTeam@usace.army.mil](mailto:CP18ProponencyTeam@usace.army.mil).

# Sensor technology advances data collection capability for munitions response project

By Shatara Riis  
USACE, Louisville District

In determining the impact of the past use of this Formerly Used Defense Site as an artillery range, the U.S. Army Corps of Engineers, Louisville District's Camp Breckinridge Environmental Restoration team has turned to advanced technology.

The UltraTEM-IV is the next generation in geophysical classification technology that scans the ground from just feet away, while being towed over the surface.

According to USACE officials, this system covers a lot of ground and turns up greater results.

"It is a towed system, so production rates are much greater than other instruments," said Clayton Hayes, Louisville District project manager. "Additionally, it has the capability to perform 'one pass classification,' which allows us to classify subsurface objects as potential UXO (unexploded ordnance) or just clutter as they are detected. This greatly increases the quality and speed of data collection."

According to Hayes, this new technology is just the latest of several industry standard sensors used at the

Camp Breckinridge Military Munitions Response Program Project 06.

"The UltraTEM is considered the most technologically advanced system in performing this particular type of geophysical survey work," Hayes said.

This technology was employed after other metal mapping machines covered the same ground.

"There are many types of equipment used in geophysical surveys, each with its own purpose and specialties," Hayes said. "They each have their limitations. This system is more powerful and it's faster."

Nick Stolte, project engineer/contracting officer's representative, adds that with the UltraTEM, equipment availability is limited and cannot be easily used in densely vegetated areas or on rough or steep terrain.

However, he added, "Camp Breckinridge is primarily agricultural fields, which is near perfect for the UltraTEM."

The UltraTEM is meant to supplement the characterization data collected during the initial remedial investigation fieldwork conducted last year, and will more accurately predict anomaly density in high-use areas.

According to Stolte, earlier data identified areas where munitions were

located on the surface and in the subsurface. Numerous fragments created a saturated response area resulting in individual anomalies not being distinguished due to the extremely high density.

The UltraTEM should provide the resolution needed to more accurately predict the anomalies, Stolte said.

"It is important to understand anomaly density, so we can develop remedial alternatives that will be successful in addressing risk and estimating costs," Stolte said. "Anomaly density is the primary cost-driver for remedial actions. More accurate prediction of the density is a critical component for cost estimating, planning, programming and budgeting for the future remedial action."

Located in western Kentucky, 30 miles southwest of Evansville, Indiana, Camp Breckinridge was once used for infantry housing, combat training and medical care.

In the past, it served as a prisoner of war camp and for troop training related to a peacetime draft and the Korean War, followed by annual field training support for summer National Guard troops, Reserve Soldiers and special field training for Army units.



U.S. Army Corps of Engineers, Louisville District's Camp Breckinridge Environmental Restoration team uses the UltraTEM-IV technology to conduct a geophysical survey at Camp Breckinridge Military Munitions Response Program Project 06. (Courtesy photo)

# Environmental Support Team Spotlight: Brian Wilson

By Jenn Miller  
USACE, Headquarters

Brian Wilson, environmental program manager with the U.S. Army Corps of Engineers, Seattle District, is currently supporting Task Force Essayons as part of USACE's Environmental Support Team.

Provided below is insight into what it is like to serve on this expeditionary team of environmental engineers and specialists, providing support to the combatant command and its components during war, contingency operations, and disaster relief operations.

## What is your current position?

I'm currently serving as the chief of Environmental Management, deployed with Task Force Essayons ISO Combined Joint Task Force - Operation Inherent Resolve and Operation Spartan Shield.

The primary goal of Task Force Essayons Environmental Branch is to protect the health and safety of the warfighter and the environment to the greatest extent practicable. We provide technical expertise, recommending best management practices and advice regarding environmental issues. Our areas of expertise include conducting environmental baseline surveys, environmental condition reports and environmental site closure surveys.

## What made you join the team?

I've been an EnvST team member for about two years. I first heard about EnvST during my deployment in 2017 to Puerto Rico in support of Hurricane Maria. One of my coworkers asked if I was a member. I wanted to be part of the bigger mission within USACE, learn new skills, and expand my capabilities for theaterwide deployment opportunities.

## How did the pre-deployment process work?

You're assigned to an Administrative Personnel Processing Office with the USACE Transatlantic Division who guides you through the process and requirements. The process takes a few months to complete, but already being an EnvST member, I had several of the required boxes checked.

For my current deployment, the pre-deployment process was a little challenging due to COVID-19 restrictions, with limited access to health care facilities for



(Courtesy photo)

*Brian Wilson, who has been with USACE for nearly 13 years, is currently supporting Task Force Essayons as part of EnvST.*

the required physical, but the training requirements were easily completed via online courses.

## What are the deployment benefits?

Aside from the typical deployment benefits, I've been afforded the opportunity to live off-post; facilitating experiencing the local culture, cuisine and sights during my off-time. As for monetary benefits, I receive normal 10% post differential pay incentive at my duty station. Additionally, if I travel to certain locations, I also receive 35% danger pay incentive.

## What opportunities has EnvST provided?

To date, EnvST has provided me the opportunity to serve a six-month detail assignment at HQUSACE as an environmental program manager, providing environmental support for southern border barrier construction activities, as well as becoming an accredited Forward Engineer Support Team-EnvST instructor/facilitator. It's also facilitated my engagement with other environmental professionals across the enterprise to learn from, teach

and train alongside new and upcoming environmental subject matter experts.

## What's your most memorable EnvST experience?

So far, my most memorable experience has been traveling throughout the Middle East, honing new skills for executing the environmental program in support of the warfighter, but also getting to experience the local cultures and making new friends.

## What key skills have you learned?

Key skills I've learned include working alongside host nation professionals and contractors, overcoming language barriers and developing courses of action for execution based on different rules and regulations. I've also learned how to successfully manage time and programs across multiple country boundaries, and providing direct SME (subject matter expert) support for various commands.

## What are the COVID-19 safety measures?

Additional safety measures include wearing face coverings when in close proximity to others, regularly assessing personal health conditions, exercising, appropriate restriction of movement when traveling between countries, all while being flexible and adaptable to changing conditions.

Although we're deployed for the purpose of providing in-theater/boots-on-the-ground capabilities, we're also exercising video teleconferencing and limiting large meetings whenever possible. Leadership continuously evaluates current conditions, COVID-19 exposures, and adjusts quickly to the needs of our warfighters.

## What would you say to teammates on the fence about joining EnvST?

I would say for every day they remain on the fence is another day of missed opportunities to serve alongside some of the most professional, fun and outstanding individuals I've had the pleasure of serving with. Being part of the EnvST family has afforded me some of the most rewarding experiences, and a great career opportunity to expand my skills and extend my capabilities beyond what I thought possible.

For information on EnvST, visit:

<https://www.usace.army.mil/Missions/Environmental/Environmental-Support-Team/>.

# Indian River Lagoon-South restoration project on track for June 2021

By Maya Jordan  
USACE, Jacksonville District

Construction of the U.S. Army Corps of Engineers, Jacksonville District's multi-billion-dollar Indian River Lagoon-South C-44 component is due for completion June 2021.

Team members and visitors met with Jacksonville District's West Palm Beach resident engineer, Stephen Montjoy, for a worksite visit.

Initially awarded in September 2015, the reservoir project with pump station, stormwater treatment area (STA), intake canal and reservoir, considered the whole C-44 project, is more than 86% complete.

The lead general contractor for the project is Barnard Construction Inc. headquartered in Bozeman, Montana. The reservoir is nestled in Martin County, Florida.

"The purpose of the project is to run some of the runoff

from the Indian River Lagoon South drainage basin through a stormwater treatment area to treat the water. This will reduce nitrogen and phosphorous and other compounds in the runoff water," said Montjoy.

The water will be distributed into the C-44 Canal which flows out into the estuaries located in the city of Stuart. Project components consist of an intake canal, reservoir, pump station, system discharge canal and the stormwater treatment area.

The reservoir will enable the storage of water and the pump station will pump the water from the intake canal into the reservoir. The system discharge canal will enable basin runoff treated within the STA to discharge into the C-44 Canal and flow into the St. Lucie Estuary.

As a result, freshwater will flow into the C-44 Canal and the St. Lucie Estuary. The intake canal will convey basin runoff into the reservoir's pump station.

The reservoir is needed because of south Florida's

tropical climate.

"We have a lot of rain in the summer and not enough rain in the winter. We need to have a consistent flow through the stormwater treatment area in order to maintain the appropriate level of vegetation that will treat the water," said Montjoy. "The reservoir acts as a storage area for millions of gallons of water that will ultimately flow through the stormwater treatment area."

"The reservoir acts as a storage area for millions of gallons of water that will ultimately flow through the stormwater treatment area," Montjoy said.

The C-44 Reservoir and Stormwater Treatment Area project is the first component of the Indian River Lagoon-South project, making it one of the largest first generation projects as part of the Comprehensive Everglades Restoration Plan.

The reservoir is the largest water storage component of the C-44 project.

The reservoir covers an area of 3,400 acres with a dam height of approximately 30 feet above natural grade, which allows a pool depth of approximately 15 feet. The reservoir will provide 50,600 acre-feet (16.5 billion gallons) of water storage. The reservoir's area takes up the equivalent space of four of New York City's Central Parks. The storage amount equals approximately 18 Superdome stadiums.

Collaboratively, USACE and the non-federal partner, the South Florida Water Management District, are looking to restore and revitalize the natural habitat of the area by capturing, storing, and treating local runoff from the adjacent basin.

"This is the first U.S. Army Corps of Engineers-built reservoir that feeds into a stormwater treatment area," Montjoy said.



(Photo by Maya Jordan)

USACE, Jacksonville District engineers review the construction worksite of the Indian River Lagoon-South C-44 Reservoir. The project is on track for completion this summer.

# ERDC researchers develop tools to address compounding threats

By Drs. Krista Rand & Igor Linkov  
U.S. Army Engineer Research and Development Center

It never rains, but it pours: the 2011 earthquake, tsunami and the Fukushima nuclear disaster; Hurricane Harvey and the Arkema plant chemical fire; COVID-19, record-setting unemployment and the Atlantic hurricane season. These are all compounding threats, or situations, where two or more major disturbances occur simultaneously.

This year, U.S. Army Engineer Research and Development Center researcher Jeffrey Cegan and postdoctoral researcher Dr. Matthew Joyner worked with the Federal Emergency Management Agency's Data Analytics Section, Region I, to determine how congregate shelter should be managed during a pandemic when demand for public shelter is likely to be high due to a high unemployment rate. The team combined existing models from the National Hurricane Program with pandemic safety precautions to create the Hurricane Evacuation Support Tool for COVID-19 Management in Region 1, or the R1 Evacuation Tool, for the answers.

Compounding threats can grow out of a variety of circumstances.

In the case of COVID-19 and the hurricane season, unrelated, independent, events occurred at the same time and place. Another possible scenario is that a major event triggers subsequent events: oceanic or coastal earthquakes lead to tsunamis that then inundate and disable nuclear power plants. This latter category is an example

of a cascading failure, a series of problems that propagate in space and time due to physical linkages between the events.

A third possibility is when a major event can be perceived as an exploitation opportunity by an adversary. The ransomware attacks affecting overwhelmed hospitals during COVID-19 is an example of this particular phenomena.

Different compounding threats call for different measures. In the case of this year's hurricane season, the R1 Evacuation Tool team's rapid development process produced estimates of evacuation participation rates, shelter demand, critical facility locations and evacuation zones during a hurricane. Shelter analyses for each state included estimates of the number of people seeking public shelter within each evacuation zone and analyses of socioeconomic vulnerability, disability and behavioral patterns. Other outputs included the staff and personal protective equipment needed per day in shelters before and after a storm, and daily food and beverage requirements.

Adjusting existing models and developing new models to handle compounding threats is a recent innovation. The U.S. is an international leader in disaster response and recovery, but current practice focused on responding to a single disaster of limited duration, such as a single hurricane.

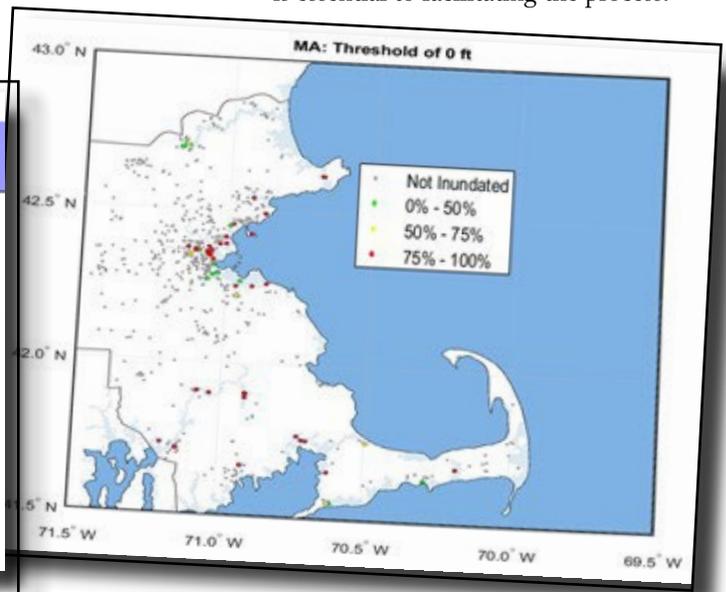
The past decade has been an eye-opening illustration of how disasters and other disruptions can interact. Drs. Igor Linkov and Brandon Boyd, with support from postdoctoral

fellow Dr. Krista Rand, are leading a large project funded by ERDC's Future Innovation Fund to develop fundamental models for compounding threats that would be applicable to both military and civilian settings. Modern military and civilian systems are composed of interacting networks. Enhancing resilience of interconnected networks in response to multiple threats is a common goal for managing a wide range of compounding threats in multiple systems.

Effective and carefully calibrated compounding threat models help reduce the number of preventable deaths, illnesses and other adverse outcomes that can result from a lack of a coordinated response and the ensuing protracted recovery. However, it is difficult to predict when compounding threats will occur; consequently, it is also difficult to predict what types of models will be necessary to support decision makers. A nimble response team will be required to overcome these threats, since frequently compounding threat models will need to be developed to prevent future crises.

The COVID-19 response and recovery experience in FEMA Region 1 offered two crucial lessons for those countering compounding threats from a research perspective. Efforts of this type require considerable coordination between experts in different fields, and good data housekeeping — ensuring data is in a consistent and machine-readable format — is essential to facilitating the process.

Inundated Facilities		
Prob. of Exc. (%)	Facility Type	Facility Name
74	Hospital	Mount Auburn Hospital
74	Hospital	Lawrence General Hospital
79	Hospital	Boston Med Ctr - East Newton Campus
80	Hospital	Boston Med Ctr - Harrison Ave. Campus
100	Hospital	Somerville Hospital
100	Hospital	Tobey Hospital
100	Hospital	Addison Gilbert Hospital
100	Hospital	Mass. Eye & Ear Infirmary
100	Hospital	Mass. General Hospital
100	Hospital	Cambridge Hospital
100	Hospital	Tufts Medical Center



(Illustrations by Dr. Matt Joyner, ERDC)

In response to 2020's disasters, U.S. Army Engineer Research and Development Center researchers developed the Hurricane Evacuation Support Tool for COVID-19 Management in Region 1 in partnership with the FEMA Data Analytics Section. The figures illustrate the probability that a given facility in FEMA's Region 1 will experience inundation greater than the threshold indicated in the plot line — in this case, 0 feet.

# Viewer targets content to address local, regional ecological priorities

**D**ue to the vast footprint of U.S. Army Corps of Engineers projects and the fact that conservation priorities under the purview of its environmental stewardship mission extend beyond the bounds of any single project, the agency's environmental stewardship mission is a vital component in fish and wildlife habitat management networks nationwide.

In order to proactively and effectively address environmental challenges spanning such large geographical extents, organizations like USACE must utilize cohesive management strategies. When the right tools for filtering multitudinous data and information are made accessible at the program level, individual projects become empowered to aid in the advancement of larger conservation goals.

The intent of the USACE Natural Resources Management Program's National Initiatives Viewer is to provide staff with this capability by delivering targeted content based on location, which has relevancy at multiple administrative levels.

The National Initiatives Viewer is an enterprise-level website co-developed by USACE's Institute of Water Resources and the Spatial Data Branch of the USACE, Mobile District's Operations Division. The website is built on the Qlik Sense self-service business intelligence and visual analytics platform.

Qlik Sense tools facilitate integration of multiple data sources, allowing users to create visual representations of data that may otherwise normally be accessed via text-based reports or spreadsheets organized with limited or restrictive formats — with the ultimate goal of delivering the data required to make better business decisions.

In its inaugural version, the National

Initiatives Viewer presents information on the spatial relationships between USACE projects and three specific conservation components: the National Fish Habitat Partnership, the whooping crane migration corridor, and monarch butterfly habitat along the I-35 migration range.

Many USACE lake and river projects have partnered with local organizations or rely on multi-state efforts to address local and regional ecological priorities, particularly for aquatic ecosystems.

## Supporting Facts:

*The mission of USACE's Environmental Stewardship Program is to manage, conserve and protect the natural and cultural resources at USACE-operated projects.*

*USACE is responsible for the stewardship of approximately 12 million acres, located throughout all corners of the United States, which are home to more than 500 species of concern and over 390,000 acres of environmentally sensitive areas.*

The National Fish Habitat Partnership's mission is to protect, restore, and enhance the nation's fish and aquatic communities through partnerships that foster fish habitat conservation. This viewer module presents information regarding the spatial relationship between National Fish Habitat Partnership regions and USACE divisions, districts and projects. The spatial overlap between USACE projects and HUC12 areas is also exhibited as well as information about anthropogenic impacts at the regional and local level, all with the specific intent of aiding in coordination that may benefit future partnership opportunities.

Twice a year, whooping cranes, which have been listed as an endangered species by the

U.S. Fish and Wildlife Service since 1967, migrate 2,500 miles between their Canadian nesting grounds and their winter habitat on the Texas coast. During their journey, they must locate stopover sites to rest — typically lakes, natural wetlands and small ponds.

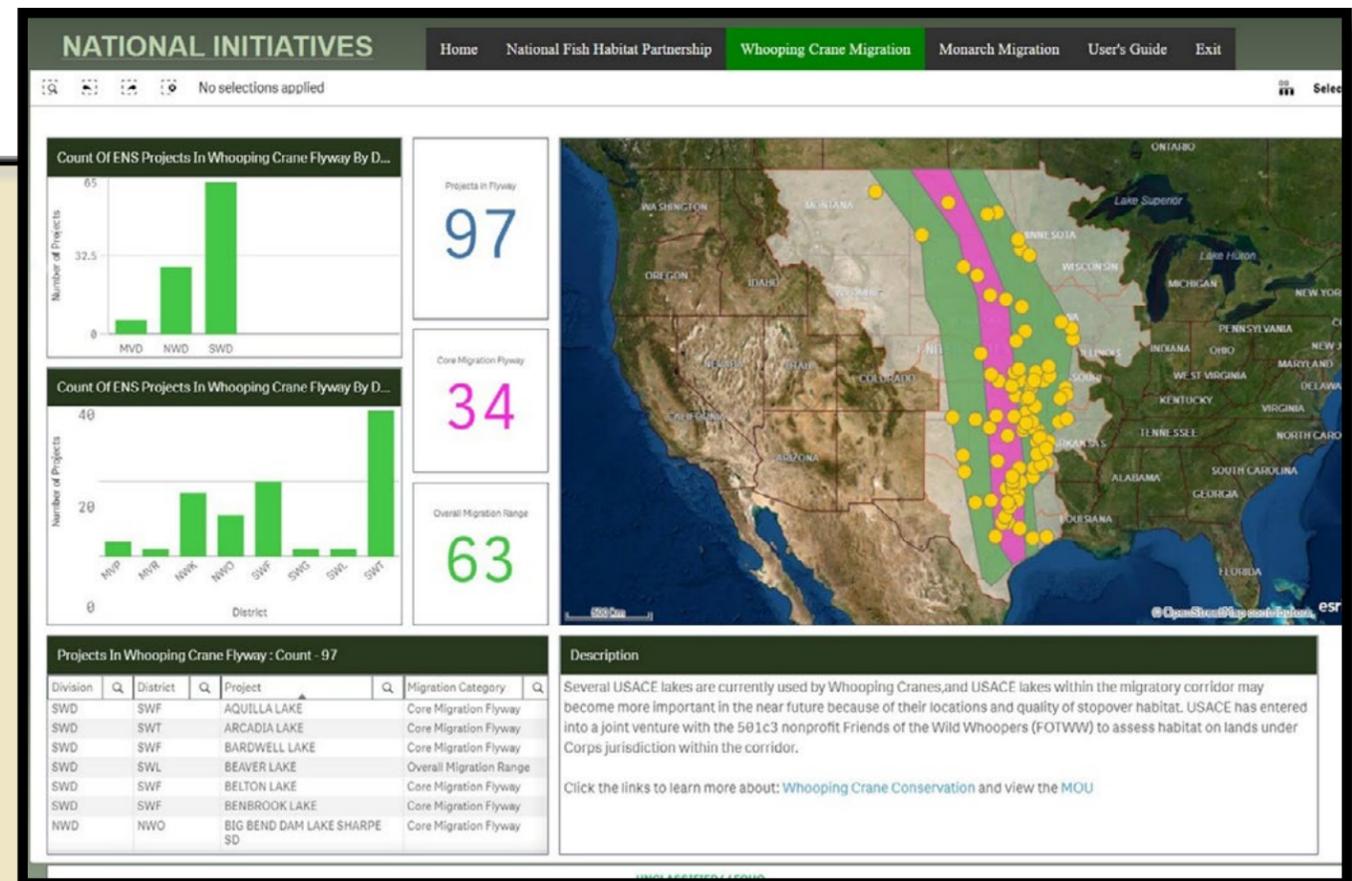
Since USACE owns a significant amount of potential stopover habitat along the migration corridor, it recently entered into a joint venture with the 501c3 non-profit Friends of the Wild Whoopers to assess the quality of that habitat.

The Viewer's Whooping Crane Migration module displays the total number of USACE Environmental Stewardship projects within the Whooping Crane Flyway and may be filtered and queried by USACE division, district, project and migration category. It also serves as a central location for accessing Friends of the Wild Whoopers habitat assessment reports with the intent of facilitating improved information sharing among locations that play a key role in this large-scale conservation priority.

The I-35 corridor, which runs north-south between Laredo, Texas, and Duluth, Minnesota, is important to many pollinator species, especially the monarch butterfly. This monarch highway is a multi-state partnership that aims to promote pollinator awareness with an emphasis on monarchs and to assist states' efforts to enhance vegetation management practices.

The viewer module, which displays the total list and locations of USACE environmental stewardship projects within the I-35 corridor, may be filtered or queried at the USACE division, district and project level.

The National Initiatives Viewer takes advantage of the powerful features of the Qlik Sense data analytics platform, which has been



## The Whooping Crane Migration module of the NRM National Initiatives Viewer.

formally adopted by USACE as a tool for project and program management.

Qlik Sense combines an associative analytics engine and in-memory data storage with sophisticated artificial intelligence and a straightforward yet robust customizable user dashboard. The associative analytics engine allows users to explore and create visualizations based on data from multiple data sources simultaneously while the columnar in-memory data storage ensures that unique entries are stored only once with relationships among data elements represented as pointers. This provides significant data compression which, in turn, delivers faster response times for users. Artificial intelligence allows users to search and explore across the data in any direction using simple, natural, interactive selections rather than pre-defined queries. It provides powerful on-the-fly data calculation and aggregation in the user dashboard.

Access to the insights generated by the National Initiatives Viewer is intended to improve communication within USACE and to facilitate a better understanding of how stewardship at USACE projects impacts

landscape-scale conservation issues without requiring specialized knowledge of geographic information systems and spatial analytical methods.

In addition to providing capabilities to the natural resource managers at the project level, the tool will support USACE's ability to influence regional goals and initiatives as well as to direct work toward targeted species, habitat type and geographic region. Additional Viewer modules are currently under development.

The CAC-enabled National Initiatives Viewer can be accessed on the Natural Resource Management Gateway's Environmental Stewardship page or by going directly to [https://qlik-dvs.usace.army.mil/extensions/Natural\\_Resource\\_Management\\_Suite/index.html](https://qlik-dvs.usace.army.mil/extensions/Natural_Resource_Management_Suite/index.html).

A link to the User's Guide, which introduces and explains how to use the National Initiatives Viewer, is available within the application.

*Contributing writers include: Ben Silvernail, Institute for Water Resources; Tara Whitsel, ERDC-Environmental Laboratory; Teresa Parks, Mobile District; Zachary Travis, Mobile District; and Ashleigh Boss, ORISE Fellow.*



(Photo by Emily Schaefer)

Workers decontaminate the barge used to dewater contaminated sediments dredged out of the AZCON Slip in Duluth, Minnesota.

# Cleanup project completed as part of Great Lakes Restoration Initiative

**By Emily Schaefer**

USACE, Detroit District

**Denise Fortin**

Environmental Protection Agency

**Lucie Amundson**

Minnesota Pollution Control Agency

The St. Louis River Area of Concern is one step closer to delisting, following completion of a contaminated sediment cleanup project at AZCON/Duluth Seaway Port Authority's Slip, Nov. 12.

The Great Lakes Restoration Initiative and Minnesota Pollution Control Agency-funded project removed 850 cubic yards of contaminated sediment and capped an additional 55,000 cubic yards using a cap comprised of clean dredged material from the federal navigation channel and armoring stone to protect it from erosion.

"By beneficially reusing the dredged material from the navigation channel, the team was able to achieve remedial objectives, limit waste generation and decrease the environmental impact," said Amanda Meyer, project manager, U.S. Army Corps of Engineers, Detroit District.

USACE awarded the contract and oversaw project dredging and construction on behalf of the Environmental Protection Agency. The contract was awarded to the Roen Salvage Company from Sturgeon Bay, Wisconsin, for nearly \$1.2 million.

The total project cost was \$2 million.

Three additional slip sediment remediation projects, Minnesota Slip, Slip 3 and Slip C were completed in the Port of Duluth-Superior within the St. Louis River AOC in 2018.

"This cleanup is an important step toward removing the St. Louis River AOC from the list of the most polluted places around the Great Lakes," said Kurt Thiede, EPA Region 5 administrator and Great Lakes national program manager. "EPA is excited to continue its collaboration with our federal, state, tribal, local and non-governmental partners as we celebrate another milestone in restoring the river."

There are many partners involved in the St. Louis River AOC including EPA, USACE, National Oceanic and Atmospheric Administration, U.S. Fish and Wildlife Service, U.S. Geological Survey, Fond du Lac Band of Lake Superior Chippewa, MPCA, Minnesota Department of Natural Resources, Minnesota Sea Grant, Wisconsin Department of Natural Resources, St. Louis River Alliance, and the cities of Duluth, Minnesota, and Superior, Wisconsin.

"The partnership between USACE, EPA and MPCA once again made for another important sediment remediation project," said LaRae Lehto, Contaminated Sediment Program coordinator, MPCA.

"We also greatly appreciate the cooperation of the Duluth Seaway Port Authority and AZCON Metals. This puts us one step closer to restoring the St. Louis River."

The St. Louis River AOC is one of the 31 U.S.-based AOCs across the Great Lakes created under the 1987 Great Lakes Water Quality Agreement. The watershed drains 3,634 square miles and encompasses a 1,020 square-mile-area. The St. Louis River is the second largest U.S.-based AOC.

The GLRI accelerates efforts to protect and restore the largest system of fresh surface water in the world — the Great Lakes. The project was conducted under the GLRI's sediment cleanup program, the Great Lakes Legacy Act.

Before modern pollution laws, historical industrial river use resulted in sediments contaminated with mercury, heavy metals, dioxins, polychlorinated biphenyls, or PCBs, and other toxins.

Several other remedial projects located in Minnesota are anticipated to begin in the next couple years. They include: Ponds behind Erie Pier, Scanlon Reservoir, Munger Landing, and Thomson Reservoir.

USACE is currently overseeing another GLRI project that is removing more than 130,000 cubic yards of material, including contaminated sediment and debris, from Howards Bay in Superior, Wisconsin, and is slated for completion by November 2021.

# USACE, Minnesota Department of Natural Resources fish for data

Story & photo by  
Melanie Peterson  
USACE, St. Paul District

**T**he U.S. Army Corps of Engineers, St. Paul District, in agreement with the Minnesota Department of Natural Resources, or MNDNR, is studying fish movement in and around the Big Sandy Lake watershed, as well as impacts on the aquatic community from operation of Sandy Lake Dam, near McGregor, Minnesota.

Walleye are currently being tagged, but additional species such as northern pike and tulibee may be included in the future. Fisheries biologists from the MNDNR use a technique called electrofishing to stun fish so they can capture and surgically insert a transmitter into the fish. Receivers are placed in and around Big Sandy Lake to detect and record data.

This tracking data will assist in estimating escapement rates through Sandy Lake Dam, movement upstream into tributaries, mortality rates and angler harvest rates. The data may inform future harvest regulations, dam management practices and the possibility of a fish passage.

“This study will allow us to better understand how fish live and move within the Big Sandy Lake watershed. By better understanding these vital resources, we can better protect and ensure a stronger future for them,” said Sam Smith, project manager. “This study utilizes a Corps of Engineers program to take advantage of MNDNR expertise and accomplish a shared objective.”

USACE and MNDNR signed a 50/50 cost-share study within the Planning Assistance to States program in January 2020. Under its Planning Assistance to States and Tribes Program, USACE is authorized to use its technical expertise in water and related land resource management to help states, federally recognized tribes and other eligible units of government with their water resource problems.



Minnesota Department of Natural Resources staff member inserts a transmitter into a fish at Big Sandy Lake, near McGregor, Minnesota, October 8.

# Synchronizing efforts to sustain ecosystems

By Brigida Sanchez  
USACE, Jacksonville District

**T**iny emerald bacteria sparkle in the vast expanse of the lake; the beauty of dispersed micro algae left me in wonder. Little specs were swirling along the currents like synchronized dancers suspended in perfect conditions for them to slowly multiply and take over the freshwater expanse of the lake and slowly suffocate the native ecosystem.

We spend the morning searching for algal blooms that were swept away by wind and current. The boat stops in what seems to be the center of Florida's Lake Okeechobee, to gather samples of the drifting harmful algal blooms.

The members of the U.S. Army Corps of Engineers Operational Water Research Team wore N-95 masks and latex gloves, and had a massive case of equipment to collect water samples in various locations on the 730 square miles of the lake. The harmful algal blooms (HABs) team needs as many specimens as possible to determine the type of bloom and how they can find a way to intercept, treat, and transform the algae as part of their research demonstration study.

The blooms found on the lake can sometimes produce toxins, but they can also have other impacts. Harmful algal blooms are essentially overgrowths of naturally occurring algae, a part of the natural cycle for nutrient transport in the environment. When there are excessive nutrients coupled with environmental

conditions that favor algae growth, algal blooms become the primary driver in the water body degradation. A process called eutrophication decreases oxygen levels and generates foul odors.

Nutrient pollution and harmful algal blooms cost the nation an estimated one billion dollars each year. The Florida Department of Health estimates the economic impact of HABs being \$22 million lost annually (including medical expenses and lost wages).

In 2019, Florida alone spent \$17.3 million of the \$19 million budget allocated to research and response to HABs.

According to the Florida Department of Environmental Protection's Algal Bloom Sampling Status Dashboard, within the past 30 days there have been 114 observations of various types of HABs in the state.

Dr. Martin Page commented on the widespread nature of the HAB threat. He is the research team lead at the Construction Engineering Research Laboratory of the U.S. Army Engineer Research and Development Center, in Champaign, Illinois.

"Cyanobacteria and harmful algal blooms are one of the greatest environmental challenges that our country is facing," he said. "They have both environmental and economic impacts on the communities where they are happening."

Page brought his team down to Lake Okeechobee to set up for the 2020 demonstration of the Harmful Algal Bloom Interception, Treatment, and Transformation System.

In case you missed HABILATS in 2019, let me

explain. HABILATS is a new HAB mitigation process in which the HABs are intercepted, treated and then transformed into usable products. It is designed to take algae out of the water and to turn it into useful resources like biofuel.

The team is currently improving fuel yields by incorporating new, environmentally friendly organic chemicals in the treatment process and increasing the system's scalability and deployability.

The team considered many factors when planning for the Florida technology demonstration study.

Weather always plays a role in the field, so they were prepared for everything, including hurricanes. What they could have never expected was a global pandemic. The COVID-19 pandemic was one of the many challenges that the mostly out-of-state team would have to overcome.

Nonetheless, they persisted. They adapted the study to accommodate travel restrictions for some team members. They were able to mobilize most of the team to Port Mayaca Spillway on Lake Okeechobee in July when blooms tend to be present at the lake.

However, windy conditions had dispersed the algae away from Lake Okeechobee's permitted test site, making demonstration testing infeasible. In response, the HABILATS team moved quickly, re-mobilized and worked closely with the USACE, Jacksonville District and their state partners to find a new location in Florida to relocate and pilot the demonstration. They were able to conduct their studies at Saddle Creek in Polk County, about three hours drive from the original demonstration site.

"Algae is a moving target. It is a challenge because a lot of planning goes into these projects, and the technology is always advancing, so we are constantly learning and adjusting," Page said. "We worked very closely with the Florida Department of Environmental Protection Agency to make sure we are safely conducting our work."

Driving north to the new demonstration site at Saddle Creek, I noticed that HABs overcame some small lakes around housing developments. I stopped to capture photos of these sites and the new demonstration site, and this time there was nothing remotely mystical to what I witnessed; a toxic green stagnant blanket covered the small body of water. I was left feeling overwhelmed, standing there with my camera in hand. The urgency of the team finding a way to solve the problem was before me.

There are three parts to the HABILATS approach: interception, treatment and transformation.

Interception is where the team focuses on getting algal blooms out of the water efficiently, using as little energy as possible.

When it comes to treatment, the team pushes the water through treatment systems at high processing rates while conserving as much energy as possible. The algae and the water are separated into a concentrated, almost paste-like form.

The concentrated algal blooms pose a challenge as they become biomass that is considered waste that potentially is toxic depending on the algae. The team needs to convert this potentially hazardous biomass into a safe and sustainable product, leading us to the

next step — transformation.

This year the team is studying the hydrothermal liquefaction process at the pilot scale. They are harvesting thousands of gallons of algae slurry paste, concentrating it further into bio-crude fuel using the hydrothermal liquefaction process. Once optimized, the process can be net energy positive, and the biocrude can be upgraded for various uses.

"This work is very challenging, and it is a dynamic system. We don't have control all the time about what the environment is going to do," Page added. "It presents problems in terms of project execution, but technically, we are focused on putting the puzzle pieces of the HABILATS process together and optimizing our efficacy."

The HABILATS team does not work alone, it is a collective force of scientists, engineers, outreach coordinators, governments, not-for-profits, contractors and local businesses. In much the same way that the tiny algae particles dance and grow into a large-scale threat to our environment, the HABILATS collaborators are a collective of synchronized strength that developed their own dance to help clean our water and provide a safe, healthy environment that sustains our ecosystems and allows us to enjoy the beauty of our outdoors.

The USACE Operation Research teams' priority is to clean the water and discharge it back into the environment. The process is challenging, but the need to quickly find an ecologically sustainable solution propels the mission and the team forward to find solutions for our nation's water systems.

# USAG Bavaria garners Secretary of the Army award for energy, water management

By **Andreas Kreuzer**

U.S. Army Garrison – Bavaria, Germany

U.S. Army Garrison - Bavaria in Grafenwoehr, Germany, was presented the 2020 Secretary of the Army Energy and Water Management Award via a Microsoft TEAMS ceremony on Oct. 21, 2020. The award recognizes smart ways to manage electricity and heating systems, as the team saved \$1.28 million this past year.

Paul Hlawatsch, energy manager for USAG Bavaria; Michael Schlosser, chief of operations and maintenance for the Directorate of Public Works; Bernhard Weber, deputy director of public works, Hohenfels, Germany; and Dieter Wittmann, project manager with the U.S. Army Corps of Engineers, Europe District, worked together to create a smart

system combining two heat and power plants.

“It’s not just about the money we save,” Hlawatsch said. “Energy conversation is vital to the environment. [It’s] very fundamental to stop climate change and to the legacy of how we leave the planet for our children and our future.”

This \$8.5 million upgrade saves \$1.28 million annually, as well as 2,640 metric tons of greenhouse gas emissions. It’s a win-win situation in saving money and the environment. The cogeneration system produces both energy and heat, and it adjusts the performance to the need of consumer demands.

According to the team, thermal heat is fed into the local heating network. Then the system uses the principle of combined heat and power generation. A combustion

engine is used to run the system. Using this energy, a utilization rate of up to 90% can be reached to produce electricity and heat.

“This is the second time we won the prize,” Hlawatsch said. “In 2015, we won the same prize with a central building control systems using different metrics, like holidays or low fluctuation in buildings, to reduce energy consumption.”

“The Corps is always exploring new techniques and technology to promote energy efficiency,” said Col. Patrick Dagon, commander of the USACE, Europe District. “The nominees’ efforts contributed to smarter energy operations that not only save taxpayer dollars, but enable warfighting readiness on installations where our Soldiers, civilians and family members live, train and work.”



*(USAG Bavaria Directorate of Public Works)*

*USAG Bavaria’s combined heat and power system received the 2020 Secretary of the Army Energy and Water Management Award.*



## Yuma Proving Ground strives to protect multiple major cultural sites

**Story & photo by Mark Schauer**  
U.S. Army Garrison, Yuma Proving Ground

As a military installation, U.S. Army Yuma Proving Ground has a proud history dating back nearly 80 years.

Part of Gen. George S. Patton's Desert Training Center/California-Arizona Maneuver Area during World War II, 20 divisions trained here for combat, and 10 of these divisions liberated Nazi concentration camps in Europe.

From the 1950s forward, the proving ground has tested virtually every piece of equipment in the ground combat arsenal for the most impressive military in world history. Technologies like the global positioning satellite system were pioneered here, and today, cutting-edge Army modernization priorities like long-range precision artillery fire capabilities are tested here.

But the installation larger in land area than the state of Rhode Island is also home to history that is far more ancient. A crossroads for native people for at least 7,000 years, there are hundreds of culturally significant sites within the modern boundaries of the desert post, and the stewardship of these irreplaceable treasures is a high priority. Some of the sites are isolated: vestigial remnants of ancient trails with the occasional arrowhead or potshard strewn on the ground. Others are awe-inducing, such as White Tanks in the Tank Mountains.

"White Tanks is an area of significant cultural and spiritual importance to multiple tribes," said Erin Goslin, YPG archaeologist. "Because of that and the federal statutes in place for preserving and protecting archaeological sites, we have to do our due diligence. Besides being good archaeology, it is being good stewards."

White Tanks is a canyon studded with natural tenaja or rock sinks that retain rainwater year-round. Some crevices within the undulating volcanic rock have impressive stone formations rising from the center of the ponds.

"In hunter-gatherer societies, anywhere in the desert where you have natural collections of water were going to draw human habitation," said Goslin. "Humans will settle at least part time near water, and given the scarcity of water in this environment, the land will have a higher level of sacred importance."

To a parched desert traveler of hunter-gatherer times, the water was life-saving. Across the millennia, passers-through decorated the canyon walls with hundreds of intricate petroglyphs that remain to this day, a faded but stirring testimony to the importance of this natural wonder to unknown numbers of travelers.

Along the top of the canyon are small caves, some of which have ancient pot sherds and other artifacts, all suggesting human habitation. There are small areas of naturally occurring obsidian, which is exceptionally rare in this region.

"From Native American times, you have evidence of habitation: ceramics, lithics, trails, petroglyphs and evidence of projectile points," said Goslin. "Because it is a natural volcanic range, it is also a source for low-grade obsidian."

White Tanks is a precious cultural resource, but also vitally important as part of the range's natural ecology. A wide variety of wildlife still relies on its natural cisterns for water in the desert.

In fact, it was here that one of the few documented sightings of Gila Monsters was recorded.

"White Tanks is a really important water source for bighorn sheep, deer and other wildlife," said Daniel Steward, YPG wildlife biologist. "It's good to have a place like White Tanks that is preserved and undisturbed."

Though site surveys over the past two decades show relatively little change, YPG personnel remain vigilant in preserving the site for future generations.

Sites like White Tanks are high-profile law enforcement areas, and access points to the area are surrounded by fortified gates and fencing with pickets, all marked by multiple no trespassing signs. Hunters who have proper permissions from YPG are allowed to walk through the area, but motorized vehicles and camping are prohibited.

"As long as hunters are hiking in, not driving, and not camping in the area, we can manage to accommodate that," he said.

# Cradle-to-grave analysis minimizes impacts from modernization technologies

By Lori Hogan

U.S. Army Environmental Command

The Army Modernization Strategy relies on devoted U.S. Army Environmental Command employees to ensure the Army maintains dominance in multi-domain operations while meeting the requirements of laws and regulations intended to safeguard the natural environment and the ecosystems in which we live.

A critical aspect of that process is a cradle-to-grave analysis of environmental impacts from new technologies.

A new technology, which could be anything from an armored vehicle to small electronics, goes through an arduous defense acquisition process from idea to conception, followed by production, fielding and use, and ultimately demilitarization and disposal.

“The entire acquisition process is complicated, but my role could be viewed as a very thin line across the spectrum that just focuses on environmental impacts,” said Charles Serafini, USAEC acquisition support.

An example would be the Stryker Infantry Carrier Vehicle that went into service in 2002 for Soldiers deployed in

support of Operation Iraqi Freedom.

“When it was being conceived, the combat developers had to create a capability requirements document that outlined the basic principle of the vehicle and what they wanted it to do,” said Serafini. “It addressed things like wheels versus tracks, the type of armor, the type of engine, etc. I had to determine if any part of the system would have adverse impacts on the environment over the course of its lifetime.”

After reviewing the CRD, Serafini noted several potential environmental impacts and submitted the document to a USAEC National Environmental Policy Act expert to review as part of the analyses for an Environmental Impact Statement.

NEPA requires identification and assessment of a reasonable range of alternatives as well as a no action alternative for each environmental assessment. The decision-maker is provided with information on each alternative and on its potential impacts on environmental resources and identifies potential mitigation measures to reduce impacts if needed.

In the case of the Stryker ICV, the engineering team determined that an eight-wheeled vehicle would have

significantly less environmental impact than a tracked system, both in combat and on training grounds.

Additionally, a variety of metals were proposed for the armor.

Engineers ultimately decided to go with a solution more environmentally friendly throughout the lifecycle of the system. Next generation combat vehicles are being conceptualized now and will go through the same process as the Stryker ICV; however, that process must be accomplished more quickly to ensure the Army is able to maintain dominance in multi-domain operations.

“We are concentrating our efforts on streamlining Army modernization processes, pushing key systems through some choke points such as demonstrating and validating concepts, efficiently and effectively informing Army planners and decision-makers how to integrate environmental considerations into the decision-making process and providing environmental expertise to help ensure acquisition compliance with environment, safety and occupational health requirements,” said Damon Cardenas, USAEC chief of Acquisition and Technology.



(U.S. Army Photo)

*The U.S. Army Environmental Command provides cradle-to-grave analysis of environmental impacts from new technologies. A new technology could be anything from an armored vehicle to a wearable fuel cell.*

# Biologists survey reservoir operations, monitor effects on endangered species

Story & photos by Preston Chasteen  
USACE, Tulsa District

The U.S. Army Corps of Engineers, Tulsa District is responsible for monitoring the interior least tern populations on the Arkansas, Canadian and Red rivers within the district's boundaries.

The district conducts these surveys to ensure compliance with the Biological Opinion they have with U.S. Fish and Wildlife Service pertaining to their reservoir operations and the effect it may have on the endangered species.

This endangered bird nests in colonies on gravel and sand bars along the rivers for greater protection of their eggs and chicks.

Typically, in late April during the bird's breeding season, the Tulsa District biologists start conducting surveys every two weeks on the rivers.

"We count three things on our surveys: the number of adults, the number of fledglings and the number of nests," said Jason Person, Tulsa District biologist and Interior Least Tern program manager. "Adults are typically larger with a black forehead and a white triangle; fledglings will typically be brown or tan with a black stripe."

The birds typically lay two to three eggs and can re-nest should they experience a disruption with the first nesting.

Incubation of the eggs lasts for about 20 to 22 days, with both parents incubating the eggs.

Newly hatched chicks become fledglings after three weeks.

The Tulsa District works closely with U.S. Fish and Wildlife Service, Oklahoma Department of Wildlife Conservation and Southwestern Power Administration on the Interior Least Tern program.

"We work with the Corps on moderating flows within the Arkansas, Canadian and Red river systems to minimize flooding of nests," said Kevin Stubbs, biologist, U.S. Fish and Wildlife Service. "We've also been working on

building new habitat and doing surveys to see how the birds are doing. It's been an ongoing effort, and we plan to continue doing those things."

The Tulsa District has used dredge disposal material to create several island habitats in the McClellan Kerr Arkansas River Navigation channel.

Utilizing great partnerships with everyone asserting a diligent effort, the interior least tern was proposed for delisting from the Endangered Species List in October 2019.

"Bottom line is due to our efforts and the great cooperation we have with other agencies like U.S. Fish and Wildlife, Southwestern Power Administration and Oklahoma Department of Wildlife Conservation, the birds are making a comeback and on their way to being delisted," said Person.



*An interior least tern chick huddles next to an unbatched egg on a sand bar in the Arkansas River.*



*An adult interior least tern nests on a sand bar in the Arkansas River.*



*Tulsa District Biologist Stacy Dunkin (right) drives an airboat with Jason Person, a fellow biologist, and Col. Scott Preston, district commander, while conducting interior least tern surveys on the Arkansas River.*



*Stacy Dunkin (right), district biologist, logs findings while fellow biologist, Jason Person, searches for interior least tern nests.*

# One person's trash, another's treasure: Using dredged sediments to rebuild

By Kit Straley  
U.S. Fish and Wildlife Service

**M**onica Chasten of the U.S. Army Corps of Engineers looked out across a degraded salt marsh on the coast of New Jersey, directing her team on where to place a hulking pipeline that would soon spray 7,000 cubic yards of sandy slurry across Ring Island. It was 2014.

Many of the birds that had attempted to nest that summer on the island were unsuccessful — their chicks drowned when rising seas inundated nests with water.

According to Chasten, her partners chose this location for a much-needed “elevation uplift” to create high marsh habitat for nesting birds.

By the next summer, the marsh at Ring Island was full of life again, Chasten said. She manages the U.S. Army Corps of Engineers, Philadelphia District's Operations Division.

“The birds found it,” she said. “We were seeing terrapins and horseshoe crabs coming back, too.”

The flooding at Ring Island is not an isolated incident. Up and down the Atlantic coast, salt marshes, and the wildlife that depend on them, are in dire trouble.

Replacing lost sediments with clean, non-polluted dredged material is just one technique in a rapidly growing toolbox to conserve tidal marsh habitat in the face of sea-level rise.

“Essentially, the marshes are drowning,” said Mitch Hartley, the North Atlantic coordinator for the Atlantic Coast Joint Venture, a group of experts that is deeply concerned about the health of Atlantic salt marshes and the at-risk species that live there.

Tidal salt marshes are defined by frequent tidal flooding, unique plant communities, and the ability to trap valuable sediments that build the marsh itself. While they are adapted to the natural ebb and flow of the tide, sea

level rise and other threats are changing the frequency and duration of flooding.

Higher wave velocities from shoreline hardening, boat wake, and increasing storms have exacerbated natural erosion processes, leading to an eroding coastline that is losing its essential sediments faster than they are being replaced. Without sediment for plants to build upon, the flooding worsens as marsh habitat converts to open water.

“Sediment is the currency of these wetlands,” said Dr. Lenore Tedesco, executive director of The Wetlands Institute, a nonprofit organization dedicated to the stewardship of coastal ecosystems for over 50 years. “Marshes are losing sediment at rapid rates. We can't wait.”

Sands, silts, gravel, rocks and broken-down peat from the marshes are carried out to sea and eventually deposited back on the shoreline or settle on the ocean floor. When sediment deposits get in the way of travel and trade, USACE Philadelphia District and its partners come in to clear key navigational channels.

In a massive feat of engineering, material from the navigational channels gets pulled up to the water's surface in a process known as dredging.

Dredged material has historically been dumped out at sea or pumped inland for storage in contained disposal facilities. But motivated by a shrinking coastline and empowered by emerging techniques, coastal engineers and biologists are working together to put sediment back where it belongs — in the marshes.

“Too much sediment clogs our navigational channels, and now this ‘waste product’ from a navigational perspective is critical for our marshes that are in sediment deficit,” Chasten said.

Transporting sufficient volumes of sediment to clear the channels and reach restoration locations is no small task. Conservation, engineering and regulatory agencies along the Atlantic coast coordinate on dredging projects to make it happen.

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*(Photo by Tim Boyle)*  
Monica Chasten, a project manager for the USACE Philadelphia District, discusses dredging and placement operations with USACE Inspector Charlie Yates (left) and Joe Hill (right), owner of Barnegat Bay Dredging Company.

**Motivated by a shrinking coastline and empowered by emerging techniques, coastal engineers and biologists are working together to put sediment back where it belongs — in the marshes.**

## SEDIMENTS

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The value of a salt marsh lies in the eye of the beholder. For commercial and recreational fishers, salt marshes are nurseries for key fish stock. For coastal towns, they act like sponges by buffering property and infrastructure from destructive storms.

A look into history reveals even more uses: for colonial salt hay farmers, they were land that could be altered to suit their livelihoods.

There's actually a long history on the Atlantic coast of extensively managing marshes for hay farming or mosquito control. The marshes today may look deceptively natural and healthy — a vast expanse of green with little ribbons of water weaving through, punctuated by the occasional duck or heron. But Nancy Pau, wildlife biologist at the U.S. Fish and Wildlife Service's Parker River National Wildlife Refuge, said historical records and aerial imagery tell managers a different story, opening the door for innovation.

"In the conservation community, marshes were to be left alone," Pau said. "But once I realized these weren't pristine places like we thought, that other humans had changed their hydrology in ways that are harmful today, it opened up space in my mind for creativity in management."

According to Pau and Susan Adamowicz, land management research and demonstration biologist for the USFWS, that history is key to planning for the future.

The two biologists, along with other colleagues, are stewards for some of the many national wildlife refuges that contain remaining salt marsh habitat.

"I try to approach marshes like a doctor approaches a patient," Adamowicz said. "Knowledge about the legacy affects our understanding of the current marsh condition, our diagnosis and treatment prescription, and the plant and animal ecology being expressed on the marsh today."

In order to treat their patients, the biologists are experimenting with sediments on a smaller scale than the USACE marsh restoration projects. At Parker River, Pau and her colleagues sourced sediments from nearby restoration sites to create smaller areas of elevation called microtopography islands.

"We are trying to raise elevation in a dispersed way that mimics natural deposition

events from hurricanes and large storms," she said, hoping that by monitoring this pilot project and natural deposition events from storms, her work will inform future marsh restoration projects using dredged sediments.

One of Pau's top management goals, which she shares with other refuge managers and wildlife professionals along the coast, is to save an endemic species.

As the salt marshes go underwater, so do the nests of the saltmarsh sparrow and other bird species.

### An intersection of interests

Armed with knowledge of the past and the latest in salt marsh restoration techniques, an expansive network of experts, salt marsh managers, USFWS biologists, and partners are marshaling efforts to save the sparrow.

Their current focus? Increasing coordination and addressing regulation.

"Beneficial use of dredged materials was going on in the USACE Engineer Research and Development Center in the 1970s," Chasten said. "It's not new, but it's coming back around due to changes in practices and environmental policy that have made it more possible. The key is developing good partnerships for dredging and having a good source of material."

In Maryland, the Dredged Material Management Act of 2001 redefined what "beneficial use" of dredged materials meant, limiting the scope to marsh enhancement, beach nourishment, shoreline stabilization and island restoration. This policy put Maryland at the forefront of beneficial use projects, as no other state has a similar policy in place.

Without offshore dumping as an option, the USACE Baltimore District and other dredge operations began to partner with conservation agencies to find places for sediment that would benefit coastal habitats over time.

Dredged material in Maryland is used in one of three main ways for wetland restoration, said Danielle Szimanski, project manager of the USACE Baltimore District. Sediment can be placed on top of the marsh to raise the marsh elevation, placed next to a marsh to expand the area covered, or be used to create or enhance entire islands that include marsh habitat.

"It's exciting when I can stand on an island or a marsh that wasn't there six months ago, a year ago," Szimanski said. "Just to know this was not here; it has been completely rebuilt and is brand new habitat."

According to Chris Guy, habitat goal implementation team coordinator at the Service's Chesapeake Bay Field Office, one of the most well-known examples of island restoration is Poplar Island in the Chesapeake Bay where the island had eroded from its historical 1,000 acres to about 120 acres. The first sediment fill was placed there in 2001, and the island is still under construction today.

Once complete, more than 1,500 acres of marsh and upland habitat will be restored.

"When we first started that project and surveyed the island in 1994 there were fewer than 11 species of bird on the remnant island, and now we have over 300 species using it, with over 30 species actively nesting," Guy said. The hope is that the sparrow will follow.

"We've seen saltmarsh sparrow migrating through Poplar Island, and we've seen them at other restoration sites, but we haven't found nesting yet," he added.

Poplar Island is expected to reach its sediment capacity in the next five years, but the project is far from over.

"I expect we will be working through 2040 to fully stabilize Poplar Island, and it will take more work for habitat creation and management," Guy said.

Sediment will then be sent over to James and Barren islands, a continuation of the Mid Bay Islands project.

Matt Whitbeck, Service wildlife biologist at Blackwater National Wildlife Refuge, is excited that the project will nearly triple the number of acres restored at Barren Island.

"About 45 acres of that island has been restored project-after-project over the decades," he said. "The Mid Bay Islands project will add another 72 acres of habitat using a more comprehensive strategy."

This new strategy includes reconnecting the two halves of the island, which will buffer the mainland from wave energy and create habitat, he said. Construction is anticipated to begin in 2022 at the earliest.

**See NEW STRATEGY, page 27**



*(Photo by Steve Droter)*  
**Matt Whitbeck, wildlife biologist, U.S. Fish and Wildlife Service at Blackwater National Wildlife Refuge, stands where 26,000 cubic yards of sediment was used to create a combination of low and high marsh habitat.**

This isn't Whitbeck's first experience using dredged sediments for restoration. In 2016, Blackwater National Wildlife Refuge received 26,000 cubic yards of sediment for thin-layer placement along the Blackwater River.

According to Hartley with the Atlantic Coast Joint Venture, the goal for the thin-layer placement technique is to apply enough sediment to raise the elevation of the marsh without smothering existing plants.

"It's a Goldilocks problem," he said. The depth has to be just right.

Whitbeck recalled preparing people for the initial visual shock of acres and acres of mud at the Blackwater thin-layer placement site.

"At first it looks pretty rough, but it revegetated very quickly," he said.

Revegetation is a large concern not only for wildlife, but also for the marsh surface itself. With sufficient root systems along Blackwater River to bind the newly added sediment in place, it stabilized and the sediments didn't erode away.

When asked what that section of marsh looks like today, Whitbeck said, "It looks fantastic — it looks like marsh."

## Hope on the horizon

Cost-effective adaptive management is the name of the game for any projects using dredged sediments for marsh restoration. For USACE, it is cost prohibitive to move dredged sediments over great distances to new sites; in fact, transportation of dredged sediment is one of the more costlier stages of any dredging operation.

Transportation over large distances is slightly easier in Maryland.

Szimanski and partners are designing a 100-acre wetland restoration site near Deal Island which will require, at its longest, 12-14 miles of pipeline. The pipeline will move 120,000 cubic yards of dredged material out of the Wicomico River to a placement site in Dame's Quarter.

According to her, the goal is to restore navigation and provide nesting habitat for declining species like the saltmarsh sparrow and black rail.

In New Jersey, Chasten and partners are gearing up for a new project under Section 1122 of the Water Resources Development Act of 2016, which she

said will allow transportation of dredged materials over longer distances than those covered by the federal standard.

Chasten worked with William Dixon, director of the New Jersey Division of Coastal Engineering, on a proposal to use dredged materials from the Barnegat Inlet — their project was one of 10 chosen nationally.

Their plan is to create a new island in Barnegat Bay within six miles of the inlet. They'll also test a method that relies on natural currents, rather than construction equipment, to place sediment. This approach involves releasing sediment near the shore and into currents, which will then deposit the sediment along the shore with the tides.

"My goal with these projects is to learn how to move sediment naturally, keep the sediment in the natural system," said Chasten, citing Engineering with Nature principles.

By refining techniques to use natural processes like currents for sediment deposition, future beneficial use projects will also be more cost effective, she said.

Barnegat Bay is a hotspot of interest in using dredged materials for marsh restoration, due to its extensive island tidal marsh system.

For the recently formed Barnegat Bay Island Working Group, the immediate goal is to develop a prioritization tool to identify future sites for beneficial placement of dredged materials. The group, founded by Virginia Rettig, manager of the Service's E.B. Forsythe National Wildlife Refuge, includes the Barnegat Bay Partnership, New Jersey Department of Transportation (DOT), New Jersey Department of Environmental Protection and Long Beach Township.

When that tool is ready, it will help send dredged materials where they're needed most.

The ultimate goal of the group is to create a management strategy for marsh islands in the bay that will improve coastal resiliency and balance the needs of wildlife, coastal engineering, and municipal agencies, said Danielle McCulloch, fish and wildlife biologist at the USFWS' New Jersey field office.

According to McCulloch, the plan is to use dredged material from state-managed channels that fall under the purview of the New Jersey DOT.

Sixty miles south as the sparrow flies, the newly established Seven Mile Island Innovation Lab, housed and co-led by The Wetlands Institute, is also continuing sediment placement work in New Jersey on Sturgeon and Gull islands along the intracoastal waterway. Tedesco estimates that 65,000-85,000 cubic yards of dredged material will be placed on these two islands, home to a third of the state's wading birds.

One issue with sediment placement is the time lag for the habitat, and wildlife, to rebound.

"A lot of folks call it thin-layer placement; there isn't anything thin about it," Tedesco said. "We're putting 3-9 inches of sediment on top of the marsh, trying to keep it thin enough so the root structure of the grasses can recolonize, while still building worthwhile elevation. For habitat creation projects, the placements are much thicker and it is a catastrophic event on the marsh. It takes time for these systems to stabilize."

The lab's goal is not just to create habitat, but to pioneer and share innovative methods for marsh restoration and wildlife management.

"Ultimately, the bigger solution is places for the marsh to migrate, but, strategically in the meantime, what can we do to protect certain species, certain populations?" asked Tedesco. "In some ways it's like we are protecting a seed bank for these species, trying to create habitat to get these birds through this crisis."



(National Archives Photo)

Factory workers conduct a visual inspection of cartridge cases at the Evansville Ordnance Plant in Indiana.

# Once vital munition plants returned to communities

By Cathy Kropp  
U.S. Army Environmental Command

**L**and that was vital to the war effort in the 1940s is now important to the surrounding communities for other reasons. Army ammunition plants were established in very rural, unpopulated areas and required thousands of acres of land that are now being returned to the communities that flourished around the facilities because of the availability of work for both men and women.

The Army's massive construction projects to support the production and storage of ammunition during World War II were unprecedented at the time and played a significant role in the Allied victory. Between 1940 and 1943, 77 industrial facilities and 30 depots were established.

Some plants became operational only six months after construction began, all in an effort to ensure U.S. military forces had what they needed to win the war. By 1945, Army ammunition facilities had produced 11 million tons of artillery ammunition, more than 475,000 tons of mortar ammunition, 6 million tons of bombs and rockets and 39 billion rounds of small arms ammunition.

But with the start of the Cold War, the plants lay empty and unused. Later, the Army would learn the toll taken on the land and water associated with these industrial facilities; and still today, Army cleanup efforts continue to restore the land for reuse by the public.

In 2001, Army leaders directed a review of the industrial base program in support of Army transformation requirements. This resulted in the identification of 13 excess industrial installations the Army wanted removed from its rolls.

Over the next decade, the Army would revise this list of excess property and make acreage available for reuse. The

U.S. General Services Administration was designated as the disposal authority. But before the land could be transferred to others, it needed to be cleaned up and declared safe for human health and the environment.

Over the last two decades, the Army has achieved Response Complete or Remedy in Place status at many of these properties.

Still, the cleanup work left is expensive and complex. The anticipated cleanup costs for these properties are in the hundreds of millions of dollars mostly related to military munitions responses and large groundwater plume cleanups.

The former Badger Army Ammunition Plant in Sauk County, Wisconsin, was originally established on 10,500 acres. In addition to supporting World War II, the plant produced ammunition for the Korean War and Vietnam Conflict.

There were originally 38 environmental cleanup sites, but all explosive decontamination and soil remediation has been completed, and only three sites remain.

More than 2,000 acres were transferred to the Department of Agriculture for the Dairy Forage Research Center. The land is used for row crop production, manure management and grazing experiments.

Approximately 1,500 acres were transferred to the Secretary of the Interior to be held in trust and became part of the Ho-Chunk Nation Reservation. These lands represent ancestral homeland to the Ho Chunk who were displaced from the area. A large

portion of the property will be restored and managed as native grassland.

A small parcel went to a municipality to maintain a wastewater treatment facility. But the largest portion, more than 3,300 acres, went to the state of Wisconsin, where the Department

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*Over the next decade, the Army would revise this list of excess property and make acreage available for reuse.*

*But before the land could be transferred to others, it needed to be cleaned up and declared safe for human health and the environment.*

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of Natural Resources established the Sauk Prairie Recreation Area.

The former Indiana Army Ammunition Plant near Charlestown, Indiana, was closed in 1988 by the Base Realignment and Closure

Commission and became an industrial park.

In 2002, the remainder was declared excess property and more than 4,000 acres transferred to the state of Indiana. Another 5,900 acres went to the River Ridge Redevelopment Authority, some at no cost and some at fair market value.

The 89 environmental sites requiring cleanup had reached response complete or remedy in place status.

The River Ridge Commerce Center currently is home to more than 60 companies employing more than 10,500 workers. The business and manufacturing park has 6,000 acres under development.

The state land went to the Department of Natural Resources who established the Charlestown State Park, the third largest park in Indiana and a stop on the Indiana Birding Trail.

Joliet Army Ammunition Plant, in the northeast corner of Illinois, included two separate facilities on more than 27,000 acres. A total of 61 sites were identified as requiring environmental cleanup, with 51 reaching response complete status. Cleanup continues on the rest.

The former ammunition plant has been transformed into multiple beneficial use areas for the community, including a veteran's cemetery, a business and transportation hub, and natural resource conservation areas.

The public land space on this site is now the largest contiguous open space for bird habitat in northeastern Illinois, serving as a habitat for several endangered species.

The Longhorn Army Ammunition Plant was originally located on 8,468 acres beside Caddo Lake in Harrison County, Texas. The Environmental Protection Agency listed the site on the National Priorities List in 1990, and cleanup began in 1996.

The Army has been coordinating cleanup actions under the existing Federal Facilities Agreement with both the EPA and the Texas Commission on Environmental Quality and continues to work closely with the environmental regulators to resolve the remaining environmental issues.

Of the 58 total environmental sites, all have remedies in place, and all but 17 are at response complete.

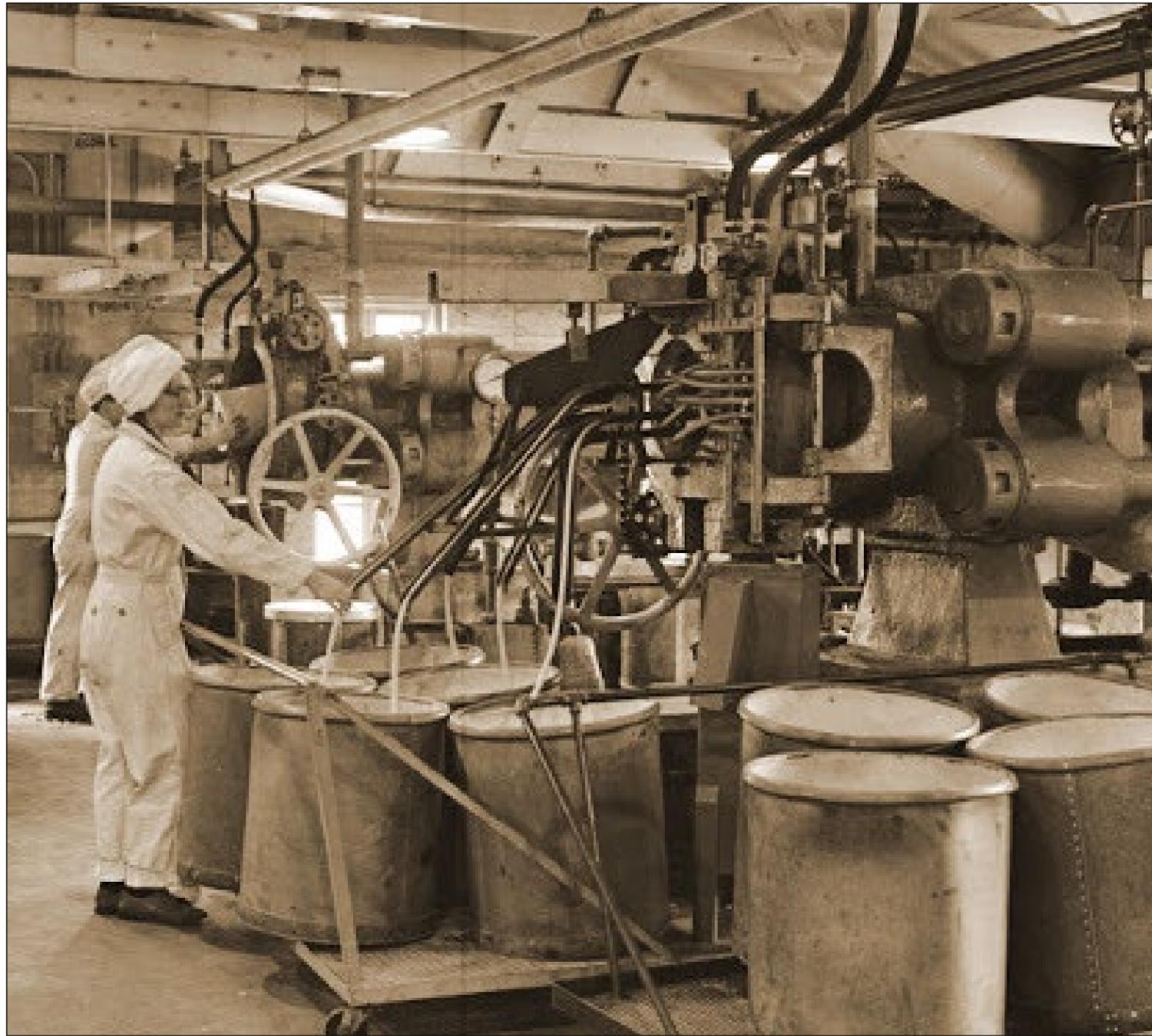
On Oct. 19, 2000, the U.S. Fish and Wildlife Service approved the establishment of the Caddo Lake National Wildlife Refuge.

In 2004, the Army and FWS entered into a memorandum of agreement that sets forth the transfer process of the former Longhorn Army Ammunition Plant acreage.

Approximately 7,200 acres have been transferred from the Army to FWS for the Caddo Lake NWR, which has been opened to the public since 2009.

All 6,439 acres of the former Volunteer Army Ammunition Plant in Tennessee have been sold or transferred. More than 5,000 acres were purchased by the city of Chattanooga and Hamilton County, enabling establishment of the Enterprise South Industrial Park.

See **PLANTS**, page 30



*(National Archives photo)*

*Factory workers extrude nitrocellulose into strands for use in smokeless propellant production at the former Badger Army Ammunition Plant in Sauk County, Wisconsin. The plant was originally established on 10,500 acres and supported World War II, the Korean War and the Vietnam Conflict.*

## PLANTS

continued from page 29

In 2010, a major automotive plant opened on 1,400 acres of the industrial park, and a large distribution center and a manufacturing plant that makes attachments such as buckets for heavy construction equipment was one of the early industrial park businesses.

Many more small businesses are located at the industrial park which has improved economic development opportunities in Chattanooga. Another 2,900 acres were transferred to the city of Chattanooga and Hamilton County, providing land for the Enterprise South Nature Park.

A total of 23 cleanup sites were identified, and 21 are response complete. For the remaining two sites, the remedial action is in place. Long-term monitoring required for

groundwater, asbestos burial pits and landfills will remain an ongoing Army responsibility.

While some former Army ammunition plant lands were transferred to other organizations, some remained with the Army. The former Ravenna Army Ammunition Plant is now called the Camp James A. Garfield Joint Military Training Center, an Ohio National Guard military base. The training site is located in Portage and Trumbull counties in Ohio. The installation consists of about 21,000 acres, all part of the former Ravenna Army Ammunition Plant. Today, various small arms weapons ranges and permanent facilities support individual and collective training events for both weekend and annual training.

More than 1,500 acres of the former

Twin Cities Army Ammunition Plant is now home to the Arden Hills Army Training Site, a military training area of the Minnesota National Guard and the Minnesota Department of Military Affairs. AHATS serves as a local training area for all military services, law enforcement and civilian agencies as well as environmental and wildlife conservation programs.

The community development and the Army cleanup continues at many of the former Army ammunition plants and the former Army land continues to provide economic, recreational and residential development opportunities for the communities that once thrived on the job opportunities provided by the plants.



*(National Archives photo)*

*Women work on the assembly line at Green River Ordnance Plant in Sterling, Illinois. Also known as the Green River Arsenal, this large munitions factory was quickly constructed in 1942 — built in just eight months — to provide ammunition and related supplies for the war effort.*

# Army cleanups support installation readiness

By Lori Hogan  
U.S. Army Environmental Command

**T**he Army's Environmental Restoration Program, more commonly known as the Army Cleanup Program, addresses a variety of hazardous contaminants and military munitions on Army installations across the globe to bolster readiness.

The initiative stemmed from the Defense Environmental Restoration Program (DERP), established in 1986 by the Department of Defense.

The mission is to ensure compliance with applicable federal and state environmental regulations, protect human health and the environment, and enable readiness by returning Army lands to usable condition. By performing cost-effective remediation on contaminated sites, cleanup efforts have enabled installations to expand and carry out critical missions.

"We deliver cost-effective, environmental services globally to enable Army readiness by providing expertise, program management and project management in compliance, conservation, restoration and pollution prevention," explained Hopeton Brown, chief of the Program and Liabilities Branch.

Under DERP guidance, the Army Cleanup Program prioritizes remediation sites into high, medium and low priority categories primarily based on relative risk. The Army evaluates relative risk by the type of contaminant hazard, migration of contaminants, and the potential exposure to humans or plants and animals.

The Army creates an Installation Action Plan for each site with an active environmental restoration project. The IAP is often based on a multi-year approach; however, with Fort Huachuca in southeastern Arizona, the planned construction of a new electronic proving ground facility on a former landmine training site propelled it into a time critical removal action.

Fort Huachuca, a product of the Indian Wars of the 1870s and 1880s, sits at the base of the Huachuca Mountains and offered protection to settlers in southern Arizona. Today, it integrates and delivers base support, including training, testing, communications and intelligence, to enable Army readiness. The new Electronic Proving Ground includes a much-needed maintenance facility to test and repair unmanned aerial vehicles, more commonly known as drones.

The area designated for construction was

undeveloped but located near existing buildings, making it more likely to contain archaeological artifacts than environmental hazards. Therefore, the first priority was to conduct an archeological survey.

As the team of archaeologists were digging, they found a metal object identified as unexploded ordnance (UXO). The area was cordoned off and the project was suspended until an explosive ordnance disposal team could respond, detonate the explosive, and determine if it was an isolated incident or if additional hazards remained.

The news was disheartening; the proposed construction site was an old landmine training site and still contained UXOs. The finding would delay the construction and potentially threaten the Army's ability to train Soldiers.

"In most cleanup projects, it takes years to get a site approved and funded, and ready to begin work," said Roberto Rivera, U.S. Army Environmental Command environmental support manager. "But because this was a construction project that was critical to the readiness of the Army, we were able to get all the approvals, funding and boots on the ground much quicker."

The cleanup also paved the way for future construction. A campus with training facilities and administrative buildings is slated to be built within the next 10 years.

While the Fort Huachuca cleanup project was determined to be time-critical, many cleanup projects are deemed non-time-critical, meaning they are no less important but do not pose an immediate danger to Army readiness or personnel.

Some past practices and substances formerly used on Army installations may have been considered safe at the time but pose a potential risk to human health and the environment. Examples include a small arms arsenal that housed munitions or a training ground scattered with munitions debris. These types of facilities have been included in an Armywide study as potential sources of soil, sediment and surface or groundwater contamination.

Cleanup of this nature falls under the Comprehensive Environmental Response, Compensation and Liability Act.

The multi-year, multi-phase process begins with site discovery, identifying installations with potential contaminants; followed by site inspection, determining if there has been a release to the environment; and finally, a remedial investigation, determining the extent of the contamination. The next phase includes the feasibility study, proposed plan, record of decision

and finally, the cleanup. For some installations, this process is long term and could be ongoing for 20 or more years.

"You never know what you're going to find," said Mary Ellen Maly, USAEC environmental support manager. "Someone might come across a UXO or a leaky drum, and suddenly you have a time-critical action taking priority. Or you might go months without finding anything. The important thing is knowing the ground has been cleared for future use. It can now be used for training, construction projects, or whatever the installation needs for readiness."

Forward thinking is what prepared Fort Gordon in Augusta, Georgia, for future development. This World War II-era installation housed an industrial site for weapons plating and cleaning.

Although the warehouses have long been destroyed, the likelihood that fuels, solvents and degreasers permeated the ground was certainly a possibility. The old industrial site is located on an unused part of the base and had been planted over with trees.

"We know those trees were planted 60 or 70 years ago, but we didn't know what lay beneath them — what contaminants could be in the soil or groundwater," said Hagan Ratliff, USAEC environmental support manager.

"We knew it needed to be investigated because of the threat posed by the use of warehouses and because we heard there was going to be significant growth on the installation over the next 10 to 20 years. They were talking about construction projects costing millions of dollars, and we had to ensure the ground was safe and free from chemicals," Ratliff said.

After the site inspection, chemicals were found in high concentrations near a French drain that carried all types of hazardous liquids from the buildings into nearby storm drains. The area had to be treated in place and proved difficult because the soil was primarily clay and resistant to water movement. In the process of determining the extent of the contamination, crews found a natural artesian well.

"We had to think outside of the box and use it to our advantage; so, we created a pumpless pump and treat system," said Ratliff.

This type of treatment falls under green remediation, meaning it does not use electricity or power. It instead uses gravity to move contaminated groundwater into carbon boxes where the water percolates up through activated carbons and then flows back onto the land surface.

See **ARMY CLEANUPS**, page 34



(U.S. Army Environmental Command courtesy photo)

Members of the environmental team conduct a site inspection to determine whether there has been a release of contaminants into the environment.

“It was an elegant solution to a task that was really complicated,” Ratliff said.

Another project at Fort Gordon was cleanup and removal of an old water tank in the railyard area. In preparation for major construction about to take place, the water utilities were privatized, and the new water company wanted to build a more efficient and modern tank.

The old tank was a 1940s-era, 2 million gallon, metal storage unit. Previous preventive measures consisted of adding a fresh coat of heavily leaded paint every five to 10 years. Crews would come in, sandblast the tank, then resurface it.

The water tank cleanup project involved a large area surrounding the tank because years of wind and weather carried paint chips several hundred yards away. The old tank was taken down, cut into little pieces and hauled away. The soil was cleaned and the new tank was successfully built just a few feet away.

Installations need to anticipate Army needs and be fully operational in the event Soldiers are called to duty. The cleanup is a combined effort of local, state and federal agencies working toward a common goal. Ratliff was quick to give kudos, recognizing the staff at Fort Gordon.

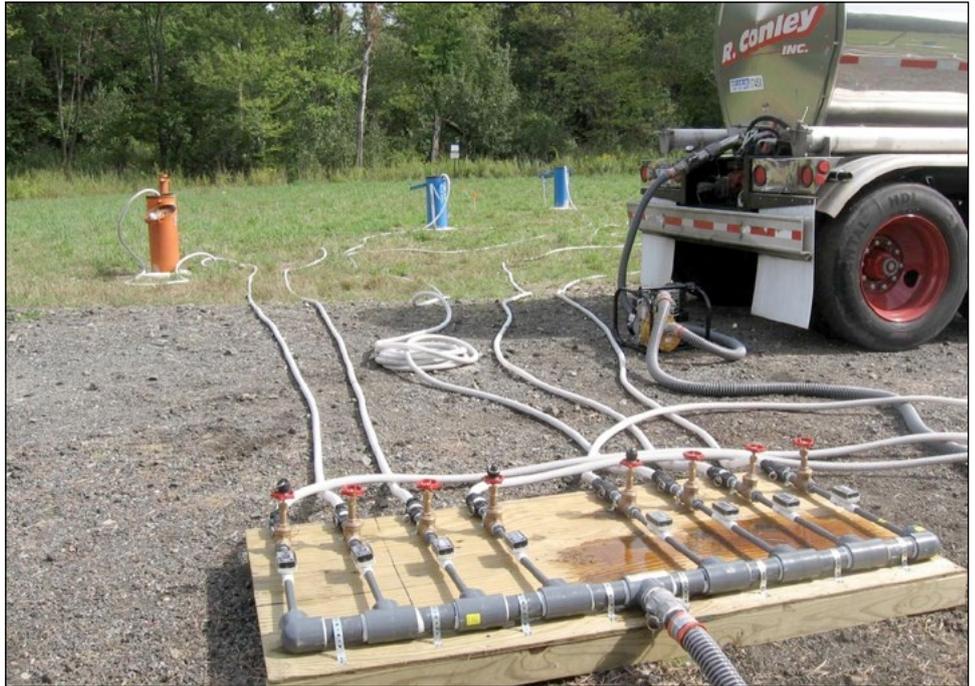
“There were a lot of entities involved, so I have to give credit to the environmental shop at Fort Gordon because they have done a marvelous job with limited staff.”

Not all cleanup projects are as straightforward. Lake City Army Ammunitions Plant in Lake City, Missouri, was added to the National Priority List on July 22, 1987, because of the types of contaminants and the hazards posing harm to human health and the environment.

The installation first opened as a small caliber ammunitions plant in 1941 when it was common to dispose of solid waste and hazardous chemicals by burying them in large outdoor pits or landfills.

LCAAP contaminants included chlorinated volatile organic compounds, polycyclic aromatic hydrocarbons, explosives, perchlorate, heavy metals, depleted uranium and non-aqueous phase liquids. Many of these contaminants do not dissolve in or mix well with water, so dilution was impossible.

USAEC Environmental Support Manager Zaynab Murray said they were making great strides on the cleanup but



(U.S. Army Environmental Command courtesy photo)

*Pumpless pump and treatment systems use gravity to move contaminated groundwater into carbon boxes where the water percolates up through activated carbons and then flows back onto the land surface.*

then encountered contaminants that posed a greater challenge and needed a unique approach.

“To find a solution, we hired two of the most progressive leaders in restoration,” said Murray. “It was through these companies that a thermal remediation solution was proposed, and Lake City became a pilot study.”

The theory is that high levels of heat applied to the subsurface affect the physical properties of volatile and non-volatile contaminants, which can then be extracted using steam-enhanced methods.

The process has been successful in returning soils to acceptable levels; however, it is costly and should only be used in rare cases to be fiscally responsible. LCAAP is currently in the process of evaluating which areas contain the highest levels of contaminants so they can create a priority list based on funding.

The Army continues to remediate contaminated sites. These sites may or may not pose an imminent and substantial endangerment to public health or the environment based on the National Priority List and future development.

USAEC’s role, according to Brown, is to “provide technical oversight to ensure installations are meeting the regulatory

requirements by state and federal agencies.

“There are certain aspects of the cleanup program, such as budgeting, permitting and coordination of all the stakeholders, that works well being centrally managed,” he explained. “More importantly, we are leading and executing cleanup in support of our Soldiers so they can train and live in a safe environment.”

The Army continues to achieve its goal by providing technical expertise to enable Soldier readiness and sustainable military communities; however, as Rivera said, “These efforts will be ongoing throughout our lifetime. New methods and strategies will make the process easier, but at the heart of the mission is dedicated staff with the U.S. Army Environmental Command who act as liaisons between installations and other agencies, making the process more effective and efficient.”



# Network for Engineering with Nature marks pivotal moment in civil engineering

By Holly Kuzmitski  
U.S. Army Engineer Research and  
Development Center

At some point in the future, the establishment of the Network for Engineering With Nature (N-EWN) will likely be regarded as a seminal moment in the history of infrastructure and civil engineering.

A partnership between the U.S. Army Corps of Engineers' Engineering With Nature<sup>®</sup> Initiative and the University of Georgia's Institute for Resilient Infrastructure Systems, N-EWN was formed in October 2020 to accelerate the delivery of nature-based solutions and the use of natural infrastructure, or NI, in public and private sector infrastructure projects.

"We'll know we have reached our overarching goal when NI and nature-based solutions have become mainstream and an integrated part of practice by public and private entities developing infrastructure," said Dr. Todd Bridges, national lead of the EWN initiative.

To get to that destination of placing NI on an equal footing with conventional approaches, N-EWN is striving to reach other milestones. One of these, IRIS Director Dr. Brian Bledsoe — who has over 30 years of experience as an engineer, hydrologist and environmental scientist in the private and public sectors — ponders frequently.

"We have to do more than postal stamps here and there, we have to bring NI to scale," Bledsoe said. "If you want to attenuate coastal flooding, how much NI do you have to build to achieve a certain level of performance? What length of river floodplain do we need to reconnect to reduce downstream floods by a certain amount?"

Rivers are Bledsoe's passion, and when he imagines the next 50 to 100

years of water infrastructure and river engineering, he sees EWN practices playing a significant role.

"Many of our rivers are highly engineered, and they will continue to be engineered, but we have a window of opportunity to reimagine what those river systems will be," he said. "They can continue to provide navigation, flood reduction and other benefits. If we can apply EWN, I'm a firm believer we can deliver even more benefits and services, such as improving water quality, habitat, flood protection as well as reversing loss of biodiversity."

Dr. Jeff King, deputy national lead of EWN, describes another N-EWN objective, creating spaces where people can come together to collaborate on projects. N-EWN now has among its members meteorologists, planners and policy experts, ecologists, economists, landscape architects, anthropologists and hydraulic engineers.

The network is deliberately multisectoral, and Bridges welcomes those in the public sector, academia, private companies and nonprofit world to join.

"We're issuing a broad invitation to organizations committed to engineering with nature in the 21st century and to solving the environmental, economic and social challenges before us," he said.

"We're looking for partners, organizations and people to contribute something substantive," Bridges continued. "That work can come in all sorts of forms; we're not necessarily looking for someone to write a check, but to invest sweat equity and to add to a mutually beneficial partnership."

Scott Pippin, a public services associate at UGA, is someone contributing to the interdisciplinary group. With a master's degree in environmental planning and a Juris

Doctor degree, Pippin is well-equipped to work on a wide range of projects, including researching how federal policy and environmental legislation affect NI and how USACE policies and procedures shape infrastructure that is being built. Eventually, he will work with communities and people on the ground to implement EWN projects.

"This is a long-lasting collaboration and it will lead to a lot of real-world projects," Pippin said.

Dr. Susana Ferreira, a professor of environmental economics at UGA, is working with a team to address a question that's crucial for expanding the use of NI: How do we quantify the benefits that nature offers us? She uses the principles of economics to understand and optimize how environmental and natural resources are developed and managed.

"Attempting to account for natural capital, recognizing that nature is an asset, is actually something that's been going on for the last two decades," Ferreira said. "Not only is USACE taking the steps towards a better modeling and incorporation of ecosystem services into projects, it's happening in other agencies worldwide."

"There's a lot of value in nature," Bridges said. "Trees, for example, are infrastructure; forests provide infrastructure functions. Concrete and asphalt can contribute to urban heating, and trees planted purposefully can substantially and measurably reduce this heat island effect on urban areas. We humans just need to figure out how to discover the value in nature, preserve it and use it."

The N-EWN website can be visited at [n-ewn.org](http://n-ewn.org) the EWN Initiative at [ewn.el.erdc.dren.mil](http://ewn.el.erdc.dren.mil) or [engineeringwithnature.org](http://engineeringwithnature.org) and the Institute for Resilient Infrastructure Systems at [iris.uga.edu](http://iris.uga.edu).

# Wildfires rage, pose serious threat to dam system

By Christopher Gaylord  
USACE, Portland District

**D**am safety can be a gloomy business at times. In order to protect a dam, engineers must first brainstorm all the different ways the structure could possibly fail. It's a strategy of predicting and preparing for the worst.

But not a whole lot about the wildfires that devastated parts of Oregon's Willamette Valley last month was predictable — even in the highly calculated world of dam safety.

In a matter of days, fires that started out small had ravaged nearly 400,000 acres east of Salem and almost 200,000 acres east of Eugene, about an hour to the south. Together, the blazes closed in on the 13-dam system the U.S. Army Corps of Engineers, Portland District operates for flood risk management, power generation, water quality improvement, irrigation, fish and wildlife habitat and recreation for the Willamette River and many of its tributaries.

## Small fires become infernos

By the time Labor Day weekend arrived, a relatively small, lightning-caused fire had been smoldering away for three weeks in a remote wilderness area too treacherous and overgrown for firefighters to safely access by foot. Referred to as the Beachie Creek Fire, it occupied a few hundred acres about an hour east of Salem, Oregon. At the same time, a separate fire, the Lionshead Fire, burned to the southeast.

Tim Ernster, operations and maintenance manager for Portland District's North Willamette Valley projects, wasn't overly worried. Neither fire posed a serious threat to any of USACE's projects. The Beachie Creek Fire burned about 10 miles to the northwest of the district's Detroit Dam, but was mostly unremarkable.

In Ernster's mind, any impacts to the dam would happen on the off chance. Just in case, he and operators at the project talked through procedures to put it and its downstream reregulation dam, Big Cliff, into a safe configuration, essentially an autopilot state, in case the dams had to be abandoned. But that didn't seem likely.

Then, on the evening of Sept. 7, the winds came. Forest officials described the situation as a "hurricane hitting a wildfire" — extremely dry gales of 50 to 75 miles per hour crossing paths with multiple fires burning throughout the Pacific Northwest — conditions that occur only a few times a century.

In Ernster's words, "all went to hell!"

The gusts put the fires into overdrive, and the blazes spread throughout the North Santiam Canyon, speeding mostly westward. Wind knocked out power lines, which ignited more than a dozen spot fires. The spot fires kicked up and joined one another as they raced through the canyon, eventually feeding the Beachie Creek Fire. Before long, the Beachie Creek and Lionshead fires merged.

"You're talking about a change that occurred within a couple of hours — fire travelling more than 10 miles," says Dustin Bengtson, Portland District's Willamette Valley deputy operations project manager. "It happened that quickly."

The off-chance scenario Ernster and his team had discussed became a reality. Mike Pomeroy, the operator on shift at the time, put the Detroit powerplant into safe condition. But by the time he was ready to leave, the fires had arrived and he was trapped.

Making matters worse, the team lost all communication with the power plant operator.



(Photo by Tom Conning)

*A walk through the town of Detroit Sept. 15, after the Beachie Creek and Lionshead fires ripped through the area, shows the destruction in the North Santiam Canyon near Detroit Dam.*

Pomeroy would secure the dam for more than 30 hours before anyone could reach him.

Meanwhile, an hour to the south, a new fire started in the McKenzie River Valley, where Portland District manages Cougar and Blue River dams, separate flood risk management projects about 10 miles apart.

At some point in the evening, downed powerlines took Cougar Dam's hydropower turbines offline. Roving operators made it to the project, which is operated remotely from a primary control center an hour southwest, put the plant into a safe configuration, and left before things got too bad.

## Everything worked as designed

Bengtson refers to what happened in the Willamette Valley as "burn-over" events. Fire surrounded and encroached on four dams — Detroit, Big Cliff, Cougar and Blue River — and their associated fish facilities. The fir trees along the hillsides around the projects, some of which look like burned matchsticks, are evidence of the destruction.

Surprisingly, however, the four projects sustained no serious damage.

According to Ross Hiner, Dam Safety program manager, some of the gauges USACE uses to measure outflows and monitor reservoir elevations at the projects were destroyed. Signs were melted to resemble twisted bits of

tin foil. A storage facility was lapped by flames, and a truck's headlights and grill melted. A USACE-built fish facility upstream of Detroit was touched. Some communication boxes burned.

But dams are designed to endure.

"There's a lot of resiliency built into the dams, in their design and in their operation and maintenance, to ensure that they're capable of withstanding what Mother Nature might subject them to," Hiner said, referring to the redundant systems in place to protect a dam. Getting electricity through a diesel generator versus a turbine (or vice versa) is one example.

Some turbine units briefly went offline, transmission lines failed under the weight of fallen trees, and ash and debris occasionally clogged generator filters. But, Ernster sees success in how the projects performed.

"Everything worked like it was supposed to," he said. No significant flow deviations. No impacts to communities downstream. No fish lost.

According to Bengtson, that credit goes to a well-oiled engineering, construction and maintenance program at the district. This is especially important in the Willamette River Basin, where many USACE dams rely on automation and remote operation.

**See WILDFIRES, page 38**



*(U.S. Army photo)*

*Smoke hangs heavy in the air around the main embankment at Cougar Dam Sept. 14, just days after the Holiday Farm Fire burned through the area, impacting Cougar and nearby Blue River dams.*

## WILDFIRES

continued from page 37

“Operators’ decisions are critical to the safe functioning of the plant, but everything they can do is a function of solid design, construction and maintenance activities,” says Bengtson. “Everything has to be well thought through, well-built, and well-maintained for an operator to be successful when it all really hits the fan.”

### Maintaining access and bracing for floods

The dams emerged from the fires relatively unscathed. According to Bengtson, the district’s infrastructure is “pretty much all ready to go.”

It’s the landscape that bore most of the devastation.

Vegetation helps stabilize slopes by holding soil together and reduces runoff after heavy rain by absorbing some of the water. But the fires burned a considerable amount of it away in the two impacted river basins.

Add to this a diminished ability of scorched soil to soak up rainwater and increased potential for landslides and falling debris, and the district’s two immediate priorities come into focus: provide safe access to the dam sites and protect communities downstream from flooding.

Teams ramp up assessments with partner agencies, like the Forest Service, to better understand these risks as the flood

season looms.

“We’ll be monitoring smaller rainfall events more closely than we have in the past,” Hiner said, adding that the district will also work quickly to ensure operators can access the area’s remote projects safely if needed. This is something Bengtson says will likely be a constant focus all winter long.

According to Paul Sclafani, Portland District’s Floodplain Management Services program manager, they’re issues that will probably remain with the district for some time.

“The road to recovery is going to take several years,” he said. “We’re going to learn a lot from this.”

Wildfire has threatened the Willamette Valley before. This time was different. The fires in the valley spread faster and grew more than most expected. They destroyed thousands of structures and killed at least five people.

Across Oregon, more than 40,000 people evacuated their homes. Half a million were under some level of evacuation alert. And the state experienced, by many accounts, its worst wildfire year in recorded history.

“We’ve been in and around wildfire on a number of occasions, but never anything like it was in those two days,” Bengtson

said. He has worked for USACE’s Willamette Valley project since 1993.

Hiner backs that up with historical data.

“There have been wildfires in the watersheds and adjacent to our reservoirs and dams in the past, but nowhere near — at least in the history of the dams — this magnitude,” he says. “The amount of acres burned is pretty remarkable when you look at historical fires in the past 50 to 60 years.”

With most unprecedented events, the experience has imparted some key lessons. In previous years, dam safety at Portland District hasn’t focused a lot of attention on wildfires, at least, not as far as seeing fire as a probable cause for a dam’s failure.

That’s likely to change.

“It’s just another potential scenario that we’ll have to consider in a little more detail than we have in the past,” said Hiner. “This experience will help us brainstorm different scenarios that we might want to think about when we do risk assessments.”

Bengtson agrees.

“We’re going to learn a lot from this,” he said. “Things we’ve speculated on before, but we have some practical experience now that will maybe take us in a different direction in terms of our contingency planning.”

# Portland District replaces part of USACE's 'unsung heroes' of navigation — king piles



Workers installing a king pile marker warning sign.

Story & photo by Jeremy Bell  
USACE, Portland District

A giant vibratory hammer pounds away at a 65-foot-long steel rod to help warn boaters that pile dikes are in the vicinity.

This \$2.1 million U.S. Army Corps of Engineers project to replace missing king piles, some of which have been in place since 1885, is part of a greater effort to repair pile dikes.

In total, boaters and barge operators will see 68 new king pile markers sporadically from Puget Island (river mile 41) to Multnomah Falls (river mile 136).

King piles mark the end and location of pile dikes to increase visibility for boaters. The tops of the USACE's pile dikes in the Columbia River are frequently just below the river surface during high water events and can seriously damage vessels trying to transit over them. Repairing missing safety markers is the priority for pile dike maintenance.

"This job is all about marking them for safety," said Matt Joerin, Portland District project engineer. USACE partnered with the U.S. Coast Guard and boating safety groups to improve safe navigation around pile dikes and increase public awareness. Pile dike locations are shown on publicly available NOAA navigation charts and USACE hydro survey charts. (<https://charts.noaa.gov/OnLineViewer/18524.shtml>)

"The fact that the pile dikes themselves could be a potential danger if you are not aware of them, and the water is often high enough that you cannot see them, makes the project a priority," said Tom Conning, Portland District spokesperson.

Also known as wing dams, the century-old sentries are made of alternating vertical timber piles running perpendicular to the river. The underwater dam structure slows the water's flow near the shore and pushes faster flowing water toward the center of the channel. Their design reduces dredging requirements, increases channel stabilization and bank protection to keep the river channel in shape and prevent navigation-blocking sand bars from forming.

"By affecting the velocity of the river flow, you are helping keep sand on the shoreline and you are helping to prevent sand from depositing in the channel at the same time," said Jessica Stokke, Portland District project manager.

Pile dikes play an important role in USACE's equation to keep the Columbia River navigation channel in shape and free of sand bars by reducing the amount of dredging necessary to keep the river usable by large ships.

"(Pile dikes) are like unsung heroes out there working every single day to help us maintain the navigation channel," Stokke said.

# Team assesses environmental impacts of Old Timbers Lake Dam

By Shatara Riis  
USACE, Louisville District

***“It is important for the Army to evaluate potential impacts and avenues to mitigate effects in order to make informed decisions.”***

**- Sandy Gruzesky**

The U.S. Army Corps of Engineers, Louisville District is currently working with U.S. Army Environmental Command to assess the environmental impacts associated with the Old Timbers Lake Dam at Jeffersonville Proving Ground in Indiana.

The Old Timbers Lake Dam has been classified as a high hazard dam; therefore, some action is required to reduce the hazard classification and to comply with Army and state of Illinois dam safety regulations.

As the dam no longer serves any mission purpose for the Army, the Army is looking at several options and their associated impacts, including reducing its impounding capacity, modifications to the dam, or removal of the dam.

According to Sandy Gruzesky, Louisville District environmental engineer, “OTLD does not meet Indiana, nor Army Dam Safety Management Program dam safety standards, and it does not function to support any U.S. Army mission requirements.”

“The project is to develop an Environmental Impact Statement to analyze the effects to human health and the environment that may result from removing the dam or reducing its water impounding capacity,” she said.

According to the Environmental Protection Agency, federal agencies prepare an EIS if a proposed major federal

action is determined to significantly affect the quality of the human environment.

“It is a document required by the National Environmental Policy Act for certain actions significantly affecting the quality of the environment,” Gruzesky said. “It describes the positive and negative environmental effects of a proposed action, and it usually also lists one or more alternative actions that may be chosen instead of the action described in the EIS.”

Old Timbers Lake supports significant biodiversity, which may be identified as threatened or endangered by the Endangered Species Act or by the Indiana Department of Natural Resources.

According to Gruzesky, the EIS will look at the potential impacts of removing the dam or reducing its impounding capacity to the biodiversity that Little Otter Fork and Old Timbers Lake Dam support.

The dam currently limits the release of sediments and contaminants to Little Otter Fork that are present within the watershed. Additionally, bald eagles and other migratory birds have been observed at Old Timbers Lake.

Thus, it is important for the Army to evaluate potential impacts and avenues to mitigate effects in order to make informed decisions, Gruzesky stated.

“While the removal of the dam will not impact military missions, it may impact recreational opportunities, such as fishing within the Big Oaks National Wildlife Refuge,” Gruzesky added. “The dam does not serve as a water supply nor a flood retaining structure.”

According to Gruzesky, the team is evaluating environmental impacts using various studies of current lake and stream conditions, along with hydraulic modeling associated with a controlled dam breach. Lake sediment was sampled and analyzed for explosives, pesticides and metals. Stream hydraulics will be evaluated to anticipate transport of sediment and how downstream habitats are affected as well as any safety concerns regarding flooding. Impacts to specific bird species are also investigated in accordance with the Endangered Species Act, Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act.

After the studies are completed, a Description of Proposed Action and Alternatives will be provided to the public and public input sought in order to further evaluate alternatives and inform future decisions. The public will have an additional opportunity to comment after the Environmental Impact Statement is drafted.



*(Photo by Sandy Gruzesky)*

*The environmental team samples for benthic macroinvertebrates. Benthic macroinvertebrates are small aquatic animals and the aquatic larval stages of insects. They include dragonfly and stonefly larvae, snails, worms and beetles.*

# Science and engineering efforts address permafrost, support readiness

By Dr. Tom Douglas  
ERDC, Cold Regions Research and Engineering Laboratory

**F**undamentally, permafrost exists in earth's cold regions. This includes 22.8 million km<sup>2</sup> (or approximately one quarter) of the northern hemisphere's land area, large expanses of the shallow parts of the Arctic Ocean, and many alpine regions of the world.

Most of the Earth's permafrost formed during the Pleistocene, a period of colder temperatures than the present, and consequently, global climate warming threatens the existence of permafrost in many regions of the world.

Earth's high latitudes are warming at greater rates than anywhere else. Permafrost in regions of Alaska, Northern Canada, and Siberia is particularly vulnerable, with borehole temperature measurements taken from across the arctic documenting a widespread warming of permafrost is already underway in these regions.

The Department of Defense recently updated their Arctic Strategy (June 2019). It identifies DOD's desired end-state for the region as one that is secure and stable, where national interests are safeguarded, the homeland is protected, and nations work cooperatively to address key challenges.

Towards this end-state, DOD will look to evolve its infrastructure and capabilities to keep pace with the changing physical environment. This will involve acquiring the ability to predict the extent and nature of change, within an acceptable level of uncertainty, and to adapt to this change through innovative planning, design and construction practices.

To continue supporting existing and expanded operations in the arctic and sub-arctic regions, cost-effective means are needed to both identify ground state condition and construct vertical and horizontal infrastructure on ice-rich terrain.

In some areas, infrastructure must be retrofit where permafrost has become or soon will become unstable. In other places, new technologies to address the ground thermal state, combined with new tools to measure

subsurface conditions, will support resilient construction projects.

Since the 1940s, science and engineering efforts led by the U.S. Army Engineer Research and Development Center (ERDC), Cold Regions Research & Engineering Laboratory, into the impacts of thawing permafrost on infrastructure, have benefited the federal government and the public.

The U.S. Air Force recently initiated a multi-billion-dollar effort to bring F-35s to Eielson Air Force Base near Fairbanks, Alaska.

In support of this major undertaking, ERDC provided measurements of permafrost characteristics, helped site and design decision-making, and participated in efforts to ensure contaminated sediments were adequately treated.

Additionally, the U.S. Army at Fort Wainwright is actively expanding their training land and facilities to include new roads, fire breaks, winter and all-season river crossings, and new targeting facilities.

ERDC has supported this with repeat imagery analyses to quantify locations of landscape and hydrologic changes and performed more than 30 km of geophysical measurements along fire breaks and road routes.

Since most of this ongoing and planned infrastructure is located on discontinuous permafrost, there is an increasing need to develop accurate stand-off assessments of current and future landscape conditions.

ERDC has started to address this by combining geostatistical analyses with boreholes and subsurface information to key permafrost geomorphologic condition with geophysical characteristics.

Planned infrastructure and environmental remediation efforts along the Alaskan arctic coast, at legacy DOD sites, as well as in other analogous denied locations, require standoff assessments of ground ice content and associated geotechnical properties to inform engineering designs and practices.

To support these needs, ERDC engineers are developing the iFROST Mapper, a UAS-based geophysical platform that will hopefully decrease costly and time-consuming needs of drilling and ground-based geophysics.

It is anticipated that the technologies being developed by ERDC can decrease site



Entrance to the Permafrost Tunnel. (Photo courtesy of CRREL)

assessment costs, promote applications of unique infrastructure solutions, and increase Soldier safety by providing next generation tools to support mobility needs across ice, snow, permafrost and actively thawing ground.

To meet the above described challenges, continuing advancements are needed in critical

to support engineering applications.

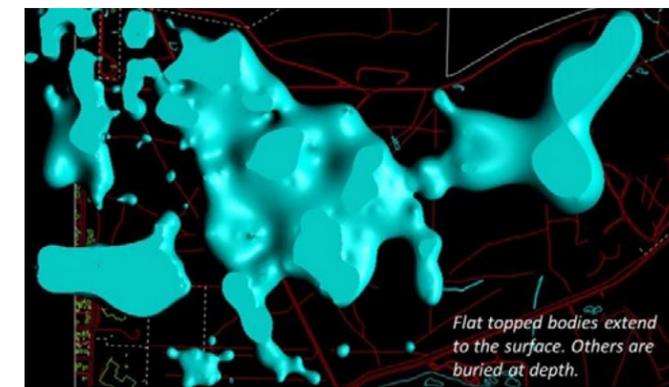
ERDC's ability to address military and civilian infrastructure needs across the arctic and sub-arctic regions, i.e., to model current and future permafrost ground state conditions, is greatly enhanced by a single unique national asset — ERDC's Permafrost Research Tunnel.

Located in Fox, Alaska, about 8 miles (13 km) north of Fairbanks, the Permafrost Tunnel has been used for more than 55 years to study permafrost, geology, geotechnical engineering, ice science, mining and construction techniques specific to permafrost environments.

Currently, the tunnel is undergoing a significant expansion that is adding hundreds of feet of new research tunnel with concurrent upgrades to the supporting electrical, refrigeration and air quality/

safety systems.

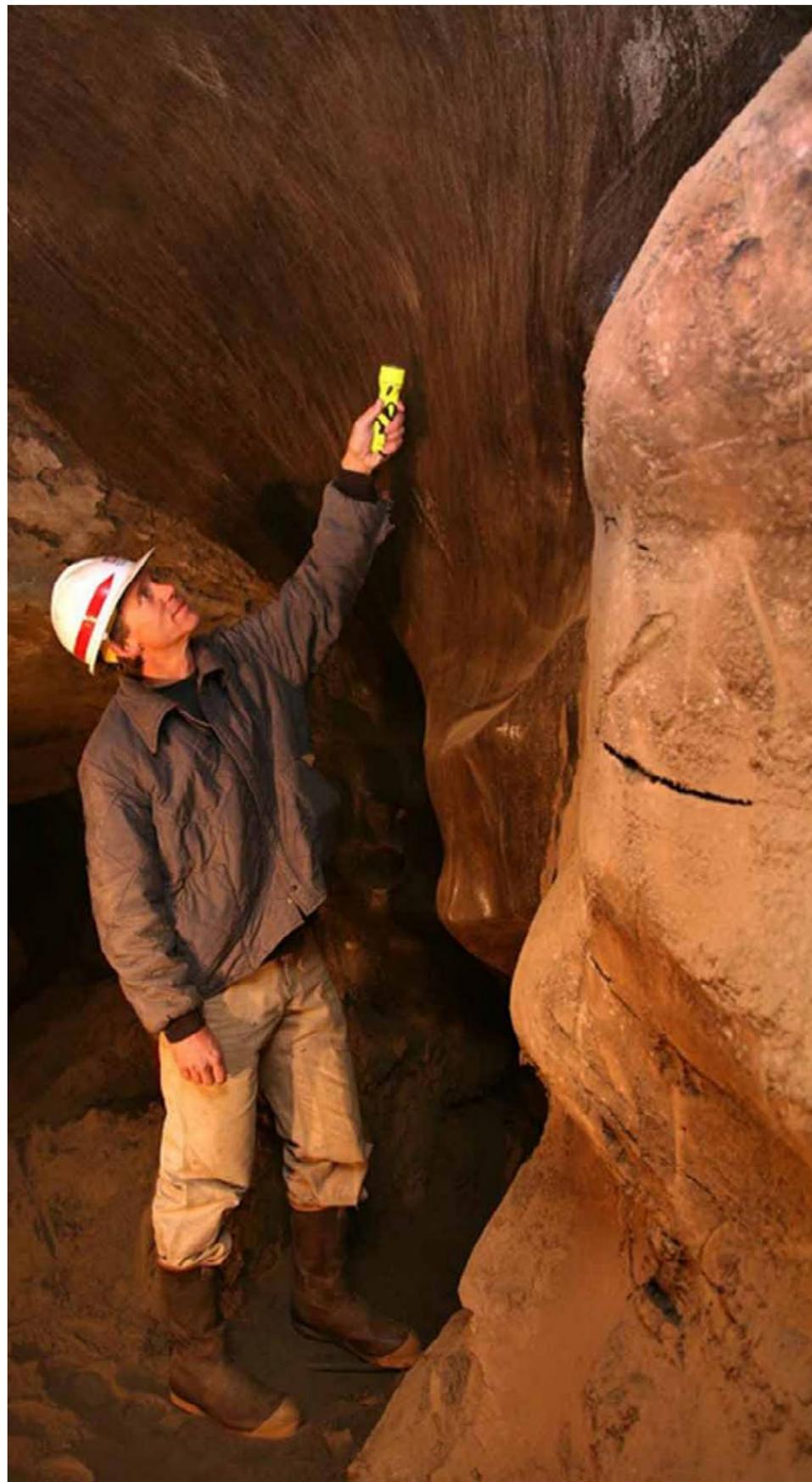
When complete, the expansion will transform the tunnel into a three-dimensional permafrost test bed that will further enable USACE to meet the needs of the Army, DOD, and the nation as it faces evolving challenges in Arctic and sub-arctic regions.



(Photo by Steve Arcone)

**The presence, absence and thermal state of massive ice bodies (vertical wedges and horizontal lenticular ice) versus ice cemented frozen ground is the main challenge in siting and designing infrastructure in permafrost terrains.**

areas of research that include: improving standoff detection technologies and subsurface geophysical methods for characterizing permafrost extent, enhanced forecasts of permafrost fate in response to warming air temperatures, and the continued development of accurate models of permafrost heterogeneity



(Photo by Marie Darling)

A CRREL researcher studies an ice wedge, one of numerous massive ice features in the tunnel.

## Just Another Day in Paradise

### A conversation with Jim Day, fisheries biological technician at Dalles Lock

**By Amber Tilton**  
USACE, Portland District

Meet Jim Day. Based on his career, he could have been a fish in his previous life. He follows salmon migration patterns, migrated from freshwater hatchery work with the Oregon and Washington departments' of Fish and Wildlife, to ocean fisheries with the National Marine Fisheries Service, and eventually returned to the freshwater of the Columbia River to join the U.S. Army Corps of Engineers.

#### What's your most memorable experience?

My time with the Peace Corps in the Philippines and at Prince William Sound hatchery in 1989 during the Exxon Valdez oil spill.

#### How long have you worked at Dalles?

I started with USACE in 2015 as a park ranger and then in 2018, I transitioned into the fisheries office.

#### What motivates you to work?

After years of working on biological problems, I recognized that many of the solutions must be engineered, and it's refreshing to work with people who have the ability and desire to make those solutions happen.

For example, take the attachment point for avian lines. These lines deter birds from eating juvenile salmon as they migrate through the sluiceway. The sluiceway is a crucial fishway that diverts fish moving downstream away from the turbine intakes. The avian lines deter gulls from picking up young salmon momentarily

disorientated at the surface by the ride through the sluiceway.

Avian wires work well and are a low-cost, low-energy solution. Part of my job is to inspect and repair the lines, make recommendations for removal and/or install more.

#### Describe your work as a volunteer firefighter.

I first volunteered with the Juniper Flat rural fire district near Maupin, Oregon, in 2011 while working at the Oak Springs hatchery. The need to protect the hatchery with active firefighting was very evident. I continued there until I moved to High Prairie in 2013. Now, I volunteer for the High Prairie Fire and Rescue District 14 in Klickitat County, Washington.

#### What motivates you to volunteer?

Respect. The Latin root literally means to "look again." Volunteering for the fire department means when I drive through my community, I can find inspiration in the specific houses, barns and lives that were saved by what I have done. This is very emotionally rewarding as well as socially fulfilling.

#### What resources do you protect?

At work, I try to minimize the impact of the dam on migratory fish and other wildlife using technology. I do the same with my volunteer efforts. Fire can damage engineered solutions severely and many of our wildlands are in fact engineered and managed. The discrete boundaries between USACE project lands and adjacent wildlands are not respected



*(Courtesy photo)*

*Jim Day, fisheries biological technician inspects avian wires at The Dalles Lock and Dam.*

by fire and must be met with active controls. In addition, the Firewise program at High Prairie is a project that removes vegetation around homes and barns and encourages replanting healthy trees away from buildings.

#### What are some engineered solutions we can do?

Tree planting is probably the most important thing we earthlings can do to help the fish.

Salmon spawning beds are vulnerable to siltation from erosion after a fire. By planting trees, keeping them healthy and thinned, we greatly reduce the severity of fire when it does happen, reducing the impact of erosion and runoff into streams.

#### What do fish and fire have in common?

Migratory fish in the Northwest are very dependent on the adjacent forest and scrub lands. Unplanned fire resulting from human impacts globally and locally will likely have very negative impacts on fish, the ecology and all of us. Fire volunteers are thinking globally and acting locally.

Both at work and in my home community, I have to respond to emergencies, so what I do, or don't do, affects everyone around me.

Fortunately, USACE has been very supportive of my volunteering with the High Prairie Fire District.

As my wife says, "Just put the dam fires out."

# ERDC researcher impacts international contaminated sediment standards

By Holly Kuzmitski  
U.S. Army Engineer Research and  
Development Center

When Dr. Burton Suedel, a research biologist with the U.S. Army Engineer Research and Development Center's Environmental Laboratory (ERDC-EL), heard about the ASTM International project to develop a guide for risk-based corrective action for contaminated sediment sites, he saw it as an opportunity for the U.S. Army Corps of Engineers to inform international contaminated sediment standards and policy.

Suedel was recognized with ASTM's Distinguished Service Award, Oct. 28, 2020, for leading this diverse group of individuals from public companies, trade groups, government agencies and environmental consultancies and bringing the four-year project to completion.

"I was completely caught off guard and humbled by being recognized by ASTM," Suedel said. "The work itself is its own reward, and if someone recognizes your effort, that's the icing on the cake. We started with over a hundred people four years ago and ended up with a smaller group. I was one of two people who took a leadership role in bringing the guide to publication."

The management of contaminated sediments is a national and an international issue in both urban and rural water bodies. Until now, there was no clear and comprehensive standard guide that was easily referenced and universally accepted for sediment corrective action in both small and mega sediment sites.

"Contaminated dredged material management costs USACE hundreds of millions of dollars every year; consequently, the development of this standard guide has significant implications for how these sediments are managed," Suedel said. "The improved management of contaminated dredged sediment will save USACE

millions of dollars in dredging management costs in the future."

"It takes a leader to bring a diverse group like this to a consensus on international standards," said Dr. Beth Fleming, deputy director of ERDC. "Burton demonstrated how effective he is in this and other roles on behalf of



(USACE courtesy photo)

*Dr. Burton Suedel, a research biologist with ERDC's Environmental Laboratory, was bestowed ASTM International's Distinguished Service Award Oct. 28, 2020, by ASTM International for leading a diverse group of individuals from public companies, trade groups, government agencies and environmental consultancies to develop a guide for risk-based corrective action for contaminated sediment sites.*

ERDC and USACE."

The funding for Suedel's effort came from the Dredging Operations Technical Support program. "This is well within the DOTS wheelhouse," he said. "The guide was about developing an applicable and consistent standard

of practice for managing contaminated sediment in a manner that is broadly protective of the environment. DOTS supports subject matter experts and provides technical expertise on dredging and navigation to help inform policy."

Suedel has represented USACE in the World Association for Waterborne Transport Infrastructure (PIANC) as well; he is the principal U.S. representative to PIANC's Environmental Commission.

Suedel's history and experience with corrective action standards made him a likely candidate for a leadership role in the ASTM effort; he worked on another ASTM project while employed in an environmental consulting capacity throughout the mid-to-late 1990s. The current guide built on those previous standards.

"The starting point for the current guide is risk-based, corrective action, or RBCA," he said, pronouncing the acronym as "Rebecca." "Risk assessment, which is its own discipline, risk management and corrective action are the underlying framework of RBCA. All RBCA standards have to have those three attributes."

He described how ERDC-EL's Dr. Paul Schroeder played a significant role in the ASTM project as well, because of his contaminated sediment management experience from an engineering perspective.

"Paul has 30-plus years of experience there, and that expertise came in handy," Suedel said. "Paul played a meaningful role throughout the four years, which says a lot about his commitment to the cause."

Thinking about the project within the context of ERDC's relationships with other organizations, Suedel said, "Our expertise in the area of assessing and managing contaminated sediment risks enhances our capabilities to support USACE field operations and expands collaboration opportunities with our cooperative research and development agreement partners."

## In harm's way: Kyle Anderson goes above and beyond

By Amber Tilton  
USACE, Portland District

Kyle Anderson, electrician at Lookout Point Dam and volunteer firefighter in his hometown of Pleasant Hill, Oregon, understands the risks — perhaps more than most — of electrical-caused fires and wildfires.

He's seen what can happen when power lines break, or trees and limbs get knocked into them and start fires, which is one of the possible causes for the fire that started near the Holiday Farm RV Park early Labor Day morning in the McKenzie River Valley.

Anderson was at the Pleasant Hill-Goshen Fire and Rescue station, on standby, like many other emergency first responders. The foreboding weather forecast of high winds and low humidity, combined with an already dry season was a trifecta for extreme fire conditions.

### Call to Duty

Anderson is no stranger to worst-case scenarios. With nine years of experience as a volunteer firefighter and emergency first responder, he is one of a few respond-from-home volunteers left in the Pleasant Hill - Goshen Rural Fire Protection District.

"The hard part of volunteering in the community where you're from is that you know someone on every street, so when you get a call, you wonder who it's going to be," Anderson said.

"You do it so someone else doesn't have to," he said. "A professor once told me, 'Those who can, should,' and that always stuck with me."

As a first-responder, Anderson says he has to live his life a little differently and explains, "If you don't have things set up, planned, equipment in good working order, you won't be available to report to work or an emergency. The public is counting on us to get it done whether the world is falling apart around us or not."

### Power to Protect

Not only does the fire district Anderson volunteers for protect his hometown, but it also protects U.S. Army Corps of Engineers' employees and projects,



(U.S. Army photo)

*Kyle Anderson stands in front of equipment used to clear debris from highways and side roads caused by the Holiday Farm wildfire.*

including Fall Creek, Blue River, Cougar, Dexter and Lookout Point dams.

Additionally, as an electrician, Anderson's safety skills are always in play.

"What I do at work and how I do it affects the well-being of everybody downstream and down the line," he said. "Early in my career when I was wiring houses, the need to provide for safety and reliability hit me early. It was not lost on me that another young family would be tucking their children into bed in some of these rooms. They would be trusting my work on those power circuits and smoke detectors."

### Mission to Lead

Given his knowledge and experience, it came as no surprise that the district fire chief recommended him to manage a highway task force with the Oregon Department of Forestry in response to the out-of-control Holiday Farm wildfire.

During the course of 21 days, Anderson oversaw three to six crews with up to 44 people in total, including heavy equipment operators, line crews and flaggers — men and women dedicated to keeping the highway and other roads clear of hazard trees, boulders and falling debris. They used

timber fallers and processors, brush rigs, excavators, low-boys, front end loaders, skidders and pickups to open and maintain access to structures like radio towers and USACE projects.

"My unique position helped to keep open and maintain access to our projects. I let operations know just how important those 'non typical' structures within the fire footprint are to the public," he explained.

At one point in the fire fight, Anderson's team inherited the responsibility of structure protection.

"You have to think on your feet as frequent critical missions pop up," he said. "You get real honest about what's a priority and what's not. It was hazardous and dangerous work and my team did great."

### 'Road Group Anderson'

"The command people made me feel like a rock star! They were happy to meet me and see who they'd been talking to," said Anderson. "They hadn't realized I'd been engaged on the fire since the day it started. I hadn't realized I'd been on the radio so much, but I guess I was!"

"They said I was 'the glue that held the whole highway operation together' and they were happy to have me on the team.

"None of that would have happened without the support of USACE," he added. "They were grateful the Corps supported me during the fight, because a change in leadership halfway through would have set things back considerably."

### Lessons Learned

"First and foremost, live prepared. It's just like that little mask in an airplane which drops out when there's trouble. You can't be an asset to anyone else if you don't have yourself and your family taken care of first," he said. "Everyone can make a difference when there is trouble, if they're ready and available. Even if you're not required to do anything initially, you will save resources that can be used to help solve the problem for others."

"Second, defensible space around buildings and homes is a big deal," he added. "It's not a guarantee, but it gives us a chance, and it helps prevent bad luck on your property from spilling over into your friends and neighbors' lives."

# SALUTES

## U.S. Army Environmental Command

**Name:** Janet Kim

**Position:** Deputy to the Commander

**Retirement date:** January 2, 2021

**Contributions:** Throughout her 40-year career, Kim served as an environmental engineer and as a technical authority and lead for strategic planning, implementation of performance-based acquisition for environmental cleanup, and deployment of Lean Six Sigma to transform business processes. She served three details at the Pentagon, two in the Army's Base Realignment and Closure Office and one in the Office of the Deputy Assistant Secretary of the Army (Environment, Safety and Occupational Health) as well as details to the Massachusetts Military Reservation Joint Program Office and as the U.S. Army Environmental Command's representative on the Army Installation Management Transformation Task Force.



Janet Kim

## U.S. Army Environmental Command



David Mays

**Name:** David Mays

**Position:** Team Lead, West Division

**Retirement date:** November 30, 2020

**Contributions:** In his final position with the U.S. Army Environmental Command, Mays provided leadership and technical expertise for the Army's environmental support managers in EPA Region 10, Korea and Japan. Throughout his career he has served as a chemical engineer, environmental engineer and environmental protection specialist with the U.S. Army Materiel Command, the U.S. Army Installation Management Command, U.S. Army Europe and the Base Realignment and Closure Office.

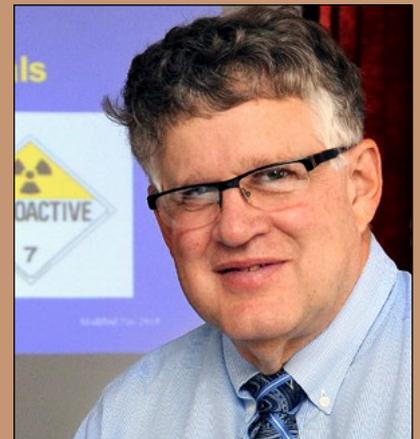
## U.S. Army Engineering and Support Center, Huntsville

**Name:** Richard J. Waples

**Position:** Regulatory Specialist

**Retirement date:** January 29, 2021

**Contributions:** During the course of his 36-year career, Waples has protected human health and the environment through his nationwide support to USACE cleanup and environmental compliance programs. A particularly noteworthy accomplishment is his support to the Formerly Utilized Remedial Action Program (FUSRAP) for which he instructed training on proper management, shipping, and disposal of radioactive waste.



Richard J. Waples

## Northwestern Division Military Integration Division

**Name:** Jane "Deb" Kobler

**Position:** Senior Program Manager

**Retirement date:** December 31, 2020

**Contributions:** Kobler's strategic thinking and operational expertise have been major factors in numerous environmental successes of the enterprise. Accomplishments include co-chairing the Contract Acquisition Working Group, developing concepts to adopt and streamline the Multiple Environmental Government Acquisition tool, and working tirelessly to foster communication and cooperation on a regional- and an enterprise-wide basis.



Jane "Deb" Kobler