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FRM BUZZ NEWSLETTER

Reducing Flood Risk: Many Partners, One Team

FHWA Releases Guide On Nature-Based Solutions For Transportation Infrastructure Resilience

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US Army Corps of Engineers

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FRM BUZZ NEWSLETTER

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Leadership Changes and Thoughts on Unprecedented Opportunities

By Mark Roupas, Deputy Chief, Office of Homeland Security

Stephen Hill, Director of Contingency Operations and Chief, Office of Homeland Security (DCO/OHS), USACE, (USACE 2020)

Whether you're a USACE colleague, a stakeholder, or one of our valuable interagency partners, thank you for taking the time to read this issue of the FRM Buzz. This is the third edition of our combined Silver Jackets and FRM newsletter, and I hope you continue to find it useful and informative. The last few months have, I'm sure, been difficult in many ways for all of us — a time marked with uncertainty and any number of challenges. The word "unprecedented" has been thrown around quite bit recently, but I think it's accurate to say that this year has truly been unprecedented in many ways.

I want to take this opportunity to thank Mr. Alex Dornstauder, the interim director of Contingency Operations and chief, Office of Homeland Security (DCO/OHS), USACE, for his leadership during this challenging time. Mr. Dornstauder took on this role in early March and since then has guided USACE, especially our Emergency Management and Flood Risk Management (FRM) communities, through a uniquely challenging time with a steady hand, attention to detail, and strategic vision. While no period of time that includes flooding can ever be called a "good" flood season, we were relatively fortunate this year compared to the magnitude and extent of flooding experienced over past years. However, the old adage, "if it's not one thing, it's another," proved true as we faced the challenges posed by a viral pandemic. USACE's contribution to the COVID-19 response, through mission assignments from the Federal Emergency Management Agency (FEMA) and through our own Civil Works authorities,

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quickly consumed Mr. Dornstauder's and our attention and focus.

As Mr. Dornstauder returns to his previous position as the Chief, Strategy and Integration Office, I am pleased to welcome our new permanent DCO/OHS, Mr. Stephen Hill. Mr. Hill is coming to us from Williams Sale Partnership (WSP)/Louis Berger, where he has served as a senior vice president. In this role, he led their Federal Programs, logistics executive advisory team, and supported the delivery of all federal and emergency response services for WSP. Mr. Hill retired from Army active duty in 2010, having previously served USACE. Over the course of his career, he has supported major disaster response and recovery efforts, such as serving as the Mission Director for the USACE/FEMA Emergency Response Power Field Office temporary power mission in Puerto Rico, or providing program management and support for the construction of the World Trade Center in New York City, among other projects.

As a former USACE chief of staff, Mr. Hill will bring a solid foundation of knowledge and understanding of our roles and missions, together with an executive skill set that will serve us well moving forward. We are excited to have him come aboard and join an experienced, seasoned group of emergency management and flood risk management practitioners to lead us through the remainder of this hurricane season. However, the COVID-19 pandemic has not yet run its course and will likely present many new challenges to navigate for the remainder of this season.

At the beginning of this article, I mentioned the word "unprecedented" and would like to close with a thought or two on that word and its relationship with our Flood Risk Management mission. I think most readers understand our FRM mission is to reduce the threat to life and reduce property damages from riverine and coastal flooding. It is a whole-government effort, accomplished at the direction of Congress and in partnership with communities across the country, who work in collaboration with us in our study development and, in the end, our design and construction of flood risk management measures and projects. Once these are completed, another key component of the program includes the operating and maintaining of our federal civil works FRM infrastructure to achieve their full benefits, planning and designing non-structural and structural FRM solutions in high-consequence areas, and efficiently constructing FRM projects to minimize risk to life and to achieve the desired flood damage reduction benefits.

Through our normal budgetary process and through congressional supplemental appropriations, we receive funding to accomplish these and other FRM roles and missions. Congressional action and administration approval of three "year over year", supplemental appropriations is unprecedented, and there is ongoing discussion for a fourth supplemental focused on repairing and restoring our aging infrastructure. It is my belief that our FRM program is poised for an unprecedented opportunity to make significant change in the deteriorating conditions within the nation's aging FRM infrastructure to ensure for future generations that our infrastructure is reliable and capable of operating at safe, authorized levels. With our current FRM leadership, working together across the entire Civil Works enterprise with our federal partners, along with our state, territorial, tribal and local stakeholders, we will be successful at both the strategic and operational levels.

Thank you again for your service and dedication for what you do each and every day, especially during these trying times.

U.S. Army Corps of Engineers, Jacksonville, District deputy commander and senior project manager for the COVID-19 emergency response, Lt. Col. Todd Polk, Corps mechanical engineer, Jason Chapple, and civil engineer, Stephen Dupries brief the Chief Engineer of the U.S. Army Corps of Engineers, Lt. Gen. Todd Semonite on the construction at the Miami Beach Convention Center to convert it to an alternate care facility during the COVID-19 response. (Photo by Brigida Sanchez)

Airborne Lidar Technology Enables Cutting-Edge Knowledge of Changing Coastal Conditions

By JoAnne Castagna, USACE New York District

In a hotel conference room on Long Island, New York, a team of experts processes data on computers. A large monitor displays topographic and bathymetric information.

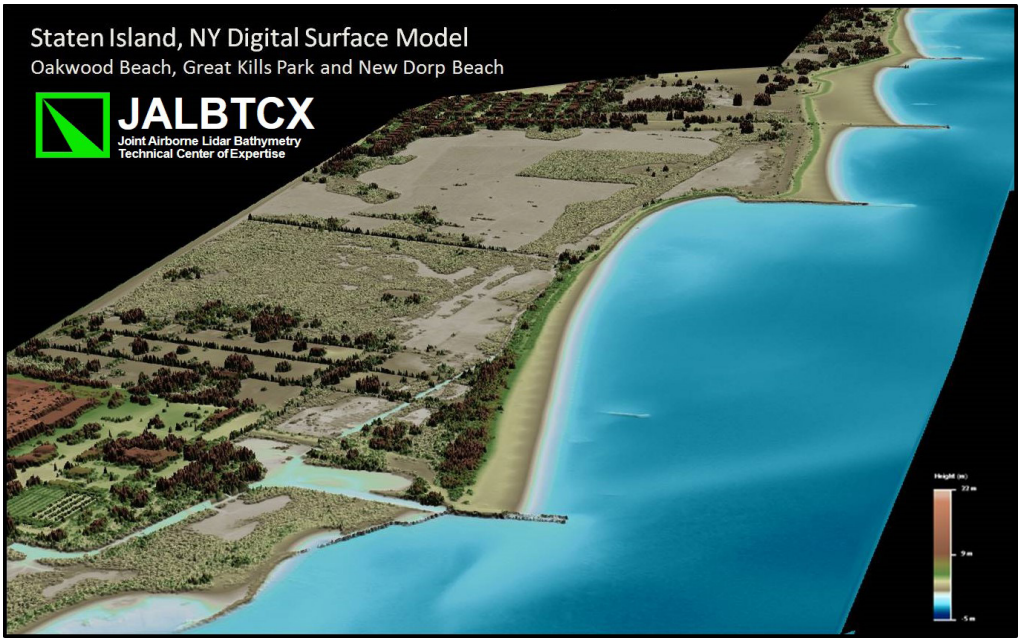
"It's a beautiful thing. On the screen they are able to observe the condition of New York's and New Jersey's coastlines almost in real-time," said Jeffrey Cusano, geospatial coordinator, New York District, U.S. Army Corps of Engineers (USACE).

The team is the Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX). Recently, Cusano and other members of the New York District seized the opportunity to use this team to obtain cutting-edge survey data about the current condition of New York's and New Jersey's coasts. USACE is already using this data to monitor and cost-effectively improve its coastal projects, as it enters the Atlantic Hurricane Season.

The JALBTCX is based at USACE's Mobile District in Alabama. The Center performs operations, research, and development in various airborne geospatial technologies to support coastal mapping and charting requirements for USACE. The Center also partners with other federal agencies, private industry, and academia to further develop these technologies.

One of the Center's programs is the National Coastal Mapping Program. The mission's intent is to acquire regional, high-resolution, high-accuracy elevation and imagery data along the sandy shorelines of the United States on a recurring basis.

To obtain this data, JALBTCX uses an aircraft equipped with government-owned, state-of-the-art remote sensing platforms. These platforms comprise a lidar sensor with both topographic and bathymetric capabilities, and two additional aerial mapping cameras. The lidar's topographic capability measures the elevation of the coastline's beach and dune systems and its bathymetric capability measures the seafloor elevations. Whether operating over land or water, the lidar sensor provides highly detailed and accurate elevation measurements, while the two additional cameras provide high-resolution images and spectral information.



A sample of the type of elevation images the JALBTCX team developed for the U.S. Army Corps of Engineers, New York District. This image shows the shoreline elevations along the coast of Staten Island, New York. (USACE)

This data is acquired along the sandy coastlines of the United States approximately every five years. The last time JALBTCX flew over the coasts of New York and New Jersey was in 2017 and it is next scheduled to fly again in 2022. The New York District wanted to get this information sooner. When they discovered that JALBTCX had a window of time available, the District coastal team quickly worked to take advantage of this opportunity.

"They wanted to understand the current coastal condition and how it compared to the 2017 condition to see what work needs to be done now to improve the condition of the coasts. This may involve such things as sand replenishment and environmental work. They also wanted to see if the work they already performed is functioning well," said Cusano.

Over a two-week period in late January, the JALBTCX team flew their lidar and cameras over portions of the New York and New Jersey coasts. The coastal team worked closely with JALBTCX to design flight plans that would produce good data coverage over New York District's coastal projects. The flights covered approximately 157 miles of coastline.

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To capture the data, the flight crew flew primarily during daylight hours at or near low tide, at an altitude of 1,300 feet above ground level and at an air speed of 140 knots, covering a swath that included between 1,000 and 2,000 meters of the nearshore and onshore area. They flew overnight operations only in the vicinity of John F. Kennedy International Airport in order to work with existing airspace restrictions. The survey aircraft operated out of the Long Island MacArthur Airport. The JALBTCX team stood up a flight operations and data production center in a hotel conference room nearby.

The JALBTCX team will produce a Change Analysis. To perform this analysis, JALBTCX used this newly acquired continuous digital elevation dataset and compared it to their dataset from 2017. Results will reveal where sand has either eroded or accumulated along the coastline.

The JALBTCX team standing with Col. Thomas Asbery, former district commander, New York District, U.S. Army Corps of Engineers (far right), in front of their aircraft, at Long Island MacArthur Airport in Ronkonkoma, New York. (USACE, 2020)

"We now have valuable information that shows us where there may be storm damage and sand loss that requires repairs," said Cusano. "It also shows us how we are progressing with ongoing coastal projects, of which we have done many in the last three years."

According to senior coastal engineer Suzana Rice, JALBTCX's lidar "is a great tool for us to monitor and understand our coastlines and compare data from previous years, to use during the 2020 Atlantic Hurricane Season."

She added that the timeliness of the Change Analysis data, having been delivered just 10 business days after the last flight, enabled one particular coastal project to proceed faster. "Because of this new data, we were able to expedite the pre-construction engineering and design phase of the Fire Island Inlet to Montauk Point Project." She added that the data is also being used to cost-effectively create the plans and specifications for the Fire Island Inlet to Moriches Inlet Emergency Stabilization Project.

In order to create these plans and specifications, the team needs to know how much sand will be needed to replenish the beach. Without the JALBTCX data, traditional surveying techniques would have been required; they would have taken longer and been more expensive.

The JALBTCX data is also useful for other purposes. For example, senior biologist Robert Smith noted that the data is being used "to design and track changes to habitats we built for endangered species, such as the Piping Plover, an endangered bird that nests along the shore in the summer. We built habitats for the plovers to nest and forage."

Likewise, Cusano noted that the data may help inform and educate the public. "This past fall we had a number of nor'easters that caused coastal damage," he said. "Because of this, residents contacted us. They sought information about damages and if rebuilding was needed. We were able to use the data to better respond to their inquiries."

Finally, the lidar data is also available to the public and other agencies. The JALBTCX team posts the data on the National Oceanic and Atmospheric Administration's Digital Coast website, which includes a multiyear archive of survey data acquired along U.S. coasts by partners in the federal mapping community and some state agencies. Website users can search for a specific coastal area, learn about available data, specify which data layers they want to view, and save the information in the format they prefer. The dataset that JALBTCX gathered recently for the New York District is currently accessible here: https://coast.noaa.gov/dataviewer/#/lidar/search/where:ID=9000.

"In my opinion, this data is a win for everybody," said Cusano. "It helps USACE monitor and cost-effectively improve our coastal projects, and it helps our agency educate the public about their coasts and the work we are doing for them, as we begin a new Atlantic hurricane season."

FHWA Releases Guide on Nature-Based Solutions for Transportation Infrastructure Resilience

By Tina Hodges, Federal Highway Administration

After conducting a pilot with FHWA that developed a conceptual design for a nature-based solution to mitigate flood risks, Delaware DOT partnered with the Delaware Department of Natural Resources and Environmental Control (DNREC) to fund and implement the nature-based solution, which was constructed earlier this year. The project, at the Read Avenue drainage outfall from Coastal Highway Route 1, includes a braided oyster reef, oyster bags, rock, artificial dune construction, marsh and dune plantings, and tide gates. (Delaware DOT, 2020)

The Federal Highway Administration (FHWA) recently released a report that provides information to state and local transportation agencies on how they can use nature-based solutions to reduce erosion and flood hazards to their coastal roads[1]. Nature-based Solutions for Coastal Highway Resilience: An Implementation Guide is the culmination of a three-year research effort that also included pilot projects and peer exchanges.

The new guide adds a crucial component to FHWA's collection of research and technical assistance products to help state and local partners build resilient transportation systems. It follows direction from the U.S. Army Corps of Engineers (USACE) and the National Oceanic and Atmospheric Administration (NOAA) that coastal flood risk mitigation should use integrated

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approaches, including structural, nature-based, and policy strategies. Upfront, the guide summarizes the current scientific literature on the benefits of nature-based solutions, including flood reduction, habitat, water quality, and recreation. It then draws from a wide range of literature to compare low, median, and high ranges of costs per linear foot for nature-based solutions vs. structural measures. From there, it follows the steps in the transportation project delivery process, providing information on how to consider nature-based solutions in the planning process, how to conduct a site assessment to determine whether nature-based solutions are appropriate, key engineering and ecological design considerations, permitting approaches, construction considerations, and monitoring, maintenance, and adaptive management strategies. The guide also includes technical fact sheets with summary information on major types of nature-based solutions, as well as appendices with site characterization tools, decision support for selecting nature-based solutions, suggested performance metrics, and links to additional tools and resources.

One key conclusion in the guide is that transportation agencies can't go it alone. They need to build partnerships with natural resource agencies, coastal engineers, hazard mitigation experts, and regulatory partners to bring nature-based projects to fruition. That's where Silver Jackets teams can be extraordinarily helpful, having already brought together the USACE district with state agencies such as the state departments of natural resources, transportation, and hazard mitigation, along with other federal and local partners to address flooding issues. The guide was featured on a Silver Jackets national webinar held in May.

The implementation guide draws in part from five pilot projects that FHWA sponsored to analyze the potential for nature-based solutions to mitigate flood risks to particularly vulnerable stretches of highway. The pilots looked at a diverse range of approaches. For instance, in Oregon, the Department of Transportation (DOT) analyzed the potential for cobble beaches, sand tubes, and mechanically stabilized earth to reduce bluff erosion that threatens multiple stretches of coastal highway US 101. Meanwhile, Mississippi DOT used hydrodynamic modeling to assess whether a vegetated berm could protect the approach spans of the Henderson Point bridge from storm surge. In New Jersey, the USACE district and Institute for Water Resources partnered with Stockton University and New Jersey state and local agencies to assess coastal flooding of Great Bay Boulevard. The team analyzed thin-layer placement of sediment to raise the marsh platform elevation at vulnerable locations along the road. Maine and New Hampshire DOTs partnered to examine potential nature-based solutions for two coastal roads that are becoming increasingly vulnerable as sea levels rise.

Participants converse at the FHWA peer exchange in Wilmington, North Carolina. (FHWA, 2020)

To gather input and direction for the guide, FHWA held peer exchanges in four coastal areas of the country: Mobile, Alabama; Oakland, California; Lewes, Delaware; and Wilmington, North Carolina. The peer exchanges sparked conversations and ideas for collaboration between the participants, which included transportation planners and engineers along with coastal engineers and ecologists.

The development of the guide was overseen by a technical review team of experts from FHWA, NOAA, USACE, state DOTs, US Fish and Wildlife Service (FWS), and academics.

The implementation guide, pilot reports, and peer exchange report are all available on FHWA's website to help state and local partners take advantage of the opportunities offered by nature to reduce flood risks while at the same time providing ecological benefits.

[1]Nature-based solutions use natural materials and process to reduce erosion, wave damage, and flood risks. Examples include restoration of wetlands, dunes, beaches, and reefs.

Lower Meramec Communities Receive Multi-Jurisdictional Floodplain Management Plan

By Matt Jones, USACE St. Paul District and Hal Graef, USACE St. Louis District

In April 2020, the St. Louis District of the U.S. Army Corps of Engineers (USACE) finalized and transferred to local governments a plan to enhance flood resilience and to reduce the impacts to some 942 flood-prone structures in the Lower Meramec River basin.

After residents and business owners experienced two devastating flood events within 18 months, a coalition of counties and municipalities partnered with multiple federal and state agencies, a national non-governmental organization (NGO) and a local university to develop a floodplain management plan (FMP) for reducing flood risks in the Lower Meramec basin.

The partnership identified and evaluated 20 mechanisms, policies and tools for managing flood risk, ultimately recommending 15 of these. Of the remainder, one is not recommended and four were determined to require further analysis and evaluation.

USACE recommended nonstructural mitigation measures for 942 flood-prone structures in the basin. It also included a cost estimate for each structure as well as total costs for each community and the basin as a whole — $92 million of potential nonstructural mitigation work, all told, including elevations, acquisitions, relocations, flood-proofing, and sewer check valves.

Public involvement and participation were paramount, not only to gather and share information with the public, but also to maintain compliance with FEMA's 10-step floodplain management planning process as outlined in Section 510 of the Community Rating System (CRS) Manual. USACE facilitated three information-gathering public workshops a few months after FMP development

FLOOD RISK MANAGEMENT MECHANISMS	EVALUATION	
Land Use Policies and Regulations	EFFECTIVE	RECOMMENDED
Public Alert Flood Warning System	EFFECTIVE	RECOMMENDED
Warning Dissemination, Multi-Media	EFFECTIVE	RECOMMENDED
Flood Emergency Preparedness Plans (or EAPs)	EFFECTIVE	RECOMMENDED
Development Policies, Moratorium	EFFECTIVE	NOT RECOMMENDED
Structure Elevations	EFFECTIVE	RECOMMENDED
Buyouts (Structure and Land Acquisition)	EFFECTIVE	RECOMMENDED
Flood proofing (Wet & Dry)	EFFECTIVE	RECOMMENDED
Community Education and Advocacy	EFFECTIVE	RECOMMENDED
Temporary Flood Risk Adaptive Measures	EFFECTIVE	RECOMMENDED
Information and Education	EFFECTIVE	RECOMMENDED
Flood Insurance	EFFECTIVE	RECOMMENDED
Community Rating System (CRS)	EFFECTIVE	RECOMMENDED
Local Drainage and Utility Protection	EFFECTIVE	FURTHER EVALUATION NEEDED
Tax Adjustments	EFFECTIVE	FURTHER EVALUATION NEEDED
Post-Flood Recovery Processes	EFFECTIVE	RECOMMENDED
Wetlands, Stream, and Riparian Protection and Restoration	EFFECTIVE	RECOMMENDED
Enhancement of Recreation and Education Opportunities	EFFECTIVE	RECOMMENDED
Detention/Retention Basins	EFFECTIVE	FURTHER EVALUATION NEEDED
Levees and Floodwalls	EFFECTIVE	FURTHER EVALUATION NEEDED

Lower Meramec Multi-Jurisdictional Floodplain Management Plan Action Plan:

1. Adopt the Lower Meramec Multi-Jurisdictional FMP
2. Implement nonstructural recommendations in Appendix E
3. Develop a comprehensive public outreach program
4. Develop a flood emergency preparedness/evacuation plan
5. Adopt higher regulatory floodplain management standards
6. Maintain and expand the existing flood warning systems
7. Join the Community Rating System (CRS)

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began. Because of the size of the study area, three different communities hosted these meetings to maximize opportunities for public attendance and participation. Likewise, following the drafting of the FMP and review by the partners, three information-sharing public meetings were held to convey the results before FMP finalization.

A commonly asked question was, "Who is going to pay for your recommendations?" To answer that, the FMP includes a Healthy Watersheds Funding Options appendix that lists a variety of federal, state, local, and private sources available to local governments. This appendix was written by Wichita State University's Environmental Finance Center and was funded through an EPA grant.

This FMP recommends an Action Plan (inset) based upon the goals, objectives, and available funding in each city and county in the Lower Meramec basin.

At the end of the day, floodplain management is a group effort. While each individual community should tailor a plan for its own success, this FMP provides a blueprint for the entire Lower Meramec basin to work together and move forward as a region.

Members of the Multi-Jurisdictional Floodplain Management Team discuss the study's results with members of the public at the first of three public meetings in the basin to convey the results On the far left is John Boeckmann (USACE Hydraulic Engineer) and on the far right is John Boggs (city of Eureka, Missouri, floodplain manager). (USACE, 2020)

Downtown Eureka, Missouri, during the May 2017 flood event.
(Photo courtesy of the *Columbia Missourian*)

Graduate-Level Risk Management Course Offers Insights and Surprises

By Kaely Megaro, USACE Kansas City District

Dear *Buzz* reader, I have to admit something that may sound heretical to you: risk management, as a topic, has always sounded as exciting to me as dry wheat toast. There, I said it. So when I was asked to interview five of the current students of the Notre Dame of Maryland University Risk Management Program, all sponsored by the National Flood Risk Management Program (NFRMP) of the U.S. Army Corps of Engineers (USACE), I was honestly curious to hear their feedback and see if it would change my perception.

The Risk Management Program is an intense, 10-month graduate-level course. After the program is over, participants can elect to take four additional courses to gain the Master of Science degree. After receiving the list of students to interview, I went to work trying to understand if risk management could actually be an interesting topic.

To my surprise, every one of the participants agreed that the course was a good experience and that they would recommend it to other Silver Jackets Coordinators and flood risk managers. When I asked why, Michelle Brown said, "It gives you a way of breaking down big scary problems to better understand them, so it isn't as scary — I like that."

In addition to this appealing idea (especially during a pandemic) of making risks less scary, everyone interviewed also noted how much this course will help them in talking about risk within their districts. Not only can they fully talk risk and jump right into risk discussions with colleagues in Dam Safety or Planning, but now they can also understand things like Monte Carlo simulations and probability distributions. The course has provided a vernacular language so that they can better communicate and integrate into multi-disciplinary teams.

This course also gave participants a way to see a broader view of risk. It's not just about floods in isolation. Students considered all forms of risk, which is probably how USACE's local partners experience it. When asked about their biggest take-away, almost all participants said the same thing: "There is no one right number; never lead with a number." Apparently, this is a mantra the famous Professor Yoe has drilled into his students.

Thomas Jester, one of the current students, explained, "Giving [partners or stakeholders] one number that doesn't match their previous personal experience creates distrust. If you tell someone their homes will flood twice over the next 30 years, but they experienced two floods last year, they are probably going to think you are full of it. But if you explain that there is a high likelihood that their homes are going to flood and we don't know exactly when, they have less confidence in our numbers but more trust in what we are saying."

Honestly, my mind was a little blown by this, and it made me reflect on how often I had accepted numbers an engineer provided me and then treated them as absolute.

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Notre Dame of Maryland University Risk Management Program graduates. (Charles Yoe)

Relatedly, a few participants emphasized the need for more open internal discussions about what assumptions are made in analyses and what implications derive from those analyses. The engineer who produced the answer may not be very confident in the precision of his or her own number, but if the rest of the team doesn't fully understand this, it becomes all too easy to appear overconfident in discussing risks with the public or with colleagues. Hmm, interesting!

And here's something else that was interesting. Building off the "no one number" concept, a few of the participants suggested that we in USACE should calculate multiple cost-benefit-ratios for our flood risk studies. Frankly, as a project manager bound by the constraints of "3 years, 3 million dollars, 3 vertical levels" it took a lot for me to bite my tongue — why would someone suggest doing more analysis in the era of 3x3x3?

The explanation turned out to be that while there is uncertainty with our costs, there is also uncertainty with our benefits. If you were to create a set of cost-benefit analyses for each final plan, you could see how often it yields a cost-benefit ratio above 1.0. For example, if you have one plan that gets you above 1.0, but only if everything goes perfectly, but another plan that will exceed 1.0 90% of the time, you know that the second plan is actually the better plan and you also have a narrative to explain why it is the better plan. On the flip side, if you have a project and there is only one plan that gets above a 1.0, and it does so only 20% of the time, you may want to talk to your sponsor about the likelihood of it actually getting budgeted.

While all the students agreed that this course is a great opportunity and recommended it for other Silver Jacket Coordinators and flood risk managers, they also warned that it is a lot of work — as much as 25 hours a week outside of work hours. Simone Rock revealed that that this was harder than doing her master's degree while working with young kids, because the course is so fast-paced and yet requires a high level of technical analysis. And now, a pandemic and the demands of homeschooling are hitting at the same time.

Jason Miller put the time commitment into perspective by explaining, "Each course is seven-to-eight weeks with no breaks during the session. You must go to class discussion boards and keep up every day. You can fall behind very easily because it is such a compressed schedule."

If you do not have a support system, both at home and at work, then you will not be successful. It takes a self-motivated person to be successful with this course. As Dan Vogler put it, it is "almost like you are on a personal quest for knowledge."

The question for me is this: am I on a personal quest for risk knowledge? Well, no. But, do I now understand why someone would be — and that it can be interesting? Yes, absolutely. So, if you do want to understand all aspects of risk management, and if you have the support system in place to devote a significant amount of time towards it, then this program might be just right for you.

Utah Silver Jackets, USACE Working With Zion National Park to Inform, Protect Slot Canyon Visitors

By J. Paul Bruton, USACE Sacramento District

Looking for strategic locations to place stream and rain gauges. The rain gauges need to be close to a stream or creek to be useful, but the gauges also have to be easily accessible for maintenance and manual data collection if necessary. (USACE Photo)

Imagine an adventurous day of hiking deep into one of Utah's rugged slot canyons. It's a bit cloudy, but precipitation isn't forecast in the area for another two hours. What you don't know is that it's already pouring rain a couple of miles upstream, with water levels rising fast. And all that water is headed your way.

The scenario above is one Zion National Park is all too familiar with, and record numbers of visitors means keeping hikers safe from flash flooding has become more challenging than ever. Since cloudburst storms can rapidly flood desert slot canyons, it can be near impossible to provide timely flash flood warnings to hikers.

The park management is determined to change that, and is actively seeking help from the U.S. Army Corps of Engineers to ensure park visitors can have the safest experience possible while exploring the spectacular slot canyons.

"On behalf of Zion, the Utah Division of Emergency Management [UDEM] approached the Corps to ask whether there is some type of flood warning system that Zion could use in conjunction with the slot canyons," said Sacramento District's Corrie Stetzel, lead planner on the Zion National Park Flood Risk Warning Support project.

An idea-sharing meeting between USACE, park personnel, Washington County and the United States Geological Survey (USGS) in early March revealed that the park service really wanted to improve the consistency of risk messaging with partners, weather forecasters, and guides and outfitters. "We're making great strides in this area," said Daniel Fagergren, Zion's chief park ranger. "We're sharing our weather reports, providing real-time updates with partners. A lot of the outfitters have agreed to not sell or rent if flooding is possible or probable, which is a great step in the right direction."

While Zion currently uses a color-coded Flash Flood Potential system inside the visitor's center, many visitors simply do not see it, especially if they bypass the center or are accessing the slot canyons with an outfitter. It is a four-color rating system, with yellow representing the lowest risk and red indicating the highest danger. Zion also sends messages and alerts via Twitter, and the National Weather Service pushes flood warning notifications to cell phones. But there is often no reception for those who are already deep within the canyons.

"Some of the things we're not able to achieve yet are the structural-based, technology-based issues to reach people. I think the best way to do it would be to provide something like an Amber Alert, a flooding alert to individual phones, but the technology isn't in place in the canyons to allow for that," said Fagergren.

"The thing is, even if you were able to put a system in place that solves one canyon, like The Narrows, or part of The Narrows, it doesn't cover the 600 other canyons," said Fagergren.

Due to the increasing popularity of Zion in recent years, the need for risk messaging has become more urgent. According to park attendance figures, the park hosted approximately 500,000 visitors annually in 1960. By 2019, visits

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Color-coded Flash Flood Potential system. (Zion National Park)

Three dimensional model provides a sense of how tributaries feed into the Virgin River. (USACE)

to the park topped 4,400,000, and permits for canyoneering day trips had risen to more than 38,000.

"As of 1961, Zion had experienced only one major casualty event related to canyoneering, but as visitation has soared the dangers have increased," said Stetzel.

In 1961, four teenaged Boy Scouts and a Scout master were killed by a flash flood as they hiked in The Narrows slot canyon. In 2015 a group of seven individuals perished in Keyhole Canyon. The fear is that with so many visitors in the canyons at once, the probability for a mass casualty event is increasing.

"The Narrows is particularly popular and is the area most at risk for a mass casualty event should heavy rains catch people off guard," said Rummel. "The Narrows has literally thousands of visitors hiking back into the canyon every day. If you were to have a major weather event occur and no warning system in place …" he shrugs with a shake of his head, as if to say, not good.

Meanwhile, a separate but related project between Zion and USACE may provide a key piece of the puzzle. The Sacramento District is working on a hydrologic model of Zion that could ultimately improve the technical accuracy of predicting flash floods in the slot canyons.

"Right now, predicting the weather and water flow into the canyons is a bit of an art form," said Stetzel. "We are working to remove the guesswork."

In conjunction with the hydrologic model, USACE and Zion discussed installation of a system of rain and stream gauges that could further improve modeling and forecasting.

"If we get the rain and stream gauges put in and are able to collect better data, we could have a whole new project in a couple of years to improve the model based on that new data," said Stetzel.

Utah's Silver Jackets team, led by UDEM, is working to put all the disparate pieces together. Silver Jackets interagency projects bring together state, federal and local partners to collaborate on flood risk management efforts. Within this framework, USACE is assisting the team in a 12-18 month effort to help identify effective solutions for the slot canyons. As part of the effort, the project team held risk communication meetings with gear outfitters in the community. The team coordinated with a researcher at Dixie State University, Utah, to develop a software program that delivers flash flood warnings to the park's shuttle buses. Moreover, the researchers' monitoring equipment was adapted to track water surface elevations at The Narrows.

"Part of our risk-messaging focus is helping visitors make good decisions for themselves. A green light doesn't automatically make the canyon safe if the visitor is unprepared for the journey. Good risk communication educates the visitor about risk and teaches them how to properly evaluate that risk for themselves," said Rummel.

"At the end of the day, we are trying to make the park as safe as possible without fighting against our own mission as a service to protect the resources and provide enjoyment," said Fagergren. "There's no way we can leave nature intact and remove all of the risk."

Watershed University: The Little Summit that Could

By Hunter Merritt, Lindsay Floyd, and Danae Olsen, USACE Sacramento District

Celebrating the 50th anniversary of Earth Day while overcoming the challenges of sheltering in place, the U.S. Army Corps of Engineers (USACE) and the California Department of Water Resources (CA DWR) collaborated through the California Silver Jackets to host a completely virtual Watershed University Summit. Held April 21–22, the summit focused on knowledge sharing among floodplain managers, emergency managers, and other water professionals.

The summit was initially scheduled as an in-person gathering at the Los Angeles River Center and Gardens, with a maximum of 100 attendees. However, the pivot to a virtual event — made just a few days before the COVID-19 quarantine orders were issued across California — enabled a significant increase in attendance, with more than 350 registrants across the nation, and more than 140 participants logging in at any given time. The experience validated Watershed University's use of online learning as an effective and worthwhile endeavor. Yet this was not the first time the learning forum adjusted and adapted to change. In fact, adapting to unforeseen circumstances has been integral to its history.

The concept for Watershed University (WU) was created in 2011 by Kathy Schaefer when she was still with the Federal Emergency Management Agency (FEMA) Region IX. It was designed to be a free alternative to conferences, helping certified floodplain managers to accumulate skills and continuing education credits. Her vision was to make it available in areas of California that didn't get as much attention as the big cities. The first event, held in Redding, was a success, and attendance doubled the following year in West Sacramento.

"The concept for Watershed University (WU) was created in 2011 by Kathy Schaefer when she was still with the Federal Emergency Management Agency (FEMA) Region IX. It was designed to be a free alternative to conferences, helping certified floodplain managers to accumulate skills and continuing education credits."

Unfortunately, however, budget constraints prevented FEMA from continuing to support the event.

When, in 2014, CA DWR asked if USACE would consider bringing back the event under the California Silver Jackets flood risk education project, USACE agreed and began planning to resurrect the program. In 2015, WU returned with an event in the small, Central Valley town of Atwater. Additionally, a new "hybrid" approach to maximize participation was piloted: all the speakers would meet in person, but the audience would be virtual. The Natural Resources Conservation Service, the United States Forest Service, and the University of California, Merced were among the agencies and organizations represented in the 2015 summit. Felix Yeung from USACE Sacramento District and Darren Suen with CA DWR (the state lead for the California Silver Jackets team), provided opening comments on the state of water management in California.

"It's nice to see that even before COVID-19, flood management professionals employed innovative ways to educate and disseminate information," said Suen, who is now a policy advisor for California's Central Valley Flood Protection Board. "Watershed University is a great forum to learn about flood risk and flood management, regardless of your knowledge level."

Following the success of the Atwater Summit, the team planned to hold another WU event in 2017, this one to be hosted by Marin County Flood Control. Unfortunately, flooding around the state that winter and spring, including the Oroville Spillway Incident, occupied many of the presenters and participants. Nevertheless, CA DWR and USACE adapted to the circumstances and made a series of monthly WU webinars in lieu of an in-person gathering. The WU Webinar series resulted in a distribution list that now has over 600 interested professionals.

In 2018, one of the most ardent supporters of California Silver Jackets, retired Marine Corps Col. Carl Morrison, pushed for a return to the traditional in-person gathering. A 2018 WU Summit was to be held in Southern California at March Air Force Base, recruiting the Civil Air Patrol as a local partner — per Morrison's enthusiastic invitation. Tragically, Morrison was killed in a plane crash that spring, and the event was put on hold until 2019. The California Silver Jackets team, in Morrison's honor, agreed to push forward with his vision for a SoCal-sited WU. With help from

Continued on page 14.

Justin Yee, the Urban Waters Federal Partnership Ambassador for the Los Angeles River, the Mountains and Rivers Conservation Authority provided the L.A. River Center and Gardens, free of charge, as a prime spot to learn about SoCal's watershed issues.

The event was scheduled for July 2019, but low enrollment forced a decision to delay it until April 2020. The Silver Jackets team redoubled efforts, placing an emphasis on a nature-based theme to coincide with the 50th anniversary of Earth Day on April 22. All of the presenters scheduled for the July 2019 event were steadfast, committed supporters, and nearly all were able to be a part of the 2020 program. Throughout the winter, the planning team worked to secure hotel rooms, plan evening activities, send invitations to colleagues, and hold meetings with presenters and coordinators.

Then the coronavirus threw the team a spiky curveball. On March 11, the planning team met to make a tough decision: Do we cancel? Do we reschedule yet again? The team considered the investment of time it would take to migrate the entire event to an all virtual platform, made a risk-informed decision, and once again embraced the opportunity to adapt: Voila! WU Virtual Summit!

The agenda stayed the same, but adapting to a new platform meant investing a lot of time practicing and preparing. Facilitators and presenters met weekly to discuss presentations and to test engagement tools. The team brainstormed fun activities to close the digital gap and figured out how to make information available and accessible to the public. In addition to expanding opportunities for participation, the move to virtual removed financial and scheduling barriers that could have prevented many from joining.

As a result, the WU team supports professional education for a community of water professionals more strongly than ever before. Yeung said, "Besides responding to flood events, it is crucial that we take preventative measures. Watershed University is one of the effective tools we have in our hands to help prevent flood disasters before they occur, and we hope to work with more communities to spread the word."

One such community is the Floodplain Management Association (FMA), a regional arm of the Association for State Floodplain Managers. The FMA Conference committee made the decision to pivot their annual conference in September 2020 to a virtual gathering, in part due to the success of the WU Summit. Moreover, the annual California Silver Jackets meeting takes place in conjunction with the FMA conference every year, and will also likely be an entirely virtual event.

"California is blessed to have an army of dedicated flood mitigation professionals at the federal, state, and local levels," said Schaefer, now retired from FEMA Region IX and completing her PhD in Engineering from University of California, Davis. "All I did at the start was provide a space and forum for the sharing of knowledge and expertise. The real credit goes to those who make it better every year."

The 2020 Watershed University virtual summit was a product of deep collaboration and communication. Here are a few tips on how to plan and facilitate virtual, collaborative events.

1. Give yourself time. It is best to decide whether you are going to "go virtual" at least six weeks before an event, and perhaps longer (10+ weeks) if you are planning something from scratch.

2. Determine the meeting platform early, and test it with the facilitation team and presenters as much as possible before the actual event. Weekly meetings are recommended, more if needed.

3. Require all meeting materials a week in advance, and establish an accessible shared location (website or shared drive) for materials, so that all participants can access materials on the fly.

4. Cut the amount of material in half if you are presenting virtually and want to promote conversation and engagement. Expect engagement for about 15-20 minutes and then switch speakers or introduce an activity or dialogue.

5. Reflect on your experience participating virtually. What do you like or dislike about being a participant in the virtual space? Offer your suggestions to facilitators early enough to incorporate them into the planning of a panel or event. (As a metaphor, think about all the work that goes into making a meal — i.e. more than just the ingredients, it is also about presentation.)

Round the National Silver Jackets Table

By Ellen Berggren, USACE Institute for Water Resources

The National Silver Jackets Team comprises 11 federal agencies that meet quarterly (see inset). "Round the Table" is a standing agenda item at National Team meetings, with each agency sharing information about new tools, publications, initiatives, and information exchange and learning opportunities. State SJ teams can send feedback to the National Silver Jackets Team at IWR.SilverJackets@usace.army.mil

Comment Opportunity

- ***NOAA National Weather Service*** is proposing changes to the Watch/Warning/Advisory System and is seeking public feedback though an on-line survey. You are encouraged to share with family, friends and neighbors to achieve wide distribution.

Webinars

- National Silver Jackets member agencies frequently present at monthly Silver Jackets webinars. The recorded webinars are posted on the Silver Jackets webpage. Recent presentations include:
  - ***USACE***, *Get on the Plane, Jane: How to Stay Connected When You're up in the Air:* Shares principles and best practices for facilitating and participating in virtual meetings so Silver Jackets teams can stay engaged when in-person meetings are not an option.
  - ***FHWA***, *Nature-Based Solutions for Coastal Highway Resilience – An Implementation Guide:* Provides guide overview that is designed to help transportation practitioners understand how and where nature-based solutions can be used to improve the resilience of coastal roads and bridges.
  - ***NOAA OCM***, *Natural Infrastructure Resources to Improve Community Resilience:* Highlights a suite of natural infrastructure products available on the Digital Coast website to help get started with natural infrastructure planning.

- ***FEMA*** hosted a five-part Building Resilient Infrastructure and Communities (BRIC) Summer Engagement Series in July 2020. FEMA subject matter experts and partners discussed key elements of the newly developed grant program. Recorded webinars and other program information are posted on the FEMA BRIC webpage. Webinar topics included:
  - Introduction to BRIC Grant Program
  - Meaning of the BRIC Name
  - BRIC and Building Codes
  - BRIC and Community Lifelines
  - BRIC and Nature-Based Solutions

National Silver Jackets Team Purpose

Support state Silver Jackets interagency flood risk management teams at the national level by:

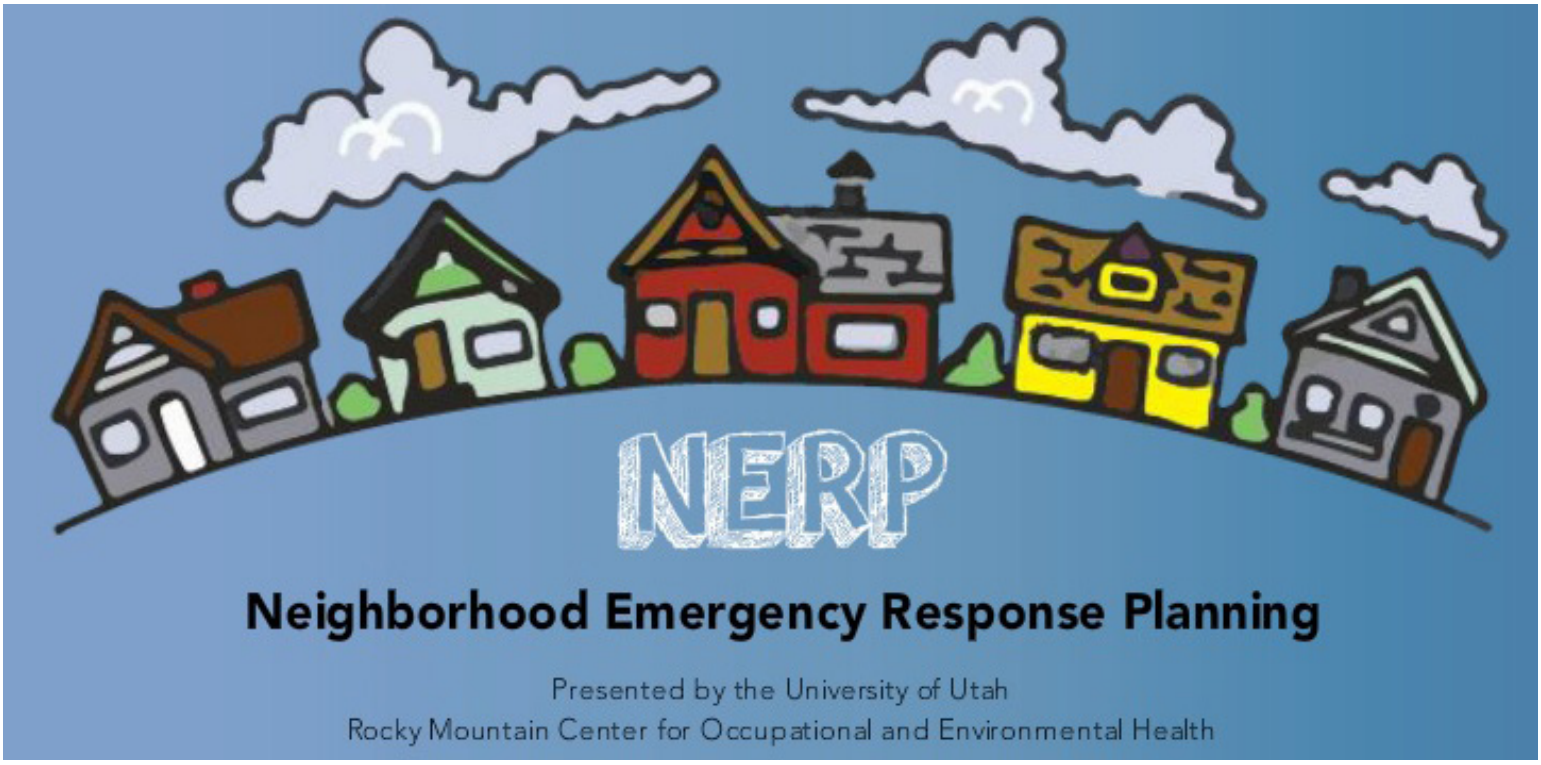
- Sharing information about agency data, programs, resources and expertise available for on-the-ground support;
- Coordinating programs and leveraging funding opportunities to enhance agency program execution and outcomes (data, technical expertise, regulatory, planning frameworks);
- Increasing agency regional staff awareness of and opportunities to support SJ teams;
- 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
- Federal Emergency Management Agency
- Federal Highway Administration
- U.S. Housing and Urban Development
- National Aeronautics and Space Administration
- Natural Resources and Conservation Service
- NOAA National Weather Service
- NOAA Office of Coastal Management
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- U.S. Geological Survey

Flood Module Released for Neighborhood Emergency Response Planning Course

By Elizabeth Dionne, USACE Sacramento District



The Neighborhood Emergency Response Planning (NERP) course, offered by the University of Utah's Rocky Mountain Center for Occupational and Environmental Health, teaches citizens how to prepare for disasters and their aftermath. (University of Utah)

In May, the University of Utah's Rocky Mountain Center for Occupational & Environmental Health released a flood risk awareness training module as part of a Neighborhood Emergency Response Planning (NERP) course. The online course is based on the FEMA guidebook, Are You Ready: A Citizen's Guide, and features six modules that teach homeowners and neighborhood organizations how to prepare for disasters, what to do in the event of a disaster, and how communities can coordinate a disaster response.

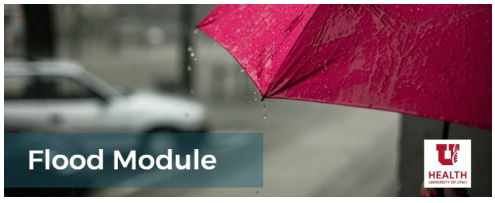
Each module takes about 30 minutes to complete. They include the following:

1. Prepare and Plan
2. Response Actions & Recovery for a Return to Normal Living
3. Earthquakes
4. Home and Wildland Fires
5. Severe Weather
6. Floods

The flood module was developed in partnership with the Sacramento District of the U.S. Army Corps of Engineers (USACE) via the Utah Silver Jackets team, and was supported by funding for interagency projects from USACE's Floodplain Management Services program.

The module features a video slideshow with accompanying narration discussing causes and characteristics of different types of floods. One section covers safety both inside and outside of the home, including what to pack in an emergency kit, steps to take when a flood warning or evacuation order is issued, and what things to expect upon returning home. This module also addresses frequently asked questions, such as, "What does '100-year flood' mean?" and "Will flood risk increase in the future?"

The NERP course is accessed annually by more than 50,000 individuals. For the people of Utah, the most costly natural hazard each year is flooding. Disaster education is one of the most cost-effective tools for risk management. The better informed people are, the better they will be able to protect themselves and their communities. Thus, it is hoped that this course will ultimately help to reduce risk and tragic loss of life or property in Utah.



A Flood Module for the NERP course was developed in conjunction with the U.S. Army Corps of Engineers and released to the public in May 2020. (University of Utah)

UPCOMING EVENTS

CONVERGE *IRB Procedures and Extreme Events Research* Training Module

The Natural Hazards Center at the University of Colorado Boulder is excited to announce the release of a fourth CONVERGE Training Module. It focuses on Institutional Review Board (IRB) Procedures and Extreme Events Research. You can register for the free online module now.

This IRB module 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 disasters. The new module covers the purpose of the IRB, the application process, and specific IRB challenges that arise in the context of extreme events research. 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 Cultural Competence in Hazards and Disaster, Disaster Mental Health, and Social Vulnerability & Disasters.

You can sign up for free resources and additional updates at the CONVERGE website at: the CONVERGE website.

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.

Workshops and Conferences

NOTE: A number of workshops and conference schedules have been rescheduled or shifted online due to the ongoing pandemic. Some have reduced their registration fees. Please confirm details with conference organizers regarding the latest status.

Floodplain Management Association Annual Conference. September 8-11, 2020. *Virtual only.*

Oklahoma Floodplain Managers Association Annual Conference. September 21-23, 2020. Norman, OK.

Kentucky Association of Mitigation Managers Conference. September 21-24, 2020. *Virtual only.*

Northwest Regional Floodplain Management Association Conference. September 22-24, 2020. *Virtual only.*

Colorado Association of Stormwater and Floodplain Managers Annual Conference. September 29-October 2, 2020. Keystone, CO.

AWRA Annual Water Resources Conference. November 9-12, 2020. Orlando/Kissimmee, FL. *Virtual only.*

Association of State Floodplain Managers (ASFPM) Annual Conference. May 9-13, 2021. Raleigh, NC.

4th European Conference on Flood Risk Management. May 21-25, 2021. Budapest, Hungary.

8th International Conference on Flood Management (ICFM8). August 9-11, 2021. Iowa City, IO. See https://icfm2020.org for details.

New Jersey Association for Floodplain Management. ***2020 conference cancelled.*** **Next: October 26-28, 2021.**

UPCOMING EVENTS

Courses & Webinars

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

NOAA Office of Coastal Management (OCM) Training Resources:

- **How to Facilitate a Virtual Meeting. Self-guided online training.**
- **Techniques for Facilitating Virtual Meetings. Reference guide.**
- **Virtual Meeting Engagement. Reference guide.**
- **Coastal Zone Management Act 101. Self-guided training resource.**
- **Green Infrastructure Effectiveness Database. Self-guided training resource.**
- **How to Map Open Space for CRS Credit. Self-guided training resource.**
- **Risk Communication Essentials for More Effective Conversations. Self-guided training resource.**
- **A Community Works Together to Restore the Floodplain and Reduce Damages. Case study.**
- **Coastal Community Resilience Indicators and Rating Systems. Report.**

Many more resources are available at NOAA OCM DigitalCoast/Training.

FEMA Emergency Management Institute (EMI) Courses:

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

E0102: Science of Disaster
- September 14-16, 2020. West Columbia, SC.
- September 28-30, 2020. Austin, TX.

E0105: Public Information and Warning
- September 3-4, 2020. Blue Lake, CA.
- September 24-25, 2020. Elkhart, IN.
- October 5-7, 2020. Emmitsburg, MD.
- October 21-23, 2020. Austin, TX.

E0273: Managing Floodplain Development through the NFIP
- September 14-17, 2020. Baton Rouge, LA.

E0278: NFIP/Community Rating System
- October 5-8, 2020. Emmitsburg, MD.

E0282: Advanced Floodplain Management Concepts II
- September 21-24, 2020. Oriskany, NY.

E0284: Advanced Floodplain Management Concepts III
- October 19-22, 2020. Knoxville, TN.

Full course schedule available at training.fema.gov.

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 Website:

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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