



# FRM

Flood Risk Management Newsletter

## Study Adapts to New Coastal Flooding Reality

2016 Flood Risk Management Awards

The National Levee Database

Post-Wildfire Impacts to USACE Flood Risk Management







# Flood Risk Management Newsletter



US Army Corps  
of Engineers

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### FRM Newsletter

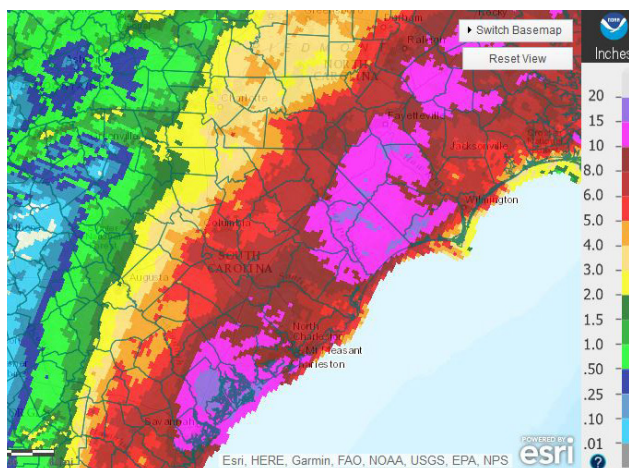
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FRM Newsletter Editor:  
Nadia Taylor, RSC

Layout:  
Winston Bush, RSC

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# 2017 Workshop Great Success for Flood Risk Management and Silver Jackets Community

By Mark Roupas, Deputy Chief, Office of Homeland Security



The 2017 Interagency Flood Risk Management (FRM) Workshop was held in St. Louis, MO from February 27 through March 3. The workshop was intended to unify our interagency flood risk management team, offer an opportunity to share repeatable and achievable interagency successes, and enhance interagency capacity to deliver integrated and adaptive approaches to flood risk management. Overall, the event was exceptional and granted an extremely valuable opportunity to convene as a community.

The first day and a half of the workshop served as an opportunity for USACE members of the FRM/Silver Jackets (SJ) community to get together as a team. One hundred ten US Army Corps of Engineers (USACE) representatives were in attendance from Headquarters, the Institute for Water Resources, the Engineer and Research Development Center and the Division and District offices. USACE participants represented FRM, SJ, Levee Safety, Emergency Management, and Planning, which provided a great opportunity to coordinate the delivery of vital programs

and policy and, above all, share experiences.

Col. Anthony Mitchell, MVS District Engineer and Commander, opened the USACE pre-meeting by welcoming USACE attendees to St. Louis. He emphasized the importance of taking the opportunity to engage colleagues throughout the week and to take lessons learned back. Mr. David Dale, the acting Director of Contingency Operations and Homeland Security, USACE, offered additional welcoming comments and encouragement for each participant to think about ways in which impending changes could be turned into opportunities and to consider ways to add value to their organization using the information and knowledge gained throughout the week.

The USACE internal sessions focused on the strategic direction of USACE and the linkage to the National Flood

Risk Management Program. Numerous subject matter experts provided information on the policies and program updates relevant to the Flood Risk Management Program. Participants heard about policy updates in the Planning program and in particular updates to the Planning Guidance Notebook. Updates were provided on the Levee Safety program, and participants gained insight into the importance of risk communication relevant to levees and dams. The status of the engineering circular for implementing Executive Order 13690 was also covered; USACE attendees were encouraged to provide comments on the guidance as the comment period has been extended.

Another key session included three individuals who are dual hatted with Flood Risk Management and Silver Jackets and a secondary community of practice. Presenters represented Planning, Engineering and Construction,



Jennifer Dunn from USACE IWR facilitates the award session during the Workshop.

*Continued on page 2.*





Participants had several breakout sessions from which to choose.

and Emergency Management and offered their viewpoints regarding what flood risk management looks like from their perspectives and in their position. This was an opportunity to share best practices and learn from one another regarding what has enabled success and offer tips as to how to successfully achieve the desired communication and partnerships across multiple communities of practice within their District's organization to deliver relevant solutions and effectively partner.

USACE participants were also offered the opportunity to review and provide feedback on the draft guidance for the National Flood Risk Management Program. Participants broke out into small discussion groups to provide important feedback on the roles and responsibilities and key internal and external relationships. This feedback is vital to developing interim guidance that is expected in the coming months.

Interagency partners including federal, state, and local representatives joined the USACE community on February 28. Forty-two state representatives joined the USACE community, which is a record number and added significant

value. Thirty-four individuals joined from other federal agencies, such as the U.S. Geological Survey, National Weather Service, the National Oceanic and Atmospheric Administration, FEMA, Environmental Protection Agency, U.S. Department of Agriculture Natural Resources Conservation Services, National Park Service, NASA, and the Department of Housing and Urban

Development. This workshop included many local representatives and several non-governmental partners such as the Koshland Science Museum with the National Academy of Science and the Nature Conservancy.

A key theme throughout the interagency sessions was that of change as an inevitable and ubiquitous force. In support of this, the theme was "Navigating through Change," in that change serves as an enabler to transition, new ways of thinking, and adopting new or improved practices. The interagency portion of the workshop opened with a session on change and adaptation, where Dr. Catherine O'Connor, Director of Engineering of the Metropolitan Water Reclamation District of Greater Chicago, offered her perspective on how the Chicago landscape has been transformed and actions her office is engaged in to effectively redirect the future relationship of the city with water.

The theme of change and adaptation continued through the session on Community Adaptation: Making Tough Decisions Pre-and Post-Disaster. This session hosted practitioners who spoke to the history and future of their



Workshop attendees participate in a hands-on serious gaming session.

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Participants meet at the Interagency World Café session.

communities including Valmeyer, IL, which is a community that effectively relocated after devastating floods; Meramec River Communities, which were heavily impacted by flooding in the Winter of 2015-16; and Norfolk, VA, which is one of the 100 Resilient Cities and connecting their flood risk management solutions with other social benefits important to their community. All offered unique perspectives with how they have dealt or are dealing with serious flood risk and emphasized the importance of open communication facilitated with the right tools at the right time.

NASA and the state of North Carolina impressed workshop participants with technical innovations in use to observe, monitor, understand, and describe the flood risk environment. Creative approaches were presented that communities and agencies use to manage risk within different geographical areas, including riverine, coastal, and urban areas. A representative from the state of New York addressed how the state is adapting to the changing climate through policies, guidance, and long-range planning.

Several speakers described their successes with integrating nature and natural features or Green Infrastructure into

floodplain management, including engineering performance studies from the USACE Research and Development Center. To confront the never ending challenges of outreach, multiple presentations spoke of successful, innovative risk communication and community engagement efforts, such as hands-on serious gaming techniques.

The Interagency World Café session was a big hit, including some 18 separate tables hosted by representatives of topics and agency programs relevant to workshop participants. The tables were setup in the cafeteria to facilitate one-on-one discussions about how an agency program or project could be leveraged to assist interagency teams as they tackle their own challenges or proposed solutions. Needless to say, the cafeteria was abuzz with enthusiasm and ideas. The Special Edition Newsletter was a great guide for participants in this session as it offers detailed information about policies and programs relevant to the interagency FRM/SJ community.

The interagency workshop was a wonderful opportunity to gather with federal, state, local, and other partners to discuss shared successes and challenges. Now that 47 states have committed to the goals and objectives of the Silver Jackets program with roots going back

to 2006, the challenge ahead is to keep the momentum going while making the teams stronger. A very large, impressive sampling of their interagency projects were prominently displayed in a poster format on the walls of the auditorium.

No doubt there were many takeaways as result of the workshop. After being reminded of the changes that confront flood risk managers, such as atmospheric rivers, climate change, expanding development, new leadership, and other factors, it can't be emphasized enough that there is a need to be adaptable and creative in the pursuit of resilient solutions. The options are expanding so it is important to go beyond the norm, while factoring in broader aspects such as social and environmental benefits. Sharing information and integrating with partners' programs have been vital and will be extremely helpful. The Silver Jackets program continues to provide a common sense approach to getting things done by working closely as partners.

Thank you to everyone who attended the workshop and for helping to make it a very successful and exciting week. Appreciation and thanks goes to the planning team for their investment of time and energy and to the speakers for their outstanding and engaging presentations, as well as their participation in the World Café sessions. It was a great learning and sharing experience.

In closing, I would like to mention one key proponent of the FRM/SJ programs who was sorely missed at this year's workshop - Ms. Karen Durham-Aguilera. Congratulations to her on her new position as the Executive Director, Army National Cemeteries Program, based at Arlington National Cemetery. Her leadership in and support of this program during her time as Director of Contingency Operations and Homeland Security were pivotal and key to enabling our successes to date. 🇺🇸



# 2016 Flood Risk Management Awards

By Jennifer Dunn, National Silver Jacket Program Manager

During the final plenary session of the 2017 Interagency Flood Risk Management Workshop in St. Louis, USACE senior leadership continued the tradition of announcing the Flood Risk Manager of the Year, Silver Jackets Coordinator of the Year, and Silver Jackets Team of the Year. These awards are intended to recognize outstanding individuals and teams who exemplify the goals and objectives of the programs.

## 2016 Flood Risk Manager of the Year Award

The Flood Risk Manager of the Year Award seeks to recognize outstanding individual efforts and contributions to flood risk management from an USACE member. This year's award recipient is Mr. Scott Whitney who is recognized for his work as Regional Flood Risk Manager in the Mississippi Valley Division (MVD) from 2011 through 2016. In this position, Mr. Whitney served as both a national and regional leader for USACE in flood risk management. He became a go-to, subject matter expert and resource for



Scott Whitney from the Mississippi Valley Division expressed his appreciation for the Flood Risk Manager of Year Award.

numerous headquarter-led initiatives aimed at improving the agency's flood risk management activities. In addition, Mr. Whitney led the development of the Regional Flood Risk Management Annex, which provided structure and strategy to flood risk management activities within MVD. His efforts

also extended to the Silver Jackets program. Under his leadership, MVD's Districts and the Silver Jackets teams they support successfully obtained more than \$700,000 for interagency projects conducted primarily through the Silver Jackets program. While serving as the Regional Flood Risk Manager, he demonstrated high personal standards for himself and his team, strong technical skills, and a contagious drive to excel. His efforts greatly reflect credit upon himself, the Mississippi Valley Division, and the USACE.

## 2016 Silver Jackets Coordinator of the Year Award

The Silver Jackets Coordinator of the Year Award seeks to recognize outstanding individual USACE efforts and contributions to a Silver Jackets team. This year we recognize two Silver Jackets co-coordinators, Ms. Ashley Stephens and Ms. JoAnn Combs of Huntington District. Ms. Stephens and Ms. Combs have jointly supported



Ashley Stephens and JoAnn Combs of the Huntington District are the recipients of the Silver Jackets Coordinator of the Year Award.

*Continued on page 5.*





Mark Baker, Stacey Underwood, and Phetmano Phannavong represent the District of Columbia team, the recipient of the Silver Jackets Team of Year Award.

the Ohio Silver Jackets team since July 2014. Their professionalism, enthusiasm, and commitment have been critical to the revitalization of this team. Since Ms. Stephens and Ms. Combs became co-coordinators for the team, membership and participation have increased substantially. This can be attributed to the strong relationships they have built with their counterparts in other supporting Districts and their interagency partners. With support from Ms. Stephens and Ms. Combs, Ohio has successfully obtained funding for six interagency projects, which have covered a variety of flood risk management topics. These projects have included updated floodplain mapping, multimedia outreach initiatives, and a return-on-investment study for mitigation activities. Their efforts greatly reflect credit upon themselves, the Huntington District, the Great Lakes and Ohio River Division, the USACE, and the Ohio Silver Jackets Team.

### **2016 Silver Jackets State Team of the Year Award**

The Silver Jackets State Team of the Year Award recognizes an outstanding team that exemplifies the goal of effective flood risk management within the context of shared responsibility and has demonstrated significant accomplishments in flood risk management throughout the preceding year. This award is unique because the winner is chosen through a peer voting process during which only other state teams have the opportunity to vote on the team most deserving of the award.

This year's award recipient is the District of Columbia Silver Jackets Team. The District of Columbia is unique. There are more than the typical number of agencies involved in flood risk management, including multiple levels of government and multiple branches of the military. Additionally, the District faces flood threats from several sources, including two rivers and tidal flooding. The team has subdivided into five task groups to work on current priorities, including flood inundation mapping, flood emergency planning, levee certification

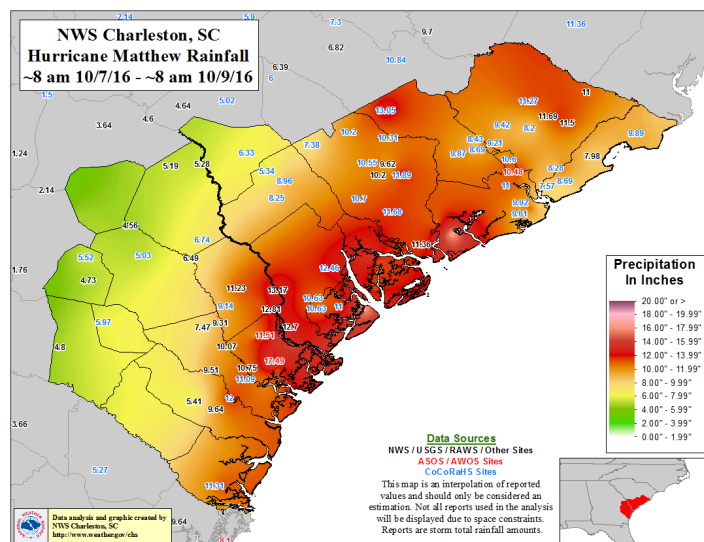
and accreditation, communication and outreach, and interior flooding. A few outstanding accomplishments to highlight include the development of updated flood inundation mapping tools that will better communicate flood impacts to agency leadership and the general public, a flood fighting exercise that brought together 58 participants from 18 of the key agencies involved in flood risk management, and coordination to make repairs to the existing FRM project to bring it back to the standards necessary to obtain accreditation from FEMA. The District of Columbia Silver Jackets team's significant contributions greatly reflect credit upon themselves, the District, and our shared Silver Jackets Program. Stacey Underwood, Phetmano Phannavong, and Mark Baker represented the team and accepted the award.

A sincere congratulations to all these stellar players! 🏆

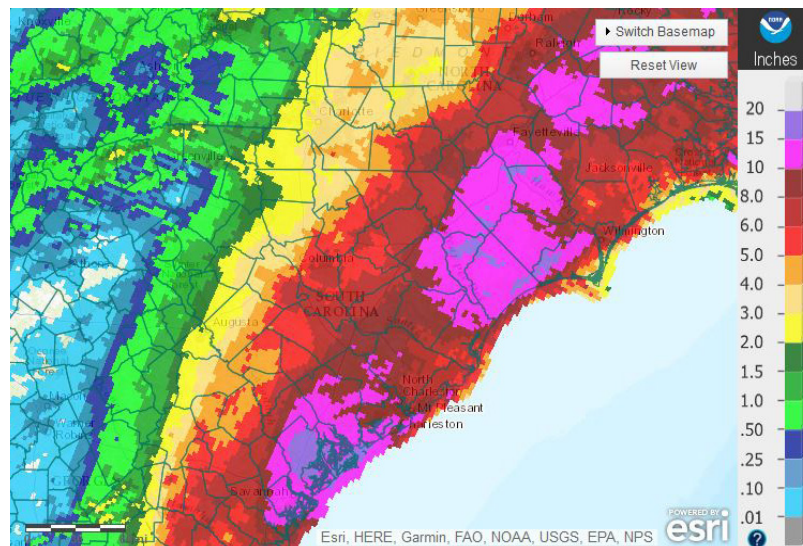


# An Innovative Approach to Hurricane Response

By Charleston District



Source NWS



Hurricane Matthew made landfall in South Carolina as a Category 1 hurricane on October 8, 2016, with wind speeds of 75 mph and wind gusts of 88 mph. Storm surge ranged between four and eight feet combined with record tide levels of nearly thirteen feet in some areas. Rainfall between 10 and 11 inches resulted in extensive flooding and watershed saturation along all of coastal South Carolina. The seemingly once-in-a-lifetime storm, which resulted in five fatalities and 25 dam breaches, occurred almost exactly one year after 51 state-regulated dams breached during a historic flood that occurred in Columbia and coastal South Carolina. This year's flooding and wind damage caused by Hurricane Matthew affected many of the same communities that were flooded during the October 2015 flood. The October 2016 flooding was prevalent and led to significant damage to numerous properties and roads and many people having to be rescued by emergency personnel. Twenty-four counties situated in the eastern/coastal part of the state were declared for individual assistance, and twenty-six counties were designated as eligible for public assistance.

Because of the 2015 flooding, South

Carolina was better situated to prepare, respond, and recover. After the October 2015 flood, the South Carolina Department of Health and Environmental Control (SCDHEC) partnered with the U.S. Army Corps of Engineers (USACE), Homeland Security, South Carolina Electric & Gas (SCE&G), and HDR Engineering to conduct a statewide assessment of 652 high- and significant-hazard dams. The team identified 192 additional dams as being in need of inspection and potentially requiring non-emergency maintenance or repairs. SCDHEC partnered with HDR Engineering to conduct a complete review of the agency's Dam Safety Program and hosted a forum for dam owners to help connect them to information and persons who can help them move toward recovery. SCDHEC continues to work with dam owners to provide technical assistance so that they can make final decisions on the future of their dams and implement repairs.

SCDHEC also worked with the South Carolina Department of Transportation (SCDOT) to share information and provide technical assistance related to roads impacted by both regulated and

unregulated dams. Following October 2015's historic rainfall, Dam Safety Program staff from SCDHEC realized that it was critical to have a mechanism to inform the owners of dams in the state when intense rainfall was forecast. It is this time, prior to the arrival of tropical systems and other inclement weather, that owners should begin preparing.

SCDHEC has contracted with Emergency Communications Network to utilize its CodeRed emergency notification system. CodeRed allows the Department to send automatic voice calls, text messages, and emails to owners and operators of regulated dams so that they may be prepared. Messages may be delivered statewide or to particular counties or regions of the state. Dam Safety Program staff use a web-based platform or smartphone application to select the delivery area and craft the message. The program also anticipates using the system for routine communications with owners, such as announcements of training and workshops for dam owners. When the message is delivered, SCDHEC receives analytics on message delivery. Prior to this, the Department relied on general

*Continued on page 7.*



## DHEC Dam Hurricane Matthew 5 Oct.

Launch ID #455194  
 Launched By Brannon Davis  
 Notification Type Emergency  
 Auto Recall Yes  
 Started 10/5/2016 10:33:08 AM  
 Ended 10/5/2016 10:39:26 AM  
 Voice Minutes Used 351  
 Emails 37  
 Phone Calls 398  
 Text Messages 0  
 TDD 0  
 Attempted Calls 482  
 Numbers Reached 344  
 Numbers Not Reached 54

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Source SCDHEC

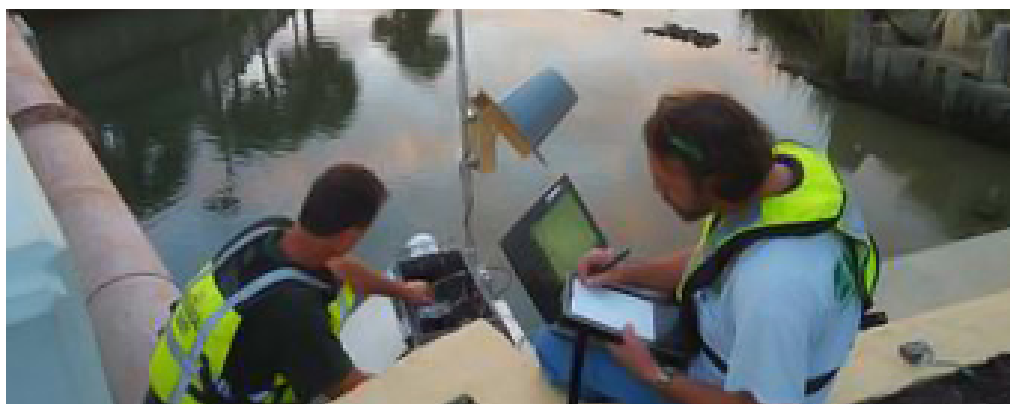
press releases to provide guidance to dam owners of pending significant storm events.

During this time period, the U.S. Geological Survey (USGS) used many forms of technology to track and document Hurricane Matthew's effects on the eastern seaboard. USGS has developed a mobile network of rapidly deployable instruments with which to observe and document hurricane-induced storm surge as storms make landfall and interact with coastal features. In South Carolina, this network was a partnership among SCDOT, USACE, and the Federal Emergency Management Agency (FEMA). USGS deployed a record number of sensors prior to Hurricane Matthew's track up the southeast coast to collect water-level and barometric pressure data. More than 70 USGS staff were working from Florida to Virginia installing 393 sensors at 290 locations. These sensors were a combination of 190 storm-tide sensors, 92 barometric pressure sensors, 79 wave sensors, and 32 Rapid Deployment Gauges (RDGs), which were deployed to collect information about the hurricane's effects on the Atlantic Coast. Hundreds of storm-tide sensors were attached to bridge piers, utility poles, and other structures along the projected track of the hurricane. The information collected by the instruments helped to define the depth and duration of the storm-surge, as well as the temporal extent of the hurricane. The information was used to help public officials assess storm damage,

discern between wind and flood damage, and improve computer models used to forecast future floods.

In addition to the storm tide sensor deployment, RDGs were installed at ungauged sites that had the potential to be impacted by storm surge or floodwaters along critical roadways. RDG installation locations were selected in coordination with state and federal response agencies. These RDGs collected water-surface elevation data and other various meteorological parameters and provided the data in real-time on the USGS National Water Information System web page. The RDGs are used to augment the network of existing USGS real-time gauging stations.

The information was critical in assisting SCDOT with evacuation planning and determining road closures due to flooding. Road closures were kept up-to-date with an online interactive map available to the public on their mobile devices. SCDOT's Enhanced 511 Traveler Information System provided traffic camera images, travel time estimates, and other technological tools for real-time visual information. SCDNR, NWS, and the Southeast River Forecast Center (SERFC) monitored USGS gages to predict flooding from rainfall, not only in South Carolina, but in North Carolina where the upper watersheds were hit with heavy rainfall.



Tim Pojunas (hydrologist) and Jym Chapman (hydrologic technician) installing a rapid deployment gage (RDG) at Withers Swash at South Ocean Blvd. near Myrtle Beach, SC. The RDG measures water-surface elevation and various meteorological parameters and transmits the data in real-time to NWISWeb. USGS photo

All of the data collected by the USGS during Hurricane Matthew is available online from the USGS Flood Event Viewer at: <http://stn.wim.usgs.gov/fev/#MatthewOctober2016>.

SCDNR's Flood Mitigation Program supplemented information provided by the SERFC to more accurately predict the flooding impacts of the rainfall of Hurricane Matthew throughout the state. The information was then used to produce inundation layers. Those layers were used to produce maps of impacted areas that were provided to SCDNR Law Enforcement and SLED for use in officer safety, staging of resources, evacuations, and rescues. SCDOT also used the inundation layer to assist in the closure of roads in impacted areas. The SCDNR Flood Mitigation Program was able to log several hours of drone flight time, assisting SCDHEC with a flight over Nichols, South Carolina, to allow better views of areas of concern.

Before, during, and after the two historic flooding events in October of 2015 and 2016, numerous federal and state agencies around South Carolina came together to use new technologies to prepare for and respond to the storms. While each storm brought new difficulties, the teamwork among these agencies helped get the people of South Carolina back on their feet sooner than imagined. 🇺🇸



# Study Adapts to New Coastal Flooding Reality

By JoAnne Castagna, Ed.D., Public Affairs Specialist with USACE New York District

Coastal storms like Hurricane Sandy aren't new, but what is new are the stakes. Today we have more development and people living on our coast. We also now face an unpredictable climate change and sea level rise, which could further compound coastal flooding. Bryce Wisemiller, project manager with the U.S. Army Corps of Engineers (USACE) New York District, is working on what could possibly be one of its largest studies ever undertaken that will look at ways to safeguard communities in the New York and New Jersey Metropolitan region from future hurricanes. A multi-agency team will work with communities to recommend a combination of risk reduction measures to enable adaptation for an unpredictable future.

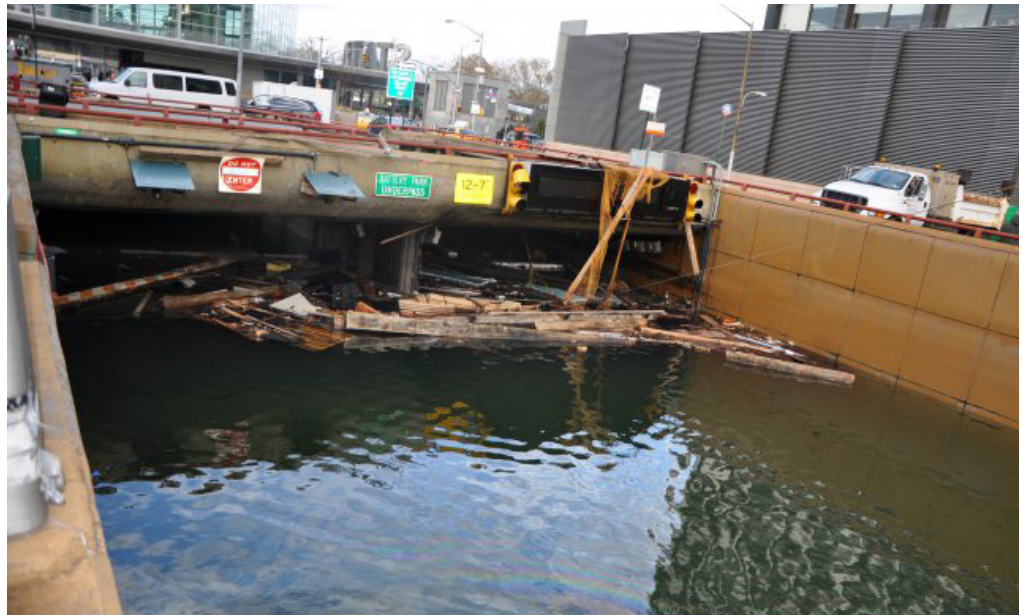
Wisemiller and two other USACE team members recently discussed the study and answered questions and concerns the public may have.

## How did this study come about?

The New York and New Jersey Harbor and Tributaries Focus Area Feasibility Study is an offshoot of a comprehensive study performed by USACE right after Hurricane Sandy, which identified risks and vulnerabilities along the North Atlantic Coast from Maine to Virginia.

"From this comprehensive study, several regions were identified for further study, including the big sleeping elephant in the room that was basically ground zero for Hurricane Sandy—the New York and New Jersey Harbor and tributaries area," said Joseph Vietri, who headed the comprehensive study and is the director of Coastal Storm Risk Management National Center of Expertise, North Atlantic Division, USACE.

"An additional study will be done in this region of approximately 16 million people because it was one of the hardest



Storm surge in downtown New York City in the aftermath of Hurricane Sandy. Credit: USACE.

hit areas during Hurricane Sandy. Not only that, the region is also apt to still have those same risks going into the future, even though there are a number of projects and studies on the way," said Wisemiller. USACE will work with many agencies on this study from New York and New Jersey, including the New York State Department of Environmental Conservation, New Jersey Department of Environmental Protection, and New York City Office of Recovery and Resiliency.

A full range of risk reduction measures is going to be offered to communities and includes structural, nonstructural and natural and nature-based features. Communities can assess these measures and alternatives and make decisions based on what they value. "You have communities that value natural and nature-based features a lot more than structural alternatives. They can increase what they see as important and downplay what they value less. To say that everything should be the same is totally not correct," said Vietri. Olivia Cackler, Coastal Section Chief with the New York District and the lead planner for the study, agreed that a one

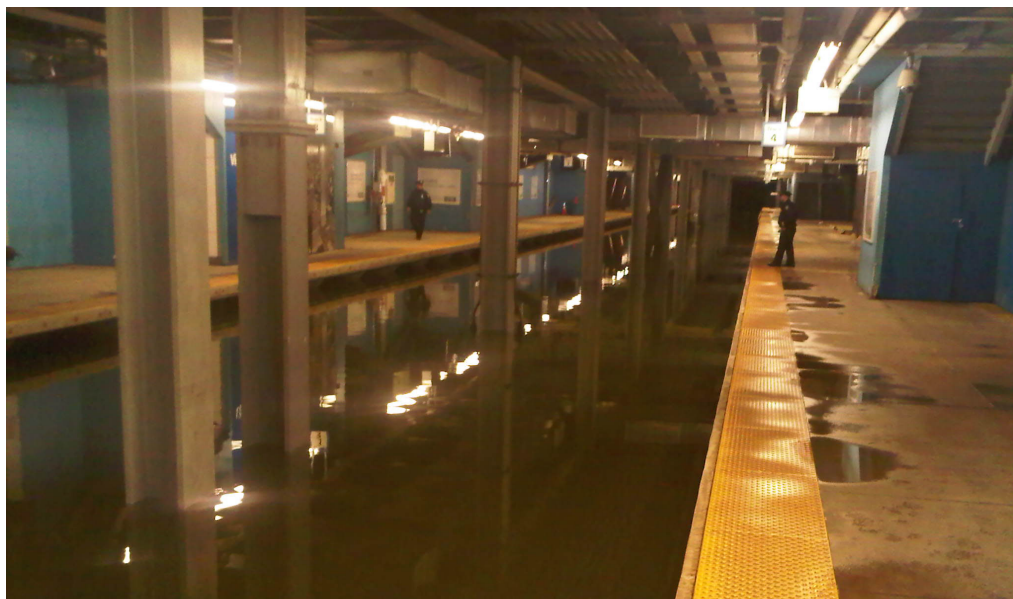
size fits all approach doesn't work. "We have a very diverse study area in terms of topography and land use. Using a combination of risk management measures allows us to tailor our approach by using the most appropriate measures for that community."

## Did you learn anything from Hurricane Sandy that will be part of this study?

"Yes and you'll see it in everything we do for generations to come," said Vietri. "When you have something like Sandy that cleans the slate, you have an opportunity to do something in a different and smarter way." He added that projects in place now are already benefiting from what we learned from Hurricane Sandy. Wisemiller agreed, "Hurricane Sandy illustrated, all too well, the risks that this area faces from coastal storms in terms of property loss, as well as the unfortunate loss of life." Vietri said, "Places that people thought they could go to get out of the high water turned out not so much. Sandy upturned a lot of what we thought was the floodplain. Because of Sandy, the

*Continued on page 9.*





Flooded New York City subway system in the aftermath of Hurricane Sandy. Credit: USACE.

team will take a relook at the scale and scope of the floodplain, and this could lead to improved hurricane evacuation planning, mapping of evacuation routes, and shelter in place locations.

Sandy also confirmed that some existing measures are already working. Cackler said, "It was discovered after Sandy, areas that had an Army Corps project in place, such as beach fill or levees, fared a lot better than areas that did not have a project. Even when there was some flooding, it was substantially reduced from what would have happened without the project in place." Vietri agreed, "There are places in New Jersey where there were healthy beach and dune systems. After Sandy, the people in these areas had minimal damages. Literally, 200 yards down the beach where there was no project there was complete devastation. Houses and roads gone."

### **Will this study factor in possible climate change and sea level rise over the next 50 years?**

Vietri said, "Whatever you think is the cause of climate change, the fact is the seas are rising. And we are going to have to take it into account in our future plans." He added that it's predicted future sea level rise could rise anywhere between 1-6 feet over the next 100 years. "That's a pretty big envelope in which


you're trying to plan a design," said Vietri. Cackler said, "How we deal with planning uncertainty is with Resilient Adaptation. This allows us to adapt to the changing conditions as we see them in real time."

### **Are we actually going to see something happen from this study?**

There is definitely interest to get this study started noted Cackler. "This study is so important that multiple staff from New York and New Jersey and the U.S. Government worked tirelessly to execute the agreement to start the study." Vietri agreed, "Funding is coming at a

faster rate to do these studies even in this era of tight funding." He added that in order for the study to be successful, everyone has the responsibility to look at these changing conditions and to make better decisions.

This requires an adaptive mindset, and he is happy to say that he is seeing it. He said one example of this is that he is seeing more agencies get tougher on developers who want to build in flood zones. "I haven't seen this in my 30 year career with the Army Corps," said Vietri. He said he also sees this changed mindset in himself and in his colleagues. Like many in the USACE, he worked on several critical missions for the agency, such as Hurricane Sandy. "What gets me the most is the impact to people. The look on their faces and the helplessness. I'm also struck by their resiliency. It pushes you to try to do something bigger and better, to search for answers that would help to reduce or eliminate this human tragedy. If you think I'm passionate about it. I am. We have to be. Otherwise we will cease to exist as an organization."

Information about The New York and New Jersey Harbor and Tributaries Focus Area Feasibility Study and upcoming community meetings about the study may be obtained by emailing [cenan-pa@usace.army.mil](mailto:cenan-pa@usace.army.mil). 



Entrance to the Battery Park Underpass in downtown New York City in the aftermath of Hurricane Sandy. Credit USACE.



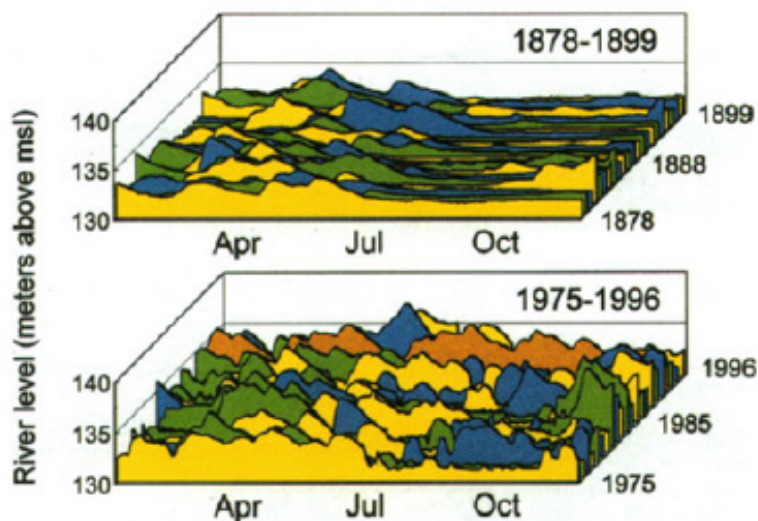
# Flood Risk Management in the Spotlight: Adaptation Issues and Alternatives

By Charles Theiling, USACE Rock Island District

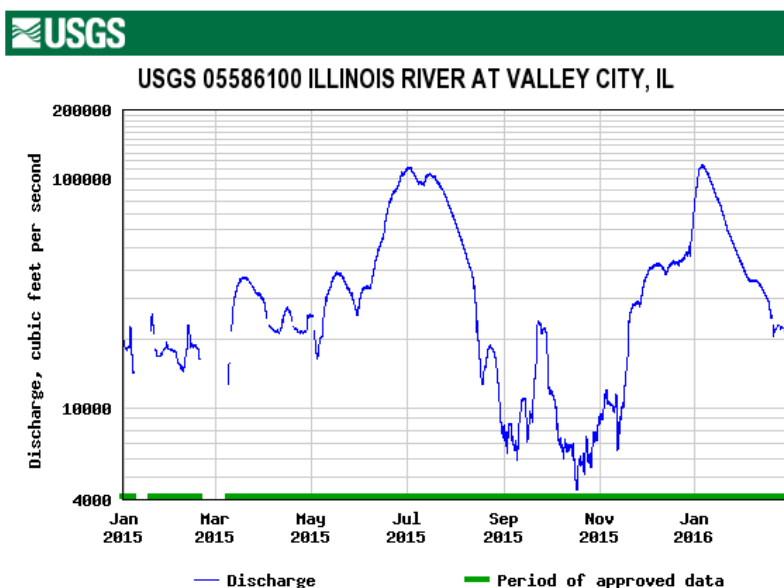
## Problem

U.S. Army Corps of Engineers (USACE), state, and federal floodplain managers and private interests have invested heavily in flood risk management (FRM) infrastructure across the nation, yet flood damages continue to increase (Jeffery 2014). Flooding is repeatedly among the most costly natural disasters for the nation (NOAA <http://www.ncdc.noaa.gov/billions/time-series>), yet FRM continues to be very cost effective with 6:1 cost:benefit ratios overall and 24:1 on significant projects like the Mississippi River and Tributaries system plan (ASCE 2013). Many large levee districts are more than 100 years old and started as private enterprises that were initially incorporated into formal, congressionally authorized projects under the Federal Flood Control Act in 1917. Levee systems may require modernization to continue functioning in a dynamic physical and social landscape.

Existing levees were designed and built assuming that riverine hydrologic environments vary within an unchanging envelop of natural variability, so that the past accurately reflects the future. However, those engineering practices have been revised because of changes in the assumptions driving precipitation and river hydrology (Milly et al. 2008, USACE 2014). Where past engineering design used the prior 30 year's rain and runoff in modeling predictions (i.e., stationarity), new recommendations acknowledge substantial change in many rivers such that the assumption of stationarity is no longer valid (USACE 2014). USACE Sea Level Change adaptation addresses the potential for nonstationary conditions through the use of a multiple scenario approach, which includes a range of future potential sea level change rates.



Illinois River historic and contemporary hydrology demonstrates loss of stationarity (Source: Sparks et al. 1998).



Uncertainty leads to planning recommendations for comparing all alternatives against all scenarios rather than determining a best alternative under any specific future scenario (ER 1100-2-8162) and enhanced design features to ward off future risk. Existing infrastructure is at risk as exhibited at the confluence of the Illinois and Sangamon Rivers at Beardstown, Illinois. The rivers

experienced record-setting, damage inducing floods twice in 2015. Floodway capacity is stressed by rapid runoff from agricultural drainage practices in upland farm fields and urban storm sewers. Floodway capacity is shrinking due to excessive alluvial filling in floodways as upland agricultural and urban sprawl increases erosion (Belmont et al. 2011).

*Continued on page 11.*





Workers stand on a flood wall made of Hesco barriers on the bank of the Cedar River, Monday, Sept. 26, 2016, in Cedar Rapids, Iowa. (Charlie Neibergall / AP).

## Alternatives


Infrastructure modernization and adaptation offers opportunities to reduce flood risk and enhance environmental quality through mission integration. USACE Flood Risk Management and ecosystem restoration missions are uniquely compatible because they both operate in systems contexts. Both missions are driven by upstream inputs and compete for space in river valleys.

Levee setbacks and removing floodway barriers (i.e., widening bridges) are common structural improvements to existing FRM systems. These setbacks can potentially reduce flood stages, as well as protect levee system resiliency, because the reconnection to a larger floodplain helps reduce flow velocities (USACE, 2012; Opperman et al., 2014; Gergel et al., 2002). Setbacks can also provide additional space to account for potential climate variations and future economical expenditure related to that variability (Zhu et al., 2007). Additionally, private land acquisition, while initially costly, can lower risk and prevent repetitive future damage (Galloway, 2005). Ecological restoration benefits are substantial when floodplains are reconnected because it reestablishes attributes of a natural, functioning, and self-regulating system. A fuller accounting of ecosystem service



Temporary setback levee constructed of Hesco Barriers along Front Street in Davenport, Iowa.

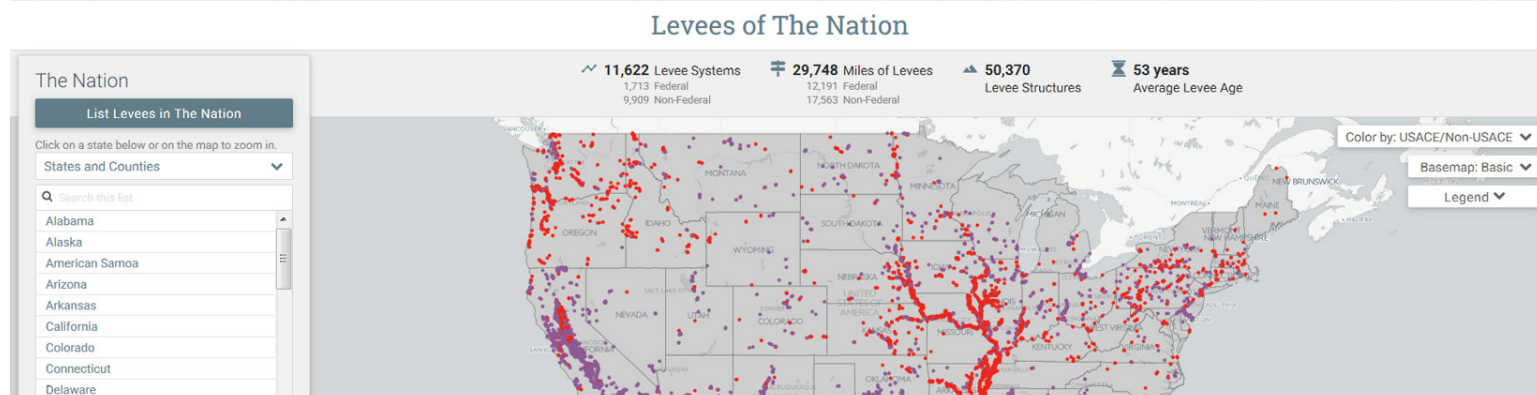
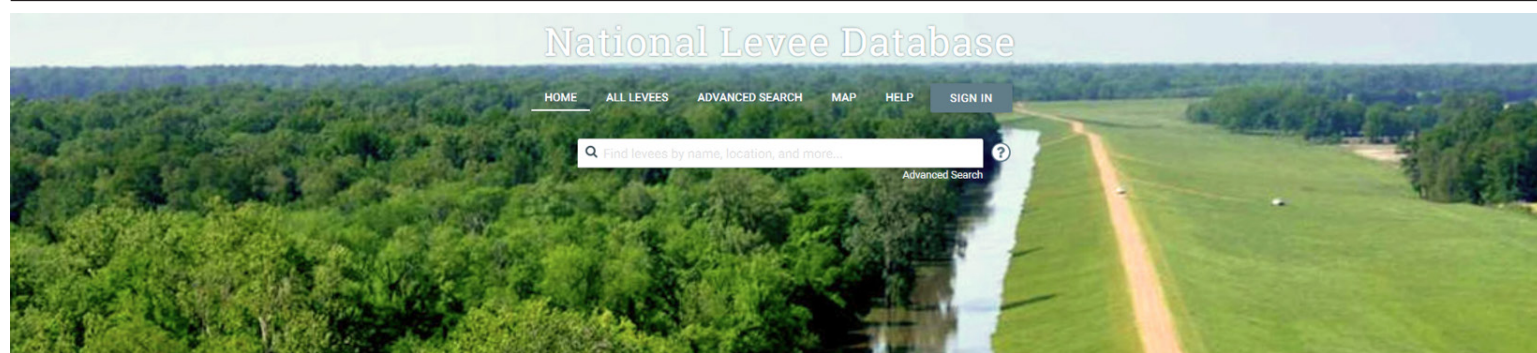
benefits would help balance costs for land acquisition in levee setbacks. Levee setbacks can be significant engineering projects, but there are also other approaches to FRM sustainability. Setbacks can be achieved using “managed” or “staged” inundation where agricultural levees are designed to overtop before urban levees during extreme floods. The planned demolition of the levee protecting the Bird’s Point-New Madrid Floodway in 2011 is an example of the rapid response that can occur and benefits of

floodplain reconnection (Mississippi River Commission, 2011). Another increasingly common approach is to install temporary FRM systems using Hesco barriers deployed at prescribed locations and river stages in order to manage the extents of flooding. This planned FRM approach allows Davenport, Iowa, to enjoy riverfront parks most of the year. In Cedar Rapids, Iowa, Hesco barriers protected the city as floodplain managers are seeking funding for improved FRM following historic floods in 2008. 



# The National Levee Database

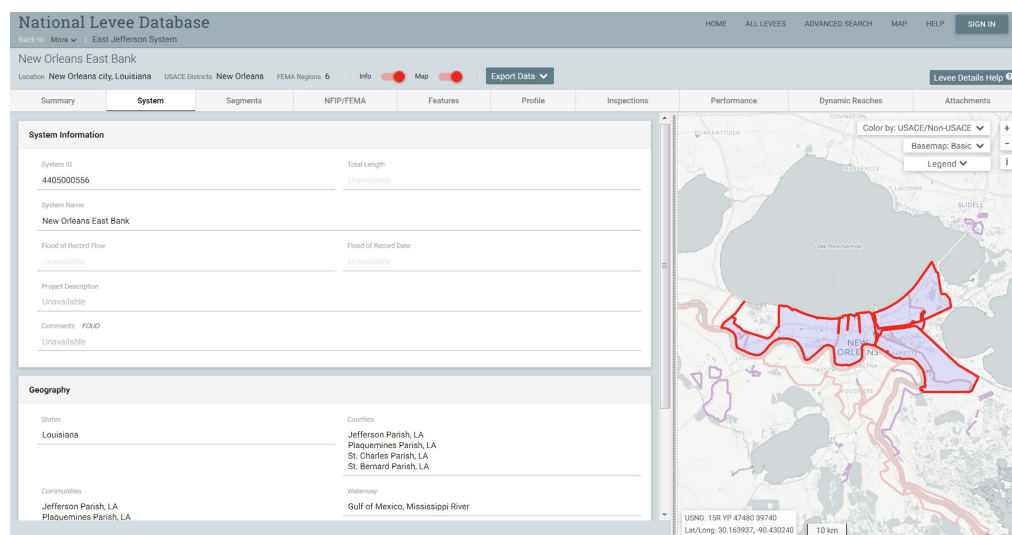
By **Chris Baker**, USACE Dam and Levee Safety Programs, and **Cathi Sanders**, National Levee Database Program Manager



## Update of the National Levee Database – Providing Better Access and More Information

For the past year, the National Levee Database (NLD) team has been working through changes and updates to improve the usability of the NLD for all users, including USACE personnel, local levee sponsors and owners, and community members. Phase 1 updates include a new web page, a completely new interface for users, a new map tool, and new search functions. Now the database also includes more access to FEMA information. USACE and FEMA internal review of the updates and webinar training will be taking place this spring.


As part of the continuing effort to update and improve tools associated with the NLD, the Levee Inspection Tool is also undergoing changes. This new mobile-capable field collection tool improves on the current technology and includes a full inspection checklist, as well as the ability to collect field data, such as data related to on-the-ground



flood fighting efforts. The upgraded Levee Inspection Tool will automatically connect to and store data in the NLD. The Levee Screening Tool, which analyzes the levee data to provide risk information, will now also be connected to the NLD, and its data will be available to view, search, and report. The updates are expected to be completed this summer.

Phase 2 of the updates, expected to also be completed this summer, will include

a dashboard so that users, such as states, sponsors, and levee owners, can track metrics and receive information from USACE. There will also be a dashboard interface available for the public to more easily access a wide variety of summarized levee information, such as a map of the levee and leveed area and levee statistics.

Public webinars will be held in early summer to cover updates to the NLD. 



# Post-Wildfire Impacts to USACE Flood Risk Management

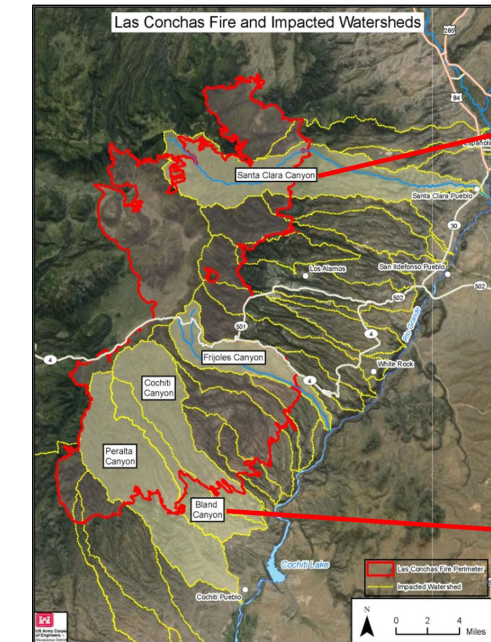
By Ian E. Floyd, Engineer Research and Development Center, and Stephen W. Brown, USACE Albuquerque District

## The problem

The Las Conchas Wildfire began on June 26, 2011, and burned more than 156,000 acres of forested land in the Jemez Mountains in northern New Mexico. During the first 14 hours, the fire burned approximately 43,000 acres, growing at an average rate of approximately one acre every 1.2 seconds and continuing for five weeks until contained by U.S. Forest Service firefighters on August 1, 2011. Burn severity was greatest in the mountainous headwaters of some 16 basins that drain directly into the Rio Grande and USACE Albuquerque District (USACE-SPA) managed Cochiti Reservoir.

The affected basins have shed sediment at rates far above their historic quantities. Recovery of these watersheds is decades away, creating an ongoing sediment management problem at Cochiti Reservoir. Observational and limited modeling data indicate dramatic changes in watershed hydrology and geomorphology have occurred within the burn area. Calibrated hydrologic studies at Santa Clara Creek found that post-fire peak flow conditions increased by 400 percent from pre-fire conditions (e.g., one percent chance event increased from 5,000 to 20,000 cubic feet per second). Other tributaries where data have been collected, such as Frijoles Canyon in Bandelier National Monument, show similar ongoing changes in flood hydrology and hydraulics.

The amount and intensity of large wildfires in the U.S. have become a major concern, especially in the western U.S. where over the past decade every state experienced a rise in the number of large fires according to the National Interagency Fire Center. Immediately following a wildfire, vegetation is removed, organic soil horizons are



Santa Clara Canyon  
July 14, 2011



Bland Canyon  
August 7, 2011

Los Conchas wildfire burn scar and Santa Clara and Bland Canyon impacted watersheds.

reduced to ash, and hydrophobic soils combine to result in increased water and sediment discharge to include destructive floods, debris-flows, mud flows, and debris-floods. In the years following a wildfire, ecotone shifts, rill and gully formation, in-channel erosion, and deposition significantly alter the geomorphic (i.e., morphology) and hydrologic system response. The resulting dramatic changes to hydraulics and sediment regimes increase potential loss of life and damage to critical infrastructure.

In addition to the USACE Cochiti Reservoir and Rio Grande Project, the altered post-Las Conchas fire hydrology directly impacts two federally-recognized tribes (Santa Clara Pueblo and Pueblo de Cochiti), Bandelier National Monument, the Valles Caldera National Preserve, and the Los Alamos National Laboratory. Post-fire flood events

have increased erosion and sediment transport processes, resulting in sediment deposition in downstream channels and significant loss of channel flow capacity and flood risk management (FRM) capabilities in downstream communities. The effort involves a broad coalition of federal and non-federal partners invested in aiding communities to recover from post-fire flooding, including FEMA, the Bureau of Reclamation, and the Bureau of Indian Affairs.

## Post-Wildfire FRM R&D

In response to the Las Conchas fire and impacted local communities and the Cochiti Reservoir, a research and development (R&D) effort began in late 2015. The R&D effort is funded by the USACE Regional Sediment Management R&D Program and the Flood and Coastal Storm Damage

*Continued on page 14.*



Reduction R&D Program to enhance post-wildfire modeling capabilities and foster interagency partnerships among U.S. Army Engineer Research and Development Center, USACE-SPA, Hydrologic Engineering Center, Cochiti de Pueblo and Santa Clara Tribes, and U.S. Air Force Civil Air Patrol. The effort aims to improve understanding of impacts and enhancement of numerical capabilities to assist with planning, management, and mitigation in post-wildfire environments using cost-effective science-based approaches and smart integrated numerical approaches.

Post-wildfire floods generate gravity driven surface runoff and erosion events that involve complex mixtures of water, ash, sediment, and entrained debris (i.e., destroyed upstream infrastructure, woody debris, and up to 'car-size' boulders). Hydrologic and hydraulic models can be useful tools for assessing wildfire impacts to FRM, with an increasing need to develop and improve post-wildfire numerical modeling capabilities within USACE models. While using the Las Conchas pre- and post-wildfire hydrodynamic, geomorphic, and sediment datasets for model calibration and validation, current


R&D is focused on enhancements to the following models: 2D Adaptive Hydraulics (AdH) and Sediment Transport Library (SEDLIB), 2D Gridded Surface Subsurface Hydrologic Analysis (GSSHA) models, 1D Hydrologic Engineering Center's River Analysis System (HEC-RAS), and 1D Hydrologic Modeling System (HEC-HMS).

### Summary and Future Research

High intensity wildfires remove vegetation, including destruction of subsurface root structures, purge organic soil, and create widespread hydrophobic soils, resulting in increased discharge, sediment transport, and extreme flood events. In the years following a wildfire, ecotone shifts, gully formation, and channel incision alter the hydrologic system response, resulting in dramatic changes to hydraulic and sediment impacts down system. In most of the western U.S., post-wildfire recovery can take decades, posing potential long-term operation and management concerns for USACE and other federal, state, and local agencies. Large wildfires represent a significant perturbation (or shock) to natural systems that dramatically

alter the geomorphology, hydrology, and sedimentation regimes of impacted watersheds. Future R&D will continue to focus on enhancing our modeling capabilities to quantify post-wildfire impacts on hydrologic and hydraulic response, geomorphic evolution, and sedimentation processes. The research will generate studies related to:

- Cost-effective (in situ and remotely sensed) data acquisition and processing methods
- Better understanding of the longer term geomorphic impacts and subsequent recovery processes in post-fire environments
- Hydrological physical processes, empirical approaches, and numerical modeling
- Hydraulics and sediment transport physical processes and numerical modeling

For additional information on ongoing post-wildfire R&D, please contact Ian E. Floyd, [Ian.E.Floyd@usace.army.mil](mailto:Ian.E.Floyd@usace.army.mil), 601-634-4160, or Stephen W. Brown, [Stephen.W.Brown@usace.army.mil](mailto:Stephen.W.Brown@usace.army.mil), 505-342-3215. 



# Infrastructure Buzzwords or Opportunities?

By Doug Bellomo, USACE HQ IWR

With increased downward pressure on government budgets at all levels (federal, state, and local), it's clear we must improve how we work together to achieve common goals and desired, measurable results for our collective investments. Having an appreciation for the differences in our water resources missions and programs is important, but finding ways to show how those missions and programs link together is key to ensuring we are more effective in accomplishing our goals while helping others achieve theirs. Finding ways to cut across disciplines (financial, legal, technical, political, and social), programs, and missions is critical. Embracing uncertainty, deliberately managing change (as opposed to trying to avoid it), and improving adaptability are needed if we are to make progress at managing risks to our critical infrastructure systems and the essential public services they provide. Our challenge is to move our processes, regulatory structures, policies, practices, and culture toward system of systems thinking, align them with risk principles, and build in resiliency concepts (prepare, adapt, recover, absorb).

Changing weather patterns, evolving hydrologic uncertainty, shifts in demographics, new technologies, and a dynamic physical landscape will continue to require active management of critical infrastructure – there is no “one and done” solution to the present infrastructure challenge that will sustain prosperity, health, and happiness in perpetuity. Investment to fix what is broken and maintain existing assets is certainly needed, but more must be done if we want to avoid a repeat of what led to the current issues. As Albert Einstein once said: “We cannot solve our problems with the same thinking we used when we created them.”


Within the USACE, there are a variety of ongoing efforts that are moving us

“System of systems, resilience, and risk may sound like a list of modern buzzwords, but if you're willing to dig a little deeper into their meaning, you'll find much more.”

toward system of systems approaches, integrated risk practices, and resilient solutions. We are improving how we manage infrastructure within our portfolio of dams, levees, harbors, and waterways by refining the way we interface with the people who rely on them, influence the risks presented, and share in the responsibility of ensuring they perform as expected and meet shifting demands. Examples of this broader engagement strategy include Silver Jackets – a program aimed at bringing together federal and state government partners sharing in flood risk reduction and management efforts to achieve desired watershed level outcomes. Within the Levee Safety program, we are strengthening relationships and using flood risk to inform decisions. Additionally, new ways of tackling emerging challenges are being deployed, including the System-Wide Improvement Framework (or SWIF). Finally, there are ongoing efforts to update USACE National Flood Risk Management Program guidance to weave in system of systems thinking, resilience concepts, and the use of risk information to help bring different missions together.

System of systems, resilience, and risk may sound like a list of modern

buzzwords, but if you're willing to dig a little deeper into their meaning, you'll find much more. Risk at its core is a currency that allows us to communicate and weigh the impact of tradeoffs across different value streams. We can use it to inform decisions and facilitate constructive dialogue about things that impact our economy, our society, and our natural resources – recognizing that none succeed by operating in isolation. The notion of different systems working together leads naturally to system of systems thinking. Thinking about how systems work with other systems offers an opportunity to go beyond a narrow “project” focus and demonstrate how our work fits into a broader spatial landscape. Whether we're working levee system improvements into a larger flood risk management strategy or showing how a dam's operation impacts a regional energy or water supply network, thinking about how our system impacts other systems opens doors to new partnerships, which leads to more creative and robust solutions. A close kin to robustness is, of course, resilience, which, to be achieved, demands that we contemplate overwhelming and unimaginable forces that make us wonder if infrastructure should be thought of as more than bricks and mortar. When pushed to contemplate failure or total loss, our designs tend to resemble living organisms built to recover from catastrophe more quickly and adapt to changing conditions.

Yes, system of systems, resilience, and risk are modern buzzwords, but they are also ideas that present opportunities to solve today's problems using different thinking than that which created them. 



## Other Important Information

### Conferences

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.

17-20 April 2017 – **National Hurricane Conference** – New Orleans, LA

24-26 April 2017 – **2nd International Conference on Coastal Cities and their Sustainable Future** – Cadiz, Spain – [witconferences.com/coastal2017](http://witconferences.com/coastal2017)

30 April-5 May 2017 – **Association of State Floodplain Managers 41st Annual Conference** – Kansas City, MS - <http://floods.org/index.asp?menuID=223&firstlevelmenuID=181&siteID=1>

6-8 June 2017 – **National Hydrologic Warning Council Biennial Conference** - Olympic Valley, CA - [http://www.hydrologicwarning.org/content.aspx?page\\_id=22&club\\_id=617218&module\\_id=199788](http://www.hydrologicwarning.org/content.aspx?page_id=22&club_id=617218&module_id=199788)

5-7 Sept 2017 – **7th International Conference on Flood Management** – Leeds, UK – <http://www.icfm7.org.uk/>

5-9 November 2017 – **Annual American Water Resources Association Conference** – Portland, OR – <http://awra.org/index.html>

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>

### Good to Know

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, <http://operations.usace.army.mil/flood.cfm>. 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](mailto:Stephanie.N.Bray@usace.army.mil).*



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