Volume 1 No. 2 **May 2020**

FRM BUZZ NEWSLETTER

Reducing Flood Risk: Many Partners, One Team

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US Army Corps of Engineers

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FRM BUZZ NEWSLETTER

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To develop and implement a long-lasting solution for this problem area, the County has partnered with the U.S. Army Corps of Engineers (USACE) under the Floodplain Management Services Program to use newly developed tools to model debris flow on the creek.

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2020 Interagency Flood Risk Management Seminars a Success for FRM and Silver Jackets Members

By Mark Roupas, Deputy Chief, Office of Homeland Security

Mark Roupas, deputy chief of Homeland Security, USACE, opens the seminar. (USACE Photo)

The 2020 Interagency Flood Risk Management (FRM) Seminar was held in St. Louis, Missouri, February 24-28. The seminar was intended to bring together those involved with FRM and Silver Jackets (SJ) and learn from one another on how to be successful in FRM given a changing environment. Overall, the seminar was a huge success and allowed for interagency interaction and learning from one another's FRM lessons learned and successes.

There were 224 participants in attendance during this seminar. Even though participation from state partners was unexpectedly limited, there was still a great turnout and array of participants with 57 percent from USACE, 11 percent representing the states, and 22 percent from other federal agencies. The remaining 10 percent represented communities, university, and non-governmental organizations.

Half of the first and second days of the seminar was dedicated to an internal USACE meeting, giving USACE FRM and SJ members the opportunity to get together as a team. One hundred twenty-eight USACE representatives were in attendance from district and division offices, the Hydrologic Engineering Center, the Engineer and Research Development Center, the Institute for Water Resources, and Headquarters. A variety of disciplines in attendance provided a great opportunity to coordinate with internal programs and share policy changes and experiences to help one another to have continued growth and success in FRM and SJ.

Mark Roupas, deputy chief, Office of Homeland Security, USACE HQ, welcomed the USACE participants and discussed the impacts of current initiatives within the National Flood Risk Management Program (NFRMP) and the Office of Homeland Security on the USACE flood risk management mission, providing context on the importance of the NFRMP.

The USACE sessions included an MSC regional group exercise which focused on mechanisms to accomplish and communicate program measures of success, strengthen internal partnerships around the life-cycle to offer more comprehensive FRM solutions, and monitor execution of program funds to ensure NFRMP goals and objectives are being accomplished.

"A variety of disciplines in attendance provided a great opportunity to coordinate with internal programs and share policy changes and experiences to help one another to have continued growth and success in FRM and SJ."

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The second half of day two began the interagency portion of the seminar. Topics covered in these sessions included opportunities to break the "damage-rebuild" cycle and how interagency collaboration can accomplish this; new policy changes related to FRM; team exercises to work together through FRM challenges; new technology and practical application of data, models, and tools; bringing people into the FRM equations; and many other valuable topics throughout the week.

There were many sessions that discussed using technology and innovation with collaboration for success in FRM. One example of this innovation was a virtual reality (VR) experience by FEMA called IMMERSED. The VR allowed users to experience a real-world scenario from the perspective of a community leader in a flood-affected town.

Another excellent opportunity for collaboration and learning about others' technology was the Interagency Café. The Interagency Café allowed teams to identify Subject Matter Experts they would like to learn more from in order to better support their efforts. Teams explored the variety of partner programs, resources, and technical expertise available to tackle interagency FRM challenges.

This seminar was a huge success and brought a wealth of information to all participants. Thank you to everyone who attended, presented, and shared experiences.

In closing, please remember the why of this seminar: to unify new and continuing flood risk management team members; promote repeatable and achievable successes in flood risk management; and to enhance capability to deliver integrated and adaptive approaches to flood risk management by breaking the cycle. I believe that this Training Seminar offered excellent opportunities for our community to accomplish all three of these goals.

Interagency Café interaction (USACE Photo)


Demonstration of FEMA's virtual reality experience (USACE Photo)

"One example of this innovation was a virtual reality (VR) experience by FEMA called IMMERSED. The VR allowed users to experience a real-world scenario from the perspective of a community leader in a flood-affected town."

USACE Evaluates the Effectiveness of Coastal Storm Surge Barriers to Mitigate Back Bay Flooding in New Jersey

By Mary Cialone, Greg Slusarczyk, and Norberto Nadal-Caraballo, USACE Engineer Research & Development Center, Coastal and Hydraulics Laboratory; Rob Hampson and Laura Bittner, USACE, Philadelphia District

The back bays of New Jersey front areas that include communities with low-lying homes and multi-story dwellings as well as schools, hospitals, roads, bridges, and other critical infrastructure that are vulnerable to coastal storm hazards as was demonstrated during Hurricane Sandy (2012). A total of 137,309 structures were damaged during that event, resulting in $4.5 billion in damages within the New Jersey Back Bay (NJBB) counties (NJDEP 2015). The region also has natural ecosystems (barrier islands and back-bay marshes) that front tidally-influenced estuarine and bay waters that are susceptible to coastal storm surge inundation and waves. The bays are hydraulically connected and vary in size, orientation, and number of inlet openings resulting in a complex, dynamic system that makes the prediction of storm surge response to approaching storms more difficult. Following Hurricane Sandy and the congressionally-authorized North Atlantic Coast Comprehensive Study (NACCS) (USACE 2015), the NJBB region of interconnected tidal water bodies was identified as one of nine high-risk areas susceptible to future flooding that required further in-depth analysis. Therefore, the NJBB Coastal Storm Risk Management (CSRM) Feasibility Study was initiated by the U.S. Army Corps of Engineers Philadelphia District (NAP) and the New Jersey Department of Environmental Protection (NJDEP) to assess NJBB flooding that affects population, critical infrastructure, property, and ecosystems and to evaluate measures to reduce damages from coastal flooding. Part of the NJBB CSRM study plan developed by the NAP Hydrologic, Hydraulic, and Coastal section is to evaluate structural storm risk management alternatives such as storm surge barriers. The plan includes

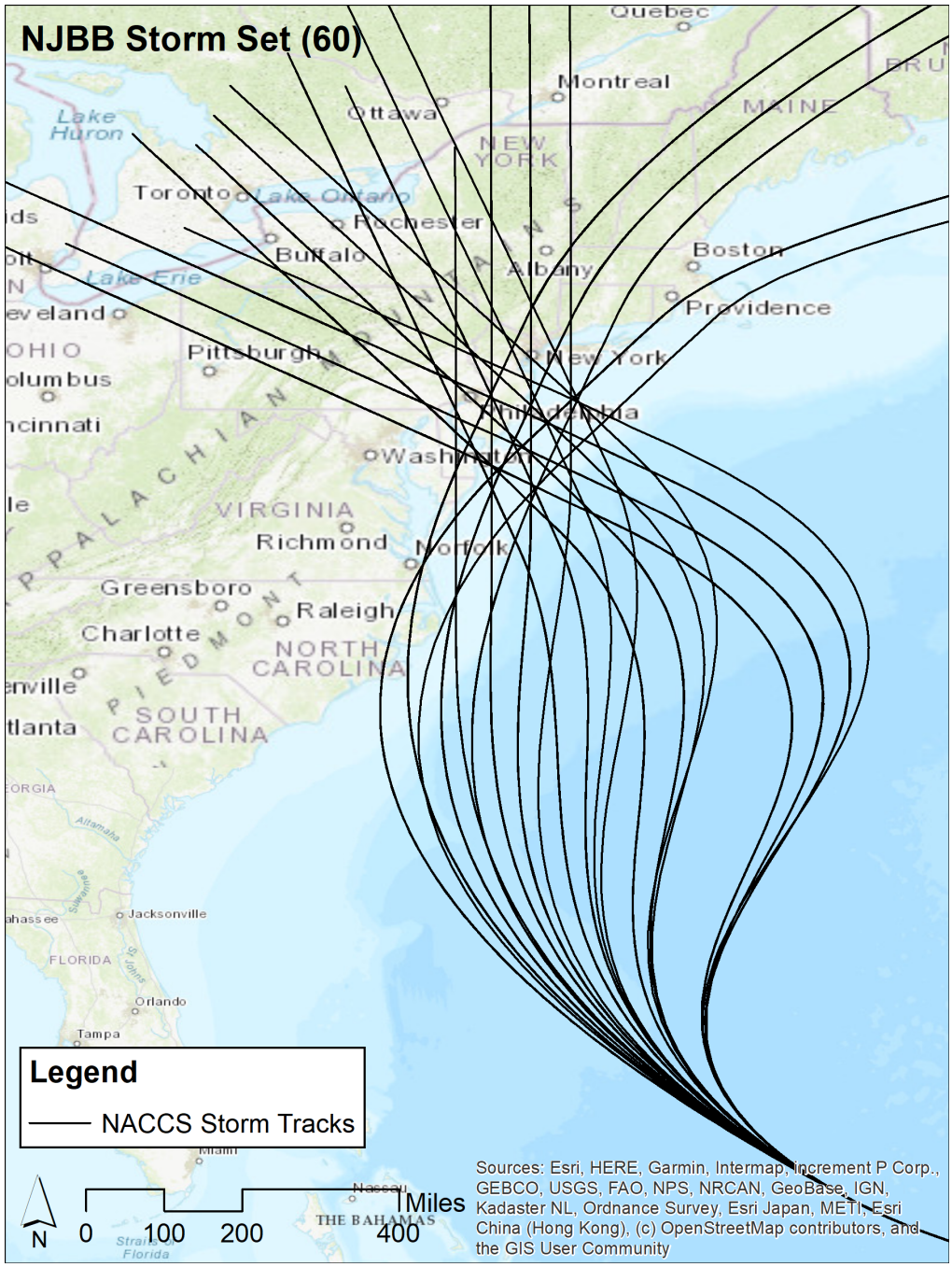

Figure 1. Storm tracks for 60-reduced storm set applied in the NJBB Study selected by from the 1050 full storm set from North Atlantic Coast Comprehensive Study (NACCS) in the Coastal Hazards System (CHS). (Slusarczyk et al. 2019)

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numerically simulating storms with and without storm surge barriers in place, in order to evaluate their effectiveness in reducing the magnitude and frequency of back bay flooding. The ability to numerically simulate a range of storm conditions provides the needed information for evaluating storm surge response to future events and ultimately optimizing the timing of inlet closures with surge barriers. The USACE Engineer Research & Development Center (ERDC) conducted the numerical modeling study.

This storm surge barrier numerical modeling study is one of many studies being conducted along the North Atlantic Coast of the United States that is taking advantage of the comprehensive coastal storm modeling and quantification of coastal storm hazards that were conducted as part of the NACCS (Cialone et al. 2015; Nadal-Caraballo et al. 2015). (The NACCS modeling included 1050 synthetic tropical cyclones and 100 extratropical storms that were simulated using the Coastal Storm Modeling System's coupled hydrodynamic (ADCIRC) and wave (STWAVE) models. The joint probability of the water level (and wave) response to these storms was used to develop hazard curves which have been incorporated into the Coastal Hazards System (CHS).) The present study included additional statistical analysis to select a subset of the NACCS storms impacting the NJBB area. Using Gaussian process metamodeling (GPM) and a design of experiments (DoE) approach, ERDC selected a subset of the NACCS synthetic tropical cyclones to maximize coverage of the probability space with storm parameters that produce storm surges across the NJBB region while reducing the hydrodynamic modeling requirements. An initial testing set of 10 storms and a more robust set of 60 storms were selected for modeling in order to complete the frequency distributions of response for both the existing conditions and with surge barriers in place. Modifications were then made to the NACCS numerical

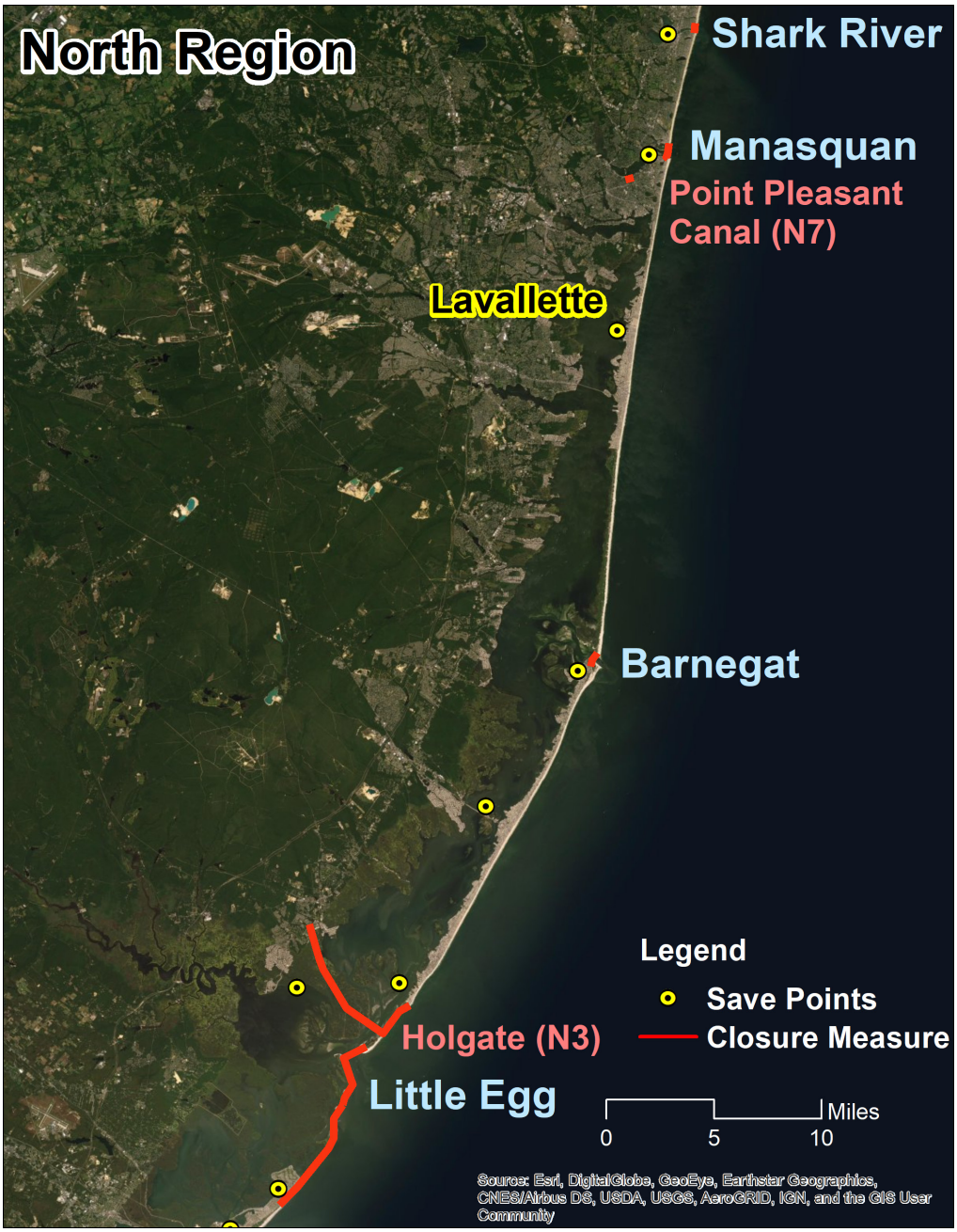

Figure 2. Location map for North Region closure combinations and NACCS save point locations. (Slusarczyk et al. 2019)

model to represent the surge barriers in the model domain. In addition, areas beyond the region of interest (such as Chesapeake Bay and Long Island Sound) were modified to reduce resolution (referred to as "de-refining") and simulation time, while maintaining the flow volume exchange from the distant locations to the area of interest.

The initial set of 10 storms was used to evaluate the influence of individual surge barriers on water levels in the bay compared to a base condition with no closure in place and provide information to guide the selection of combinations of surge barriers. From these initial simulations, it was found that individual closures can reduce back bay water levels, mainly in the bays closest to the closure location, but if other nearby "open" inlets allow flow into the bay then water level reductions are less significant. Thus, some individual surge barriers were effective at reducing water levels while others may perform better as part of a system of closures. From

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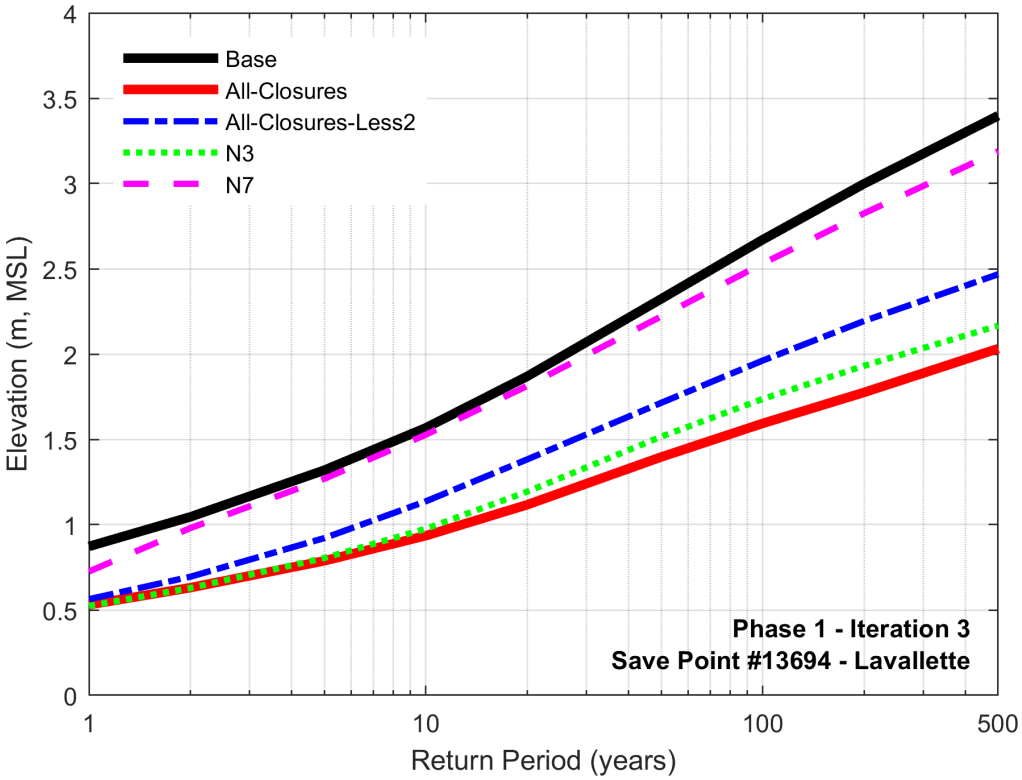

Figure 3. Hazard curve for Lavallette, New Jersey, generated by Norberto Nadal-Caraballo using a Gaussian process metamodel (GPM) trained with results derived from the 60 tropical cyclone reduced storm sets. (Slusarczyk et al. 2019)

these findings, a set of simulations that included 17 combinations of surge barriers were evaluated with the 10-storm suite and based on the evaluation of those combinations, a final select set of six surge barrier combinations were simulated with the full 60-storm suite. The six combinations focused on evaluating systems of closures including cross-bay closures while other combinations were designed to consider environmentally-sensitive estuaries near Little Egg/Brigantine, Corson, and Hereford Inlets. The numerical modeling results show that many of the closure combinations are effective at reducing back-bay water levels. Other combinations show considerable sensitivity to the storm characteristics (e.g., wind speed and direction) and could potentially increase water levels on the bayside of a surge barrier. Based on these findings, the final set of closure combinations was designed and selected for simulation to focus on the North, Central, and South regions of the study area.

For example, the North (N) Region was evaluated with five surge barrier and cross-bay closure combinations including: 1) the base condition with all inlets open; 2) all inlets closed; 3) all inlets closed except Little Egg/ Brigantine and Hereford and referred to as All Closed Less 2; 4) North Region 3 (N3) defined as having closures at Manasquan Inlet, Barnegat Inlet, and a cross-bay closure at Holgate; and 5) North Region 7 (N7) defined as having closures at Manasquan Inlet and a cross-bay closure at Point Pleasant Canal. These closure combinations were simulated with the 60-storm suite shown in Figure 1 and the results from the simulated suite were used in the development of the frequency distributions of response. Figure 2 focuses on the North Region of the study area and includes the location of the N3 and N7 inlet closures and cross-bay closures that were evaluated with the 60-storm suite. An evaluation of the hazards curves with the surge barriers in place was compared to the base-condition hazard curves at the locations shown in yellow in Figure 2. For example, the hazard curve for Lavallette (Figure 3) indicates that closure combinations can be effective at reducing peak still-water levels, which could likely reduce economic damages. N7 is nearly ineffective at reducing peak water levels, indicating that the Manasquan River has little influence on Barnegat Bay and at a minimum, closing Barnegat Inlet is necessary to reduce water levels. Closing other openings to the bay (as in the case of All Closed and N3) leads to the greatest potential reductions in peak water level from storms at this location. Note that this numerical modeling evaluation also indicated that surge barriers have the potential for blocking return flow from the bay to the ocean, depending upon the characteristics (wind direction and duration) of the storm. Timing of a storm in the tidal cycle could also factor into this negative impact of surge barriers. Therefore guidance on surge barrier operations (closing and re-opening) should take these factors into consideration.

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FEMA Helps Fund Dam Removal as Part of Innovative Public-Private Partnership

By Tony Mendes, FEMA Region 8

DENVER – Built in 1904, Rattlesnake Creek Dam played an integral part of the water supply for the city of Missoula, Montana. But at more than a century old, the dam is no longer in use and is a potential hazard to its environment and local community. Without its removal, the Federal Emergency Management Agency (FEMA) estimates Rattlesnake Dam could cause more than $6 million in damages if it failed.

To tackle a project this large, the City formed a partnership with external organizations, such as Trout Unlimited, the Watershed Education Network, and the Montana Department of Fish, Wildlife and Parks. They've worked together over the past several years to prepare the dam for its removal, and the public-private partnership successfully applied for several grants from Patagonia, Northwestern Energy, and FEMA.

FEMA's Hazard Mitigation Grant Program is funding more than $700,000 of the project that will go to the removal of the dam and the restoration and re-stabilization of the site. The program provides funds to states following a major disaster declaration, allowing them to fund projects that will minimize the impact of future disasters.

A bird's eye view of Rattlesnake Dam in Missoula. (Trout Unlimited)

The FEMA grant provides 75 percent of the needed funding to remove the dam, and the partnership has secured the remaining allocations. The City expects the dam to be officially removed during the summer of 2020.

Rattlesnake Creek Dam is just one example out of hundreds of other barriers that pose potential risks to local communities. According to the Association of State Dam Safety Officials, 70 percent of dams will be past their 50-year life spans by 2025.

"It's important to identify opportunities where partnerships can really strengthen local communities," said FEMA Region 8 Mitigation Division Director Jeanine Petterson. "We hope others see the potential and the power of public-private relationships, and that we can serve as an example to remove other aged dams and keep communities safe."

With the help of UC-Davis Center for Community and Citizen Science, the Rattlesnake Dam partnership will be turned into a model for future restoration efforts throughout the western United States. The Center works to build capacity for local groups to monitor watersheds before, during, and after dam removal through a grant from the Open Rivers Fund. The Rattlesnake Dam removal will be highlighted as a successful example in their final report to help others with watershed restorations.

Additional information about the project is available at www.rattlesnakedam.org.

2018 and 2019 Silver Jackets and Flood Risk Management Award Recipients

By JoAnn Combs, USACE Huntington District

2018 and 2019 were outstanding years for the Silver Jackets and Flood Risk Management communities. Nearly every state had an active team and numerous interagency projects creating collaborative solutions to manage flood risks. To acknowledge some of these amazing achievements, awards were presented to Flood Risk Managers of the Year, Silver Jackets Coordinators of the Year, and State Silver Jackets Teams of the Year for 2018 and 2019. Recipients provided observations from their experiences as successful members of the flood risk management community during the 2020 Interagency Flood Risk Management Training Seminar in St. Louis, Missouri. The individuals and teams recognized with these awards have exemplified goals and objectives of the programs and demonstrated their abilities to go above and beyond what is required.

2018 and 2019 Flood Risk Manager of the Year

The Flood Risk Manager of the Year Award recognizes outstanding individual efforts and contributions to flood risk management. The Flood Risk Manager of the Year is a member of USACE who has made outstanding contributions in advancing the goals and objectives of the Flood Risk Management Program.

The award recipient for 2018 is Mr. Marco Ciarla, who serves as a Project Manager for a variety of Floodplain Management Services and Silver Jackets efforts in Baltimore District. Mr. Ciarla is recognized for his technical abilities along with his ability to bring together internal and external partners to develop flood risk management solutions. He capitalized on existing resources while executing these activities by leveraging the expertise of four USACE districts and the National

Marco Ciarla, 2018 Flood Risk Manager of the Year.

Nonstructural Committee (NNC). His valuable work with the NNC allowed him to gain and bring back to his District, the knowledge and understanding of nonstructural flood risk management. Mr. Ciarla has also demonstrated commitment to supporting local communities, as well as state, local, and other interagency partners in meeting their flood risk management needs.

The award recipient for 2019 is Ms. Laura Ortiz, who serves as the Flood Risk Manager and Silver Jackets Coordinator in the Buffalo District. Ms. Ortiz is passionate about her contributions to these roles and has brought expertise established from a 30-year career with USACE. She has demonstrated and proven her dedication to working within her USACE teams, with state and local leaders, and with the general public to improve the understanding of flood risk and floodplain management. Ms. Ortiz also provides exceptional assistance to neighboring USACE districts, including the New York District, where she partners to co-lead the New York Silver Jackets team and serves as a USACE representative on the Ohio Silver Jackets team.

Mark Roupas presents Laura Ortiz with the 2019 Flood Risk Manager of the Year Award (USACE Photo)

2018 and 2019 Silver Jackets Coordinator of the Year Awards

The Silver Jackets Coordinator of the Year Award recognizes outstanding individual USACE efforts and contributions to a Silver Jackets team. The Silver Jackets Coordinator of the Year is a member of USACE who has made outstanding contributions in advancing the goals and objectives of the Silver Jackets Program.
The award recipient for 2018 is Mr. Brian Balukonis, formerly of the New England District. Mr. Balukonis was the USACE Silver Jackets Coordinator for five Silver Jackets teams and the support coordinator for the Vermont Silver Jackets team. He quickly became an extremely valued and well-respected member of the District and the NFRMP and made significant contributions to all teams that he coordinates. Through his highly effective coordination, the New England District Silver Jackets teams have either successfully completed or have underway a dozen interagency efforts, which have and will continue

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Brian Balukonis, 2018 Silver Jackets Coordinator of the Year.

to result in positive risk reduction for the partners and communities. Mr. Balukonis currently serves as an Infrastructure Systems RSF (IS-RSF) Field Coordinator in Puerto Rico under the National Disaster Recovery Framework. He is credited with successfully leading the initial plan formulation and cultivating stakeholder acceptance for multiple projects associated with USACE's IS-RSF FEMA support. Mr. Balukonis also served a prior detail in Puerto Rico during which he helped launch and support the Puerto Rico Silver Jackets program.

The award recipient for 2019 is Mr. Brian Rast, of the Kansas City District. Mr. Rast serves as the USACE Silver Jackets Coordinator for the Kansas and Missouri Silver Jackets teams and has made significant contributions to meeting the states' priorities for flood risk management in these roles. Mr. Rast has utilized the State Silver Jackets teams' webpages to effectively communicate the teams' partnership and interagency efforts and to keep past work readily accessible for reference. He has focused on building relationships between federal agencies to support the state teams, including co-facilitating a USACE-FEMA Partnering Meeting and establishing a Federal Partners Mitigation Workgroup. Mr. Rast readily shares his knowledge and expertise by conducting training sessions with

Mark Roupas presents Brian Rast with the 2019 Silver Jackets Coordinator of the Year Award (USACE Photo)

partners on floodplain management plans and nonstructural flood risk management approaches.

2018 and 2019 Silver Jackets State Team of the Year Awards

The Silver Jackets State Team of the Year Award recognizes an outstanding team that exemplifies the goal of effective flood risk management within the context of shared responsibility and that has demonstrated significant accomplishments in flood risk management throughout the preceding year. The award recognizes outstanding team efforts and contributions to optimize the use of federal resources and leverage state investment, prevent duplication among federal agencies, and produce results that save lives and/or reduce future damages, including through nonstructural projects and communication of risk. This award is unique because the winner is chosen through a peer voting process, during which only other state teams have the opportunity to vote on the team most deserving of the award.

The 2018 award recipient is the Montana Silver Jackets Team. The Montana Silver Jackets team serves the citizens and stakeholders of the State of Montana by bringing together federal, state, and local representatives and was recognized as a model for the nation. Through strong partnerships and dedication, the team's collaborative leveraging of advanced technical tools and resources has provided communities with accurate and easily communicable flood risk information. They have excelled in engaging with the public through outreach and communication efforts, providing leadership to improve existing processes, and collaborating with local officials. The Montana Silver Jackets team, along with the support from the Cold Regions Research and Engineering Laboratory, National Weather Service, and U.S. Geological Survey, developed a user-friendly cell phone app allowing the public to monitor and report ice jam conditions. The team also implemented the 'Highwater Mark Signage' public outreach campaign. The successful accomplishments of the Montana Silver Jackets team can be attributed to the active participation of the various team members and agencies involved.

The 2019 award recipient is the Maryland Silver Jackets Team. The Maryland Silver Jackets team serves the citizens and stakeholders of the state of Maryland by bringing together federal, state, and local representatives and is recognized as a model for the nation. The team has focused on providing community outreach and support, updating flood modeling and mapping, and empowering local communities. Several outreach efforts have been undertaken, including nonstructural floodproofing workshops and levee risk communication public meetings. These workshops and meetings have helped local communities better understand their flood risk and how to address it on their own and with partners at other levels of government. The Maryland Silver Jackets team has also provided significant assistance to the town of Ellicott City, which has experienced several devastating flash floods in the last few years. Recognizing the state's need for more "real time" flood

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inundation maps in watersheds without stream gages, the team has worked collaboratively to pilot a mapping tool aimed at creating inundation maps using the National Weather Service's National Water Model data. The successful accomplishments of this team can be attributed to the active participation by the many dedicated team members and agencies involved, demonstrating collaboration and shared responsibility in action.

Congratulations to all the award recipients who serve as models for the flood risk management community. Your work is greatly appreciated!

Worby MacNamee and Rachel Shrader receive the 2018 SJ Team of the Year Award from Mark Roupas on behalf of the Montana Silver Jackets Team. (USACE Photo)

The Maryland Silver Jackets Team receives the 2019 SJ Team of the Year Award. From left: Jason Stick, Stacey Underwood, Mark Roupas, JaLeesa Tate, Bob Pierson. (USACE Photo)

News on Tap: New York City Drinking Water

By JoAnne Castagna, USACE New York District

Drinking water safety has been in the news. A few years ago, the community of Flint, Michigan, struggled with lead contamination in its fresh water supply and more recently, residents of Newark, New Jersey, experienced the same.

What doesn't always make the headlines are the good things that are occurring concerning the public's drinking water.

Recently, employees from the U.S. Army Corps of Engineers, New York District completed four streambank management projects in Delaware County, New York, that are helping to protect the quality of New York City's drinking water.

Ensuring that stream banks are fortified is important. If a streambank is eroding, soil and storm water runoff - that may contain contaminates from nearby streets and land - can easily flow into the stream and adversely affect the water quality. These streams may eventually flow into reservoirs that supply fresh drinking water to the public.

In New York state, the Cannonsville and Pepacton reservoirs are two of several reservoirs that provide billions of gallons of water to New York City.

Several streams that flow into these reservoirs were eroding until the Army Corps restored them under its New York City Watershed Environmental Assistance Program.

"This program funds projects that are protecting the water quality of New York state's watersheds that provide drinking water to millions of New York City residents and businesses," said Rifat Salim, project manager, U.S. Army Corps of Engineers, New York District.

A watershed is an area of land that catches rain and snow that drains or seeps into a marsh, stream, river, lake or groundwater. This water eventually gets stored in reservoirs, a place where water is collected and kept for use when wanted, such as to supply a city.

"Before" photo: Graydon Dutcher walks USACE personnel through the tall, invasive plants on the Walton floodplain. (JoAnne Castagna, 2016)

To perform this work, several agencies collaborated with the Army Corps including the Delaware County Soil and Watershed Conservation District, New York State Department of Environmental Conservation, New York City Department of Environmental Protection, town of Andes, town of Roxbury, town of Walton and the village of Walton.

One of these projects is the Floodplain Reclamation Project located in the town of Walton.

In the Town, the West Branch Delaware River flows near the village streets.

Bordering this river are 13-acres of floodplain that is actually part of the river. The purpose of a floodplain is to help keep a river clean and to give it space to spread out and slow down, during big storm events.

Over the years, the floodplain was filled with 10-feet of fill. This raised and hardened the land, killed natural vegetation and caused invasive plant species to flourish, and eroded the river's edge causing soil and trees to fall into the water.

As a result, when the river floods the water that would naturally be absorbed, filtered, and transported by the floodplain is unable to, so floodwaters back up and stay trapped on the village streets, flooding homes and businesses.

When this high volume of stormwater runoff floods the streets, it can sweep up contaminates and carry them to the West Branch Delaware River that flows into the Cannonsville Reservoir.

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"After" photo: The completed Walton floodplain project. (JoAnne Castagna, 2019)

"Today, the floodplain is on its way to becoming healthy," said Graydon Dutcher, stream program coordinator with the Delaware County Soil and Water Conservation District. "The fill was removed and recycled."

Dutcher, who is also a Walton resident, added, "The residents of Walton were so happy about this work that they took it further. They used their own time and resources to remove the overgrown invasive plants, such as Knot Weed."

The Village and Town also mowed and graded the land to the correct elevation and slope to allow water to spread out onto the floodplain, instead of overtopping the banks and flooding nearby businesses.

Afterwards, grass was planted on the floodplain and native vegetation and shrubs were planted along the river including a mix of maple and ash trees. Dutcher said, "Now floodwaters will drain from the town's streets, building rooftops and parking lots and filter through the vegetation before entering the river."

The vegetation traps and absorbs sediment and pollutants, like harmful phosphorus and nitrogen particles, from entering the river. Plant roots also stabilize the soil and prevent it from running into the river.

An added benefit of this project is that it will lessen the damages of flooding.

It will provide flood reductions for a 100-year storm event. This is a flood whose strength and water height is predicted to occur, on average, about once in 100 years. The project will also be useful for storms that happen more frequently.

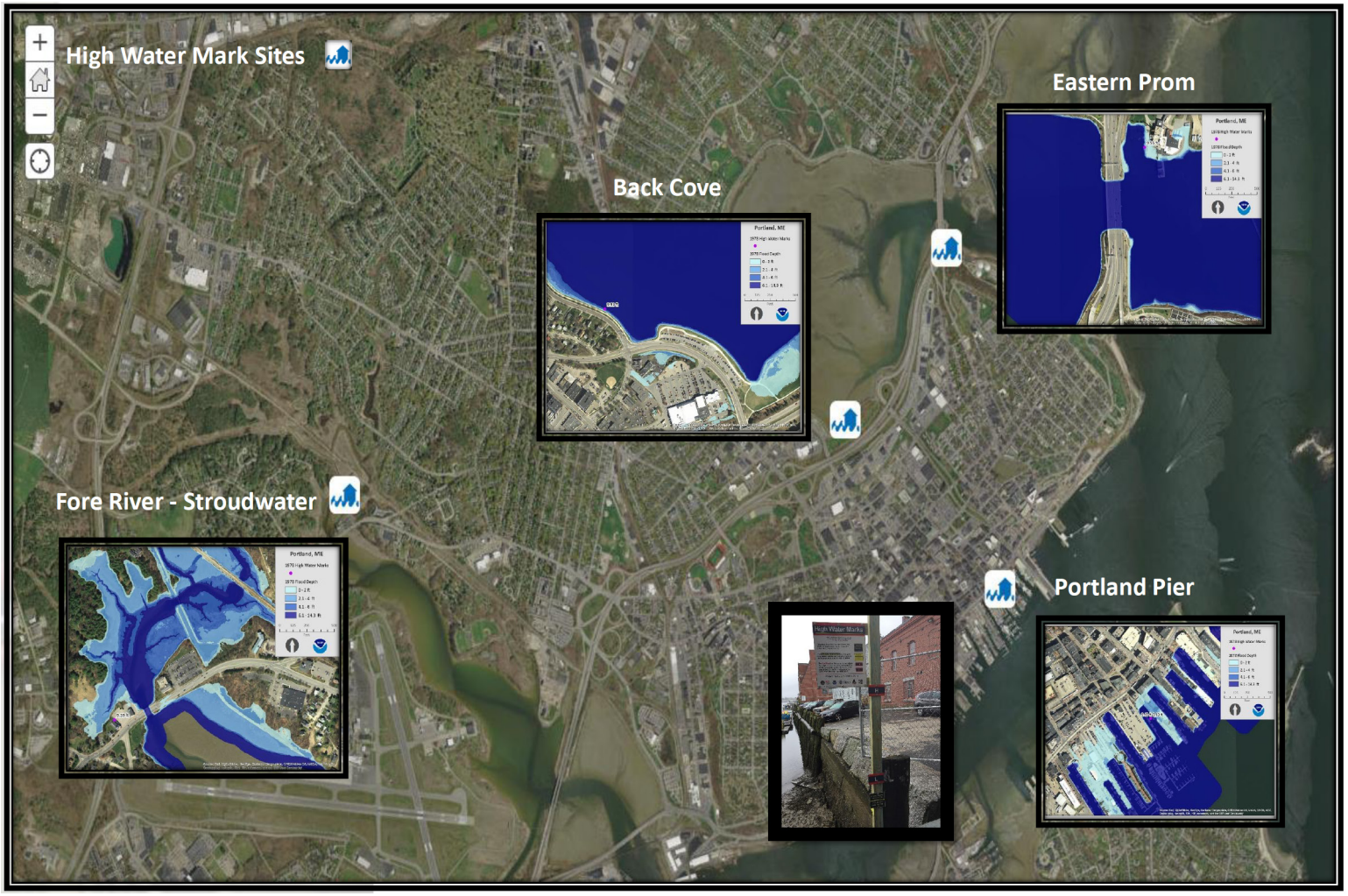
Dutcher said, "The Village is ecstatic. We have a clean slate here."

He said that the Village's plans for the land are to create a small pocket park for the community that will include trails, walkways, athletic fields and a boat launch.

The Floodplain Reclamation Project and other streambank management projects are completed, but the Army Corps' New York City Watershed Environmental Assistance Program is continuing to support efforts that will protect the quality of New York City's drinking water supply. More news to come!

Maine Silver Jackets Mark Progress Toward Coastal Resilience

By Bari Greenfeld, USACE Institute for Water Resources



Story map dashboard showing the High Water Mark sign locations and inundation maps for Portland, Maine.

In May 2019, the City of Portland and the town of York, Maine, unveiled a set of signs to educate the public about historic flood events and the risks of sea-level rise on waterfront homes, businesses, and infrastructure.

Over the past decade, coastal communities across the Northeast have experienced a 140% increase in the number of days each year that streets flood during high tide. In Maine, the most severe flooding often happens during the winter, when nor'easters add storm surge on top of astronomical tides. With 55% of Maine's population living in coastal portions of the state, communities are looking to the future and encouraging residents to take adaptation measures. "The important thing is not the fact that we are putting up signs, but the fact that they represent a step forward in our thinking about floods, coastal risk, and resiliency," said Portland's Waterfront Director Bill Needelman.

Forty-two years ago, Maine experienced a one-percent annual chance coastal storm. The Blizzard of 1978 caused more than $20 million of damage to public and private infrastructure as a result of coastal flooding, tidal surge, and high winds. After this event, the USGS surveyed and catalogued approximately 100 high-water marks along the Maine coastline. While the Blizzard of 1978 still holds the high-water record in many areas, more recent storms have caused flooding close to that level. In addition, data and modeling from the Maine Coastal Program and Maine Geological Survey indicate that with one foot of sea-level rise, water levels associated with the Blizzard of 1978 could become 10 times more likely to occur. Through the Maine Silver Jackets team, an interagency group came together to revisit the 1978 high-water marks and use them as the foundation for an innovative coastal resilience project. The Maine Silver Jackets High Water Mark Initiative was modeled on FEMA's

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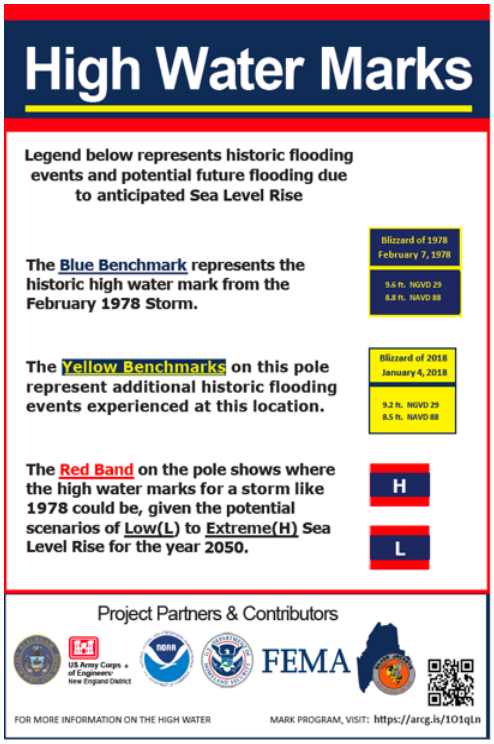
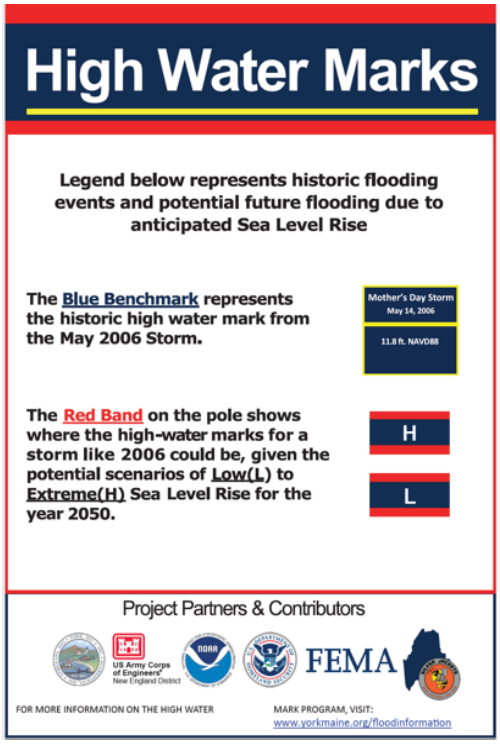
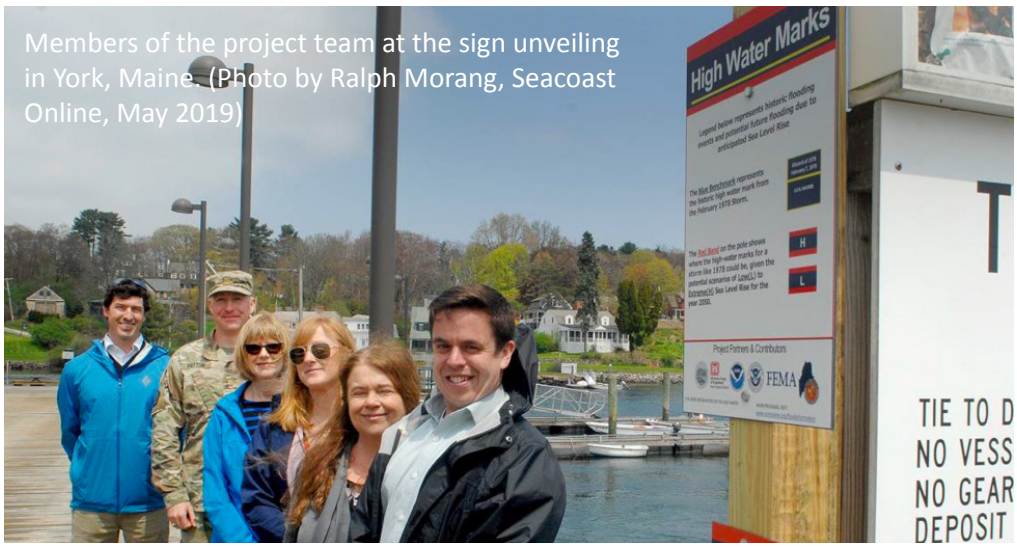
High Water Mark Initiative, with the goal of increasing communities' awareness of flood risk and inspiring action to mitigate that risk. The project began by locating the 1978 high-water marks and validating their accuracy. If necessary, the team re-surveyed to identify better locations. Next, the recorded elevations were used to identify accessible public spaces where high-water mark signs could be placed. Sites for the high-water mark signs were selected based on four factors: 1) a high volume of pedestrian foot and bicycle traffic, 2) close proximity to multi-use paths, 3) close proximity to a downtown area, and 4) potential for education and outreach opportunities. For each site, signs were designed to show the historic 1978 high-water mark, high-water marks from recent storms, as well as where future flood levels could be if similar storms occur under low and high sea-level rise scenarios. Finally, the signs were installed and revealed in conjunction with public events.





High Water Mark sign legends in Portland, Maine (left) and York, Maine (right).



Members of the project team at the sign unveiling in York, Maine. (Photo by Ralph Morang, Seacoast Online, May 2019)

This project was a highly collaborative effort across all levels of government. It was piloted in the city of Portland and town of York, where the team included several municipal partners. Staff from the Maine Coastal Program, the Maine Floodplain Management Program, the Maine Department of Environmental Protection, NOAA's Office for Coastal Management, and the USACE New England District also contributed to this effort. The project utilized flood visualization tools provided by NOAA's Office for Coastal Management. These included the Digital Coast Sea Level Rise Viewer, which allows users to visualize different sea-level rise scenarios through dynamic map layers and photo simulations that show how rising seas might affect local landmarks.

The project team applied these visualization techniques to create inundation maps and photo simulations based on the 1978 data, current conditions, and future sea-level rise scenarios. This information helped to site the high-water mark signs and fed into an online story map dashboard that displays project outcomes in an interactive and easily understandable format for the public. As an additional benefit, the high-water mark signs and companion dashboard can be used to earn Community Rating System credits to help reduce the communities' flood insurance premiums.

With the right planning, tools, and collaboration, both Portland and York were empowered to select a cost-effective and community-enhancing method of raising awareness. "Our hope with these high-water marks is that residents will seriously consider how a major flood could impact them and take at least one new step to protect themselves or their homes," said York's Code Enforcement Officer Amber Harrison and Stormwater Manager Leslie Hinz. "Whether it's making an emergency plan, preparing a supply kit, or safeguarding valuable information in waterproof containers, there are low-cost and even no-cost ways to protect ourselves, our loved ones and our property from floods."

Using Innovative Tools to Assess Debris Flow Hazards in Ouray County, Colorado

By Kellie Jemes, USACE Sacramento District

Evidence of past debris flows on Corbett Creek just upstream of the CR-17 crossing area. (Kellie Jemes, 2019)

Existing culvert under CR-17. (Kellie Jemes, 2019)

Debris flows that repeatedly occur on Corbett Creek in scenic Ouray County, Colorado, are known to carry rocks the size of small vehicles and thousands of yards of mud, rocks, and trees. These events have endangered lives and caused substantial damage to critical local infrastructure. To develop and implement a long-lasting solution for this problem area, the County has partnered with the U.S. Army Corps of Engineers (USACE) under the Floodplain Management Services Program to use newly developed tools to model debris flow on the creek.

Corbett Creek is part of a small and steep mountain drainage (2.9 square miles) that passes through a slot canyon just upstream of a housing development and a culvert where County Road (CR)-17 crosses the creek. The upper portion of the watershed contains sediment that is easily transported during runoff events, resulting in frequent debris flows on the creek. These events have damaged the culvert and CR-17 multiple times over the past 10 years, resulting in road closures, repairs, and excessive maintenance. Road closures on CR-17 are particularly problematic, as the road serves a backup evacuation route for the city of Ouray.

Debris flow events on Corbett Creek and around Ouray County have been documented and studied for over 100 years. A historical study by Jochim (1986) recorded approximately 50 debris flow events occurring on different creeks around Ouray County from 1874 to 1982, with five of the events occurring on Corbett Creek. More recent events from the last 15 years have been recorded in local newspapers. These events and the repair history of the CR-17 crossing are also recalled by local residents. USACE staff observed the damage caused by recent events on site visits to Corbett Creek in 2018 and 2019. An attempt to mitigate the effects of the debris flows was made by constructing three sediment retaining ponds upstream of the CR-17 crossing in 2008. The retaining ponds have not proven to be effective, as they require significant maintenance and did not prevent the road from washing out during an event in 2016.

Debris flows do not behave in the same way as clear-water flood flows. Water is a considered a Newtonian fluid and behaves according to Newtonian physics. However, when the sediment concentration in water is greater than approximately 10%, the flow begins to behave as a non-Newtonian fluid.

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Ian Floyd (ERDC) and Stanford Gibson (HEC) collect sediment data. (Melissa Weymiller)

The non-Newtonian behavior of debris flows causes them to travel at different velocities and depths and with more momentum than water alone. This behavior causes the debris flow to inundate different areas or follow different paths of destruction than a clear-water flow. Thus, conventional flood models fail to accurately describe or predict the impacts of debris flows.

Debris flows have been studied by the USACE Hydrologic Engineering Center (HEC) and the Engineer Research and Development Center (ERDC). A feature was recently added to the HEC-River Analysis System (HEC-RAS) hydraulic model to allow for modeling of non-Newtonian fluids such as debris flows. Meanwhile, ERDC is in the process of creating a library of debris flow data (DebrisLib) to inform the input parameters required for debris flow modeling. Thus, the USACE Sacramento District, HEC, and ERDC are collaborating to use the new features in HEC-RAS and DebrisLib to model debris flows on Corbett Creek. The modeling will be used to assess the existing conditions, evaluate alternative measures, and give an estimate of the magnitude of debris flow events that may occur in the future. This information can be used to assess proposed solutions for the CR-17 crossing area.

Debris flow disasters are not unique to Ouray County, and have been observed in other areas with similarly steep drainages. They are particularly a risk in watersheds that have suffered burn damage from wildfires. This new ability to model debris flows using HEC-RAS provides great value to the Corbett Creek study and has the potential to aid in the assessment of other areas with debris flow hazards, which will ultimately enable more effective risk-mitigation measures to be implemented.

Training Workshop Helps Districts Plan for Communicating Dam Risk Information to Key Audiences

By Katie Noland, USACE Vicksburg District

The purpose of the U.S. Army Corps of Engineers (USACE) Dam Safety Program is to protect life, property, lifelines, and the environment by ensuring all dams are designed, constructed, regulated, operated, and maintained as safely and effectively as reasonably practicable. As part of the program's routine activities, such as inspections and risk assessments, USACE collects information that tells a story about the state of the dam, needed repairs and management actions (both short- and long-term), flood risks, and who and what benefits from or could be harmed if the dam was to fail.

While this information is key to USACE managing dams, it is equally important for people who live upstream and downstream of a dam. Sharing information about the benefits and risks associated with dams is a priority for the program, and an important tool that can help emergency managers, communities, and individuals plan for and manage dam-related flood risks.

Building on the momentum of the Levee Safety Program, the Dam Safety Program worked with the Public Awareness and Communications Team (hosted by the Levee Safety Center), the Collaboration and Public Participation Center of Expertise, and the Office of Public Affairs, to develop an interactive, hands-on workshop intended to provide Dam Safety staff skills and resources to plan for and share risk information with key stakeholders. By the end of the workshop, participants have the start of a draft plan to communicate project-specific information with key stakeholders, a draft risk characterization that explains in plain language the risk factors associated with the dam, and description of planned actions to manage those risks.

Huntington District staff brainstorm how to measure the success of the communication strategies they've identified to share information about the dam. (USACE Photo)

The workshop is designed to focus on a specific project or a system of projects with similar partners and potentially impacted communities. Districts are encouraged to include staff from Dam Safety, Operations (district and project staff), Flood Risk Management, Silver Jackets, Emergency Management, Planning, and Public Affairs in the three-day interactive workshop. Participants use the workshop time to learn and practice soft skills, and to collaborate within their multi-discipline team to identify key topics and information to share, audiences who have an interest in that information, and draft materials to communicate that information to key audiences.

The workshops are hosted at the project site or in the district office, and led by a training team with expertise in risk communication, facilitation, and dam safety. The training team works with districts in advance of the workshop to tailor the workshop to the needs and priorities of the district. Once the workshop is complete, one trainer remains available to help districts complete their project specific communication plan or to develop support materials such as fact sheets or handouts that can be used in support of the communication plan.

Workshop participants work through an adapted version of the new USACE Integrated Communication Plan Template, which is intended to provide a consistent framework to plan, track, and monitor communication efforts.

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Small group from Tulsa District works through a piece of the communication plan template with assistance from the training team. (USACE Photo)

Huntington District workshop participants discuss key risk drivers at Fishtrap Dam. (USACE Photo)

In cases where a district already has a project-specific communication plan, the workshop is adapted to focus exercises on updating or adding risk related messaging to the plan. During the workshop, participants complete an analysis of communication strengths, opportunities, weaknesses, and threats to understand the context. Participants draft key messages, identify strategies and tactics to deliver those messages to key stakeholders, and consider how to measure the success of their communication over time.

These training workshops support the Dam Safety Program's goal to have a communication strategy in place for all dams with potential loss of life to communicate about USACE projects, why they were built, the benefits they provide, what risks exist, and actions to take to reduce or manage those risks. Communication plans should be scaled to the complexities of the project risks and potentially impacted stakeholders, aligned with ongoing dam risk management activities, and designed to support long-term engagement with emergency managers, flood risk managers, and communities.

The training team plans to host at least one training in each district by the end of fiscal 2021. To date, the team has trained 10 districts and will continue to reach out to Dam Safety Program Managers to schedule trainings.

If you have questions about scheduling or participating in a training, or if you would like to know more, please reach out to us using the following mailbox: CEMVK-HQ-Dam-and-Levee-Risk@usace.army.mil.

National Shoreline Management Study: Shoreline Management on the Great Lakes

By Marriah Abellera, USACE Institute for Water Resources, and Lynn M. Greer, USACE Buffalo District

"Many engineered shoreline structures were built 50 to 200 years ago, and about half of them are at risk of failure with serious impacts to the shorelines or harbors they were designed to protect."

Currently focused upon the Great Lakes, the U.S. Army Corps of Engineers' National Shoreline Management Study (NSMS) is a national and regional study that characterizes physical coastal processes and current policies regarding shoreline management. The primary focus areas of NSMS are:

- Socio-economic and environmental impacts of erosion and accretion in the Great Lakes;
- Climate impacts on erosion and accretion;
- Actions that are being taken by federal, state, and local governments to address these impacts and improve shoreline resilience; and
- Findings, recommendations, and key gaps that need to be filled to improve shoreline management.

The federal governments of both the U.S. and Canada are active in managing the shorelines of the Great Lakes, work in partnership with the province of Ontario, the eight bordering U.S. states, local government, tribes, corporations, nonprofit organizations, interest groups, and other stakeholders. Study activities have been collaborative efforts with other federal, regional, and state agencies and tribes. In recent years, the NSMS has focused on each of the Great Lakes (U.S. shorelines), preparing individual lake reports, and synthesizing regional findings and recommendations. Reports for Lake Michigan, Lake Erie, and Lake Ontario have been completed and can be found at: https://www.iwr.usace.army.mil/Missions/Coasts/National-Shoreline-Management/NSMS-Study-Products/. Furthermore, reports on Lake Huron, Lake Superior, as well as an overview of all of the Great Lakes are forthcoming. The following present some preliminary findings.

The Great Lakes' 14,000 miles of shoreline are made up of bluffs, beaches, wetlands, bedrock, and armored shorelines. Armored and bedrock make up 42 percent of the total shoreline. *Fifty-eight percent of the shorelines are susceptible to erosion*. Many engineered shoreline structures were built 50 to 200 years ago, and about half of them are at risk of failure with serious impacts to the shorelines or harbors they were designed to protect. Erosion rates appear to be rising. The southwestern shoreline of Lake Erie is eroding 6 to 10 feet per year, and

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Michigan Department of Environment, Great Lakes, and Energy has reported rates up to 17 feet per year along 250 miles of shoreline designated as "high-risk erosion areas" along 3,300 miles (or 7.5 percent) of lakes Michigan, Superior, and Huron.

It is also noted that erosion and accretion (accumulation of sediment from erosion and other forces) threaten the Great Lakes economy, which is critical to this region and the nation. In 2016, lake-based gross domestic product (GDP) totaled $19.0 billion in Great Lakes coastal counties, with tourism and recreation accounting for $11.1 billion (or 59 percent) of that value. To put this GDP value into perspective, if the Great Lakes region were considered its own country, it would rank second in the world, ahead of Japan, Germany, the UK, and France (World Bank 2020). Erosion and accretion result in billions of dollars of direct and indirect economic impacts on lake-dependent tourism and recreation. Erosion and accretion threaten lake-dependent tourism and boating by limiting access and degrading the quality of shorelines that attract users and their spending. Accretion particularly impacts commercial navigation.

The environmental impacts of erosion and accretion are difficult to quantify, given interaction with other environmental stressors. However, in general, erosion and sedimentation smother bottom habitats, which can change the benthic community, reduce biodiversity, and impact invertebrate populations on which fish depend for food. Erosion and sedimentation of the shoreline can also create conditions that are favorable for invasive species.

Shoreline erosion of the Great Lakes is also undergoing changes due to climate change including:

- Declining ice cover reduces the protective effect of ice on the shoreline from waves and storms.

Shoreline erosion in Indiana. (EPA GLNPO)

- More frequent and intense precipitation increases erosion and sedimentation

- Fluctuating lake levels cause more flooding and accelerate erosion by alternatively saturating and drying out shorelines, making them less stable and affecting shoreline ecosystems.

At both federal and international levels, there appears to be increasing attention to more resilient shoreline management approaches. The Great Lakes Coastal Resiliency Study, proposed in late 2016, is intended to be a collaboration among the Great Lakes states, USACE, and other federal agencies to identify vulnerable areas and recommend measures to increase resilience. The International Joint Commission (IJC) has developed revised approaches to manage water levels in Lake Ontario-St. Lawrence River system and Lake Superior. Furthermore, approaches for shoreline management span structural, nonstructural, natural and nature-based, and institutional/ regulatory solutions. At the state level, agencies have implemented state-level coastal zone management programs (following the framework of the Coastal Zone Management Act of 1972). Furthermore, states are using land-use planning, strict building codes, and coastal setbacks as the most effective approaches to address erosion along the shoreline, particularly for undeveloped shorelines.

As the Great Lakes Overview of the NSMS is completed, additional findings, recommendations, and key gaps will be identified.

Round the National Silver Jackets Table

By Ellen Berggren, USACE Institute for Water Resources

"Round the Table" is a standing agenda item at National Silver Jackets Team meetings, with each agency sharing information about new tools, publications, initiatives, and information exchange and learning opportunities. These informal discussions may launch more in-depth discussion at future meetings or inspire future collaborative efforts. Information shared at a recent meeting is listed below.

State SJ teams can send feedback to the National Silver Jackets Team at IWR. SilverJackets@usace.army.mil

- FHWA published a new August 2019 report titled *Nature-Based Solutions for Coastal Highway Resilience: An Implementation Guide*. An upcoming Silver Jackets webinar will be offered on the guide.

- USACE hosted its annual Interagency Flood Risk Management Training Seminars in February 2020. National Silver Jackets Team agencies supported the Seminars as instructors on a wide array of topics related to agency policy updates; new technologies and data-sharing platforms; riverine and coastal data, models and tools; floods associated with hurricanes, ice jams and wildfire; risk communication; social media; nonstructural and nature-based strategies; collaborative recovery; hazard mitigation grant programs; and regulatory permits. Slide presentations are posted on the Silver Jackets website.

- The Mitigation Framework Leadership Group (MitFLG) published a National Mitigation Investment Strategy in August 2019. (National Silver Jackets Team agencies are members of the MitFLG.) An implementation plan is currently being developed. Review the Strategy and examples of mitigation actions you can take at FEMA's Mitigation Best Practices library.

National Silver Jackets Team Purpose

- Support state Silver Jackets interagency flood risk management teams at the national level by:
  - Sharing information about agency data, programs, resources and expertise available for on-the-ground support.
  - Coordinating programs and leveraging funding opportunities to enhance agency program execution and outcomes (data, technical expertise, regulatory functions, planning frameworks).
  - Increasing agency regional staff awareness of SJ teams and opportunities to support them.
  - Addressing challenges SJ teams identify in the field that would benefit from coordination and collaboration at a national level.
  - Sharing best practices to promote shared responsibility resulting in sound flood risk management and more resilient communities.

National Silver Jackets Team Participating Agencies

- Environmental Protection Agency (EPA)
- Federal Emergency Management Agency (FEMA)
- U.S. Housing and Urban Development (HUD)
- National Aeronautics and Space Administration (NASA)
- USDA Natural Resources and Conservation Service (NRCS)
- NOAA National Weather Service (NOAA NWS)

UPCOMING EVENTS

CONVERGE *Cultural Competence in Hazards and Disaster* Research Training Module

The Natural Hazards Center at the University of Colorado Boulder is pleased to share its newly released CONVERGE Cultural Competence in Hazards and Disaster Research Training Module. You can register for the free online module here: https://converge.colorado.edu/training-modules.

This is part of a larger series of online modules designed to accelerate the training of a diverse hazards and disaster workforce. These interactive, 30- to 60-minute courses cover a variety of topics that researchers and practitioners can use to quickly background themselves on research relevant to the study of extreme events. Upon successful completion of a 10-question quiz, users receive a certificate (so these can be useful for classroom assignments as well as other activities). Other active modules include Disaster Mental Health and Social Vulnerability & Disasters. For more information on the CONVERGE modules, see https://converge.colorado.edu/training-modules.

You can sign up for free resources and additional updates at the CONVERGE website at: https://converge.colorado.edu/signup.

Note: The CONVERGE training modules are based upon work supported by the National Science Foundation (NSF Award #1841338). Any opinions, findings, conclusions, or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the NSF.

2020 CTP Summer Special Topics Course at EMI (August 3-6, 2020)

If you are a newer Cooperating Technical Partner (CTP), new to a CTP organization, or simply need a refresher, this summer's Special Topics training course at the Emergency Management Institute (EMI) in Emmitsburg, Maryland, is a great opportunity. The four-day course will provide training on communications and outreach strategies related to the Risk Mapping, Assessment, and Planning Program (Risk MAP). To apply, you must work for an organization that is currently a CTP. If your organization is interested in becoming a CTP, please reach out to your Regional FEMA office.

The deadline for registration is ***June 5, 2020.*** Admission spots are limited and available on a first-come-first-serve basis, so candidates are encouraged to apply for a pre-approval letter at your earliest convenience. To do so, please follow these steps:

1. Complete the eligibility questions to qualify for a pre-approval letter
2. If approved, you will receive a pre-approval letter and you must apply directly to EMI by June 5, 2020, and attach your pre-approval letter to your online application.

For more information about the 2020 CTP Summer Special Topics course, contact CTPAdmin@riskmapCDS.com or Laura Algeo, National CTP Program Coordinator (Laura.Algeo@fema.dhs.gov).

UPCOMING EVENTS

Workshops and Conferences

NOTE: In-person workshops and conference schedules are in flux due to the ongoing pandemic. As of the time of writing, the following events are still scheduled to take place. However, please confirm details with conference organizers regarding the latest status.

Association of State Floodplain Managers (ASFPM) Annual Conference. June 7-11, 2020. *Attention: this conference has moved from Fort Worth, Texas, to fully* ***virtual.***

National Association of Flood and Stormwater Management Agencies (NAFSMA) Annual Meeting. August 10-13, 2020. Park City, Utah.

Floodplain Management Association Annual Conference. September 8-11, 2020. Sacramento, California.

Kentucky Association of Mitigation Managers Conference. September 21-24, 2020. Pikeville, Kentucky.

AWRA Annual Water Resources Conference. November 9-12, 2020. Orlando/Kissimmee, Florida.

8th International Conference on Flood Management (ICFM8): "Lowering Risk by Increasing Resilience." *Attention: this conference has been postponed to August 9-11, 2021.* **Iowa City, Iowa. See https://icfm2020.org for details.**

Courses & Webinars

Community Rating System (CRS) Webinars are archived at: https://crsresources.org/training/

NOAA Office of Coastal Management (OCM) Courses & Webinars:

***Seven Best Practices for Risk Communication* (webinar). June 16, 2020. 3:00-4:30 PM Eastern.**

Facilitation Basics for Coastal Managers. July 23, 2020. Stellwagen Bank National Marine Sanctuary, Scituate, Massachusetts. For additional information, email tim.sartwell@noaa.gov.

Planning and Facilitating Collaborative Meetings

- **May 12-13, 2020. Delaware National Estuarine Research Reserve, Dover, Delaware.**
- **June 16-17, 2020. Texas General Land Office, Austin, Texas.**
- **June 17-18, 2020. Stanford Gallery, Sacramento, California.**

FEMA Emergency Management Institute (EMI) Courses:

Emmitsburg, MD. Admissions: 301-447-1000, netcadmissions@fema.dhs.gov.

E0102: Science of Disaster
- August 19-21, 2020.

E0105: Public Information and Warning
- July 13-15, 2020.
- August 26-27, 2020.

E0312: Fundamentals of Building Science
- August 31-September 3, 2020.

E0313: Basic HAZUS
- June 8-11, 2020.
- July 13-16, 2020.
- August 17-20, 2020.

E0172: HAZUS for Flood
- July 27-30, 2020.

E0273: Managing Floodplain Development through the NFIP
- May 18-21, 2020 in Alexandria, LA.
- May 26-29, 2020 in Wye Mills, MD.
- August 10-13, 2020.
- August 31-September 3, 2020.

E0278: NFIP/Community Rating System
- July 27-30, 2020.

E0279: Retrofitting Flood-Prone Residential Buildings
- August 17-20, 2020.

E0282: Advanced Floodplain Management Concepts II
- July 27-30, 2020.

E0284: Advanced Floodplain Management Concepts III
- May 18-21, 2020 in Knoxville, TN.
- July 6-9, 2020.

FRM BUZZ NEWSLETTER

Reducing Flood Risk: Many Partners, One Team

USACE Flood Risk Management Program:
https://www.iwr.usace.army.mil/Missions/Flood-Risk-Management/Flood-Risk-Management-Program

Silver Jackets Program:

http://silverjackets.nfrmp.us

FRM BUZZ Statements of Need: Submitting "Statement of Need" is the first step in the process of a concept becoming a requirement for research and development. If USACE district personnel have problems or situations they feel should be addressed by research, the Flood Risk Management Gateway, http://operations.usace.army.mil/flood.cfm, is the place to submit these research Statements of Need (SoNs).

Past issues of this newsletter, various links, news items, and presentations, are all available on the Flood Risk Management Gateway, https://operations.erdc.dren.mil Check it out!

This newsletter is a product for and by the Flood Risk Management Community. The views and opinions expressed in this unofficial publication are not necessarily those of the U.S. Army Corps of Engineers or the Department of the Army.

If you would like to submit an article or an idea for an article for the next edition of the newsletter, or if you have any comments or questions about articles in this edition, please email ***Stephanie.N.Bray@usace.army.mil.***

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