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Flood Risk Management Newsletter

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Flood Risk Management Newsletter



US Army Corps
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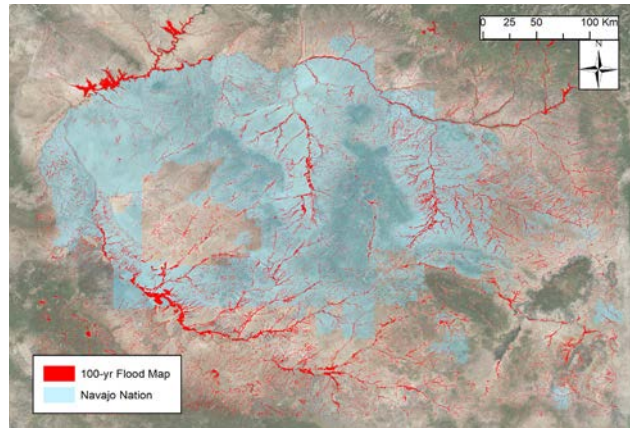
April 2019 • vol 12 no 2

CONTENTS

April 2019

- P.1** Achieving Resilience and Lifecycle Disaster Risk Management – Requires Full Spectrum Action Not Just Response
- P.4** Utilizing Simple Large-Scale Flood Models to Prioritize Deployment of HEC-RAS 2D Models: Case Study of Navajo Nation Flood Inundation Maps
- P.8** Huntington Flood Risk and Levee Safety Tabletop Improves Flood Risk Response and Builds Relationships
- P.10** Upcoming During-Storm Field Experiment: A Collaborative Effort
- P.12** Urban Flooding – An Emerging Challenge
- P.13** The International Communities' Pursuit of Guidelines for Natural and Nature-Based Features
- P.15** Engineering With Nature®: A Resource for Flood Risk Management Practitioners
- P.18** Hail and Farewells
- P.19** Other Important Information

In This Issue



Utilizing Simple Large-Scale Flood Models to Prioritize Deployment of HEC-RAS 2D Models

The Navajo Nation in Arizona, New Mexico, and Utah requested assistance from the U.S. Army Corps of Engineers to provide updated flood inundation maps in areas most prone to flooding.

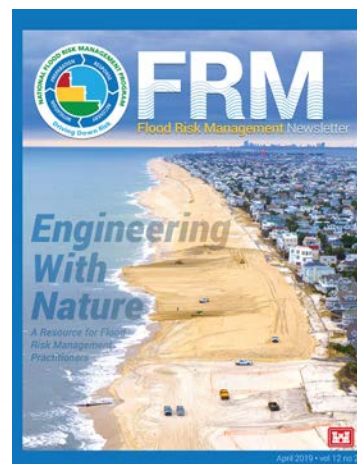
P.4



Urban Flooding – An Emerging Challenge

Pluvial flooding, sometimes known as urban flooding, is beginning to gain prominence in discussions about flood risk.

P.12



On the Cover

Engineering With Nature®: A Resource for Flood Risk Management Practitioners

"Engineering With Nature®: an Atlas," highlights 56 unique and successful projects from around the world — of particular importance to flood risk management practitioners are the 30 descriptions of Natural and Nature-Based Features projects.

P.15

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Achieving Resilience and Lifecycle Disaster Risk Management – Requires Full Spectrum Action Not Just Response

By Mark Roupas, Deputy Chief, Office of Homeland Security



Welcome to Spring!

Thank you for taking the time today to read this edition of the Flood Risk Management Newsletter. As we cycle through another year, we have definitely moved into the spring flood season. As a bit of an aside, this article was started well before the current flood disaster we are supporting in the Midwest. Since then, I have had the opportunity to travel twice to both the Kansas City and Omaha Districts to observe first-hand, the devastation and extent of the flooding. With this in mind, I am adding some background and context I believe will demonstrate how flood risk management and emergency management communities can better work together to improve the support we provide to the Nation.

Both districts, together with

leadership and support from the Northwest Division (NWD) continue their Missouri River Basin flood recovery efforts, with over 100 identified levee breaches between Omaha and Kansas City. The current plan calls for a three phased effort focused on emergency repairs, bringing the system back to pre-flood conditions, and looking for long term opportunities for change.

On April 17th, MG Spellmon and NWD Missouri River Basin Water Management Chief John Remus testified before the Senate EPW Committee Field Hearing on Missouri River Flooding. The hearing was conducted in Glenwood, IA with SENs Ernst (IA), Grassley (IA), Moran (KS), and Gillibrand (NY) in attendance. Immediately following the hearing, Governor Reynolds of Iowa also met with senior USACE officials to discuss recovery efforts in her State. In both meetings, there was a discussion that we cannot continue to do the same repairs as before and expect a different future result. This was underscored by Sen. Ernst's comment during the hearing that, "The trend of flood and rebuild, flood and rebuild must end." My observation was that a developing consensus seems to be emerging, providing an opportunity if you will, to examine how to do things differently to prevent future flooding. There is strong consensus that this should occur as an integrated local, state, all-federal agency effort to identify potential solutions (structural

and non-structural) – and should include the realization that the best solutions may not be able to be federally funded without new legislation.

With that preamble, please consider the ongoing response and recovery as you read the remainder of the article.

This active flood fight is being carried out under our PL 84-99 and CW authorities, and we are providing support to FEMA under a Stafford Act Presidential Major Declaration. Simultaneously, NWD is managing the passage of a significant snow melt, which if coupled with additional rainfall, may result in additional flooding to an already damaged system. Together with our State and local partners, we will remain vigilant to additional challenges and opportunities to practice our Life Cycle Risk Management trade.

- When will it stop?
- Did we provide technical and or direct assistance and how did it work?
- Were damages incurred and could they have been avoided?
- Did the existing local and federal projects perform as designed?
- Will the initial and long-term recovery use a system-wide approach with recommendations, structural and non-structural, federal and non-federal to mitigate future damage from

Continued on page 2.

occurring and protect lives and improved property?

- Will recovery include risk communication from the federal perspective to locals and locals to its citizens?
- How will the local Silver Jackets Team be engaged in the post-event local, state, federal after action review?
- What processes and programs do FEMA and other federal agencies have to assist in assessing risk and developing mitigation and resilience?
- How open are the locals and state to doing more than returning to pre-event conditions?
- Do the locals and state have the resources to do more than return to pre-event conditions?
- Do the locals have someone who can write a grant request to FEMA or other federal agency?
- Are the local officials willing to accept the UNESCO flood risk management principles?
- Are local officials willing to communicate anticipated future risks of their decisions regarding levels of protection produced during recovery?

The questions above are just a few questions we consider when discussing Lifecycle Disaster Risk Management. It is an extremely complex and complicated endeavor that requires us to think past USACE authorities to assist in normal times to focus on pre-, during and post-event risk management. To achieve risk management we must consider all resources available across the local, state, non-governmental organizations, and federal programs. We specifically need to be able to address what we, USACE, can provide – some of it being advice

and guidance and some being non-structural and structural solutions. And, yes, some of risk management is when we provide response actions using technical assistance or direct assistance to local jurisdictions. While USACE Districts and the enterprise as a whole performs response exceptionally well, it is the last resort piece of the greater risk management environment.

Per Director's Policy Memorandum 2018-04, National Flood Risk Management Program, issued by the Director of Civil Works in April 2018, USACE has embraced the UNESCO principles which show that all risk cannot be abated, some risk must be accepted and response should be anticipated. Please reflect on the UNESCO principles as you carry out your flood risk management and emergency management duties:

1. Accept that absolute protection is not possible and plan for exceedance;
2. Promote some flooding as desirable;
3. Base decisions on an understanding of risk and uncertainty;
4. Recognize that the future will be different from the past;
5. Implement a portfolio of responses, and do not rely on a single measure;
6. Use limited resources efficiently and fairly to reduce risk;
7. Be clear on responsibilities for governance and action;
8. Communicate risk and uncertainty effectively and widely; and
9. Reflect local context and integrate with other planning processes.

When we say disaster risk management, some might think specifically of emergency management, which is often more narrowly and incorrectly interpreted to mean emergency response. But there are different and more mature understandings of the titles. Emergency Managers at all levels of government and industry have been transitioning from 'break glass - pull handle for help' to life cycle disaster risk managers. In USACE this includes Emergency Managers becoming knowledgeable of life cycle disaster risk management techniques, and that includes the USACE National Flood Risk Management Program.

The Office of Homeland Security is the center of gravity for USACE for lifecycle disaster risk management. The Emergency Management program at the HQ level includes: preparedness and response for All-Hazards natural disasters through Public Law 84-99, man-made disaster event preparedness through the National Emergency Preparedness Program, flood risk management through the National Flood Risk Management Program, and critical infrastructure preparedness through the Critical Infrastructure Protection and Resilience Program. We also serve as the lead for the Emergency Management Community of Practice and the emergency management occupational series 0089. As the EM COP lead we fully recognize the integrated nature of all COPs across USACE to achieve unity of effort in all we do. As an example, while we have some stovepipe topics, we understand that activities undertaken by the flood risk management community are critical to achieving

Continued on page 3.

the overall EM COP objective of lifecycle disaster risk management.

Our emergency managers use disaster risk management principles to focus on the entire lifecycle – preparation, response, recovery, and mitigation. The programs in the Office of Homeland Security also focus on this entire lifecycle, and reach out to other partner programs within USACE and outside USACE for additional support through these phases. There are many ways in which the flood risk management and emergency management communities can work together to improve the service that we provide to the Nation. There has been significant focus in recent years on using green infrastructure or nature-based solutions, and even using a mix of traditional (i.e., gray) infrastructure and green infrastructure. These approaches may typically be considered within the realm of flood risk management, but they have significant impact on and benefits to the PL 84-99 program under the District's emergency manager and life cycle disaster risk management as a whole. We need to work together to understand how best to use these methods, quantify their benefits and communicate them to local sponsors. The emergency managers' efforts during recovery and peacetime must communicate future risk, mitigation, and resilience to local sponsors. The FRM community is the 'go to' for the recommendations for mitigation, resilience and to collaborate on communicating the risks.

There has been a lot of attention focused on incorporating disaster resilience, both before and after disasters. There is significant focus on mitigation, which can

be implemented at various points in the risk management lifecycle. Implementing mitigation activities and incorporating resilience are areas that emergency managers rely on the flood risk management community to provide. Flood risk managers should count on emergency managers and their discussions with local sponsors to identify additional opportunities for mitigation and incorporating resilience. The interdependency reinforces the need and benefits of the two communities of practice and the practitioners to be well integrated and synchronized.

"We look forward to working together with all communities of practice to achieve full and real lifecycle disaster risk management that truly cuts across the Civil Works enterprise."

An additional area that would benefit from closer alignment is found in urban flooding. This is a significant problem across the Nation, and not one that has an easy solution or solutions within USACE authorities. The resources available to address this problem are limited and dispersed among local and state jurisdictions and various federal government agencies. If comprehensive methods of approaching this flood risk management challenge are not developed, the toll it will take on the 'response' portion of the emergency management community, as well as engineering, contracting and construction, will be severe. People impacted by urban flood situations will require rescue, temporary shelter, and other assistance to recover from events. Hence the USACE PL 84-99 and FEMA Stafford Act involvement

currently in the Midwest. While the integration of flood risk management advice, guidance and techniques into the emergency management programs is critical across all levels of government we can only help to affect our actions within USACE. If we bring the flood risk managers and emergency managers closer together to address this challenge, even if we need to be creative in how we address the challenge, we have a better chance of developing more comprehensive and sustainable solutions for the future. Granted, our solutions are most often suggestions to the local sponsors of flood risk management projects, but we will have more and better solutions available.

We look forward to working together with all communities of practice to achieve full and real lifecycle disaster risk management that truly cuts across the Civil Works enterprise. We also look forward to better integrated emergency management and flood risk management efforts with local communities - the Silver Jackets collaborations are a great example of local, state, federal and internal USACE integration. By more closely aligning flood risk management and emergency management at the MSC and District level, and focusing on lifecycle disaster risk management rather than individual pieces of the broader picture, we will move toward increased resilience. Working together, both internal and external to USACE, to build resilience should be the goal of all of our efforts. This helps us better serve the nation and ensures that we, as USACE, can continue to design (or contribute to the design of) solutions to the Nation's toughest engineering challenges. I hope you enjoy the rest of this edition! 📖

Utilizing Simple Large-Scale Flood Models to Prioritize Deployment of HEC-RAS 2D Models: Case Study of Navajo Nation Flood Inundation Maps

By Michael L. Follum, USACE-ERDC-CHL; Jose M. Paredes, USACE-SPD-SPL; Elissa M. Yeates, USACE-ERDC-CHL; and Ricardo Vera, USACE-ERDC-CRREL

Maps showing the extent of flood inundation are a valuable asset to the public and can help prevent the loss of lives, infrastructure, and property. However, they are costly and time-consuming to develop using high-fidelity hydraulic models. The Navajo Nation in Arizona, New Mexico, and Utah (Figure 1) requested assistance from the Los Angeles District (SPL) of the U.S. Army Corps of Engineers (USACE) to provide updated flood inundation maps in areas most prone to flooding. The Navajo Nation is large (~70,000 km²) and SPL had limited funding to conduct the detailed flood studies, which often cost between \$100k and \$300k per study in rural towns. SPL decided that the best approach would be to develop initial, simplified flood inundation maps for the entire Navajo Nation using the most up-to-date flow and geospatial data to help prioritize where the detailed flood studies would be conducted. These initial flood maps were produced relatively quickly using the AutoRoute model.

Although originally developed to assist in mobility analysis for the military, the AutoRoute model has proven to be a useful tool in developing high-resolution flood inundation maps quickly over large regions: a 230,000 km² area in the Midwest United States; a 109,500 km² area in the Mississippi Delta (Follum et al., 2017); the Sava River Basin (unpublished follow-on study

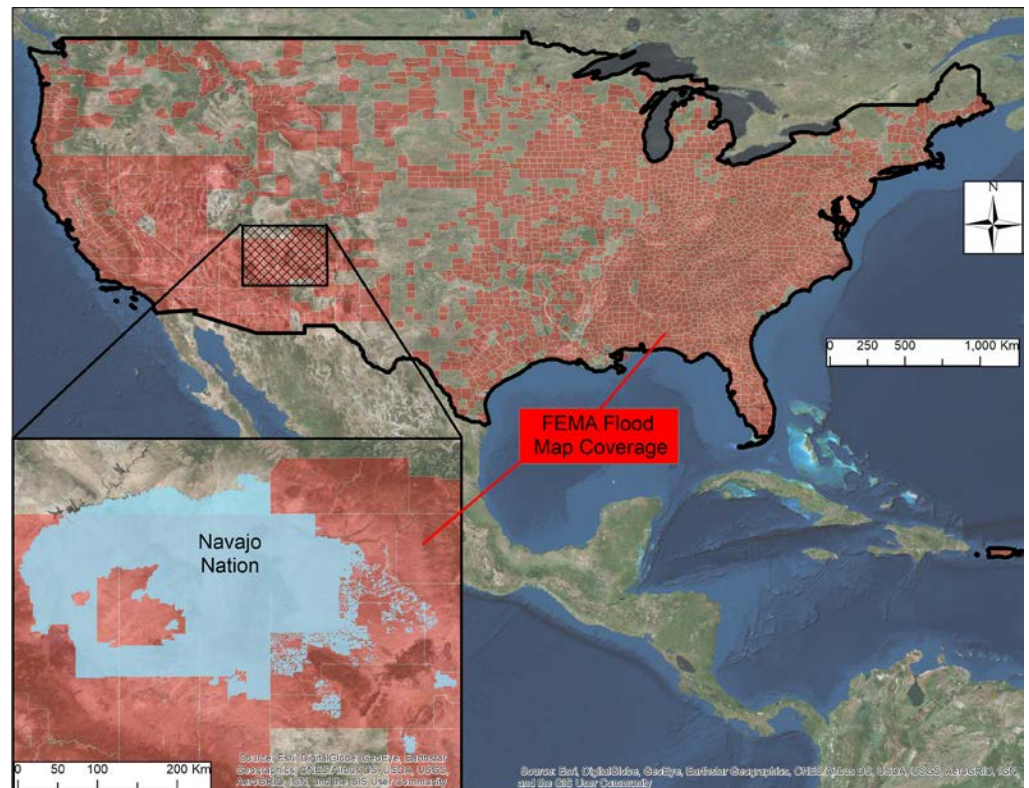


Figure 1. Navajo Nation (~70,000 km²) in Arizona, New Mexico, and Utah. Also shown is where Federal Emergency Management Agency (FEMA) flood inundation maps exist for the continental U.S. (<https://hazards.fema.gov/gis/nfhl/services>; accessed via ArcGIS 10.3 (ESRI, 2011)). Sources of the background imagery in Figures 1-5 include ESRI, DigitalGlobe, Earthstar Geographics, CNES/Airbus DS, GeoEye, USDA FSA, USGS, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community.

to Follum et al., 2016); Puerto Rico (Follum et al., 2018); and Luzon, Philippines (Wahl et al., 2017). AutoRoute is low-fidelity in that it solves simple hydraulic equations (the Manning equation) and makes several simplifying assumptions (e.g. that flow is at normal depth and is one-dimensional in the downstream direction). Despite its simplicities, AutoRoute has shown to be accurate in medium-to-high topography regions and in areas with limited backwater (Follum et al., 2017;

Afshari 2018). AutoRoute has four main data requirements. The data and the associated references used within this study include the following:

1. Elevation data – 3 and 10 m resolution National Elevation Dataset (Gesch et al., 2002)
2. Stream locations – 40,488 stream reaches in Navajo Nation from the NHDPlus stream network (Horizon Systems Corporation, 2007)

Continued on page 5.

3. Flow estimates – 100-year flow estimates calculated for each stream reach based on USGS flow regression equations (Waltemeyer, 2006)
4. Land cover data – 2011 National Land Cover Dataset (Homer et al., 2015)

100-year flood maps were developed for the entire Navajo Nation and took approximately 24 hours to create. The man-hour and compute-hour requirements to simulate a 100-year flood event for the Navajo Nation are shown in Table 1. These numbers reflect having prior knowledge of set-up and execution of AutoRoute flood models. Additionally, the flow regression equations applicable to the Navajo Nation region from Waltemeyer (2006) use only mean basin elevation and drainage area as arguments to calculate flow rates, whereas USGS flow regression equations for other areas can be more complex and require more arguments (such as mean annual precipitation).

Figures 2-5 show the 100-year flood inundation maps generated for the Navajo Nation. Where available, the FEMA flood maps are also shown. Figure 2 shows the 100-yr flood inundation map simulated by AutoRoute for the entire Navajo Nation, demonstrating the scale

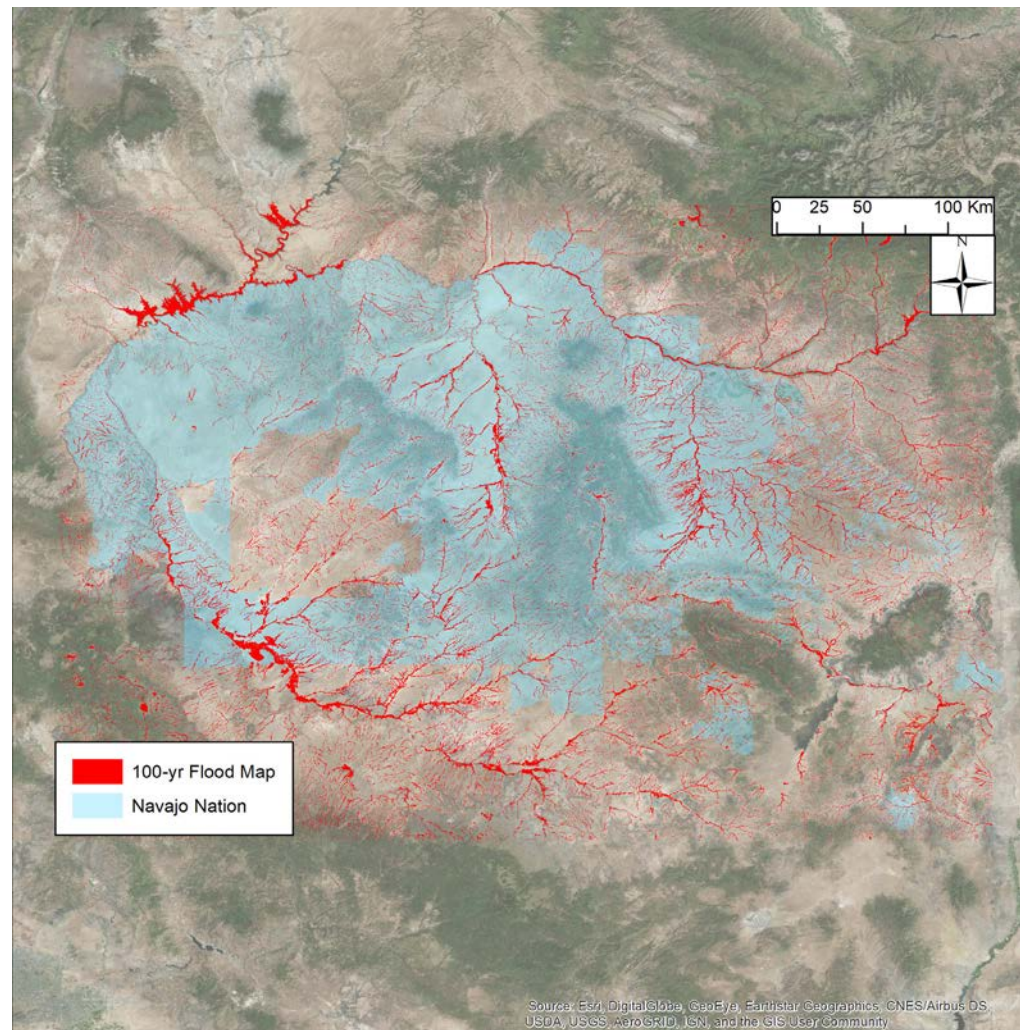


Figure 2. 100-yr flood map for entire Navajo Nation.

at which high-resolution flood inundation maps can be quickly generated. Where FEMA flood inundation maps (Figures 3 and 4) exist they match well with the flood inundation maps simulated using AutoRoute, indicating that the flood inundation maps generated by

AutoRoute can have similar accuracy to FEMA.

The flood maps shown in Figures 2-5 are currently being used by the USACE Albuquerque District (SPA), Sacramento District (SPK), and SPL to prioritize locations to develop more detailed flood studies. The flood maps generated by AutoRoute provide an initial estimate of what areas may be affected by extreme flood events. This information helps guide and defend decisions on deployment of the detailed flood studies conducted by SPA, SPK, and SPL.

Table 1. Man-hour and compute-hour requirements to simulate 100-yr flood events for all river reaches

Task	Man-hours	Compute-hours
Data Collection	4	-
Flow Rate Calculation	4	-
Data Preprocessing	2	2
AutoRoute Model Runs	2	4
Flood Map Post-Processing	2	2
Total	14	18

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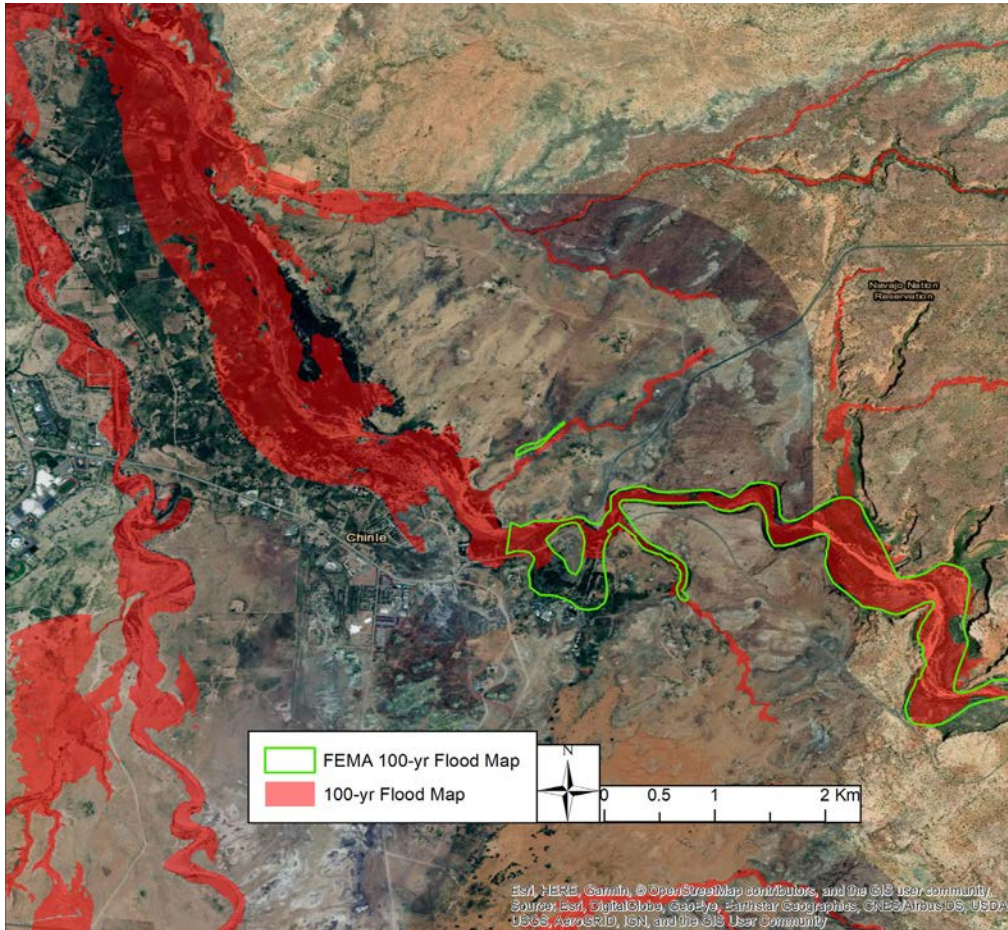


Figure 3. 100-yr flood maps for Chinle, AZ. Flood map simulated using AutoRoute is shown in red and FEMA flood maps is shown with a green outline.

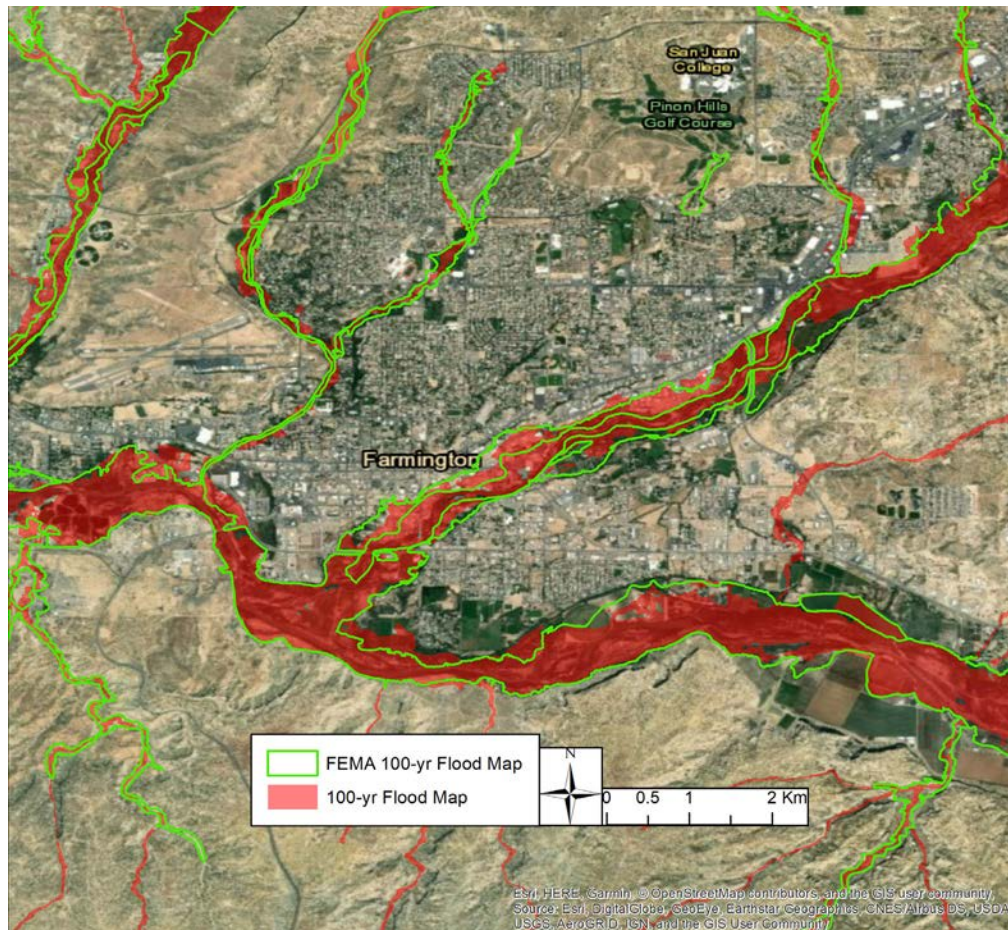


Figure 4. 100-yr flood maps for Farmington, NM. Flood map simulated using AutoRoute is shown in red and FEMA flood maps is shown with a green outline. Farmington is not within the Navajo Nation, but was modeled in this study and has complete FEMA flood maps for comparison.

Continued on page 7.



Although the flood inundation maps generated using AutoRoute match well with the FEMA flood maps, maps generated using AutoRoute are not meant to replace FEMA flood maps. Additionally, AutoRoute is not designed to, nor has the fidelity to replace advanced hydraulic models, such as HEC-RAS 2D (Brunner, 2016), in completing detailed flood studies. This study did show that using simple flood models to generate initial flood maps quickly using readily-available data can be used to prioritize the deployment of more advanced hydraulics models. This results in an overall more efficient and cost-effective approach to floodplain management, ensuring that more costly high-fidelity flood maps are developed for the locations in which they are most needed for public safety.

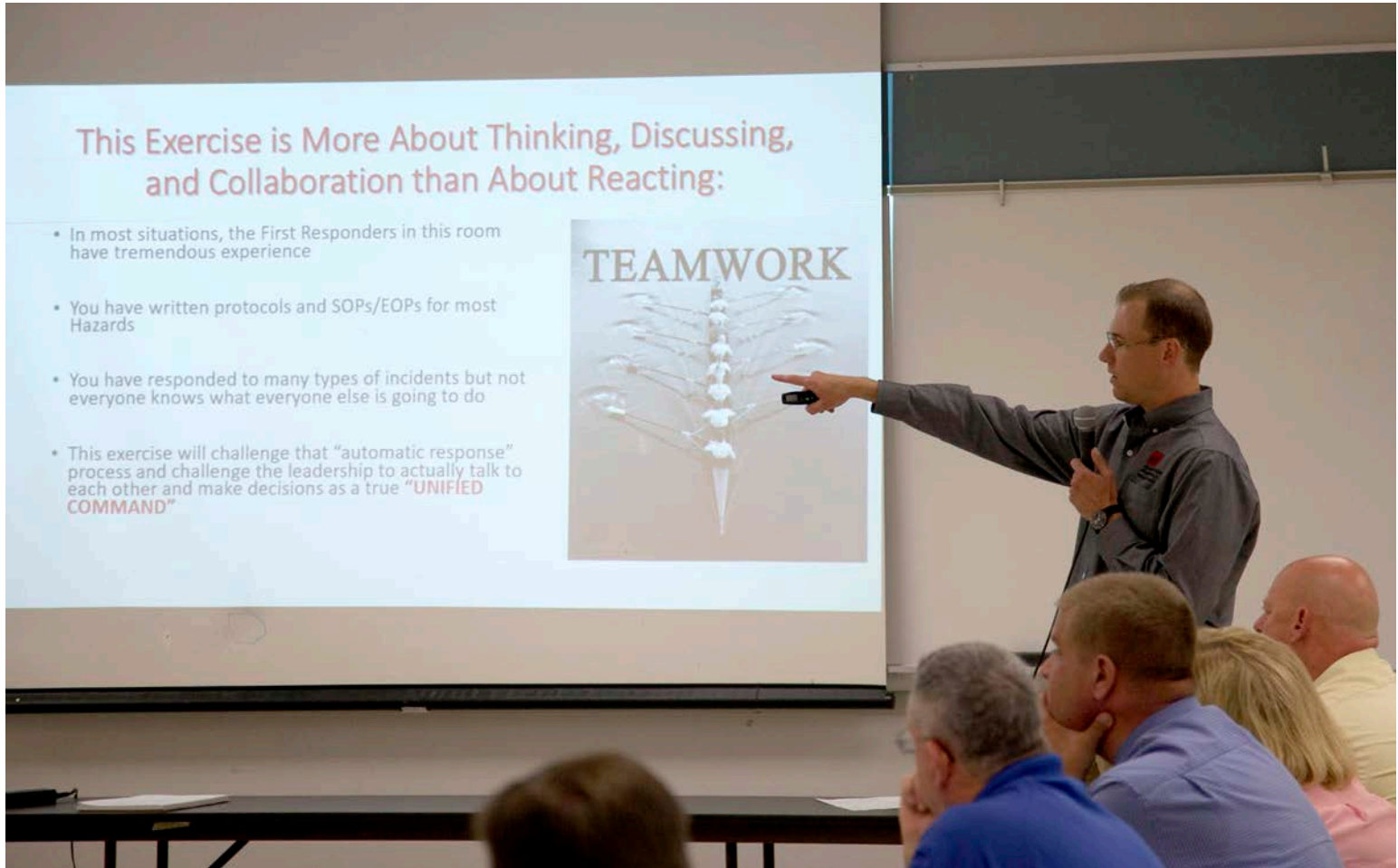
Figure 5. 100-yr flood map for Ganado, AZ. Flood map simulated using AutoRoute is shown in red and no FEMA flood map was available.

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Huntington Flood Risk and Levee Safety Tabletop Improves Flood Risk Response and Builds Relationships.

By Charles Goad, USACE Huntington District



More than 50 local, state and federal leaders and decision makers met in July 2018 to participate in a flood risk and levee safety tabletop exercise. The exercise was jointly developed by the Huntington District of the Corps of Engineers, West Virginia Homeland Security, the Cabell County Emergency Management Agency (EMA) and the Huntington Stormwater Utility.

A tabletop exercise is designed to allow decision makers to review their contingency plans and measure them against a fictional scenario developed to test their agencies ability to respond. Participants in a tabletop exercise often find many unknown variables that could

potentially affect their organizations ability to respond to threats. Tabletop exercises have been used in emergency management circles for many years, but has only recently been applied to flood risk reduction projects. The value of a tabletop exercise is widely regarded as being very effective in finding potential oversights in plans. Additionally, the non-judgmental and no-stress nature of a tabletop helps in finding omissions that may have otherwise not been found until an actual emergency occurred.

The participants of the Huntington Flood Risk Reduction and Levee Safety Tabletop were faced with a major, slowly progressing, flood along

the Ohio and Guyandotte River. The flood was modeled after an actual event, the January 1937 flood of record for Huntington, which saw water levels near the second story in some downtown buildings. But this time, the city would be protected by a levee and floodwall system which was constructed by the Corps of Engineers between 1938 and 1943. The city of Huntington and the surrounding towns would be tested on their plans and ability to emplace gates in many of the floodwall's 30 gates. As well as, how would they be able to pump water out of the city using its 17 pump stations. Local industry partners, who manage gates on their

Continued on page 9.



property, were invited to discuss their plans and participated in the tabletop. Likewise, representatives from the local hospitals and nursing homes were invited to understand evacuation plans and participated in the event.

The developers of the tabletop felt confident in the Huntington Stormwater Utilities' ability to handle normal floods, but wanted to push their plans to the limit. In addition to amplifying the flood to historic levels, they also threw many other difficulties at the city such as seepage under the floodwall, failing pumps and more. While the participants were overwhelmed, at the end they were very satisfied in the exercise. The presenters and facilitators constantly emphasized that the tabletop was a problem solving activity. And that all the participants were gathered together to improve their plans and learn about their performance. An unforeseen, but very valuable outcome of the exercise was the knowledge gained of the capabilities of sister organizations in the city, county and state. Many previous contingency plans had relied on resources from other agencies, such as heavy equipment,

sandbags and lumber. During the tabletop, many agencies learned that their reliance on other agencies was not practical. The heavy equipment was no longer in the agency inventory; sandbags had been used years ago; and the lumber was in use. In other cases, agencies found that there were more resources available than previously known.

One of the greatest outcomes from the exercise was the lessons learned by all who attended. They left with a new understanding of the processes and procedures in place to protect the community as well as future plans to fix and improve processes that were found inadequate. Another great outcome of the event was the relationships made during the event. The role of the presenter and facilitator were key in keeping the event on track and ensuring discussion was kept on target. As well as making sure the conversations were kept detached from personal differences. The Cabell County EMA requested participants complete after action reports (AAR). The reports were overwhelmingly supportive and extraordinarily enthusiastic about the

event. Many of the AAR's requested that the event be established yearly. The core planning team is developing a written comprehensive after action report that will capture lessons learned and make recommendations to participants. The final AAR will be provided to all the participants and distributed to other levee system operators in order to assist them in similar situations. **END**

Huntington Interagency Levee Safety Tabletop Exercise



After-Action Report 26 July 2018

The After-Action Report (AAR) aligns exercise objectives with preparedness doctrine to include the National Preparedness Goal and related frameworks and guidance. Exercise information required for preparedness reporting and trend analysis is included, users are encouraged to add additional sections as needed to support their own organizational needs.

Upcoming During-Storm Field Experiment: A Collaborative Effort

By Mary Cialone, Julie Rosati, Stephen Deloach, and Katherine Brodie, USACE-ERDC-CHL

The DURING Nearshore Event eXperiment (DUNEX) is an academic, multi-agency, and non-government collaborative community experiment being supported by and planned under the U.S. Coastal Research Program (USCRP) to study nearshore coastal processes during one or more coastal storms. The motivation for DUNEX is to: 1) improve understanding of storm processes; 2) improve the ability to calculate and predict storm processes and impacts; 3) incorporate better physical representation of nearshore processes into numerical models; 4) identify and reduce sources of error in numerical predictions of storm processes; 5) identify knowledge gaps and collaborative research ideas to address those gaps; 6) improve strategies for short- and long-term coastal resilience; and 7) develop more effective communication methods for coastal communities impacted by storms. The target data of the experiment include: hydrodynamics, meteorology, hydrology, sediment transport, geomorphology, morphological evolution of the beach/dune, dune overtopping/overland flow, and ecology.

DUNEX Information Webinar

On 31 January 2019, the DUNEX Leadership Team held a webinar to provide general information on the DUNEX pilot study to be conducted in the Fall 2019 and the full experiment focused on storm measurements to be conducted in the Fall 2020 to Winter 2021 time frame. DUNEX will be conducted at a fixed-site along the Outer Banks, North Carolina with the US Army Corps of Engineer's Field Research Facility (FRF) serving as the logistical base for the operation. Webinar attendees, which included over 100 participants from 12 academic



institutions, 3 federal agencies, and 2 non-government organizations, were able to pose questions during the webinar via live chat as well as verbally after the formal presentation portion of the webinar. Responses to the questions were made verbally and captured in a frequently-asked-question (FAQ) document. The presentation slides and set of frequently-asked-questions (FAQs) are available on-line at <https://uscoastalresearch.org/dunex>, along with a DUNEX Fact Sheet and Logistics Survey regarding potential participation in DUNEX.

“The DURING Nearshore Event eXperiment (DUNEX) is an academic, multi-agency, and non-government collaborative community experiment being supported by and planned under the U.S. Coastal Research Program (USCRP) to study nearshore coastal processes during one or more coastal storms.”

Continued on page 11.

DUNEX Logistics Survey

The DUNEX Leadership Team formed the initial leadership of the DUNEX Logistics Team which is tasked to identify individual researcher's goals and support needs, identify group support needs, schedule resources, and develop a data sharing plan. The DUNEX Logistics Team will eventually expand to include a Principal Investigator (PI) from each science team involved in the DUNEX experiment. The DUNEX Logistics Team has developed a Logistics Survey that is available on-line to identify interest in related researcher initiatives to facilitate collaboration, common data needs that could be provided by agency collaborators (e.g. bathymetry), logistical support needs (e.g. deployment; fabrication etc.), and potential training topics of interest to the participants. The purpose of the Logistics Survey is only to identify researcher's interest in participating in DUNEX, pending funding. Researchers are not required to have funding secured at this time. To help the DUNEX Logistic Team plan and the FRF team host the experiment, interested participants are requested submit a Logistics Survey immediately for the pilot experiment and by 31 Dec 2019 for the full experiment. Earlier submission is encouraged and plans may be updated at any time. The Logistics Survey can be downloaded from the USCRP website at <https://uscoastalresearch.org/dunex>. Other logistical information such as reserving office space, sources for lodging, ocean/sound access, and permitting will be posted at this site in the near future.

Opportunities to Participate in DUNEX

Individuals interested in conducting an experiment as a PI during the DUNEX Pilot Study and/or Full DUNEX Experiment should fill out a Logistics Survey so that experiment organizers can begin logistical planning. PIs must secure their own funding, will need to contribute a logistical support fee


~\$500-4500/wk per team depending on the level of support needed, and agree to a data sharing policy. Other means of participating include attending or leading a training session in the field and/or classroom. Lastly, students interested in the experiment are welcome to volunteer and assist with field work.

DUNEX Training Opportunities

DUNEX will include training opportunities centered on the active field work, FRF facility, and the group of coastal experts on-site conducting experiments. Offered training will consist of traditional lectures focused on coastal processes including topics such as waves, water levels, currents, sediment transport, coastal geology and methods of coastal protection. This training will also include field exercises that focus on some aspect of the lecture topic, for example, identifying dune scarping, wave type, wave period, changes in the wave breaking zone, wave runup, or possibly the formation of beach cusps. The second type of training will target more hands-on training in field methods, geared towards the different types of instrumentation. This training will include all things related to data – such as data collection methods, data analysis and interpretation, data and instrument uncertainty, and how to design a data collection experiment. The third type of training will be offered as evening talks by the various DUNEX investigators discussing their experiment, new field methods and theories, and general networking to seek new ideas from other researchers. Lastly hands-on numerical modeling sessions will be offered for individuals to learn particular tools that can be applied to an area of interest or to validate to data collected during DUNEX. These training opportunities are open and offered to students, staff from the federal agencies, local coastal managers, and other interested parties. Training space is limited, therefore interested individuals should complete the Logistics Survey to participate or suggest other derivatives of the training

opportunities mentioned here. There is no cost to participate in the training exercises.

USCRP Support

The USCRP supports the planning of DUNEX and is committed to helping promote DUNEX to a multi-disciplinary audience to ensure diverse data collection. USCRP's Virtual Program Office is working closely with the DUNEX Leadership, Logistics, and Training teams to coordinate logistical support and facilitate the development of the complete Logistics Team. The complete Logistics Team will consist of science PIs in collaboration with an NSF-funded Convergence-RAISE grant (OCE-1848650), who will: 1) assist in coordinating with local stakeholders; 2) assist in coordinating training classes and student volunteers to further the career development of U.S coastal researchers; 3) provide a community website for information, discussion, data sharing and access; and 4) coordinate agency-supported data collection efforts. 

“DUNEX will include training opportunities centered on the active field work, FRF facility, and the group of coastal experts on-site conducting experiments. Offered training will consist of traditional lectures focused on coastal processes including topics such as waves, water levels, currents, sediment transport, coastal geology and methods of coastal protection.”

Urban Flooding – An Emerging Challenge By Stephanie Bray, PhD, HQSACE



Street flooding of an urban area



When thinking of flooding, typically riverine and coastal flooding come to mind. However, pluvial flooding, sometimes known as urban flooding, is beginning to gain prominence in discussions about flood risk. Though a consensus definition has not yet been developed and put forward, urban flooding is typically thought of as surface water flooding caused by rainfall in developed areas. The flooding may be due to limited infiltration, limited stormwater system capacity, or other causes.

The University of Maryland (Dr. Gerry Galloway and Dr. Allison Reilly) and Texas A&M (Dr. Sam Brody) recently issued the report “The Growing Threat of Urban Flooding: A National Challenge” (<https://cdr.umd.edu/urban-flooding-report>). This report does an excellent job of articulating the problems associated with urban flooding and analyzing the scope, scale, and cause(s) of the problem faced nationwide. Based on the data analyzed, including a survey of knowledgeable floodplain managers and others, as well as GIS mapping of various federal program payouts across the Nation, the report draws a few conclusions and makes

recommendations for moving forward to address this challenge. This report is intended to be complementary to a National Academy of Sciences report on urban flooding that is expected to be released shortly. These two reports together will help begin a much broader dialogue about how best to address the challenge.

“We should expect to see and hear more discussion of urban flooding in the future and should be prepared to turn our attention to how we can work together to solve these problems.”

Similarly, the Association of State Floodplain Managers Foundation has recognized this growing problem. The Foundation focused their Gilbert F. White National Policy Forum, held 12-13 March 2019 in Washington, DC on “Increasing Our Resiliency to Urban Flooding.” The forum brought 100 invited experts in the field of flood risk and floodplain management together to discuss various aspects of urban flooding. Discussion focused on the

roles, responsibilities, and authorities of partners at all levels for managing this unique flood risk, the limited amount of attention and funding available for addressing it, the role of insurance, and many other topics. The Foundation will prepare a set of recommendations, gleaned from this discussion, which will be provided in a report issued in the coming months.

Congress has taken an interest in urban flood challenges as well. Section 1211 of America’s Water Infrastructure Act of 2018 (Public Law 115-270) directed USACE to provide within one year a study on flooding within urban floodplains. The Act additionally required USACE to report on federal policy constraints impacting the ability of USACE to address urban flooding. At this time, plans have not been made for how this will be implemented.

Urban flooding is coming to be recognized as a more significant flooding challenge than previously recognized. We should expect to see and hear more discussion of urban flooding in the future and should be prepared to turn our attention to how we can work together to solve these problems. ■

The International Communities' Pursuit of Guidelines for Natural and Nature-Based Features

By **Jeffrey K. King, PhD, PE**, Deputy National Lead, Engineering With Nature® Initiative, US Army Corps of Engineers.

A USACE-led collaboration has been underway since Fall 2016 to develop guidelines to inform the design, construction and use of natural and nature-based features (NNBF) in reducing storm and flood risk for coastal and riverine systems. The project team includes several countries and approximately 30 organizations consisting of Federal/state agencies, NGOs, private-sector companies, and academic institutions. In fact, the global dialogue that has been underway for several years, between the USACE's Engineering with Nature® (EWN®) Initiative in the United States, the Building with Nature (BwN) approach in the Netherlands, and the United Kingdom's Working with Nature processes. These communications have revealed a demand for authoritative guidance on the use of NNBF in support of integrated, water resources management.

Collectively, NNBF can be differentiated into two related categories of features, natural features and nature-based features. Natural features (e.g. reefs, barrier islands, dunes, beaches, wetlands, flood plains and maritime forest) are comparatively "long-standing" in terms of age and are created through the action of natural physical, biological and chemical processes over time. Whereas, nature-based features are created by human design, engineering and construction to mimic natural features and are designed to provide similar, if not identical, services (Bridges et al., 2015).

Construction and use of NNBF has occurred for decades to support a variety of objectives in coastal and fluvial systems. In more recent years, however, there has also been a growing interest in developing a technically



sound engineering approach for integrating NNBF, in combination with conventional flood defense systems (e.g., levees, seawalls, etc.), for more comprehensive and sustainable flood defense. This interest was further stimulated by the outcomes of recent storm and flood events, including Hurricanes Katrina and Sandy in the United States as well as England's floods in Somerset and Cumbria, which have given rise to a range of studies and projects focused on the role of landscape features in flood risk management.

In order to address the need for guidelines, USACE initiated this collaboration in the fall of 2016 to develop and publish international guidelines on the development and implementation of NNBF to support engineering functions in the context of the overall sustainability and resilience of our coasts, bays, estuaries, riverine

and fluvial systems. The guidelines are planned to address the full project life cycle, including conceptualization, design, engineering, construction, and maintenance. One of the key criteria for the success of the guidelines will be their ability to support technically sound use of NNBF based on best science and engineering practices. As evident by the diverse number of organizations involved with this project, developing these international guidelines is drawing from a broad base of experience among the relevant sectors, including government, academia, NGOs, engineering firms, construction companies, etc.

Representatives of these diverse organizations are working collaboratively throughout the year and meet twice annually at in-person meetings to develop and refine the chapters that will ultimately comprise the NNBF

Continued on page 14.




Guidelines. It will consist of four distinct sections including overarching concepts/recommendations, specific coastal applications, specific fluvial applications, and conclusions. For example, overarching chapters include “Performance and Metrics” and “Community Engagement”, while specific coastal chapters offer more details for NNBF types such as coastal wetlands, beaches and dunes, and reefs.

NNBF Symposiums have often accompanied the various in-person meetings that are held twice a year. The symposiums generally attract a much larger audience than just the team members working on the guidelines, and these forums also include a diverse number of international speakers that offer the audience a detailed look at the inner workings of NNBF projects with regional significance. In turn, the lessons learned from these presentations and discussions are integrated by chapter teams into their working drafts. To date, in-person meetings have occurred in Vicksburg, MS (Fall 2016); London, UK (Summer 2017); Washington, DC (Fall 2017); Delft, Netherlands (Spring 2018); and Santa Cruz, California (Fall

2018). Most of the aforementioned, in-person meetings also included a day for NNBF site visits, which builds upon principles and concepts discussed during the weeklong event. In May 2019, the UK’s Environment Agency, the Scottish

Environmental Protection Agency, and the Scottish Government will host the international team at the Edinburgh Centre for Carbon Innovation in Edinburgh, Scotland.

Publication of the Guidelines is scheduled for 2020. In addition to publication of the guidelines, project organizers anticipate several technology transfer and training activities that will introduce the NNBF Guidelines to practitioners located around the world. To learn more about this project and other activities related to NNBF, please visit the EWN Website at: www.engineeringwithnature.org.

You may also contact Dr. Todd Bridges, Senior Research Scientist for Environmental Science, with the US Army’s Engineering Research and Development Center and National Lead for the Engineering With Nature Initiative, at todd.s.bridges@usace.army.mil or Dr. Jeffrey King, Deputy National Lead for the Engineering With Nature Initiative, at jeffrey.k.king@usace.army.mil. 



Engineering With Nature®: A Resource for Flood Risk Management Practitioners

By Holly Kuzmitski, USACE-ERDC



A section of restored stream that abuts a mature stand of hardwoods in the Springhouse Run Stream Restoration project in Washington, D.C. The project was a collaboration between USFWS and other partner organizations. (Photo by Tim Welp, ERDC)

“Engineering With Nature®: an Atlas,” was launched at a festive event hosted by the U.S. Army Corps of Engineers for more than 120 guests from private industry, academia and U.S. and international government agencies at the National Building Museum in Washington, D.C. on January 16, 2019. Described by Corps of Engineers Director of Civil Works James Dalton as an “effective communication tool for the EWN® initiative,” the book highlights 56 unique and successful projects from around the world — of particular importance to flood risk management practitioners are the 30 descriptions

of Natural and Nature-Based Features projects.

The EWN initiative was established by the Corps in 2010 to promote more sustainable water resources practices and projects through the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaboration.

Mary Bryant, a research hydraulic engineer who works primarily on coastal flooding research with the U.S. Army Engineer Research and

Development Center’s Coastal and Hydraulic Laboratory, said, “I think the overarching purpose of the book is to change your mindset. The examples and photos help you to better visualize EWN opportunities — the book gets you thinking about how to use natural systems to maximum benefit; it shows you how to think creatively about projects.”

The EWN approach is defined by four critical elements: using science and engineering to produce operational efficiencies; using natural processes to

Continued on page 16.



The Philadelphia District pumps sand onto Brant Beach, N.J., in 2013. The work was part of an effort to restore the coastal storm risk management project from damages associated with Hurricane Sandy. (Photo by Philadelphia District)

maximize benefit; increasing the value provided by projects to include social, environmental, and economic benefits; and using collaborative processes to organize, engage, and focus interests, stakeholders and partners.

Each project is summarized on the section's first page and followed with narratives that describe how the project fits the four critical elements. "It was nice to see the key elements specifically addressed — what they mean when they are actually applied to projects as opposed to discussing them as simply concepts," Bryant said. "There was clear illustration of the concepts, highlighted by concrete examples. It helped to clarify what the key points of EWN are." The use of Natural and Nature-Based Features is one facet of the EWN initiative that has been growing internationally. NNBF are natural or

created (nature-based) landscape features — such as beaches and dunes, islands, forests, wetlands and reefs — that provide engineering solutions to flood risk management challenges; the features also provide multi-tiered economic, environmental and social benefits. Projects that fall under this category were designated by the NNBF symbol.

"The (NNBF) callouts are helpful because we're able to focus on those projects with special relevance to flood risk management practitioners: projects that focus on both flood risk management and ecosystem restoration goals," Bryant said. "The photos give you a general idea about the scale of each project — some projects have a smaller footprint," she said. "You also get a basic introduction of how something like the concrete reefballs were positioned, for example."

One example of an NNBF project that addresses coastal flooding is the Long Beach Island Coastal Storm Damage Reduction project, featured in the "Beaches and Dunes" chapter. A joint effort by the Philadelphia District and the New Jersey Department of Environmental Protection, the project was completed in 2016. The NNBF, a berm and dune that were extended along the oceanside of the island, were built with sand procured from offshore sources. The features deliver social and economic benefits as they diminish erosion and protect Long Beach Island communities from flooding that can result from extreme weather events.

Riverine flood mitigation is addressed in the Missouri River Levee Setbacks description, which was in the chapter, "Levee Setbacks and Floodplains." This

Continued on page 17.

description, which outlines another NNBF project, discusses the relocation of a Levee L-575 segment by the Corps and partners from the levee's previous position near the riverbanks to a location further back. The project reconnected part of the Missouri River to its floodplain, increased flood conveyance and improved the levee system's resilience.

The flood risk management practitioner can also gain insights from other projects in the book. The "Riverine Systems" chapter outlines the 2017 Springhouse Run Stream Restoration project in Washington, D.C., where a state-of-the-art Regenerative Design process was deployed by Underwood and Associates. The process helped the U.S. Fish and Wildlife Service and its partners transform pollutant-tainted water into a stream that self-cleans as it conveys water to larger bodies, harmonizes with the aesthetics of the U.S. National Arboretum and is a source of pride to the local community.

Another goal behind the publication's creation was to inspire idea sharing between the Corps and Corps partners. For Catherine Wright, a director of


Flood and Coastal Risk Management at the Environment Agency in London, United Kingdom, the book will be used as a teaching tool for practitioners in her country to show what EWN can do. Her organization contributed nine projects to the book, with most focusing on mitigating flood risk. "We'll also be learning from each other about approaches for engaging communities," she said.

Don McNeill, director of the Natural Infrastructure Initiative and Strategic Growth Manager for Caterpillar Inc., delivered a stakeholder perspective at the book launch. He described his organization as a grouping of like-minded companies and nongovernmental organizations that came together in 2017 to provide a collective national voice to promote and accelerate the advancement of natural solutions. AECOM, Caterpillar Inc., Great Lakes Dredge and Dock Company and The Nature Conservancy are a few member companies. "The 'Atlas' demonstrates and brings awareness to the many opportunities and solutions that natural infrastructure can provide," McNeill said. "These include mitigating costs and damages from flood events. We're

very proud that several projects in the 'Atlas' highlight involvement with NII members."

Dr. Lynn Scarlett, Vice President for Public Policy and Government Relations for The Nature Conservancy, also delivered a stakeholder perspective at the book launch. "The risk-reducing benefits of nature's assets are not hypothetical," she said. "The Conservancy and other researchers have modelled storm surge and damages from Hurricane Sandy; for example, we found that coastal wetlands prevented almost \$625M in property damages."

"I am thrilled, and the Conservancy is thrilled to work with the Corps," Scarlett said, describing a project in Hamilton, California, that combines setback levees with floodplain restoration to reduce flood damage and enhance riparian habitat, benefitting both people and nature. "It illustrates the blending of built and natural infrastructure," she said. "The Corps is helping to pioneer 21st century thinking about infrastructure and how to engineer with nature."

"Engineering With Nature®: an Atlas" can be accessed online at <http://www.engineeringwithnature.org/>. 

An aerial panoramic view of Missouri River Levee L-575 Setback project, 2012. (Photo by Dave Crane. Omaha District)



Hail and Farewells

By Stephanie Bray, PhD, HQUSACE



Doug Bellomo

The NFRMP has recently said farewell to two important members of the team at HQ/IWR. Mr. Doug Bellomo departed USACE on 15 March to enter the private sector. Doug joined the USACE NFRMP team after departing from FEMA in 2015 and has served as the Special Assistant for Flood Risk Management. In that time he has assisted with NFRMP implementation, guidance development, levee safety initiatives, coastal flood initiatives, and interagency coordination efforts. In recent months, Doug has also served as the acting Flood Risk Management Business Line Manager. Doug has been instrumental in moving the NFRMP forward since joining the program and we are grateful for his efforts. Thank you Doug and good luck in your future endeavors!



Norb Schwartz

Additionally, Mr. Norb Schwartz has retired for a second time. Norb joined USACE in 2012 as a rehired annuitant after retiring as the FEMA Region V Mitigation Division Director. In his past role at FEMA, Norb supported and guided the formation of the Silver Jackets program via a pilot within FEMA Region V. After joining USACE, Norb continued to support the program in many ways, including developing and hosting monthly webinars for Silver Jackets partners and developing the quarterly Silver Jackets newsletter “The Buzz”. He has also supported interagency efforts conducted by various interagency teams. Norb’s work in the past few years has greatly strengthened our understanding of interagency opportunities. Thank you Norb and enjoy your well-deserved retirement!



Phoebe Percell

HQ also welcomes a new Chief, Dam & Levee Safety Branch, who will play a key role in setting the direction of flood risk management in USACE moving forward. Ms. Phoebe Percell joins USACE from HDR, where she served as a senior technical advisor for HDR’s dams and civil works. Prior to joining HDR, Phoebe spent 17 years with the Bureau of Reclamation, where some of her key areas of responsibility included dam safety and security and emergency management. We are very excited to have Phoebe at HQ and look forward to the contributions she will make to the USACE FRM mission moving forward. Welcome Phoebe! 🎉

Other Important Information

Events

This listing is for information only and is not a complete list of FRM-related meetings. These meetings are not endorsed by the Corps of Engineers unless specifically stated. If we have failed to list a conference/meeting/symposium that would be of interest to the Flood Risk Management community, please forward the conference details to us.

22-25 April 2019 – **National Hurricane Conference** – New Orleans, LA - <http://hurricanemeeting.com/>

19-24 May 2019 – **ASFPM Annual Conference** – Cleveland, OH - <http://www.floods.org/index.asp?menuID=223&firstlevelmenuID=181&siteID=1>

2-5 June 2019 – **National Flood Conference** – Washington, DC - <http://pcievents.cvent.com/events/national-flood-conference/custom-18-dccdc7ce00074e038ed93896b8fb7356.aspx>

16-19 June 2019 – **2019 AWRA Summer Conference** – Sparks, NV - https://www.awra.org/Members/Events_and_Networking/Events/Summer_2019_Specialty_Conference.aspx

3-6 September 2019 – **2019 Floodplain Management Association Conference** – San Diego, CA - <https://floodplain.org/page/AnnualConference>

3-7 November 2018 – **2019 AWRA Annual Water Resources Conference** – Salt Lake City, UT – <https://www.awra.org/>

Be sure to check out floods.org for the dates of state conferences and training opportunities: <http://www.floods.org/n-calendar/calendar.asp?date=3/12/2016>

FRM 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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