A1: CRS - National Focus

CRS Transformation: Incentivizing the Future of Risk Reduction
Rachel Sears, CFM, FEMA, rachel.sears@fema.dhs.gov
Co-presenters: Mary Jo Mullen, PE, PMP, mmullen@advantagestrat.com

Abstract: Since the CRS program started, there have been major changes in understanding flood risk, flood risk reduction techniques, and technology. There are a series of transformations in programmatic approaches within the NFIP, and CRS will need to align to all these evolutions in programs, policies, and knowledge. CRS Transformation is the multi-year effort to make this happen.   This presentation will inform state and local partners about the purpose, timeline, and ongoing work on FEMA's Community Rating System (CRS) Transformation. Participants will learn the goals and objectives of this effort and how they too can contribute to shaping the new CRS. Join us to be a part of making change and improving this valued program!

Biography: Rachel Sears joined the Federal Emergency Management Agency (FEMA) in 2004 and currently serves as the Director for the Floodplain Management Division. In this capacity, Ms. Sears provides leadership in the implementation of the floodplain management requirements of the National Flood Insurance Program (NFIP) and oversees FEMA's work as the lead agency under the Unified National Program for Floodplain Management and as the consultation agency under Executive Order 11988, Floodplain Management.   In her previous capacity as the Senior Policy Advisor for the Federal Insurance and Mitigation Administration, Rachel played a lead role in advancing FEMA's work in national climate adaptation and resilience policy, supporting the development and implementation of the Federal Flood Risk Management Standard (EO13690), Presidential Policy Directive 8 - National Preparedness, the President's Climate Action Plan, the Hurricane Sandy Rebuilding Strategy, and the Principles and Guidelines to Water Resource Management. Rachel has also been involved in the many reforms of the National Flood Insurance Program.   She has worked multiple disasters in the national operations center and has been deployed to disaster field assignments in Florida, Mississippi, Louisiana, and Iowa.   Ms. Sears has a B.S. in Environmental Sciences from Shepherd University and a Masters of Public Policy from George Mason University.

The Community Rating System: Program Updates and the 2021 Addendum
Bill Lesser, CFM, FEMA, bill.lesser@fema.dhs.gov
Co-presenters: Molly J. O'Toole, P.E., D.WRE, CFM Sherry Harper, CFM

Abstract: In January 2021, new Community Rating System (CRS) prerequisite requirements became effective and new CRS credits were made available. These changes are included in the 2021 Addendum (Appendix) to the 2017 CRS Coordinator's Manual, which is serving as a "bridge" between the existing guidance materials and the more comprehensive update to the CRS program (CRS Transformation) that is part of the National Flood Insurance Program (NFIP) Transformation. This CRS program update presentation will highlight the 2021 Class 9 prerequisite for Elevation Certificates, the Class 8 prerequisite for freeboard, the new credit opportunities, and several credit simplifications. The

discussion will also include how the CRS program is transitioning (implementing) the Addendum, both at cycle verification visits and at annual recertifications, and recommendations for communities. Additionally, other program updates and CRS priorities for the near future will be discussed.

Biography: Bill Lesser, CFM, works in the FEMA Federal Insurance and Mitigation Administration, Mitigation Directorate, Floodplain Management Division as the National Coordinator for the National Flood Insurance Program's (NFIP) Community Rating System (CRS). He coordinates overall operation of CRS through the ten FEMA Regional Offices with the support of Insurance Services Office which provides field delivery of the CRS to communities. Bill has worked with FEMA since 1993 in various capacities including NFIP Community Eligibility and Compliance, Congressional Affairs, as a Subject Matter Expert with the FEMA National Emergency Training Center and most recently as the CRS National Coordinator. Prior to working for FEMA he worked with the Commonwealth of Virginia in the Floodplain Management Branch and with the Commonwealth of Massachusetts with the Department of Environmental Management.

New CRS Credits for Conservation and Recovery of Threatened and Endangered Species
French Wetmore, French & Associates, Ltd., French@FrenchAsoc.com
Co-presenters: Bret Gates, CFM, FEMA, Bret.Gates@fema.dhs.gov

Abstract: FEMA worked collaboratively with the U.S. and Wildlife Service and National Marine Fisheries Service to develop a plan to further the conservation of threatened and endangered species and designated critical habitats pursuant to Section 7(a)(1) of the Endangered Species Act (ESA). After several years of research, discussion, and pilot studies, FEMA developed new tools and two new CRS credits (effective with the 2021 CRS Coordinator's Manual Addendum). The first tool is a FEMA.gov website, "Floodplains and Wildlife Conservation." The website explains how communities can incorporate species and habitat conservation into floodplain management strategies and decisions; and also reviews the benefits to the community with several success stories. The second tool is FRESH (Flood Risk and Endangered Species Habitat), a Web-based mapping tool identifying species' ranges and critical habitats within a community's Special Flood Hazard Areas. FRESH shows communities which species they should address and where. The third tool is two new CRS credits, the Floodplain Species Assessment (FSA) and Floodplain Species Plan (FSP), which are credited under the natural floodplain functions plan element (NFP) in Activity 510 (Floodplain Management Planning). One credit is an assessment of ESA species with ranges and/or critical habitat in the community, how the species relate to the community's floodplain, and what relevant activities the community is implementing that warrant CRS credit. The FSA takes advantage of the FRESH mapping tool. The second new credit encourages the community to leverage the FSA and to identify conservation and recovery actions that it could take to help priority ESA species. The new CRS credits are dependent on reviews with appropriate federal, state, and local natural resources agencies and organizations. The presentation will review the new tools and walk through the new CRS credits, including best practices to develop FSAs and FSPs by three pilot CRS communities.

Biography: French Wetmore is President of French & Associates, a floodplain management consulting firm. French's consulting projects have included assisting communities, states, and federal agencies with their floodplain management programs, mitigation plans and programs, floodproofing projects, and flood warning and response programs. French & Associates was the lead consultant to FEMA and the Insurance Services Office on the Community Rating System from its inception in 1988 until 2014 and the

lead CRS instructor at FEMA's Emergency Management Institute during that time. Most recently, French has been working with FEMA on ways to use its authorities, especially the CRS, to promote conservation and recovery of threatened and endangered species. French served as Chair of the Association of State Floodplain Managers (1985 – 1987), President of the Certification Board of Regents (2001 – 2004), and on the Board of Directors for the Illinois Association for Floodplain and Stormwater Management (1989 – 2007). He has a B.A. in Government from Indiana University (1968) and a Masters in Public Administration from Syracuse University (1972).

Bret Gates is the National NFIP ESA Coordinator in FEMA's Federal Insurance & Mitigation Administration. He is currently responsible for national NFIP ESA Coordination, Floodplain Management policy and special projects. He has previously served as Program Manager of the Community Assistance Program – State Support Services Element (CAP-SSSE); and National Coordinator of FEMA's Community Rating System (CRS) 1990-2006; Other responsibilities have included serving as Program Lead for the Pre-Disaster Mitigation (PDM), and the Flood Mitigation Assistance (FMA) programs.

A2: Mitigation Successes and Loss Avoidance Studies

The Results are in! Building Codes Save
Jonathan Westcott, PE, FEMA Headquarters, Jonathan.Westcott@fema.dhs.gov
Co-presenters: Shane Parson, PhD, PE, CFM, Compass/AECOM, shane.parson@aecom.com

Abstract: Adopting the latest hazard-resistant building codes is a community investment in mitigation and damage prevention – FEMA's Building Codes Save Study shows the return on investment represented as losses avoided and supports FEMA's programs and efforts that promote and support hazard-resistant building code adoption and enforcement. Using big data, FEMA's modeling of the 18.1M buildings constructed in the United States since 2000 has found that the nation has benefited to the tune of $1.6 billion in savings each year. These savings represent the cumulative losses avoided from property damage associated with using the International Codes or similar building codes during floods, hurricane, and earthquakes. FEMA projects that, by the year 2040, the nation will save around $3.2 billion in savings per year. This adds up to almost $133 billion in total losses avoided from 2000 to 2040. This presentation will provide a brief overview of FEMA's Building Code Saves freeboard-based flood hazard analysis using nationwide parcel-level datasets, State and local building code adoption history, and Hazus modeling. The presentation will focus on flood hazard results, big picture trends, and advancing community resilience through building codes.

Biography: Jonathan Westcott is a Civil Engineer with FEMA's Building Science Branch in the Risk Management Directorate. Mr. Westcott has been with FEMA's Federal Insurance and Mitigation Administration since 2006. He is responsible for development of technical policy, standards, and guidance on building science issues. Mr. Westcott is also responsible for planning and oversight of FEMAs Technical Bulletin updates and serves on the National Windstorm Impact Reduction Program, Windstorm Working Group. In 2017, Mr. Westcott traveled to the US Virgin Islands as part of the Mitigation Assessment Team. Mr. Westcott earned his B.S. in Civil Engineering from Lehigh University with a Coastal Engineering specialty and a Coastal Engineering Certificate from Old Dominion University. He is a registered professional engineer in the Commonwealth of Virginia.

Dr. Shane Parson is a Natural Hazard and Climate Change Modeling Analyst with the AECOM Germantown, Maryland Office. His expertise is in applying modeling with data analytics to projects ranging from benefit cost analysis to natural hazard simulations to climate change modeling to risk assessment modeling. In addition to being a Certified Floodplain Manager, he also became an Amazon Web Services Certified Cloud Practitioner.

Shorewood, Illinois Loss Avoidance Study: 24 years and 17 floods later

Lisa Graff, GISP, CFM, Prairie Research Institute, Illinios State Water Survey, lgraff@illinois.edu
Co-presenters: Rebecca Leitschuh, Brad McVay, Chris Hanstad, and Mary Richardson

Abstract: During the past century, the Village of Shorewood, Illinois transitioned from a sleepy summer cottage respite along the DuPage River to a rapidly expanding suburban community. However, following an historic rainfall event in July 1996, the community of Shorewood received a federal disaster declaration and centered their focus on recovery and mitigation. This loss avoidance study estimates flood damages that would have occurred in Shorewood along the DuPage River if at-risk properties had not been mitigated. It also tells the story of Shorewood, its residents, and their collective resolve in the wake of repeated flooding. This presentation will evaluate the mitigation benefits from 56 property acquisitions between 1996 and 2010, funded through four different public sources. The mitigation benefits, or return on investment, have already surpassed the initial investment, and they will continue to accrue into perpetuity. The presentation will also discuss the local financial mechanisms to facilitate long-term capital improvement projects, the complementary community plans and ordinances, and the role of local champions who seized the momentum following the recovery effort.

Biography: Lisa Graff is a GIS Team Manager with the University of Illinois, Illinois State Water Survey, a GIS Professional, a Hazus Trained Professional and a Certified Floodplain Manager. She is currently leading a team to develop Local Hazard Mitigation Plans for counties in Illinois, as well as using GIS to assess the impact of flooding in Illinois. Lisa understands the importance of good information in data driven decision-making, and the impact of accessible tools to guide communities in becoming safer and more resilient from flooding. She has also worked on floodplain mapping though FEMA's MapMod and RiskMAP initiatives.

Bomb Cyclone Shelter – Why Grand Island Stayed Dry in the Flood of 2019

John Callen, JEO Consulting Group, Inc., jcallen@jeo.com
Co-presenters: Lalit Jha, PE, D.WRE, CFM

Abstract: Grand Island and the surrounding region has experienced severe flooding over many decades. In 2005, the Central Platte Natural Resources District (NRD), City of Grand Island and Hall County, NE undertook a flood risk reduction project to minimize the risk of flooding to Grand Island. The project includes multiple risk reduction actions including dams, a detention cell, and a levee. Also included is an effort to enhance local understanding of flood risks through awareness outreach, promotion flood insurance, and development of a flood alert system. Construction was completed in 2019, totaling 6 million cubic yards of excavation, 1.5 miles of levee, and four dry dams, costing approximately $25 million. The project is estimated to reduce damages from a single major flood event by an amount exceeding the project cost. Historical flooding occurred in March 2019 when a bomb cyclone took direct aim at Nebraska bringing snowfall and rain on frozen snow-covered terrain. Over one billion dollars of damage occurred statewide. Due to the abnormal conditions causing the flood, it is difficult to

determine the recurrence interval at Grand Island; however, the elevation of the flooding indicates near 500-year flood levels. The project performed and prevented millions of dollars of damage to Grand Island.   This presentation will discuss components of this project that allowed the development of a long-term flood risk reduction effort. It will discuss how the project performed during March 2019 and lessons learned, as well as key actions the NRD and Grand Island will take to continue to promote awareness of flooding risks, understanding of residual risk, and ongoing implementation of the flood alert system. This project is a prime example of how agency collaboration and a long-term vision for flood risk reduction for a community resulted in flood risk reduction benefits during a significant real-world test.

Biography: John Callen has over 17 years of industry experience working with flood risk and floodplain management. John is currently a Senior Project Engineer in the Water Resources Engineering Department at JEO Consulting Group, Inc. John holds a Bachelor of Science degree in Biological Systems Engineering from the University of Nebraska at Lincoln and is a licensed Professional Engineer in Nebraska, Iowa, and South Dakota. John is also an Association of State Floodplain Managers Certified Floodplain Manager and serves as the Second Vice Chair of the Nebraska Floodplain and Stormwater Managers Association. His professional experience includes hydrologic and hydraulic modeling to support flood risk analysis and floodplain mapping, floodplain management, and flood risk mitigation. John's experience also includes 4 years with the Nebraska Department of Natural Resources where he worked on floodplain mapping projects and also served as NFIP State Coordinator for Nebraska. His recent efforts have been focused on flood risk analysis and mapping projects, including multiple CLOMR and LOMR submittals as well as FEMA CTP projects. John has also worked with flood risk awareness and communication through both structural projects involving existing levees as well as nonstructural projects such as parcel by parcel flood risk identification and alternatives analysis.

A3: 2D Floodways: The Confluence of Modeling and Regulations

Two-Dimensional Floodway Testing and Evaluation
Isaac Allen, PE, CFM, AECOM, Isaac.allen@aecom.com
Co-presenters: Andrew Bonner, PE, PMP, CFM (AECOM)

Abstract: In 2020, FEMA created an integrated project team (IPT) to define how to evaluate regulatory compliance for floodway analysis based on two-dimensional (2D) models. The intended outcomes of the IPT were to determine short-term solutions via updates to guidance and standards, as well as to identify long-term solutions or alternatives for floodway development that help align floodway regulation with continuously evolving technologies used for flood risk studies. The pursuit of both the short-term and long-term goals identified by the IPT resulted in several topics requiring further attention and testing.   To address these topics and facilitate continued efforts of the IPT, Compass worked with FEMA to conduct a 2D based floodway testing program. The testing identified hydraulic models throughout the country representing a wide range of modeling software, topographic and geographic conditions, and modeling challenges. Key questions investigated for each area included the nuances of evaluation line and surcharge averaging approaches introduced in the November 2020 guidance and standards updates, assessment of alternative encroachment techniques more closely aligned with

development in the floodplain, use of standardized depth and velocity criteria as the means for establishing the regulatory floodway, and comparison of various modeling techniques and their impacts on the final delineated floodway. Draft results for the various project areas will be shared and presenters will discuss how those results may help shape further advancements in floodway analysis procedures.

Biography: Isaac Allen is a water resources engineer in the surface water department at AECOM. Over the last five years he has primarily been involved in H&H modeling for floodplain development and mitigation projects, with a recent focus on developing 2D models for regulatory flood studies. Isaac received his master's of science in water resources engineering from the University at Buffalo in Buffalo, NY and a bachelor's of science in environmental engineering from Syracuse University in Syracuse, NY.

2D Hydraulic Modeling including Multiple Levee Systems and Floodway Analyses – A Case Study of the Payette River in Payette County, Idaho

Lori Schrader, PE, CFM, Stantec, lori.schrader@stantec.com
Co-presenters: Erica Schmitz and Will Zung

Abstract: The Payette River floodplain in Payette County, ID is very shallow, spanning thousands of feet wide with several diversion channels and levee systems aligning the river; thus a 2D HEC-RAS hydraulic model was recommended for its ability to simulate the unsteady and unconfined flow patterns. There are six levee systems along the Payette River in Payette County. Five of the six levee systems along the Payette River are non-accredited but are hydraulically significant, while the sixth levee system is provisionally accredited. This new study will determine new and valid updated engineering data for the Payette River to provide communities with base flood elevations and flood hazard mapping for the Local Levee Partnership Team (LLPT) to evaluate for the eventual revision to the FIRM. The study performed 2D hydraulic modeling of the river as well as the Natural Valley Analysis of each levee system for multiple recurrence intervals. A 2D floodway was also determined in coordination with FEMA Region X and communities.   This presentation will go through the intricate 2D hydraulic analyses of the Payette River, covering the distinction between 'with levee' and Natural Valley scenarios to determine hydraulic significance and to identify areas impacted by levee systems as well as highlighting the complexities of a 2D, unsteady floodway analysis where multiple flow paths are present.

Biography: Lori Schrader, PE, CFM is a Water Resources Engineer and Project Manager for Stantec out of the Overland Park, Kansas office. While at Stantec, Lori has worked on a variety of hydrologic and hydraulic modeling projects throughout the US related to FEMA flood studies and levee analysis. She has her Masters in Civil Engineering from Purdue University and a Bachelors in Civil Engineering from UCLA.

Erica Schmitz, IE, is a Water Resources Engineer-in-training for Stantec out of the Overland Park, Kansas office. While at Stantec, Erica has worked on a variety of hydrologic and hydraulic modeling projects throughout the US related to FEMA flood studies and levee analysis. She received a Bachelors and Masters in Biological and Agricultural Engineering from Kansas State University.

Will is the Levee Support Control Account Manager for STARR II, a Professional Technical Services (PTS) provider to FEMA, as well as the Officer Manager and Water Resources Manager in the Kansas City office of Stantec. He leads teams of subject matter experts providing levee related flood risk analysis, flood hazard mapping, and flood risk communication. He is a Project Management Professional and

Certified Floodplain Manager, with 21 years of experience with FEMA's National Flood Insurance Program as a hydrologist with a background in hydrologic and hydraulic modeling.

Floodway Assessment: 1D vs 2D Modeling Perspectives

Stephen Sands, Hazen & Sawyer, P.C., ssands@hazenandsawyer.com
Co-presenters: Martha Cardona, PE

Abstract: Regulatory floodplains typically consist of a floodplain and a floodway. The floodway is the primary conveyance area with depths and velocities that are more hazardous than the remainder of the floodplain. The floodway is subject to more protective regulatory restrictions. Therefore, the identification of the floodway boundary is a critical element of successful floodplain management. Floodplain managers are recognizing that the historical methods of defining the floodway may not best serve the community. Specifically, floodplain managers are recognizing that the one-foot surcharge may not be the appropriate value for some floodplain conditions. In some cases, defining the floodway/flood fringe using one generic value may result in floodways widths and flood fringe velocities/depths that are inappropriate. Factors that influence the floodplain and floodway definition include stream slope, terrain, meanders, roughness, culverts, bridges, etc.   The advancements of two-dimensional hydraulic models provide floodplain managers with access to better tools to quantify floodway hydraulic conditions. Using two-dimensional hydraulic models may define floodway boundaries more accurately through assessments of spatial distribution of flow velocities and depths versus the historical methods using the one-dimensional approach.   This presentation will compare floodway definition results using one-dimensional and two-dimensional hydraulic modeling. Various criterions to define the floodway will be assessed including velocity times depth criterion, high manning's coefficient values for floodplain fringe areas, and pre-defined percent of the regulatory flood flow to be carried through the floodway. A comparison of the different modeling results including floodway limits; surcharge amounts; and flow depths and velocities will be presented. The presentation will also address the influence of stream slope, hydraulic restrictions, meanders and floodplain obstructions on floodway definitions.

Biography: Mr. Sands has over 35 years' experience including positions in the consulting industry and as a municipal employee with the Lexington-Fayette Urban County Government and managing the Charlotte, NC Storm Water program. Mr. Sands' expertise includes NPDES MS4 program implementation, watershed modeling, and capital improvement project design. Stephen Sands graduated with a Civil Engineering degree from the University of Kentucky. He is a professional engineer and certified floodplain manager.

A4: Evolution of the National Flood Mapping Program

Evolution of Floodplain Mapping

Cindy Engelhardt, PE, CFM, Halff Associates, cengelhardt@halff.com
Co-presenters: Michael Moya, PE, CFM

Abstract: Flood risk is top of mind for many municipalities and residents because of severe storm events in recent years. Floods can strike at any time, and more work is being done to identify the flood-prone areas that exist within our communities, so we can incorporate mitigation efforts, make neighborhoods

safer and reduce the loss of life. This presentation will discuss how flood-risk technology has advanced including the paper-to-digital revolution, changes in rainfall records, and advancements of modeling and floodplain inundation mapping. Allison, Katrina, Sandy, and Harvey are names that will forever be synonymous with the United States—for all the wrong reasons. While these storms were devastating, they have also had a great impact on the evolution of technology to identify flood risk, bring awareness to the forefront in a proactive manner, and help make smarter, informed decisions. Floods are difficult to predict. However, many state and government agencies are trying to factor rainfall variability into the design of future projects. Initialized in the 1960s, computer models that simulate rainfall runoff and flood elevations are the basis of floodplain mapping efforts. Today's detailed GIS-based, two-dimensional modeling technology is driving the stormwater industry. Modeling and mapping technology will continue to evolve and enable floodplain managers to accurately identify critical flood risk in urban areas and assess risk for areas beyond the confines of the regulatory FEMA flood zone.

Biography: Cindy Engelhardt is a civil engineer with a focus on water resources. In her 15 years at Halff, she has been involved in numerous flood planning and design projects throughout the state. Through these projects, she has formed a trusted working relationship with local, state, and federal agencies.

Michael Moya is a senior vice president and water resources practice leader at Halff Associates. In his 35-year career he has played a critical role in the preparation of stormwater planning, studies, and infrastructure design. He has also been a leader of floodplain management through his federal, state and local projects.

Stakeholder Feedback on the Future of Flood Risk Data: Insights from the TMAC 2020 Stakeholder Engagement Effort
Jen Marcy, PMP, CFM, Atkins, jennifer.marcy@atkinsglobal.com
Co-presenters: Lauren Finegan, PE, PMP, CFM; Ann Terranova, CFM

Abstract: In 2020, TMAC conducted the largest stakeholder engagement effort ever completed by the Mapping Program by deploying an online survey, facilitating two webinars, and guiding eleven focus group meetings with stakeholders representing Floodplain Management, Flood Hazard Mitigation, Flood Hazard Mapping, and Flood Insurance elements of the program. By analyzing the data from this effort, we can gain insights into stakeholder sentiments on the shift from binary to graduated risk, the probabilistic data that supports that shift, understand what resources or tools stakeholders say they need from the program in the future, and the elements of the current program that remain useful as the program moves forward.

Biography: Jennifer Marcy is a provider of flood risk-related outreach, training, and expertise in FEMA's National Flood Insurance Program, having trained thousands of federal, state, local, and private floodplain managers across the country. She has served as co-chair for the Association of State Floodplain Manager's (ASFPM's) Training and Outreach Committee since 2009, and is also active in the New York State Floodplain and Stormwater Managers Association. She lives with her family in Buffalo, New York.

Dream. Design. Deliver: Demonstrating the Future of Flood Risk Data
Sarah Abdelrahim, FEMA, sarah.abdelrahim@fema.dhs.gov
Co-presenters: Christina Lindemer, FEMA; Sarah Abdelrahim, FEMA; David Bascom, FEMA; Peter Herrick, Paul Rooney;

Abstract: This session will include a discussion with the audience on flood information stakeholders and their objectives. In FY21, FEMA aims to better understand our flood information stakeholders, our stakeholders' capabilities and objectives, and how our stakeholders make decisions. FEMA currently takes a binary approach to flood hazard analysis (i.e., mapping the 100-year floodplain) that does not reflect the spectrum of flooding scenarios. Through its Future of Flood Risk Data (FFRD) initiative, FEMA is exploring ways to develop more comprehensive and consistent flood hazard and flood risk information across the nation. FFRD information will reflect a range of flood and storm events (frequent to extreme, mild to intense) and hazard sources (fluvial, pluvial, coastal, etc.).

The information offers new opportunities to promote mitigation action and risk awareness by supporting more efficient development of regulatory products (i.e., the FIRM) and nonregulatory products that support multiple objectives. By making more comprehensive information available to the public, information can be leveraged by other federal agencies; state, local, tribal, and territorial stakeholders; and the private sector to serve the objectives of FEMA's diverse set of stakeholders. This information can be communicated through a wide range of formats – e.g., maps, computational tools, text-based information, etc. – to support stakeholder outcomes. An improved understanding of our stakeholders will enable a capability for FFRD information to meet a specific need for a specific user in a specific geography.

This presentation will do the following:

- Discuss opportunities associated with probabilistically-derived graduated hazard and risk information for promoting mitigation action and increasing risk awareness
- Discuss how more comprehensive flood hazard and flood risk information can support specific stakeholder outcomes and analytical capabilities
- Obtain participant feedback on the flood information ecosystem, its stakeholders, and flood resilience objectives
- Discuss how increased integration with stakeholders can help FEMA more effectively support stakeholders in a time of reduced financial resources and increased need

Biography: David Bascom is the chief of the Engineering Resources Branch in FEMA's Risk Management Directorate.

A5: Innovative Risk Communications

Weathering the Storm of Project Development: Public Affairs Tips & Tricks
Rocky Schneider, MBA, CFM, Advanced Engineering and Environmental Services, Inc. (AE2S),
Rocky.Schneider@ae2s.com
Co-presenters: None

Abstract: This presentation will cover the Public Affairs Tips and Tricks honed over a decade of experiences on a multi-billion dollar flood protection project that straddles the North Dakota / Minnesota border. The presentation will include four tried and true methods along with the tools and deliverables utilized to make them successful.

The project took over a decade to develop in a region where the rules of the game keep changing due to the complexities of changing FEMA floodplains, strong urban population growth, and shifting political climates.

Ensuring a successful public affairs program was essential in order to obtain the political and financial support necessary to move forward this massive civil works project across a community of more than 250,000 residents living in numerous different political jurisdictions.

Biography: Rocky Schneider has worked on flood protection projects in the Fargo-Moorhead region for more than a decade. Born and raised in Fargo, ND, Schneider attended the University of Minnesota for his undergraduate and received an MBA from North Dakota State University. Rocky previously worked for the U.S. Senate Budget Committee, Congressman Earl Pomeroy, and for the Homebuilders Association of Fargo-Moorhead. In 2013, Rocky joined AE2S, a specialized civil and environmental consulting engineering firm based in North Dakota. He was instrumental in leading public outreach and public affairs efforts to procure more than $3 billion in local, state, and federal funding. Schneider lives in Fargo with his wife and two children. He enjoys pickle ball, bicycling and his own jokes.

New Technologies and Skills Will Solve The Challenges of The Future
Joe Clarke, PhD, Meng, Deng, Jacobs, joe.clarke@jacobs.com
Co-presenters: None

Abstract: From collaboration platforms to common data environments, technology is ever more important in the working lives of practitioners in every sector. For decades, Flood and Coastal Erosion Risk Management in the UK and elsewhere has been a breeding ground for digital innovation – from hydraulic modelling to 3D visualisation. Today, technology buzzwords, such as Machine Learning, Big Data and Blockchain, are often thrown around as the next big thing. While they could all have a role to play in creating a more resilient world, as an industry we need the right skills not just to embrace them, but to marry technology with the deep knowledge of our catchments and coastlines so we can better understand how and where to apply them.   This talk plots a path from past to present to future, about technology in floodplain management and the skills that will be needed in the future. It will look back at the evolution of project delivery; the impact it has had on the skills we need and the emergence of technological tools that have evolved with ever-changing industry demands. It will present examples of recent innovative products and projects that have built on yesterday's cutting-edge solutions, applied today's novel technology to solve real-world challenges and create the launch pad for tomorrow's technological leap. And it will look forward to how we will solve the biggest challenges in our industry (and our world): the technology we will need to underpin our understanding of everything from climate change and adaptive pathways, natural flood management and natural and social capital, and the skills and digital disruption needed to embrace that future.

Biography: Dr. Joe Clarke plays a major role in Jacobs' UK-based Hydroinformatics team, combining technology expertise and a deep understanding of the complexity of problem-solving and decision-making in a water, flood risk management and climate resilience context. Joe develops and applies systems thinking, automation, decision science and web visualisation to solve complex problems and engage stakeholders in the process. His experience ranges from national scale flood risk management strategy and research to flood risk analysis solution architecture to local flood risk management

practice. He combines technical understanding and creativity with a holistic approach to problem-solving in order to bring innovative solutions to complex problems.

Playing for Keeps: Serious Games for Floodplain Management
Andrew Warren, Deltares, andrew.warren@deltares.nl
Co-presenters: None

Abstract: Serious games are receiving increasing attention as effective tools for stakeholder engagement and learning. They provide a fun and engaging environment within which to share and translate scientific knowledge and information. They challenge players by simulating realistic problems. Players can test a range of potential solutions and observe the practical implications with no delay. This gives them the opportunity to learn in a safe environment and avoid disastrous situations. The realism of serious games heightens the experience and helps to communicate scientific information. Multi-player games also encourage discussions between participants and the exchange of information, promote teamwork and allow players to better understand the processes they are involved in.   Deltares has developed serious games for various aspects of life in delta regions, and we view serious gaming as an essential tool for strategic planning, training for crisis situations and education. Our games typically combine knowledge about environment and infrastructure, game rules that reflect the span of control of the stakeholders, and a realistic visualisation of the area. Our serious games are played by policy makers, students, water managers, infrastructure inspectors, and the general public.   This presentation will describe Deltares' approach to serious gaming: its theoretical underpinnings, when to apply it, and the advantages serious games bring in terms of project delivery and their ability to help solve complex, practical problems. The presentation will also present lessons we have learned from the development of our games over the past 12 years, which could be applied by others seeking to develop their own games in the future.

Biography: Andrew Warren is an expert in climate change adaptation and integrated water resources management at Deltares. He primarily develops and applies Decision Making under Deep Uncertainty (DMDU) methodologies, such as adaptation pathways, to incorporate future uncertainties into long-term strategic planning processes. He has worked in a variety of international settings in both developed and emerging economies, and particularly enjoys contextualising DMDU approaches to the realities present in each setting. An experienced facilitator and trainer, Andrew also enjoys engaging stakeholders in planning processes through the development and application collaborative modelling approaches, including serious gaming.

A6: AECOM Showcase

AECOM: Building and Strengthening CTP Capabilities - Envisioning the Next 20 Years

A7: Dam and Levee Risk Education

State of California Model Floodplain Management Ordinances, Higher Standards, and Quick Guide
Kelly Soule, PE, MBA, CA Department of Water Resources, Kelly.Soule@water.ca.gov

Co-presenters: Anntonette Duncan, PE, Senior Engineer, CA Department of Water Resources, Anntonette.Duncan@water.ca.gov

Abstract: The State of California currently has 528 participating communities in the National Flood Insurance Program (NFIP). One of the requirements of the NFIP is that each community adopt a floodplain management ordinance that meets the minimum requirements of the NFIP. The California Building Code (Title 24 of the California Code of Regulations) was updated in 2019 and became effective in January 2020. The updated code requires 1-foot of freeboard over the base flood elevation (BFE). This now is the minimum requirement for NFIP compliance in California. The CA Department of Water Resources updated the State's model floodplain management ordinances, developed guidelines for communities to adopt higher standards, and developed a Quick Guide that aligns with the updated building code. This presentation will serve as an introduction to these documents so that California communities and other states are aware of the NFIP requirements, the 2019 building code, and the resources that have been developed that are available for their use.

Biography: Kelly Soule' has been working as an engineer in the water industry within the state of California for the past 25 years. She is a registered professional civil engineer and has her masters degree in business administration. She has worked as a consultant, at the county level, and she has now been employed with the California State Department of Water Resources for the last 12 years. She has been employed in different roles within the Departments' Division of Flood Management. Her current role as a Supervising Engineer is that of Branch Chief of the Community Assistance and Risk Awareness Branch in the Office of Floodplain Management. Her branch is responsible for communication, education, and outreach to the public, as well as all California communities on floodplain management issues. Her branch is also responsible for administering the National Flood Insurance Program within the state in cooperation with FEMA and Kelly serves as the State's NFIP Coordinator.

Anntonette Duncan is a Senior Engineer for the California Department of Water Resources in the Office of Floodplain Management. Her team is responsible for administering the National Flood Insurance Program and provides education, outreach, and technical assistance to California communities on floodplain management. She has experience in land development and over 12 years of experience working for the County of Sacramento including asset management, planning, designing, and construction of wastewater treatment and improvement projects. She holds a Bachelor's of Science degree in Civil Engineering and is a registered professional civil engineer.

North Carolina Dam Monitoring Gauges and Alert System
Thomas Langan, PE, CFM, North Carolina Floodplain Mapping Program, tom.langan@ncdps.gov
Co-presenters: Gary William Thompson, PLS, North Carolina Emergency Management, Gary.Thompson@ncdps.gov

Abstract: As part of North Carolina State Legislature Section 1.2 of SL 2019-250 House Bill 200 the NC legislature provided North Carolina Emergency Management (NCEM) $4.8 million to establish water level and breach monitoring systems for 1,510 high and intermediate risk dams. As part of this project and to assist with the operation of dam Emergency Action Plans (EAP) and first responders and emergency management, NCEM is installing low-cost water level sensors at approximately 130 state and local government owned intermediate and high hazard dams. These gauges will be installed upstream of the dam embankment and will be used to monitor when the water level at a dam reaches critical

thresholds including scenarios that may require a site visit or downstream evacuation due to a potential breach. Gauge data will be sent via cellular signal to a secure dam monitoring and alert application, DamWatch, that will be used to alert key personnel of potential hazardous situations. This presentation will provide a general overview and background information about this innovative project focus on the low-cost ultrasonic and pressure transducer technologies being used to monitor water levels at these gauges and how this information will be incorporated and utilized by the DamWatch application to alert first responders, NCEM and NC Dam Safety to potential critical water level thresholds.

Biography: Tom Langan has worked in North Carolina State and Local Government for the past 15 and previously spent 5 years in engineering consulting. He currently is an Engineering Supervisor with the North Carolina Emergency Management, Risk Management Section and oversees projects related to digital flood insurance rate map and database production and quality assurance, multi-hazard probability assessment, and other research projects related to risk management. He earned his Masters of Science in Civil Engineering from the University of Virginia and his Bachelors of Science in Environmental Science from Virginia Tech.

Mr. Gary W. Thompson is the Deputy Risk Management Chief, North Carolina Emergency Management/Risk Management and Chief of the North Carolina Geodetic Survey/Risk Management/NC Emergency Management. He has held a professional license as a Professional Land Surveyor (PLS) in North Carolina since 1980. He has served as president of both the North Carolina Society of Surveyors (NCSS) and the National Society of Professional Surveyors (NSPS). He is an emeritus member of the North Carolina Board of Examiners for Engineers and Surveyors (NCBEES), and a former commission member of the ABET Applied and Natural Science Accreditation Commission.

Dam Safety Signage Guidance – Promoting Public Awareness and Preventing Loss of Life and Property

Jim Maroukis, Booz Allen Hamilton, Maroukis_James@bah.com
Co-presenters: James Demby, Senior Technical and Policy Advisor, FEMA National Dam Safety Program, james.demby@fema.dhs.gov

Abstract: How do you ensure safety surrounding our nation's dams and promote public awareness of the risks when people are prone to be desensitized to warnings? See how the Federal Emergency Management Agency (FEMA) National Dam Safety Program (NDSP) and Booz Allen Hamilton (Booz Allen) team is tackling the issue in and around Dam sites. The team is leveraging behavioral change techniques and the most effective communication methods to convey risk while drafting National Dam Warning Sign Guidance. This Guidance will be designed to encourage greater use and adoption of Dam warning signs across the nation to prevent loss of life and property. Dams are a key part of our nation's infrastructure, but pose a great risk to owners, operators, and the public if proper precautions and safety protocols are not followed while at a dam site. NDSP and the Booz Allen team compiled data from leaders in the industry, such as U.S. Army Corps of Engineers, the U.S. Bureau of Reclamation, and the Canadian Dam Association, to analyze best practices and trends for warning signs. We also conducted interviews and a focus group study with various stakeholders to further gather information regarding messaging and effective use of signage pictograms. This presentation will show how to leverage the best practices gleaned from industry research and stakeholder collaboration to properly convey risks through dam warning signs.

Biography: Mr. Jim Maroukis brings over 20 years of program management experience supporting FEMA, DHS and a variety of other federal agencies and direct experience supporting the National Dam Safety Program (NDSP). While with the NDSP, Mr. Maroukis implemented several new tools and techniques to track and monitor the Dam Safety program including National and Regional Grants Management Dashboards. His team supported the High Hazard Potential Dams Grants program for 2019 and worked with a variety of national and regional stakeholders.   Mr. Maroukis has extensive experience working with stakeholders and senior leaders to design, develop and implement organizational evaluation and change initiatives. His knowledge and experience with the tools necessary to successfully analyze an organization, define strengths and weaknesses, and implement lasting change spans the majority of his 20+ years of work experience. Mr. Maroukis serves as a Subject Matter Expert in performance management, organization design, strategic planning, and change strategy/change leadership.

Session B
Tuesday, May 11 – 1:30-3:00 PM central

B1: Floodplain Management Compliance

A Fresh Look at Community Compliance with the National Flood Insurance Program
Sarah Owen, , FEMA, Floodplain Management Division, sarah.owen@fema.dhs.gov
Co-presenters: None

Abstract: As climate change makes flooding events more frequent and intense, effective floodplain management is critical, now more than ever. The Federal Emergency Management Agency (FEMA) works closely with communities participating in the National Flood Insurance Program (NFIP) to adopt and enforce floodplain management ordinances and other standards to promote community resiliency and flood-loss reduction. In order to better execute this mission, FEMA is transforming the NFIP compliance program including reimagining the processes for assessing community compliance with the NFIP and implementing a new Community Compliance Improvement measure. The reimagined CAC/CAV process is intended to provide greater transparency, consistency, and accountability for the audit and technical assistance functions of the CAC/CAV process. Further, the Community Compliance Improvement measure would allow FEMA to forecast the nation's state of compliance at any given time and better understand trends in local land use and development.   This session will provide state and local officials with the opportunity to learn about these latest enhancements to the NFIP Compliance Program. We encourage participants to lend their advice and feedback, leveraging their lessons learned and best practices helping promote higher floodplain management standards in their communities.

Biography: Ms. Owen has been a Regional Floodplain Management Liaison at FIMA Headquarters for the last two years. She is a National Flood Insurance Program (NFIP) compliance subject matter expert and liaison for FEMA Regions IV, VIII, and X. At Headquarters she is the Compliance Committee lead working with the committee on reimagining how the agency enforces compliance with the NFIP regulations so that we more efficiently and thoroughly increase disaster resilience throughout the nation. Ms. Owen is also the subject matter expert on FEMA's new Agricultural and Accessory Structures

Policy. Prior to this occupation, Ms. Owen was a Natural Hazards Program Specialist at FEMA Region IX for over 10 years where she regulated NFIP communities in Northern California, the State of Nevada and the State of Hawaii. She has experience interpreting and enforcing NFIP regulations in arid regions, coastal zones, riverine areas, highly urbanized and extremely rural areas, including conducting mapping outreach, providing technical assistance, working with communities to correct violations, and conducting various training courses on the NFIP.

Long Term Substantial Damage in South Carolina

Jessica Artz, CFM, SCDNR, artzj@dnr.sc.gov
Co-presenters: None

Abstract: FEMA began a pilot Long Term Substantial Damage (LTSD) Program in 2017. The goal of this program is to assist communities in bringing substantially damaged structures into compliance and ensure that the community remains in compliance with the NFIP. This pilot program continued in South Carolina following Hurricane Florence in 2018. The SC NFIP coordinating office, housed within the SC Department of Natural Resources (SCDNR), worked closely with FEMA to implement the LTSD Program within the affected communities throughout the state following Hurricane Florence. FEMA had approximately four staff in SC dedicated to LTSD and they worked with approximately 35 communities. SCDNR worked with the remaining 8 communities.   This presentation will describe the process that was implemented by FEMA and SCDNR to track substantially damaged properties. Additionally, this presentation will focus on the successes and challenges of the program including, communication with communities, tracking methods, when to reach "closure" status and the number of compliant versus non-compliant structures in the 4 years since the time of the event. This presentation will conclude with a number of recommendations for how to improve the efficiency of the Long-Term Substantial Damage program.

Biography: Jessica Artz is a Flood Mitigation Specialist with the SC Department of Natural Resources. She provides technical assistance to communities that participate in the National Flood Insurance Program in SC and she manages the Flood Mitigation Assistance Grant. Jessica has been with DNR since June of 2015. Before that, she worked in the Flood Mitigation Program for the State of Texas for 2 years. Jessica received her Master's of Earth and Environmental Resource Management from the University of South Carolina and her Bachelors in Geography from Texas State University.

FEMA's New Direction on NFIP ESA Compliance

Bret Gates, FEMA, bret.gates@fema.dhs.gov
Co-presenters: None

Abstract: FEMA plans to re-evaluate the implementation of the NFIP under the Endangered Species Act (ESA) at the national level. FEMA will develop a national programmatic framework to set forth its approach to nationwide compliance and complete a revised Biological Evaluation re-examining whether NFIP actions influence private land development decisions; the potential for such actions to have adverse effects on listed species and critical habitat; and to identify program changes to mitigate adverse effects to avoid jeopardy to listed species and/or critical habitat.   Consideration of program changes will center on the natural and beneficial functions of floodplains, as these activities have the best potential to mutually reduce flood losses and conserve endangered species and habitat.

Biography: Bret Gates is the NFIP ESA Coordinator in FEMA's Floodplain Management Division, Mitigation Directorate, Federal Insurance & Mitigation Administration. He is currently responsible for national NFIP ESA Coordination, Floodplain Management policy and special projects. He has previously served as Program Manager of the Community Assistance Program – State Support Services Element (CAP-SSSE); and National Coordinator of FEMA's Community Rating System (CRS) 1990-2006; Other responsibilities have included serving as Program Lead for the Pre-Disaster Mitigation (PDM), and the Flood Mitigation Assistance (FMA) programs.

B2: Mitigation and Resilience Planning

Mitigation Planning Program Essentials for Floodplain Managers
Shubha Shrivastava, AICP, CFM, FEMA, shubha.shrivastava@fema.dhs.gov
Co-presenters: Cathleen Carlisle, MPA, CFM

Abstract: Mitigation plans are a prerequisite for communities to receive certain kinds of non-emergency disaster funding, but the power of planning is about so much more than grants eligibility. Mitigation planning supports and amplifies other plans, processes, policies, and decisions that reduce risk. When the mitigation plan is used as a blueprint for resilience, it allows the community to organize its resources and set a strategy rooted in current capabilities and available resources. Planning and floodplain management are complementary techniques that can amplify each other for helping a community invest in resilience.   In this session, FEMA's National Mitigation Planning Program will discuss the connection between planning requirements, effective mitigation plans and comprehensive floodplain management. Program leaders will explain how state floodplain managers can support building hazard mitigation program capabilities by participating in annual state consultations. The planners will also explain how local floodplain managers can help build more effective mitigation plans that lead to actions implemented through a variety of public and private funding sources, e.g. by bringing in infrastructure owners early into the planning process.   State and local governments are more resource-strapped now, especially because of the pandemic, and a carefully-scoped plan update process, integrated with other community processes, and focused on the real reasons and purpose of the update, will help make the most effective use of the time and energy spent on planning for mitigation. The Program will discuss this initiative around early and often engagement, besides other recent news on policy updates, training courses, tools, resources and success stories.

Biography: Shubha Shrivastava, CFM works at FEMA Headquarters in the National Mitigation Planning Program, currently leading training and technical assistance initiatives. Before joining FEMA, Shubha worked in the private sector conducting mitigation, recovery and resilience planning efforts for state and local governments, and supporting FEMA's guidance development, plan reviews, training, grants and floodplain management work under various contracts since 2002. Shubha holds a Master of Urban Planning from the University of Illinois at Urbana-Champaign and a Bachelor of Physical Planning from the School of Planning and Architecture, New Delhi.

Cathleen Carlisle, MPA, CFM is a hazard mitigation planner with the Federal Insurance and Mitigation Administration at FEMA Headquarters where she leads project teams to produce policy guidance, training and other tools to support FEMA's National Mitigation Planning Program in FEMA's ten regional

offices. Cathleen has also served as Lead Mitigation Planner for FEMA Region 2 in New York City leading a team of planners providing technical assistance, and plan review for the States of New York and New Jersey. Prior to joining FEMA, Cathleen planned and coordinated mitigation programs for the City of Portland, Oregon Office of Planning and Development Review where she worked to develop and implement policies with City Planning and Building Officials to mitigate flood and earthquake risk to the city.

Resilience is More than a Word: A New Bern, NC Case Study

Mike Robinson, CFM, Moffatt & Nichol, mrobinson@moffattnichol.com
Co-presenters: Amanda Ohlensehlen, Community & Economic Development Manager for the City of New Bern

Abstract: The City of New Bern, North Carolina is a beautiful coastal community with a long history and a wide range of local assets and historic properties. It is also vulnerable to a combination of riverine, coastal, stormwater, high tide, and sea level rise flooding threats. To address these threats, the City is completing a process to develop a citywide Resiliency and Hazard Mitigation Plan to increase community resilience to flood hazards, including the effects of climate change.   The process utilizes the frameworks provided in the Regional Resilience Tool Kit, the 12 North Carolina State Disaster Recovery Framework Recovery Support Functions, and the 6 FEMA Recovery Support Functions, and incorporates enhanced public participation and stakeholder engagement. The plan will determine the best ways to reshape existing social, economic, and municipal systems so that New Bern is less vulnerable and more resilient to natural disasters and reduce the City's cost and reliance on federal funding following future disasters.   The project focuses on avoiding hazards where possible, better withstanding future shocks and stressors, engaging better short and long-term recovery principles, and establishing the ability to "build back better" at the citizen, business, and municipal levels. Identified solutions will range from routine and highly feasible alternatives to more aggressive and ambitious alternatives.   The final plan will pay specific attention to reaching underserved populations; innovative and implementable solutions for historic preservation; use of green and hybrid infrastructure solutions; innovative and implementable solutions that increase structural and economic resilience in historic main street and commercial areas; land-use regulatory changes; and coordination within and beyond the corporate limits of New Bern.   This presentation will provide participants with a comprehensive overview of the City's goals, approach, planning process, and project outcomes, and will provide real examples of how this process has been successfully implemented at the local level.

Biography: Mike has a strong, 20-year background in hazard mitigation planning, floodplain management, emergency management and resiliency, along with practical experience in risk assessment, risk analysis and risk communication. He has worked closely with local, state, and Federal government agencies throughout the United States in the development and implementation of risk reduction programs aimed at minimizing the impacts of future disasters.

State Resilience Planning: Learnings from Emerging Practices Across the Country

Sarah Edwards, The Pew Charitable Trusts, sedwards2@pewtrusts.org
Co-presenters: None

Abstract: The Pew Charitable Trusts' flood-prepared communities team is proposing a presentation on research that will identify leading practices for state resilience planning focused on reducing flood risks.

Across the country, a small but increasing number of states are launching efforts to address the growing costs and impacts of natural disasters. Governors and legislatures are creating new offices and appointing resilience officials to lead statewide plans to better prepare communities for the risks of future flooding and other climate hazards. These states are initiating comprehensive assessments to evaluate flood vulnerabilities, identify affected activities, and outline regional priorities to inform smarter decisions about where and how to build. Despite these recent initiatives, no consistent practices or protocols currently exist. State leaders are seeking examples of effective strategies to systematically incorporate resilience. To help address this need The Pew Charitable Trusts is supporting research that analyzes existing and emerging state-level flood resilience plans to identify leading practices. Policymakers and advocates will be able to use these transferable learnings to incorporate in new or updated resilience plans. This proposed presentation will preview a range of strategies and early findings from the ongoing research.

Biography: Sarah Edwards is a senior associate with The Pew Charitable Trusts' flood-prepared communities team. Her work includes researching state and local policy to reduce flood risks and assessing trends of flood resilience strategies across the country. She uses this research to facilitate a network of state resilience planners through webinars and roundtable discussions. Previously, Edwards worked at the Virginia Coastal Policy Center (VCPC) while attending William & Mary Law School. Her work at VCPC focused on implementing regulations under the National Flood Insurance Program for Virginia localities, as well as socio-economic implications of recurrent flooding in Hampton Roads. She wrote a model ordinance on this subject that was published in the William & Mary Environmental Law & Policy Review. Edwards received a bachelor's degree in English literature from the University of South Carolina and a Juris Doctor from William & Mary Law School.

B3: Modeling Coastal Hazards

Extreme Storm Event Preparedness – GIS Mapping of NCDOT's Vulnerable Bridges
Matthew Lauffer, PE, CPM, NCDOT, mslauffer@ncdot.gov
Co-presenters: Brian M. Radakovic, PE, NC Dept. of Transporation, bmradakovic@ncdot.gov

Abstract: A report was prepared in 2013 which summarizes the work performed by Ocean Engineering International, PLLC (now Intera, Inc.) for North Carolina Department of Transportation (NCDOT) on the vulnerability of selected NCDOT coastal bridges to storm surge and wave loads. From the report's abstract: "In this study, the bridge is considered to be vulnerable if the surge/wave forces and moments (with the appropriate load factors) exceed the resistive forces and moments created by the dead weight of the superstructure for any of the spans. A Level III storm surge/wave analysis was performed to provide the design water level and wave parameters needed to compute the loads. This analysis entailed 1) the hindcasting of 62 of the most severe tropical storms and hurricanes that have impacted North Carolina coastal waters over the past 160 years, and 2) performing extreme value analyses on water elevation, wave heights, and depth averaged current velocities throughout the area covered by the model to obtain 100-year design conditions." The study results were presented in tables in the report and in a GIS database, from which a more convenient web-based GIS map application was developed. This presentation will discuss how NCDOT has used this application in conjunction with

tropical storm surge data provided by the Coastal Emergency Risk Assessment website to determine where vulnerable coastal bridges were in the path of a predicted storm track in order to quickly assess whether any of them could potentially be vulnerable to damage from the approaching storm.

Biography: Matt Lauffer is Assistant State Hydraulics Engineer for the NC Department of Transportation. He has nearly 30 years' experience serving including roles public and private practice serving previously with the USGS, Tetra Tech, and the NC Division of Water Quality. For the NCDOT, Matt has served several roles, namely Project Engineer for the Highway Stormwater Program, Project Manager for the Central Region, managing the Highway Stormwater Program, and now as Assistant State Hydraulics Engineer. He has a BS in Civil Engineering from The Ohio State University. Matt is a Professional Engineer and a Certified Public Manager.

Brian has over twelve years' work experience in the NCDOT Hydraulics Unit and currently is an advanced engineer in the Highway Floodplain Program involved in coordinating FEMA NFIP compliance for NCDOT projects. He holds a master's degree from University of Florida. He works with a multidisciplinary team including geotechnical and structural engineers to maintain FHWA Bridge Scour Program compliance statewide for all NCDOT bridges over streams. He also coordinates development and maintenance of the Hydraulics Unit's website, project tracking databases, and GIS data resources.

Leveraging 2D Storm Surge Modeling Results to Support Coastal Graduate Risk Analyses

Ashley Kauppila, , Taylor Engineering, AKauppila@taylorengineering.com
Co-presenters: None

Abstract: FEMA has initiated the investigation of flood risk assessment transitioning from a binary approach (in or out of the floodplain) to a probabilistic approach with the intent to examine graduated risk at a structure level. Building on methodologies developed for riverine probabilistic flood risk assessment (PFRA), the framework of the coastal PFRA (CPFRA) aims at leveraging data available from FEMA FISs to develop a modular system where input data can be swapped and/or augmented, based on data availability within that specific US coastal location, with the ultimate goal to quantify the flooding risk through the computation of estimated damages and average annualized loss (AAL) at the structure level.   Moving from a binary determination of flooding risks to a graduated approach requires investigation of flooding and associated wave heights that move toward considering the entire range of frequencies from high-frequency levels (~50% to ~10% annual chance event) to low-frequency levels (~1% to ~0.1% annual chance event) and away from the determining only the 1% and 0.2% events. The requirement to have TWLs, inclusive of the wave component, across a wider range of frequencies for AAL calculations creates the need for data not typically produced by the standard FIS approach. This is because TWL values are normally only produced for the 1% annual chance event, and only sometimes for the 0.2% annual chance event.   This presentation will provide an overview of the CPFRA methodology and explore the development of TWL estimates, and associated water level frequency curves, leveraging the existing 2D wave and comparing results with the 1D FIS analysis. Influence of methodologies on AALs will be shown for areas along the Mid- and South Atlantic together with discussion on how improved methods lead to more enhanced and streamlined stakeholder capacity in a time of reduced financial resources and increased need.

Biography: Ashley has been a coastal engineer with Taylor Engineering, Inc. since 2007. She focuses on 2D hydrodynamic and wave modeling with SWAN+ADCIRC.

Conveying the Various Messages around Coastal Erosion
Brian Caufield, CDM Smith, caufieldba@cdmsmith.com
Co-presenters: Tim Adams, CDM Smith and Carson Hauck, CDM Smith

Abstract: Coastal erosion is a component included when evaluating coastal flood hazards. But many communities are concerned about the future state of their shorelines with climate change and sea level rise. FEMA Region I has developed a method to project coastal erosion hazards as a result of sea level change, but there are other data sources out there. USGS has a Shoreline Vulnerability Index that looks at the potential of change at transects. USGS has also implemented forecast modeling of shoreline change as a result of storms. And States and Local Governments are also looking at coastal erosion risk and vulnerability. This presentation will compare and contrast the various tools and show how we can better understand the risk of our shores.

Biography: Mr. Caufield is CDM Smith's Coastal Systems Resilience Discipline Lead. He has over 20 years if experience evaluating coastal flood hazards.

B4: Mapping Communication and Outreach Adaptation to the Virtual World

Innovative Community Outreach Solutions: How the GA CTP Program Has Overcome Community Engagement Obstacles Through Customized Approaches and Technological Innovations
Shannon Brewer, PMP, CFM, Dewberry, sbrewer@dewberry.com
Co-presenters: Joe Martinenza, Georgia Department of Natural Resources, joseph.martinenza@dnr.ga.gov and Jeff Butler, Atkins, jeffrey.butler@atkinsglobal.com

Abstract: Advances in technology keep pushing forward how CTP's and communities conduct flood studies in today's ever-changing world. each day brings new challenges, some of which impact our lives and businesses in ways we never could imagine. The Georgia DNR CTP Program is working to embrace change and use technology as a bridge to meet and surpass obstacles. Emerging trends in virtual communication, large scale modeling and structure-based risk analysis have been valuable tools to create innovative solutions that meet the needs of Georgia's mapping program, such as keeping mapping projects moving forward, communicating personalized risk information to individuals remotely, and producing and disseminating vast amounts of flood risk information for hundreds of communities in a short period of time. This presentation will feature the following solutions GA CTP Program has created to address those pressing program needs: - The Pandemic and resulting social distancing requirements have impacted how flood study outreach is conducted. The Flood Risk Open House has been a vital step towards community understanding and acceptance of Risk MAP Projects. To continue to provide this opportunity to communities in light of the circumstances was critical and called for an approach where the same level of engagement could exist while adhering to the appropriate safety measures. Through GA DNR's Virtual Open House website, the in-person Open House experience has been recreated in an online platform using ESRI's ArcGIS Experience. Visitors can look up their individualized flood risk, easily determine if there will be flood insurance requirements, learn more about the mapping project and the map change process, and also meet one-on-one with program experts through use of an online booking application that has been integrated into the website. - GA's CTP Program produces large quantities of new modeling each year, over 6,000 miles across 11

watersheds this past year alone. Traditionally it has been cumbersome to retrieve this data, limiting the potential uses and value of the information. The GA CTP Program is providing on-line access to these models through a stream-by-stream, map-based Flood Model Search portal and access to resulting mapping information, such as floodplains, Base Flood Elevations/Water Surface Elevations, flood depths, Finished First Floor elevations and other risk information through a variety of ESRI ArcGIS Online Applications and customized map viewers. The return on investment and potential value of the flood risk information is substantially increased when made available to floodplain managers, local engineers, developers and others state departments like GEMA, GDOT, and GA Regional Planning Commissions. GA CTP Program is also rolling out their first Base Level Engineering (BLE) project to local communities. To provide additional support to these communities, the GA CTP Program developed a quick reference tool, called the GA Community BLE Playbook, that clearly guides Floodplain Managers, Surveyors, Engineers, Land Developers, Emergency Managers, and others on the variety of BLE applications.

Biography: Ms. Brewer has 23 years of experience serving state and local government agencies with water resources and floodplain management projects; primarily focusing on FEMA NFIP state and regional flood study projects. She is an Associate Vice President in Dewberry's Atlanta Office and manages a team of GIS Professionals producing mapping products and analytical services for a variety of flood study projects across the country. Most notably, Ms. Brewer has been providing technical and project management support to GA DNR's State Flood MAP Program for the past 14 years. Prior to starting her career, she earned a bachelor's degree in Geography with a double concentration in Environmental Science and Urban Planning from the University of North Carolina at Greensboro. She also joined the GAFM Executive Board 5 years ago and currently serves as Chair. In her spare time, she enjoys spending time with her family and attempting to keep up with her amazing and energetic 6- and 3-year old daughters.

Outreach During the Pandemic: Making Virtual Risk MAP Connections
Carey Johnson, Kentucky Division of Water, carey.johnson@ky.gov
Co-presenters: Katherine Osborne

Abstract: During the COVID-19 pandemic, digital solutions have become increasingly important as we sustain and further our relationships with communities. The Kentucky Division of Water (DOW) developed a story map for use during the first Discovery Meeting to be hosted virtually. The story map for the Lower Ohio-Little Pigeon Watershed was provided to community officials prior to the meeting and served as the exclusive visual aid during the webinar, replacing maps, handouts, and PowerPoint presentations. This story map outlined the flood risk project lifecycle conveniently on each tab starting with watershed information, community statistics, Base Level Engineering (BLE) results, meeting milestones, and Frequently Asked Questions (FAQs). As the project progresses it will be the repository for each phase and allow access to deliverables including structure-based risk assessments. This presentation will detail the information included in the story map and how it will guide engagement throughout the project, improving virtual collaboration in a time when in-person interaction is limited.

Biography: Carey Johnson is the Assistant Director of the Kentucky Division of Water. He assumed the Assistant Director role in November 2018 and has since been instrumental in the Division accomplishing goals in floodplain management, dam safety, Clean Water Act, and Safe Drinking Water Act activities. Additionally, Carey manages the Cooperating Technical Partnership (CTP) activities between the Division and FEMA. Carey has played a leading role in statewide efforts to collect LiDAR terrain data and

currently serves on the KY statewide LIDAR/orthoimagery advisory committee with USGS, NRCS, the Kentucky Transportation Cabinet and several other stakeholders. Carey has served as a member of the Technical Mapping Advisory Council (TMAC) since 2018 and is the Division's proxy on the National Dam Safety Review Board (NDSRB). He is the current chair of the Association of State Floodplain Managers (ASFPM) Board of Directors. He also serves on the KY State Hazard Mitigation Council and is the state lead for Kentucky Silver Jackets. Carey is a founding member, past chair, and current board member of the Kentucky Association of Mitigation Managers (KAMM); Kentucky's ASFPM state chapter. In 2019, he was instrumental in KAMM receiving a grant from EPA to incorporate Green Infrastructure and Low Impact Development (GI/LID) concepts into the Commonwealth's Enhanced Hazard Mitigation Plan.

Flooding Information On The Cloud – Sharing Understanding Without Transferring Any Data
Cameron Druery, Worley, cameron.druery@worley.com
Co-presenters: None

Abstract: Flooding data is truly massive. A single county or municipality may have from hundreds of gigabytes to several terabytes of flooding data. Accessing and using this information presents a significant issue to data custodians given the considerable volume of data that must be transferred and managed. The technical nature of the datasets poses another issue in terms of its usability by a non-technical audience. The onset of COVID-19 presented a global problem to a distributed workforce attempting to access these large amounts of data from home. Using case studies from Australia, this presentation will explore how government authorities are using the cloud to provide rich access to flooding information, without the transfer of any data. Centralized cloud servers provide the means and framework for rapid data access and dissemination on a scale impossible just a few years ago. This provides scope for users of flooding data to fully interact, visualize and analyze their datasets without needing to copy nor understand how the information is actually stored. This presentation will explore, using case studies:

- Data management – single point of truth and data histories
- Data vs Information – how complex flooding data can be converted into usable flood information
- Data accessibility – accessing usable information in a format understandable by the end user
- Data interrogation – using the cloud for visualization and interrogation of flooding data
- Flood intelligence – integration of flooding data with community, infrastructure and facility data to create meaningful information on flood affectation
- Emergency response and flood forecasting – using flooding data for emergency planning and real-time response to floods
- Issues and problems – issues and concerns with hosting flooding information on the cloud

Biography: Cameron Druery is a Principal Engineer with Worley's Digital group. He has more than 20 years' experience in hydraulic modeling, floodplain and flood emergency management, flood forecasting, GIS and spatial analysis, and software development. His interests lie in the development of spatial software to assist in solving natural environment problems.

B5: Social Justice, Equity, and Flood Risk Management

Adapting Risk Communications to Create Equitable Mitigation Strategies
Alyx Colgan, MPH, Guidehouse, acolgan@guidehousefederal.com
Co-presenters: None

Abstract: Large-scale disasters have been increasing in frequency and strength over the last few decades. For many individuals living in low-income communities, their position within society puts them at a greater risk for disaster and creates longer lasting impacts when disaster strikes. Disasters compound existing inequality and scarcity within society, leaving low-income individuals and other historically underserved communities unable to recover from the impacts. Mitigation activities are the key to expanding Whole Community resiliency, and these activities must consider barriers to participation and expand access to all citizens.   Traditional mitigation strategies have overlooked equity as a lens through which policy, strategy, and action are understood and measured. Equity in community mitigation requires leaders to understand and invest in critical partnerships, community perspective, and resources that prioritize equitable access.   Guidehouse will provide a case study of four projects targeting mitigation in socially, politically, and economically under-resourced communities, identifying the communication strategies and resources with the greatest impact. Our team will highlight mitigation projects across the country, drawing on best practices backed by behavioral science principles to uncover key communication strategies that create equity.   Successful risk communication considers the relationship between vulnerable communities to each other and to the government, understanding that trust and agency are critical to message delivery. This presentation aims to examine the impact of and relationship between inequity and risk communication and highlight outreach strategies that create access to participation, ultimately increasing resilience for every member of our society.

Biography: Alyx Colgan, MPH, is a Senior Consultant at Guidehouse. Ms. Colgan has 8 years of experience in education and non-profit leadership and uses this experience to provide training, communications, and strategy solutions to federal clients. Ms. Colgan has supported directorates across the Federal Emergency Management Agency (FEMA) including the Office of the Chief Financial Officer (OCFO), Mission Support (MS), and the Federal Insurance and Mitigation Administration (FIMA), providing communications, training and development, strategy and project management, and facilitation support. Ms. Colgan has a master's degree in public health and a culminating thesis on community-driven disaster risk reduction. Her passion for equity shapes her approach to work.

Housing Security and Flood-Risk Mitigation Activities
Terence Milstead, PhD, Ogilvy, terence.milstead@ogilvy.com
Co-presenters: None

Abstract: This presentation will provide a discussion of factors known to influence how residents prioritize home-related improvements, and the role that housing tenure security in particular plays in those decisions. This discussion will then be extended to consider the possible impact of these factors, and of housing tenure security specifically, on flood-risk mitigation activities. The hope is that this line of inquiry might inform more targeted flood risk mitigation outreach efforts by increasing awareness of the broader socio-economic and cultural context within which those efforts must occur, and that it will

facilitate collaboration and cross-sector dialogue between floodplain managers and housing policy experts.

An extensive literature already exists examining the influence of home-ownership on residents' willingness to invest time, effort and/or money into upgrading their dwellings (Milstead & Miles, 2011; Davidson & Leather, 2000; Galster, 1987; Hill & Worthing, 2005; Littlewood & Munro, 1996; Munro & Leather, 2000; Ozanne & Struyk, 1976). Moreover, it has been suggested that residents across socio-economic groups, and even geo-cultural contexts, are similarly inclined to maintain/improve their homes over time as finances allow if institutional conditions permit them the freedom to do so (Burns, 1983; Habraken, 1985; Pugh, 2000; Turner, 1965, 1972, 1976), with one of those conditions being security of tenure.

A more focused question, then, is to what extent housing-tenure security influences people's flood risk mitigationactivities. One might expect that even when someone feels secure in their tenure flood risk could be under-estimated and flood risk-mitigation activities less likely than other types of activities due to cognitive biases. Two such biases are the availability or confirmability heuristics which suggest, respectively, that the ease with which a similar event can be recalled, or one's personal experience with such an event, influence their behaviors (Hennighausen & Suter, 2020; Tagat & Kapoor, 2020). Alternately, it could be that when someone feels secure in their tenure they are more attuned to potential threats to their dwelling, especially if they have already invested "sweat equity" into that home, and are therefore more likely to mitigate against flooding. Ogilvy will explore:

- What does the existing literature suggest about the effects of housing tenure security on flood-risk mitigation activities?
- How have floodplain managers and housing experts aligned their efforts in various geographic contexts to achieve their respective or mutual policy goals, especially with regard to housing security?
- What have the obstacles or challenges been?
- What can floodplain managers do to align their conversations/goals with those of housing policy planners?
- What are the immediate next steps that floodplain managers should take to strengthen relationships with housing policy counterparts?

Biography: Terence Milstead, PhD has over two decades of domestic and international public affairs experience in issues management, strategic partnership development and communications/community outreach. He currently works for Resilience Action Partners (RAP) under the FEMA Community Engagement and Risk Communication (CERC) contract and is the Community Engagement Risk Communication Liaison (CERC-L) for FEMA R3.   Terence holds a Masters and doctorate in Urban and Regional Planning, spent several years as a university instructor and researcher, several years as government-sector urban planner, and for the last several years has worked in private sector governmental consulting

Get Hurricane Smart! Taking on the Problem of Educational Vulnerability
Merrie Koester, USC Center for Science Education, merriekoester@comcast.net
Co-presenters: None

Abstract: In this session, Dr. Merrie Koester, director of the Kids Teaching Flood Resilience (KTFR), of the University of SC Center for Science Education, will share the results of five years of case studies aimed at pre-disaster mitigation through youth and family-based flood and hurricane resilience education. Centering a community empowerment strategy that aligns with the needs, systems, and values of a community, (beginning with its youth) the model seeks to tap into the inherent resilience and build the collective efficacy of low income, flood prone communities, so often deemed "vulnerable" or "powerless" in traditional, deficit-based models of social vulnerability. Poor, ethnic minority communities are those most adversely affected by environmental issues like sea level rise and climate change. They are also the most likely populations to lack access to traditional means of information disbursement. EDUCATIONAL VULNERABILITY – the lack of access to or awareness of knowledge and resources that might reduce one's risk of harm from a hazard—can be directly mitigated through the design, development, and implementation of culturally responsive, socially empowering, community-specific hazard risk literacy and messaging programs. The Charleston Regional Hazard Mitigation Plan specifically includes Educational Vulnerability as an area of concern. KTFR is a nationally recognized NOAA Weather Ready Nation Ambassador program, co-created in community with the Charleston, SC, City and County emergency management directors, Charleston County Project Impact, the SC Association of Hazard Mitigation, professional storm water engineers and flood plain managers, multiple cultural leaders, school officials, community STEM experts, and higher education researchers.

Biography: Dr. Merrie Koester is a veteran science teacher and educational researcher, specializing in youth based participatory action research. Her work is focused on building research practice partnerships between higher education, schools, community programs, and civic leaders to effect positive change in historically underserved schools and communities.   In 2016, Merrie initiated an action research study called Kids Teaching Flood Resilience, which positions youth in low-income flooding schools as resources of knowledge and flood resilience. Each new KTFR case study features input from local emergency management experts, government officials, NWS meteorologists, cultural leaders, school officials, professional artists, volunteer STEM experts, and higher education researchers. Students learn what to Notice, Know, and Do to mitigate harm from extreme weather-related hazards. They then create hazard-risk communication media, whose goal is to help their families/community become more hurricane resilient. The KTFR program, which has been supported by the USC Center for Science Education, Charleston County Project Impact, the SC Association of Hazard Mitigation, and Davis and Floyd Engineers, has now been endorsed by the National Weather Service Weather Ready Nation Ambassador program, the Cities of Charleston and North Charleston Emergency Management Offices, the Charleston Resilience Network, the National Disaster Preparedness Training Center, and the Charleston County HMP program.

B6: Student Paper Competition

Seasonal Forecasting of Coherent Floods in the United States using Climate Information for Flood Risk Management
Equisha Glenn, The City College of New York

Building Social Equity into Floodplain Buyouts
Sarah Lipuma, Duke University

Planning for floods after fires: Lessons from the 2018 Montecito Debris Flows"
Ying Chik (Vanessa) Lee, University of California at Berkeley
Co-authors: Alev Bilginsoy, Yiwen Chen, Dana Clark, Adam Dickenson, Kendal Harris, Xiaoyue Wang, and Shauna Wright

B7: Local Urban Flooding Initiatives

Going digital with open channel storm water asset management for a high elevation municipality
Edward Schenk, CFM, Flagstaff Water Services, edward.schenk@flagstaffaz.gov
Co-presenters: Corryn Smith, City of Flagstaff, clsmith@flagstaffaz.gov

Abstract: Maintaining stream channels and drainage conveyances is a large task for any municipality, but especially for cities that regularly experience extreme weather events. Flagstaff Arizona is situated at 7000 feet above sea level and includes large snow events, monsoonal strong, but short, summer storms, and post-wildfire flash floods from the nearby San Francisco Mountains. The City of Flagstaff Water Services Division has implemented a Computerized Maintenance Management System (CMMS) and a GIS database to maintain, restore, and improve their open channels. By going digital, staff are now able to quickly retrieve information regarding the open channels and the maintenance status by using Inspection and Work Order forms in the field. Data collected by the field crews are stored in the database and displayed on interactive web maps and dashboards for managers and policy makers. The CMMS has allowed for prioritization of channel maintenance as well as a spatial understanding of poorly designed drainage conveyances or invasive weed infestations.

Biography: Ed Schenk serves as a stormwater project manager with the City of Flagstaff. He holds a CFM and a Masters in Water Resources. Past experience includes research hydrology with the USGS and NPS as well as non-profit and consulting experience in aridland hydrology and water management.

Corryn Smith is the Information Systems Administrator for City of Flagstaff Water Services. She manages the CMMS and GIS for all things water, wastewater, stormwater, and reclaimed water in the City of Flagstaff. She has a Masters of Science in GIS from Northern Arizona University and a Bachelors in Environmental Spatial Analysis from the University of North Georgia. Previous experience includes work at the USGS, NAU, and Flagstaff Open Space.

A Decision Modeling Approach to Project Selection
Eddie Paulino, PE, CFM, MWRDGC, paulinoe@mwrd.org
Co-presenters: Josepth (Joe) Kratzer, MWRDGC, kratzerj@mwrd.org

Abstract: The MWRDGC faces various challenges in ensuring the optimal and equitable use of the tax dollars appropriated to its Stormwater Management and Green Infrastructure programs. These challenges include the impact of separate project selection and cost sharing processes, the consideration of project schedules while planning for multiple years, the impact of changing budgetary limits, and the selection of objective and equitable project evaluation criteria, among others. Attendees will be able to take some of the lessons learned from the challenges the MWRDGC has faced to think about how they could build their own watershed, regional, and/or municipal project selection model that meets their objectives and constraints. A template project selection model will be described to illustrate the use of the Excel Solver optimization add-in and to simulate the outcomes when including uncertainty in the selection criteria. The template model will consider economic data like project benefits and costs, household income data, budgets, historical flooding damages, and historical spending habits. The template model will also demonstrate how non-economic or other data that is difficult to economically quantify like the number of structures impacted, natural habitat enhancement, and public health benefits, can be carefully considered in the model.   As an introduction to some of the data analytics tools available in Microsoft Excel, the presentation will discuss how public agencies can use these tools in the evaluation of project selection data to optimize public resources and to manage uncertainty. Attendees will also be exposed to economic terms like discount rate and internal rate of return to learn about the cost of investments and to learn about a quantitative way to look at the value their organization is creating for their communities.

Biography: Eddie received BS degrees in Civil and Architectural Engineering from the Illinois Institute of Technology and his MBA from the University of Chicago's Booth School of Business. He has worked in the MWRDGC's Engineering Department within the Program Management group, the Stormwater Management group, and now serves as Resident Engineer for Construction Field Services overseeing the execution of various construction projects from sewer lining, flood control, streambank stabilization, to force main installation work across Cook County IL. Eddie has helped create decision models to analyze the MWRDGC's call for project data submissions for its green infrastructure and stormwater phase II MWRDGC programs.

Joe Kratzer has been with the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) for 17 years and is the Managing Civil Engineer in its Stormwater Management section. Through a variety of green and grey solutions, and strategic partnerships with local, state, and federal agencies, the MWRDGC's stormwater programs address both regional and local flooding problems throughout the Chicagoland area. Joe has a B.S. in Civil Engineering from Purdue University, and is a licensed Professional Engineer in Illinois, as well as a Certified Floodplain Manager. Prior to joining the MWRD in 2003, Joe worked as an environmental consulting engineer for seven years.

Flood Mitigation in an Urban Environment: Cypress Street Outfall Regional Stormwater Improvements, City of Tampa, FL
Michael Thatcher, PE, CDT, ENV SP, Tetra Tech, michael.thatcher@tetratech.com
Co-presenters: None

Abstract: This presentation will summarize the findings of a large-scale flooding retrofit project in a highly-urbanized environment. Intense rainfall in a highly-developed urban environment can be a predominant cause of major roadway and property flooding. A lack of adequate stormwater infrastructure can exacerbate this issue. Heavy rainfall causes high-velocity overland flow which can

result in stormwater facilities exceeding their capacity. Increasing the size and capacity of stormwater facilities in this highly-developed urban environment can be demanding, due to the large number of existing utilities, and in the instances of this project, narrow right-of-ways. The City of Tampa is implementing these major stormwater improvements to reduce flooding at both a regional and local level. These improvements include approximately 7,500-ft of box culvert, varying in size from 5'x6' to twin-8'x8' boxes, to reduce regional flooding within a 220-acre basin. This project also includes roadway regrading to improve drainage patterns, the design of secondary stormwater collection to capture local roadway flooding before connecting to the regional box culverts, as well as the relocation of multiple major utilities to facilitate these improvements. The proposed drainage improvements are designed to capture and convey stormwater runoff for the 25-year/24-hour storm, which has the potential to impound approximately 450 cfs to its outfall at the Hillsborough River and Tampa Bay, an impaired waterbody. The proposed improvements were modeled in the XP-SWMM two-dimensional platform. Model results indicate that the roadway and property flooding is significantly reduced by the proposed improvements. A detailed analysis was performed to enhance this projects water quality benefit within the confined right-of-way, to limit impacts to the downstream waterbodies. Included are BMPs to aid in increasing water quality; consisting of pervious pavement, second-generation nutrient separating baffle boxes, and grassed swales.

Biography: Mr. Thatcher serves as a Senior Project Engineer, Project Manager, and Technical Group Leader with Tetra Tech. His experience includes design, permitting, and construction phase services for stormwater and transportation projects for a host of federal, state, local, and private clients. Mr. Thatcher is a licensed Professional Engineer (P.E.) in the State of Florida, and is also a credentialed Envision Sustainability Professional (ENV SP), and an FDEP Qualified Stormwater Management Inspector. Mr. Thatcher is a professional member of the Association of State Floodplain Managers (ASFPM), Florida Engineering Society (FES), and American Society of Civil Engineers (ASCE). Since joining Tetra Tech in 2012, Mr. Thatcher has implemented over 100 major infrastructure improvement projects in multiples states including Florida, Texas, Tennessee, New York, Massachusetts, Connecticut, and Ohio, all in a variety of disciplines and capacities, and has been a Project Manager and Engineer of Record (EOR) on more than 15 projects, some with individual construction budgets that exceed $37 million. Mr. Thatcher has extensive experience in the design of stormwater infrastructure improvements; focusing on regional stormwater management, flood mitigation, stormwater retrofitting, Community Rating System (CRS) technical assistance, and stormwater master planning. Mr. Thatcher has implemented the vital design of systems in critical areas; including BMAP priority focus areas, wetlands, impaired waterbodies, and tidally influenced outfalls. Mr. Thatcher holds a bachelor's degree in Civil Engineering from the University of Hartford.

Session C
Tuesday, May 11 – 3:30-5:30 PM central

C1: Local Floodplain Management Initiatives

Reimagining the City of San Diego's Approach to Floodplain Management
Stefani Bell, PE, CFM, Michael Baker International, stefani.bell@mbakerintl.com

Co-presenters: Eric Mosolgo, PE, CFM, City of San Diego, emosolgo@sandiego.gov and Sumer Hasenin, City of San Diego Transportation & Stormwater, syhasenin@sandiego.gov

Abstract: The City of San Diego has made a conscientious effort to revamp their floodplain management program to align with the overall goals and mission of the National Flood Insurance Program (NFIP). The city recognizes that dollars spent mitigating flood risk benefit the community in multiple ways. Some examples include:

- Procuring funding for a dual-purpose flood control and water quality project in an economically challenged neighborhood through FEMA's new Building Resilient Infrastructure and Communities (BRIC) program.
- Becoming a Cooperating Technical Partner (CTP) to obtain funding for Floodplain Reviews (which the existing program currently performs).
- Successfully coordinating with FEMA to update the city's Ordinance for Special Flood Hazard Areas. The effort required cross-coordination with state agencies such as the California Coastal Commission.
- Obtaining additional credits to advance standing in the Community Rating System (CRS).

Biography: Ms. Bell is a project manager for Michael Baker International, specializing in floodplain management, stormwater management, surface water resources and water quality management. She has a B.S. in engineering from Virginia Tech and a M.S. in engineering from NCSU. Ms. Bell moved to San Diego in 2016 where she works closely with the City's floodplain management team.

How strong is your local floodplain ordinance? Findings and recommendations from the Red River Basin
Joe Waln, PE, CFM, Barr Engineering Co., JWACCOUNTS@GMAIL.COM
Co-presenters: April Walker, PE, CFM

Abstract: Local floodplain ordinances are critical for the effective mitigation of community flood risk. The Red River Basin Commission has a goal of promoting consistent and rigorous standards for floodplain management in communities in the Red River Valley (North Dakota, Minnesota, Manitoba). The Commission's Long-Term Flood Study defines strategies and objectives for reducing flood risk in the basin. The recent update to this study reviewed local floodplain ordinances within the basin to evaluate consistency, highlight best practices, and identify areas for improvement. The study update focuses on the current policy structure within a large watershed, but the value of the findings and recommendations are applicable to communities around the country. This presentation will provide a summary of the findings of the floodplain ordinance review and recommendations for improving local floodplain ordinances.

Biography: Joe Waln is a professional civil engineer and certified floodplain manager working at Barr Engineering Co. in Minneapolis, MN. Joe is an experienced project manager who has worked on civil engineering and water resources projects across the United States and in Canada. He specializes in working with communities to help them understand and mitigate their flood risk. Joe is the webmaster

and legislative committee chair for the Minnesota Association of Floodplain Managers. He has a Masters in Education from the University of Notre Dame and a B.S. in Civil Engineering from the University of Portland.

April Walker, PE, CFM is a graduate of North Dakota State University. She currently resides in West Fargo ND and is the owner of A. Walker Consulting. She began her career as a highway designer for the state of California but moved to Fargo in 2002 where she worked for the City of Fargo as a Traffic Engineer, the Storm Sewer Utility Engineer, and ultimately as the City Engineer. As a City employee, she gained experience dealing with floodplain management, emergency flood fighting, flood risk reduction, and mitigation issues. During her tenure, April helped to develop and began the implementation of a flood protection plan that has resulted in the construction of over 20 miles of permanent Levees and Floodwalls within the City.   In her new role as a consultant, April is seeking to bring the skills she has acquired to benefit a broader population. April also served as an Adjunct Professor for NDSU, she is a member of the City of West Fargo's Planning Commission and serves on the Board of Directors for the FM Area Foundation.

Structure Level Floodplain Analysis and Flood Elevation Points in Indiana
David Knipe, Indiana Dept. Natural Resources, dknipe@dnr.in.gov
Co-presenters: Marianne Cardwell

Abstract: This presentation will detail efforts in Indiana to perform Structure Level Floodplain Analysis (SLFA) statewide, and present results from a pilot project in Clark County, Indiana. Details about SLFA will include data sources, methodologies, and the incorporation of existing data sets. Additionally, this presentation will describe the details behind Flood Elevation Points (FEP's), which are Indiana's solution to present 'point and click" Base Flood Elevations without having to generate grids for legacy studies. Information that will be included will be the methodology for deriving FEP's, pros and cons for using FEP's versus grid solutions, and how FEP's are integrated into the Indiana Floodplain Information Portal (INFIP).

Biography: David is the Section Manager of the Central Basin Team in the Engineering Services Center of the Indiana Department of Natural Resources, Division of Water. As section manager, he is responsible for the development and review of hydrologic and hydraulic modeling for various floodplain management and dam safety applications, and also manages Indiana's floodplain mapping program and the Cooperating Technical Partner program though FEMA. David currently serves as co-chair of the Mapping and Engineering Standards Committee for the Association of State Flood Plain Managers. He has been with the Division of Water since 1992.

Marianne Cardwell is a GIS Project Coordinator at the Polis Center at IUPUI focusing on environmental and disaster geoinformatics. She has over 20 years of experience in the GIS field, having been an analyst, programmer, and manager. She worked as a consultant for 20 years, focusing on local and federal government projects as well as utilities and airports. She holds a B.S. in Geography from Michigan State University, a M.S. in Geographic & Cartographic Sciences from George Mason University, and a graduate certificate in Data Science from Indiana University. She is a certified Project Management Professional (PMP) and GIS Professional (GISP).

C2: Highlighting Local Mitigation Projects

Forensics of Flood Evaluation in Sauquoit Cree, NY and Innovative Flood Mitigations

Shaun Gannon, PE, D.WRE, CFM, P.H., Ramboll, shaun.gannon@ramboll.com
Co-presenters: Ahintha H. Kandamby Ph.D., P.E, CFM; Margaret H. Reilly P.E.; Ryan Hastings, EIT; David Glen – Chairperson Sauquoit Creek Basin Intermunicipal Commission and Supervisor; Shaun Kaleta – Town of Whitestown, NY.

Abstract: The Village of Whitesboro, NY has experienced historic repetitive flooding including three 2% Annual Chance events in the past five years, with the most recent storm event occurring on October 31, 2019. This event was particularly intense with rainfall total of 2.9 inches in 24 hours causing damage to multiple residential foundations resulting in orders of condemnation.   In response to the significant impacts of flooding the Town of Whitestown and Village of Whitesboro, NY, the "Sauquoit Creek Basin Intermunicipal Commission" (SCBIC), in partnership with Oneida County, the Town and Village, conducted an extensive study to mitigate the repetitive flooding and flood damage to the residential and commercial properties.   This program has generated three projects to date, in which the first is already constructed creating 6 acres of natural floodplain and proven the effectiveness of natural flood benches supplementing additional conveyance and temporary storage during a flood event. Project two is scheduled for construction in late 2020, which will restore 13 acres of natural floodplain.   These significant losses in the Village prompted the parties to commission an analysis of the event to better understand why this event resulted in significantly more damage than past events. The analysis consists of several unsteady state 2-D hydrodynamic modeling to visualize and understand, at a lot level, why certain structures experienced structural damage while the adjacent lot did not. Using 2-D and 3-D flood animation the reports detailed the reasons for damages and investigated the effectiveness of a variety of additional resiliency measures proposed by the stakeholders.   This presentation will detail the program progress to date, future program objectives and how the effort of the community leaders and the studies resulted in a $20M NRCS buyout program.

Biography: Shaun Gannon, P.E., D. WRE, P.H., CFM, PMP: Mr. Gannon is a hydraulic and hydrology engineer with over 22 years of experience in modeling related to Flood Insurance Studies (FIS), floodplain management and restoration, flood warning and operation systems, channel restoration, interior drainage / pump stations as well as dam safety hydraulic features, dam breach analysis, watershed management, and related hydraulic outlet works structures.   Mr. Gannon specializes in watershed and stream hydrology, fluvial river hydraulics, and geomorphology. He leads the watershed and riverine Practice Group at Ramboll Americas Engineering Solutions, Inc. this group is experienced with and focuses on one, two and three dimensional steady and unsteady modeling related to riverine flood response, flood resiliency, sediment and containment transport, dam safety, and ice freeze up and jamming.   He has an M.S. in Civil Engineering and is a registered Professional Engineer in the states of New York, Ohio and Pennsylvania. He is a member of the American Society of Civil Engineers (ASCE) and is a Diplomate of the American Academy of Water Resource Engineers (D.WRE), a certified Professional Hydrologist (PH), an Association of State Floodplain Managers Certified Floodplain Manager (CFM) and a certified Project Management Professional (PMP). Shaun is an Adjunct Professor in the Civil Engineering Department at the State University of New York Polytechnic Institute where he teaches a senior elective in Hydrology. He has given presentations to the Association of State Floodplain Managers, the

Association of Dam Safety Officials, NYS Office of General Services 2017 Design Conference, and the multiple New York State Floodplain and Stormwater Managers Association.

Development of a Joint Water Quality and Flood Mitigation Goal Driven Capital Improvement Program

David Kroening, PG, CFM, GC, Charlotte-Mecklenburg Storm Water Services, David.Kroening@MecklenburgCountyNC.gov
Co-presenters: Tim Trautman, PE, CFM, Program Manager, Charlotte Mecklenburg Storm Water Services

Abstract: Charlotte-Mecklenburg Storm Water Services (CMSWS) has been implementing water quality and flood mitigation projects as part of a Capital Improvement Program (CIP) for more than 20 years. Recently, CMSWS initiated an evaluation of past performance of the CIP program with a focus on defining the endpoints for the programs. For the Flood Mitigation CIP, the endpoint or goal was defined through development of the concept of 'Residual Flood Risk, which is defined as the level of flood risk that will remain in Charlotte-Mecklenburg after all flood mitigation projects have been implemented. CMSWS considered community values, limited funding, past performance, its Risk Assessment Risk Reduction Plan and the newly developed 'Viability Index' in development of the level of Residual Flood Risk appropriate for Charlotte-Mecklenburg. Identification of the level of Residual Flood Risk allowed for development of funding scenarios and associated implementation schedules to define a path to goal attainment. Definition of the goal allowed for clear identification of annual flood risk reduction goals along with built-in longer-term intermediate checkpoints for program level evaluation. Development of the goal allowed for accurate communication of program performance with elected officials and citizens. The Water Quality CIP has focused upon improvement of in-stream conditions through the application of restoration and enhancement techniques targeting geomorphic, biological and water chemistry indicators. The Stream Restoration Ranking System (SRRS) has allowed the development of a numeric score for each stream in Charlotte-Mecklenburg along with individual reach and system wide goals set to restore the designated uses of the surface water. CMSWS recognized the importance of financial, stream corridor constraints and community value constraints in the development of a residual SRRS goal. The Water Quality and Flood Mitigation goals are expected to be used in concert to identify multi-objective project areas that leverage limited funding for maximum benefit.

Biography: David Kroening is a Lead Project Manager for Charlotte-Mecklenburg Storm Water Services. David has approximately 30 years of experience working on both water quality and flood mitigation projects in North Carolina. He has been involved in TMDL development, CIP project development and flood mitigation planning and implementation. David is currently focused upon the integration of Low-Cost Flood Sensors with Flood Risk Tools to enable better flood response and post-flood recovery.

Implementing the Largest Flood Protection P3 Project in the World

Joel Paulsen, Metro Flood Diversion Authority, PaulsenJ@FMDiversion.gov
Co-presenters: None

Abstract: Federal and local public officials have worked for decades trying to solve flooding problems facing Fargo, ND and Moorhead, MN. The flat floodplain combined with a northerly-flowing Red River create a perfect storm of water facing the community almost every spring. The FM Area Diversion Project was created to address the flooding risk facing those communities, and is being built by a dynamic group of partners. The Project is estimated to cost $2.75 Billion and is the largest flood

protection effort being built in partnership with the U.S. Army Corps of Engineers and a Public-Private Partnership (P3) developer. The federal government has committed $750 Million toward the effort. The local sponsors of the Project include a 13-person board comprised of individuals appointed from seven local government entities.   The flood protection project diverts floodwaters around the metropolitan area. Given the area is at the bottom of an ancient glacial lakebed, the solution is complex. Protection will be provided by a 20-mile long embankment, a 30 mile diversion channel, river control structures, aqueducts, spillways, bridges, railroad crossings, ditches and more. Construction started on the project in 2017 and has been ongoing, but one of the most unique parts of the project is the incorporation of P3 to construct the Channel portion of the Project. A P3 developer is expected to be on board by spring 2021.   This Presentation will cover an overview of how the Project was developed, an in-depth look at how the P3 component was developed to shorten construction timelines and deliver the Project quickly, and a discussion about balancing financing options for large infrastructure projects.

Biography: Joel Paulsen was hired as the first Executive Director for the $2.75 Billion FM Area Diversion Project after a nation-wide search was conducted. Paulsen started on Sept. 3, 2019.   Prior to becoming the Executive Director, he had almost 15 years of engineer and civil works related experience. Previously, he was an engineer and Office Leader for Stantec Engineering. He has worked on projects from utility replacements, transportation improvements, levee systems, and community planning. Paulsen is a Certified Floodplain Manager, a University of Minnesota Certified Storm Water Pollution Prevention Plan Designer, and a member of the National Society of Professional Engineers in Minnesota. He was also the Vice President of the Red River Valley Professional chapter of Engineers without Borders.   Paulsen has also served in local government, most recently on the Moorhead City Council. While on the Council, Paulsen was appointed by Minnesota Gov. Mark Dayton to the Governors' Task Force in 2018. The Task Force was a group convened by the governors of Minnesota and North Dakota to find solutions to achieve permanent flood protection for Fargo, ND and Moorhead, MN. Paulsen was one of 16 individuals on the Task Force.   Paulsen grew up in Moorhead, MN and received a Civil Engineering degree from North Dakota State University. Joel and his wife have four children.

C3: Flood Risk Assessment in Complex Urban Environments

CHOOSING THE RIGHT MODEL TO ESTIMATE URBAN FLOOD RISK IN THE CONTINENTAL USA
Sivaramakrishnan Sangameswaran, PhD, PE, D.WRE, CFM, Dewberry,
ssangameswaran_ie@dewberry.com
Co-presenters: John Paine

Abstract: Hurricanes (eg: Michael, Laura) and flood events (eg: September, 2020 in DC, February, 2020 in Oregon) have demonstrated the devastating impacts of flooding in localized and widespread scales. Urban flooding is caused by independent or concurrent inundation from fluvial, coastal, groundwater, pluvial, and other sources. Multi-modal and multi-pathway based urban flooding poses a significant challenge to water resources practitioners starting from model selection to implementation to interpretation of flood risk. Watershed and urban stormwater models have evolved to improve the understanding of complexities in urban flow patterns and underlying processes. However, many modeling options do not offer a single, robust framework for modeling the integrated and cumulative

impacts of stormwater, combined drainage systems (water supply, wastewater), coastal storm surge, wind tide impacts, and all in a single framework. Many can be used as planning and design tools, and few have operational applications. Integrated 2D modeling frameworks and systems integration solutions (APIs) are critical to ensuring model accuracy, robust solution implementation and ultimately quantifying flood risk at a given point from all possible sources. The key first step is model selection – one which incorporates all contributing factors and can provide a realistic representation of the system. Statistical techniques should be part of event selection to represent duration and intensity and analysis of results. This presentation will overview a decision tree for model selection explaining above aspects using project examples by Dewberry and GKY. Key subjects discussed will be urban flood hazard modeling, flooding modes and pathways, and consideration to anticipated future climate stressors. Example case studies include City of Virginia Beach (DHI MIKE), Clover Hill Drainage Study (PCSWMM 2D), USNA flood risk mitigation (XPSWMM 2D), Stream restoration in Chesterfield, VA (SWMM), Rain-on-grid modeling for City of Houston (Hurricane Harvey), and Chesapeake, VA (HEC RAS2D), Currituck County Vulnerability Study (geospatial data analytics).

Biography: Siva Sangameswaran is a Project Manager, Technical Leader with the Resilience Solutions Group work. He has lead many pioneering efforts of Dewberry with FEMA, USACE and municipal clients like the City of Virginia Beach in the areas of climate vulnerability assessment, mitigation design and implementation. His passion lies in the development of current and future climate based community resilience solutions through a combination of water resources engineering and modeling, computational statistics, geospatial data analytics and research. He has been integral parts of design teams of post-Katrina Hurricane and Storm Damage Risk Reduction System in Greater New Orleans area. He has and continues to manage multiple projects for FEMA Region II and innovations efforts including the engineering side of Risk Rating 2.0 Today, he will be presenting, GKY's John Paine on case studies from across the nation summarizing experiences, decision points and lessons learnt on what is the right modeling approach to answer the multi-million $ question - urban flood risk determination.

Comparison of 2D HEC-RAS Models of Shallow Urban Floodplain, Without and Without Buildings

Karen Kabbes, PE, CFM, Kabbes Engineering, Inc, kckabbes@kabbesengineering.com
Co-presenters: John W Hood, PE, Kabbes Engineering, Inc. and Mickey Davis, CFM, Kabbes Engineering, Inc.

Abstract: This presentation will show the results of using HEC-RAS 2D to model flood elevations, with and without buildings, in a shallow urban floodplain, using a detailed LiDAR grid system. KEI was asked to model a flat, shallow, urban floodplain using HEC-RAS 2D. The floodplain serves as an overflow path during high flow events. Older topographic and floodplain data made the route of the overflow path unclear. The decision was made to use a detailed grid system to clearly define the extensive rectangular roadway network in this densely populated area of mostly single-family homes. As the houses are so close together, a question was raised as to what impact the homes may have on flood elevations? Instead of just using higher Manning "n" values to model the dense neighborhood, the 2D model offered an opportunity to look more precisely at the impact the homes have on flood flows. With readily available LiDAR data, KEI was able to filter the LiDAR data so as to clearly define the neighborhood streets and curbs and the buildings. The 2D model was run with the buildings in place. An additional run was made using the more typically filtered LiDAR data to remove the buildings. A

comparison was made of the two modeling approaches, including the impact on floodplain mapping. The model provided a way to more directly depict the impact of the dense neighborhood on the floodplain. The use of a detailed LiDAR grid provided a dynamic and graphical depiction, suitable for public viewing, as to how floodwaters overflow the stream and then flow through the neighborhood streets and homes.

Biography: Karen C. Kabbes is president of KEI, an award-winning water resources and environmental engineering firm with offices in Barrington, Illinois and Fayetteville, North Carolina.   A former State of IL floodplain manager, she was the lead author of the state's Chicago metropolitan area floodway rules and served as the state lead for FEMA's Community Assistance Program for the region, which included overseeing the training, development, and floodplain ordinance review of the approximately 300 communities in the region. Ms. Kabbes was Lake County, IL first Chief Stormwater Engineer and responsible for development of the first county-wide floodplain and stormwater ordinance and technical reference manual.   A member of both the Illinois and North Carolina state associations, she served as a Chapter Representative on the ASFPM Board, in addition to being a past co-chair of ASFPM's Mapping and Engineering Committee and the former Multiple-Objective Management Committee and ASFPM Technical Conference Chair. She is a founding member and past chair of the IL association. A civil engineer, she was also the 2014 President of ASCE's 23,000 member international Environmental and Water Resources Institute.   A registered professional engineer in Illinois and North Carolina, Ms. Kabbes, is a Certified Floodplain Manager and a Board Certified Water Resources Engineer. Ms. Kabbes has a B.S. in Civil Engineering from University of Illinois in Champaign-Urbana and a M.A.S. in Public Policy Analysis from the University of Illinois in Chicago.

Lessons Learned from Integrating 1D and 2D Riverine and Collection System Models
Jeremy McCall, Arcadis, jeremylmccallpe@gmail.com
Co-presenters: Alicia Lanier, City of Fayetteville, Alanier@ci.fay.nc.us

Abstract: Many communities in North Carolina and across the country suffer from routine and often severe flooding due to a combination of riverine impacts and old, undersized stormwater collection systems. But how many communities have the opportunity to developed detailed hydrologic and hydraulic models of both systems on a watershed scale? The City of Fayetteville NC had the vision and financial commitment to analyze drainage issues across all 12 of its watersheds located within the City. Arcadis was tasked with supporting the City and its program manager Freese and Nichols with performing detailed modeling of the Blounts Creek Watershed. With its 7.0 square mile area and a stream length of 9.0 river miles, it is the largest and most developed of the City's watersheds. Work included developing detailed 1D (all areas) and 2D (high priority areas) hydrologic and hydraulic models using HEC-HMS/HEC-RAS for the primary (riverine) system and ICM for the secondary (collection) system; performing a field assessment of high priority stream reaches, and identifying issues and problem areas that require mitigation with new drainage solutions. The catch was the modeling work needed to be completed within 6 months. This presentation will step through the process of developing, validating, and integrating the 1D and 2D riverine and collection system models within such a short timeframe, the manpower and coordination required to complete the work, and the lessons learned for how to prepare, manage and successfully meet project goals.

Biography: Jeremy has a B.S. in Civil Engineering from NC State University. He is a Senior Water Engineer with Arcadis with a focus on providing clients with stormwater solutions in the NC and VA area. Jeremy

has 15 years' experience in the design and implementation of stormwater projects and previously spent four years as the City of Greensboro's Stormwater Engineer and Floodplain Administrator.

C4: Understanding and Mitigating Coastal Flooding

Sea-Level Rise: Turning uncertainty into action
Renee Collini, MS-AL Sea Grant/Mississippi State University, r.collini@msstate.edu
Co-presenters: None

Abstract: Sea-level rise is already exacerbating hazards in coastal areas, such as stormwater, high-tide, and tropical storm flooding making it important to consider in floodplain management; however, knowing where to start can be challenging. Information around sea-level rise and its impacts are being made available at an unprecedented rate. These data are instrumental to making informed decisions, but with the data being released at such a rapid pace, it can be difficult to keep up. In this presentation, key resources for considering sea-level rise will be reviewed. A suite of resources will be used to demonstrate how to find local projections of sea-level rise and how to narrow the range of available scenarios to a specific planning range to meet individual project and planning needs. The presentation will also include how to take the next step by translating sea-level rise scenarios into actionable information. This presentation will provide individuals with practical skills and steps for easily integrating information about future conditions during project planning and design, enhancing their community's resilience to current and future flooding.

Biography: Collini has a dual appointment as a Coastal Climate Resilience Specialist with Mississippi State University and Mississippi-Alabama Sea Grant Consortium. Focused on sea-level rise, Collini facilitates the flow of information between researchers and decision-makers to improve science application. The Program Coordinator of the Northern Gulf of Mexico Sentinel Site Cooperative, she integrates a multi-state network of stakeholders, researchers, NGOs, and state and federal agencies to build tools, programs, and projects to address gaps in sea-level rise observing, research, and decision-making in the northern Gulf of Mexico. She has collaborated on projects and efforts that have improved coastal community and environmental resilience and has led development of tools that have been applied throughout the Gulf and across the United States and is a recognized leader in resilience across the Gulf of Mexico.

The political complexity of coastal flood risk reduction
D.J. Rasmussen, PhD, Princeton University, dmr2@princeton.edu
Co-presenters: None

Abstract: Coastal climate adaptation public works, such as storm surge barriers and levees, are central elements of several current proposals to limit damages from coastal storms and sea-level rise in the U.S. Academic analysis of these public works projects is dominated by technocratic and engineering-driven frameworks. However, social conflict, laws, political incentives, governance structures, and other political factors have played pivotal roles in determining the fate of government-led coastal flood risk reduction efforts. Here, we review the ways in which politics has enabled or hindered the conception, design, and implementation of coastal risk reduction projects in the U.S. We draw from the literature in

natural hazards, infrastructure, political science, and climate adaptation and give supporting examples. Overall, we find that 1) multiple floods are often needed to elicit earnest planning; 2) strong and continuous leadership from elected officials is necessary to advance projects; 3) stakeholder participation during the design stage has improved outcomes; 4) legal challenges to procedural and substantive shortcomings under environmental protection statutes present an enduring obstacle to implementing megastructure proposals.

Biography: D.J. Rasmussen is a climate scientist, engineer, and policy scholar. He studies coastal floods, sea-level rise, and public works strategies for managing their economic and social costs. He is co-author of "Economic Risks of Climate Change: An American Prospectus", and his research has informed multiple IPCC assessment reports and has been published in Science Magazine. He completed his PhD in Public and International Affairs at Princeton University.

Property Values, Taxes, Infrastructure: What's at Stake? Assessing Coastal Infrastructure at Risk

Lauren Knapp, PhD, CSS Inc. on contract to NOAA/Office of Coastal Management, lauren.knapp@noaa.gov
Co-presenters: None

Abstract: This presentation will examine a series of case studies that use ESRI Business Analyst data—property taxes, property values, and extent of infrastructure—to give an indicator of the value of infrastructure (and potential municipal tax revenues) at risk in vulnerable coastal areas. Coastal decision-makers can only manage what they can count. To understand and inform coastal investment decisions under limited budgets in the face of increasing hazards, officials must have a full understanding of the magnitude of infrastructure that is at risk. This information also provides a gauge for associated impacts if those structures are lost, such as funding for local schools. To increase the accuracy of these economic estimates, we are working on an agreement with Zillow's ZTRAX database to pull in higher-fidelity infrastructure economic information for specific commercial and residential properties. These economic metrics can be supplemented with additional socioeconomic and demographic layers to provide answers for local areas. See how these data can be calculated and used to help prioritize important decisions on development, mitigation, adaptation, and managed retreat.

Biography: Dr. Lauren Knapp holds a Ph.D. and postdoctoral training with 4 years of professional experience and 210+ citations on peer-reviewed publications. By training, she is an environmental economist and employs various methods from cost-benefit analysis to ecosystem services valuation and stated preference estimation. On contract to NOAA's OCM, she helps on efforts to value marine economies, train local communities on how to use economics to inform their decision-making, capture benefit data for natural coastal infrastructure, comprehensively value U.S. coral reefs, and use economics to inform other related efforts.

C5: Behavioral Science and Risk Communication

Behavior-based change – What Can Flood Mitigation Leaders Learn from the Energy Industry
Jordanna Rubin, LEED AP O+M, ENV SP, AECOM, Jordanna.rubin@aecom.com
Co-presenters: None

Abstract: Behavior-based change is reliance on social science-based strategies rather than traditional approaches of incentives, rebates, or legal or policy strategies to effectively drive behavior change. Preparation for natural disasters and emergencies is found to be more effective when focusing on changing human behavior in ways that reduce climate risks and consequences.   Behavior-based change is an important component of disaster risk reduction and a method to reduce people's risk and ability to cope with hazard impacts. Human preparation for disasters typically results from a diverse set of factors from people's risk perception to direct and indirect experiences with past emergencies. All hazards require people to take "survival actions" (i.e., emergency food supplies and water) or even structural changes (i.e., earthquake building codes or elevations for flooding).   However, while individual and community preparedness is important to reducing hazard impacts, evidence suggests that increased incidence and awareness of disasters is not driving increased preparedness.[1] In order to develop effective behavior-based approaches to mitigation, we must understand which behavioral theories have been used, where they have been used, and which are preferred methods.   This presentation will explore the diverse set of variables and relationships that result in behavior change leading to disaster preparedness. We will use examples from the energy industry and identify each example's relevance to flood mitigation programs.

Biography: Jordanna Rubin brings over 20 years of experience focused on the design and implementation of resilient and equitable disaster recovery programs. At the heart of her work is a passion for client success and a focus on building trusted partnerships. Jordanna currently serves as Vice President of Resilience and Disaster Recovery for AECOM. Jordanna has led the successful implementation of equitable and innovative programs throughout the country. Many of those programs have required creative thinking, faced unbalanced markets, helped facilitate public policy, and managed chaos.   Jordanna has helped with the relocation of an indigenous community out of a high risk zone in southern Louisiana; developed a COVID-19 food security program to reach vulnerable populations; produced water reuse and solar feasibility studies; and managed resilience & recovery teams in California, New York, Florida and Texas that implemented housing and infrastructure programs that helped communities not just recovery from disasters but improve their futures.   During her career, Jordanna has served as the Director of Resilience & Sustainability for APTIM, Environmental Manager for the City of Miami Beach, Assistant Director for the Columbia University Energy Policy Center, and as an analyst for NASA's Goddard Institute for Space Studies. She has served as a Co-Chair of the Florida Green Building Coalition, Local Government Committee and has also volunteered as a mentor for young professionals for the San Diego American Planners Association and Barnard College.

Common Barriers to Achieving Resilience in Hazard Mitigation and Personal Financial Planning

Glenn Locke, PMP, PMI-ACP, Booz Allen Hamilton, locke_glenn2@bah.com
Co-presenters: Steven C. Eberbach, CFP®, Clarity Financial Planning Group, Principal / Financial Advisor, steve.eberbach@nm.com

Abstract: Two seemingly unrelated topics, hazard mitigation planning and personal financial planning, will be brought together to introduce common barriers to resilience. Both topics involve risk

assessment and development of actionable strategies that reduce risk. Challenges are commonly encountered as not all people arrive at the same conclusion based on their risk tolerance, level of trust in professionals helping them identify and mitigate risk, and overall predisposition to behavioral change. Examples of common barriers from both areas of discipline will be presented as we demonstrate that both are critical to the long-term sustainability of modern society.   This presentation will explore the process that results in risk reducing behaviors, the barriers that must be overcome along the way, and practical actions professionals can take within this context. The path to resilience may look different for everyone, but there are specific barriers that we can examine as professionals to help individuals, families, businesses, and communities move closer to resilience.

Biography: Glenn Locke is a program management and technical project delivery specialist with over 15 years of experience supporting Hazard Mitigation. Mr. Locke has supported FEMA's Map Modernization Program, Risk MAP Program, National Integration Center, and National Exercise Program. Mr. Locke also has experience in personal finance and is well versed in insurance products. He has a Master of Business Administration degree from Drexel University and an undergraduate degree in Computers and Information Systems from King's College.

Using Data and Science to Influence Complex Decisions in a Complex World
Kristin Murphy, Booz Allen Hamilton, Murphy_Kristin@bah.com
Co-presenters: None

Abstract: Even under the best of circumstances, communicating about flood risk is hard. There are myriad personal experiences, beliefs, motivations, and pressures that are acting upon our daily decisions. And as the world becomes more polarized, that web of influence surrounding each of us is becoming more complex and impenetrable every day. It follows that the age-old ways of communicating informational messages about flood risk are becoming much less effective. This presentation will focus on using publicly available data to scientifically profile and prioritize your audiences and then develop targeted communications strategies for driving their decisions about flood risk. The presentation will then deconstruct communications case examples to highlight how data, profiling, and change techniques translate into messages, images, and channels.

Biography: Kristin Murphy is a senior strategy consultant with Booz Allen Hamilton and has spent over 16 years developing and implementing business solutions for federal programs and private industry within the mission spaces of resilience, environmental protection, and climate change adaptation. Ms. Murphy delivers integrated program and portfolio strategy, analytics, behavior change, and stakeholder engagement solutions that transform organizational performance and optimize mission-level outcomes. Ms. Murphy is also an industry award-winning expert in applied innovation and design thinking theory for workshops and collaborative engagements; recognized multiple times for her work with FEMA and the National Flood Insurance Program (NFIP).

C6: Policy Matters: ASFPM as an Advocate

How the Sausage is Made – ASFPM's Work to Help Shape Federal Policy, Regulations and Program Implementation
Merrie Inderfurth, ASFPM, merrie@floods.org

Abstract: Learn about the federal legislative process and ASFPM's work in shaping policy related to flood hazard identification, flood risk reduction and effective floodplain management. The session will focus on the importance of advocacy and education in the development of federal legislation and the regulations and guidance that agencies use to implement programs. The differences between education, advocacy and lobbying and appropriate uses will be discussed. Roles of the ASFPM Policy Team, Technical Committees, the Flood Science Center, ASFPM State Chapters, ASFPM members and partner groups in successful education and advocacy will be highlighted through real life examples.

Biography: Meredith Inderfurth (Merrie) has served as Washington Liaison for the Association of State Floodplain Managers for more than 25 years. In this capacity she helps Association officers, staff, Board of Directors, Policy Committees and other members to keep informed about policy and legislative developments of interest and importance to the Association. Inderfurth became involved with the National Flood Insurance Program and associated insurance and flood loss reduction issues during 15 years on the staff of former Congresswoman Lindy Boggs of New Orleans, Louisiana. Congresswoman Boggs was particularly active in supporting development of the National Flood Insurance Program and served on the House Appropriations Subcommittee which funded Federal Emergency Management Agency (FEMA) and United States Department of Housing and Urban Development. Inderfurth worked on the annual appropriations bills for those agencies and handled all flood insurance and FEMA issues for Mrs. Boggs along with housing, banking, small business and other issues. Inderfurth has a bachelor's from Brown University and a master's of public administration from George Washington University.

Grass Roots Advocacy to Federal Legislation - The Atlas 14 Story
David Conrad, CFM, ASFPM, david@floods.org

Abstract: The session will relate the process of identifying a problem, defining the issue, exploring the options to improve the situation and taking action. A case study of advocating for a stable funding source for periodic updating Atlas 14 for the nation will be presented. The process of identifying the issue of outdated precipitation frequency data and the lack of a consistent funding source grew from a post Hurricane Harvey grass roots effort into an ASFPM policy priority. The presentation will recap the journey and the actions taken to achieve the desired goal. At the time of abstract development, the advocacy effort is still underway. Hopefully, the successful conclusion can be presented at the conference, otherwise the next steps to keep the issue moving forward will be discussed.

Biography: Since March, 2017 David has served as Water Resources Policy Advisor to the Association of State Floodplain Managers (ASFPM) in Washington DC, advising and representing ASFPM on a wide variety of policy and legislative issues, including the National Flood Insurance Program, Stafford Act Disaster Assistance and flood-related programs of the U.S. Army Corps of Engineers. ASFPM is the nation's leading organization of flood risk management professionals. For more than forty years, David has served as an analyst and advocate for federal and state policies and practices supporting wise water resources management. He served previously for 23 years as the National Wildlife Federation's Senior Water Resources Policy specialist, and has written extensively on flood and floodplain management policy, including serving as Project Manager and a principal author of the National Wildlife Federation's landmark Higher Ground report in 1998, which brought national attention to problems with "repetitive flood losses" and highlighted new "non-structural" programs, such as voluntary buyouts and building elevations, to mitigate and reduce flood-related risks. David received a Bachelor of Arts in

Environmental Sciences from the University of Virginia in 1974, and resides in with his wife, Paula Dinerstein, in Chevy Chase, MD. David is also a Certified Floodplain Manager.

Tackling State and Local Issues and Tools to Help Effective Advocacy
Meg Galloway, PE, ASFPM, meg@floods.org

Abstract: Good public policy is shaped by people who know and work in the subject field or are impacted by the issue. Legislators and policy makers make decisions based on their knowledge and the information provided by others. This session will discuss the skills and process to assure decision makers hear from professionals who work on floodplain issues. Particular focus will be directed to individuals and ASFPM Chapter members who can make a difference advocating at the state and local level. We will touch on the difference between education, advocacy and lobbying to help individuals determine what reasonable actions they can take within limitation that may be imposed by their employment. Case studies will provide information on how ASFPM policy staff can help state and local professionals and Chapters become involved in advocacy. ASFPM's new advocacy tool ASFPM Engage! will be demonstrated so potential state and local advocates understand how it can be used to help the get attention for their issue.

Biography: Meg Galloway joined the Association of Floodplain Managers in 2019 as a Senior Policy Advisor. Her entire career has been focused on water resource management and public safety issues, primarily in the areas of floodplains and dams. Prior to joining ASFPM, Ms. Galloway spent 7 years in consulting and then 29 years with the Wisconsin Department of Natural Resources, the last 10 years managing the floodplain management, floodplain mapping and dam safety program. She earned her B.S. in Civil and Environmental Engineering from the University of Wisconsin – Madison and is a registered professional engineer in the State of Wisconsin.

C7: Building Resilience into Recovery

Mexico Beach: A Hurricane Michael Story of a Small Beach Community on the "Never" Forgotten Coast
Del Schwalls, PE, CFM, Schwalls Consulting, dschwalls@schwallsconsulting.com
Co-presenters: None

Abstract: On October 10, 2018, Michael made landfall as a Category 5 hurricane at Mexico Beach, FL. By the time the wind and storm surge had abated, much of this small coastal haven had been wiped off the map, with nothing remaining but debris and bare concrete slabs. Since then, this close-knit community of residents, business owners, and perennial vacationers have been struggling to reclaim what was lost. This presentation will look at Mexico Beach before and after the storm, showing the severity of the devastation through photographs from the residents themselves. This presentation will discuss the regulatory framework established after the storm, the floodplain management struggles faced since, and provide an update of where the City is now and where they are headed. And the presentation will discuss the recovery process, connecting real people and real stories to the headlines seen in the news, through the voice and eyes of the speaker Del Schwalls, whose family and friends lived it.

Biography: Del Schwalls is President of Schwalls Consulting, with more than 20 years of experience in floodplain management, hydrologic and hydraulic analyses, and water resources engineering. He specializes in working with communities throughout Florida to achieve their floodplain management

goals, including refining their Community Rating System program and regulatory framework. He conducts trainings across Florida and the country on accurately completing FEMA Elevation Certificates (ECs) and addressing EC deficiencies. He has extensive experience with the FEMA Hazard Mitigation Assistance (HMA) grant programs, and serves as a subject matter expert (SME) in HMA grants and FEMA benefit cost analysis for states and communities. He has developed floodplain modeling and mapping across the nation, and specializes in conducting independent QA/QC of FEMA Flood Risk projects. Mr. Schwalls has prepared numerous LOMAs and LOMRs across the Southeast US, and began his career in D.C. reviewing LOMRs and FISs for FEMA. He is currently the Hydrology SME to the Florida Commission on Hurricane Loss Projection Methodology. Mr. Schwalls holds a BS in environmental engineering from Mercer University, is a registered PE in FL, AL, GA, and SC, and earned his CFM in 2003. He is Past Chair of the Florida Floodplain Managers Association and Region 4 Director of ASFPM.

Roll'n on the River – 2019 Flood – Arkansas River Park Remediation

WB Smith, PE, CFM, HISIINC LLC, wbsmith@hisinc.us
Co-presenters: None

Abstract: In May-June 2019, the Arkansas River through Tulsa experienced a historic flood event. While the peak river flow was not as high as the 3 to 4 day peak in 1986, the high flow flooding in the Special Flood Hazard Area lasted for over 51 days, totally saturating the banks of the river. When the river levels dropped, the banks of the Arkansas River along the River Parks Authority trails sloughed and failed due to rapid drawdown and weakened conditions due to saturation.   With limited funding for repair, the River Parks Authority proceeded with evaluation, design, and is in the construction phase of several "high" priority projects that affected public safety due to trail damage and slope damage adjacent to the trail, along with several park amenities. This presentation will address not only the process and procedure for the remediation of the park facilities, but also the ongoing learning experience of the FEMA Public Assistance Program and reimbursement that is being approved – in a much-limited manner – as compared with the actual costs incurred; in contradiction to the original anticipated reimbursement.

Biography: "Bill" Smith is President of Hydropower International Services Inter-National Consultancy, L.L.C., a private consulting firm providing engineering services, for hydroelectric generating projects, and other hydrologic, hydraulic, and floodplain management projects. Mr. Smith has almost 50 years of hydrology and hydraulic engineering experience in stormwater and floodplain management.   Mr. Smith received his certification (CFM) as a Floodplain Manager in 2004, and has been a member of the Oklahoma Floodplain Managers Association (OFMA) for since January 2004. Mr. Smith is a Past Chair of OFMA (2007-2008) (2017-2018) and Co-Chair (2019-2020), a member of the Professional Development Certification Committee, Past Region 2 Representative, an OFMA Training Cadre Instructor, and the OFMA Disaster Response Team (DRT) Creator and Coordinator. Mr. Smith is Co-Chair of the Education Committee for ASFPM.   Mr. Smith was also President of the National Hydropower Association (NHA) from 1988-1989 and was an active member of NHA's Board of Directors for over five years (1984-1989). He also served as Vice President, Creator and Chairman of both the FERC Committee and the International Committee and represented NHA as a technical specialist on Trade Missions throughout the world from 1989 to 1994. He is the recipient of the NHA 2008 Dr. Kenneth Henwood Lifetime Achievement Award.

Responding to Near Drowning with Resilient Actions – A Real World Example
Dan Fricke, JEO Consulting Group, dfricke@jeo.com
Co-presenters: John Callen, PE, CFM Senior Project Engineer

Abstract: Imagine a river of ice chunks (the size of houses) hurtling towards you flowing on a record flood wave, an event never before experienced by anyone in your community. This exact nightmare played out along every major waterway in Nebraska during the bomb cyclone and resultant record flooding of March 2019. Flood risk impacts came from ice affected flows, road embankment and levee breaches, and never-before-experienced overflow paths of the Platte and Elkhorn Rivers. As a result, Fremont, NE (with a population over 25,000) was an island and isolated for multiple days, requiring airlifts for supplies and critical medical care. As part of the flood event, the City's emergency operations had both successes and challenges. Since then, post flood recovery is complex and ongoing, with multiple avenues towards resilience being pursued and implemented.   JEO was a part of the emergency response and is supporting the City's implementation of multiple resilience efforts. As part of recovery effort, JEO has assisted the City with a multi-faceted approach to flood risk reduction and resilience alternatives. Alternatives investigated include both non-structural mitigation through home elevations and structural mitigation assessment and prioritization through evaluating the role of an historically-abandoned levee embankment coupled with strategic CIP planning for future flood mitigation action. These activities have been coordinated with the local multi-jurisdictional Hazard Mitigation Plan and disaster funding has been tapped to maximize the potential resilience actions and mitigation strategy. Also, outreach communication tools to convey the mitigation strategy in an accessible way have been developed.   This presentation will discuss the key points of the transition from emergency response to flood risk resilience actions taken in the aftermath of record flooding. Resilience action funding program success and struggles will be discussed and best practices/needs of a community recovering from record flooding will be highlighted.

Biography: Dan Fricke is a Senior Project Manager in Water Resources at JEO Consulting Group, Inc. where he has worked for over 15 years. He holds a Bachelor of Science degree in Civil Engineering and serves as a Board Member of the Nebraska Floodplain and Stormwater Managers Association. Dan's focus is large scale flood risk reduction planning and implementation for communities across the Midwest. He was involved in the emergency response in the days following the record flooding in Fremont, NE and has continued to serve the city in their resilience actions. Dan champions flood risk reduction using every tool available and is especially fond of non-structural flood risk reduction and flood risk awareness outreach and communication efforts.

Session D
Wednesday, May 12 – 9:00-10:30 AM central

D1: Flood Insurance

The Evolution of the Private Flood Insurance Market: A Look at the Past, Present and Future of Flood Insurance

Bruce Bender CFM, Bender Consulting Services, Inc., babender@cox.net
Co-presenters: None

Abstract: While the reform legislation of 2012 and 2014 provided FEMA direction to improve the financial stability of the NFIP, it--along with newer technology--also helped trigger the growth of the private flood insurance market. But this advancement in technology has also allowed FEMA to develop a new and simpler approach to how federal flood insurance will soon be rated.   This session will first provide a look the federal flood insurance program's past and where we are now. It will then focus more on the private flood insurance market, how it has grown and where it may go. It also will highlight what floodplain managers and others should know and be aware of when discussing or considering private flood insurance.

Biography: Bruce Bender has been providing community engagement/outreach services and flood insurance expertise since 2002. Bruce has been supporting FEMA's NFIP national marketing programs (e.g., FloodSmart, C3) and national mapping programs (e.g., Map Mod, Risk MAP). At the local level, he assists counties and communities with their community engagement and outreach efforts. Bruce has participated in numerous flood insurance-related research studies and been an expert witness in court cases related to flood and private flood insurance. He is currently a Co-Chair of ASFPM's Flood Insurance Committee.   Previously, Bruce worked in the insurance industry for close to 15 years, including managing one of FEMA's largest WYO flood insurance programs and an insurance agency. He has a B.S. in Geology from The College of William and Mary…and a flood insurance policy!

Risk Rating 2.0: Progress to Date and Next Steps
Lloyd "Tony" Hake, , FEMA, Lloyd.Hake@fema.dhs.gov
Co-presenters: Andy Neal

Abstract: In the quest to be a world-class insurance operation and to close the insurance gap, FEMA's FID is focused on improving the service provided to its customers — flood insurance policyholders. A significant part of this transformation is Risk Rating 2.0, which will redesign the way FEMA rates a property's flood risk and prices insurance.   FEMA will deliver flood insurance rates under Risk Rating 2.0 that are easier to understand and better reflect a property's unique flood risk. Knowing the true risk of one's property will help to inform appropriate mitigation measures property owners can take to ultimately reduce their risk.   Policyholders can speak with local officials about completing mitigation activities in their communities and can take steps to mitigate flood risk in their home, such as elevating structures or installing proper flood openings, to help reduce their flood insurance costs.   The presentation will provide a more technical perspective on the new rating approach and further discusses how FEMA has leveraged industry best practices and current technology in order to make risk easier for agents and customers to understand. We will also discuss how enhancing an understanding of risk relies on achieving a graduated view of flood risk, taking into consideration a wider range of risk variables, and performing an accurate assessment of risk at a structural level. In addition to providing the latest updates on Risk Rating 2.0 during this session, FEMA staff will also address audience questions.

Biography: Mr. Hake is the Director for National Flood Insurance Program (NFIP) Transformation Initiative, of which Risk Rating 2.0 is a major component. Risk Rating 2.0 streamlines and simplifies the delivery of the NFIP for stakeholders and policyholders. Tony has led numerous transformation activities

in various capacities with FEMA and the Federal Insurance and Mitigation Administration (FIMA) including the Hazard Mitigation Grant Programs, the Individual Assistance Grant Programs, and Cadre Management. In a previous Federal Insurance role, he served as the Director for Product Delivery Division which encompasses NFIP Claims Processing and Underwriting, Industry Management, and the NFIP Direct contractor. Together these branches led and oversaw the multitude of private entities that aid FEMA in the delivery of the NFIP through a unique public-private partnership. In addition, the Division actively engages with policyholders, Congress, OMB, other government agencies, State Insurance Commissioners, across FEMA headquarters, Regional and Field offices, and with other related industry groups, organizations and committees.

Andy Neal is the Chief Actuary of the Actuarial and Catastrophic Modeling Branch within the Risk Management Directorate of FEMA's Federal Insurance and Mitigation Administration (FIMA). He is involved with rate-setting and reporting on the NFIP's financial risk to management and stakeholders under Risk Rating 2.0 and the original rate setting model.

Office of the Flood Insurance Advocate: Five Years of Advocacy
David Stearrett, FEMA, rhonda.montgomery@fema.dhs.gov
Co-presenters: Rhonda Montgomery, Deputy Flood Insurance Advocate, FEMA

Abstract: The Office of the Flood Insurance Advocate (OFIA) serves as a resource to assist policyholders and property owners who face complex challenges navigating the National Flood Insurance Program (NFIP). In recognition of its five-year anniversary in 2020, the OFIA will provide the audience with highlights of the last five years of advocacy. Every year the OFIA identifies trends affecting NFIP customers and proposes recommendations to FEMA to improve the NFIP customer experience. To date, the OFIA has identified 23 areas of customer concern and has made 59 recommendations. In this session, the OFIA will re-visit the most impactful solutions the NFIP has implemented based on OFIA recommendations, brief flood insurance stakeholders on specific topics of importance to be aware of over the next year, and illustrate how the Federal Insurance and Mitigation Administration (FIMA) and the OFIA will focus on community and individual mitigation in their 2021-2023 strategies. Beginning with an overview of significant milestones the Office has met since its establishment, the session will highlight those changes across the programs that have benefited NFIP customers, and how FIMA intends to invest its resources and efforts over the next three years. This presentation will inform the audience of:

- The OFIA's journey and its future initiatives
- The types of inquiries submitted by NFIP customers
- Customer- centric changes that have been made to the NFIP
- FIMA's new strategic objectives related to risk mitigation and how the OFIA plans to support them

Biography: David Stearrett joined the Federal Emergency Management Agency (FEMA) in 1999 and is currently assigned as the Director of the Office of the Flood Insurance Advocate. David's prior role was as Chief of the Floodplain Management Branch from 2006-2015. He has also served as a Program Specialist in Mitigation's Risk Analysis Division and the Floodplain Management Branch as a Regional Liaison. Prior to joining FEMA, David worked in the North Carolina NFIP State Coordinating Office as a

coastal and riverine flood mitigation specialist.   David is retired from the United States Marine Corps Reserve after 22 years of service.

Rhonda Montgomery is the Deputy Flood Insurance Advocate at the Federal Insurance and Mitigation Administration and has been in this position since October 2016. Previously, Ms. Montgomery was on detail to the Executive Office of the President's Council on Environmental Quality as the Deputy Associate Director for Flood Preparedness. She also served as the Executive Officer for the Federal Insurance and Mitigation Administration at FEMA, and as a member of the Floodplain Management Branch. Ms. Montgomery has held her Certified Floodplain Manager designation since 2000 and received her MPA from the University of Kansas.

D2: Spotlight on Mitigation Techniques

A Match (Maybe) Made in Heaven: FEMA Acquired Properties & Land Trusts
Mary-Carson Stiff, CFM, Wetlands Watch, mc.stiff@wetlandswatch.org
Co-presenters: None

Abstract: Wetlands Watch is working to build resilience to sea level rise through land conservation. To achieve this goal, we are leading a project with two partners, an urban land trust, the Living River Trust, and the City of Chesapeake, a community at risk from the impacts of sea level rise, to help the City transfer five contiguous shoreline acquired open space parcels to the land trust. Local governments have successfully transferred FEMA acquired parcels to land trusts elsewhere in the country, but not in the way our project hopes to achieve. FEMA's Property Acquisitions for Open Space Program seems to contemplate our transfer scenario, but the Model Deed of Restrictions, as written, makes the transfer difficult. We submitted revisions to FMEA's Model Deed that will better align land trust programs with FEMA's acquisition program.   This presentation will discuss why land trusts could be strong partners for local governments engaged in FEMA acquisition projects. A discussion of the stakeholder goals and concerns will explain the project's unique approach. Our project team seeks to develop and implement "adaptive land management strategies" that can be adopted on FEMA acquired parcels in urban and suburban communities. These strategies aim to generate as many multiple benefits to as many stakeholders as possible. If successful, this project could pave the way for land trusts and local governments across the country to partner and breathe new life into neighborhoods checkerboarded with buy-out parcels.

Biography: Mary-Carson Stiff is Director of Policy at Wetlands Watch where she specializes in the National Flood Insurance Program and sea level rise adaptation planning and policy. She is a Certified Floodplain Manager, Chair of the Coastal Virginia Community Rating System Workgroup, & Board Member of the Virginia Land Conservation Foundation, Virginia Floodplain Management Association, and the Living River Trust. Before joining Wetlands Watch, she worked as Consulting Manager for Policy & Programs for the Virginia Coastal Policy Center at William & Mary Law School, where she obtained a J.D. in 2013. Mary-Carson graduated from Bates College with a B.A. in 2008.

Home Elevation for Flood Hazard Mitigation

Tammie DeVooght Blaney, International Assn of Structural Movers, tammie@iasm.org
Co-presenters: None

Abstract: Home Elevation for Flood Hazard Mitigation will present multiple scenarios/case studies of Home Elevation Projects completed between 2016 and 2020.   Communities don't know where to start when disaster strikes and they are faced with hundreds of homes needing to be mitigated from future flood damage. Leaders don't know where to begin when thinking of using elevation as a preventive measure to mitigate future flood risk. This session will discuss flood hazard mitigation through elevation and the implications for changes in public policy. Participants will learn about best practices elevating a home including: how to ensure a competent professional home elevation contractor is hired, what questions to ask about insurance, how to understand state regulations and what the industry standards are for structural elevation, and how elevating homes affects flood insurance rates. Multuple elevation success stories will be highlighted. In addition, information about the basics of home elevation, and what we have learned post-Sandy including best practices in home elevation from completed flood hazard mitigation projects.

Biography: Tammie DeVooght Blaney is the Executive Director of the International Association of Structural Movers (IASM), a professional association representing over 300 structural moving and home elevation companies. DeVooght Blaney's roles within the IASM include: managing membership, legislative outreach, public relations/marketing and serving as Editor of the IASM's Industry magazine – STRUCTURALMOVER. DeVooght Blaney received her Bachelor's Degree from the University of Wisconsin-Oshkosh and her Master's Degree from Lakeland University in Sheboygan, Wisconsin. DeVooght Blaney is actively involved in working with individuals and communities on projects related to historic preservation, flood hazard mitigation and structural relocation.

Flood Protection Measures - When, Where, and How

Michael MacGowan, ILC Dover, macgom@ilcdover.com
Co-presenters: None

Abstract: ILC Dover is well-known for the application of softgoods composite technology for extra vehicular space suits and impact attenuation bags to land rover vehicles on Mars. Based on work with NASA and the Department of Homeland Security, ILC has developed flood mitigation solutions to support the growing need to protect critical facilities and their infrastructure from flood events caused by any type of occurrence. This presentation will examine the design, selection, and life cycle costs of various dry flood mitigation solutions.   ILC Dover has provided solutions for the space, aerospace, defense, and human health and safety industries for over 75 years. The ILC technology platform focuses on the innovative use of softgoods to design and develop tensioned fabric structures. Softgoods are flexible, lightweight materials that can be stowed in a smaller volume than they occupy upon operation. The ILC infrastructure protection systems embrace the benefits of softgoods by allowing the barriers to pack in a small volume and store at the point of use. The advantage of a stored at point of use system is rapid deployment with minimal training, equipment, and personnel which is critical to ensure successful deployment prior to a flood event. Further, with rapid deployment capability, this can minimize any operational impact both pre and post flood event. Tensioned fabric structures are capable of design flood elevations in excess of 30 feet and spans of 50 feet; however, there are structural, maintenance, and functional implications that must be considered when defining the configuration of the flood barrier

system. This lecture will examine critical requirements, such as flood elevation and impact loads, which typically defines the flood mitigation solution required for a site. Other considerations such as life cycle costs, maintenance, ease of deployment, and acquisition costs must also be considered when selecting a flood mitigation solution.

Biography: Mr. MacGowan is a design engineer for the Infrastructure Protection and Flood Mitigation business at ILC Dover with extensive experience in designing solutions for dry flood proofing for many types of clients and situations. He graduated from East Carolina University with a Bachelors in Mechanical Engineering and currently is a certified flood plain manager.   Since joining ILC Dover in 2018, Mr. MacGowan has had the opportunity to support and lead design projects in the flood mitigation business units. Michael has led the design of sub-assemblies on each of the primary flood mitigation product platform designs, supported site specific flood mitigation systems, and led installation teams during product install and checkout. Obtaining his floodplain manger certification, combined with design and installation experience of flood mitigation products, has allowed Michael to also support clients in early phases of the flood mitigation design process.

D3: Modeling for Flood Warning Systems

FIMAN-T: NCDOT's Response Tool for Managing Flood Impacts to Transportation Assets
David Key, PE,CFM, ESP Associates, Inc., dkey@espassociates.com
Co-presenters: Matthew S. Lauffer, PE, CPM, Assistant State Hydraulics Engineer, NCDOT Hydraulics Unit

Abstract: Since approximately 2004, the NC Floodplain Mapping program and NC Emergency Management have developed, maintained, and enhanced the State's Flood Inundation Mapping and Alert Network (FIMAN). In 2016, the site was made available to both the public and other emergency responders. This award-winning site has been established as a valuable situational awareness and emergency response tool during flood events and was especially useful during Hurricanes Matthew (2016), Florence (2018) and Dorian (2019). During Hurricane Florence, the State of North Carolina experienced significant flooding that included unprecedented impacts to the transportation system in the eastern part of the state. Many roads, including interstate highways, were inundated and closed for days, impacting not only routine travel throughout the state, but the ability for emergency responders to reach areas in need. During and immediately following the event, many questions concerning impacts to the transportation system arose from senior leadership that could not be readily answered. This prompted NCDOT to begin the development of FIMAN-T, a web application based on the architecture of the FIMAN system. The FIMAN-T application provides real-time and forecasted riverine and coastal flood inundation and depths along roads/assets and provides real-time hydraulic performance for bridges such as freeboard and overtopping conditions. The system also includes reporting tools for Emergency Operation Center briefings. FIMAN-T was developed in conjunction with North Carolina Emergency Management and expands upon the successful FIMAN application.   This presentation will provide a brief history of the FIMAN application and explain the drivers for development of FIMAN-T. The system architecture will be overviewed prior to providing a walk-through of the application highlighting its features and use.

Biography: David Key serves as Director of Water Resources, Hazard Mitigation and GIS Services at ESP Associates and has over 29 years of experience. His focus of his entire career has been watershed H&H modeling, FEMA Flood Insurance Studies, flood mitigation, GIS, application development and flood warning application development. He has served as Project Manager for the NC Floodplain Mapping Program for 20 years. His recent focus has been the development of the flood warning applications including FIMAN, FIMAN-T, SERA and the Flood Warning Application for the City of Roanoke. David is married with 3 children (and one Boykin Spaniel puppy) and lives in Holly Springs.

Feed the Machine: Flood Response Automated Predictions to Improve Emergency Planning

David Leone, PE, CFM, GZA, davidm.leone@gza.com
Co-presenters: Daniel Boudreau, Jr., GISP, GZA, daniel.boudreau@gza.com

Abstract: Flooding from storm surges, rivers, and intense precipitation results in loss of life, billions of dollars in damages, disruption to businesses, and obstruction of safe passage by emergency responders. As the intensity of storms increases over time, the challenge posed by flooding is rising to the forefront of municipal emergency planners and responders, private businesses concerned with logistics, and essential workers who do not have the option of telecommuting, even when flood conditions arise. How do you warn people to avoid these hazards, improve their awareness of flooded road hazards, or help people to choose a safer route? The prediction of floods that create these challenges on a short-term, highly localized and accurate basis is a burgeoning area of innovation. However, linking high-quality rainfall or storm condition forecast data to coupled high-resolution hydrodynamic models to predict flood areas often requires too many computing hours, is labor-intensive, and is often cost prohibitive.   This presentation will walk through the Flood Response Automated Predictions (FRAP) process as applied in the RISE Urban Mobility Resilience Challenge in Hampton Roads, Virginia. The FRAP process combines pre-planned hydrodynamic modeling with near-real-time forecast data to predict flood inundation areas for a variety of potential flood causing mechanisms. It will also introduce concepts of machine learning and artificial intelligence that can enable large reductions of computational simulation time and also increase the robustness of the process. Finally, we will discuss visualization of the results using Geographic Information Systems platforms and the compatibility of FRAP outputs with other widely used communication platforms like Advanced Driver-Assistance Systems like Waze to reach a broad audience of consumers.

Biography: David Leone is a hydraulic engineer and associate principal at GZA GeoEnvironmental, Inc. He leads GZA's Dams and Water Resources technical practice group. Over his 20 plus years in the engineering field, he has specialized in hydrology and hydraulics, natural hazard and climate change vulnerability assessment, and design of flood mitigation structures. He has an extensive background in hydrologic, hydraulic, and hydrodynamic numerical modeling and visualization using geographic information systems. David is also a licensed professional engineer in four states and a Certified Floodplain Manager.

Mr. Boudreau has extensive experience in all aspects of geospatial technology. As a certified GIS Professional, he brings over 30 years of combined CAD and GIS experience in data management, data development, spatial analysis, cartographic design and production, and field data collection. Mr. Boudreau serves as the Geospatial Systems Lead and heads the Geospatial Solutions Practice for GZA and manages GZA's Esri Partner Program relationship. He also is the administrator of GZA's ArcGIS Enterprise deployment and oversees the management of GZA's central data repository, as well as the

development/deployment of GIS web and mobile applications. He co-developed the GZA GeoTool web mapping platform, which is central to several of GZA's Technical Practices such as Natural Resources, Water Resources, Stormwater Management, Asset Management and Natural Hazards Mitigation and Resilience practices.

Urban Flooding Open Knowledge Network: Delivering Flood Information to Anyone, Anytime, Anywhere

Venkatesh Merwade, Purdue University, vmerwade@purdue.edu
Co-presenters: Lilit Yeghiazarian; J. Michael Johnson; Adam Shepherd; Peter J. Singhofen; Sadegh Riasi; Sankar Arumugam; Ximing Cai; Torsten Hahmann; Siddharth Saksena; Jerad Bales, Jeffrey Horsburgh; Charles Matthews

Abstract: When an urban area gets heavy rainfall, the impact of flooding resulting from this rainfall event is dictated not just by the amount of rainfall, but how the physical infrastructure, such as the stormwater network, power stations and water retaining structures is able to collectively absorb shocks produced by the flooding event. Most often the emergency responders are able to see the impact of rising water levels on humans, but the impact on the urban infrastructure and its interconnected components, and its role in flooding is not visible or understood. To take a holistic approach to understanding the impacts of urban floods so we can mitigate the human and economic losses resulting from, an Urban Flooding Open Knowledge Network (UF-OKN), an open and shared infrastructure that provides an information backbone for homeowners, utility operators, and consumers of various urban systems during flooding, is being developed. The UF-OKN merges the state-of-the-art practices in hydrological and hydraulic engineering; systems analysis, optimization & control; computer science; public health; geography; socioeconomics; transportation, civil and electrical engineering to deliver actionable flood information to anyone, anytime and anywhere. The UF-OKN simulates how flood water propagates across the urban systems in a way that provides clear insights about existing and potential flooding problems. This talk will demonstrate the project overview, aims and goals of the UF-OKN, and details on how it is being implemented. This presentation will provide an overview of the UF-OKN including the conceptual framework, its delivery and potential use by multiple stakeholders from general public to government agencies at local, state and federal levels.

Biography: Dr. Venkatesh Merwade is a professor in the Lyles School of Civil Engineering at Purdue University, where he has been since 2006. During 2004 – 2006, he worked as worked as post-doctoral fellow at the Center for Research in Water Resources at the University of Texas at Austin. Dr. Merwade received his Bachelor of Engineering in Environmental Engineering from Shivaji University, India in 1997, MSc in Engineering Hydrology from the National University of Ireland, Galway, Ireland in 2000, and PhD in Civil Engineering from the University of Texas at Austin, USA in 2004. From 1997-1999, he worked as project engineer at Montgomery Watson (now Stantec) in Mumbai, India. His research and teaching interests include surface water hydrology with specific focus on flood modeling and mapping. Much of his work has been on improving the simulation of hydrologic processes for flood prediction by using geographic information systems (GIS), data driven techniques and advances in cyberinfrastructure. He has authored more than 80 peer reviewed journal articles and conference proceedings in the area of river channels, watershed hydrology and flood modeling. Some of his awards include the Outstanding Achievement Award (2018) from the Indiana Water Resources Association for work related to flood prediction and mapping for Indiana streams, Excellence in GIS Award (2017) from Indiana Geographic

Information Council for Soil-Based Floodplain Maps for Indiana, and the Quentin Martin Best Practice Paper (2011) from the ASCE Journal of Water Resources Planning and Management. Dr. Merwade disseminates his educational material as online tutorials, which have been used by tens of thousands of students, faculty and working professionals around the world for learning GIS and hydrologic modeling.

D4: Mapping Avant-Garde

Developing Floodplain Designations that Account for Future Climate Change: A Case Study on Implementation of the Community Risk and Resiliency Act (CRRA) in New York.

David Sutley, PE, Dewberry Engineers, Inc., dsutley@dewberry.com
Co-presenters: Dano Wilusz, PhD, CFM, Dewberry Engineers, Inc., dwilusz@Dewberry.com

Abstract: Modeled after the late Executive Order 13690, New York State (NYS) enacted the Community Risk and Resiliency Act (CRRA) in 2014 to require state agencies to consider future flood risk in specified regulations and funding programs. This presentation describes recent NYS efforts to (1) evaluate actionable, science-based approaches to map future "climate-informed" flood risk and (2) develop a cost-effective statistical approach to scale-up map production statewide. First, we produced flood hazard maps for a 3,500 square mile pilot region covering two NYS counties and compared three approaches to modifying the 100-year floodplain designation to account for climate change: design-flow multipliers, upper confidence bounding, and freeboard (additional vertical and horizonal extent). A comparative analysis of the three approaches show significant differences in terms of area of the flood hazard and the number of affected structures. The advantages and limitations of each approach is discussed. Second, we developed a random forest statistical model that uses landscape characteristics to estimate or "predict" a climate-informed floodplain extent. The random forest model correctly predicted the location of flood hazard areas in the pilot region, compared to the mapped floodplain, with an average accuracy, precision, and recall of 86%, 86%, and 77% respectively. The results suggest the statistical model could provide useful information about flooding in unmapped river reaches, especially reaches that that are close to mapped areas, in moderate to high relief terrain, and not heavily regulated by built infrastructure. This case study illustrates the use of statistical mapping approaches to predict effects of climate change on riverine floodplains. These approaches can be used to develop flood risk management strategies to increase resilience and reduce the exposure to structures from local flood hazards.

Biography: David Sutley is a resilience expert with more than 15 years' experience in flood risk management working for four federal agencies, including the Federal Emergency Management Agency (FEMA), National Weather Service, Bureau of Reclamation, and U.S. Army Corps of Engineers (USACE). He joined Dewberry's Resilience Solutions Group in September of 2019 and has been supporting the advancement of unique flood risk management solutions. David grew up along the Gulf Coast and lived through many significant flood events. That exposure instilled a passion and desire to learn more about how flooding works, so he pursed and completed Bachelor's and Master's degrees from the University of Alabama in Civil Engineering focusing on open-channel hydraulics, hydrology and statistics. Flood risk communication is currently David's professional passion, and he is always interested in discovering new ways to improve the way a complicated subject can be presented in a way that tells a better story.

Outside of work he enjoys water sports and camping in the summer with his family and snowboarding in the Colorado mountains.

Dr. Dano Wilusz is a water resources professional with 15 years of experience in engineering, climate resiliency, and public sector project management. He works for Dewberry based in Fairfax, VA, where he leads and supports water and infrastructure vulnerability assessments for local, state, and federal clients. His areas of expertise include 2D hydrology and hydraulics modeling, probabilistic flood risk mapping, water quality simulation, and climate change risk assessment. From 2006-2012, Dr. Wilusz was a Foreign Affairs Officer at the U.S. Department of State, where he worked with EPA, USGS, USACE, and other federal agencies to develop a U.S. government-wide Global Water Strategy. Dano has a PhD in water resources engineering from Johns Hopkins University and a Master of Public Policy from the University of California at Berkeley.

Why Do People Keep Talking about Probabilistic? Is it Probability? Now, I Am Confused!

Sarada Kalikivaya, PE, PMP, CFM, Atkins North America, Sarada.kalikivaya@atkinsglobal.com
Co-presenters: None

Abstract: FEMA has initiated multiple initiatives to transform the National Flood Insurance Program into a risk informed program that will reduce human suffering, economic loss, and environmental damage resulting from flooding. One of the initiatives includes establishing a new, modernized, approach for pricing flood insurance by leveraging industry best practices and current technology to deliver flood insurance rates that are fairer, easier to understand, and better reflect a property's unique flood risk. Current flood insurance rates and floodplain management have been institutionalized based on a binary view of flood risks (in or out of Special Flood Hazard Areas) using a deterministic approach without consideration of uncertainty. Regulatory mapping products, such as Flood Insurance Rate Maps (FIRMs) do not consider the contribution of pluvial flood hazard, dam and levee performance, and future conditions flood hazards. Current FIRM products alone do not provide structure-specific risk information for risk reduction or mitigation options. The probabilistic flood hazard and risk assessment approaches represent an exciting advance in the way flood hazard and risk information is developed, which considers multiple sources of existing and future flood hazards, the performance of flood risk reduction structures, and hazard and risk data integration. This presentation will provide a simple explanation of the difference between the current approach of flood hazard identification—deterministic and the probabilistic approach. While the deterministic approach is a simplified method used by many for decades, the probabilistic approach in a new way to identify hazard and assess risk with uncertainty considerations. Participants will lean and appreciate the application of the probabilistic approach that has been widely used in the past five years because of advanced technology. The presentation will also highlight multiple applications of the probabilistic approach by the public sector, such as the Nuclear Regulatory Commission; and the private sector including the insurance industry.

Biography: Sarada Kalikivaya is a Project Director with Atkins North America working in the Dallas Office. She currently serves as the Deputy Mapping Program Manager for STARR II and Task Order Manager in FEMA Region 6 for PTS contract and project manager for various Cooperating Technical Partners. Also, she is currently involved managing multiple Flood Risk studies using the new technologies such as cloud computing across the US to gain efficiencies. Ms. Kalikivaya has a Master of Civil Engineering from the University of Louisiana at Lafayette with Water Resources focus. She is registered as a Professional Engineer in the State of Louisiana and Missouri

BLEs and the Flood Risk Factor: Competing Sources, Different Stories, or Beneficial Partners?
Lee Beshoner, FTN Associates, Ltd., ljb@ftn-assoc.com
Co-presenters: Whit Montague

Abstract: Flooding is the most common and expensive natural disaster in the United States, when it comes to property damage and lives lost. To understand their flood risk, almost all Americans look to FEMA's Flood Insurance Rate Maps (FIRMs), which leads to a common misunderstanding of what the FIRM does and does not really represent.   Over the past 5 years, FEMA Region 6 has encouraged the development of Base Level Engineering data within the Region. The State of Arkansas, through its CTP Program, has embraced the BLE process as a way to not only produce updated flood risk data for its rural, and often underserved, communities, but also as a great way to conduct outreach and encourage its communities to embrace this new information for floodplain management. Now, with the recent release of the First Street Foundation's Flood Factor online tool, which per the website "makes it easy for Americans to find their property's risk of flooding and understand how flood risks are changing because of a changing environment", it poses the question of whether there is now competing data sources telling different stories, how do they compare, etc.?   The purpose of this presentation is to use available data in the State of Arkansas to objectively examine the BLE and the Flood Factor processes, discussing their similarities and differences, and also seeing if there are possible areas for future collaboration.

Biography: Lee is the Branch Office Manager and a Water Resources Engineer in Fayetteville, AR, for FTN Associates, Ltd., a water resources/environmental consulting firm based in Little Rock, AR. He is a registered professional engineer in the States of Arkansas, Louisiana, Oklahoma, Mississippi, Missouri, and Texas, and he is a Certified Floodplain Manager. He has over 18+ years of experience in water resources engineering, including analysis with hydrologic/hydraulic and water quality modeling, flood insurance studies, and engineering design in diverse riverine environments. He has worked on a wide range of projects involving hydrologic and hydraulic engineering design and water quality modeling, and has extensive experience working on various types of FEMA projects, the Map Modernization Program, Risk MAP, and regulatory issues and requirements.   Lee serves as FTN's lead engineer in the use of GIS in hydrologic and hydraulic applications, and is the Technical Lead on the Arkansas Cooperating Technical Partnership (CTP) project for FTN Associates, Ltd.

D5: Case Studies in Risk Communication

DHS Flood Apex: Enhancing Flood Mitigation Strategies and Tools in Mecklenburg County
James Scanlon, CFM, GISP, Charlotte-Mecklenburg Storm Water Services, james.scanlon@mecknc.gov
Co-presenters: Dr. David J. Alexander, Senior Science Advisor Science & Technology Directorate DHS
Neal Banerjee, PE, CFM Water Resources Department Manager ESP Associates, Inc.

Abstract: Mecklenburg County, North Carolina maintains one of the most proactive local flood mitigation programs in the United States. Since 1999, Charlotte-Mecklenburg Storm Water Services (CMSWS) has implemented many innovative strategies in Mecklenburg County to reduce losses from flooding through a combination of investment in data/technology, regulatory policies, program practices, and the implementation of mitigation projects. Examples of these innovative strategies

include: becoming one of the first Cooperating Technical Partners (CTPs) in the Country, mapping and regulating to future conditions, developing a real-time flood warning system (FINS), removing flood prone structures through an active buyout program, implementing a dynamic, data-driven Risk Assessment/Risk Reduction (RARR) plan and analysis tools, and initiating a community-based flood mitigation grant program (RetroFIT).   CMSWS, in partnership with the DHS Flood Apex Program, began a multi-year initiative in 2018 to develop, test, and implement enhanced mitigation strategies and tools. The strategies and tools that have been developed will not only aid the County in better addressing local flood risks, but are also intended to be shared publicly so that other communities can leverage them to create or enhance their own programs. The overall initiative included: soliciting input from other communities through national outreach, updates and enhancements to the County's existing RARR tools, development of a Community Guidebook, and implementation and integration of low-cost flood sensors for real-time flood inundation mapping and event-based analysis. Through these efforts, Mecklenburg County can now share the strategies, methodologies, and tools developed as part of the Flood Apex initiative for the benefit of the floodplain management community at large.   This presentation will provide an overview of CMSWS/DHS partnership for mitigation enhancement initiatives, sharing highlights on the products, as well as a preview/demonstration of how other entities can access project-related materials through online portals.

Biography: James Scanlon serves as a Geospatial Technical Lead for Charlotte-Mecklenburg Storm Water Services (CMSWS) in North Carolina. He has been with CMSWS since 2013, providing geospatial data management and analysis for planning projects and public communication efforts that provide community resilience to flood losses in Mecklenburg County, NC. This includes supporting the flood hazard mapping, risk assessment and mitigation implementation programs that proactively manage flood risk as well as aiding in flood response and recovery efforts. Additionally, James provides support for water quality CIP, NPDES and volunteer programs that build and maintain green infrastructure. Overall, James has over 12 years of combined public and private sector experience, working on flood-related projects funded at the local, State and Federal levels. James holds a bachelor's degree in Environmental Policy and Planning from Virginia Tech.

City of Baltimore Public Outreach Campaign for Flood Awareness
Bruna Attila, PMP, LEED AP, CFM, City of Baltimore, bruna.attila@baltimorecity.gov
Co-presenters: None

Abstract: This presentation will describe the public outreach efforts conducted by the City of Baltimore intended to increase flood awareness in the communities located along the Frederick Avenue corridor. The area suffers from recurring flood events, including a devastating flood in July of 2018 that occasioned over 6 feet of rushing water over its main road. Some of the activities include:

1. Flood Awareness Committee: The committee meets twice per month, and includes local and State officials, members of the community and community leaders. The intent of the committee is to increase flood awareness in the Frederick Avenue area, and empower residents to take action to reduce their flood risk. The committee has spearheaded a public outreach project that gathers video testimonials from community members to recount their experiences with flood in the area, mitigation strategies utilized by the community, and actions residents take prior to a storm to minimize flood risk. The testimonials will be shared on social media to increase flood awareness citywide.

2. Canvassing Event: On 7/28/2020 the Office of Emergency Management, with internal and external partners, conducted a door to door canvasing event to Baltimore City residents who have faced recurring flood events. As part of the event, area residents were given resources on flood mitigation and general emergency preparedness, and were provided with instructions on how to sign up for local emergency alerts through the BMORE Alert system. Over 30 volunteers and committee members were involved in the event.
3. B'more Prepared for Urban Flooding: a webinar was held on 10/22/2020 to increase the community's awareness regarding flood risk, the importance of flood insurance, and to present mitigation strategies to avoid and minimize flood damage. The event was advertised citywide, and 80 residents registered for the event.

Biography: Bruna Attila is the Coastal Resources Planner and acting Floodplain Manager for the City of Baltimore. She contributes to the implementation and compliance with the National Flood Insurance Program and Community Ratings System program, for which Baltimore is rated a Class 5. She has worked extensively in the environmental field and has performed watershed assessments and prepared mitigation plans for projects with national and international scopes. Bruna holds a Master of Environmental Science from Towson University and a Master of Environmental Planning and Management from Johns Hopkins University. In her free time, she enjoys cooking and reading. She is also a fan of long hikes in both urban and natural environments.

Communicating the Value of Flood Insurance During Flood Awareness Campaigns
Olivia Humilde, FEMA, Olivia.Humilde@fema.dhs.gov
Co-presenters: James G. Sink, FEMA Region 5, james.sink@fema.dhs.gov and Mia Van Horn, Floodplain Program at the Wisconsin Department of Natural Resources, michele.vanhorn@wisconsin.gov

Abstract: The National Flood Insurance Program's (NFIP) Marketing and Outreach (M&O) team explored new and engaging ways to communicate the value of flood insurance during flood awareness week initiatives and campaigns. The objective was to reach residents of communities during a time of year when state and local jurisdictions were talking about flood preparedness and mitigation. In this presentation, our team will highlight lessons learned from supporting state and local partners seeking to heighten awareness around the NFIP and flood insurance as an option for reducing risk. Attendees will learn about the importance of leveraging flood awareness or other hazard-based awareness weeks that influence flood-risk as a means to increase policies within your community. Attendees will learn: • How the NFIP supports marketing and outreach in communities promoting flood preparedness and mitigation measures. • Recommendations for how to reach, create, and deliver a successful flood awareness effort that communicates the value of flood insurance to diverse communities

Biography: With over a decade of disaster and emergency management experience, Olivia works to promote effective and vital communication between agencies, programs and the public. Specializing in risk communication, strategic outreach and public affairs, Olivia manages and supports the needs of diverse populations and audiences. She has been involved in over 25 disaster declarations, reviewing thousands of applications and meeting directly with affected individuals in a dozen states. Whether working with the U.S. Small Business Administration or the Federal Emergency Management Agency, Olivia has led emergency and disaster management initiatives and promoted essential programs to prepare for, respond to, recover from and mitigate risk of life and loss of property.

James G. Sink is the Regional Flood Insurance Liaison for FEMA Region 5. James works with NFIP partners and stakeholders to build resilient communities by increasing understanding of the NFIP, conducting insurance outreach and education, and assisting NFIP partners and stakeholders. Previously, James was a FEMA reservist in the Planning Cadre where he served as the Customer Care Group Supervisor in the Hurricane Sandy [NFIP] Claims Review Division. James has conducted continuity of operations and emergency operations planning for a large rural healthcare provider, as well as a large agricultural producer. He was a co-researcher of "The New Normal: The Direct and Indirect Impacts of Oil Drilling and Production on the Emergency Management Function in North Dakota." James holds a Bachelor of Science degree in Emergency Management from North Dakota State University.

Mia Van Horn is a Water Regulations and Zoning Specialist, Sr with the Floodplain Program at the Wisconsin Department of Natural Resources. Mia works with Wisconsin communities to assist them in adopting floodplain zoning regulations and joining the NFIP. She promotes the purchase of flood insurance with Wisconsin citizens, businesses and communities. Previously, Mia worked to write Emergency Action Plans and Inspection Operation and Maintenance Plans for large dams owned by the Wisconsin Department of Natural Resources. She has worked in natural resources for 17 years, previously as an ecologist in wetlands delineation and restoration in south Florida. Mia holds a Masters degree in Ecology from the University of Missouri-Columbia and a Bachelor of Science degree in Wildlife and Natural Resource Management from the University of Wisconsin-Stevens Point.

D6: Showcase
Wood Showcase

D7: Joint USACE & FEMA Levee Session

National Levee Safety Program and National Levee Database Updates: Improving Community Resilience
Tammy Comforti, PE, CFM, USACE; Suzanne Vermeer PE, CFM, FEMA; Brian VanBockern, USACE; Will Lehman, USACE; David Bascom, FEMA

Session E

Wednesday, May 12 – 1:30-2:30 PM central

E1: International Floodplain Management

Flood Risk Management Along the Rio Grande on the US-Mexico Border
Alejandro Riano, PE, CFM, AECOM, alejandro.riano@aecom.com
Co-presenters: Jay Springer, Northern Engineering and Consulting

Abstract: The United States shares a long border with Mexico to the south, and Canada to the north. Water management along these borders can create contentious circumstances that threaten the livelihood of residents on either side of the border. Flood risk management must take into

consideration the hydrology from each side as well as the hydraulic implications to stakeholders on both sides of the border. These implications often involve far more that the management of flood risks, including ecosystem impairments and can significantly affect agricultural operations. This presentation will provide an overview of how the US Section of the International Boundary and Water Commission (USIBWC) manages flood risk along the Rio Grande Valley. Additionally, we will discuss the formative flood events that shaped the USIBWC's mission and how they have applied this mission in recent years.

Biography: Alejandro Riano is a senior water resources engineer with AECOM's Phoenix, Arizona office. He is the Latin-America and Caribbean coordinator for ASFPM's International Committee. He is an expert in applied hydrologic and hydraulic analyses, drainage master planning, urban hydrology and regional climate model analysis in the arid regions along the southern border of the US. A native of Columbia, Alejandro has a keen understanding of Flood Risk Management both in the US and in Spanish speaking countries in central and south America.

Jay Springer is a principal and licensed engineer in Northern Engineering and Consulting's (NECI) Havre, MT office. He has over 30 years of engineering and survey experience along the Canadian border of the United States, as a project manager, crew chief, and construction inspector for transportation, hydrographic, and land development projects. Jay represented the Northern Montana Flood Coalition in testimony before Congress and supported the development of several drafts of the Montana Flood Plain Regulations.

The Complexity of Transnational Cooperation – 70 Years of International River Basin Flood Management along the River Rhine
Marc Daniel Heintz, International Commission for the Protection of the Rhine (ICPR), marcdaniel.heintz@iksr.de
Co-presenters: None

Abstract: The Rhine river basin is one of the most densely populated in Europe, serving competing interests such as navigation, industry, energy, ecological functions, and drinking water for 60+ million people spread among nine countries, and three languages.

70 years ago, and only five years after World War II, the countries in the Rhine river basin founded the International Commission for the Protection of the Rhine (ICPR). Building on centuries of collaboration, the ICPR is one of the oldest international river basin commissions in the world. By eliminating the catastrophic pollution of the 1970s, restoring upriver access for migratory fish, and dramatically reducing flood risk using politically, technically and ecologically sound modern techniques, the Rhine river basin has become a success story and a role model for other international river basins and for environmental legislation throughout Europe.

Despite advances, the river basin has suffered severe throwbacks like the Sandoz chemical accident in 1986 and the massive flooding events of 1993 and 1995 which caused billions of dollars in damage. Recovery, however, has led to even stronger and more effective international cooperation, including an investment of $16+ billion in flood mitigation measures – with a potential 500% return on investment already, including security for 5 million at-risk inhabitants.

With climate change causing more frequent and severe winter floods and summer droughts, the Rhine river system faces new challenges. In 2020, environmental ministers adopted the "Rhine 2040" program

with ambitious, measurable goals for water quality, ecology, flood management and climate change adaptation.

In our presentation, we aim to "look behind the scenes" of transnational river management, focusing on flood risk assessment and cooperative response. Questions related to decision-making, dispute resolution, implementation/effectiveness of common measures and cooperative mitigation of acute flooding events, along with lessons learned over the past 70 years will be addressed.

Biography: Marc Daniel Heintz studied geography with a focus on natural hazards and urban planning in Bonn, Germany. After having worked for the Bavarian Environment Agency in the Department of Flood Risk Management and for the Municipal Drainage Company in Cologne, Germany, as a project manager for a flood retention basin and head of unit for urban planning, he is executive secretary of the ICPR since 2020.

Transboundary River Basin Management to Prevent Drowning of the Mekong Delta

Anna Serra-Llobet, PhD, University of California, Berkeley, annaserrallobet@berkeley.edu
Co-presenters: Matt Kondolf and Rafael Schmitt

Abstract: In this presentation, we explain the role of river basin scale sediment management in preventing flooding of a delta of global importance.

The Mekong Delta is a geologically young landform, having prograded 250 km to its current extent over the last 7000 years. Lack of coordinated transboundary management of the waters and sediment of the Mekong River now threaten to exacerbate the Delta's already severe flooding problems and permanently put most of the delta under water by 2100.

Like any delta, the Mekong Delta is the result of a balance between the rate of sediment supplied by its river system and the rate of coastal erosion and subsidence. The Mekong was historically sediment rich, carrying 140-160Mt/y to its delta. The sediment not only built up the delta landform but also provided nutrients upon which a remarkably productive ecosystem and agricultural system was based. The Mekong's hydrology is characterized by pronounced annual flooding, inundating floodplains in Cambodia and Vietnam, providing habitat for diverse fish assemblages and depositing rich silts, which supported agriculture on the floodplains. While residents were adapted to seasonal flooding, building houses on stilts above the annual floodwaters, dikes are now being constructed to keep floodplains and delta lands from flooding, which prevents beneficial sediment deposition.

Over the past three decades, the sediment balance of the Mekong has been disrupted by uncoordinated development, especially of hydroelectric dams, which have already reduced the river's sediment load by half. While there are approaches to pass sediment around or through dams to maintain sediment continuity, and these have been required for two mainstem dams in the Lower Mekong by the Mekong River Commission, these techniques add expense to dam construction and are rarely implemented. The sediment starvation is exacerbated by uncontrolled mining of sand from the river channels.

Compounding the problems, natural subsidence in the delta is accelerated by uncontrolled groundwater pumping. Considering all these drivers together, the business-as-usual scenario results in >90% of the delta sinking below sea level by 2100. However, if coordinated transboundary basin management were possible (avoiding the most impactful dam sites, incorporating sustainable sediment management into

dam design and operation, controlling sand mining, and controlling groundwater pumping), the subsidence rate could be reduced and as little as 20% of the Delta could be submerged by 2100.

Biography: Anna Serra-Llobet is an environmental scientist whose research concerns to flood risk management policies. Anna Serra-Llobet received her PhD in Environmental Sciences from the Autonomous University of Barcelona in 2011. After finishing her PhD, she interned at the Water Unit of the Directorate General for the Environment at the European Commission (European Union) in Brussels. Currently she is the Director of the Sustainable Floodplains Initiative at the Institute of International Studies, University of California Berkeley.

E2: Nature-Based Mitigation Actions

Nature Based Solutions to Hazard Mitigation
Johnny Mojica, Earth Economics, jmojica@eartheconomics.org
Co-presenters: Rowan Schmidt

Abstract: Natural disasters such as floods, wildfires, and droughts are increasing in frequency and severity in the US. FEMA has begun to recognize and emphasize the value of investing in the conservation and stewardship of healthy landscapes for mitigating the impacts of floods, wildfires, and droughts, as reflected by recent policy updates in 2013 and 2016, and is also placing a greater emphasis on proactive investments before disasters occur (PDM). This has made it easier to use FEMA mitigation funding for land conservation (especially in floodplains) and other nature-based solutions such as post-wildfire restoration of forested lands, aquifer storage and recovery, and wetland and riparian restoration. Earth Economics supported FEMA on the economics behind their 2013 and 2016 policies, and has been supporting partners in CA (post-wildfire), TX (post-Harvey), SC (post-Florence) and other states to navigate these opportunities, conduct benefit-cost analysis, and apply for HMPG funding for projects that have overlapping conservation and hazard mitigation benefits. Earth Economics helps by providing expertise in economic benefits, as well as a deeper knowledge of the process—especially those considerations more likely to result in grant approval.   Past Project Examples: California: Acquisition, restoration, and ongoing stewardship of a 2,000-acre parcel of land in the hillside adjacent to the City of Ventura to reduce fire risk to nearby homes. California: Acquisition and restoration of a 28-acre parcel along the Ventura River, which will increase the flood water storage potential of the floodplain and reduce flood risk to adjacent and downstream structures. South Carolina: Acquisition and restoration of parcels with structures and open space parcels in the floodplain along the Waccamaw River near Conway to reduce flood risk to downstream structures. Texas: Acquisition of a 300 surface-acre impoundment reservoir and reconnection to 400 acres of floodplain land for use as floodwater storage infrastructure during future floods.

Biography: As a Project Director at Earth Economics, Johnny specializes in holistic economic analyses of public spaces, river systems, and the outdoor industry. He works to assess the impact of policy, management, and business decisions by using economic tools such as input-output modeling and benefit-cost analysis. His work has resulted in providing local, state, and national park systems with the tools needed to quantify the social, environmental, and economic benefits of public spaces. Johnny is currently working with land conservation groups throughout the country to build stronger, more

resilient communities by developing green infrastructure projects and submitting them for funding under the Hazard Mitigation Grant Program and Building Resilient Infrastructure and Communities (BRIC) program. His experience working with nonprofits, tribes, business groups, and all levels of government, allows Johnny to leverage his findings with diverse communities and decision makers.

Bootstrapping Federal Grants on your way to Green Resilience
Matt Lyttle, Guidehouse, mlyttle@guidehousefederal.com
Co-presenters: Angela Gladwell, FEMA, angela.gladwell@fema.dhs.gov

Abstract: Infrastructure and climate experts agree: the nation requires major investment to mitigate the impacts of our changing climate. Nature-based solutions that prioritize the preservation and restoration of natural areas can be a powerful tool to curb the effects of floods and climate change, but only if communities choose to embrace them. A growing number of communities want to fund and implement these new "green infrastructure" solutions independent of or alongside traditional "grey infrastructure." And now several federal agencies offer grants and technical assistance to make these projects a reality in your hometown.   Guidehouse has supported federal agencies at the forefront of flood mitigation and natural resource protection. This session will feature best practices in planning – and funding – nature-based infrastructure based on stories of success collected by Guidehouse staff across multiple federal engagements. The speaker will share how to develop compelling and achievable green infrastructure proposals that improve the likelihood of federal funding. More than just a showcase of existing grant programs, the session will offer attendees insights on how to string multiple federal resources together into larger, more ambitious projects. Participants should expect to gain awareness of where to find federal dollars for these green solutions and how to maximize their impact in a community. In total, this presentation will provide a wide-ranging overview of existing federal funding for nature-based flood mitigation solutions.

Biography: Matt Lyttle is an Associate Director in the National Security Segment at Guidehouse. Before joining Guidehouse, he was staff to the Senate Homeland Security and Government Affairs Committee (HSGAC), where he developed legislation on green infrastructure, disaster resilience, and federal emergency management. Matt has held several positions within FEMA's National Preparedness Directorate, including as the Acting Deputy Director of Individual and Community Preparedness. Matt is a Returned Peace Corps Volunteer, having served from 2008 to 2010 in Nicaragua where he witnessed the long-term effects of insufficient hazard mitigation. He has continued to build resilience in Latin America by introducing successful preparedness initiatives to Bolivia, Chile, and Mexico. Matt and his family live in Fairfax County, Virginia where he volunteers on local land use and planning task forces.

Angela R. Gladwell serves as the Federal Emergency Management Agency's (FEMA) Director for Hazard Mitigation Assistance in the Mitigation Directorate within the Federal Insurance and Mitigation Administration. Throughout her more than twenty years of experience in emergency management and environmental policy and over twelve years leading federal programs, Ms. Gladwell has worked to inform public decision-making and improve inter-governmental collaboration, partnership and transparency in reducing the nation's risk to natural disasters.

Biomimicry and Nature-Based Solutions: Designing for Optimized Social and Ecological Value
Elise Ibendahl, Jacobs, elise.Ibendahl@jacobs.com
Co-presenters: Christopher Lee Allen, Jacobs, Senior Consultant, chris.allen@jacobs.com

Abstract: The National Mitigation Investment Strategy (NMIS) identifies nature-based solutions as a cost-effective approach to keep natural hazards from becoming costly disasters. The potential value of including nature-based solutions in resilience planning comes from the many benefits they offer and the wide range of partners and stakeholders that can be assembled to support the approach. According to FEMA, the potential benefits can include improved water quality, cleaner water supplies, improved air quality, healthier wildlife habitats, increased property values, green job creation, and improved public health. Optimizing the co-benefits from nature-based solutions that can compliment risk reduction requires a thoughtful, methodological, and interdisciplinary approach to planning and coordination. Key to ensuring long term benefits from nature-based solutions also requires an understanding of and accounting for regional ecological, social, and economic dynamics that will exert impacts on the project in the short, medium, and long terms. Having this regional context knowledge to inform planning and design teams at the outset of the project is vital. This presentation will explore Biomimicry as a method for analyzing regional systems to provide clues and inspiration that can support a well-informed and inspiring integration of nature-based solutions in community resilience planning and design. Biomimicry is the art and science of learning from and then emulating nature's forms, processes, and ecosystems to create more sustainable and resilient designs. The session will be both informative, sharing innovative biomimicry approaches to sustainability and resilience planning, and interactive, providing a place for dialogue and group brainstorming about the unique opportunities afforded by the biomimicry approach to resilience planning that can generate a range of co-benefits and engage stakeholders in an innovative approach.

Biography: Elise Ibendahl is the Global Technology Lead for Flood Modeling and Planning for Jacobs Engineering Group, Inc. She is a licensed engineer in the State of Missouri, a Certified Floodplain Manager (CFM) and has over 23 years of experience in the water resources industry. She is a leader in the engineering community, respected for her past service as an ASCE Region VII Governor and her current service as a Trustee for the ASFPM Foundation Board. Ms. Ibendahl often serves as a senior technical resource for the hydrologic and hydraulic (H&H) components of Jacobs project work, specializing in urban flood analysis and mitigation design, and has served as a regional leader within Jacobs for FEMA Public Assistance Technical Assistance Contractor teams. She is experienced in hydrologic and hydraulic modeling of both sewer and open channels in a variety of platforms. She also has expertise in both 1D and 2D modeling and has performed in the role of project manager and/or subject matter expert for over 70 projects related to flood risk management for Federal, State, and Local entities throughout her career. She has provided design and analysis services for both local and nation-wide projects that contain aspects of drainage and stormwater management studies, including stream restoration, flood control study and design, urban stormwater master planning, green infrastructure solutions, and floodplain permitting.

E3: Beyond Regulatory: Risk Assessment and Climate Adaptation

North Carolina Floodplain Mapping Program's (NCFMP) Advisory Floods Studies & Website
Gray Minton, PE, GISP, AECOM, Gray.Minton@aecom.com
Co-presenters: Paul Ervin, PhD, North Carolina Emergency Management, paul.ervin@ncdps.gov and Tyler Longberry, PE, CFM, AECOM, tyler.longberry@aecom.com

Abstract: The North Carolina Floodplain Mapping Program (NCFMP) has developed the Advisory Floods Website in order to display Advisory Flood hazard data resources being developed as a part of river based 2-dimensional (2D) modeling studies. The Advisory Floods hazard data presented in the website provides more flood recurrence intervals and spatial breadth of flood hazard data coverage as the mapping activities used to produce this information are performed further into the extent of the river basins than NCFMP's traditional regulatory floodplain mapping studies. The website will provide water surface elevation information for the 20%, 10%, 4%, 2%, 1%, 0.5%, 0.2%, and 0.1% annual chance frequency events. Additionally, the 1%-plus event representing the upper confidence bound of the 1% annual chance rainfall event and an additional three future rainfall events may be displayed based on the median 1% annual chance rainfall depth, plus 10%, plus 20%, and plus 30%, to model climate adaptation.   Risk assessments and mitigation strategies will be displayed on the website for building footprints that intersect the hazard areas described above. These studies will offer flood hazard data and flood risk products to areas where they were previously unavailable, and the Advisory Floods website will be used to help communicate that information in order to protect and preserve the lives and property of citizens in North Carolina.

Biography: Mr. Minton (PE, GISP) serves as AECOM's Technology Solutions Manager and has over 25 years of experience dedicated to FEMA-funded projects for federal/state/local agencies encompassing engineering, GIS, and software development. He has worked with many CTP's nationwide and, being originally from North Carolina, he is proud to have worked with the North Carolina Floodplain Mapping Program since its inception, managing the development of many groundbreaking tools and workflows. Mr. Minton manages the development, improvement, and implementation of tools and processes used to streamline production efforts, as well as leading innovative projects to improve the quality and capabilities of data products. His unique combination of engineering, GIS, programming and project management experience makes him a key technical resource for solving complex problems as well as providing thought leadership and technical support to teammates and clients.

Dr. Paul Ervin has been an economist with the North Carolina Department of Public Safety's Emergency Management Division since 2018. Dr. Ervin works on policy, disaster response, and insurance and risk management. He obtained his PhD from Washington State University in 2016. He has also worked in Paraguay and has written on poverty, malnutrition, and food insecurity.

Mr. Longberry (PE, CFM) is a Senior Water Resources Engineer with more than a decade of experience in water resources engineering, primarily in support of FEMA flood studies. Over the course of his career he has worked closely to support the North Carolina Floodplain Mapping Program with hydrologic and hydraulic (H&H) modeling for riverine and coastal study areas, focusing heavily on 1D (steady and unsteady) and 2D modeling.

America's Next Top Model: Comparing Climate Change Modeling Tools and Data Sets for Practical Applications

Matthew Jones, CCM, Woodard & Curran, msjones@woodardcurran.com
Co-presenters: Ian Jaffe, PE, Project Engineer, Woodard & Curran, ijaffe@woodardcurran.com and Millicent Cowley-Crawford, PE, CFM, Senior Project Manager, Woodard & Curran

Abstract: Our shifting climate is forcing communities across the country to re-evaluate their previous understanding of local and regional flood risk. Decision-makers are increasingly incorporating climate

change into planning and design of infrastructure as they seek to build resiliency. But identifying the right climate change data sets, analyses and risk tolerance can be a daunting task. Even highly rigorous scientific analyses are still a prediction, and will the benefits of additional local resolution outweigh the costs?   This paper provides a high-level summary of the strengths, weakness, and practical applicability of available climate change modeling tools and datasets across multiple regions of the United States. There will be a discussion of the level of detail required by a range of infrastructure planning objectives. Some of the approaches to be evaluated include quantitative downscaling of Global Climate Model (GCM) data, regional climate outlook tools (e.g., CalAdapt, NOAA Climate Resilience Toolkit), and statistical extrapolations of historical data for future climate scenarios. Recommendations will be made as to practical approaches to efficiently and effectively address climate change in a wide variety of infrastructure planning.

Biography: Matthew Jones, meteorologist and project manager, specializes in modeling, consultation, and project management in Woodard & Curran's Environment & Remediation group. His experience includes weather and climate modeling, air pollution chemical transport simulation, accidental release consequence analyses, and toxic plume deposition modeling. By employing cutting-edge modeling approaches to solve clients' unique risk assessment challenges, Matt has assisted numerous clients in identifying and resolving air quality issues and achieve their project goals.

Ian Jaffe is a Project Engineer with Woodard & Curran specializing in master planning and hydraulic modeling. His background includes potable water, wastewater, recycled water and water resources projects for clients across the country. Ian has over 6 years of experience and holds a B.S. in Civil Engineering from UC Berkeley and an M.S. in Environmental Engineering from Stanford University.

Great Interagency Collaboration, Greater Mitigation Outcomes
Sarah Abdelrahim, FEMA, sarah.abdelrahim@fema.dhs.gov
Co-presenters: Casey Zuzak, FEMA; Will Lehman, U.S. Army Corps of Engineers; and David Bascom, FEMA

Abstract: In order to develop and deliver flood hazard and flood risk information, FEMA collaborates with other federal, state, and local agencies. For example, FEMA is working with the U.S. Army Corps of Engineers (USACE) to improve the data in the National Levee Database and understand the risks of levee overtopping or failure. No single federal agency has complete authority for modeling flood hazards across the country. Interagency collaboration can leverage the strengths and expertise of each agency, while maximizing limited resources.   Through its Future of Flood Risk Data initiative, FEMA is exploring ways to develop more comprehensive and consistent flood hazard and flood risk information across the nation. This approach involves a shift from FEMA's current binary approach to flood mapping (i.e., mapping the 100-year flood) to an approach that delivers probabilistically-derived graduated data across a range of different flooding scenarios. A national modeling framework could bring together federal datasets and models to support graduated flood hazard and flood risk identification.

This presentation will do the following:

- Share examples of FEMA's flood data and information partnerships
- Highlight the importance of interagency collaboration for flood hazard and flood risk identification in order to advance mitigation, floodplain management, and insurance uptake

- Share objectives of a memorandum of understanding between FEMA, the National Oceanic and Atmospheric Administration (NOAA), the U.S. Army Corps of Engineers (USACE), and the United States Geological Service (USGS) that can support FEMA's future delivery of flood risk data and information
- Share opportunities to bring agency flood models together to deliver more consistent and comprehensive data across the nation
- Discuss how interagency collaboration can lead to more enhanced and streamlined stakeholder capacity in a time of reduced financial resources and increased need

Biography: Sarah Abdelrahim is an Emergency Management Specialist with FEMA's Risk Management Directorate.

E4: CTP Ensemble

Better Together – The Value of a State CTP and Interagency Partnership
Jerry Snead, PE, CFM, NCDOT, jmsnead@ncdot.gov
Co-presenters: None

Abstract: NCDOT has implemented a Highway Floodplain Program to support compliance with various federal and state regulations which encourage a broad and unified effort to prevent uneconomic, hazardous, or incompatible use and development of floodplains. The primary driver of this program was the establishment in 2008 of a state Memorandum of Agreement (MOA) between NCDOT and the North Carolina Floodplain Mapping Program (NCFMP) in the Division of Emergency Management within the North Carolina Department of Public Safety. Prior to this, in September 2000, FEMA designated North Carolina as a Cooperating Technical Partner (CTP) and thereby delegated the responsibility to NCFMP to update and maintain the state's Special Flood Hazard Areas (SFHAs), Digital Flood Insurance Rate Maps (DFIRMs), and processing of all Letters of Map Changes (LOMC) in North Carolina to ensure compliance with FEMA's National Flood Insurance Program (NFIP) regulations. Both NCDOT and the NCFMP recognized the need to function in a collaborative partnership in order to effectively deliver NCDOT's multi-modal transportation programs, including road improvements, bridge and culvert construction or repair, maintenance facilities operations, ferry operations, greenways, railways, etc. This led to the 2008 signing of the MOA, which allows for efficient use of both agencies' resources and has been developed in a manner to streamline project FEMA approval reviews and maintain construction schedules in a cost-effective way. This presentation will discuss how the MOA between NCDOT and NCFMP has served to mutually benefit both state agencies in fulfilling their respective missions and goals over the past twelve years. Discussion will include a summary of past successes, lessons learned, and future goals for the continuation of this MOA between the two state agencies.

Biography: Jerry Snead, PE, CFM has a BSCE degree from Va. Tech and over 29 years of experience in the NCDOT Hydraulics Unit. He is currently the engineering supervisor of the unit's statewide Highway Floodplain Program which was established to ensure compliance with FEMA's National Flood Insurance Program regulations for NCDOT projects. He also has been involved in the development and maintenance of NCDOT's Guidelines for Drainage Studies and Hydraulic Design manual and related

computer and web resources, including a GIS database for a Level III wave vulnerability study of NCDOT's coastal bridges.

Correcting an Overstated Un-Numbered "A" Flood Zone for the Chena Slough through a CTP Grant

Nancy Durham, MURP, CFM, Fairbanks North Star Borough, nancy.durham@fnsb.gov
Co-presenters: None

Abstract: Property owners along the Chena Slough in Interior Alaska have long disputed the flood zone designations in the area. When Moose Creek Dam and Tanana River Levee were constructed in the late 1970s, the Slough was cut-off from the Tanana River, severing the connection and flow of water from the Tanana River to the Chena River. With the adoption of the 2014 FIRMs, the unnumbered "A" flood zone increased significantly. This promoted the Borough to work with FEMA to obtain a CTP grant and conduct a detailed flood study. 479 parcels were subsequently removed from the flood plain, saving the community $5,008,500 in flood insurance. This presentation will focus on the flood study process, a few bumps along the way, lessons learned and plans for the future.

Biography: Nancy Durham has over 15 years of experience in community planning. Since June 2015, she has served as the Flood Plain Administrator for Fairbanks North Star Borough (FNSB). Her responsibilities include all aspects of floodplain management, overseeing flood map revisions and Cooperative Technical Partnership Grants, which she secures. Nancy is intimately familiar with flood planning disaster management after her personal and professional experience with Hurricane Katrina in 2005. She worked tirelessly and selflessly to help property owners that were impacted while she herself briefly faced homelessness. During the recovery and rebuild efforts she served as essential personnel and worked closely with Slidell Chief of Staff's office to provide needed information to make the best decisions for the community.   In addition to her current position with FNSB, Nancy is actively involved with the Emergency Operation Center Team for disaster recovery. She served as Director in Training and Director of the EOC during the 2019 Shovel Creek Wildfire. She also served as Planning Section Support Chief during the 2020 COVID-19 Pandemic. Nancy has been instrumental in providing outreach and education services to bring awareness to the importance of floodplain management in Slidell, Louisiana and FNSB. She is committed to finding mitigation solutions for the prevention of potential flooding within FNSB. Nancy holds a master's degree in Urban and Regional Planning from UNO; has been a member of ASFPM and a Certified Floodplain Manager since 2009; engages in continuing education and personal development to stay compliant with the latest policies and trends.

Cooperating Technical Partners 5-Year Operations Plan (2022-2027)

Laura Algeo, FEMA HQ, laura.algeo@fema.dhs.gov
Co-presenters: None

Abstract: Building off the 2020 ASFPM concurrent session on the Feedback Survey results, this session will showcase how the CTP Program is improving by implementing several key changes collaboratively developed through the Feedback Survey process. Changes include new tools, processes, resources, and features, such as the Performance Measures Reporting Tool, to improve management and effectiveness of the Program.   This presentation will show how implementing the 5-Year operations plan supporting CTPs, communities, and stakeholders, we will ensure that CTPs have the training, tools and resources they need to maximize the budgets received by FEMA and leverage their internal budgets to ensure

delivery of information to assist communities in achieving resiliency through mitigation and flood risk awareness.

Biography: Laura Algeo is an Emergency Management Specialist with the Federal Emergency Management Agency (FEMA) Headquarters working in the Engineering Services Branch of FIMA's Risk Management Directorate. She currently serves as the technical team lead and the national coordinator for the Cooperating Technical Partners program focusing on collaboration and innovation in the programs and development of training, policy and guidance. Previously, Laura served as a Senior Civil Engineer for the Mitigation Division in the FEMA Region IV office. She has been with FEMA since August 1999 and with FEMA Headquarters since 2015.   Ms. Algeo has a Bachelor of Civil Engineering from the Georgia Institute of Technology with an environmental focus and a Bachelor of Science from Berry College in Rome Georgia. She is registered as a Professional Engineer in the State of Georgia.

E5: Flood Risk Training & Education Programs and Practices

RISE Challenge - Engaging Youth to Build Resilient Communities
Tony Mendes, CFM, FEMA, tony.mendes@fema.dhs.gov
Co-presenters: Vince Meldrum, CEO Earth Force

Abstract: Join FEMA Region 8, Earth Force, and Resilience Action Partners to learn how students are making communities more resilient by learning about and protecting floodplain and fragile natural resources. Follow along as we provide the history of how the RISE Challenge developed from idea to pilot, and pilot to national program.   By participating in this presentation you will learn how the RISE Challenge has developed over the years into a turn-key program that 80% of participating students say has motivated them to be involved in local resilience planning and has prepared them to be future leaders of community floodplain efforts. Participants will also learn what makes the program successful and learn how they can bring the RISE Challenge to their community.   The RISE Challenge is part classroom learning, part competition, and part summit, focused on natural hazards and student-led learning. Guided by the Earth Force Community Action and Problem-Solving Process, the RISE Challenge engages students in the exploration of their communities to determine where they are vulnerable to natural disasters and tasks them with developing their own ideas for making their community more resilient. The RISE Challenge represents an innovative approach to preparing citizens to play a role in community resilience. Through this initiative, we are developing engaged citizens by building their resilience toolbox when they are still young.   Ultimately, this effort is intended to create young citizens who engage in the community's dialogue around resiliency and sustainability, who are then able to move into future leadership roles within their various communities as they grow, armed with knowledge and awareness of the natural hazards we all live with, and the abilities to identify what to do (mitigation) and how to do it (political engagement).

Biography: Louis "Tony" Mendes serves as a Senior Mitigation Specialist with the Federal Emergency Management Agency's (FEMA) Risk Analysis Division in Region VIII, headquartered in Denver, Colorado. Mendes has 30 years of experience in Emergency Management, serving the United States Army and Colorado Office of Emergency Management before joining FEMA in 1992. Mendes holds a degree in Business Administration and Finance from the University of San Francisco, and studied at the University

of Denver Korbel School of International Studies with an emphasis in Homeland Security.   Within FEMA, Mendes has played numerous roles focused on program and grant management, operational planning, risk communications, and fiscal analysis. He has managed more than 40 Field Disaster Joint Field Offices (JFO) and led successful efforts to develop non-traditional funding mechanisms that ensured effective Community Redevelopment in post-disaster situations. In his current capacity, Mendes supports the Region's disaster operations, outreach and risk analysis programs, evaluating the effectiveness of federal investments through Benefit-Cost Analysis and overseeing the Community Engagement and Risk Communication (CERC) contract.   A Certified Floodplain Manager (CFM), Mendes serves as the Senior Mitigation Curricula Instructor for FEMA Headquarters, teaching a variety of courses on mitigation planning, mitigation plan development and grant management across the country. He has developed numerous Hazard Mitigation Proposals (HMPs) for 406 Mitigation efforts in partnership with Public Assistance on behalf of communities, and innovated mitigation roles in a new Public Assistance Delivery Model to measure customer relations and effectiveness.   Mendes has two sons and enjoys traveling, gardening, skiing, and raising Kunekune pigs and Friesian horses in Denver, Colorado and at Raven's Nest Farm in south-central Wisconsin.

Vince Meldrum has been active in the academic and nonprofit world for over 20 years, and has led a national nonprofit organization, developed successful nonprofit/corporate partnership programs, chaired national education efforts and served as a field leader on steering committees and advisory boards. As the President of Earth Force, Meldrum leads a team of committed and talented individuals who set the national standard for quality civic and environmental education for America's youth. Among his most important achievements is committing Earth Force to high standards of accountability for individual, organizational and programmatic excellence.   Meldrum's focus on developing systems for personal accountability tied to outside program evaluation, helped make Earth Force one of the highest performing organizations in the fields of environmental education and service learning. Prior to his leadership at Earth Force, Meldrum spearheaded efforts to develop philanthropic strategies for the wireless telephone industry as the Director of Operations at the Wireless Foundation.   Meldrum created national initiatives that provided vital human services while enhancing marketing, public relations and government relations efforts of contributing companies. Call To Protect, for example, a national partnership between the National Coalition Against Domestic Violence, Motorola, wireless telephone carriers and local domestic violence organizations—provided wireless phones and airtime to victims of domestic violence, in many cases saving their lives. The partnership, which just celebrated its 12-year anniversary, has donated over $10,000,000 to domestic violence organizations nationwide, engaged hundreds of members of congress and generated very positive media coverage.

Statewide Virtual Training - FFMA's Approach to Education During the Pandemic

Michael Rimoldi, MPA, CBO, CFM, Florida Floodplain Managers Association, mike@rimoldi.org
Co-presenters: None

Abstract: In the midst of the pandemic, the Florida Floodplain Managers Association (FFMA) saw the need to adapt their training capabilities. First their annual conference was cancelled, then in-person class after class faced the grim reality of cancellation due to the pandemic. But instead of just giving in, FFMA found a new way! Transitioning both their annual conference AND ongoing classes to a virtual format, success was realized for both the organization AND members. While at first glance some might see virtual training as restrictive, it's just the opposite. Now attendees who normally might not be able to attend a class in person can do so remotely. The restraints of geography (Florida is a big state when

you drive from one end to the other) and the limitations of being able to get out of the office are no more. In addition, many of the classes which typical had a sole instructor, can now incorporate several instructors with little or no logistical concerns that would be faced if multiple people were to try to meet at one geographic location.   This presentation will show how FFMA has not just survived in the virtual training endeavor but succeeded! This session will demonstrate how other organizations around the country can do so as well. Techniques for success, what has worked and what hasn't and how we got where we are as an organization will be discussed and shared with the hopes other groups can utilize the procedural information of providing training for their members even in the unknowns of a worldwide health event.

Biography: Michael's over thirty years of experience has been gained on both sides of the permitting counter. His experience includes several years spent in the local government sector with the Hillsborough County, Florida Development Services Division in the Building Department. He worked as a plans examiner and then was subsequently promoted to the position of General Manager of Building Code Compliance and Contractor Licensing and eventually became the Building Official for Hillsborough County; a jurisdiction of over 1 000 square miles and a population of 1.2 million.   In addition to applying and interpreting the building codes, Michael is also a licensed building contractor who has worked on both residential and commercial projects of various scopes. He is also an ASFPM Certified Floodplain Manager.   Michael is a credited reviewer of several FEMA construction-related documents including the Coastal Construction Manual, the Local Officials Guide to Coastal Construction and Natural Hazards and Sustainability for Residential Buildings. He has appeared on several national media outlets discussing building codes and construction including CNN, Good Morning America, and The Weather Channel.   Michael's experience extends into the classroom where he teaches a variety of classes on the building codes, disaster preparation and floodplain management. Audiences include all levels from those new to the topics to advanced students learning the latest code changes and requirements.   Michael received a Masters in Public Administration in 2011 from the University of South Florida and is currently a PhD candidate at University of South Florida.

The A, B, C's of Facilitating a Virtual Community Meeting

Kelly Keefe, AECOM, kelly.keefe@aecom.com
Co-presenters: McKenzie Houston, CFM, AECOM

Abstract: Virtual platforms can provide us with new opportunities to engage with the community and document that process differently. Although it can be challenging to keep the face-to-face momentum and excitement in a virtual environment, the reality is that virtual tools save time and money and allow for larger attendance. But there are also trade-offs, such as getting people to call in and engage or participate like they would in an in-person meeting.   Accessibility- The ADA was enacted to ensure people with disabilities have the same opportunities as those without. It provides multiple ways for people with disabilities to participate, including written, verbal, and visual methods.   Build Trust- Partners and stakeholders are challenged to adapt to a new way of building trust without eye contact and handshakes. Offering emotional check-ins at the beginning of each meeting allow people to share and connect. This creates space for acknowledging missteps or where things could be better throughout the meeting and opens the lines of communication with your participants.   Comply with open meeting laws. Open meeting laws protect the right of the public to be notified regarding deliberations of public officials as they make decisions. Laws vary by state, so check the specific requirements where you are conducting meetings.   Design a well thought out meeting.   Agenda should be simple. In a virtual

platform you can't read the room and modify easily, so it is easy to lose attention of attendees. Send agenda ahead of time, ensure a neutral background and minimize distractions.   Ban multitasking. Close the session with clarity and commitment   This presentation will demonstrate how we as facilitators can support each other and engage through a variety of ways to help our stakeholders become more comfortable using virtual platforms and understanding risk.

Biography: Ms. Keefe has 20 years of experience supporting local, state, and Federal governments with building robust emergency management programs. She serves as Program Account Manager providing support for maintaining integration of outreach efforts across Risk MAP providers on Compass PTS Team. She has worked as a Program Analyst for FEMA specializing in Risk Analysis and Planning while facilitating Mitigation Program Consultations. She served as Policy Development Specialist for GEMA specializing in risk reduction, hazard mitigation planning and grants administration. She attended Florida Atlantic University where she graduated with a Bachelor of Science in Public Management from the College of Architecture and Urban Public Affairs.

E6: Challenges in Dealing with Rising Tides

High Tide Flooding Thresholds: Real-World Consequences of Scientific Datums
Carey Schafer, The National Academies / Northern Gulf of Mexico Sentinel Site Cooperative, careyscha@gmail.com
Co-presenters: Renee C. Collini; Vincent M. Brown; Amanda B. Lewis; Barry D. Keim; Clay S. Tucker

Abstract: The frequency of high tide flooding (HTF), also known as nuisance or sunny day flooding, has increased along the United States coast by 100% in the last 30 years due to sea-level rise (SLR). As SLR continues, HTF will become more frequent and affect areas that have not previously seen impacts. For many of these areas, HTF is a significant disruptive event that negatively impacts low-lying infrastructure, interrupts municipal services, and impedes commerce. Understanding how HTF will change in the future is critical for assessing current and future risk and determining how best to utilize limited resources. However, decision-makers may be basing flood resilience planning on HTF projections that use thresholds that do not reflect on-the-ground impacts.   HTF thresholds are used to quantify when a flooding event triggers 'minor' impacts and to project future flooding occurrences. HTF thresholds derived by Sweet et al. (2018) represent a standardized approach based on the great diurnal tidal datum, the height difference between mean higher high water (MHHW), and mean lower low water (MLLW). Standardization allows HTF to be compared across the country; however, the threshold often does not align with observed impacts at the community level. The HTF thresholds from NOAA Weather Forecasting Offices (WFOs) are established in concert with emergency managers, keeping local impacts in mind. This results in ~75 different minor flooding (HTF) definitions across the country. However, based on local news reports of flooding, HTF estimates from NOAA WFOs may also mischaracterize the number of days per year residents experience flood impacts.   Using locations in the Gulf of Mexico, we will examine how reflective these two thresholds are of real-world impacts. Also, we will discuss how these thresholds can be integrated into policy planning and implementation and provide suggestions to guide future planning that considers HTF.

Biography: Carey Schafer is currently working as a Science Policy Fellow with the National Academies during the 2020-2021 school year. As a fellow she was placed with the Northern Gulf of Mexico Sentinel

Site Cooperative, a partnership that works to fill identified gaps and needs in sea-level rise science and management throughout the northern Gulf of Mexico. Before joining the National Academies, Carey earned her M.S. in marine science from the University of South Florida College of Marine Science and her B.S. in environmental science from Tulane University.

Considering Sea-Level Rise in Long-Term Infrastructure Planning - What is it worth?

Camille Sicangco, University of Florida, camillesicangco@ufl.edu
Co-presenters: Renee Collini, Mississippi State University and Chase Glisson, Jackson County Utility Authority

Abstract: Sea-level rise (SLR) is negatively impacting coastal infrastructure such as reducing the effectiveness of stormwater systems, jeopardizing key aspects of fresh and wastewater systems, and flooding roads more frequently. Adapting to these challenges can take on a variety of formats depending on the specific needs of the systems and the people they serve. To understand the benefits of planning for long-term flood risks as sea levels rise, we examined the costs associated with long-term flood protection around a planned new water reclamation facility in Jackson County. We leveraged a recently released tool, the National Institute of Standards and Technology's Economics Decision Guide Software (EDGe$), that is designed specifically to facilitate considering the costs and benefits of taking resilient action. Together, we worked through the various inputs for costs, the potential losses that would be sustained during a flood by the Jackson County Utility Authority, and potential losses that would be sustained by the broader community if the new facility were to be flooded. Through this effort many things about the process were identified that could inform future efforts including key assumptions, regulatory requirements in cost-benefit analyses, and challenges in considering changing flood risk over time. The results of this specific cost-benefit analysis will be presented. Additionally, we will share lessons learned from the process and recommendations for similar efforts in the future.

Biography: Camille Sicangco is a third-year undergraduate at the University of Florida dual-majoring in mathematics and botany. As a Summer 2020 Undergraduate Apprentice with Mississippi State University's Coastal Research and Extension Center, Camille evaluated the cost-effectiveness of local sea level rise adaptation strategies. She also conducts research on plant biomechanics and the dynamics of understory biodiversity at UF. Camille hopes to pursue a career that combines her research interests in plant ecology, community decision-making, and sustainability.

Staying dry with rising tides - case study Miami Beach

Gabe Lederman, Wapro Inc, gabe.lederman@wapro.com
Co-presenters: None

Abstract: The City of Miami Beach, Florida, is a beautiful resort community nestled between the Atlantic Ocean and Biscayne Bay, built on natural and man-made barrier islands.   Infrastructure which ensures residents and tourists in Miami Beach aren't regularly flooded by sea water is often taken for granted however with a changing climate it has become evident to residents that there are issues that need to be dealt with.   Much of the system that transports stormwater directly to the sea was built just a few inches to one to two inches above sea level. Over the years these outlet structures have settled, and sea levels have risen, often causing seawater to flow into the stormwater system.   Overfilled stormwater systems cause seawater to flood streets, residential and commercial properties causing blocked roads, inconvenienced pedestrians, closed businesses, and damaged homes.   A team of scientists of the

Potsdam Institute for Climate Impact Research (PIK) in Potsdam, Germany has detected a clear upward trend in the past few decades toward more unprecedented daily rainfall events. The institute found that these once anomalous events have increased in frequency 24 percent in central and eastern US.   Miami Beach is spending over US$500m to brace for the scientific projection that the sea level will rise 60 inches by the turn of the century. This paper will present issues surrounding aging infrastructure, and solutions put in place during phase 1 & 2 of this monumental project exhibiting the success of the project and potential issues surrounding trying to flood-proof a city.

Biography: Gabe Lederman, has worked in the water segment for 20 years worldwide. He has been involved in projects in Delaware, Maryland, New York, New Jersey, Pennsylvania, and throughout the Middle East primarily working with city councils to ensure their infrastructure is future-proof in terms of flood prevention caused by back flow in stormwater systems.

E7: Addressing Social Justice in Floodplain Management

Flood Risk at the Frontline: Systemic Inequities in Floodplain Management

Jessica Ludy, U.S. Army Corps of Engineers, jessica.j.ludy@usace.army.mil
Co-presenters: Dámaris Villalobos-Galindo, PE, QSP/D, CFM, Valley Water

Abstract: Floods disproportionately impact communities of color, Black and Indigenous communities, and other marginalized groups. Often left out of decisions that significantly affect them, communities of color are also more likely to be relocated than white or affluent communities, who are instead 'protected' in place. Furthermore, these frontline communities are on track to experience adverse climate change effects more severely and frequently than the rest of us.   As floodplain managers, we are well-positioned to build resilience for all communities in an equitable way—especially for our most vulnerable. But advancing social equity in flood risk management requires first understanding the problem. How did we get here? What legacy discrimination and other policies have contributed to this outcome? How does our standard risk analysis capture or ignore the needs of frontline communities? In what ways does flooding exacerbate existing inequities, and what additional factors could be at play? This presentation will discuss how systemic racism touches every part of the flood risk management cycle, making frontline communities less prepared for, less able to respond to, and recover from floods. Beginning with a history of racism in flood management, this presentation will also explain how well-intended flood and disaster policies and practices have unintended consequences that cause further harm to vulnerable groups. Finally, presenters will briefly discuss opportunities to advance equity through our work as floodpain managers. Audience brainstorming is encouraged to help move this important work forward.

Biography: Jessica Ludy is the Flood Risk Program Manager and Silver Jackets Coordinator with the U.S. Army Corps of Engineers, San Francisco District. She works with communities from Northern California to better understand, communicate, and manage their flood risk. Jessica has 14 years professional experience, including time spent in the Netherlands as Fulbright Scholar and Researcher with Delft University of Technology and the Unesco Institute of Hydraulic Engineers. Jessica is a co-chair of ASFPM's flood risk communication committee and an active member of ASFPM's new social justice committee. She hails from the great state of Michigan and lives now in Oakland, California.

ASFPM Social Justice Committee: Working for Diversity, Equity and Inclusion in Floodplain Management
Eileen Shader, CFM, American Rivers, eshader@americanrivers.org
Co-presenters: Jessica Ludy and other members of the ASFPM Social Justice Committee

Abstract: ASFPM believes it is our responsibility as leaders of the floodplain management community to ensure all individuals at risk of flooding are treated equitably. We recognize that past and current floodplain management policies and programs contribute to racial and socioeconomic inequalities in society and to flood risk that is prevalent in some vulnerable communities. As leaders of the floodplain management community, ASFPM has a responsibility to work to promote and implement inclusive, equitable and just floodplain management policies and practices at all levels of government and to ensure that all individuals and communities at risk of flooding are treated equitably. To fulfill this commitment, in 2020 ASFPM created a Social Justice Committee that is working to 1) better understand the issues and policies that have contributed to inequality in floodplain management 2) identify actions that ASFPM can take to promote inclusive, equitable, and just floodplain management policy changes; and 3) identify actions ASFPM can take to help ASFPM members to promote inclusive, equitable and just floodplain management in their communities. This presentation will provide an overview of the actions the Social Justice Committee has and will take to complete its mission. We will gather input from attendees on the actions they would like to see the Committee and ASFPM take to promote equitable floodplain management.

Biography: Eileen Shader leads American Rivers' national floodplain restoration program. She works at the intersection of flood management and river conservation to reform federal flood management policies and programs, and build capacity for equitable, integrated, and natural floodplain management. She has worked for American Rivers since 2006 and has experience working on a wide variety of river conservation policies spanning flood management, river restoration and protection, and water quality. Eileen is a Certified Floodplain Manager and serves as Co-Chair of the Natural and Beneficial Functions Committee for the Association of State Floodplain Managers and as a steering committee member of the Natural Floodplain Functions Alliance.

Laying the Foundation for an Equity-Centered Directorate
Peter Herrick, FEMA, peter.herrickjr@fema.dhs.gov
Co-presenters: Bradley Dean, Partnerships Specialist, Federal Emergency Management Agency; Seleana Wright, National Outreach Director, Resilience Action Partners

Abstract: In 2019, FEMA's Risk Management Directorate (RMD) aimed to gain a better understanding of how it could become more centered on diversity, equity, and inclusion (DEI), both internally and externally. RMD views being more equity-centered as more than a social requirement. It is a necessity to meet the changing needs of the U.S. population. The demographics of the communities RMD serves and the workforce overall are shifting. For example, members of generation Z, who will soon surpass millennials by population, connect with causes based on shared values and want to work for employers whose values align with theirs. These considerations shaped RMD's approach to beginning discovery for becoming more equity-centered: - RMD conducted primary (with partners) and secondary research, to understand best practices in becoming equity-centered. Learn about the methodology and key themes from this discovery phase.   - Regional Support for Equity: Initial communication material updates and equity-centered strategic advice for regional work - RMD has made the commitment to deliver

programs with equity to increase resilience of all communities. The Directorate, in alignment with the FIMA strategy, is identifying planning for both internal and external implementation.   Additionally, RMD held the Resilient Nation Partnership Network Alliances for Equity Virtual Forum throughout October 2020. It provided an opportunity for 30 speakers from public, private and nonprofit sectors to come together to discuss current challenges and actionable steps toward prioritizing and building a more equitable future. Attendees will be able to better understand how RMD implemented its discovery phase to become more equity-centered internally and externally.

Biography: Mr. Herrick joined FEMA in 2010 and has worked in External Affairs, Response Planning, and National Preparedness prior to joining the Federal Insurance & Mitigation Administration (FIMA). He has a wide range of experience across FEMA including disaster response and recovery activities. He is the Communications Lead for the Risk Management Directorate where he is responsible for communicating risk to the Whole Community and conveying the value of reducing and mitigating risk. Mr. Herrick oversees the Community Engagement and Risk Communications efforts for FIMA.

Session F
Wednesday, May 12 – 3:30-5:00 PM central

F1: Discussions on Floodplain Management Policy

Changing the NFIP for a Changing Climate: Update the NFIP's Floodplain Management Regulations
Joel Scata, esq., NRDC, jscata@nrdc.org
Co-presenters: None

Abstract: Flooding poses a significant threat to life and property and is the most common and costly natural hazard in the United States. Further, the risk of flooding is increasing due to climate change impacts, like sea level rise and changing precipitation patterns, and increased development in the nation's floodplains. As atmospheric greenhouse gas concentrations continue to rise, flood risk will continue to increase, presenting grave challenges to our nation's cities, towns, and neighborhoods. Theoretically, the National Flood Insurance Program (NFIP) should deter development in flood-prone areas, ensure that any new development in the floodplains minimizes the potential for flood-damage, and reduces federal expenditures on disaster recovery costs. In practice, the rising debts of the NFIP and growing severity and frequency of flood-related damages, suggest the program is failing to achieve its primary goal.   The Federal Emergency Management Agency (FEMA) is required to establish the minimum building, land use, and floodplain management criteria that communities must adopt to participate in the program. Additionally, FEMA must develop, update, and maintain the NFIP's flood maps. However, FEMA has not comprehensively amended the minimum criteria for construction and land-use in flood-prone areas since the early 1970's nor has FEMA developed flood maps that reflect future flood risks.   This presentation will describe how smart policy and the law both mandate that FEMA revise the NFIP-implementing regulations to adequately account for the increasing risk of flooding due to climate change. Proposed changes to the NFIP's building (i.e., higher freeboard), land-use (i.e.,

"full conveyance" floodway) and mapping (i.e., incorporate future conditions onto flood maps) regulations will be discussed. Given the substantial amount of credible, scientific evidence concerning climate change's role in increasing flood risk, coupled with growing development in flood-hazard areas, the nation needs a federal flood program that adequately accounts for these impacts.

Biography: Joel Scata is an attorney with the Natural Resources Defense Council's (NRDC) Water and Climate Team. At NRDC, Scata advocates for and develops federal and state policies and programs that can help adapt the United States to the impacts of climate change. Particularly, he works to: better public access to flood risk information; enact stronger flood protection standards; improve the process to buy out flood-prone homes, and reform the National Flood Insurance Program. Prior to joining NRDC in 2014, Scata served as a Peace Corps Volunteer in Mali, working to conserve land threatened by desertification. He is based in Chicago.

Shifting from Binary to Graduated View of Flood Risks: Workable and Flexible Minimum NFIP Requirements
Phetmano Phannavong, PE, PMP, CFM, Atkins, phetmano.phannavong@atkinsglobal.com
Co-presenters: None

Abstract: The National Flood Insurance Program (NFIP) marked its 50th anniversary in 2018. Designed by Congress to decrease the nation's flood risk by offering a government-administered insurance program for homes in flood-prone areas. Despite a long history, the NFIP was never intended as a permanent federal subsidy for flood-prone properties. It was intended that the NFIP would evolve over time as all levels of government worked together and knowledge was gained. Relying on FEMA to enforce participating communities to meet minimum NFIP requirements is challenging given the limited options available to FEMA under the current law and regulations. The NFIP reauthorization must adopt a new set of minimum NFIP requirements, including criteria that are flexible and workable for state and local governments to achieve common goals. Instead of specifying the actions one must take, the criteria could be performance-based that require the attainment of outcomes and allow flexibility in how to meet them. The performance-based criteria include a variety of measures to reduce flood risks, such as adopting resilience focus areas in zoning regulations, incorporating a resilience concept into development decisions, and establishing ongoing community engagement. This presentation will explore the performance-based regulations approach with examples of existing regulations in different fields of law. The challenges and opportunities to the approach by regulators and regulated entities will be examined and presented. The presentation will help floodplain managers to reimagine a possible new set of minimum NFIP requirements and to enhance local floodplain regulations to building community resilience. The NFIP is more than just an insurance program, it is also a floodplain management and flood risk mitigation program. Enforcement of minimum NFIP requirements, however, is a real challenge. By allowing communities flexibility in how they reduce flood risk, we can sustain cooperation across all levels of government to fulfill the NFIP goals.

Biography: Phetmano Phannavong, Senior Project Manager at Atkins, has 18 years of water resources engineering and project management experience involving flood risk management, flood modeling and mapping, community and stakeholder engagement, and national flood risk management policies. As a former DC NFIP coordinator, he established a comprehensive flood risk management program in the District of Columbia to enhance its NFIP implementation in a changing climate. He was a founder of the award-winning DC Silver Jackets team. His accomplishments include building flood resilience in an urban

environment through integrated planning and strong partnerships among public and private stakeholders and all levels of government. Phetmano is a flood resilience subject matter expert who is well regarded by many stakeholders nationally and internationally, including DC building code board, USACE Institute for Water Resources, and C40 Cities Climate Leadership Group.   Phetmano receives engineering and legal education. He has a bachelor's degree in Civil Engineering from Kasetsart University (Thailand) and a master's degree in Civil and Environmental Engineering from the George Washington University. He holds a Juris Doctor degree from the University of the District of Columbia David A. Clarke School of Law, a public interest law school that focuses on serving those most in need of legal services. Phetmano is licensed as a professional engineer in DC and VA and admitted to the Minnesota State bar. He is a PMI certified project manager (PMP) and a Certified Floodplain Manager (CFM) by the Association of State Floodplain Managers.

The Compelling Case for a Residential Flood-Resistant Construction Appraisal Addendum

Stuart Adams, Stantec, stuart.adams@stantec.com
Co-presenters: Carol Friedland, PE, PhD, CFM, Louisiana State University

Abstract: This presentation will demonstrate the increasing compelling case for a Residential Flood-Resistant Construction Appraisal Addendum and showcase the ongoing efforts to establish an Appraisal Institute standard. The real estate market is dynamically evolving to recognize the value proposition of residential buildings based on their flood vulnerabilities. In August 2020, Realtor.com added the estimated FEMA flood zone designation and Flood FactorTM to its products citing an internal study that homes within the SFHA appreciated in value less than homes outside the SFHA. The need for actionable, hazard-vulnerability products for the real estate market is further strengthened by recent studies including the Estimating the Effect of FORTIFIED Home™ Construction on Home Resale Value, which demonstrated that certified resilient homes sold for 7% more than comparable homes, as well as Neglected No More: Housing Markets, Mortgage Lending, and Sea Level Rise, which explored dynamic changes in the capitalization of sea level rise risk in housing and mortgage markets. This presentation showcases the ongoing development of an innovative product that is poised to influence the trillion-dollar housing and mortgage industry - the Residential Flood-Resistant Construction Appraisal Addendum. This addendum conveys NFIP savings and consumer preference to the residential appraised value in a manner similar to the Appraisal Institute Form 820.06 Residential Green and Energy Efficient Addendum, which conveys utility savings and consumer preference to residential appraisals. The addendum framework, consumer preference methodology and insurance premium savings metrics will be outlined. The go-to-market strategy including industry, federal and SLTT partnerships will be discussed alongside a call-to-action from the audience to participate in the next steps.

Biography: Stuart is an associate, project manager and structural engineer specializing in hazard-resistant design and mitigation. Stuart serves as the STARR II Joint Venture Building Science Program Area Manager to the Building Science Branch of the Federal Emergency Management Agency (FEMA), and was the contractor lead for both the Puerto Rico Mitigation Assessment Team (MAT) and Puerto Rico Special Wind Region development efforts following Hurricanes Irma and Maria. He is the Deputy Project Manager for contractor support to the National Institute of Standards and Technology (NIST) Engineering Services to Evaluate the Performance of Critical Buildings to Support the NCST Investigation of Hurricane Maria's Impacts on Puerto Rico. Stuart provides Subject Matter Expertise for community resilience to federal, state, and local clients including General Services Office (GSA), Maryland State Highway Administration (MDSHA), and National Railroad Passenger Corporation (Amtrak). Prior to

joining Stantec, Stuart held hazard-mitigation outreach and research positions at Louisiana State University, Massachusetts Institute of Technology and the National Institute of Standards and Technology. He is an active contributor to resilience committees including the Federal Alliance for Safe Home (FLASH) Technical Advisory Council and ASTM E54.02 Work Group on Community Resilience Planning. Stuart furthers his passion for community engagement as an award-winning civic association president.

F2: FEMA Hazard Mitigation Programs and Requirements

Overview of FEMA's Hazard Mitigation Assistance (HMA) Grant Programs 2021: What Applicants Should Know
Kayed Lakhia, FEMA, Kayed.Lakhia@fema.dhs.gov
Co-presenters: None

Abstract: FEMA's Hazard Mitigation Assistance (HMA) branch has grant programs available for communities who are interested in leverage grant funding for mitigation and resilience projects. This session will provide examples of innovative projects and tools and resources applicants and sub applicants can leverage to learn more about these various programs in more detail, as well as download and listen to webinars.   This presentation will provide a brief overview of FEMA's main HMA Grant Programs, discuss the overarching priorities of the HMA programs and how they align with FEMA and FIMA priorities and strategic plan over the next 3-5 years:

- Hazard Mitigation Grant Program (HMGP) – Discussion around the next phase of HMGP and what impact (if any) COVID has had on this program.
- HMGP Post Fire – What has worked, what has not; what have we learned in the past three years.
- Flood Mitigation Assistance (FMA) – Information on how many, what types, and where we received projects from and discussion around the challenges with Severe Repetitive Loss and Repetitive Loss projects.
- Building Resilient Infrastructure and Communities (BRIC) – How many, what types, and where we received projects from. What have we learned from the first year of BRIC and how the second year of BRIC may be different.   This session is geared toward hazard mitigation grant applicants such as State Hazard Mitigation Officers, tribal leaders, community leaders and individuals interested in learning more about the BRIC Program.

Biography: Kayed Lakhia is the Deputy Division Director of Hazard Mitigation Assistance (HMA) at the Federal Emergency Management Agency (FEMA). Prior to this appointment, Mr. Lakhia served as the Deputy Division Director for Risk Reduction from 2012 and has also held the position of Acting Deputy Assistant Administrator for FEMA's Recovery Division. Mr. Lakhia has over 10 years' experience in emergency management at the federal level and in the private sector.   As Deputy Division Director, Mr. Lakhia oversees the administration of over $1B annually in hazard mitigation grants, including FEMA's Pre-Disaster Grant Program (PDM); Building Resilient Infrastructure and Communities (BRIC); the Flood Mitigation Assistance (FMA) Program; Hazard Mitigation Grant Program (HMGP); and, Post-Fire HMGP, which provides funds to enact mitigation measures that reduce loss of life and property

prior to and after disasters.   Mr. Lakhia has significant experience in disaster operations including Grants Management, Floodplain Management, and Building Sciences. During Hurricane Sandy, Mr. Lakhia represented FEMA at the Rebuild by Design Competition led by HUD and advocated for resilient building and sustainable land-use practices. In the aftermath of Hurricanes Sandy and Maria, Mr. Lakhia has led the implementation of FEMA's largest mitigation portfolio.   Mr. Lakhia holds a Master of Science degree from MIT. Mr. Lakhia is a Registered Architect in New York and Florida, Certified Floodplain Manager, and LEED Accredited Professional. He completed post-graduate studies at Harvard's National Preparedness Leadership Institute and University of Virginia's Darden School of Business. He is an OPM Certified member of the Senior Executive Service (SES).

Technical Observations from the Inaugural BRIC Application Cycle

Eric Kenney, PE, PMP, CFM, CDM Smith, kenneyed@cdmsmith.com
Co-presenters: Manny Perotin, PE, PMP, CFM and Jordan Williams, CFM

Abstract: The inaugural cycle of the Building Resilient Infrastructure and Communities (BRIC) program saw $500 million in Federal share funding; double recent Pre-Disaster Mitigation (PDM) and increased the maximum Federal share of a single mitigation project to $50 million. Similarly, the Flood Mitigation Assistance (FMA) program is encouraging larger, community flood mitigation projects with a Federal share of up to $30 million. In addition to larger projects, the BRIC program developed a Mitigation Action Portfolio highlighting innovative mitigation including drought mitigation, microgrids, communication systems, tsunami mitigation as well as a wide range of inland and coastal flooding mitigation projects that would fit within the BRIC program.   Between program funding levels and the consideration of larger innovative project types the Fiscal Year (FY) 2020 cycle reflects a continued evolution of the Hazard Mitigation Assistance (HMA) programs in supporting larger, more complex mitigation projects which has both the benefit of mitigating risk to larger portions of a community, but can often present a challenge in clearly demonstrating conformance with the HMA program requirements.   This presentation will present technical observations from the review of the largest, most complex projects submitted this cycle and highlight common themes from projects that passed the technical review portion; as well as those that did not. These observations can be used to gather lessons learned and best practices to improve applications submitted in future years as the BRIC program continues to evolve and funding levels increase, potentially significantly.

Biography: Eric Kenney is a Senior Project Manager with CDM Smith. For the better part of a decade he has focused on supporting FEMA on a range of tasks, including the Hazard Mitigation Assistance (HMA) grants program supporting HMA program improvement and technical and benefit cost analysis reviews of HMA grants. For the last five years has led the contractor support for the National Technical Review (NTR) of non-disaster grants supporting the review of over 1,900 applications for the Pre-Disaster Mitigation and Flood Mitigation Assistance programs, as well as hundreds of HMGP applications nationwide under multiple disaster declarations.

Making Nature-Based Solutions Possible with Hazard Mitigation Funding

Chris Levitz, AECOM, Chris.levitz@aecom.com
Co-presenters: Sarah Murdock, The Nature Conservancy (TNC); Nathan Woiwode, The Nature Conservancy (TNC); Taylor Nordstrom, AECOM; and Erica Harris, AECOM

Abstract: The Nature Conservancy is working with AECOM to further a collective understanding and approach to capturing FEMA hazard mitigation funding for nature-based solutions. TNC and AECOM are developing a guidebook to help communities plan, apply for, and fund nature-based solutions to flood and wildfire risks. Based on these efforts, this presentation will focus on key factors to consider and address when applying for FEMA mitigation funds for nature-based projects. While nature-based solutions have a broad range of definitions, a common thread is that they are a better investment than single-purpose, gray infrastructure, yielding additional community and ecosystem benefits and enhancing the overall resilience of a site.   Nature-based solutions are evolving, as are the funding pathways for their implementation. The FEMA Hazard Mitigation Assistance (HMA) programs present a crucial opportunity to reduce the risk to communities from natural hazards, while simultaneously reducing communities' overall reliance on Federal disaster funds. The HMA program includes three grant types for pre- and post-disaster mitigation projects that reduce loss or damage to life and property. All three HMA funding streams encourage nature-based solutions as eligible project types to provide hazard mitigation, while also supporting communities' environmental, social, and economic goals.   Although nature-based solutions can mitigate the risks of natural hazards while building overall resilience for a community, selecting the appropriate HMA grant and type of nature-based solution will vary depending on factors like the hazard posing a threat to the community and the desired scale of mitigation. In this presentation we'll focus on four key steps for selecting a nature-based solution for hazard mitigation, including:

- Understanding the hazard the project would mitigate;
- Choosing an applicable nature-based solution for a given project site;
- Using multiple funding mechanisms based on project eligibility; and
- Determining the scale of hazard protection.

Biography: Mr. Levitz is a coastal engineering and resilience manager in the Houston AECOM office. He has fifteen years of experience with a focus on planning and engineering efforts that develop ecological and community resilience, specifically related to riverine, urban, and coastal flood risk.

F3: Assessing Impact of Unique Factors on Flood Risk

Western Kansas: The Wild West of Hydrology
Tara Lanzrath, CFM, Kansas Department of Agriculture, Tara.lanzrath@ks.gov
Co-presenters: Lori Schrader, PE, CFM, Water Resources Engineer, Stantec, lori.schrader@stantec.com and Hayden Edwards, Water Resources Engineer, AECOM, Hayden.Edwards@aecom.com

Abstract: The State of Kansas has two distinct climate regions within the state. The eastern portion receives significantly more rainfall then the western portion that is semiarid and has suffered the effects of streamflow decline due to prolonged groundwater irrigation. This has complicated a standardized Base Level Engineering (BLE) approach across the state. Traditional regression equations overestimate the base flow in Western Kansas, and while the preference is on gage data, this does not always exist, or reaches back in time to streamflow conditions that no longer exist. The State of Kansas, as a Cooperating Technical Partner, has taken the initiative to explore alternative methods of hydrology using technical assistance funds to more accurately represent the variability of flooding across the state.

In this presentation, we will discuss how technical assistance projects have been used in studies to determine the best approach for hydrology in Western Kansas. The focus will be on two case studies in Western Kansas, one is a levee project in Southwest Kansas in Dodge City, where amidst the wild west museums and tumble weeds, lies the typically sandy Arkansas Riverbed. The other case study is in Northwest Kansas, in the Upper Republican Watershed, where the floods are flashier in nature and not typical of what would be put on the FEMA Flood Insurance Rate Map (FIRM). The results of the studies will be discussed with some guidance on how to handle these complex hydrologic situations and their impacts on, an application to future uses of 2D BLE including better representation of flood risk through probabilistic flood forecasting for future studies.

Biography: Tara Lanzrath is the Floodplain Mapping Coordinator for the Kansas Department of Agriculture, Division of Water Resources. She has a Bachelor's Degree in Environmental Studies with a minor in Geography from The University of Kansas. Currently, she serves as project manager for contractual flood hazard studies under the CTP Program while assessing mapping needs for the State of Kansas. In recent years, her focus has been on using 2D Base Level Engineering (BLE) to identify technical assistance projects early in the Risk MAP process. In a broader sense, Tara has focused on using GIS for various water resource issues in Kansas ranging from groundwater hydrology to riverine flooding and has worked for the State of Kansas since 2008. In her spare time, she enjoys exploring the outdoors and visits a different national park each year.

Lori Schrader, PE, CFM is a Water Resources Engineer and Project Manager for Stantec out of the Overland Park, Kansas office. While at Stantec, Lori has worked on a variety of hydrologic and hydraulic modeling projects throughout the US related to FEMA flood studies and levee analysis. She has her Masters in Civil Engineering from Purdue University and a Bachelors in Civil Engineering from UCLA.

Hayden Edwards is a Water Resources Engineer with AECOM. He has served as the Technical Engineering Lead for the Kansas 2D BLE projects for the past two years. He has worked with KDA and other contractors in the state to develop a 2D BLE program for the state. He is currently working on a pilot project to study the effects of groundwater irrigation in Western Kansas on the hydrology inputs and results for the KS 2D BLE state-wide program

Deforestation, Reforestation / Afforestation, What Has It Got To Do With My H&H?
Sravan Krovidi, PE, CFM, Atkins - SNC Lavalin Group, sravan.krovidi@atkinsglobal.com
Co-presenters: None

Abstract: The world has lost nearly 12 million hectares of tree cover in 2019(1), and California alone lost nearly 19% of its tree cover in past couple decades(2). While there is direct link between the tree cover loss and global warming, there are also impacts to the Hydrologic and Hydraulic cycles. The presentation explores the impacts of having this one variable change and utilizes a case study to demonstrate the importance of the parameter. The presentation will also touch upon difference scenarios of the variable changes, including impacts due to wildfires, swapping out with impervious covers, converting to wastelands and finally review the H&H aspects. The presentation is aimed towards Floodplain Administrators, Policy Makers, Planners, and Engineers in general. (1) https://www.wri.org/blog/2020/06/global-tree-cover-loss-data-2019 (2)Global Forest Watch. "Tree cover loss in California". Accessed on 20/10/2020 from www.globalforestwatch.org.

Biography: Mr. Krovidi has over 13 years of experience in Water Resources Engineering and Construction Management. He has an Masters Degree in Civil & Environmental Engineering from Rutgers and Bachelors and Diploma in Civil Engineering from India.

Ice Jam Flood Risk Assessment: Methods & Lessons Learned

Mark McBroom, Michael Baker International, mmcbroom@mbakerintl.com
Co-presenters: None

Abstract: River ice jam flooding can significantly increase flood risk beyond open water conditions, resulting in greater property and infrastructure damage and risk to human life. Additional flood risks associated with ice jams can be surprising, increasing the water surface elevation by multiple feet, which has the potential to yield greater risk during an ice-affected 10-year event than an open water 100-year event. Because of the challenges associated with ice jam assessment and a general misunderstanding of ice jam processes, most risk assessments are limited to open water conditions or predict erroneous ice jam impacts. The U.S. Army Corps of Engineers Ice Jam Database has documented over 20,000 unique ice jam events on 2,813 rivers in 43 states of the continental United States and Alaska. Understandably, the potential influence of ice jams on flood risk should be considered where warranted. This presentation will discuss FEMA guidance for ice jam analysis, procedures for identifying high-risk rivers using stage-frequency analysis, and the challenges and caveats of modeling ice jams in HEC-RAS 1D and coupled 1D/2D. Unique methods of calibration and probabilistic modeling using Monte Carlo analysis, as well as 2D implicit ice jam modeling, will also be presented. Case studies will be used to highlight these methods and provide lessons learned assessing ice jam flood risk for local communities and private entities.

Biography: Mark is a Water Resources-Technical Manager at Michael Baker. He has spent 15 years studying river breakup processes across Alaska and providing unique solutions to complex problems for state, local, and private clients. Thanks to Michael Baker's strong national water practice Mark has also been involved in projects across the western states, assessing flood risk using 1D and 2D hydraulic modeling, predicting scour and erosion risk in support of infrastructure design, and building in-house tools for efficient and complex analysis of hydrologic and hydraulic processes. After starting out in Alaska, Mark is now living back in his home state of Colorado, spending much of his free time hiking and climbing with family and friends.

F4: FEMA Tools and Resources

Tools of the Trade: Leveraging FEMA's Flood Risk Toolbox

Bradford Hartley Jr., PMP, GISP, CFM, ABS Group, a member of Compass PTS JV, brhartley@absconsulting.com
Co-presenters: None

Abstract: Since 1979, FEMA has been administering the National Flood Insurance Program (NFIP) which currently has over 22,500 participating communities and around 5 million active policies. Managing a complex Program uses an immense number of staff and resources. FEMA's capabilities to mine data and create products that identify flood risk and advocate how to mitigate risks has grown with recent

advancements in technology.   FEMA has embraced and incorporated many advancements in technology within Map Modernization, Risk MAP, and Risk Rating 2.0 throughout the years. This valuable data can only be extracted to its greatest value once it is shared with and interpreted by communities and stakeholders. Today, FEMA's Flood Risk Toolbox is a platform that unlocks the true potential of this data across programs and serves a wide variety of stakeholders, helping people before, during, and after disasters.

With the advancement in our technology, it provides us with new and innovative tools for research and analysis at our fingertips; however, it also presents us with new challenges of where to locate and how to use these products. This presentation will showcase the tools, resources, and repositories within FEMA's Flood Risk Toolbox that may not be as widely known to stakeholders. We will take a deeper dive into several resources focused on flood risk and mitigation. Content will be applicable to state and local levels, both technical and non-technical. FEMA's Flood Risk Toolbox is constantly expanding, adding new and improved resources for public consumption. This session will inform the audience on how to access historical and current data, viewer dashboards, how-to guides, and knowledge repositories for stakeholders to leverage that enhance decision making and collaboration.

Biography: Mr. Hartley's technical experience includes over fourteen years of dedication to FEMA's floodplain mapping programs. His current responsibilities within the Compass Joint Venture include project management within the Natural Hazards Risk Assessment Program (NHRAP), directing programmatic inquiries, and aiding in the approval and tracking of NFIP acceptable floodplain models. He also provides technical guidance for the Coordinated Needs Management Strategy (CNMS), data visualization, and performing geospatial analytics. Previous experience includes overseeing riverine and coastal floodplain mapping projects and was the geospatial lead at the FEMA Region 5 Service Center.

Viewing Best Available Flood Hazard Data for a Location and Creating a Report on Proposed Changes

Daniel Horner, CFM, NiyamIT, dhorner@niyamit.com
Co-presenters: None

Abstract: There are new tools available to easily view the best available flood hazard data for your location and for understanding how proposed map updates will change flood zones and elevations. This presentation will introduce to new floodplain managers and those looking to expand their knowledge of available datasets FEMA's Draft National Flood Hazard Viewer and FEMA's Flood Map Changes Viewer. These tools communicate several life stages of data and the Changes Since Last FIRM (CSLF) calculated from FEMA's National Flood Hazard Layer. This presentation will demonstrate how to find what the best available data is for a location, how to access the viewers, download the datasets, and how to create reports that display the proposed changes for a location.

Biography: Dan Horner has been working in floodplain management for 15 years and has been working with Niyam since 2016 to continue developing new tools and processes that help FEMA and groups like ASFPM meet their floodplain management and risk communication missions. He has lead the design and build for several FEMA projects that have significantly improved data access and availability such as the Map Service Center and the viewers and tools you will see in this presentation. Dan is an avid backpacker, overnight touring kayaker, and hockey player that sometimes attempts to do downhill skiing.

eLOMA – A Collaborative Tool for Licensed Professionals, Communities, and FEMA
David Mummert, Michael Baker Intl., dmummert@mbakerintl.com
Co-presenters: None

Abstract: The Federal Emergency Management Agency's (FEMA) Electronic Letter of Map Amendment (eLOMA) tool to provides licensed land surveyors and professional engineers with an internet-based system to submit a variety of LOMA requests as a faster alternative to the standard application process. The eLOMA tool is available to any licensed professional who registers through FEMA's Mapping Information Platform, which is located online at https://hazards.fema.gov.   This presentation will provide a summary of the eLOMA tool; outline improvements to the eLOMA process, such as the expansion of accepted request types and application tracking via the new user workbench; highlight plans for future user trainings and web-based learning opportunities; provide insight into how the accuracy of eLOMA submittals correlates directly with audit frequency; and discuss the steps necessary to achieve an eLOMA Super User status to reduce the number of audited submittals.

Biography: David Mummert has over 19 years of National Flood Insurance Program experience with Michael Baker International in the MT-1 (LOMA) Group. He is a graduate of St. Mary's College of Maryland with a degree in Biology with a specialization in Environmental Science. He is currently the NWRC eLOMA Coordinator for FEMA Regions 1-10, Technical Manager for the NWRC MT-1 Group, and Subject Matter Expert for LOMA and eLOMA processing through FEMA's Mapping Information Platform (MIP) website.

F5: Showcase #4

TBD

F6: Natural & Beneficial Floodplain Functions

Nutrient Retention in Ecologically Functional Floodplains: A Review
Olivia Dorothy, CFM, American Rivers, odorothy@americanrivers.org
Co-presenters: None

Abstract: This presentation will review the potential nutrient pollution retention in ecologically functional floodplains and make recommendations on how to design floodplain restoration projects to maximize nutrient pollution removal from rivers. Nutrient loads in fresh and coastal waters continue to lead to harmful algal blooms across the globe. Historically, floodplains—low-lying areas adjacent to streams and rivers that become inundated during high-flow events—would have been nutrient deposition and/or removal sites within riparian corridors, but many floodplains have been developed and/or disconnected. This review synthesizes literature and data available from field studies quantifying nitrogen and phosphorus removal within floodplains across North America and Europe to determine

how effective floodplain restoration is at removing nutrients and draw conclusions on how to design floodplain restoration projects to maximize removal of nitrogen and phosphorus from rivers.

Biography: Olivia joined American Rivers in 2014 and directs their Upper Mississippi River Program. She facilitates the Nicollet Island Coalition, a group of environmental, taxpayer, and conservation organizations focused on restoring a sustainable Upper Mississippi River. Prior Olivia worked on similar issues at the Izaak Walton League of America. Before entering the non-profit sector, Olivia worked in Illinois government as a rivers and water policy advisor for Governor Pat Quinn and Lt. Governor Sheila Simon. Olivia has a Bachelor of Science in Natural Resources and Environmental Sciences and a Master of Art in Environmental Studies from the University of Illinois.

Building Healthy Soil to Reduce Flooding – A Case Study of Holistic Land Management in Arizona

Ricardo Aguirre, PE, CFM, WEST Consultants, raguirre@westconsultants.com
Co-presenters: Kieran Sikdar and Lee von Gynz-Guethle

Abstract: Can healthy soil reduce flooding? Common sense and a basic understanding of soil's role in the hydrologic cycle suggests that the condition of the soil can have a significant impact on peak rainfall-runoff rates. What is healthy soil though, and what are the conditions that would optimize soil's ability to reduce runoff? At WEST, we are breaking new ground in search of an answer to that question. In partnership with Cochise County near Tucson, Arizona, we are attempting to improve the health of the soil on a 500-acre plot by applying the Savory Institute's Holistic Management methods, often referred to as Holistic Land Management. This presentation will provide an overview of soils and their role in the hydrologic cycle, the Holistic Land Management philosophy, and our efforts to reduce flooding by improving soil health.

Biography: Mr. Aguirre is a Director with WEST Consultants and is developing the land management and water security service line. Mr. Aguirre has 22 years of experience in engineering with primary skill in hydraulics, hydrology, stormwater infrastructure design, land management, groundwater recharge, and project management. Mr. Aguirre is focused on creating innovative approaches to evolve the conventional engineering perspective by integrating natural processes into large scale engineering projects. His primary professional focus is to implement functional design strategies to achieve multiple synergistic objectives such as reversing desertification through water harvesting and by increasing soil organic matter.

Letting Nature Take Its Course: Integrated Improvements and Avoidance Measures Achieve Flood Protection with Reduced Maintenance

Tim Harrison, PE, LEED AP, Woodard & Curran, tharrison@woodardcurran.com
Co-presenters: None

Abstract: When developing flood protection projects, a holistic approach can yield multiple benefits. In the case of the Upper Llagas Creek Flood Protection Project, the project team prioritized balancing flood protection, habitat preservation and enhancement, and low-impact, long-term maintenance. With thoughtful planning and a blend of techniques, the project achieves 1% flood protection for urban areas, protects habitat, and preserves the community's ability to enjoy the creek. The project involves enlarging the creek channel and creating a high-flow culvert and tunnel that would convey runoff from storm events and bypass developed areas to avoid overwhelming the creek channel and reduce

flooding. Separating high flows allows the existing creek alignment to act as the low flow conveyance through a downtown center. This approach preserves the public's enjoyment of the creek and the existing habitat in the downtown area and reduces impacts to residents and businesses.   The project owner wanted to incorporate natural processes and environmental benefits into the project that also lead to a low maintenance facility. The project team used impact reduction measures like strategic excavation on one bank only to minimize disturbance to riparian habitat and trees. Existing topsoil was managed and reapplied to re-establish the existing soil ecosystem. Seeds from local native trees were harvested and grown to mitigate tree removal. Geomorphological science was utilized to create a stable bankful channel form and profile. This approach, along with creation of areas where sediment can naturally deposit and be transported without impacting flood conveyance, minimizes the impacts of long-term sediment erosion and deposition. The channel cross-section is also designed such that minimal vegetation management is needed except in the channel bottom, allowing the habitat on the benches and channel banks to develop and mature over time.

Biography: Tim Harrison is a registered civil engineer with 19 years of experience in design, construction management, flood protection, watershed studies, master planning, and grant applications. Through his work on multi-disciplinary projects, Tim has worked on many facets of water, wastewater, recycled water, and watershed projects. He has broad industry perspective having been employed both as a consultant and public employee. As a consultant Tim has led multi-discipline teams to plan, design, and construct wastewater and stormwater/flood protection projects. As a public employee. Tim also has experience incorporating spatial analysis and tools into project workflows to increase efficiency and ability to communicate about complex systems with clients, stakeholders, and the public.

F7: Modeling for Urban Flooding Project Prioritization

Mitigation Alternatives for Regional Flooding Issues in Cudia City Wash
Thirumurugan Bose, PE CFM, Michael Baker International, Thiru.Bose@mbakerIntl.com
Co-presenters: Ron Coupland

Abstract: The Cudia City Wash Area Drainage Master Study was a regional drainage study conducted by the Flood Control District of Maricopa County, in partnership with the city of Phoenix and town of Paradise Valley. The approximately 14 square-mile watershed has five Special Flood Hazard Areas within its boundary, each with the potential for floodplain remapping, flood hazard mitigation, and city/agency maintenance cost reduction. FLO-2D, a 2-D stormwater modeling software officially recognized by FEMA, integrated with SWMM components used to model underground flow routing, provided the basis to conduct the hydrologic & hydraulic analysis. Flood hazard areas were identified and prioritized using the model results, public/stakeholder input, and the effective FEMA FIRM panels. Mitigation alternatives for the highest priority flood hazard areas were generated with special consideration given to alternatives mitigating the flood risks along Cudia City Wash (Echo Canyon Wash per FEMA).

Biography: Mr. Bose has experience more than 16 years in water resources engineering with an emphasis in floodplain management, design of flood control facilities, and drainage issues. His experience includes drainage design, dam and spillway hydraulics, area drainage master plans, erosion protection, storm water management, floodplain studies and mapping, hydraulic modeling and analysis,

and mapping review. He is familiar with state-of-the-art hydrologic and hydraulic modeling methodologies and computer programs including FLO-2D and integrated SWMM, and RAS2D.

Ron Coupland is a water resource engineer at Michael Baker International. He has worked on projects in Arizona, Utah, Texas, and California for a variety of clients including the Flood Control District of Maricopa County, Carson City Water Conservancy, Customs and Border Patrol, and more. His strengths include 1-D and 2-D modeling in software from FLO-2D to HEC-RAS and map creation and model refinement and analysis in GIS.

Utilizing BLE Modeling in Stormwater Master Planning

Maria Neeland, PE, CFM, Wood, maria.neeland@woodplc.com
Co-presenters: None

Abstract: Over the last several years, the State of Kansas, as a Cooperating Technical Partner, has taken an initiative to explore additional assistance opportunities, in the form of technical assistance projects funded by FEMA Region 7, to provide additional resources and tools for interested communities that can ultimately aid in the mitigation of flood risk. One of these projects included two-dimensional HEC-RAS modeling, utilizing predominately base level engineering methods, for all areas in the City of Topeka, KS to help better understand and ultimately reduce flooding issues within the City. The City of Topeka has since moved forward with a Master Planning project for the Stormwater Utility for reducing risk within the Topeka Watersheds. The goal of the Master Plan is to identify and prioritize future projects based on the consequence and likelihood of failure. The 2D modeling, done as part of the technical assistance project, was utilized to highlight key flood risk areas with the City. Flood information documented by the City of Topeka and Shawnee County on past flooding events was used to validate the key areas of flood concern. Identified areas of high flood risk, along with a stormwater asset review, were used to provide a recommendation for key locations to be considered for alternatives analysis and Capital Improvement Plan development. Review of the 2D modeling results, including an array of useful grids that provide valuable flood information (ie. depth and velocity grids) greatly aided in the focus of effort on specific problem areas within the City, significantly reducing the overall cost associated with development of a beneficial Master Plan that meet's the City's risk mitigation goals.   This presentation will show how local communities are truly benefiting from technical assistance provided by CTPs and taking the next step toward real mitigation efforts. The Topeka Master Planning project is a great example of shared commitment by local and state entities for flood risk reduction.

Biography: Maria Neeland is a water resources engineer and project manager for Wood Environment & Infrastructure Solutions Inc. in the Topeka, Kansas office. She has 9 years of professional experience. Her work focuses on hydrologic and hydraulic engineering, stormwater drainage analysis, flood inundation mapping, flood reduction studies, and water quality analyses. She has experience with FEMA DFIRM and RiskMap projects, community management planning, stormwater mitigation and alternatives analysis, and technical review of engineering analyses and stormwater management plans.

Redeveloping the City of Presidents in 2D

David White, Woodard & Curran, dwhite@woodardcurran.com
Co-presenters: Paul Costello, City Engineer, pcostello@quincyma.gov

Abstract: Aptly called the City of Presidents, Quincy, Massachusetts is one of the nation's oldest cities, settled in 1625 and incorporated in 1888. With 27 miles of coastline, the historic New England city is

prone to flooding. As such, it is a member of the National Flood Insurance Program (NFIP) and, since 1993, an early participant in the Community Rating System (CRS) program. In 2018, Quincy achieved a CRS Class of 7, one of just a few in Massachusetts. Even still, Quincy has the state's largest percentage of coastal and riverine Special Flood Hazard Area (SFHA) with the most insured properties at 3,423. FEMA's Map Maintenance Update in 2014 identified an additional 1,400 properties in the SFHA, validating higher risk for approximately 2,700 additional properties.   Many coastal communities can relate to the floodplain challenges Quincy faces with frequent storm events, tidal flooding, and sea level rise. Urban flooding, even in areas that are not in an SFHA, are common occurrences. This presentation will focus on Quincy's city-wide floodplain mapping and flood mitigation efforts, including the detailed drainage system and flood analysis being conducted with a coupled 1D/2D model to assess current extreme rainfall events, historical flood data, and the impact of sea level rise. This work is being used to identify and communicate the flood risks, inform the prioritization of an estimated $120 million in flood mitigation and stormwater capital project needs, and serve as a road map to leverage city-led redevelopment opportunities in the in three of the Quincy's urban centers. Attendees will learn of the challenges associated with implementing such a cost-effective city-wide model and the how the results can inform urban revitalization efforts.

Biography: David is the Leader for the National Stormwater Practice and is a senior technical expert in the area of stormwater/green infrastructure, hydraulic and hydrologic, and flood mitigation. He is a professional civil engineer with over 25 years of technical and project management experience in design, permitting and construction of stormwater related infrastructure projects in both riverine and coast environments throughout the United States. David has extensive hydraulic and hydrologic expertise gained from designing and implementing measures to address both watershed-wide and site-specific stormwater quantity and quality concerns. He has been responsible for the development of numerous stormwater management plans including implementation of green infrastructure (GI) and low impact development (LID) techniques, urban flood mitigation projects, design and assessments of culverts, bridges, and hydraulic control structures, design of stream relocations, in-stream erosion control devices, as well as stream-bank stabilization projects. In addition, he has performed numerous riverine and tidal hydraulic/hydrologic analyses including for FEMA floodplain delineation, bridge capacity and scour assessments and countermeasure design. David has helped secure tens of millions of dollars in FEMA mitigation and state resiliency/ecologic restoration funds that lead to more resilient and sustainable communities.

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Session G

Thursday, May 13 – 9:00-10:30 AM central

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G1: CRS - Local Focus

Regional CRS and Floodplain Management: Making it Work for Resource-Limited Communities
Shannon Hulst, CFM, Barnstable County Cape Cod Cooperative Extension / Woods Hole Sea Grant, shannon.hulst@barnstablecounty.org
Co-presenters: Joy Duperault, Massachusetts NFIP Coordinator; Molly Kaput; and Katie Rand, FEMA Region I

Abstract: This presentation will review a program developed in Barnstable County, Massachusetts to assist the 15 communities on Cape Cod with floodplain management and Community Rating System participation. The presentation will discuss the keys to success and the benefits of this program. For the CRS, the keys to success include consistent reporting, processes, and documentation across communities; maximizing credit through documentation of existing capabilities; use of regional GIS resources; and centralizing the workload for resource-limited communities, among others. For regional floodplain management assistance, the keys to success include supplementing local resources in floodplain management, flood insurance, and flood risk identification by giving local officials, residents, and businesses access to advanced locally-based information. Finally, a benefit and key to the success of the regional program is the facilitation of coordination between state, federal, and other partners that improves local access to experts, enables broad communication about common issues, and improves coordination between local governments and state and federal officials.   This presentation will provide an overview of the regional floodplain and CRS management program in Barnstable County, MA including the keys to success and benefits of a regional approach.

Biography: Shannon Hulst, CFM is Deputy Director of Cape Cod Cooperative Extension as well as Floodplain Specialist and Community Rating System (CRS) Coordinator for Barnstable County, MA through Cape Cod Cooperative Extension and Woods Hole Sea Grant. She is a Certified Floodplain Manager® with a Master's degree in Marine Affairs from the University of Rhode Island. She serves on the board of the Massachusetts Association for Floodplain Management. Shannon assists communities, businesses, and residents with flood-related technical assistance with an overall goal of improving flood resiliency. She manages a first-of-its-kind regional CRS program. Barnstable County's regional CRS program has been recognized nationally, earning the Association of State Floodplain Managers' 2017 James Lee Witt Local Award for Excellence in Floodplain Management and serving as the inspiration for a bill from Congressman Keating in the pending National Flood Insurance Program reauthorization. Shannon is also the recipient of the 2020 CRS Award for Excellence.

CRS Retrograde, Now What?
Josh Overmyer, CFM, Charlotte County, josh.overmyer@charlottecountyfl.gov
Co-presenters: None

Abstract: For over a decade, Charlotte County, Florida participated in the NFIP Community Rating system as a Class 5 rated community. In the period after the 2014 Cycle Visit, their floodplain manager retired, the CRS Coordinator's Manual changed, and an ordinance update removed some higher standards. Due to those and other changes, Charlotte County lost several hundred points and retrograded to CRS Class 6. This resulted in over $1.3 million in lost premium discounts for policy holders in Charlotte County.   This presentation will describe the process a community goes through when dealing with a significant loss in premium discounts, including going through a version of the 5 Stages of Grief. It will discuss the steps moving forward to attempt to reclaim a higher rating in the future.

Biography: Josh Overmyer is the Floodplain Coordinator and CRS Coordinator for Charlotte County, in Southwest Florida. He is also the Chair of the Florida Floodplain Managers Association. Josh has 8 years of experience in floodplain management, having previously worked in the State Floodplain Management Office, the Town of Fort Myers Beach, and Lee County, FL. Josh has also co-instructed the field-deployed L-278 NFIP/CRS course in Florida. He has a Bachelor of Urban Planning and Development from Ball State

University in Muncie, Indiana. Josh presented at the 2018 ASFPM Conference in Phoenix on The Florida CRS Initiative: Providing State Support of Municipal CRS Programs.

Using Emergency Management as a Lever to Improve your CRS Score
Heather Hilliard, CEM, CFM, IEM, heather.hilliard@rre-llc.com
Co-presenters: None

Abstract: Sometimes floodplain expertise gets dampened until there's flooding when, in reality, mitigation is an all-weather activity. By using the high-powered emergency management megaphone, Ms. Hilliard led the community's CRS score one whole Class in a single cycle (lowering NFIP eligible policy premiums by 20% in the AE / 10% in X) and has completed cycle updates with an achievable (pending official grading) of a two-Class improvement (to Class 4). You can do it, too! By incorporating HM and PA grants, RLs and watershed plans as well as doing a root cause review on your BCEGS activity, sustainable and substantive change can be achieved even with a small budget. This session will be led by a dual CEM-CFM in New Orleans, Louisiana, who has worked for 25 years in EM. By virtue of environment, she began a floodplain focus to capitalize on grant opportunities, both pre-and post-disaster, and incorporating a single strategic plan throughout many municipal activities. Topics of focus for impactful sustainable improvements include mapping, ordinances, training, and general organization of your CRS information.

Biography: Heather M. Hilliard is an experienced emergency management and flood mitigation professional with more than 25 years of service. Ms. Hilliard has served as a Professor of Practice at Tulane University in New Orleans for more than a decade and has also lectured at US NORTHCOMM, the Department of Defense as well as the US Industrial College of the Armed Forces. Heather recently served as Assistant Director of Emergency Management/ CRS Floodplain Coordinator where she improved the city's FEMA CRS rating to Class 6 along with the fire department rating to Class 1. She now works as a Project Manager helping build safe, secure and resilient communities. Among her accomplishments, Ms. Hilliard has earned federal and local commendations in New Orleans for her contributions to the responses of Hurricanes Katrina and Gustav and her role in the Deepwater Horizon oil spill response. She has worked in the state Department of Health in the 2009 Pandemic and has worked declared disasters such as F5 tornadoes, international typhoons, earthquakes, and public health epidemics. Ms. Hilliard's after action report for the international response to a Pacific typhoon was shared with the United Nations to help reshape the way the world responds to catastrophes, which are increasing due to climate change. She has published several emergency management articles and edited textbooks. Her grant writing success has helped governmental entities win numerous federal awards in the millions of dollars.

G2: Risk Assessments

Establishing a nationwide baseline for natural hazard risk in the U.S.
Casey Zuzak, , FEMA, casey.zuzak@fema.dhs.gov
Co-presenters: None

Abstract: With its initial Phase 1 release, the National Risk Index (NRI) provides a comprehensive understanding of natural hazard risk. The NRI is a new online tool and dataset that incorporates authoritative data for 18 natural hazards, social vulnerability, and community resilience to calculate risk to natural hazards for each U.S. county and census tract. In collaboration with partners in academia, federal, state, and local government, and private industry, FEMA has established the NRI as a nationwide baseline risk assessment and a first-of-its-kind, multi-hazard analysis. With the help of the NRI, decision-makers at all levels can focus less on data collection and more on creating effective risk-reduction strategies. As a dataset, the National Risk Index includes historical and probabilistic details about the likelihood and consequence of 18 natural hazards, such as riverine and coastal flooding, tsunami, earthquake, and drought. Hazard information is processed into a figure of "Expected Annual Loss", or the dollar loss from building value, population and/or agriculture exposure each year due to natural hazards. These losses are combined with socioeconomic and demographic descriptions of vulnerability and resilience to create a holistic, relative Risk Index score for each location. As an online tool, the NRI enables everyone to quickly access and understand risk, as well as the underlying hazard details, for their community. This presentation will provide an overview of the National Risk Index dataset and online tool, as well as demonstrate its many uses in both floodplain management and hazard analysis in general.

Biography: Casey Zuzak, GISP is a Senior Risk Analyst for Hazus and the Natural Hazards Risk Assessment Program (NHRAP) at the Federal Emergency Management Agency (FEMA). NHRAP provides natural hazard risk assessment data, tools, and analyses to support FEMA strategic goals in the development of risk communication. Casey has worked for FEMA since 2011 and has a M.S. in Geography from the University of South Carolina.

Integrating Social Vulnerability in Flood Risk Assessments: A New Bern, NC Case Study
Matt Hutchins, , FernLeaf Interactive, mhutchins@fernleafinteractive.com
Co-presenters: Aashka Patel, FernLeaf Interactive

Abstract: Loss-based risk assessments have the potential to skew flood control interventions toward higher income neighborhoods, potentially undervaluing impacts to socially vulnerable, flood prone communities. In the past year, the national conversation around equity has caused a number of communities to seek ways of balancing the selection and prioritization of flood reduction projects to be more representative of the populations governments serve. By augmenting traditional loss-based risk assessments with social and economic vulnerability assessments, communities can develop a deeper understanding of how to protect community cohesion in their flood resilience planning.   This presentation will examine how the City of New Bern, North Carolina, a coastal community with a diverse population and a history of major flooding events, is taking a data-informed approach to quantifying social and economic vulnerability as it develops and prioritizes flood reduction projects to achieve wide community benefits. We will examine how the City has used data resources and an analytical framework to promote wider community participation in the plan, develop a deeper insight into true community risks and vulnerabilities and ensure projects are equitably selected.

Biography: Matt is the Services Lead and Senior Resilience Analyst for FernLeaf Interactive, a climate technology and consulting firm in Asheville, NC. Matt has over a decade of experience supporting groups and communities in planning and making informed decisions regarding climate risk and vulnerability as well as resilience plan development. He has specialized experience in quantitative resilience

assessments using GIS and FernLeaf's unique tool, AccelAdapt, to assist decision-makers in developing climate adaptation and mitigation plans. Matt was part of the team that developed NOAA's U.S. Climate Resilience Toolkit. Among the communities Matt has worked with on climate plans are Charleston, SC, Palm Beach County and Tallahassee, Florida and Asheville, NC.   Matt has a Masters Degree from the University of North Carolina in Asheville and is a member of the American Society of Adaptation Professionals.

North Carolina Emergency Management's (NCEM) Statewide Building Footprint Data Development & Maintenance

Richard Fogleman, AECOM, Richard.Fogleman@aecom.com
Co-presenters: Chris Koltyk, North Carolina Emergency Management, Chris.Koltyk@ncdps.gov and Gray Minton, PE, GISP, AECOM, Gray.Minton@aecom.com

Abstract: NCEM provides risk information to all communities in North Carolina through its ongoing hazard-based studies across the state. In addition to hazard mapping, NCEM also provides building footprint data that depict the impacts of those hazard-based studies on the built environment. It is essential that these building footprint geometries and their attributions be kept up to date to provide the most accurate representations of risk, for communication to the citizens of North Carolina.

NCEM has developed strategies for the development and update of these data as they are currently stored in NCEM's iRISK Geodatabase. This includes protocols for the incorporation of new building footprint geometries, modification of existing building footprint geometries, and the removal of demolished building footprint geometries. In addition to geometry updates, the maintenance strategy also includes 1) protocols to update the physical attributes of buildings to reflect the latest federal, county, and/or municipal data acquisitions, 2) protocols to apply hazard impacts, and 3) the assessment or re-assessment of risk in the form of percent damage and dollar damage.

The iRISK Geodatabase serves building footprint data to several NCEM websites including but not limited to the Risk Management Tool (RMT), the Advisory Floods Viewer, the Flood Risk Information System (FRIS), the Flood Inundation Mapping and Alert Network (FIMAN), the State Emergency Response Application (SERA), and the School Risk Management Plan (SRMP) application.

Biography: Mr. Fogleman is a Technical Director at AECOM and brings more than 23 years of experience with FEMA floodplain mapping projects, the North Carolina Floodplain Mapping Program, and focused experience in GIS administration and workflow development.

Krzysztof "Chris" Koltyk Assistant Director for the North Carolina Emergency Management, Risk Management Chief. Chris has more than 20 years of experience working in public sector both in US and abroad. Mr. Koltyk served as the CIO - City of Jacksonville, NC, Director GIS and Planning in Moore County, NC, Assistant Manager for Gdansk, Poland. Chris completed; GISP, CGCIO from UNC School of Government, Master of Science in Economics - International Trade from Gdansk University, Poland and Master of Public Administration – City and County Management from ASU Boone, NC.

Mr. Minton (PE, GISP) serves as AECOM's Technology Solutions Manager and has over 25 years of experience dedicated to FEMA-funded projects for federal/state/local agencies encompassing engineering, GIS, and software development. He has worked with many CTP's nationwide and, being originally from North Carolina, he is proud to have worked with the North Carolina Floodplain Mapping

Program since its inception, managing the development of many groundbreaking tools and workflows. Mr. Minton manages the development, improvement, and implementation of tools and processes used to streamline production efforts, as well as leading innovative projects to improve the quality and capabilities of data products. His unique combination of engineering, GIS, programming, and project management experience makes him a key technical resource for solving complex problems as well as providing thought leadership and technical support to teammates and clients.

G3: Hydraulic Analysis for Risk and Structure Evaluation

Cache River Valley 2D Floodplain Analysis
Chris Hanstad, PE, CFM, Illinois State Water Survey, hanstad@illinois.edu
Co-presenters: None

Abstract: The Cache River Valley, located in southern Illinois, was the historic channel of the Ohio River. Aggradation of the historic Ohio River channel (current Cache River valley) caused the Ohio River to breach the drainage divide between the Cumberland and Ohio Rivers and the current watercourse of the Ohio River was carved. The valley abandoned by the Ohio River stretches over 50 miles between the current Ohio River and the Mississippi River and the landscape still displays evidence of the historic Ohio River.   In more recent history, the Cache River Valley served as an overflow for extreme Ohio River floods while draining the major tributaries of the Shawnee Hill country from the north through the low relief wetlands of the Cache River Valley. During the last century, major drainage and flood control infrastructure have transformed the hydrology of the Cache River Valley to allow for more agricultural opportunity. Most significantly, the Reevesville Levee prevents Ohio River floods from entering the Cache River Valley and the construction of Post Creek Cutoff diverts most of the upper Cache River to the Ohio River away from the lower Cache River Valley.   FEMA is funding floodplain mapping efforts in the southern Illinois counties containing the Cache River Valley. A massive two-dimensional HEC-RAS model is being developed to capture the flow complexities of the Cache River Valley and to simulate the various flood controlling scenarios of the levees and drainage infrastructure. This presentation will focus on the modeling process and decision making to develop defensible floodplain mapping for the Cache River Valley. The presentation will also showcase the initial two-dimensional modeling results.

Biography: Chris Hanstad, P.E., CFM is an engineer with the Illinois State Water Survey's Coordinated Hazard Assessment and Mapping Program (CHAMP). He has over 10 year of experience in floodplain mapping and hydrologic and hydraulic analysis. He is Licensed Professional Engineer in Illinois, Indiana, and Wisconsin and a Certified Floodplain Manager. He has led the Illinois Letter of Map Revision Review Partners Program at the Water Survey for 10 years. He also performs hydrologic and hydraulic modeling for FEMA floodplain maps studies. He has helped perform loss avoidance studies and risk assessments. He has earned a Bachelor of Science in General engineering and Masters of Science in Civil Engineering from the University of Illinois at Urbana-Champaign.

Understanding the Importance of Hydraulic Controls and Mesh Resolution in 2D Hydraulic Modeling
Scott Hogan, PE, FHWA, scott.hogan@dot.gov
Co-presenters: None

Abstract: The Federal Highway Administration (FHWA) has been actively promoting the use of two-dimensional hydraulic modeling (2D modeling) for bridge hydraulic and floodplain analysis, and scour evaluations. Over the past few years, the use of 2D modeling for transportation related hydraulics has grown significantly and is now used by most state departments of transportation (DOTs).   Based on FHWA's experience with DOTs, consultants, and others, many new modelers do not thoroughly understand the importance of correctly capturing hydraulic controls in the mesh development for a 2D model and how the selection of mesh element size and resolution effects the results. This presentation will highlight the importance of these considerations and provide case study examples to demonstrate the consequences of not considering them.   Ultimately, as 2D hydraulic modeling becomes more widely used as standard engineering practice, we wish to help ensure that engineers are educated in how to use these new tools correctly.

Biography: Mr. Hogan has spent more than 30-years working in the field of river engineering hydraulics. For the past 15 years he has worked with the US Federal Highway Administration (FHWA) and was a consulting engineer prior to that. He graduated from Colorado State University with a B.S. and M.S. in Civil Engineering.   Mr. Hogan specializes in bridge hydraulic modeling and design, scour analyses, sediment transport, counter measure design, and floodplain analysis. For more than 25 years he has been an instructor for several hydraulics training courses through FHWA National Highway Institute (NHI). He has a sincere passion for hydraulic engineering and advancing the state of our practice.

Machine Learning Insight for Rapid Inundation Screening

Mark Bartlett, Stantec, Mark.BartlettJr@Stantec.com
Co-presenters: Jeff Albee

Abstract: This presentation will show that an effective, rapid prediction of pluvial flood inundation is achieved through a direct statistical simulation of hydrologic averages coupled to the insight of a machine learning model that extends localized (high-resolution) HEC-RAS 2D model results to regional areas.   Abstract: Rapid, regional scale riverine and pluvial flood risk assessment and forecasting is complicated by hydrology and hydraulic complexity. Complexity is not fully captured by the most detailed of hydrology models—causing model results to deviate from observations over long time scales. Moreover, as the spatial extents (i.e., scale) and resolution of the study area increase, the associated traditional hydraulic models become computationally expensive. Accordingly, traditional hydrology and hydraulic modeling seemingly is at odds with the efficiency needed for detailed, regional flood analysis. Here, we show that an effective, rapid prediction of pluvial flood inundation (at the regional scale) is achieved through a direct statistical simulation of hydrologic averages coupled to the insight of a machine learning model that extends localized (high-resolution) HEC-RAS 2D model results to regional areas. We find that the direct statistical simulation of the watershed water balance provides a reliable baseline of the watershed moisture status (in comparison to satellite data) and so provides for a reasonable estimation of runoff. This runoff estimation then is mapped to inundation extents based on the machine learning process. While the machine learning accuracy is around 80-percent in comparison to the detailed HEC-RAS 2D models, we show the results are more reasonable and detailed when compared to previous mapping efforts. For two case study areas, our results demonstrate how machine learning provides flood risk insights from data whether it be remote sensing or model derived. We anticipate that similar machine learning approaches will start to complement traditional hydraulic modeling efforts in rapidly extending results to large regions. As machine learning approaches evolve,

we foresee data driven machine learning approaches capturing more of the complex functional dynamics of flood modeling without the parameter uncertainty of the traditional modeling approaches.

Biography: Mark is the Engineering Insight & Analytics Technical Lead at Stantec where he has innovated engineering analytics for extracting data insights that expedite the modeling process. Mark is an expert in climate change, hydraulic and hydrologic modeling, stormwater management, agricultural and ecohydrological modeling, and the application of probability and statistics in science and engineering. Mark's research agenda advances the study of hydro-climate variability, surface and subsurface hydrology, stochastic (i.e., random) processes, and ecohydrology - the interdisciplinary analysis of the interactions between water and ecosystems. As part of his doctoral research in watershed hydrology, Mark worked on the climate model of the National Oceanic and Atmospheric Administration (NOAA) Geophysical Fluid Dynamics Laboratory (GFDL), and specifically, he developed a module for improving the representation of plant water and carbon uptake. After completing his PhD in 2016, he became a fellow in the National Institute of Food and Agriculture of the United States Department of Agriculture (USDA) and was awarded funding for a two-year project that compares the benefits of C4, and crassulacean acid metabolism (CAM) photosynthesis cultivation on semi-arid, marginal lands for biofuel production. In 2017, he became a visiting researcher at Princeton University, and in addition to the USDA project, he worked on stormwater hydrology and advancing the fundamental mathematics for representing stochastic processes and groundwater hydrology.

G4: Risk MAP Lifecycle

Third-Party Data and the Golden Triangle (Cost, Schedule, Quality)
Taylor Grove, PE, CFM, ENV-SP, CDM Smith, grovet@cdmsmith.com
Co-presenters: Matt McGlone, CDMSmith and Sydney Rauh, CDM Smith, rauhsj@cdmsmith.com and Matt McGlone, CFM, CDM Smith, mcgloneml@cdmsmith.com

Abstract: In today's world of flood risk management, collaboration amongst Federal, state, and local partners is critical to identifying and assessing flood risk during a FEMA Risk MAP project. Flood risk data management collaboration amongst all partners benefits the public by supporting a more flood resilient community. Successful cooperation among local and state flood risk project stakeholders has multiple benefits, from creating the most accurate risk tools to inform the public, to saving taxpayer dollars. There are many aspects to consider and navigate when developing and refining data during FEMA Risk MAP projects, collaboration should be key among them. Our presentation will focus on how to successfully navigate the Golden Triangle of project management: quality, time, cost. Our goal is to provide insights, tools and examples that local communities, state partners, and CTP partners may use during the FEMA Risk MAP Project lifecycle to improve and align the data development process. We want to provide the attendees with a Compass to better navigate the Golden Triangle, where quality, time, and cost with regards to data collaboration. Through the creation of synergy and in the spirit of collaboration, together we can work towards more flood resilient communities.

Biography: Ms. Taylor Grove is a water resources engineer who has delved into the world of project management. She has worked extensively with H&H models and interfaces, and supported FEMA

Appeal Submissions. Taylor now focuses her efforts on creating a symbiotic golden triangle in her work whenever possible

Ms. Rauh has nine years of experience supporting FEMA's Risk Mapping, Assessment and Planning (Risk MAP) program. She serves as the Deputy RPS Manager for FEMA Region 6 and the MIP Black Belt for FEMA Region 1 and FEMA Region 6.

Mr. McGlone is a Certified Floodplain Manager and Project Manager who has over ten years of experience on FEMA mapping projects, including both Map Modernization and Risk Map phases. He currently serves as the Regional Technical Coordinator for FEMA Region 8.

The Forgotten "P": Reviving Mitigation Planning Technical Assistance in Risk Mapping, Assessment, and Planning (Risk MAP)

Traci Danielle Murray, CFM, Atkins North America, traci.murray@atkinsglobal.com
Co-presenters: None

Abstract: The Risk Mapping, Assessment, and Planning (Risk MAP) program philosophy has always been that flood hazard identification should be an iterative process that is about more than just the Flood Insurance Rate Map (FIRM). Since its inception, Risk MAP has progressed to this original vision with the addition of new stakeholder touchpoints and the inclusion of mitigation planning technical assistance as an optional Risk MAP activity to strengthen the "P" (P is for planning) in Risk MAP. However, because Risk MAP remains primarily a path towards developing regulatory products, it has fallen short of the vision of mitigation planning technical assistance being a component of every flood risk project. This is due, in part, to the difficulty of communicating broader risk and resilience topics during Risk MAP touchpoints. This presentation will cover the various ways mitigation planning technical assistance can, and should be incorporated throughout the Risk MAP lifecycle to identify opportunities to support the hazard mitigation planning process through the use of existing Risk MAP data.

Biography: Traci Murray is currently a Senior Technical Coordinator at Atkins. Traci has more than 8 years of technical production with extensive experience analyzing environmental data, hazard resiliency, and floodplain management. Much of her experience has been leading community outreach for state and local Cooperating Technical Partners (CTPs) including helping those programs to develop effective outreach plans to increase flood risk awareness. Traci joined the Association of State Floodplain Management (ASFPM) and the Georgia Association of Floodplain Management (GAFM) in Spring 2010. Since 2016, she has served as GAFM's Treasurer and Conference Chair. In addition to her voluntary efforts with GAFM, Traci also serves on the Junior League of Atlanta's Coalitions Strategies Council supporting the Criminal Justice Coordinating Council's Statewide Human Trafficking Task Force and Georgia Appleseed's Healthy Housing Project. Traci is a proud resident of Cobb County where she resides with her husband and three daughters.

Leveraging Local Mapping Needs into FEMA's Discovery Process: A Discovery Needs Ranking System Overview

Emily Whitehead, Stantec / STARR II, emily.whitehead@stantec.com
Co-presenters: Andy Dobson, AICP, CFM, Stantec, andy.dobson@stantec.com

Abstract: This presentation will discuss how local and state flood mapping needs are being factored into FEMA's Risk MAP Discovery process. An overview of Strategic Alliance for Risk Reduction II (STARR II)'s

Discovery Needs Ranking System will be provided, including Discovery success stories from Watersheds in New York, Indiana, Michigan, and Ohio. Topics covered will include stakeholder engagement methods, data collection and analysis, and (hard-earned) wisdom to carry forward to the next Discovery project.

Biography: Emily Whitehead is a Project Manager with the Cincinnati, Ohio office of Strategic Alliance for Risk Reduction II (STARR II), and is in her eighteenth year of professional practice in Geographic Information Systems (GIS) and flood risk identification and hazard mapping. Emily received a Bachelor of Science Degree in Geography from Ohio University and an Information Technology certificate in Web Development from the University of Cincinnati. Over the past seventeen years, Emily has been active in FEMA's Map Modernization and Risk Map Programs throughout the United States, focusing on project management, floodplain mapping, DFIRM production, quality control, and community outreach.

Andy Dobson, AICP, CFM is a Senior Planner with Stantec. He has over twenty years professional planning experience working with local government, county government, and private consultants. Projects Andy has worked on include land development regulation, community engagement, comprehensive planning, non-profit administration, transportation planning, floodplain management, and GIS mapping applications. Currently he is working on FEMA Risk Map projects building community awareness and information tools related to various natural hazards.

G5: Crowd-Sourcing for Risk Communications

Using Social Media to Crowdsource Community Feedback Throughout Project Implementation
Patrick Heck, CSM, Guidehouse, pheck@guidehousefederal.com
Co-presenters: None

Abstract: What do BRIC, Risk Rating 2.0, and NFIP reauthorization have in common? They each could benefit from social media research and analysis (SMRA), a process of continuous data collection from diverse social media channels based on keywords, hashtags, and mentions of one's company, agency, or product.   Social media offers a novel and generally untapped data source for government agencies to understand the needs of their constituents. While social media data is commonly analyzed in the commercial sector to reveal insights into brand, reputation, and customer experience, there is valuable potential for the federal government to analyze social media data before, during, and after project implementation to crowdsource feedback and public experience.   Guidehouse will provide an overview of SMRA techniques and strategies to provide insight into the public's experiences and perceptions of a given project or program, as well as how they interact and respond to related information published by an agency and traditional media outlets. Key terms associated with the project can be captured, analyzed, and tracked from internet search activity and social media posts to form a swift organically tailored response.   SMRA will allow government agencies to identify – and place in context – critical trends on the most frequently used words, phrases, and links; identify public sentiment and examine public awareness; determine the geographic distribution of mentions; and classify inquiries, topics of discussion, and emerging themes related to a project. SMRA is an open source solution that provides a holistic landscape of data to comprehensively understand public opinion and make data-driven decisions.   SMRA capabilities can aid in making communities more resilient by organically

crowdsourcing feedback and using that feedback to tailor response, communications, and outreach. This capability can (and should be) used to monitor public feedback on the rollout of BRIC, Risk Rating 2.0, NFIP reauthorization, and other projects.

Biography: Patrick Heck, CSM, is an Associate Director at Guidehouse. Mr. Heck has 11 years of experience providing support in areas of strategic planning, course design, training development, issues and crisis management, and technology implementation to Federal clients, Fortune 500 companies, foreign governments, and not for profit organizations. Positioned as an internal subject matter expert on operational performance since 2011, Mr. Heck provides advisory support to maximize system capabilities across multiple directorates across the Federal Emergency Management Agency (FEMA) including the Office of the Chief Financial Officer (OCFO), Radiological Emergency Preparedness Program (REPP), the Office of Chief Financial Officer and the Office of the Chief Component Human Capital Officer (OCCHCO), and the Flood Insurance and Mitigation Administration (FIMA) Federal Insurance Directorate (FID). Mr. Heck has a deep understanding of FEMA and the National Flood Insurance Program and is prepared to discuss challenges around flood insurance and benefits of investing in sensor technology and dam safety.

Correlating Citizen Tidal Flooding Observations with Understanding Roadway Impacts

Daniel Tomczak, CFM, Jacobs Engineering Group, Inc., daniel.tomczak@jacobs.com
Co-presenters: Christine Voss, Ph.D., University of North Carolina Institute of Marine Sciences; Miyuki Hino, Ph.D., University of North Carolina, Chapel Hill; and Sarah Spiegler, North Carolina Sea Grant

Abstract: The North Carolina King Tides (NCKT) Project began in 2015 as an initiative for public outreach and for citizens to become engaged in understanding, photo-documenting, and measuring water levels during tidal events in coastal communities. Volunteers and citizen scientists submit their photos of high water images to the NCKT Project and include observations of impacts to roadways, parking lots, residential buildings, non-residential buildings, or open spaces (yard, beach, park, etc). Both residential and commercial districts within communities as well as the daily lives of the citizens can be disrupted by the tidal flooding. During these tidal flooding events, high water can obstruct transportation routes for people commuting to work, supplies being delivered to businesses, students going to school, or emergency vehicle routes. Roadways including Canal Drive in Carolina Beach, NC and Front Street in Beaufort, NC can experience localized flooding during tidal events such as King Tides. What is the frequency and duration of road closures within these different coastal communities as a result of tidal flooding? What sections of the roadways have been closed due to the tidal flooding? This evaluation correlates tidal high water events (i.e., King Tides) with the impacts to roadways and other structures as reported by volunteers and citizen scientists or by photos and information provided from community officials. Observations by citizen scientists are particularly useful in capturing tidal flooding because the events may be brief and highly localized, making it at times difficult to capture from other sources.

This presentation will help communities plan for future impacts by tidal flooding to infrastructure, communicate to the residents and businesses that are along the roadways impacted, and establish rerouting for traffic and emergency responses.

Biography: Daniel is currently a project manager and certified floodplain manager with Jacobs Engineering Group with over 22 years in the field working on environmental, water resources, and sediment projects. He is also active in the North Carolina Association of Floodplain Managers (NCAFPM)

as the Education and Outreach Chair and has helped with launching the NCAFPM scholarship program. He has also teamed with staff from the University of North Carolina and NC Sea Grant in growing the NC King Tides Project and promoting the project with volunteer and citizen scientist groups and through social media.

A Community Flood Notebook: Gilbert White Meets Crowdsourcing

Jeff Stone, ASFPM, jeff@floods.org
Co-presenters: None

Abstract: Dr. Gilbert White, considered the father of floodplain management, created the "Boulder Creek Flood Notebook" as a research program aimed at emergency managers to report, in a timely fashion, the extent of loss of life, property damage, social disruption, and environmental destruction associated with historic flooding on Colorado's Boulder Creek. Every year individuals use their smartphones to take thousands of digital photos of flooding whether it's part of their job or because the flood is directly impacting their community or property. These photos are often shared on Facebook, Flickr or in news stories, but just as often, these photos are subsequently lost once the next big flood event or news story comes along.   The Community Flood Notebook platform being developed and researched by ASFPM's Flood Science Center, would allow communities to harness the crowdsourcing capabilities of mobile devices to engage the public to document flood events. The Notebook would provide a standardized, comprehensive platform for storage and retrieval of flood event data by the public in partnership with local professional staff including floodplain and coastal managers, planners, and emergency managers. Data could be collected before, during and after a flood and may include, but is not limited to geolocated photos, hydrographs, precipitation maps, river/tide gauges, videos and high water marks. Communities would create a unique "Flood Event" for each flood that impacts their community. Over time, a collection of events would be archived, supporting the community's institutional memory, hazard mitigation planning and flood risk communication efforts to name a few, all aimed at using information on past floods to reduce future flood losses.   This presentation will highlight the gaps in existing tools and data collection, share examples and opportunities for a standardized, integrated approach and demonstrate a prototype version of the Community Flood Notebook.

Biography: Jeff Stone is a Research Manager with the Association of State Floodplain Managers (ASFPM). As part ASFPM's Flood Science Center, he manages research and outreach projects that focus on informing flood policy through science. Projects include, but are not limited to developing and evaluating tools, websites and software; researching the legal, practical and technological issues related to flood management policy and practices; and communicating effective use of GIS tools and applications through webinars and workshops. He earned his B.S. and M.S. in Geographic Information Sciences with a strong emphasis on coastal and fluvial geomorphology from the University of Wisconsin-Madison.

G6: Tech & Tools for Warning Systems

Explorations of a community-based repository for rapid flood response data using cloud technologies – OpenWELL

Mark Jensen, PE, Pacific Northwest National Laboratory, mark.jensen@pnnl.gov
Co-presenters: David Judi; Dan Corbiani; Tim McPherson; Cindy Rakowski; John Wilson

Abstract: Rapid flood response is vital in saving lives and reduction of economic impacts via property damage as a result of flooding. Physics-based and data-driven modeling for flood forecasting generates substantial data and requires significant expertise. In addition, there are limitations in the ability to effectively integrate and disseminate information to support flood situational awareness. The current state-of-practice for rapid response data sharing involves hyperlinks to cloud-based storage, uploads and downloads of data, and utilization of desktop or server-based geospatial information systems (GIS) to generate maps. This approach is inefficient and costly, and results in duplication of large raw datasets. In addition, users (e.g., decision makers) of said data are often bewildered by a bombardment of disparate data originating from a variety of models and forecasts.   These complexities lead to a rise in uncertainty and can confound decision processes during response and recovery activities.   We have explored new methods of leveraging cloud-based technologies to enhance collaboration between developers of data and the broader flood response community. Embracing a community approach to disaster predictive analytics by exploring technologies to integrate, store, evaluate, and visualize multiple model simulations. Historically, sharing these large datasets has had constraints due to the size of data. Emersion of cloud-based technology allows for ease of access and enabling scalable solutions. These solutions also present more cost-effective ways of dealing with large datasets via serverless technologies.   To test and evaluate these approaches, we have developed a prototype utilizing Microsoft Azure, adapting our previously developed flood simulation archive, WELL, to a community-based approach Open-WELL. This talk will present the prototype technology and discuss the technology as it relates to advancements in flood response.

Biography: Mark Jensen is a data scientist at Pacific Northwest National Laboratory. His responsibilities include cloud-based software development for hydrologic and hydraulic modeling. Mark has developed cloud- and web-based software including geospatial data pipelining and creation of user interfaces. His research interests are in water distribution, flood modeling and storm water infrastructure security. He is involved in developing complex data pipelines used in flood model development and deployment. Mark has developed flood modeling studies as a consultant for various small dams in Utah, utilizing Probable Maximum Flood (PMF) analyses and HEC-RAS dam break failure models. He was also a City Engineer for Herriman City, UT directing engineering and inspection of a fast growing city. Including management of FIRM mapping submittals for creeks lying within the City.   Mark holds a MS in civil & environmental engineering from the University of Utah, and a BS in civil & environmental engineering from the University of Utah.

Low Cost Flood Sensors: An Urban Installation Guidebook

Matthew Storosh, CFM, Charlotte-Mecklenburg Storm Water Services, matthew.storosh@mecknc.gov
Co-presenters: Josh McSwain, Charlotte-Mecklenburg Storm Water Services, Josh.McSwain@MeckNC.gov and Ryan Spidel, Charlotte-Mecklenburg Storm Water Services, Ryan.Spidel@MeckNC.gov

Abstract: In April 2018, Charlotte-Mecklenburg Storm Water Services (CMSWS) sought to expand their existing Flood Information and Notification System (FINS) in partnership with the U.S. Department of Homeland Security, Science and Technology Directorate (DHS) as a part of the Flood Apex Program. Over the past two and a half years, CMSWS has worked to test, evaluate, and integrate over 165 Low Cost

Flood Sensors (LCS) into the FINS network.   During year one of the three-year contract, CMSWS deployed 75 alpha (first generation) sensors from three private vendors and reported their performance to DHS. During year two, CMSWS deployed 93 additional sensors (beta units – second generation) from a single private vendor selected by DHS from the pool of three Alpha sensor providers. Year three of the project focused on the integration of the LCS with CMSWS' existing flood warning system. The process of expanding the FINS network has been a multi-year project involving several specialized groups within CMSWS. The conclusion of these efforts was a largely expanded flood monitoring network and the publication of an "Urban Installation Guidebook". The "Urban Installation Guidebook" is a comprehensive framework and how-to manual to help other communities better understand the hardware, technology and expertise needed to develop or expand a flood monitoring and alert network. This presentation will discuss how CMSWS and DHS came to develop and publish the "Urban Installation Guidebook," divulging into topics such as site selection and preparation, equipment installation and associated costs, operation and maintenance, and communication capabilities. DHS, Science and Technology Directorate and CMSWS is looking to share the lessons we have learned and provide guidance to other communities looking to develop and/or expand their flood monitoring efforts, as well as explore new ways to leverage LCS data for other use cases.

Biography: Matthew has been with CMSWS since 2017 conducting Industrial and Municipal Stormwater inspections and managing the County's Continuous Monitoring and Alert Notification Network (CMANN). In the past two years, he has overseen the implementation and maintenance of the Low-Cost Flood Sensor Network as part of a Flood Apex Program with the Science and Technology Directorate of the U.S. Department of Homeland Security.

Floodcast: Delivering Real-Time Flood Impact Decision Intelligence to DOT's and Beyond
Mathew Mampara, PE, Dewberry, mmampara@dewberry.com
Co-presenters:

Abstract: Emergency managers at state Department of Transportation agencies (DOT's) across the country must respond with whatever information is available leading up to and during flood events to support road closures and take actions to ensure threats to public safety are minimized. This is a challenging responsibility, as each state's DOT assets include thousands of miles of roadway, hundreds or thousands of bridges, tunnels, and other infrastructure. The tools available for flood prediction, response and recovery vary widely from state to state.   Floodcast, a multi-year project directed by the National Academies of Sciences' Transportation Research Board, has focused on understanding these challenges faced by DOT's, and pilot approaches and tools for informing timely response to fast moving and broad ranging flood events. The current phase of the project includes the development of an automated system for creating flood models at all locations where DOT assets are in proximity to inland flooding sources. Combined with forecasts from the National Water Model, hourly stage predictions are made possible at all assets across a state, to provide context in time and space for making decisions on what roads/bridges to close and when. This talk will discuss advances in the Floodcast system for taking real-time hydrologic predictions and serving flood forecasts to DOT's. Case studies will show the challenges and successes of this approach at varying locations throughout the country.

Biography: Mr. Mampara is a national subject matter expert in the areas of climate risk and resilience. He has extensive experience helping organizations at the national, state, and local levels understand vulnerability to natural hazards, assess risks, and develop/implement strategies to reduce risks. He has

served as Principal Investigator for a number of National Academy of Sciences areas of inquiry and worked with a range of Federal agencies to advance the nation's understanding of natural hazard risk including FEMA, USACE, NOAA, and USGS.

G7: Post-Flood Floodplain Management Compliance Assistance

Leveraging Mutual Aid Teams and DRRA 1206 for Post-Disaster Compliance Success
John Ingargiola, EI, CBO, CFM, FEMA Headquarters, john.ingargiola@fema.dhs.gov
Co-presenters: Shandy Heil, CFM, Louisiana Disaster Response Team and Stuart Adams, STARRII/Stantec

Abstract: Following major disasters that affect multiple counties and jurisdictions, smaller communities often face a unique set of challenges for response and recovery efforts. Overcoming these hardships including staffing constraints and resource limitations is necessary to satisfy post-disaster compliance requirements of community ordinances. This dynamic presentation provides up-to-date developments on the utilization of mutual aid, floodplain management and building safety response teams with insights from the federal and SLTT perspective. A case study on leveraging DRRA 1206 for response efforts including Substantial Damage Estimates (SDE) and building code enforcement following Hurricanes Laura and Delta will be showcased. Recently developed tools and resources including the FEMA Building Science's Mutual Aid Tracking for Building Departments Regional Fact Sheets will be featured in the presentation.

Biography:

Implementing the DRRA Section 1206, Code Implementation and Enforcement, Policy for Floodplain Managers
Jennifer Tylander, , FEMA HQ, jennifer.tylander@fema.dhs.gov
Co-presenters: Adrienne Sheldon, FEMA HQ John Lyons, FEMA HQ Molly Kaput, FEMA Region I

Abstract: In response to unprecedented challenges and disasters, FEMA worked closely with Congress in 2018 to inform legislative and programmatic changes to improve our disaster preparedness, response, recovery, and mitigation programs that culminated in the Disaster Recovery Reform Act (DRRA). DRRA Section 1206 grants FEMA new authorities to provide communities with the resources needed to effectively administer and enforce building code and floodplain management ordinances for up to 180 days after a presidential disaster declaration. In doing so, DRRA Section 1206 aims to increase the overall speed of post-disaster recovery and enhance compliance with state and locally-adopted building codes and floodplain management ordinances, including substantial damage operations.   DRRA Section 1206 was implemented through a policy which provides more details about the specific types of work that are eligible for assistance. Signed October 2020, the intent of this policy is to provide communities with the resources needed to effectively administer and enforce state and locally adopted building codes and floodplain management ordinances for a period of no longer than 180 days after the date of the major disaster declaration. The policy also provides parameters for eligible work and costs that are afforded to communities.   This presentation will provide an overview of the policy and its impact on post-disaster operations. FEMA recognizes that this Policy represents a new way of providing assistance to state, local, tribal, and territorial governments for building code and floodplain management ordinance administration and enforcement in a post-disaster environment. As such, this session will serve as a critical touchpoint with key stakeholders to communicate the impacts of DRRA

Section 1206 on their current post-disaster roles and responsibilities and field any questions or concerns they may have.

Biography: Bio needed.

Floodplain Management Community Engagement - Lessons Learned from the 2020 Oregon Wildfires

Celinda Adair, State of Oregon Department of Land Conservation and Development (DLCD), celinda.adair@state.or.us
Co-presenters: Mitch Paine, CFM , Mitigation Division, FEMA Region 10, mitch.paine@fema.dhs.gov

Abstract: This presentation will cover the best practices, tools, and challenges learned from providing support to local communities with post-wildfire floodplain management responsibilities, after the 2020 Oregon wildfires. Presenters will be Celinda Adair, the State of Oregon NFIP Coordinator, and Mitch Paine, FEMA Region 10 Floodplain Specialist for Oregon. The devastating 2020 Oregon historic wildfires caused significant damage to homes and properties within community flood hazard areas. This presentation will discuss what we learned and provide recommendations for how to engage with communities regarding floodplain management requirements (including Substantial Damage obligations), flood after fire risk communication, post-wildfire risk assessments, and the importance of rebuilding in a more resilient manner to mitigate future flood risks after significant wildfire events.

Biography: Celinda Adair, CFM is the National Flood Insurance Program (NFIP) Coordinator for the State of Oregon Department of Land Conservation and Development (DLCD). Celinda is currently the ASFPM Regional Director for Region 10. She was previously employed at the State of Oregon DLCD as a Natural Hazards Planner. Celinda has local floodplain management experience through her role as a Planner and Community Rating Systems (CRS) Coordinator for Thurston County, Washington. Celinda also held the role of Map Modernization/Risk MAP Program Coordinator for the State of Montana for four years. Celinda's other roles include: Business Development Consultant for Haefeli-Lysnar Geospatial and Project Manager for a landmark native title settlement project for the State of Western Australia. Celinda possesses a Bachelor's Degree in Political Science from the University of Texas at San Antonio and a Master's Degree in Environmental Studies from the Evergreen State College.

Mitch Paine is a Floodplain Management Specialist for FEMA Region 10. He works primarily with Oregon communities on their participation in the National Flood Insurance Program, including providing technical assistance on a range of topics from floodplain permitting to flood hazard mitigation planning. Prior to joining FEMA, Mitch was the Community Rating System coordinator for King County, Washington and before that the State Floodplain Manager for Nebraska. Mitch is also a part-time lecturer at the University of Washington, teaching floodplain management graduate classes. He holds a Master of Regional Planning degree from Cornell University.

H1: Local Floodplain Management Initiatives 2

4 Score and Seven Years Ago – City of Dallas Journey towards becoming a CRS Class 4

Kimberly Dewailly, PE, CFM, City of Dallas, Dallas Water Utilities, kimberly.dewailly@dallascityhall.com

Co-presenters: Steve Parker, P.E., CFM, Floodplain Administrator, Dallas Water Utilities, City of Dallas; Jarred Overbey, P.E., CFM, Water Resources Team Leader, Halff Associates, Inc and Katherine Hawkins, P.E., CFM, Project Manager, Halff Associates, Inc.

Abstract: The City of Dallas has been a participant in the CRS program since 1991. By the early 2000s, the City of Dallas had reached a CRS Class 7 rating and began to diligently strategize on how to meet Class 6 prerequisites and improve their rating for their next verification cycle visit. After overcoming several hurdles, the City obtained a Class 5 during the 2009 verification cycle, the best rating in Texas. With the Class 5 rating and community benefits achieved, development and redevelopment within the community continued to occur. The City's need for a strong floodplain management program continued to be essential. The activities and higher regulatory standards that the City has implemented as part of their robust floodplain management program have inherently improved the value of their CRS credit points.   Over the past seven years, the City's CRS Class 5 rating has been maintained while their credit points have steadily increased to be within Class 3 credit range. With this in mind, the City established and has worked toward a new goal - meeting all Class 4 prerequisites.   This presentation summarizes the seven-year journey of the City of Dallas' experience as they navigate through the CRS program to accomplish their goal of a Class 4 or better. It highlights the achievements and challenges, such as establishing a city-wide watershed masterplan, that the City of Dallas has encountered as it supports the community's floodplain management needs to benefit all residents.

Biography: Kimberly Dewailly joined the City of Dallas Trinity Watershed Management Department – Floodplain Management Section in 2015. Previous to working at the City of Dallas, Kimberly worked in the engineering consulting field from 2006-2015.   Kimberly has served as the Texas Floodplain Managers Association Region 10 Director since the summer of 2017. Kimberly maintains continuing education for her PE and CFM annually. Kimberly has worked on floodplain modeling and delineation, floodplain management plans, flood drainage concerns, floodplain related permitting, dam breach analyses, and EAPs during her career.

Floodplain Management and COVID-19 Pandemic Response – An Essential Industry's Agility and Opportunities

Glenn Shephard, PE, Ventura County Public Works Agency Watershed Protection,
Glenn.Shephard@ventura.org
Co-presenters: None

Abstract: The Ventura County Public Works Agency's Watershed Protection (WP) evolved from a flood control district into a premier watershed protection entity over 76 years. Its mission to protect life, property, and community infrastructure from flood events; improve water resources management; and enhance the health and natural function of watersheds garners public trust. WP's annual structural revenue of $40 million supports 215 miles of channels, 56 dams, 4 pump stations, 14 stormwater quality stations, and 120 hydrology monitoring stations. WP's floodplain management is a vital mission component by assessing flood mapping needs, risk communication, mitigation and reduction, future conditions due to climate change, future conditions due to watershed development, green infrastructure, emergency management demands, and ecosystem requirements. WP floodplain management programs support the Federal Emergency Management Agency's (FEMA) Community Rating System, Floodplain Development Permitting, and Emergency Action Plans. Aging infrastructure, climate uncertainty, post-wildfire flood risk, and increasingly complex environmental permitting

challenges have driven strategic goals and objectives change. Additionally, this year's pandemic emergency presented a new operating environment. This opportunity meant continued uninterrupted service from this essential 'critical infrastructure industry' and sent a demand signal to quickly adapt; thus, it was a catalyst for industry innovation and modernization. This presentation will showcase adaptive innovation and new initiatives that modernize WP and delivery of its core floodplain management functions, improving data access, infrastructure planning and life-cycle analysis, and inculcating resiliency due to climate uncertainty. Highlighted examples include the Flood Warning System (FWS) web portal and code modernization, utilizing Artificial Intelligence (AI) to track permits and future development, implementing FEMA's Dam Safety Collaborative Technical Assistance program during the COVID-19 pandemic emergency response for dam failure risks, developing an infrastructure failure consequence dashboard for public safety agencies, partnering with the United States Army Corps of Engineers' Engineering Research and Development Center to modernize regional sediment management, and, utilizing countywide 2D debris flow modeling to support evacuation decision making.

Biography: Glenn Shephard is the Director of Ventura County's Watershed Protection District, a Public Works Agency Department, and a retired United States Navy Captain, Civil Engineer Corps. He is a Professional Engineer (Civil) licensed in California, a former member of the Defense Acquisition Corps. In his current role, he's responsible for planning, budgeting, permitting, design and construction, operating and maintaining County flood protection and storm water management assets – including 56 dams, 215 miles of levee, channel and district drainage related facilities; coordinating watershed and groundwater management programs, Sustainable Groundwater Management Act requirements and managing storm water quality programs; and operating and maintaining the County's flood warning system; all governed by the Ventura County Board of Supervisors.   During his twenty–eight year Navy career, he led units, world-wide, responsible for public works, construction, asset management, environmental stewardship and Navy Seabees. During one unique position was as Director, Infrastructure and Logistics Division, Directorate of Defense Affairs, Multi-National Security Transition Command – Iraq, he was an advisor to Iraq's Ministry of Defense for new military basing, and from which he was awarded the 2008 Society of American Military Engineers, Moreell Medal.   He is a 1984 graduate of Granada High School in Livermore, CA, and a 1989 Bachelor's of Science Civil Engineer graduate from San Jose State University, San Jose, CA. He earned a Master's of Science Degree in Civil Engineering from the University of Florida in 1999, and a completed the Strategy and Organization Executive Management Program at Stanford University in 2011.

Community Planning, Support and Engagement in Floodplain Protection

Sandy Cross, Town of Duck, scross@townofduck.com
Co-presenters: None

Abstract: Dare County and its six municipalities comprise the area of North Carolina known as the Outer Banks, a series of barrier islands surrounded by the Atlantic Ocean and several estuarine water bodies. On June 19, 2020 new Flood Insurance Rate Maps became effective in Dare County, culminating a four-year review cycle for the new maps.   The preliminary maps released by FEMA and the State of North Carolina in June 2016 drastically reduced the number of properties designated as special flood hazard areas (SFHA). Thousands of properties throughout Dare County were reclassified as Shaded X or X zones requiring no flood elevations.   For those properties remaining in the SFHAs, base flood elevations of eight, nine and ten feet were decreased to four feet.   Dare County governments acknowledged the potential flood insurance cost savings for property owners. However, the local

governments also had concerns that owners would construct substantial improvements in flood-prone areas or have a false sense of security and cancel flood insurance policies.   With thousands of properties potentially reclassified in non-flood zones where known flooding has occurred, community planners looked to develop a regulatory framework to mitigate flood losses. The development of these standards took over two years and involved conversations with a variety of stakeholders. This process resulted in the adoption of higher flood protection standards throughout the County and an educational campaign designed to educate property owners about the risks associated with flooding. Once the regulatory framework was in place, planners were put to the task of developing positive results from a Community Rating System (CRS) standpoint.   This presentation will report on the methods used to provide a united message to its community stakeholders, to garner support from the community, the process of developing those higher regulatory standards, and the challenge of gaining credit through the CRS.

Biography: Sandy Cross is the permit coordinator for the Town of Duck and has been with the Town for 18 years. She graduated from the University of Maryland and serves the Duck community as a certified zoning official, floodplain manager, and a CAMA local permit officer. Sandy is a member of the OBX CRS Users group and will be presenting information related to all communities in Dare County related to this topic. She is an avid beachgoer and has a passion for promoting community involvement.

H2: Hazard Mitigation Policy

Effectiveness and Equity Considerations of Buy-Out Programs: Johnson Creek Willing Seller Program Assessment
Laura Marshall, ECONorthwest, marshall@econw.com
Co-presenters: None

Abstract: Johnson Creek Watershed is a 55-square mile area in and around Portland, Oregon. Since 1997, Portland's Bureau of Environmental Services (BES) has administered a willing seller program that purchases homes from property owners to fulfill the multiple goals of flood risk reduction and floodplain restoration, including water quality improvements, and habitat enhancement. ECONorthwest performed a program evaluation to assist BES with obtaining a better understanding how the practices and policies of the JCWS Program affect the program's effectiveness and how it may impact financially-vulnerable willing sellers, ECONorthwest performed a program evaluation. Specifically, the analysis evaluated how the program's compensation package influences homeowner's ability to purchase replacement housing, as well as how alternative purchase strategies like partial acquisitions could influence BES's ability to purchase properties within the floodplain. Also of consideration is how other valuation methods could improve outcomes for economically-vulnerable willing sellers. ECONorthwest performed extensive GIS mapping of home values and characteristics as well as socioeconomic and demographic factors to evaluate these questions. The research team also evaluated case studies of other willing seller programs to see how policies compare to the Johnson Creek program. This presentation will not only inform participants about the Johnson Creek Willing Seller Program, but also provide recommendations for how programs can be structured to increase program effectiveness and provide homeowners with increased opportunity to purchase adequate replacement housing. Of particular focus will be how the involuntary

compensation under HUD policy compares to the Johnson Creek and other willing seller compensation strategies.

Biography: Laura Marshall is a Project Manager with ECONorthwest, an economics consulting firm headquartered in Portland, Oregon. Laura holds a dual masters degree from Oregon State University in Applied Economics and Water Resource Policy and Management. She specializes in natural resource economics, benefit-cost analysis, and economic impact analysis. Her professional and academic experience focuses on the economics of natural resources, particularly water resources, forestry, recreation amenities, and resiliency planning.

Losing Ground: Mitigation Status of Severe Repetitive Loss Properties

Anna Weber, Natural Resources Defense Council, aweber@nrdc.org
Co-presenters: None

Abstract: In the 50 years between the creation of the National Flood Insurance Program and 2018, nearly 37,000 properties have been categorized as "severe repetitive loss" (SRL) after sustaining multiple damaging floods. These SRL properties, which have flooded five times each, on average, are prioritized for mitigation under FEMA's Flood Mitigation Assistance grants and other programs. However, according to FEMA data, less than one third of SRL properties have been mitigated—fewer than have dropped out of the NFIP without having been mitigated. If current programs and policies cannot keep up with the existing mitigation needs of the most flood-prone properties, what does that mean for the future? And what does that mean for the communities that are being left behind?   This presentation will examine the locations, characteristics, and mitigation trends of SRL properties across the United States using the Natural Resources Defense Council's interactive SRL data visualization tool, "Losing Ground." The presentation will also examine the demographics of communities that have large numbers of non-mitigated SRL properties and discuss the equity implications for hazard mitigation policy.

Biography: Anna Weber researches and advocates for policies that advance equitable adaptation to climate change as a member of the Natural Resources Defense Council's Water & Climate Team. The team works to incorporate the current and future effects of flooding, sea level rise, and other climate-driven hazards into local, state, and national decision making and to ensure that adaptation policies benefit those on the front lines of climate change. Prior to joining NRDC, Anna spent ten years at The Cadmus Group, where she supported U.S. Environmental Protection Agency contracts related to water quality, infrastructure, and resilience. She holds a bachelor's degree in geology and a master's of public health in environmental health science and policy.

Policies to Help Communities Benefit from Buyouts: Partnerships, Valuing Multiple Benefits, and Other Key Strategies

Matt Fuchs, The Pew Charitable Trusts, mfuchs@pewtrusts.org
Co-presenters: None

Abstract: The Pew Charitable Trusts is developing a report on recommendations for policy changes at the federal level to make buyouts of flood-prone properties more effective. The analyses will be released in summer 2021.   Since 2000, the nation has seen over $850 billion in damage from flood-related disasters. Research demonstrates every dollar invested in mitigation saves an average of $6 in disaster costs. Buyouts can be an especially effective mitigation strategy, relocating residents and

businesses out of harm's way. Yet, buyouts have been underfunded, hindered by ineffective policies, and under-utilized before disasters strike. According to the Government Accountability Office, from 1989 through 2018, 75 percent of federal funds obligated for flood mitigation went toward property acquisitions—but only 18 percent of those funds were allocated pre-flood. Following disasters, buyout programs often operate too slowly. Unable to wait months or even years for the buyout process to be completed, many communities have no choice but to rebuild in at-risk areas.   Pew's research involved interviews with subject matter experts and federal officials to gain perspectives on strategies to enhance the effectiveness and efficiency of buyout programs. State and local officials were engaged to learn from examples of challenges and successes with using federal grants as well as designing programs run locally. Pew also convened a workshop with policy leaders and practitioners to identify social and economic challenges faced by communities in floodplains looking to move to safer areas.   This proposed presentation will review recent federal policy changes for mitigation and give an early 'teaser' ofthe top findings and recommendations of Pew's research, which span the importance of leveraging local programs, valuing the multiple benefits of buyouts, and using pre-disaster partnerships to plan, facilitate and pay for buyouts.

Biography: Matt Fuchs leads research and disaster mitigation efforts for The Pew Charitable Trusts' flood-prepared communities initiative, which aims to reform flood and disaster policy to better prepare people and property for future flooding. In his research role, he has analyzed public school flood risk, developed recommendations for improving buyouts of flood prone properties, and designed a menu of policy options for communities looking to become more resilient to floods. His focus at Pew also includes working with bipartisan members of Congress to advance policy solutions and build support for innovative financing mechanisms to fund mitigation activities.   Fuchs holds a bachelor's degree from Johns Hopkins University and a Juris Doctor from the University of Maryland School of Law.

H3: Advancing Hydrologic Methods for Flood Risk Assessment

Adapting 1D Hydrologic Methods for 2D Hydraulic Applications in Clark County, Nevada and Orange County, California
Clark Barlow, PE, CFM, Atkins, clark.barlow@atkinsglobal.com
Co-presenters: None

Abstract: The capabilities of hydrologic and hydraulic modeling tools are advancing at a historic pace. This has opened doors to new ways of analyzing problems that were never available before. Still, hydrologic conditions vary significantly from region to region and local standards often contain the best guidance for predicting the rainfall-runoff relationship. Local criteria, however, advances at a much slower pace than the tools they were built on. This has made it challenging to apply new technology in a way that also satisfies local criteria.
This presentation will examine guidance in current engineering manuals in comparison with advanced tools that are becoming more standard across the engineering community. Using lessons learned from two case studies in Orange County, California and Clark County, Nevada, we'll review the process of applying complex two-dimensional HEC-RAS model approaches in regions where hydrologic criteria is still largely written for simplified steady state analysis. We'll also identify several workarounds that can help satisfy the requirements of local criteria while leveraging the power of advanced modeling until

further research is performed and guidance developed. Join us as we review the work of engineering giants before us and consider just a few ways we can build on their tremendous legacy.

Biography: Mr. Barlow is a senior water resources engineer with Atkins and an expert in complex hydrologic and hydraulic modeling. He has played a key role in several challenging H&H modeling projects across the United States, including a statewide dam inundation mapping effort in North Carolina. He has also provided numerous training courses on advanced H&H models throughout the US and internationally. He also has experience in the design of flood control facilities within Clark County, Nevada and currently serves as the technical director for the update of the Clark County Hydrologic Criteria and Drainage Design Manual for the Clark County Regional Flood Control District.

Transformations in Hydrologic Methods without Transforms, Testing of New HEC-RAS 6.0 Rain-On-Grid Solution

Mark Forest, PE, CFM, HDR, mark.forest@hdrinc.com
Co-presenters: None

Abstract: The use of rain-on-grid solutions is the rapidly evolving approach to performing hydrologic analysis on catchments of various sizes and topographic complexity. Rain-on-grid solutions provide a more physically based approach for modeling the catchment response to rainfall excess that allows for more spatially and temporally specific inputs of rainfall, initial abstraction, infiltration parameters and runoff accumulation. It also provides an opportunity to perform the hydrologic and hydraulic computations simultaneously and identify flood hazards throughout the watershed, rather than just at key concentration points.   In recent years the industry is greatly benefitted from the availability of several proprietary software packages that provide rain-on-grid capability. The US Army Corps of Engineers (USACE) has now added a range of additional capabilities to their 2D modelling package HEC-RAS 6.0. One of the newest enhancements to HEC-RAS 6.0 is the incorporation of gridded rainfall and spatially variable infiltration with enhancements to the infiltration loss computational methods. This enhancement to HEC-RAS allows for spatially and temporally specific rainfall patterns that can be combined with spatially specific initial abstraction and infiltration characteristics.   This approach, combined with the sub-grid terrain technology utilized in the HEC-RAS 2D computational approach, provides the potential for a unique rain-on-grid solution. The use of HEC-RAS 6.0 is especially robust when combined with improving LiDAR terrain data products that provide better definition of the terrain surface which is essential to properly capturing the shallow runoff conditions that are key to a rain-on-grid solution, especially in an urban setting.   HDR tested the new HEC-RAS 6.0 gridded rainfall and spatially variable abstraction/infiltration approaches using both urban and non-urban catchments to evaluate the ability of these new features to replicate observed runoff responses from recent events and compared those results to traditional transform methods. This paper will present and evaluate those findings.

Biography: Mark Forest is HDR's Sr. Business Class Leader for Floodplain Management and Surface Water Modeling where he is responsible for managing HDR's technical practices in these disciplines. He has over 38 years of experience in floodplain management, hydrologic/hydraulic modelling and drainage/flood control design and planning in both the public and private sectors. He has been a beta tester of HEC-RAS for the last 20 years also performs training courses on hydrologic and hydraulic modeling, HEC-RAS 2D and floodplain management both internally and externally to HDR for clients and at technical society conferences. Mark also serves on the Board of Trustees of the ASFPM Foundation.

Utilizing a Citywide Rain-on-Mesh Analysis to Identify Flood Risk for the City of Fayetteville
Ed Dickson, PE, CFM, Freese & Nichols, Ed.Dickson@freese.com
Co-presenters: Alicia Lanier, City of Fayetteville, ALanier@ci.fay.nc.us

Abstract: The City of Fayetteville has taken decisive action after a growing number of urban flood concerns have been experienced following increasingly frequent and intense rainfall events. In 2018 the City began planning for a long-term, foundational approach to identify strategic watershed mitigation projects citywide. The initial step in this significant initiative was to comprehensively identify and quantify flood risk citywide to understand how to prioritize areas for further study and project development. By taking this strategic pro-active approach, the City will be able to stretch resources as well as prioritize critical infrastructure and watershed needs. The City began this process by coordinating across departments to identify persistent flood areas of concern. This effort was followed by performing a citywide rain-on-mesh analysis to identify and minimize gaps in those reported flooding concerns. The City used the reported flooding areas of concern in tandem with the citywide rain-on-mesh results to prioritize subsequent detailed analyses within each watershed. Currently, the City is conducting these detailed analyses and identifying projects. In the future, the citywide model will be evaluated as a major event flood forecasting tool, with results possibly being used as best available data for development review purposes. As this pro-active strategic planning program is developed and refined, it will provide the City with the tools necessary to more strategically implement projects that minimize the impacts of urban flooding.

Biography: Ed is an Associate in Freese and Nichols's Charlotte, NC office who specializes in watershed-based H&H analyses, flood mapping, and flood management projects across the U.S. He has 20 years of progressive experience working with municipal, state, and federal flood mitigation and master plan partners throughout the Southeast. He is a licensed professional engineer with a Master's degree in Water Resources Engineering and a certified floodplain manager.

Alicia Lanier, PE, supports the City of Fayetteville, NC, in managing the Citywide Watershed Master Plan program. Alicia has over 20-years of consulting experience providing project management services to complex projects for a variety of clients. In her current role as Stormwater Project Manager – Special Projects, Alicia focuses on supporting cross-collaboration across internal and external teams, and building intergovernmental and institutional collaborations and partnerships.

H4: Coastal Mapping Advances

All the Ways We See Level Rise
Brian Caufield, PE, CFM, CDM Smith
Co-presenters: None

Abstract:

Bio: Mr. Caufield is CDM Smith's Coastal Systems Resilience Discipline Lead. He has over 20 years if experience evaluating coastal flood hazards.

Is Holding the Line Sustainable? Retreat as a Means of Defense
Jennifer Pongratz, CFM, DE Dept. of Natural Resources and Enviornmental Control,

jennifer.pongratz@delaware.gov
Co-presenters: None

Abstract: Delaware's coastline is subject to multiple threats, such as coastal storms, beach erosion and sea level rise. In order to defend against these threats, Delaware manages construction in the beach area with a regulatory building line.   By establishing a determinate line along the coast to control development, the Delaware Beach Regulatory Building Line has provided protection to coastal dunes and has ultimately helped preserve the shape and integrity of the beaches allowing them to serve their protective function. However, over time the building line has become obsolete in certain areas. The original building line was drawn in 1979 and has not been officially revised statewide. Managing and communicating flood risk has been challenging due to the outdated line that does not account for a changing shoreline, giving property owners a false sense of security behind the line.   In 2019, a new coastal construction evaluation line was mapped to assess the ever-changing nature of the coast. Using the line as a guidance tool allows Delaware officials to make decision to help make communities more resilient at a time when sea-level rise is becoming a critical threat to tourism, public natural resources, and protection to infrastructure from coastal storm damage. This presentation will go over the mapping exercise and the possible outcomes of adopting an updated building line.

Biography: Jennifer Luoma Pongratz is an Environmental Scientist IV with the Shoreline and Waterway Management Section of Delaware's Department of Natural Resources and Environmental Control (DNREC) and is a Certified Floodplain Manager. She has a Bachelor of Science degree from the University of Delaware with a minor in Geology. She also is a member of the Dean's Advisory Council for the University of Delaware's College of Earth, Ocean and Environment. Her primary responsibilities are enforcing the Regulations Governing Beach Protection and the Uses of Beaches through a permitting process. Other job duties include preserving, enhancing and protecting the beaches and dunes of Delaware through education and outreach efforts, conducting storm damage assessments and organizing dune plantings. Jennifer has been with the Department for the past 22 years.

Storm Surge Study Update for Select Communities in North Carolina

Jeff Gangai, CFM, Dewberry, jgangai@dewberry.com
Co-presenters: Steve Garrett, NC Emergency Management, Steve.Garrett@ncdps.gov

Abstract: The North Carolina Floodplain Mapping Program (NCFMP) received a request to review the 1-percent-annual-chance storm surge values in three locations: the Morehead City/Beaufort area of Carteret County, Jacksonville City in Onslow County, and Surf City in Pender and Onslow Counties. A sensitivity analysis to changes in model mesh resolution and updates to the topographic and bathymetry data revealed that these revisions may result in meaningful changes in the 1-percent-annual-chance storm surge values in these select communities. After meeting with the communities, the NCFMP, in collaboration with the communities, determined updates to the 1-percent-annual chance storm surge values, as well as other associated return periods, is warranted for areas within Onslow and Carteret County, specifically the Jacksonville City and Morehead City areas.   This study demonstrates how regional surge studies can be updated for local areas. The presentation will describe the data and methods that were used to update the storm surge study. Not only was the topographic and bathymetric data updated in the two communities, but the storms used to define the Joint Probably Method (JPM) probabilistic model were also updated to capture the last 10-15 years of storm history in North Carolina. The model was also updated to the most recent ADCIRC version that is now coupled

with the SWAN 2-D wave model, which was validated using recent storms that have impacted North Carolina. The results of the updated storm surge modeling will be discussed with a focus on areas that changed and the reasoning behind it.

Biography: Mr. Jeff Gangai has been practicing coastal engineering for over 25 years. He holds a Bachelor of Science in Maritime Systems Engineering from Texas A&M University at Galveston and a certificate in Coastal Engineering from Old Dominion University. His area of specialty is coastal hazards including coastal processes and marine structures. Before joining Dewberry he worked for five years with the U.S. Army Corps of Engineers at the Galveston, TX District. For over 20 years he has worked at Dewberry on the National Flood Insurance Program for the coastal regions of U.S., evaluating and reviewing coastal flood hazards. He serves as a senior coastal technical specialist and coastal project manager supporting coastal hazard studies.

Steve Garrett became the State NFIP Coordinator for North Carolina on September 14, 2020. From May 2005 until recently, Steve served as a planner for the Risk Management Section of North Carolina Emergency Management; providing outreach and technical assistance for Floodplain Management and the Floodplain Mapping Program, overseeing the Memorandum of Agreement (MOA) between NCFMP and NCDOT, and serving as the Manager for the LOMR Review Partners Program. Prior to working with Risk Management, Steve served as a grant project manager and environmental specialist with the Hazard Mitigation Section of North Carolina Emergency Management for 5 years. He attended North Carolina State University receiving a Bachelor of Science in Natural Resources in 1997, and a Master of Science in Natural Resources Management in 2000.

H5: FEMA Program Tools and Resources

Reinforce Mitigation Messaging – Leverage the FEMA Mapping and Insurance eXchange
Kimberley Schwenk, CFM, Michael Baker International, kimberley.schwenk@mbakerintl.com
Co-presenters: John Magnotti, FEMA and Matthew Reed, Michael Baker International

Abstract: Over 150,000 customers reach out to the FEMA Mapping and Insurance eXchange (FMIX) contact center each year. By holding comprehensive conversations that cover the breadth of flood mapping, insurance, floodplain management, and mitigation, FMIX specialists help customers identify areas of opportunity to reduce losses. The FMIX is a valuable resource for communities to use to amplify and endorse mitigation messaging and insurance needs. Leveraging the FMIX to promote mitigation locally unifies the stakeholder experience and bolsters the community's impact. The FMIX also researches and fulfills requests for flood claims history reports for current property owners. This report is a free informational document that can be requested by current property owners and provides thorough information about all National Flood Insurance Program flood claim records for a specific structure. Increasing awareness of this simple request for information can strengthen mitigation conversations and build resilience in communities.

Biography: Kimberley Schwenk is a Senior Associate at Michael Baker International where she supports FEMA as the manager of the FEMA Mapping and Insurance eXchange (FMIX) contact center. She began her pursuits in environmental science and disaster management at the University of Hawaii at Manoa.

Her technical proficiencies are fortified with over 15 years of customer experience management expertise. With her unique skillset, Kimberley leads FEMA's contact center with a focus on an exceptional customer journey and enriched conversations on flood risk and mitigation.

Finding the Right Fit: FEMA Region 5's Mitigation Assistance Resource Guides

Steve Greene, FEMA, steven.greene@fema.dhs.gov
Co-presenters: Sarah Halle, AICP, Resilience Action Partners, sarah.halle@mbakerintl.com

Abstract: Innovative and effective funding for mitigation projects can be the difference between being prepared for a disaster and not. This session will explore the gap that FEMA Region 5 saw in local communities' knowledge of funding and technical assistance resources to implement their hazard mitigation plans and how, in early 2019, we released version 1 of mitigation funding guides designed to fill that gap for each state and for tribal partners in the region. In the summer of 2020, we released version 2 of the guides and included nonprofit and nongovernmental resources as well as federal and state resources.   In this session we will tell the story of the evolution of these mitigation funding resource guides, including what prompted their development, how we engaged stakeholders, and the guides' final form. We will share an example of the guides in action in Region 5 and show how the guides are evolving to meet the ever-changing needs of our communities. Additionally, we'll discuss how other FEMA regions are taking the guides and making them their own. Mitigation funding is not a short and simple story, but by listening to our communities and responding to their needs, we've taken steps toward reducing the complexity of implementing these important plans.

Biography: Since 2009, Steve has been with the Federal Emergency Management Agency (FEMA), serving in various roles during pre- and post-disaster operations, including hurricanes Sandy and Harvey. Steve is currently a Hazard Mitigation Community Planner for FEMA Region 5 and previously served as a Hazard Mitigation Community Planner in FEMA Region VII. Prior to his tenure at FEMA, he served as the Legislative Liaison for the Illinois Emergency Management Agency, developing legislation and policies advancing Illinois' emergency management, homeland security, and nuclear safety programs. Steve holds a B.A. in Political Science and Labor Relations from the University of Illinois – Springfield.

Sarah is an urban and hazard mitigation planner, and currently serves as the Mitigation Champion for FEMA Region 5 under the CERC contract. She leads mitigation and communications projects in Region 5 and across the country. Sarah holds an MCP from the University of Pennsylvania and a BA in Environmental Studies from Mount Holyoke College.

Living with Levees: FEMA's Products and Tools for Community Officials and Professionals

Will Zung, STARR II, will.zung@stantec.com
Co-presenters: Leslie Skardon; Suzanne Vermeer; and Brad Winters

Abstract: While levee systems can help reduce the risk of flooding, it is important to remember that they do not eliminate risk, and advancing mitigation through diverse methods is critical. Two key mitigation tools outside of direct financial investment are FEMA's flood studies, which analyze and identify flood hazard areas landward of levee systems, and communication tools that convey the relationship between levee systems and flood risk. Analysis and communication go hand-in-hand during a flood study. This presentation will help attendees combine technical analysis and mapping approaches with engagement and risk communication strategies to meet stakeholder needs.   This presentation will show participants how to maximize existing investments in flood risk projects to analyze and

communicate levee related flood risk efficiently. Participants will crosswalk the matrix of phases during a flood risk project to identify opportunities and strategies to communicate important information to diverse stakeholder groups. The regulations, standards, technical references, and guidance for flood risk analysis and mapping studies are explained with examples for the different levee system status shown on a FIRM, which includes accreditation, provisionally accredited, non-accredited, construction and restoration (Zone A99 or AR).   The Levee Chapter of the Risk MAP Playbook communicates technical concepts using plain language and easy to understand visuals. Supporting documents include a series of meeting presentations, meeting invitations, templates, fact sheets, and infographics designed to increase community capacity by bringing greater consistency, continuity, and efficiency to the community engagement process for levee mapping projects. Using these tools is a low-cost way to effectively communicate the importance of mitigation.   The presentation will help participants understand the regulatory reasons for levee system analysis and mapping, the technical approaches utilized, how to better leverage community engagement tools to enhance community outreach, and ultimately to maximize available resources to help people take action to reduce their risk.

Biography: Will is the Levee Support Control Account Manager for STARR II, a Professional Technical Services (PTS) provider to FEMA, as well as the Officer Manager and Water Resources Manager in the Kansas City office of Stantec. He leads teams of subject matter experts providing levee related flood risk analysis, flood hazard mapping, and flood risk communication. He is a Project Management Professional and Certified Floodplain Manager, with 21 years of experience with FEMA's National Flood Insurance Program as a hydrologist with a background in hydrologic and hydraulic modeling.   Will is a graduate of the University of Missouri - Rolla and the University of Kansas and has a wife, a 14-year old daughter, and 11-year old son.

H6: Green Infrastructure and Living Shorelines for Coastal Flood Mitigation

Waterfront Parks Sea Level Rise and Flooding Adaptations
Jannek Cederberg, PE, Cummins Cederberg, Inc., colnick@cumminscederberg.com
Co-presenters: None

Abstract: Public waterfront park spaces need to adapt to flooding based on today's seasonal tides and storm surge, as well as future conditions. Active parks have many of the same infrastructure found in small waterfront communities including roads and trails, shoreline structures and protection, stormwater management, marinas or kayak ramps, and landscaping/hardscaping. Miami-Dade County's Parks Department is leading the efforts in South Florida to develop recommendations, sea level rise capital improvement budgets, and phasing plans for adaptation of their parks. Cummins Cederberg was contracted to review the flood vulnerability of their waterfront parks including Matheson Hammock, Crandon, and Haulover Parks, totaling over 1500 acres combined.   Cummins Cederberg initiated a review of a single park, Matheson Hammock, in 2017. After a six month study, a plan was assembled for the various features of the park (marina, road, trail, swimming atoll, riprap, seawall, and parking areas) based on the existing topography and sea level rise under the projections and scenarios adopted by the Southeast Florida Regional Climate Change Compact. From this information, a schedule of when various features would need to be adapted and what the adaptation would be was developed. Sample plans for

the recommended retrofits and elevations of the infrastructure features were provided. The County's Capital Improvement Project could use the costs and phasing to budget in improvements over the coming years on their need-based priority. This approach allows for individual park elements to have their specific adaptation strategy within the context of a holistic adaptation approach for the park. In coastal communities' stakeholders and property owners need to know ahead so they can plan adaptation criteria. Every maintenance project becomes an opportunity for adaptation and having a holistic approach will lead to significant cost savings.

Biography: Jannek Cederberg, P.E., is a coastal engineer with over 20 years of experience in planning, designing, and permitting coastal and marine projects throughout Southeast Florida. Jannek is formally trained from the Technical University of Denmark. He has experience in marine field investigations, hydrodynamics, linear and nonlinear wave dynamics, sediment transport, hurricanes, numerical modeling, coastal structure design, sea level rise, environmental permitting and infrastructure projects. He has also conducted hurricane modeling in Florida and throughout the Caribbean creating flood maps and determining base flood elevations. He is regularly consulted on FEMA flood maps and building requirements relative to flood insurances and impacts from climate changes and has extensive experience with shorelines of Miami-Dade County. He has managed numerous projects for waterfront condominium associations and has successfully navigated through their desire of increased resiliency while maintaining a functional waterfront for residents. Jannek recently led a team conducting a Sea Level Rise Flood Mitigation Roadmap completed for Miami-Dade County Parks. The study received great praise for translating complex studies into hands-on realistic and functional design solutions as well as providing a clear path forward for the County relative to design, planning, and cost. He also led a team analyzing the resiliency of the entire Town of Bay Harbor as well as developing climate change strategies and adaptation design for Brickell Key, an island community in Biscayne Bay.

Fortifying our Coastal Economies and Ecosystems with Living Shorelines

Alaurah Moss, Dewberry, amoss@Dewberry.com
Co-presenters: Joshua Raglin, Chief Sustainability Officer, Norfolk Southern Corporation

Abstract: Norfolk Southern Railway Company has completed construction of a living shoreline at Lamberts Point Coal Terminal which is located along the Elizabeth River in Norfolk, Virginia. Lamberts Point is home to Norfolk Southern's Pier VI, the largest and fastest rail-to-ship transloading facility in the Northern Hemisphere. As such, Lamberts Point is important to the economic vitality of the City of Norfolk, the Hampton Roads region, and the Commonwealth of Virginia. The Elizabeth River offers significant advantages to Norfolk Sothern's operations but also brings increasing flood risks to the railway infrastructure. The project site, located along a 1,500-foot stretch of shoreline, had been eroding at about two feet per year. A 'No-Action' analysis forecasted that an additional 1 acre of land could be lost in the next 30 years. The objective of this project was to identify an innovative cost-effective solution that brings the natural system back into balance while protecting critical infrastructure and reclaiming historically lost land. The living shoreline system consists of eleven stone breakwaters embedded with oyster shells that dampen wave energy and provide a calm environment for half an acre of tidal wetland vegetation. Construction was completed in July 2020. This presentation will take the audience on a journey of the design and construction process from beginning to end – relying primarily on photographs and drone video footage. The goal is to share effective practices that were learned throughout each stage of the process - including project planning and field data collection, flood and

erosion risk analysis, alternative analysis, design, permitting, construction, and post-construction monitoring.

Biography: Mrs. Moss is a Project Manager and Coastal Scientist at Dewberry Engineers' Virginia Beach office. Her mission is to help coastal communities understand their flood risks and vulnerabilities and develop sustainable, resilient, and cost-effective solutions. Her expertise includes overseeing the execution of innovative design projects which offer a wide range of community benefits, including ecosystem restoration and protection of people and assets. Mrs. Moss works with a wide range of clients including federal, municipal, and private. Her vision is for all coastal communities to work collaboratively together to share effective practices for sea level rise adaptation to ensure our economies, people, and ecosystems thrive now and into the future.

Beyond Local Boundaries: Local and Regional Sea Level Rise Adaptation Strategies on the San Francisco Peninsula

Millicent Cowley-Crawford, Woodard & Curran, mcrawford@woodardcurran.com
Co-presenters: Len Materman, CEO, San Mateo County Flood and Sea Level Rise Resiliency District

Abstract: Within the past year, the cities of Millbrae and Burlingame on the San Francisco Peninsula developed Sea Level Rise Adaptation Assessments, funded by a grant from San Mateo County. The Assessments address the potential impacts of sea level rise on portions of these cities along San Francisco Bay, which include vital transportation corridors and business areas. Just north of these cities, San Francisco International Airport (SFO) is designing a separate effort to protect itself from the impacts of sea level rise, which are already felt throughout the region. Also within the past year, in response to a study that found San Mateo County the most vulnerable in the State to sea level rise, a new independent countywide government agency that works across jurisdictional boundaries was established to secure and leverage public and private resources for long-term resilience. That agency, the San Mateo County Flood and Sea Level Rise Resiliency District (the Resiliency District) is the first of its kind on the West Coast. It is already planning and building solutions to the climate change impacts of sea level rise, flooding, and coastal erosion with a focus on utilizing natural infrastructure and enhancing recreational amenities. While individual jurisdictional plans have built upon previous studies and reflect a variety of interests that can be implemented by the Cities alone, regional sea level rise mitigations can't be limited by jurisdictional boundaries but must be considered holistically in partnership with neighbors and private stakeholders. To that end, the Resiliency District, Burlingame, Millbrae, and SFO are working together to connect and align their efforts into a set of actionable mitigation alternatives to protect all three entities against a water level ten feet above today's high tide. This presentation by agency leadership and technical experts involved in this effort will share lessons learned from the regional partnership and strategies for communities to approach flooding problems that extend beyond their borders.

Biography: Millie is a senior expert in water resources management and planning at Woodard & Curran with over 20 years of experience in funding, hydrologic and hydraulic modeling, sea level rise and climate change adaptation, levee and canal inspections and risk assessments, disaster response and recovery, and the NFIP.

Len is the CEO of The San Mateo County Flood and Sea Level Rise Resiliency District, known as OneShoreline, an independent government agency that builds solutions across jurisdictional boundaries to address the climate change impacts of sea level rise, flooding, and coastal erosion for the California county most at risk from these issues. Len has served in various governmental and non-profit capacities over the past 30 years.

H7: Local Levee Challenges

One Levee's Journey Towards FEMA Certification – Case Study in New Orleans
Patti Sexton, PE, CFM, Tetra Tech, patti.sexton@tetratech.com
Co-presenters: Roger Colwell, CFM, GIS Supervisor, Flood Protection Authority-East

Abstract: This presentation will provide an overview of the challenges and opportunities that the Flood Protection Authority – East and Tetra Tech team have faced in the course of certifying the 40 Arpent levee system. This levee is located within Orleans and St Bernard Parish and ties into the federal Hurricane and Storm Damage Risk Reductions System (HSDRRS) project. The system includes 20 miles of levee, 5 miles of concrete and sheet pile floodwall, 7 pump stations and multiple closure structures. In the course of the certification it was determined that a segment would require remediation including the addition of closure structures to allow for access by the commercial users of the adjacent land. CDBG grant money (through CPRA) was successfully obtained to support the reconstruction efforts. FEMA B/C analyses were performed to show the value of the project that included an evaluation of the individual homes impacted by the floodplain. A reinspection effort is currently underway to evaluate any changes to the system since the initial inspection was conducted. A drone pilot study is being performed to determine that appropriate level of detail can be obtained to identify the condition of the levee. It is anticipated that use of this technology will save time, provide data that is re-usable for other purposes, and enhance safety (associated with local wildlife). Come see the results of that pilot study – we will share the considerations in developing it and the challenges in performing it.

Biography: Patti Sexton is a water resource engineer with Tetra Tech. She leads levee work for the company nationwide and has worked on projects in WA, OR, CA, MN, LA, and DC. This has included analysis and design of levee systems (including 2D breach analyses), FEMA levee certification, and USACE Periodic Inspections. She has her Bachelor of Science degree in Civil Engineering from Virginia Tech (Go Hokies!) and her Master's in Civil and Environmental Engineering from George Washington University. She is a mother of 3 wonderful children and 1 gorgeous Russian Blue cat.

Roger Colwell is a GIS Manager with the Southeast Louisiana Flood Protection Authority – East in New Orleans, LA. He has worked along the LA/MS Gulf Coast for 25+ years in the spatial information and mapping field. This has included, working in the Emergency Operations Center maintaining floodgate status during hurricanes, levee inspections, levee inspection software development, levee safety permit software development, asset mapping, project management, and recently a licensed FAA drone pilot. He received his B.A. in Geography with an emphasis in GIS. He's been blessed to be married for 26 years, has two boys, and two dachshunds.

Making Lumberton Resilient by putting Floodgate in the Levee System

Amit Sachan, PE, CFM, Atkins, amit.sachan@atkinsglobal.com
Co-presenters: Rob Armstrong, PE, City of Lumberton

Abstract: The City of Lumberton was flooded within the levee "protected" zone twice in a two-year period: from Hurricanes Matthew and Florence. The point of vulnerability was the opening in the embankment where I-95 crosses over VFW Road and an active CSX railroad line. Finding a more permanent solution for "plugging the hole" in the levee system, over against the current sandbagging protocol, has long been a desire of the City. The City in partnership with the State of North Carolina, with funding from a private foundation, and in consultation with the Federal Highway Administration, and the CSX railroad are working to address this repetitive flood problem. FEMA, the NRCS, and the US Army Corps of engineers are also key partners focused on the flood prevention afforded by the existing levee.   Atkins, serving as the Engineer-of Record was retained by the City to design a flood prevention closure gate at a CSX railroad underpass at Interstate 95 that is a critical point of vulnerability. Partners such as with the North Carolina Department of Transportation, and the Federal Highway Administration as they retain land ownership that must be addressed.   In addition to the engineering design of the Floodgate system, the presentation will focus on the roles of the various partners and how the design effort is managed to address the partner requirements, address how emergency preparedness is built into the gate operations, and how funding is being secured to construct the project. Local, private, state, and federal partnerships are the key to addressing the City of Lumberton repetitive flooding and can serve as an example to other communities as to the value of effective partnerships to fund and construct critical flood prevention infrastructure.

Biography: Mr. Sachan is Project Director with Atkins in Public and Private Business Unit in Raleigh. With over 19 years career spanning academics and private sectors, Amit has served in engineering and business development roles. His project experience includes riverine modeling, stream restoration, stormwater capital improvement, flood control, erosion control and roadway drainage projects for municipal, state, and federal clients. Originally from India, Amit received an undergrad from IIT Bombay and graduate degrees from Virginia Tech and NC State.   Amit has been on the board of directors for American Council of Engineering Companies (ACEC/NC) and he is a former chairman for North Carolina Association of Floodplain Managers (NCAFPM). On personal front, Amit enjoys volunteering for STEM education programs such as MATHCOUNTS and FutureCities. Amit stays in Cary with his wife and two kids and they enjoy outdoor activities.

Hurricane Harvey Recovery: Modernizing drainage systems inside a fully developed levee.

Phil Martin, Fort Bend County Levee Improvement District No. 2, gm1@fbclid2.com
Co-presenters: None

Abstract: In 2017, Hurricane Harvey flooded 230 homes in Fort Bend County Levee Improvement District No. 2 (LID2). The 5,300 acres protected by LID2 levees are fully developed creating many design challenges to reduce flood risk. LID2 is three years into a five-year, $80,000,000 CIP to modernize the 40-year old drainage system, as quickly as possible, using the latest standards and best available data. During Harvey, LID2 and the City of Sugar Land engaged Freese & Nichols to model the internal drainage system and identify the causes of, and potential solutions to, structural flooding. Initial results were presented to the public within 2 months. As modeling continued, LID 2 adopted modern design standards for all flood control projects, including higher freeboard requirements and ATLAS 14 rainfall.

Less than 6 months after Harvey, AECOM was selected to design a new 980,000 GPM stormwater pump station inside a neighborhood. The expedited design accommodates a variety of constraints including limited access, lack of staging areas, and workday/noise restrictions. The new pump station is expected to be operational before the 2021 Hurricane Season.   LID2 is already halfway complete with a drainage channel rehabilitation program, and LJA is designing a widening project for the main channel. LJA is also designing another pump station expansion to increase capacity by 160,000 GPM. A partnership with the golf course is also being pursued to provide additional flood storage.   Post-Harvey public communication projects included website redevelopment, email/text alert system, routine public forums, and flood awareness graphics. LID2 again partnered with Sugar Land to add rain/stream gauges inside the levee. In early-May 2019, 8-10 inches of rain fell inside LID2 in a few hours causing more structural flooding. Data from these new gauges and the modeling completed by Freese & Nichols helped forecast flood levels inside the levee throughout the event.

Biography: Phil Martin graduated from Texas A&M University with a degree in Recreation, Park, and Tourism Science and has 15 years of experience in public administration, operations, and project management. He is a Certified Floodplain Manager (CFM) and serves as the General Manager for Fort Bend County Levee Improvement District No. 2 and No. 15. Mr. Martin is also a member of the Texas Floodplain Management Association and has presented on flood control projects at state and national conferences.

J1: Data Analysis for Floodplain Management Decisions

Elevation Certificate Data: Unlocking Opportunities for More Informed Floodplain Management
Susanna Pho, CFM, Forerunner, susanna@withforerunner.com
Co-presenters: None

Abstract: Elevation certificates play a central role in floodplain management. They enable floodplain development regulation, track community-scale changes, and act as advocacy tools for residents seeking to augment their flood insurance policies. While these documents are collected to ensure regulatory compliance, they also represent an immensely useful dataset documenting per-property risk. When aggregated, information contained in ECs can be utilized to make better decisions around mitigation investments and land use planning or to enable more targeted outreach to residents. For communities working with existing hazard models that illustrate exposure, elevation certificates offer a granular understanding of current and future flood impacts. While local municipalities are uniquely positioned to collect and deploy elevation data through permits like ECs, unlocking these datasets can be tricky — operational capacity, document management, digitization, and analysis can all pose challenges.   This presentation will utilize case studies to discuss potential methods for mobilizing Elevation Certificate data. We'll outline applications of EC datasets for purposes ranging from planning to community risk education, share technical insights, and discuss challenges to implementation as well as transferrable lessons learned.

Biography: Susanna Pho is a co-founder of Forerunner, a software startup working with government agencies to leverage per-property flood risk information to streamline planning, compliance, and outreach. The company has partnered with U.S. communities of all sizes to mobilize data for applications ranging from regulation enforcement to adaptation planning. Susanna is a Certified

Floodplain Manager based in the Bay Area with experience working with local government in research and community development capacities. She holds an M.Des degree in Risk and Resilience from Harvard University and an M.Arch degree from MIT.

Emerging Technologies: Web-Based Tools to Analyze Data and Drive Decisions

Quentin Cummings, CFM, FEMA, quentin.cummings@fema.dhs.gov
Co-presenters: James Graham, Environmental Protection Specialist, FEMA and Jonathon Wescott, PE, Civil Engineer, FEMA

Abstract: FEMA has developed three web-based, GIS mapping tools to assist floodplain managers in understanding risk and making decisions to improve community resiliency. The tools are: Building Code Adoption and Tracking system (BCATS), v2.0 of the Community Engagement Prioritization Tool (CEPT), and the Flood Risk and Endangered Species Habitat (FRESH).   CEPT serves as a data-driven, decision-support tool for states and Regions to prioritize engagements across three strategic attributes: Risk, Opportunity, and Interest/Need. Version 2.0 is a massive upgrade from the 2019 Excel-based version and now features map visualizations, double the indicators, pre-configured engagement types, and updated datasets. CEPT helps answer questions such as "What is the community's history of mitigating high-risk properties?" and "Are there significant gap areas within a State or FEMA Region which need greater attention?"   FRESH provides information for a community to visualize ESA listed species in relation to its Special Flood Hazard Layer (SFHA) boundaries and designated critical habitats. It can be used as a planning tool to aid NFIP-participating communities with the integration of species conservation activities into their floodplain management programs or to receive additional CRS credits. It also streamlines a communities' floodplain management processes by providing SFHA and ESA information in one place.   BCATS aids in the advancement of higher standards knowledge and information nationwide. The backbone of BCATS is its regularly updated database of tracked and reporting jurisdictions, including tracking NFIP participation, adoption of latest codes/standards, and whether a model code adoption has been weakened by State or local amendment. It has information at the community level and is a helpful data source as states work on verifying higher standards for their individual communities.   This presentation will demonstrate each of the web-based applications and inform participants of the online tools available to them to better understand their communities and inform decisions.   https://www.arcgis.com/home/item.html?id=5fa5b18b137e487c8073c147af2d9ee9 https://geo.stantec.com/National_BCATS_Portal/viewer/

Biography: Mr. Quentin Cummings is a Floodplain Management specialist, Certified Floodplain Manager (CFM), and Chair of the Data Analytics & Systems Committee for the FEMA Floodplain Management Division. He has served numerous roles in FEMA disaster response and recovery operations throughout the country for the last seven years, and was the Brigade Battle Captain for the 78th Homeland Response Force in Atlanta, GA – a Chemical, Biological, Radiological, Nuclear, and Explosive (CBRNE) domestic response unit with responsibility for FEMA Region 4 prior to joining FEMA. Quentin is a graduate of the 2014 FEMA Emerging Leaders Program and a former FIMA Resilience Fellow. He has twice been awarded the FEMA Administrator's Award, one for Exemplary Emergency Manager and the other for Innovation. Quentin Cummings is currently working towards a Masters in Geospatial Information Sciences at the University of Maryland, College Park.

Post Disaster Rapid Screening for Likely Substantially Damaged Structures

Christopher Moss, PE, CFM, Taylor Engineering, cmoss@taylorengineering.com

Co-presenters: Charles Cook, CFM, Floodplain Management & Insurance Branch Chief, Mitigation Division, FEMA Region 6 and Benjamin Roberts, ASA, Data Science Manager, ABS Group

Abstract: In the immediate aftermath of a disaster, FEMA and their partners work diligently to identify areas with structures hardest hit to focus resources. One of the means by which this is accomplished is using available data to screen structures in the Special Flood Hazard Area for which the total cost of repairs is estimated to be 50 percent or more of the structure's market value prior to the disaster. These structures are commonly referred to as substantially damaged (SD). Traditional screening techniques leverage National Flood Insurance Policy (NFIP) claims, Individual Assistance (IA) claims, U.S. Geological Survey (USGS) high water marks (HWMs), and structure inventory data. NFIP claims data is not available in the immediate aftermath of the disaster and USGS HWMs are difficult to relate to a structure's interior inundation levels.   AECOM, along with FEMA Region VI, developed a screening process for likely SD structures based on high-water marks (HWMs) sourced from IA inspections. This approach defines four key HWM thresholds for single-family and manufactured homes shaped by inspection experience and industry Depth-Damage Functions (DDFs), and allows FEMA and the community to identify hot spot areas where SD is likely. When applied properly, this approach allows for prioritization of resources at the post-disaster 30-day mark. This process allows for a much simpler and streamlined approach compared to previous efforts and allows the information to be leveraged during community compliance visits.

Biography: Mr. Moss provides over 21 years of experience with more than a decade of project management experience focused on flood risk analysis, mapping, and hazard mitigation. He served as Task Order Manager for the Tropical Storm Imelda and Hurricane Laura Substantial Damage Analysis and Mapping task orders. He has overseen FEMA risk analysis studies throughout 10 states in FEMA Regions I, II, III, IV, and VI, including riverine and coastal surge analysis.   His management experience extends beyond FEMA to municipal clients including master drainage planning projects including identification and mitigation of high hazard areas providing both structural (e.g. upgrading an existing culvert or bridge) and non-structural (e.g. buyouts) mitigation alternatives. He has experience managing on-call permit reviews for three North Texas municipalities.   Chris offers unique perspectives insight from working for a Texas municipality where he focused on the community's Community Rating System (CRS) and Cooperating Technical Partner (CTP) program, including development and prioritization of the annual needs strategy submitted to FEMA for federal funding.

J2: Building Science and Mitigation

Using Asset Vulnerability To Assess Flood Mitigation For Multiple Building Facilities
Adam Reeder, PE, CFM, CDM Smith, reederaj@cdmsmith.com
Co-presenters: None

Abstract: While owners may recognize that they have a flood risk to multiple buildings on their facility, they often do not understand how damage impacts to the building, to the building contents, and/or to the loss of building use impacts the overall facility. Once the risk is understood then flood mitigation measures can be evaluated. While an ideal approach would be to flood retrofit all the buildings simultaneously, this is often an unreasonable expectation due to funding limitations and/or

inconveniences of daily disruptions during construction. With this in mind, it is important to develop an evaluation method to assess each building's vulnerability and create a strategy to compare the assessed flood risk of the buildings. The comparative vulnerability assessment of buildings allows for a strategic approach to the facility as well as having the ability to perform a comparative vulnerability assessment across a larger area of multiple facilities.   The presentation will discuss a methodology which allows a multi-disciplinary team of engineers to quickly evaluate multiple buildings and provide an owner with site-specific risk profiles for a group of buildings. This approach will outline considerations for determining the building site flood risk and strategy for collecting and documenting building assets during a site visit. The site data collected will be used to create a probabilistic flood depth damage function, which is used to understand the current building risk. Upon understanding the existing building risk, multiple flood risk reduction mitigation options can be assessed. Comparison of the effectiveness of multiple mitigation measures allows for mitigation cost and risk reduction effectiveness to be evaluated for each building, as well as amongst buildings. This provides capabilities to prioritize the order in which the buildings should be retrofitted. Examples of applying this approach will be presented and discussed to improve the attendees understanding of the methodology.

Biography: Mr. Reeder is a civil/structural engineer in CDM Smith's Raleigh office. He has over 23 years of experience with a wide range of structural engineering projects involving design, scheduling, bid document production, construction management, disaster assessments, flood and wind retrofitting and litigation. Since 2007 Mr. Reeder has worked on numerous projects for FEMA providing structural engineering and benefit-cost analysis (BCA) expertise for high winds, riverine flooding, and coastal areas. Mr. Reeder has authored chapters on over a dozen FEMA Building Science Branch publications. In 2016 he conducted an analysis on the benefits of freeboard for public and nonresidential use buildings in coastal areas. Since 2010 he has been a lead instructor for FEMA's Coastal Construction Class and FEMA's Fundamentals of Building Science Class. Mr. Reeder was a lead author in FEMA's multifamily flood mitigation guide that should be released in the spring of 2020. In February of 2019 Mr. Reeder completed the flood retrofit analysis for the Natural Hazard Mitigation Saves - Version 2.0 study. He has also developed a course for FEMA to teach design professionals how incorporate climate change into flood design and created an MS Excel based tool to approximate freeboard for sea level rise. Mr. Reeder is a licensed Professional Engineer in North Carolina and South Carolina and a Certified Floodplain Manager.

Virtual Damage and Building Performance Assessments During a Pandemic
Daniel Bass, RA, CFM, FEMA Headquarters, daniel.bass@fema.dhs.gov
Co-presenters: Manny Perotin, PE, CFM, Compass/CDMSmith

Abstract: Due to the added complexities of conducting building performance assessments while taking preventative measures to protect the health and safety of disaster survivors and the disaster workforce, an added emphasis was placed on remote assessments or inspections during the 2020 hurricane season. The FEMA Building Science Branch evaluates the performance of buildings and related infrastructure in response to the effects of natural hazards. The conclusions and recommendations from these assessments are normally published in a Mitigation Assessment Team (MAT) Report. The National Science Foundation (NSF) funded Structural Extreme Events Reconnaissance (StEER) Network deepens the structural natural hazards engineering (NHE) community's capacity for reliable post-event reconnaissance. StEER's mandate is to collect perishable data swiftly and systematically in order to inform the continued study of a disaster through subsequent in-depth data collection that addresses

specific research questions.   This presentation will focus on our experience in collaborating among the FEMA Building Science Branch, NSF StEER, and other post-event damage assessments efforts; building performance observations related to flood loads following Hurricane Laura; as well as data leveraged throughout the process to facilitate their building assessments. Our goal is to help communities leverage resources so that post-disaster damage assessment can be used for a variety of purposes (FEMA preliminary damage assessment, building safety evaluation, substantial damage, building performance assessment, etc.). In addition, we hope to share best practices related to building performance and floodplain management requirements, to help improve flood resistant design and construction based on observations from Hurricane Laura.

Biography: In addition to Daniel Bass's two plus decades of practicing architect, his 14 years of training and experience in disaster resistant design, construction and resilience has made him a subject matter expert. While working in FEMA's Building Science Branch of the Risk Management Directorate, Mr. Bass has worked with and advised fellow design professionals, project owners and government officials in their recovery from natural disasters, repair of damaged facilities as well as the development of new disaster resistant structures. He is currently leading FEMA's Mitigation Assessment Team program.

Out-Smarting Flood: Resilience in the Face of the Storm
Jessica Waters, FM Global, jessica.waters@fmglobal.com
Co-presenters: None

Abstract: As weather trends result in increased levels of extreme precipitation, new approaches are needed to out-smart floods. Past solutions may be inadequate for tomorrow's severe weather.   Yet, amid flood destruction are tangible examples of companies well prepared for the risks of a changing climate. How could one business stay dry while neighboring companies were flooded by rising water? This presentation will, through a series of amazing success stories, demonstrate how leading organizations throughout the US are taking measures to effectively safeguard their properties and operations from the flood threat. This includes partnerships with local authorities for community protection, permanent and temporary floodproofing measures, emergency response, and business continuity planning. Discover solutions to keep the water out and keep your business running.

Biography: Jessica Waters is a staff vice president, senior engineering technical specialist for FM Global, one of the world's largest commercial property insurers.   Waters leads the company's loss prevention engineering strategy for flood, wildland fire and other natural hazards. This includes leveraging the vast knowledge of FM Global's research group and the reach of the company's 1,800 property loss prevention engineers to help the company's Fortune 1000-size clients better address their business risk from a changing climate.   Since joining the organization in 2001, Waters has held various engineering roles including loss prevention consultant, account engineer and operations chief engineer. She has extensive project and emergency management experience and expertise in evaluating a wide range of property hazards including those related to windstorm, fire, flood and equipment.   Waters has a Bachelor of Science in marine engineering and a Master of Science in emergency management from the Massachusetts Maritime Academy and currently serves as vice chair of the Academy's board of trustees. She also is an active member of the Society of Women Engineers and the Society of Fire Protection Engineers.

J3: Analyzing and Leveraging Data for H&H Analysis

Model Library: Approaches for cataloguing and querying flood hazard models in the cloud
Seth Lawler, , Dewberry, slawler@dewberry.com
Co-presenters: Randall Goss, USACE; David Bascom, FEMA; Will Lehman, USACE; and Mat Mampara, Dewberry

Abstract: Modern flood hazards studies have relied heavily on the development of physics based, empirical, or process driven models to inform risk, guide design, and create regulatory products. For state and federal agencies involved in flood hazards analysis, the many and varied risk studies undertaken in the past several decades have resulted in the creation of the hundreds of thousands of models of different type, scale, and application. Due to the geographic and political boundaries dictating project limits for these studies, models are most often stored digitally (on local or cloud servers) under a hierarchical structure dictated by project. For this talk, we will explore approaches for making archived models discoverable in a Model Library using cloud tools. To demonstrate this, we will discuss the development of a Model Content and Analysis Tool (MCAT), conceptualized through collaboration between USACE and FEMA. The talk will highlight how the MCAT approach allows users to understand not only what models are available and where (geospatially) but metadata useful for understanding the currency of models developed and in the inventory for future or ongoing projects. Further, examples of how the MCAT allows a single system to produce information from different models in the inventory (e.g. HEC-RAS, HEC-HMS, WHAFIS) and explore use cases that demonstrate the benefits of creating such a system. As agencies seek to share not just data, but also models, the systems for delivering this capability, and supporting a wide range of use cases, will be critical. This effort is intended to demonstrate how interagency partnerships, improved methods, and increased integration lead to more enhanced and streamlined stakeholder capacity in a time of reduced financial resources and increased need.

Biography: Seth Lawler is a Computational Scientist with extensive expertise in coastal and riverine surface water modeling. He is a subject matter expert in scientific and geospatial programming with experience developing and scaling serial applications for parallel processing in High Performance and Cloud Computing environments. He has worked on broad ranging projects at the national, state, and local level including the development and quality control of tools in use by the US Army Corps of Engineers, the National Oceanic and Atmospheric Administration, and the United States Geological Survey. Seth is currently completing a PhD in Civil Engineering at George Mason University, where he is conducting research with the National Weather Service to enhance modeling and forecasting.

Uncertainty and Sensitivity Analysis for Risk Assessments and Planning
Al Souid, PhD, PE, CFM, Wood, PLC., al.souid@woodplc.com
Co-presenters: None

Abstract: The study of the uncertainty of input variables and the computed results of any model is very essential step to understand the model output and to improve forecasting predictions and risk analysis all aimed to improve mitigation decisions and strategies. The presentation will focus on the importance of studying model sensitivity when analyzing any computed model results. It will explain various methods used to inspect model input and then illustrate how to produce a distribution of the

results and ways to analyze them by probability.   A framework will be demonstrated to show how to compute the output exceedance probability of one variable or combined effects of variables. Such computation is important to understand the stochastic nature of output from any model subject to uncertainty and to identify the relative contributions of the various uncertainties on the model predictions.   An example to clarify the methodology will be demonstrated on the Rainfall-Runoff (R-R) models which are used to study natural storm events to predict the severity of these events and delineate flood zoning. Such R-R study is so much needed in community planning to reduce risk of loss of life and property damages. However, the R-R model prediction is subject to several uncertainties. Flood estimates depend on meteorological inputs (i.e., rainfall temporal and spatial distribution), hydrological model variables (i.e., catchment characteristic), terrain resolution (i.e., LiDAR acquisition date, point density), landuse (i.e., impervious coverage, roughness and waterbody), hydraulic model variables (i.e., cross sections spacing, modeling approach) and other uncertainty factors as well. The example will illustrate sources of R-R model uncertainty and identify measures to enhance model predictions.   Community planners, floodplain administrators, decisions makers, modelers and engineers can benefit from this topic.

Biography: Al Souid is a licensed professional civil engineer with a PhD in Environmental Engineering from the State University of New York with emphasis on Water Resources. He has been with Wood since 2005 where he is serving as a senior water resources engineer. His area of expertise is coastal flooding, riverine hydrology and hydraulics, watershed studies, risk products and software tool development.

StreamStats: A web-based application for retrieving basin characteristics and streamflow statistics (such as the 1-percent flood) for gaged and ungaged streams

Peter McCarthy, USGS, pmccarth@usgs.gov
Co-presenters: Katharine Kolb

Abstract: The U.S. Geological Survey's StreamStats program, version 4, is a geographically-enabled interactive web application (https://streamstats.usgs.gov/ss/) that can provide soil and water conservation practitioners and engineers with information they can use in their daily work. StreamStats users can locate and select USGS streamgages on the map-based user interface and obtain previously computed streamflow statistics and basin characteristics, as well as descriptive information for the streamgages. Users also can select any location along a stream and obtain the drainage-basin boundary, basin characteristics, and estimates of streamflow statistics for the location. As each state was implemented separately in StreamStats, the information that is available for the streamgages and for user-selected sites varies among the states. Examples of the more than 800 basin characteristics that may be available at a particular location are the drainage area, stream slope, mean annual precipitation, and percentages of various land uses and soil types with the basin. Examples of the more than 2,500 streamflow statistics that may be available at a location include the 1-percent (100-year) flood, the mean flow, and the 7-day 10-year low flow. The drainage-basin boundaries obtained from StreamStats can be saved in a variety of formats, with the basin characteristics and streamflow statistics included as attributes. The statistical information also can be printed or saved in tab-delineated files. In addition, StreamStats version 4 allows users to obtain land-surface distances and elevation profiles. It also includes several tools that use stream-network navigation to determine paths of flow between selected points on the land surface and a stream, as well between points on streams, and also to identify and obtain information for points of interest along streams, such as streamgages and dams. This

presentation will provide a description of StreamStats, provide updates on recent applications and tools, and discuss plans for future enhancements.

Biography: Peter began his career with USGS in Helena Montana in 2000 as a student and returned in 2003 after graduating from Colorado State University. Peter has spent the last 17 years working (and playing) in streams and rivers throughout Montana and many nearby states. Peter accepted National StreamStats coordinator position in 2017 and works with the StreamStats team to operate and maintain the StreamStats application as well as implement new methods and technologies for performing basin delineations, computing basin and streamflow characteristics, and other applications which use similar data and tools that are developed for StreamStats.

J4: GIS-Geospatial Data Advancements, Workflow & Tools

We're not finished - Flood maps, the impact of ongoing collection of high resolution lidar, and the public understanding of what that all means.
Hope Morgan, NCPLS, , GISP, TBM, CFM, AECOM, Hope.morgan@aecom.com
Co-presenters: Marcia Tobin, AICP, VP Climate Adaptation + Resilience, AECOM

Abstract: FEMA is close to the NVUE milestone of 80% of the Nation's flood hazard data representative of current conditions. This is a proud moment, but what does this milestone mean for floodplain mapping? In the background, there have been technological advances including: high density LiDAR collection over large land areas, terrain creation improvements, data format improvements, which lead to data driven modeling advances. With data advances and improvements towards digital environments that can be stored in the cloud and processed faster and cheaper than ever before we have the opportunity to focus on the users experience with the data. All of these advances lead to closing the gap on the remaining streams to be studied, and allowing existing studies to advance with better, newer and more accurate data. More importantly, this data allows for local governments to study potential risks, to understand what the impacts will be to their population and the ability to better plan for resiliency, structurally and economically. Indeed, these advances provide the opportunity to bring to the public a better understanding of the need for flood insurance. Let's talk about what the data and advancements mean to flood map advancement for the federal, state, and local governments and the public they represent.

Biography: Hope Morgan has been working in the remote sensing field for 23 years, and is currently the Technical Excellence Lead for the Geospatial Domain with AECOM. Her past experience include collecting Lidar for a state, over 5 million structures, working with GIS applications for floodplain mapping and gage readings as well as hazard risk information.

Introducing QGIS to Communities as a Free and Open Source Tool for Floodplain Management:
Andrew MacDonald, CFM, Atkins, Andrew.MacDonald2@atkinsglobal.com
Co-presenters: Nick Turner GISP, CFM, nick.turner@atkinsglobal.com

Abstract: The purpose of this presentation will be to introduce communities to QGIS as a free, open source, and easily available GIS platform that can be used for their own floodplain management needs. The presentation will begin with a brief introduction of QGIS, as well as where and how to download the software. The presentation will also explain the concepts of general public licensing and what it means for a software to be open source. Over the course of the presentation, there will be several slides to show attendees how to add and view their flood hazard data in QGIS, as well as symbolize and label the data in accordance to FEMA guidelines. The audience will also be shown how to access geoprocessing tools that they might use for their own flood hazard needs. This presentation will show communities that there are safe, free, open source GIS software available wherein they can view and use the flood hazard GIS data that is available to them. Not all communities have a budget to pay for proprietary GIS software, so the point of this presentation is show that there is a free and easy to use alternative software so that communities may utilize their data and asses their flood risk to the fullest extent possible.

Biography: Originally from South Florida, I have spent the last 16 years living in North Georgia near the Appalachian Mountains. I am an avid hiker and camper and enjoy the outdoors in general. In spring of 2015 I graduated from the University of North Georgia with a Bachelor's Degree in Environmental Spatial Analysis, and spent a year doing survey and GPS collection on Atlanta Gas Light asbuilt pipelines. I have since then joined Atkins and have been a GIS Analyst working in the FEMA Floodplains Division for nearly four years. Within the last few months, I have been named Deputy Project Manager on seven Great Lakes coastal projects in FEMA region V, but I have also done quite a bit of work in FEMA regions IV, VII, and IX. During the GAFM conference of spring 2018 I obtained my CFM and am currently working towards obtaining my GISP.

Simplifying and Automating Geospatial Data Workflows - Quality, Transformation, and Geoprocessing

Eliza Ledwell, NiyamIT, eledwell@niyamit.com
Co-presenters: Daniel Horner, Vice President, Niyam IT

Abstract: Today's floodplain management data is primarily GIS. From structure footprints and parcels, Hydraulics and Hydrologic inputs and outputs, gage and terrain, the data gets more precise, more complex, and larger in size each day. Processing these datasets to produce quality, clean, standardized datasets and allow them to easily integrate, to discover meaningful insight, or support the data stories we need can be a challenge. This presentation will demonstrate best practices and common tools for conducting quality control, schema and projection transformations, and geoprocessing tasks including making high quality maps to help you mature your GIS data operations and enhance the displays and reports that communicate what is necessary to meet your GIS goals.

Biography: Eliza has a Bachelor's degree in Environmental Science from University of Maryland, Baltimore County and has been an ASFPM member and Certified Floodplain Manager since 2013. Operating within Niyam IT as the Director of GIS solutions she currently supports FEMA daily as the Business Architect for their Pivot Program in the Federal Insurance Directorate. She is an avid backpacker, exploratory overnight kayak tourer, and lifelong downhill skier.

J5: Mitigation Planning and Outreach

PIVOT! The One with the New Approach to Public Outreach
Lori Laster, PE, CFM, Papio-Missouri River Natural Resources District, llaster@papionrd.org
Co-presenters: Brooke Seachord, JEO Consulting Group, Inc., bseachord@jeo.com

Abstract: We've heard it countless times – 2020 was unprecedented. But life must go on. With the expiration date of its Hazard Mitigation Plan in 2021, the Papio-Missouri River Natural Resources District had to pivot in order to continue engaging municipalities, other stakeholders, and the public during the planning process.   While meetings between plan participants and plan writers were easy enough to pivot to virtual, how can you engage the public when gatherings are limited? The default of open houses or attending fairs and festivals is not available during a global pandemic. But to be honest, those modes aren't exactly successful in creating opportunities to gather real input from the general public. The answer seemed to be social media. But in past planning efforts, even using Facebook and online surveys only garnered a handful of useful responses.   The P-MRNRD team worked with its plan writing consultant, JEO Consulting Group, Inc. and a local advertising firm, MediaSpark, to develop a creative and engaging social media campaign. With the creation of eye-catching graphics and partnering with local influencers, the "Would You Rather" campaign reached the eyes of 52,000 social media users. This resulted in driving 2,700 of those users to the project website to complete 700 survey responses, representing 100 times more engagement than the previous plan update effort.   Unlike attempting to push a large sofa up a small staircase, this pivot was successful. A thoughtful and well executed social media campaign provided invaluable engagement with the public to help inform future planning and communication efforts.   This presentation will demonstrate how to leverage resources in your community to increase public participation in planning efforts.

Biography: Lori Laster is a Professional Engineer (Nebraska) and Certified Floodplain Manager with over 15 years of experience in floodplain and stormwater management. She is currently the Stormwater Management Engineer for the Papio-Missouri River Natural Resources District where she manages projects relating to flood mitigation and stormwater management and reviews development plans for compliance with local regulations. Prior to joining P-MRNRD, she worked as a consultant specializing in industrial stormwater management for clients in the Western U.S. Lori has a Bachelor of Science degree in Geological Engineering from Montana Tech. She is currently the secretary of the Nebraska Floodplain and Stormwater Managers Association and Chapter District 4 Director for ASFPM.

Brooke Seachord is a Hazard Mitigation and Emergency Planner with JEO Consulting Group. She has facilitated and developed single jurisdictional, regional, and tribal hazard mitigation plans in four states and two FEMA regions. Brooke's work has also included developing and facilitating emergency preparedness plans, continuity of operations plans, emergency exercises, and wildfire preparedness.

Staying Engaged in Mitigation During a Global Pandemic
Alison Miskiman, GISP, CFM, Tetra Tech, alison.miskiman@tetratech.com
Co-presenters: None

Abstract: As a result of COVID-19, many people are working from home and limited to collaborative planning via emails, telephone calls and virtual meetings. The usual face-to-face interactions for hazard mitigation planning and public engagement has been limited in 2020. In order to keep the public

engaged and to provide platforms for mitigation planning partners to communicate seamlessly and effectively, we have leveraged technology. ArcGIS online products i.e. Story Map, Survey 123, Dashboards and Tetra Tech's BATool have enabled opportunities to reach planning partners and stakeholders in a quick and accessible format during the hazard mitigation planning update process. The use of these technologies goes beyond collecting data and information; they provide a space for people to feel heard, to collaborate as they once did in face-to-face meeting during challenging times, and to stay connected in the planning process. In addition, these platforms have propelled our public response reaching a larger audience during challenging times.   This presentation will provide an overview of creative solutions used to collect data and input from planning partners and the public during hazard mitigation planning in an effective and engaging virtual format during the COVID-19 pandemic.

Biography: Alison Miskiman has more than 15 years of experience with a focus on mitigation and resilience planning and demonstrated expertise in Geographic Information Systems (GIS), natural hazard risk assessment and benefit-cost analyses (BCA). As the Mitigation and Resilience Technical Director, Ms. Miskiman leads state and local hazard mitigation planning in compliance with DMA 2000 and leads the national GIS team in conducting natural hazard risk assessments for all private sector and local/state hazard mitigation and community resiliency planning projects. Ms. Miskiman manages large-scale GIS, data management, and web-based application development projects to simplify and streamline the collection and analysis of information for environmental, emergency management and economic development projects. Ms. Miskiman has extensive technical experience in the development of BCAs incorporating state of the art strategies to include quantifiable benefits to demonstrate economic feasibility of federally and locally-funded projects. Ms. Miskiman has collaborated with federal, state and local government agencies, private companies and the general public.

"Turning Obstacles into Opportunities"
Vikram Shrivastava, Atkins, vikram.shrivastava@atkinsglobal.com
Co-presenters: Mike Schlesener, Atkins, mike.schlesner@atkinsglobal.com

Abstract: Covid19 travel and public gathering limitations have impacted in-person Flood Risk Review, CCO, and, Open House Meetings with the community officials and public. To assist community officials in better understanding the changing flood risks due to a restudy the Iowa DNR, a CTP, utilized a geospatial dashboard that allows community officials to obtain a count of structures being removed and added to the SFHA, SFHA increases and decreases, and identification of structure specific SFHA changes and WSEL. Furthermore, the Iowa DNR has developed a Virtual Open House Meeting "Lobby", a web-based experience similar to an in-person Open House Meeting. In this virtual lobby, property owners can access changing flood hazard mapping and impact on their property, obtain information normally presented at an Open House Meeting, contact the Iowa DNR, and attend a scheduled virtual meeting with the Iowa DNR. The presentation will include a live demonstration of the Flood Risk Review Dashboard and Virtual Open House Meeting Lobby. The Iowa DNR sees the utilization of such tools to augment traditional outreach in a "post Covid19" world. This presentation will provide attendees with ideas on augmenting traditional outreach with tools that can be used in the current pandemic situation.

Biography: Vikram Shrivastava, PE. PMP, D.WRE, CFM is a Project Director with Atkins. He specializes in natural hazard risk identification and analyses, risk assessment and mitigation. Many of his projects involve water resources focused projects - floodplain mapping, levees, flood risk assessment, floodplain

management plans, stormwater management and public outreach. Vikram has a BS degree in Water Resources Engineering from the University of Guelph and a MS degree in Agricultural and Biosystems Engineering from McGill University.

Mike Schlesener is a Project Manager with over 16 years experience in flood hazard modeling and mapping. Mike has a BS in Geography from the Fort Hays State University.

J6: Watershed Management Initiatives

Introduction to Louisiana's Watershed Initiative
Alexandra Carter, AICP, Louisiana Watershed Initiative, alexandra.carter@la.gov
Co-presenters: None

Abstract: In preparation for its recently received guidance on 1.2 billion in CDBG-MIT funding, the State of Louisiana has spent the last year building the foundational elements of the Louisiana Watershed Initiative; which was established by Gov. Edwards in 2018 to serve as a coordinated, interagency structure at the state level for watershed-based flood risk reduction efforts. Initiative activities include (1) the establishment of statewide regional watershed boundaries, (2) the formation of regional steering committees, and (3) facilitating procurement of hydrologic and hydraulic models that—together—will cover the entire state and provide both state and regional entities with the science and data to better understand and address their risk in coordination with anticipated CDBG-MIT project and planning development activities.   Extensive outreach efforts (statewide, nationally, and internationally) were undertaken to inform this process and enhance next steps in program implementation. For example, a statewide Regional Capacity Building Grant Program was launched in August 2019 to incentivize formation of regional steering committees and to support anticipated local and regional efforts associated with watershed-level outreach, project design, and planning activities. Attend this session to learn more about the Louisiana Watershed Initiative's long-term goals and next steps in program implementation from state staff and leading agency representatives.

Biography: Alexandra Gelpi Carter, AICP, is a Resilience Planning Manager with Louisiana's Office of Community Development-Disaster Recovery Unit (OCD-DR). She is currently working with state and local stakeholders to implement the Louisiana Watershed Initiative, which was launched in August 2018 by Governor John Bel Edwards and aims to lead a long-range vision for the state's multi-pronged approach to mitigating future flood risk focused on natural boundaries.

The Trinity River Common Vision Program: 30 Years and Growing
Mia Brown, CFM, North Central Texas Council of Governments, mbbrown@nctcog.org
Co-presenters: None

Abstract: The North Central Texas Council of Governments (NCTCOG) is a non-regulatory, voluntary association of, by, and for over 230-member governments in a 16-county region, including the rapidly growing Dallas-Fort Worth Metroplex, with a population exceeding 7 million people. Through the Metroplex flows the Clear Fork, West Fork, and Elm Fork of the Trinity River, all of which converge into the Trinity River main stem that flows through Dallas. Although flood control infrastructure is provided by multiple entities, there is no unified regulatory flood control district within the North Central Texas (NCT) region. The NCT region is also unique in that within it resides the United States Army Corps of

Engineers (USACE) Fort Worth District office, the Federal Emergency Management Agency (FEMA) Region 6 office, and regional river authorities and water districts. These agencies are members of the Trinity Common Vision Program, a 30-year cooperative effort of entities along the Trinity River that, alongside other program goals and initiatives, works to conserve the flood storage of the Trinity River and its branches through the Corridor Development Certificate (CDC) process.   As rural areas of the NCTCOG region begin experiencing population gains, a unique opportunity is present to avoid loss of valuable flood storage in other branches of the Trinity River. The East Fork Trinity River is located in one of the fastest growing areas of the region, yet much of it was only mapped as Zone A. Through partnerships with FEMA Region 6, the USACE Fort Worth District, and current and prospective Trinity Common Vision members, a portion of the East Fork Trinity is joining the Trinity River Common Vision Program. This presentation will focus on the extensive multi-jurisdictional collaboration and communication efforts that have facilitated the first geographic expansion since the program's inception.

Biography: Mia Brown is a Senior Environment and Development Planner at the North Central Texas Council of Governments (NCTCOG).   Mia currently manages the Trinity Common Vision Program, the FEMA Cooperating Technical Partners grant program, and other regional floodplain programs which provide training and resources to communities in the NCTCOG region, in addition to supervising work on the Regional Public Works program. She is a member of the Texas Floodplain Management Association and has been a Certified Floodplain Manager since 2016. Mia previously served as a park ranger with both the Louisiana Office of State Parks and the Texas Parks and Wildlife Department.   Mia received her Master of Science in Biology degree from the University of Texas at Arlington in 2019 and her Bachelor of Science in Forestry degree from Stephen F. Austin State University in 2010.

Watershed Scale Coastal Resilience: Concept through Delivery Case Study: Delaware's Inland Bays/Town of Dewey Beach – Read Avenue Area Resilience

Larry Trout, Jr., PE, Straughan Environmental, ltrout@straughanenvironmental.com
Co-presenters: Jim Eisenhardt, CFM, RK&K, jeisenhardt@rkk.com

Abstract: The Delaware Inland Bays, a National Estuary Program led by the Delaware Center for Inland Bays (CIB), is comprised of three bays (Indian River Bay, Little Assawoman Bay, and Rehoboth Bay). The Bays have TMDLs for nitrogen and phosphorous, and the shorelines are especially sensitive to environmental changes and vulnerable to coastal flooding and erosion. That said, there have been many success stories associated with nature-based solutions being successfully implemented for flood/surge protection, due to exceptional efforts by a diverse set of partnerships. This abstract is a case study for a successful collaborative program between the CIB and Town of Dewey Beach to improve the bays by the performance of innovative coastal assessment efforts, planning, design, and the implementation of 'green" shoreline enhancement and stormwater retrofit technologies for protection of natural resource habitats, water quality improvements, and property protection from flooding. The case study will present the planning, funding, design, stakeholder involvement, community involvement, permitting, and implementation/construction steps for this program. This presentation will discuss the program elements and include the following:

- Comprehensive Planning for the watershed
- Transportation infrastructure resilience studies
- Community resilience studies

- Project siting and prioritization studies
- Landowner/community collaboration
- Design of priority projects – including diverse stabilization techniques • Permitting both site specific and state program
- Funding strategies
- Stakeholder engagement/Public Education & Outreach
- Next Steps

Biography: Mr. Trout, a Deputy Director with Straughan Environmental brings exceptional talent in the area of coastal resiliency, modeling, shoreline erosion protection assessment and design. With 25 years of experience, he has unique expertise in the areas of shoreline protection (living shorelines), wave/surge modeling, sea level rise projections, coastal erosion control, green stormwater infrastructure, stream restoration, hydraulic and hydrologic routing, erosion and sediment control, and flood control design throughout the Northeast. His experience includes coastal shoreline stabilization and stream bank stabilization using both bioengineering and engineering methods, analysis and design of storm drainage and stormwater management, erosion and sediment control, stream channel improvements, channel erosion control measures, wetland and waterway construction permits, watershed hydraulic/hydrologic modeling, environmental reviews; preparation of plans, hydrologic/hydraulic analysis and reports for structures, storm drains, culverts, wetlands creation; drainage and flooding investigations/remedial actions/construction; construction review; wetland permits; and floodplain permits.

J7: Spotlighting Stormwater Management Techniques

Healthy Streets for Urban Flooding in Your Neighborhood
Dustin Atchison, PE, PMP, Jacobs, dustin.atchison@jacobs.com
Co-presenters: Elise Ibendahl, PE, PMP®, F.ASCE, CFM, ENV SP, Jacobs, elise.ibendahl@jacobs.com

Abstract: The global pandemic has seen radical and unprecedented shifts in how people have been forced to behave – but also how people have adapted their streets and spaces so their communities can continue to function. Data shows that street adaptations would benefit people who would prefer to walk and cycle more than drive. At the same time, climate change factors such increased incidence of high-intensity cloudburst events cause urban flooding where it hasn't been experienced before. Neighborhood-scale transit-type adaptations present an opportunity to intersect multi-modal designs with holistic measures such as blue-green infrastructure to create healthy and safe options for residents. This presentation will explore how changes in how we approach neighborhood design and resident interactions have helped achieve the multiple benefits of healthy streets and how they are compatible with the principles of green infrastructure and flood mitigation. The presentation will include stories of public spaces, particularly streets, that have been reimagined to amplify non-motorized uses and improve stormwater performance, including real-world examples from the US and UK where green stormwater projects have been constructed in partnership with rebuilt public space. One example will explore how neighborhood greenway retrofit incorporating green stormwater infrastructure was included the City of Seattle's designation of 20 miles of "Stay Healthy Streets" to enable social distancing

on neighborhood streets in response to COVID-19. Such efforts have been so well received that Seattle is moving to make some of these streets a permanent designation. The presentation will focus on local neighborhoods rather than city centres.

Biography: Mr. Atchison is Jacobs' Global Technology Lead for Stormwater and Watershed Management and has over 22 years of experience (15+ at Jacobs/CH2M) in water resources and stormwater management.   Mr. Atchison is a recognized regional and national leader in green infrastructure with expertise in development of master plans, guidelines, education and implementation of stormwater solutions that bring multiple benefits to communities. He has taught Low Impact Development in certification programs through the University of Washington, Washington State University, Washington State Department of Ecology and numerous seminars and workshops around the U.S. He is a licensed engineer in the State of Washington and a Project Management Professional (PMP). Dustin also brings project management and design expertise and experience in ecosystem restoration projects including stream and wetland restoration and culvert fish passage replacement projects.

Flood Management: An Ancillary Benefit to Site Development and Public Works Projects
Chris Jansen, PE, LEED GA, Tetra Tech, chris.jansen@tetratech.com
Co-presenters: None

Abstract: Site development and public works projects often provide ancillary benefits beyond their primary objectives. At times, these ancillary benefits include some form of flood management. For example, in California, new developments are required to reduce hydromodification impacts resulting from changes in runoff volume, time of concentration, and/or peak flow rate. This requirement ensures that existing stormwater infrastructure is not compromised by extensive development.   In terms of public works projects, there is currently a massive green infrastructure initiative in Los Angeles County for developments within the public right-of-way that aim to improve water quality, increase local water supply, reduce urban heat island effects, and improve the overall quality of life. By removing stormwater from street gutters upstream of storm drain inlets, these projects also help to reduce flooding in the streets. There is also a large push in Southern California for stormwater capture projects that remove water from storm drains and flood control channels for beneficial use such as infiltration, on-site irrigation, and recycled water applications. The primary goal of these projects is to improve water quality in downstream receiving waters; however, they also provide flood management benefits by reducing runoff in the storm drains and flood control channels.   This presentation will discuss the above concepts in more detail by exploring at least three (3) case studies of low impact development (LID) projects at the site, local, and regional levels. The goal of the presentation is to inform the audience on how projects that are not necessarily centered around flood management can be leveraged for their multiple benefits to reduce flood risk while simultaneously making communities more resilient and/or improving water quality.

Biography: Mr. Jansen is a civil engineer whose work primarily consists of stormwater-related projects in Southern California. Mr. Jansen has both design and construction support experience in such areas as storm drain and pump station design, hydraulic and hydrologic modeling, stormwater capture and use projects, PS&E's, and RFI and shop drawing review. Mr. Jansen holds civil engineering degrees from both UCLA (B.S., 2016) and Stanford University (M.S., 2017) with an emphasis in water resources engineering, environmental fluid mechanics, and hydrology. Mr. Jansen also served four years in the Marine Corps as a Logistics Specialist, including two tours to Afghanistan.

Action Plan for Advancing Nature-based Stormwater Strategies in North Carolina

Kristiane Huber, The Pew Charitable Trusts, khuber@pewtrusts.org
Co-presenters: None

Abstract: North Carolina's flood disasters and projected increases in rainfall, coastal flooding, and population demonstrate the need to assertively address flood risk. State leadership has highlighted the opportunity to use nature-based solutions to reduce stormwater runoff, limiting the magnitude of flooding and water quality challenges. The Pew Charitable Trusts and the North Carolina Coastal Federation organized a year-long stakeholder working group process to identify the barriers, and opportunities, to broad application of nature-based solutions across the state. Academic experts, developers, investors, engineers, landscape architects, state officials, conservation organizations, and others formed the four working groups focused on new developments, stormwater retrofits, transportation, and working lands.   The working groups convened throughout 2020 to discuss and provide input for the "Action Plan for Nature-based Stormwater Strategies," scheduled to be released in early 2021. The report will outline recommendations for the state and local governments, non-profits, practitioners, and others.   The Pew Charitable Trusts is proposing a presentation on the Action Plan's recommendations. These will include state policy opportunities, community technical assistance, training for government staff and practitioners, and further research needs. The session will also highlight recommendations that are particularly relevant for practitioners, from engineers to floodplain managers to local decision makers, in North Carolina and beyond to contribute to a more flood-resilient future.

Biography: Kristiane Huber is a principal associate on the state policy and campaigns portfolio of Pew's flood-prepared communities initiative. Her work promotes state-level planning that prioritizes and incentivizes nature-based solutions to flooding, and discourages development in areas with flood risk, focusing on North Carolina.   Previously, Huber was a fellow at the Center for Climate and Energy Solutions (C2ES), leading the resilience program. She researched and authored reports, published articles, hosted webinars and organized conference sessions on climate change impacts to local economies, corporate climate disclosure, local climate adaptation strategies, and infrastructure resilience.   Huber holds a bachelor's degree in environmental studies and government from Connecticut College, and a master of science in natural resources and environment from the University of Michigan School for Environment and Sustainability.