In-person Concurrent Sessions Narrative Program

ASFPM Annual National Conference – Raleigh, North Carolina

May 7-11, 2023

Concurrent Session A

A1: National FPM Policy: NFIP/Floodplain Management

Climate Change and the NFIP: How FEMA will Update the NFIP's Floodplain Management Standards through Rulemaking

Joel Scata, 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. The National Flood Insurance Program (NFIP), through its minimum building and land-use standards, was intended to deter development in flood-prone areas. However, the rising debts of the NFIP and growing severity and frequency of flood-related damages suggest the program is failing to achieve its mission. 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 Ford administration nor has FEMA developed flood maps that reflect future flood risks. This presentation will describe the rulemaking process FEMA will use to revise the NFIP-implementing regulations. The presentation will also discuss the 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 that FEMA must pursue to ensure the NFIP adequately accounts for the increasing risk of flooding due to climate change and future development. 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 a senior attorney with the Natural Resources Defense Council's (NRDC) Water and Climate Team. At NRDC, Joel advocates for and develops federal and state policies 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, Joel served as a Peace Corps Volunteer in Mali, working to conserve land threatened by desertification. He is based in Chicago.

Updates on the National Flood Insurance Program (NFIP) Endangered Species Act (ESA) Compliance Planning and Request for Information

Zane Hadzick, FEMA, zane.hadzick@fema.dhs.gov
Co-presenters: None

Abstract: Over four years ago, FEMA Headquarters began working collaboratively with the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) toward a national programmatic consultation under Section 7 of the Endangered Species Act (ESA), as amended (16 United States Code [U.S.C.] § 1536) to assess the implementation of the National Flood Insurance Program (NFIP) nationwide. FEMA is getting ready to re-evaluate the impact on threatened and endangered species from implementation of the NFIP at the national level. In 2021, FEMA launched a nationwide NFIP ESA Section 7(a)(1) Conservation Action Program after informal consultation with USFWS and NMFS (collectively, referred to as the Services) to promote conservation of listed species and critical habitat. In addition, FEMA Headquarters is currently working with the Services toward conducting a national programmatic consultation on implementation of the NFIP under ESA section 7(a)(2). Concurrently with the national NFIP ESA efforts, two FEMA regions are undertaking ESA consultations. Region 9 undertook an evaluation of potential impacts to listed species and habitats in three counties in California with development of a Programmatic Biological Assessment (PBA). The three-county PBA will inform a statewide ESA consultation. Region 10 is evaluating its plan for implementing Reasonable and Prudent Alternatives (RPAs) resulting from a consultation with NMFS. As a part of this effort, R10 and FEMA Headquarters are currently in a scoping process to review potential impacts from implementing the RPAs in compliance with the National Environmental Policy Act (NEPA). FEMA Headquarters will also provide an update on the Request for Information (RFI), which was published in the Federal Register in October 2021 seeking public comment on opportunities to amend the NFIP's minimum floodplain management standards to help communities become safer, stronger, and more resilient. This presentation will provide an update on the status of FEMA's ESA efforts with the Services and provide an update on the RFI.

Biography: Zane Hadzick serves as the National Endangered Species Act (ESA) Coordinator at FEMA Headquarters. Zane is responsible for overall coordination and support of FEMA's ESA compliance initiatives so that actions are coordinated appropriately, knowledge and visibility is shared between affected offices, and that related projects are aligned. He also coordinates an interdisciplinary project team of subject matter experts representing the National Flood Insurance Program (NFIP) and program and advisory offices of FIMA to ensure appropriate processes are followed as required by the National Environmental Policy Act (NEPA) and ESA. Previously, Zane served as the Senior Planning Specialist in the Floodplain Management and Insurance (FMI) Branch of the FEMA's Region 3 office. Zane supervised the FMI team and together they worked to support the Region 3 State Partners and local communities in the implementation of the NFIP. He was responsible for helping communities protect people and property through floodplain management regulations, conducting compliance visits, providing technical assistance, reviewing floodplain regulations, interpreting flood maps and studies, and advocating for the purchase of flood insurance. Zane was also part of the nationally recognized group that developed and implemented the FEMA Region 3 Substantial Damage Administrative Procedures to help communities become more resilient and better prepared for disaster events. During times of disaster, he served as Liaison Officer (LNO) supporting the Region 3 State Partners. He also deployed as an External Affairs Specialist to support the first-in-nation Mobile Vaccination Units (MVUs) for COVID-19 response efforts

to support historically underserved communities. Previously, Zane was an Environmental Planner for the City of Baltimore, Maryland where he worked as a Floodplain Manager and Community Rating System (CRS) Coordinator. He holds a Bachelor of Science in Environmental Science and Policy with a focus in Soil, Water, and Land Resources from the University of Maryland and Master's Degree in Natural Resources and the Environment from the University of Michigan.

FEMA Earmarks for Coastal Zone Resilience

Grace Morris, Atkins North America, grace.morris@atkinsglobal.com
Co-presenters: Phetmano Phannavong, PE, PMP, CFM phetmano.phannavong@atkinsglobal.com

Abstract: Climate change is increasing the frequency and severity of coastal weather hazards. More people and high value assets exist in the coastal zone than ever before, increasing the risk of disaster. Proactive approaches to climate resilience are not standard practice in the United States, yet extreme weather events with disastrous outcomes require comprehensive planning efforts. Within the past year (2022) the United States and its territories experienced 18 major disaster events totaling $169.8B dollars in damages. This marked the 3rd most disastrous year on record for the U.S. Other less costly events, including Typhoon Merbok that battered Alaska, still disrupt daily life. In the aftermath of extreme weather events, states may request a disaster declaration to receive federal assistance for the recovery process. To prevent a Declaration of Disaster, earmarks—language integrated into Congressional spending allocations to reserve funding for specific, congressionally requested projects—provide an opportunity for state and local governments to address their resilience needs proactively. According to the National Institute of Building Sciences "Natural Hazard Mitigation Saves" Report of 2019, adopting model building codes as a mitigation strategy saves $11 USD per every $1 USD spent. Additionally, non-competitive Federal grants—like the Pre-Disaster Mitigation Grant Program which funds earmarked projects—save $6 USD per every $1 USD spent on mitigation. Understanding how Congressional members support their coastal communities by requesting earmarked Federal funding will magnify the opportunities for resilience in a changing climate.

Aligning planning efforts with proactive mitigation strategies can help States address their climate resilience priorities and minimize the risk of disruption of daily life, damages to the home, and loss of life from extreme coastal weather events. This presentation will explore the Federal Emergency Management Agency's Fiscal Year 2023 earmarks where Congressional Members have requested pre-disaster assistance from the Federal government to support local coastal hazard mitigation strategies and create climate resilient communities.

Biography: Grace Morris has three years of experience in national marine and environmental policy analysis, environmental justice, and qualitative data analysis and management. She has two years of experience examining coastal disasters and stakeholder engagement. She presented her research on sense-of-place in floodplain management at the Association of State Floodplain Manager's 2022 Conference where her team received 1st place in the Collegiate Student Paper competition. As an engineer at Atkins, Grace provides technical support to FEMA under the PTS contract, including interpreting and communicating environmental policy and grant programs. Grace earned a Master of Marine Affairs from the University of Washington with a certificate in International Development for her work analyzing coastal disaster preparedness.

A2: State Mitigation Initiatives: Mitigation

Resilient NC: 25+ Years of Mitigation Planning & Implementation

Nathan Slaughter, AICP, CFM, ESP Associates, nslaughter@espassociates.com
Co-presenters: Chris Crew, john.crew@ncdps.gov; Darrin Punchard, darrin@punchardconsulting.com; Gavin Smith, gavin_smith@ncsu.edu

Abstract: For over 25 years, North Carolina has served as a successful case study in mitigation. This presentation will provide an overview of that story while sharing ideas that other states and communities can use to help enhance their own programs.

Topics to be covered include:

- The state's Hazard Mitigation Planning Initiative (HMPI) which pre-dated the Disaster Mitigation Act of 2000, resulting in some of the first hazard mitigation plans in the country and informing national mitigation planning policy.
- The state's Floodplain Mapping Program which has grown into a national model for innovative all-hazards risk management. • Successes with local and state-level hazard mitigation planning, including:
    - Enhanced State Hazard Mitigation Plan Status
    - Regional Hazard Mitigation Plans (some going over 15 years strong)
- Project implementation. North Carolina has completed mitigation projects for thousands of properties (HMGP Fran, Floyd, Matthew, Florence, and recent success with BRIC grants just to name a few).
- Unprecedented state-level support and funding, including:
    - More than 20 years and $100 million in state funding to meet non-federal HMGP match requirements oHundreds of millions of dollars in state funding to support post-disaster recovery, redevelopment, and long-term resilience building This presentation will bring together many key figures from North Carolina's hazard mitigation history, including current and former state mitigation staff, consultants, and academic partners, to share the story of how North Carolina's hazard mitigation and floodplain management programs have evolved over the past few decades. Each speaker will provide the audience with succinct takeaways from their experiences over the years, including lessons learned and applied, and insight or ideas that other states and communities can use to help build or improve their own programs. Details will also be provided on where North Carolina is heading in terms of the next generation of hazard mitigation and flood risk management.

Biography: Mr. Slaughter is a certified professional planner and floodplain manager with over twenty-three years of experience in hazard mitigation, resilience and disaster recovery planning, business development, and project management. He has assisted in the development of hazard mitigation plans and disaster recovery plans for over one thousand municipal, county, state, and tribal government clients across the country. Mr. Slaughter has worked in hazard mitigation North Carolina since 2001 and currently serves as the Hazard Mitigation Department Manager at ESP Associates. He recently served as Project Manager for important projects such as the 2023 update of the State of North Carolina's

Enhanced Hazard Mitigation Plan, 12 Regional Hazard Mitigation Plans in North Carolina. He is currently working on Hazard Mitigation Plans in Mount Pleasant and Charleston South Carolina.

First Comes Fire-Then Comes Floods & More, (State Post Wildfire Mitigation Team), State Floodplain Manager & SHMO Partnerships Are Key

Kathy Holder, CFM, Utah Division of Emergency Management, kcholder@utah.gov
Co-presenters: Tracie J Harrison, CFM, tjharrison@utah.gov

Abstract: How to Build Your State Post Wildfire Mitigation Team- Utah Lessons Learned This is a look at how Utah's Floodplain Manager, State Hazard Mitigation Officer, and Forestry Fire and Start Lands pulled together State and Federal Partnerships to initiate a successful "State Post Wildfire Mitigation Team". Utah has created a "One Stop Shop" for community mitigation options post wildfire.

Biography: *Kathy Holder* is Utah's State Hazard Mitigation Officer, as well as the Mitigation and Recovery Section Manager for the Utah Division of Emergency Management. She leads Utah's Post Wildfire Mitigation Team and Utah's State Hazard Mitigation Team. She served as the State Floodplain Manager/National Flood Insurance Coordinator for the State of Utah before her current position. She is a Certified Floodplain Manager with 14 years of experience in Emergency Management. Kathy has worked on several presidentially declared disasters in recovery and held the position of the Deputy State Coordinating Officer for Public Assistance for two of Utah's most recent presidentially declared disasters. Kathy has held a position on the board of the Utah Floodplain and Stormwater Management Association (UFSMA) for the past 6 years. She holds degrees in Masters of Business Administration, Bachelors of Public Administration, and General Science. She has taught at the University level for over 11 years. Kathy engages in educating Utah communities, government agencies, private nonprofits, and citizens on regulations, permitting, building codes, mitigation, and recovery.

Tracie Harrison is Utah's State Floodplain Program Manager, as well as the National Flood Insurance Program Coordinator for the Utah Division of Emergency Management. As manager of the state national floodplain insurance program she provides technical assistance, training, and assists communities in regulating their floodplains. She is a Certified Floodplain Manager with an additional 20 years' experience in the insurance industry helping individuals manage risk.

Prior to coming to Utah she held a position with the Federal Emergency Management Agency (FEMA) as a mitigation specialist focusing on post wildfire flood risk mitigation and outreach for the states of Montana, Colorado, Wyoming, and Utah. The role gave her the opportunity to assist community officials and learn the importance of building working relationships to achieve success in emergency preparedness with a focus on public safety.

She earned her Bachelor of Science degree from the University of Utah in Geographic and Environmental Sustainability, is a licensed insurance agent, a member of the Association of State Floodplain Managers (ASFPM), and holds a position on the Utah Floodplain and Stormwater Managers Association (UFSMA).

Big Floods, but No Big Media Presence – Minnesota's Flood Risk Reduction Successes

Ceil Strauss, MnDNR, ceil.strauss@state.mn.us
Co-presenters: None

Abstract: As is happening around the country, Minnesota is seeing trends towards more frequent storms that are both larger and more intense. Many communities are seeing major flooding that is of the same magnitude as past major flooding, but are experiencing such significant reductions in damage that there is little media coverage when the flooding occurred. Higher state regulatory standards and proactive local governments working on flood risk reduction projects have helped reduce flood damage, especially to homes and businesses. This presentation will briefly discuss state higher standards and the State Flood Hazard Mitigation grant program, but will focus on case studies of several communities with past and more recent flooding of similar magnitude, but with significantly less damage due to local efforts. What kinds of projects did they do and how did they leverage federal, state and local funding.

Biography: Ceil Strauss is the Minnesota State Floodplain Manager. Ceil has been in the Floodplain Program at Minnesota DNR since 2002, and in the State Floodplain Manager role since 2007. She has worked with the Minnesota DNR an additional 14 years, mainly as an Area (or Field) Hydrologist in the western Twin Cities area. She is past Chair of the national Association of State Floodplain Managers (ASFPM).

A3: Modeling Unique Features & Problems: Modeling

How to model the moon: A novel approach to analyzing the hydrology and hydraulics of landscape featuring Carolina Bays

Steve Marks, PE, CFM, WithersRavenel smarks@withersravenel.com
Co-presenters: Amanda Hollingsworth PE, CFM, ahollingsworth@withersravenel.com; Nathaniel Eddy, EI, neddy@withersravenel.com

Abstract: Red Springs, a town of approximately 3,500 located in the upper coastal plain of North Carolina, may not technically be the moon; however, it bears a striking resemblance to our lunar neighbor when viewed through the lens of a digital elevation model. Like much of southeastern NC, the landscape of Red Springs is mostly flat and largely features dry Carolina Bays. Believed to be relics of thermokarst lakes, these bays are the cause for the unique landscape and are elliptically shaped depressions oriented southeast-northwest. Attempting to schematically represent a drainage basin without defined flow paths and outlets proves to be a tricky problem. To solve this issue, WithersRavenel prepared a comprehensive HEC-RAS v6.3.1 2D model of the Town. This presentation will discuss the following unique modeling methods and feature lessons learned and things to consider for other technical experts looking to replicate a similar approach. Those methods include:

- Gridded rainfall with green-ampt soil loss to simulate precipitation, infiltration, and runoff
- How to model urban closed-drainage systems using DEM adjusted inlets and junctions
- How to leverage python scripting to model over 400 storm drain pipes
- Using 1D SWMM to validate model results and adjust object parameters
- Process of calibrating the model to historical hurricanes.

Biography: Mr. Marks is WithersRavenel's Director of Stormwater. He is a veteran stormwater and environmental engineer, with more than 12 years of project experience. Areas of expertise include coastal resiliency and surge modeling, stormwater design, watershed master planning, stream and

wetland restoration, hydrologic and hydraulic modeling, FEMA floodplain permitting, residential storm drainage design, GIS analysis and mapping, enterprise software development, dam break analysis and EAP and project management. He is committed to client communication, community engagement, and customer service. He is proficient in a variety of modeling programs.

Rapidly Characterizing Risk from Post-Fire Debris Flows

Jamie Prochno, PE, CFM, FEMA Region 8, jamie.prochno@fema.dhs.gov
Co-presenters: Shane Putnam, PhD; sputnam@Dewberry.com; Thad Wasklewicz, PhD; Thad.Wasklewicz@stantec.com

Abstract: Increased occurrences of wildfires and extreme rainfall have heightened the potential for post-wildfire debris flows and floods in Colorado (2021) and have caused more damages and loss of life than riverine flooding characterized by Risk MAP products. In 2013, the USGS began producing Emergency Assessments of Post-Fire Debris-Flow Hazards immediately following wildfires across the western US. They produce the probability of debris-flow generation for specific rainfall intensities and estimates of debris-flow volumes at burned watershed outlets. USGS models do not consider runout pathways downstream of the watershed, debris-flow depth, or inundation. We built on the USGS models and constructed a nimble framework that can be both customized and rapidly deployed using publicly available, nationally consistent datasets to quantify the potential impact of debris flows to infrastructure. A two-phase approach was developed to accommodate both screening-level and detailed risk assessments. In the screening-level phase, we developed a combined risk and impact assessment to screen and prioritize the most vulnerable locations within nine wildfires in Colorado. The highest ranked HUC-12 watersheds from each wildfire were selected for additional analysis in the detailed risk assessment phase. In this phase, a credible debris flow susceptibility scenario was developed and modeled probabilistically to support the development of the risk cost to infrastructure within the nine wildfires. Results from both phases of the risk analysis show a high correlation with areas known to have debris flows in 2021 and 2022. This presentation will show how our nimble approach to post-fire debris flow hazard assessments can provide direct short-term measures to ensure safety to life and property before the next flood season and inform planning and mitigation efforts long-term. This underscores the value of characterizing the changing nature of flood hazards in a probabilistic way, which helps tailor risk information to the needs of the western US.

Biography: Jamie is a Professional Engineer with over 16 years of experience modeling and managing flood risk. At FEMA Region 8, she serves as the technical lead for the Risk MAP program and the Dam Safety Program Manager. Previously, she worked as a Civil Engineer with the U.S. Army Corps of Engineers, Omaha District and as the National Flood Insurance Program Coordinator for Colorado.

Split-Flows & Over-Flows: A US Highway Design to Keep Traffic Flowing

Kyle Miller, Meshek & Associates, LLC, kmiller@meshekengr.com
Co-presenters: None

Abstract: US Highway 70 at Muddy Boggy Creek, located in southeast Oklahoma, was forced to shut down twice in 2015 due to severe flooding. Although, the bridge had more than adequate capacity to handle flow through the channel, the stream overtopped the highway roughly 0.75 miles to east of the channel bridge due to a large split flow just upstream. The Oklahoma Department of Transportation has resolved to reduce the frequency of floods overtopping US-70 through the construction of an overflow

bridge. Modeling of the project comes with the added challenges of the local topography and hydraulic structures. The upstream floodplain is several miles across, even in a more frequent floods such as a 20% AEP flood, acting more like a reservoir than a stream. Flow in the channel rushes through a narrowed corridor, while flow at the overflow is wide and slow due to the inverse slope and a railroad embankment just downstream. The railroad creates a tailwater condition for the highway overflow location, controlling water-surface elevations and velocities. The presentation will cover: hydrologic methods for Muddy Boggy Creek, ultimately using the stream gage at the US-70 project site; hydraulic topography and structural challenges in a 2D model; calibration of hydraulic model to the stream gage and observed measurements; lastly, the final project design layout to reduce the frequency of highway overtopping. We want listeners to gain an understanding of how to anticipate, model, and design infrastructure in scenarios of large stream split flows, overflow topography, and adjacent hydraulic structures.

Biography: Kyle earned a Bachelor of Science degree in Civil Engineering from The Georgia Institute of Technology in 2010. After working in soils and construction his first few years as an Engineer, Kyle pursued a career as a Water Resource Engineer, joining Meshek & Associates in May 2014. He currently serves the company as a Project Manager in the Hydrology & Hydraulics department. Kyle is a Professional Engineer and Certified Floodplain Manager in the State of Oklahoma. His experience in water resource engineering ranges from stormwater master planning, hydrologic and hydraulic studies of streams and storm sewers, reservoir design, studies of highway stream crossings for Departments of Transportation and Turnpike Authorities, to Federal flood insurance products.

A4: Modeling to Mapping Case Studies: Mapping

Teton River: 2D Modeling Complexities and Floodways

Brandon Gonzalez, EIT, Atkins, brandon.gonzalez@atkinsglobal.com
Co-presenters: Soumya Sagarika, soumya.sagarika@atkinsglobal.com

Abstract: This presentation will cover a project located in Madison Co., Idaho. This is the area in which the Teton Dam failure occurred in 1976 and produced catastrophic damage. FEMA and STARRII are exploring the updated floodplain mapping using 2D split-flow floodways to better inform the community of its flood risk and help mitigate any future flood damages. The presentation will talk about the history and coordination of the project with the community, calibration, levee considerations, and 2D floodway development.

Biography: Brandon Gonzalez is an EIT with 3 years of experience with water resources engineering analysis. This experience includes hydrologic and hydraulic analyses of watersheds, open channel hydraulics, FEMA FIS Report production, and flood zone mapping developments across various states and regions. Brandon is proficient in 1D and 2D H&H studies using his proficiency in HEC-RAS, HEC-HMS, and GIS software. Brandon specializes in novel modeling techniques and methods with a keen interest in 2D hydraulic modeling with an emphasis in complex modeling scenarios, such as urban drainage, watershed level 2D BLE, and levee and dam risk analysis.

Joint Probability Method in Guam and CNMI: Optimal Storms and Optimization Schemes

Kun Yang, PHD, CFM, Stantec, kun.yang@stantec.com
Co-presenters: None

Abstract: STARR II is supporting FEMA Region 9 in a Flood Insurance Study (FIS) to update the flood hazard information for the territories of Guam and The Commonwealth of the Northern Marianna Islands (CNMI) by applying the Joint Probability Method with Optimal Sampling (JPM-OS) via two optimization schemes. First, historical storms affecting the area between 1945-2021 were reviewed, storm landfall parameters including central pressure deficit, radius of maximum wind, storm forward speed, storm heading direction, and landfall location were determined. Synthetic storms were then developed using combinations of these landfall parameters. Sensitivity analysis was conducted by simulating the synthetic storms using coupled ADCIRC and SWAN. From the sensitivity analysis approximately 150 optimal storms were selected from all possible synthetic storms by analyzing the surface response (storm surge level) and wave heights within select nearshore and offshore stations around the islands. The optimal storm suite was then used in the JPM-OS with two optimization schemes, including a Kriging surrogate model and the Response Surface model. From these results probabilistic water levels and wave heights were calculated. This presentation will describe the methodologies of sensitivity analysis and selecting the optimal storm suite for production runs. Also, the advantages and limitations of the Kriging surrogate model and response surface model will be discussed.

Biography: Kun is a coastal and environmental engineer with a background in numerical modeling, storm surge forecasting and coastal hazard mapping. He is specialized in model development and calibration of hydrodynamic and hydraulic models including ADCIRC, DELFT3D, MIKE21, HECRAC, and applying the models to study storm surge, coastal flooding, sediment transport, and morphological changes. As a Certified Floodplain Manager, Kun has rich experiences in developing and using FEMA's Flood Insurance Rate Maps, reducing the flood losses, and enhancing the natural and beneficial functions of the floodplains. Kun got his PhD in Coastal Engineering from the University of Florida.

Tanana River PMR: Floodplain & Floodway 2D Modeling and Mapping on a Large Braided River System

Keith Weaver, PE, HDR Engineering, keith.weaver@hdrinc.com
Co-presenters: Mark Forest, mark.forest@hdrinc.com

Abstract: A Physical Map Revision for 45 river miles of the Tanana River in the area of Fairbanks, AK was initiated utilizing grant funding obtained by Fairbanks North Star Borough through the FEMA Cooperating Technical Partner program. Updated hydrology was developed utilizing Bulletin 17C analysis of USGS gage records to calculate peak flow rates for the Tanana River, as well as for the Chena River, a major tributary to the Tanana. Unsteady flow hydrographs for input into the HEC-RAS hydraulic model were created using the balanced hydrograph method. A fully two-dimensional (2D) HEC-RAS model was developed, extending from the area of Salcha, AK to 9 miles downstream of Fairbanks, AK. Channel bathymetry was imposed upon the model terrain using HEC-RAS Mapper terrain modification tools. Floodplain modeling included a Natural Valley Analysis of possible breaches of the Richardson Highway which runs along the right bank of the Tanana in the upper portion of the model domain. Floodway modeling within a 2D hydraulic model is a complex issue, especially in a region like the Tanana braidplain, which includes numerous extensive side channels. The currently effective floodway along the Tanana within the study reach was updated utilizing high Manning's n roughness values to exclude flow

from the floodway fringe within the 2D model. This approach is one of several options being assessed by FEMA. This project has been submitted to the current FEMA IPT committee as an example of 2D floodway modeling challenges in a highly braided system. This presentation will illustrate the potential options for modeling floodway fringe in a 2D simulation and the hydrologic and hydraulic results of the floodway analysis with a blocked fringe.

Biography: Keith Weaver is a Senior Water Resources Engineer with HDR with over 20 years of experience in hydrologic and hydraulic modeling, as well as floodplain management. He has been involved with numerous large-scale FEMA floodplain Physical Map Revisions, as well as dam breach analyses and flood management design projects.

A5: Setting Up Communities for Success: Risk Communication

From Traditional Training and Technical Assistance to Capacity Building: Using a Flexible Framework to Achieve Sustainability

Susannah Numa, Booz Allen Hamilton, Numa_Susannah@bah.com
Co-presenters: Katrina Tavanlar, Booz Allen Hamilton

Abstract: The harsh reality: Often times, recipients of training and technical assistance (TTA) fail to actually apply the knowledge gained in their organizations, systems, and communities. While traditional approaches to TTA are great for individual knowledge acquisition (think building stakeholders' understanding of model and evidence-based practices and relevant skills), recipients often fail to institutionalize the concepts learned. This results in wasted opportunities to create sustainable and lasting change.

This session will introduce attendees to several new approaches for TTA that apply a capacity-buildingmodel to address challenges and promote measurable change for state, local, tribal, and other organizations. Professionals in Technical Assistance will share how these models can support flood mitigation programs by removing barriers that may impede success in a community's programmatic, management, financial, technological, or human resources. Presenters will also discuss how to scale TTA for use as a force multiplier of federal investments.

Biography: Susannah Numa has over twenty years of experience helping all levels of government solve their most critical challenges, working with federal, state, local, and tribal governments in over 30 states. She has analyzed a diverse set of government functions, including: criminal justice and public safety, administrative services, land use and development, health and human services, and infrastructure management. For more than 10+ years, Ms. Numa has served as a senior justice program leader, standing up national training and technical assistance programs focused on building system capacity, addressing systemic justice challenges, and building trust in the justice system. For example, Ms. Numa served as the Deputy Project Director (contractor) for the Office of Justice Program Diagnostic Center – a TTA program focused on help justice agencies address systemic public safety challenges by leveraging the evidence-based about what works in criminal justice policy and practice. Additionally, Ms. Numa was the Program Manager (contractor) responsible for the design and operating of Office for Victims of Crime (OVC) Human Trafficking Capacity Building Center, a federal program focused on building the nation's capacity to serve all victims of all forms of human trafficking. Currently,

Ms. Numa serves as the Project Director (contractor) for the OVC Tribal Victim Services Capacity Building and Technical Assistance program, a new federal program dedicated to building the capacity of tribal organizations to serve all victims of crime. Ms. Numa holds a Master of Public Administration and a Bachelor of Arts in Government and International Relations from Clark University and Project Management Professional certification from the Project Management Institute; and successfully completed the Change Management Advanced Practitioner Program through the McDonough School of Business, Georgetown University.

Ms. Katrina Tavanlar is Senior Associate at Booz Allen Hamilton with more than 20 years of experience leading and providing organizational development and mission support in the areas of Resilience, Climate, and Infrastructure. Over the last decade, Ms. Tavanlar provided strategic advice to the Federal Emergency Management Agency's (FEMA) leadership in the areas of Floodplain Management, Hazard Mitigation, and Resilience. She has been instrumental in helping enhance and transform FEMA's floodplain management programs especially in the areas of Community Assistance Visits and technical assistance. Ms. Tavanlar has supported the development of several FEMA publications, guidance documents, and educational materials aimed at enhancing local community capability in floodplain management including FEMA-480: Floodplain Management Requirements: A Study Guide and Desk. FEMA's Ms. Tavanlar received a B.A. in Environmental Science from UC Berkeley and a M.C.P in Environmental Policy and Planning from the Massachusetts Institute of Technology (MIT).

A Goal Without a Plan Is Just a Wish: Using Multi-Year Strategic Planning to Support Risk Reduction in Communities

Peter Herrick, Jr., FEMA, peter.herrickjr@fema.dhs.gov
Co-presenters: Francie Israeli, francie.israeli@ogilvy.com

Abstract: FEMA's strategic plan puts forth bold and ambitious goals. These goals help to empower partners and communities. They also contribute to a more equitable, resilient nation. It is vital to achieve these goals. However, they will require major shifts in how FEMA delivers its programs and supports community resilience. This kind of change is hard to manage without disciplined, long-term planning. One tool FEMA uses to achieve this is the National Outreach Strategy (NOS). The NOS is a framework for the Risk Management Directorate. It supports strategic, informed decisions and plans for outreach and engagement work that:

- Improves equitable and customer-centric service delivery.
- Helps communities plan for future conditions.
- Empowers partners to drive local action.
- Supports outcome-driven, measurable risk reduction.
- Manages change and accounts for risks and disruptions.

In this presentation, FEMA will show how it uses multi-year planning efforts like the NOS to effectively manage this change over time, improve customer engagement and drive impact within communities.

Biography: Mr. Herrick is communications specialist for FEMA in Washington, DC. He 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, most recently during Hurricane Harvey. He works in the Data & Communications Branch in 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 (CERC) efforts for FIMA. Mr. Herrick hails from New England, having grown up in Vermont and Maine. Mr. Herrick holds a Bachelor's degree in Political Science from Norwich University.

Mapping the Story of Nebraska's Flood Mitigation

Jamie Reinke, Nebraska Department of Natural Resources, jamie.reinke@nebraska.gov
Co-presenters: Derek Schriner, PE; Derek.Schriner@usace.army.mil

Abstract: As the Nebraska Silver Jackets Team continues to work with communities throughout the state, a common theme has emerged: many communities don't know where to start when it comes to reducing their risk to natural hazards. The team began searching for ways to help communities identify potential projects, navigate the many funding opportunities, and overcome other challenges associated with completing mitigation projects. This search led to the development of the Mitigation Project Interactive Map. The Mitigation Project Interactive Map is a compilation of mitigation projects that have been completed throughout the state of Nebraska. The map lists the funding mechanisms, team partners, hazard addressed, and other project information for mitigation activities going back to the year 2000, or earlier when possible. By compiling the data across the entire state, the map will show that even smaller mitigation activities, occurring throughout a community, watershed, or region, can have noticeable benefits for residents. The team recognizes that many communities have limited capacity, are unfamiliar with the specific requirements of grants that may be available, and that they need help meeting the local funding match. This map will provide communities with a resource that can highlight successful mitigation projects, provide information on how other jurisdictions have teamed to fund these projects, and get communities and residents focused on the long-term benefits that result from reducing their hazard risks. The initial phase of work is nearly complete, but we hope that it is just one step in the larger effort of implementing risk reduction actions and that it can serve as an example for communities across the nation.

Biography: Jamie joined the Nebraska Department of Natural Resources (NeDNR) in 2016 as a water resources engineer and is now the team lead of the Floodplain Management Section. She currently serves as the state CTP manager and interim state NFIP coordinator. She is responsible for developing guidelines and procedures for mapping work, reviewing hydrologic and hydraulic studies, overseeing technical staff, and reviewing engineering and mapping submittals. Jamie also coordinates with consulting firms that are completing contracted CTP projects and she performs technical reviews on projects submitted by local jurisdictions. In addition, she is responsible for grant management tasks, grant reporting, and conducting outreach for NeDNR. Before joining NeDNR, Jamie spent the previous four years at the Nebraska Department of Transportation in the Bridge Hydraulics Section completing hydrologic and hydraulic analyses for bridge design, performing project reviews, and consultant coordination. Jamie was also responsible for managing the NDOT Bridge Division floodplain management program. Prior to her experience at NDOT, Jamie has over six years of experience with engineering consultants.

A6: Understanding Inequality in Flood Risk: Equity

Equity Considerations for Floodplain Management: Existing Federal Efforts to Address Needs of Historically Underserved Communities

Ummekulsoom Lalani, Atkins North America, ummekulsoom.lalani@atkinsglobal.com
Co-presenters: Phetmano Phannavong, phetmano.phannavong@atkinsglobal.com

Abstract: As impacts of global climate change continue to intensify and impact at-risk communities, changes in land development, weather patterns, and sea levels may result in communities having a greater risk of flooding. State, local, tribal, and territorial governments continue to face pressures as they determine how to address the needs of communities to respond to flood hazards. Furthermore, resources for flood risk management are often inequitably distributed even though socially vulnerable populations experience the worst repercussions. The debilitating impacts of disasters on at-risk communities has shifted the conversations around how to prioritize equity and social justice considerations for floodplain management. ASFPM has also committed to reassessing current policies, programs, and practices in the field of floodplain management to examine approaches that alleviate inequities. Other relevant national shifts include the Justice40 Initiative which requires 40 percent of the overall benefits from federal investments in climate and clean energy to flow to disadvantaged communities and includes programs such as FEMA's BRIC and FMA grant programs as well as the Risk Mapping Assessment and Planning program. Executive Orders 14008 and 13950 both address the need to build resilience against the impacts of climate change with a focus on advancing racial equity and support for underserved communities through the federal government. This presentation will use examples from the aftermath of Hurricane Ian and Hurricane Fiona to demonstrate the importance of applying an equity lens before, during, and after disasters to address the needs of underserved and vulnerable communities. It will also provide an overview of current national and federal initiatives, such as the White House's National Initiative to Advance Building Codes, FEMA's Building Codes Strategy, Building Codes Adoption Tracking Portal and the Climate and Economic Screening Justice Tool to examine opportunities to enhance flood risk management that incorporate considerations for equity.

Biography: Ummekulsoom Lalani has 10 years of experience on social justice and equity with a focus on global health, health systems strengthening and program management. She has 3 years of experience on disaster management, resilience, and national flood policies. As a project manager at Atkins, Umme provides technical support to FEMA under the PTS contract, including the FEMA Building Codes Strategy development and the White House's National Initiative to Advance Building Codes where she facilitated and supported the Mitigation Framework Leadership Group undertake a landscape analysis to determine federal priorities and gaps for building code advancement and enforcement. She promotes equity considerations when addressing flood risk management and has experience managing projects focused on identifying solutions that drive implementation and support capacity building, governance, and cross-sector partnerships. In her previous role as research faculty at Johns Hopkins University, she provided analytic, technical, and strategic support to strengthen health systems and equity in Asia, Africa and the Middle East. Umme has a Master's in Public Policy from the University of Cambridge.

Who are risk models leaving behind?

Carlos Genatios, Ph.D., Miami Dade College, carlosgenatios@gmail.com
Co-presenters: None

Abstract: Risk models typically use public data, which, in several cases, is unprecise or non-updated. Besides, the averaged probabilistic values in census tracts or census blocks do not allow an adequate risk assessment of populations with high or low social vulnerability.

Some data requiring local verification for risk assessment are: topography, building inventory, building footprint, statistics of the population, property values, recently built infrastructure, modifications to the coastline, alterations to dunes and vegetation, and the situation of the sea walls, among others.

We have analyzed several Census tracts from the cities of Miami and Miami Beach to compare the results (a) using data from public information and (b) using updated and improved data from drone flights and local verification. In these examples, the economic losses produced by hurricanes and floods using the improved inventory equal 2.7 and 1.7 times the losses obtained with the public inventory.

Videos captured with drones over the last three years show the impacts of King Tides. In some census tracts considered medium risk, we verified the presence of buildings with a high physical vulnerability that can be severely affected while also showing high social vulnerability.

To improve risk analysis and generate more inclusive procedures, we have implemented: Use of drones and lidar for data capture, generation of topographies, DSM, and DTM; Correction of building footprints and building inventory; Survey for the structural characterization of buildings. We are also working on data collection with drones to evaluate dunes and the replenishment of beaches. We have also developed a comprehensive risk analysis survey that includes aspects of social vulnerability and community resilience. In addition, as part of a community engagement effort, we have created a College Credit Certificate in GIS technology, with environmental risk analysis examples, which provides for articulation with High School, and is stackable to Associate in Sciences and Bachelor of Sciences degrees in Information Technology.

This presentation will show variations and inaccuracies in risk assessment examples under flooding and hurricane hazards, using available public data and procedures to improve the results.

Biography: Carlos Genatios, Ph.D. Civil Engineer with a 40-year professional career. He is the Director of Engineering, Technology, and Design at Miami Dade College, Director of Geopolis: International Network for Natural Disasters Risk Reduction, and consultant for the Interamerican Development Bank, United Nations, World Bank, CAF, UN, ECLAC. He has led cooperation programs with the European Union. He is a Grand Officer of the National Order of Merit and Commander of the Order of Academic Palms, France. Inducted member of the Venezuelan National Academy for Engineering and the Habitat, Emeritus professor of the Universidad Central de Venezuela, has been Minister of Science and Technology, President of the Andean Council for Science and Technology, and a member of the Board of Directors of the International Centre for Nuclear & Environmental Sciences. He is the author or co-author of 18 books, 120 scientific, and 300 op-Ed articles. https://www.linkedin.com/in/carlosgenatios/

Developing Improved Benefit Cost Analysis (BCA) Guidance: Equitable Alternatives to Traditional BCA

Anne Watkins, AECOM, anne.watkins@aecom.com
Co-presenters: Jenna Rao, Texas Water Development Board, jenna.rao@twdb.texas.gov; Saul Nuccitelli,

Texas Water Development Board, Saul.Nuccitelli@twdb.texas.gov; Emily Schwimmer, AECOM, Emily.Schwimmer@aecom.com

Abstract: Protecting communities from flooding through a variety of mitigation techniques is essential to creating a more resilient future. One way to assess the feasibility of a given flood mitigation project is the benefit cost analysis (BCA). Funding for flood mitigation often relies on the project having a benefit cost ratio (BCR) that exceeds 1. However, not all municipalities have the resources to conduct a BCA. Additionally, traditional BCA has come under scrutiny by researchers who posit that it prioritizes "dense, high-value property areas and promotes retreat from low-density, low value areas" (Tate 2016). It is important for floodplain managers to work to provide equitable outcomes for all communities whether urban or rural, high or low income.

The Texas Water Development Board (TWDB) and AECOM previously developed a BCA Input Tool to assist local project sponsors in preparing a BCA to meet the requirements of the State Flood Plan and Flood Infrastructure Fund. They are currently developing a BCA Guidance document to identify scalable approaches and investigate a range of additional benefit types and values to support communities in developing more comprehensive BCAs. The scalable approach to BCA analysis includes detailed BCAs for specific, identified projects that are seeking financial assistance as well as more approximate BCAs for high level planning purposes. The guidance document aims to include traditionally underrepresented land use types (agricultural, transportation, utility infrastructure) and impact types (social, health/safety, environmental) to emphasize people rather than property. One methodology involves applying equity weights to certain benefit categories to incorporate the higher marginal value of each dollar spent on flood recovery to lower income residents. This presentation will review common BCA approaches and discuss alternatives with the goal of offering equitable solutions to ensure that all communities in Texas can fairly compete for funding for a variety of flood mitigation projects.

Biography: Anne Watkins is an economist with over a decade of experience evaluating the feasibility and cost-effectiveness of a variety of civil infrastructure types for local, state, and federal governments. Ms. Watkins has conducted benefit-cost and economic impact analyses for flood control, water supply, ecosystem restoration, navigation, transit, freight rail, and highway projects. She has prepared the benefit-cost analyses for numerous winning grant applications, helping to secure over $100 million in federal funding for her clients. Ms. Watkins has completed economic impact analyses using IMPLAN software, has experience creating and testing models for the U.S. Army Corps of Engineers, and is familiar with the economic models used by several government agencies, including FEMA's BCA Toolkit, USDOT's BCA.Net, and the USACE's HarborSym Model and Suite of Tools. This range of experience gives her a unique perspective and allows her to combine different methodologies and benefit types to ensure that all aspects of a project can be appropriately evaluated. She holds a Bachelor of Business Administration in Economics and Finance and a Master of Business Administration from Loyola University New Orleans. Saul Nuccitelli is the Director of Flood Science and Community Assistance at the Texas Water Development Board. He has more than 25 years of civil engineering experience in the public and private sectors. Nuccitelli received his bachelor's and master's degrees in civil and environmental engineering from the Massachusetts Institute of Technology. Jenna Rao is a Senior Water Resources Engineer on the Flood Modeling Team at the Texas Water Development Board. She has over 8 years of experience in the water resources fields in private and public sectors. Mrs. Rao received her bachelor's degree in Civil Engineering from Texas A&M and her masters in Geological Sciences from the Univeristy of Texas at Austin

A7: Substantial Damage Planning and Operations: Post-Disaster

Managing Effective Substantial Damage Operations

Molly Kaput, FEMA, molly.kaput@fema.dhs.gov
Co-presenters: Adrienne Sheldon, adrienne.sheldon@fema.dhs.gov

Abstract: Making substantial determinations can be the most difficult part of post-disaster recovery for floodplain administrators. The data needed to make these determinations are perishable and information needs to be collected in a timely manner. In addition, there is an urgency of the local permitting work that needs to be completed before survivors can begin repairs. In the immediate aftermath of an event, survivors make decisions about how to repair damage and spend the expedited funding available to them (through claim payments, federal or state assistance etc.). Completing these vital activities as soon as possible ensures that survivors recover in a way that makes them more resilient. Resources such as FEMA Public Assistance reimbursement, programs such as FEMA's Substantial Damage Administrative Procedures Workshop, and best practices from recent disasters (FL. KY) have been developed to assist floodplain administrators in planning and executing post-disaster activities. Making a plan, collecting data ahead of time, and leveraging available resources can make the process less daunting and more streamlined. Incorporating and using the many programs and resources at the right time both pre- and post-disaster can assist local communities in effectively administering floodplain regulation. In this presentation we will discuss opportunities to prepare for substantial damage missions, provide an update of FEMA's post-disaster programs, and help locals make use of a wide variety of financial and personnel resources.

Biography: Molly was hired in January 2022 into the new role of Disaster Operations Coordinator with FEMA's Floodplain Management Division. Molly has been working with communities since 2012 to ensure compliance with the National Flood Insurance Program. Prior to FPMD, she worked for over four years in Region I in Boston supporting New England states and for five years in FEMA Region III in Philadelphia supporting mid-Atlantic states. She has completed multiple deployments in support of disaster recovery efforts with a specific focus on substantial damage operations and is currently serving as FEMA's Floodplain Management Division's SD and Disaster Operations Committee Co-Chair.

Substantial Damage Response Planning: Striving for the Ideal State

Rob Flaner, CFM, Tetra Tech, Inc, rob.flaner@tetratech.com
Co-presenters: Danny Hinson, CFM, danny.hinson@tetratech.com

Abstract: The United States has experienced unprecedented natural disasters with significant impacts to structures in the past. Whether it is a hurricane, flood, fire, or another type of incident, addressing substantial damage is a requirement of the National Flood Insurance Program (NFIP). NFIP-participating communities must adopt and enforce a flood damage prevention ordinance that meets or exceeds the NFIP minimum standards found in 44 CFR 60.3. These require substantial damage evaluations based on inspection of structures that have incurred damage of at least 50% of their pre-damage value. Communities can benefit by creating a pre-disaster substantial damage response plan (SDRP) to facilitate the process and enable elected officials and the whole community to better understand the substantial damage process. In order to adequately prepare for the after-effects of a disaster, it is crucial to develop a strategy to conduct substantial damage assessments prior to an incident.

Approaching substantial damage assessments with a response plan will expedite orderly recovery. Until now, there have been few options to address this type of proactive planning in the floodplain manager's toolbox. In order to address this, Tetra Tech has developed an approach that uses the framework of a Community Rating System Substantial Damage Plan (SDP) enhanced with a "response" feature to create a functional and potentially CRS creditable SDRP. This presentation will present the "Ideal State "initiative being led by FEMA Region VI that has set an objective of establishing a model SDRP program by working with communities that have been negatively impacted by recent hazard events within the Region. The basis for the presentation will be actual case studies where SDRP's have been prepared.

Biography: Rob Flaner, a Certified Floodplain Manager (CFM), is the Hazard Mitigation Program Manager for Tetra Tech, Inc. He is based out of Boise, ID, and leads Tetra Tech's Hazard Mitigation Practice under the Emergency Management Community Resilience (EMCR) program. Mr. Flaner has performed floodplain management and hazard mitigation planning projects all over the U.S. Mr. Flaner developed a comprehensive background in all aspects of floodplain management and FEMA hazard mitigation programs while administering the Community Rating System (CRS) under contract with the Federal Emergency Management Agency (FEMA). Rob was responsible for coordinating all CRS objectives between State, Local, and Federal entities in a 9-state territory that spanned three FEMA Regions. During his tenure with the CRS program, Rob was able to develop strong working relationships with his Federal, State, and Local partners. Rob has strong facilitation skills developed in working with over 1000 local governments seeking compliance with the Disaster Mitigation Act of 2000 since 2003. In 2016 and 2017, Mr. Flaner served as a lead facilitator for the U.S. EPA's Building Blocks technical assistance program under the Flood Resilience tool, which includes a two-day workshop to identify and develop an action plan to increase the community's flood resilience.

There's No Place Like Home: How Substantial Damage Determinations Provide a Gateway to Rebuilding after Disaster Strikes

David Rubenstein, AECOM, david.rubenstein@aecom.com
Co-presenters: Elizabeth Levitz, elizabeth.levitz@aecom.com

Abstract: While much effort is undertaken by communities to remove structures from the risk of flood, or mitigate the risks when that is not possible, it is ultimately a matter of time until a natural disaster occurs resulting in damage to structures. Upon a presidential disaster declaration, Substantial Damage Determinations (SSD) are the critical first step in communities building back. SSDs apply to structures located within a Special Flood Hazard Area (SFHA) with estimated repairs of 50 percent or higher of the structure's market value prior to the event and this designation requires homeowners to meet current building codes and floodplain management regulations, when rebuilding after a disaster. This presentation will cover recent updates to the SDD process, which determines when a SDD is applicable, while also sharing best practices to prepare for and perform SDDs in accordance with the Disaster Recovery Reform Act (DRRA) of 2018 Section 1206. This information is invaluable for communities to understand thoroughly as FEMA does not make SDDs, the local community official does. As a result, there is much for the local building official or floodplain manager to understand before an event occurs to prevent timely delays or confusion during the recovery period. Under DRRA, if the disaster is authorized for assistance under a major disaster declaration with FEMA Public Assistance permanent work, then the cost for the post-disaster floodplain permitting, floodplain damage inspections and SDD and appeals process may be reimbursed. We will cover the proactive measures communities can take to

be prepared before they are impacted, leading to increased resilience as their ability to respond to disasters is increased.

Biography: Mr. Rubenstein is Certified Floodplain Manager and a Project Manager Professional currently focused on water resources and project management out of the AECOM Dallas, Texas office. Mr. Rubenstein has dedicated a majority of his 21-year career, by working with the National Flood Insurance Program (NFIP) and leads in communicating FEMA's vision of creating and communicating the various Flood Risk Products that allow various state and local stakeholders to make informed risk-based mitigation strategy decisions. Mr. Rubenstein has 15+ years' experience in GIS and has detailed knowledge of many of the ARC GIS components. Mr. Rubenstein has been working on and leading Substantial Damage Determination (SDD) teams since the Mississippi Spring flood of 2011. Mr. Rubenstein has since served on 8 other SDD assignments from New Jersey To Texas and has led in the assessment of thousands of structures.

A8: Local Stormwater and Master Planning: Stormwater

Assessing Flood Resiliency in Bladen County, North Carolina

Chris Stanley, PE, CFM, McAdams cstanley@mcadamsco.com
Co-presenters: Cameron James, PE, CFM, james@mcadamsco.com

Abstract: North Carolina continues to be impacted by an undeniable increase in the frequency and severity of major stormwater events each year, including hurricanes and tropical storms as well as just the more common short-duration, high-intensity rainfall events that are frequent throughout the year. This is particularly true for the eastern part of the state, which is highly susceptible to the rapidly changing climatic patterns impacting our coastal communities. Characterized by flat terrains and many existing developments and communities located near major flood sources such as rivers and streams, finding solutions to mitigate flooding within these communities can be a significant challenge. Combined with the challenges of upgrading and maintaining its rapidly-aging drainage infrastructure, communities are being forced to gain a better understanding of its stormwater assets and find ways to fund the much needed improvements. McAdams is performing a watershed study and storm drainage analysis for several municipalities within Bladen County, including the Towns of Bladenboro, Elizabethtown, Dublin, White Lake, Clarkton, and White Lake. These municipalities within the County have experienced severe flooding on multiple occasions through the years, including during Hurricanes Matthew and Florence, due to a combination of poor drainage and aging, undersized stormwater infrastructure. Bladen County has an interest in preventing or minimizing the flooding during significant weather events in each of these municipalities, including the more frequent, nuisance type flooding events that these areas experience routinely. The overarching goal of this project is to assess each community's drainage system and identify areas of deficiency and required improvements. McAdams will be leading the stormwater hydrologic and hydraulic modeling process as part of an engineering team to assist in the identification of needed stormwater upgrades and will also assist in the development of Stormwater Capital Improvement Planning (CIP) for each municipality. This will aid in building better resiliency for these communities against an evolving climate, changes in rainfall patterns, and the threat of future flooding from hurricanes and other significant weather events. This study is

being funded by a grant from The North Carolina Office of Resiliency and Recovery CDBG-DR. This presentation will highlight some of the 1-D and 2-D modeling technologies that McAdams is applying to this project to assess predicted flooding and will also highlight some of the strategies each of the communities are considering to help mitigate flooding, plan for future capital projects, and prepare for future storm events.

Biography: Chris Stanley of McAdams is a stormwater engineer with over 18 years of experience in both the public and private water resources industry. Chris has a Bachelor's and Master's Degree in Civil Engineering from NC State University and has spent most of his career focused on the study, design and construction of municipal stormwater planning and improvements, including watershed inventory and master planning, conveyance infrastructure and Capital Project Improvements, and stormwater program management. Chris is the CIP Practice Lead at McAdams and also a Certified Floodplain Manager.

A Stormwater Management Evolution: Lessons From Consolidating Two Decades of Watershed Master Planning

Dan Fricke, PE, CFM, JEO Consulting Group, dfricke@jeo.com
Co-presenters: Tim Zach, TZach@lincoln.ne.gov

Abstract: This presentation will provide lessons learned from the review and consolidation of 20 years of flood risk management, stream stability and water quality master planning, which can inform other and future stormwater programs and planning efforts. Considerations which will be highlighted include: leveraging technology for public education and reporting; prioritization methodologies for different project types as well as scoring considerations in 2022 compared to 2000; nonstructural/land use controls necessary to address flood and erosion hazards; and GIS, hydrologic, and hydraulic data creation and cataloguing for effective stormwater and floodplain management. Historically, urban stormwater was viewed no differently than the version which goes down the toilet, to be flushed away as expeditiously as possible. Over time we began to understand more of its value, along with its risks, as well as the complexity of managing order-of-magnitude-swings in discharges. Communities undertaking urban stormwater management must balance its scale, available funding, and land use planning while satiating development needs, risk reduction, water quality, and stormwater corridor management. Between 2000 and 2018, the City of Lincoln, Nebraska developed 14 different Watershed Master Plans for all its watersheds, including future growth areas. These 14 plans have been used to identify watershed management projects (over 200) and recommendations consistent with local priorities, including flood risk reduction, stream stability, and water quality. Project implementation needs far outweigh available funding, with less than one-third of planned projects having been implemented to-date. Given the 14 different planning efforts, each having been completed for different purposes and at different times, as well as the need to prioritize implementation funding, the city recently consolidated these 14 Watershed Master Plans into a single Comprehensive Watershed Master Plan.

Biography: Dan Fricke is a Senior Project Manager in Water Resources at JEO Consulting Group, Inc. where he has worked for 17 years. He holds a Bachelor of Science degree in Civil Engineering his focus is stormwater and flood risk management planning and implementation for communities across the Midwest. He has served as a Board Member of the Nebraska Floodplain and Stormwater Managers Association for many years. Dan champions stormwater planning and 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.

Cloquet's Stormwater Resilience Assessment & Action Plan: Prioritizing Flood Resilience Projects based on Damage Potential & Vulnerability Assessments

Riley Mondloch, SEH, rmondloch@sehinc.com
Co-presenters: Carson Webb, cwebb@sehinc.com

Abstract: The City of Cloquet secured more than $100,000 from a recently established funding program in Minnesota focusing on planning activities that increase community resilience to climate change and reduce localized flooding. SEH worked closely with the City to develop a Stormwater Resilience Assessment & Action Plan that identifies locations and causes of localized flooding, assesses risk, damage potential and community vulnerability due to localized flooding, develops potential projects to reduce flooding and mitigate the effects of climate change, and estimates the cost of project implementation. Public engagement was conducted during the development of this Plan to obtain information about past flooding and provide educational opportunities for the public to learn about the City's stormwater infrastructure, climate change, and their ability to improve community resiliency. This presentation will provide an overview of the recent work completed to develop the City of Cloquet's Stormwater Resilience Assessment & Action Plan.

Biography: Riley Mondloch is a Water Resources Engineer and Certified Floodplain Manager at SEH specializing in water resources engineering. He has experience with numerous types of hydrologic and hydraulic modeling, including experience with one-dimensional (1D) and two-dimensional (2D) hydraulic models. He has worked on a number of projects creating urban hydrologic/hydraulic models for community stormwater management system. He has experience with floodplain mapping and hydraulic modeling following FEMA guidelines for flood risk mapping, including projects requiring complex 1D and 2D RAS and SRH2D models. He graduated from UW Platteville in 2012 and University of Iowa in 2014 with degrees in Environmental Engineering and Water Resources Engineering.

A9: Moffatt & Nichol Showcase: Enough with the mumbo-jumbo: translating technical information to actionable policy and projects

Moderator: Lynette Cardoch, PhD, Director, Resilience & Adaptation, Moffatt & Nichol

- Andy Sternad, Architect & Urban Designer/Business Unit Leader, Waggonner and Ball
- Christian Kamrath, CFM, Resilience Program Manager Adaptation, Miami-Dade County, Miami, FL
- Dale Morris, Chief Resilience Officer, City of Charleston, SC.
- Kyle Spencer, City of Norfolk, VA
- Julia Kumari Drapkin, CEO and Founder, ISeeChange

Concurrent Session B

B1: CRS: You Can Do It!: NFIP/Floodplain Management

CRS Next: How CRS is Evolving & Simplifying

Rachel Sears, CFM, FEMA, Rachel.Sears@fema.dhs.gov
Co-presenters: Bill Lesser, bill.lesser@fema.dhs.gov

Abstract: FEMA is currently working to transform the Community Rating System (CRS) in a multi-year effort. FEMA has been working to analyze and review the current program and stakeholder feedback, and is now moving towards evaluating options in transforming the program. This presentation will discuss some of the outcomes of our analysis of the current program and look forward into the directions the program could take. We will present a timeline for when we will be asking for additional public feedback as well as the implementation of the new CRS.

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

CRS: Is your community living up to its full potential?

Christina Groves, CFM, Tetra Tech, christina.groves@tetratech.com
Co-presenters: Melissa Mitchell, CFM, melissa.mitchell@tetratech.com

Abstract: The Community Rating System (CRS) was created by the Federal Emergency Management Agency (FEMA) to encourage communities to reduce losses and avoid flood damage to insurable property, strengthen and support the insurance aspects of the NFIP, and foster more comprehensive floodplain management. Through participation in CRS, a community can become more disaster resilient, and reduce flood insurance premiums. In theory, it could be said that achieving these goals would highlight 'best practices' of a local program. Unfortunately, this is not always the case, with scorable activities often left on the table. As two former CRS Specialists, with a combined 19-years of experience working with the program, we have a unique perspective to share to help communities maximize CRS program participation. During our time with the program, we observed many communities were not fully participating, due in part to a deficit in understanding program nuance. In this session, we will discuss some of the reasons why communities might not be realizing their full potential in the CRS

program and what can be done to change this! By increasing awareness and simplifying the process, you can help your community take advantage of the program and receive the greatest benefits!

Biography: Christina Groves is a Senior Community Resilience Planner for Tetra Tech. She has over 20 years of experience working with floodplain management, the Community Rating System, planning and zoning, and local government.

It Takes More Than a Village: A Roadmap for Under-Resourced Communities Seeking Climate Adaptation

Julie Nucci, PhD, Village of Owego resident, NHMA Fellow, jn28@cornell.edu
Co-presenters: Gary O'Neal

Abstract: The Village of Owego, located at the confluence of the Susquehanna River and the Owego Creek in Upstate NY, catastrophically flooded in 2011 when Tropical Storm Lee left 75% of village properties under water. Resilience efforts since then highlight how grassroots community activism combined with federal coordination and support, state and local municipal action, private partnerships, and non-profit collaboration, is moving an under-resourced community to action and towards CRS entry. The Village partnered with Barton & Loguidice to put forth a NYS Climate Smart Communities (CSC) grant that was awarded in Dec 2022. In addition to promoting climate smart policies, this grant will fund a Community Rating System (CRS) entry strategy and further Owego's success in the NYSERDA's Clean Energy Communities (CEC) program. The National Hazard Mitigation Association will support Owego in its upcoming five-year Hazard Mitigation Plan (HMP) update by providing guidance to develop a CRS-friendly HMP update that promotes stable CRS participation. Lastly, NHMA will work with the Village of Owego to develop a funding strategy for CRS program advancement.

Biography: Julie Nucci is the Flood Resiliency Coordinator for the Village of Owego, NY, a volunteer position she created with village leadership. She is also the Climate Smart Communities Task Force Chair and serves on Planning Board. Her local advocacy led to a position as a National Hazard Mitigation Association Fellow. Nucci holds a BS in Materials Engineering from RPI, an MS in Applied Physics from Harvard University, and MS and PhD degrees in Materials Science and Engineering from Cornell University Gary O'Neal is a Member of the Board of Directors for the National Hazard Mitigation Association (NHMA) where he chairs the Public Policy, Advocacy and Education Committee. He has worked with local, state and federal officials on floodplain management, hazard mitigation and grants management in the disaster recovery space for over a decade. Mr. O'Neal is also a Board Member for the Louisiana Floodplain Management Association (LFMA) where he chairs the Legislative Committee. He is also a Commissioner for both the Amite River Basin Commission (ARBC) and the City of Walker Planning and Zoning Commission.

B2: Hazard Mitigation Assistance Programs and Guidance: Mitigation

Hazard Mitigation Assistance (HMA) MythBusting: Debunking Common HMA Program Misconceptions

Ryan Janda, FIMA-FEMA, ryan.janda@fema.dhs.gov
Co-presenters: Camille Crain, h-camille.crain@fema.dhs.gov

Abstract: For all too long, myths surrounding program eligibility and requirements have haunted FEMA and its stakeholders. Please join FEMA as they debunk some of the most pervasive myths that hamper stakeholder success. The HMA grant programs are designed to support state and local governments, tribes, and territories through helping communities build capability and capacity to improve resiliency to natural hazards. Despite the significant funding for community resilience currently available, many communities struggle with developing potential projects and submitting grant applications. In this session, FEMA will begin by providing a brief overview of the programs available for communities including the Hazard Mitigation Grant Program (HMPG), Flood Mitigation Assistance (FMA), Building Resilient Infrastructure and Communities (BRIC), Pre-Disaster Mitigation (PDM), and non-financial Direct Technical Assistance (DTA). Following this overview, FEMA will conduct an interactive "Myth Busters" presentation that will provide the audience with questions, offering them a chance to debunk misconceptions about HMA grant programs and the application process with the goal of better understanding HMA programs.

Biography: Ryan Janda is a Branch Chief in FEMA's Hazard Mitigation Assistance Division. Currently, Ryan's Branch manages the implementation of FEMA's non-disaster mitigation grant programs which includes the Building Resilient Infrastructure and Communities, Flood Mitigation Assistance, and Pre-Disaster Mitigation grant programs. Ryan brings over 25 years of emergency management experience to his role as HMA's Non-Disaster Implementation Branch Chief and has been managing the implementation of these programs since 2016. Prior to this position, he served as Deputy Branch Chief and Program Lead for the Hazard Mitigation Assistance Division. As Program Lead, Ryan was instrumental in implementing the merge of the flood mitigation grant programs into one combined Flood Mitigation Assistance program, as well as managing the Hazard Mitigation Grant Program and Pre-Disaster Mitigation program which have provided over $20 Billion to States, Tribes, Territories and communities since 1989. These programs provide much needed funding to make communities more resilient to natural hazards and their effects by implementing long-term risk reduction measures.

FMA Localized Flood Risk Reduction Projects & FY22 FMA Swift Current Initiative: Outcomes, Lessons Learned, and What's Next

Brandon Sweezea, FIMA-FEMA, Brandon.Sweezea@fema.dhs.gov
Co-presenters: None

Abstract: Localized Flood Risk Reduction Projects (previously called Community Flood Mitigation Projects) is one of the priorities of the Flood Mitigation Assistance (FMA) program. These projects address localized flood risk for the purpose of protecting lives, property and infrastructure, and reducing National Flood Insurance Program (NFIP) flood claim payments. FEMA is allocating significantly more funds to the Localized Flood Risk Reduction Project priority due to the increase in funding made available to the FMA program through the Infrastructure Investment and Jobs Act (IIJA), more commonly referred to as the Bipartisan Infrastructure Law (BIL). For example, in FY22, FEMA allocated up to $340 million to Localized Flood Risk Reduction Projects, compared to $70 million in FY21. The goal of this session is to provide information and suggestions for Localized Flood Risk Reduction project design to encourage SLTTs to submit subapplications to this priority in FY23. (The FY23 FMA application period will open in late September 2023.) This presentation will provide participants with: • A clear understanding of the FMA Localized Flood Risk Reduction Project priority, including eligibility, cost share (including increased cost share established by the IIJA/BIL), priority scoring criteria (including CDC SVI),

etc. • Examples of projects that FEMA has funded under this priority • Suggestions for project design

Biography: Brandon has been with FEMA for 10 years working both in the Region 10 field offices and at headquarters. Currently he is a Flood Mitigation Assistance (FMA) Section Chief for FEMA Headquarters in Washington, DC where he works within the NonDisaster Implementation Branch of Mitigation improving grant program delivery for projects that reduce risk on repetitively flooded building & communities nationwide. Previously, he was a project lead in FEMA Region 10 where he was in charge of managing disaster mitigation projects designed to improve community resiliency for State & Tribal communities in Washington and Oregon. While with FEMA he also deployed for Superstorm Sandy acting as the External Affairs Officer for the Manhattan Borough. Prior to coming to FEMA in 2011, Brandon was a Community Planner for Island County in Washington state where he reviewed land-use development permits, coordinated projects with internal and external partners, and developed Comprehensive Plan elements. His educational background includes a Bachelor's in Political Science and a Master's in Business Administration focusing on emerging technologies from the University of Washington. He holds a Project Management Professional (PMP), LEED Green Associate, Federal Grants Administration certifications, and is also an Eagle Scout.

How To Write A Winning BRIC or FMA Grant Without Hiring A Consultant

Kaine Riggan, North Carolina Department of Public Safety, kaine.riggan@ncdps.gov
Co-presenters: None

Abstract: This presentation will show participants how to develop a winning BRIC and FMA grant application without having to hire a consultant. The session will brief the funding priorities for both of these FEMA grant programs ($3.1B awarded in the 2022 round) and show examples of the North Carolina projects funded in the national competition in 2020 and 2021. Participants will gain knowledge of the federal grant review process from the perspective of a federal grant panelist and discover the tools for developing a non-disaster infrastructure grant available through the North Carolina Department of Public Safety and FEMA.

Biography: Kaine Riggan serves a federal grant panelist for the US Department of Labor, US Department of Agriculture, DHHS and other agencies, including FEMA. For the North Carolina Department of Public Safety, he has guided the state's cities and counties in winning more project awards in FEMA's Building Resilience In Communities (BRIC) grant competition than any other state for the first two years of the program.

B3: Updates in Modeling Policies & Standards: Modeling

Updates and Advancements in 2-Dimensional Modeling Processes: FEMA's 2D IPT

Laura Algeo, FEMA HQ, laura.algeo@fema.dhs.gov
Co-presenters: Geoff Uhlemann, geoff.uhlemann@mbakerintl.com; Andy Bonner, andrew.bonner@aecom.com

Abstract: In 2019, FEMA initiated an Integrated Project Team (IPT) to focus on 2D floodway mapping issues. Several short-term issues were discussed and solved for with updates made to guidance in the

2020/2021 cycle. In June 2022, FEMA expanded this IPT to find solutions to various questions and issues associated more generally with 2D modeling as a whole. The IPT is focusing on the use of 2D meshes for flood modeling and how to ensure our products can be consistent between 1D and 2D modeling techniques. As our roles in supporting resilient communisis change over time, so does the delivery of our program, the IPT is also investigating potential changes in what and how we deliver flood hazard data to be successful in the future. The IPT consists of over 100 members across the public and private sectors. Members formed subgroups to focus on finding solutions related to flood products, maps, hydrology, hydraulics, regulatory requirements, and model setup. This presentation will review the 2D IPT, changes already suggested and approved, and the progress made to-date.

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 national coordinator for the Cooperating Technical Partners program focusing on the development of training, policy, and guidance. She also serves as the technical mapping team lead and oversees guidance and training related to modeling and mapping for FEMA studies. Previously, Laura served as a Senior Civil Engineer in 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.

HEC-RAS Junction, What's Your Function

Kevin Donnelly, PE, CFM, PMP, GISP, Stantec, kevin.donnelly@stantec.com
Co-presenters: None

Abstract: The Junction feature of HEC-RAS is typically not utilized for 1D steady flow on FEMA hydraulic studies. A stream junction is a location where two or more streams come together or split apart. The Junction in HEC-RAS links two reaches together and applies the backwater of one stream upon the other. When this function is not used, FEMA Mapping Partners typically model two streams separately, each assuming a normal depth based upon the channel slope at the downstream end of the stream. After the modeling is completed, the Mapping Partner manually assigns the main stem water surface elevation to the tributary for each flood profile (10%, 4%, 2%, 1%, 0.2%, 1%+) for each tributary cross section where the main stems water surface elevation exceeds that of the tributary for that flood profile. The incorrect application of backwater is one of the main errors FEMA Mapping Partners make in the development of FIS studies and has led to revised Preliminary Map Products needing to be issued, resulting in significant delays in completion of RiskMap projects. In order to avoid these mapping errors and delays, FEMA Mapping Partners spend significant amounts of effort assigning and checking backwater and water surface elevations at confluences. This presentation will look at the FEMA Guidance that prevents the wider use of this function and the consequences of its use/non-use. We will explore questions such as, are the assumptions in the FEMA Guidance appropriate and/or worthwhile? Why is this an option built into HEC-RAS by the USACE, if it is not technically credible? The presentation will compare results of studies modeled with and without Junctions to see if there are significant differences in the end results and if considerations such as relative stream size, terrain, or level of hydraulic analysis should impact the choice to use this function.

Biography: Mr. Donnelly is a Principal Engineer with more than 23 years of experience in hydrologic, hydraulic, and water resources engineering, specifically floodplain mapping, and management of floodplain projects and programs that increase community engagement and risk awareness. His experiences include program and project management of PTS and IDIQ contracts with the Federal Emergency Management Agency (FEMA) under the Risk MAP and Map Modernization program.

Exploring Mesh Considerations for Basin Scale 2D Hydrologic Modeling with HEC-RAS 6.3.1

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

Abstract: As FEMA is working on the development of Guidelines and Standards for 2D modeling solutions within the NFIP, the FEMA 2D IPT Committee, Hydrology Subgroup has been evaluating the influence of grid size and other model mesh refinements on result sensitivity. The initial findings indicated grid size sensitivity. This presentation will explore the factors that are important for accurate and consistent watershed scale rain-on-mesh simulations to avoid grid size sensitivity. The use of rain-on-mesh solutions is the rapidly evolving approach to performing hydrologic analysis on watersheds of various sizes and topographic complexity. Rain-on-grid solutions provide a more physically based approach for modelling the flow accumulation from the watershed as an option to unit hydrographs and simulates rainfall excess with spatially and temporally specific inputs of rainfall, initial abstraction and infiltration parameters. Rain-on-mesh simulations also provide an opportunity to perform the hydrologic and hydraulic computations simultaneously and identify flood hazards throughout the watershed. However, there are modeling considerations to consider when attempting to use the results for both hydrology and hydraulics that will be explored in this presentation as well. This testing was performed using HEC-RAS 6.3.1. The goal of the testing was to identify key principles necessary to get more consistent results with variation in grid size.

Biography: Mark Forest is HDR's Sr. Business Class Leader for Floodplain Management and Surface Water Modelling based in Reno, Nevada. He has 40 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 modelling, HEC-RAS 2D and floodplain management both internally and externally to HDR for clients and at technical society conferences. Mark currently serves on the Board of Trustees of the ASFPM Foundation and is a past Chairman of the Floodplain Management Association.

B4: BLE Mapping: Mapping

Using Multiple FEMA Regional Branches to Carry the Base Level Engineering Message

Diane Howe, CFM, FEMA Region 6, diane.howe@fema.dhs.gov
Co-presenters: Bruce Bender, CFM, babender@cox.net

Abstract: SUMMARY Where flood maps are old or don’t exist, communities should be urged to adopt and use Base Level Engineering (BLE) when it becomes available. However, most communities are new to BLE and don’t know its many benefits and uses. Therefore, FEMA Region 6 brought three of its

Region's branches together to highlight, capture, and promote the many ways communities can benefit from using and adopting BLE early. In FEMA Region 6, that are many communities with outdated (or no) flood maps. To provide updated flood risk information, FEMA Region 6 is creating Base Level Engineering (BLE) for the entire Region. It is readily accessible through the free Estimated Base Flood Elevation viewer. The challenge is 1) getting local officials to understand the many benefits of BLE, so 2) they adopt and use BLE data early on, and not wait for a new flood map. SESSION DESCRIPTION: The many uses of BLE extend across several areas (e.g., emergency management, floodplain management, grants, and planning) for which different FEMA Region 6 Branches are responsible. To help improve the delivery of BLE messaging Region-wide, members from the multiple FEMA Branches came together to share the many uses of BLE. The meeting also included mapping contractors and two Cooperating Technical Partners (CTPs). From this meeting, a 3-hour workshop was created and presented to CTPs, Branch staff, and mapping contractors. It was also recorded and is now a three-part training video for FEMA and CTPs to promote BLE's benefits and uses, and why BLE should be adopted early on.

WHAT ATTENDEES WILL TAKE AWAY:

- An overview of the benefits and uses of Base Level Engineering and the value of adopting BLE early in a mapping project.
- The importance of involving different FEMA Regional Branches and CTPs in planning BLE outreach. • The benefit of recording a workshop for future training and outreach.

Biography: Diane Howe has been with FEMA for 16 years is the Risk MAP Lead for FEMA in Region 6. She provides program guidance to all of Region 6's CTPs and is the Appeals coordinator for Region 6. Before this role, she worked with FEMA as the Risk Analysis Communications and Outreach Coordinator for 10 years, focusing on mapping communication product development to support all five of the Region 6 states. She is a CFM with a background of 40 years in public and stakeholder communications and outreach.

Adapting to New Standards, Delivering 2D BLE Mapping in South Dakota

James Johnston, CFM, GISP, PMP, AECOM, james.johnston@aecom.com
Co-presenters: Madi Pluss, madeleine.pluss@fema.dhs.gov

Abstract: Two-dimensional (2D) Large Scale Base Level Engineering (LSBLE) hydraulic models were developed across 27 counties in eastern South Dakota using HEC-RAS 5.03. This large scale modeling allowed FEMA Region VIII to quickly expand their digital footprint in to areas that were either unstudied or had paper-based maps. To support successful delivery and acceptance of the project, Region VIII staff led an extensive engagement and outreach effort with the nearly 50 affected communities. This presentation will catch up with the ongoing coordination efforts as communities in various stages of the process provide feedback and input into the mapping process and work toward adopting their new maps.

Biography: Mr. Johnston is a GIS Professional with over 18 years of experience working in the field of floodplain mapping. He is the AECOM control account manager for FEMA Region 8 where he oversee's production and mapping including the South Dakota 2D BLE project. During his career in Floodplain Management Mr. Johnston has supported many aspects of the program across multiple regions.

Improving the BLE workflow: Leveraging ArcGIS Pro Capabilities

David Smith, CFM, GISP, CDM Smith, smithd@cdmsmith.com
Co-presenters: Marta Blanco Castano, CFM, GISP, Colorado Water Conservation Board, marta.blancocastano@state.co.us

Abstract: Base level engineering (BLE) datasets are often large files that require a lot of computing power to translate into special flood hazard area boundaries. Processing these datasets pushes the extent of ArcMap capabilities which can often require workarounds that decrease efficiency and increase costs. Workarounds can involve moving geoprocessing to virtual machines or altering workflows to filter raw mapping outputs to allow simplification and smoothing to occur. Pro provides a solution that can process BLE datasets in a more efficient manner by creating workflows with increased geoprocessing and visualization speed, integrative user interface (UI), and is interoperable with the suite of ESRI products such as Notebooks. CDM Smith is integrating ArcGIS Pro into their BLE workflow to better support a Cooperating Technical Partners (CTP) contract with the Colorado Water Conservation Board (CWCB). This change in software increases efficiency in processing large BLE datasets, reduces human error in regulatory products for 2-Dimensional studies, and automates quality assurance and quality control (QAQC) checks during review. This presentation will explore the benefits of transitioning Risk MAP workflows to include a more automated process using ArcGIS Pro. A brief introduction of ArcGIS Pro UI as well as an overview of the specific labor-intensive tasks associated with BLE development will be covered prior to showcasing CWCB examples.

Biography: Mr. Smith is a GIS Specialist and study manager with CDM Smith out of the Albany, NY office. He holds seven years of geospatial experience, half of which have been spent working on Risk MAP and related CTP contracts for CDM Smith. His experience spans across the flood insurance study project life cycle including Discovery QAQC, Hydraulic and Floodplain Mapping, draft DFIRM, and preparing preliminary products. In 2022 he co-presented with Jared Newell at ASFPM Orlando discussing the various nuances of Large Scale BLE mapping across the regions. Building out from that presentation, Mr. Smith will discuss reasons why the industry needs to make the shift to ArcGIS Pro especially within BLE mapping tasks.

B5: Whole-Community Approaches to Risk Communication: Risk Communication

TBD

Insights From the Community: Partnership and Trust Through Equity-Focused Community Engagement

Alyx Colgan, Guidehouse, acolgan@guidehousefederal.com
Co-presenters: None

Abstract: Community engagement is critical to ensuring all communities are considered, included, and consulted when developing emergency mitigation and preparedness plans. Historically underserved communities have typically been denied the opportunity to engage with the government and provide

inputs on the solutions and strategies that will best meet their needs. Therefore, community engagement is critical in building trust, establishing equitable solutions, and ensuring solutions meet the unique needs of communities. FEMA and Guidehouse have been working together to develop town hall conversations with local communities. Through intentional outreach, these conversations have drawn support and attendance from groups all across various communities – representing a diverse group of thought and experience to inform FEMA's understanding of how communities prepare for, cope with, and recover from disasters. This presentation will provide inclusive and equitable approaches for engaging community members and maximizing collaboration to achieve effective disaster resilience and response outcomes. The presentation will share stories from town halls to highlight the unique learnings that come from listening to communities. Throughout, individuals will learn principles and strategies for effective community engagement.

Biography: Alyx Colgan has 11 years of experience, with 5 in education and non-profit leadership supporting teachers, principals, and school systems leaders in Miami-Dade County to address educational equity across roughly 40 low-income schools. Her work included facilitating conversations with white teachers on the role of race, class, and privilege in the classroom, to develop knowledge and skill of classroom teachers rooted in equity. Ms. Colgan directly supported students through a program called R.O.O.T.S, Realizing Our Own True Strengths, where she worked directly with inner-city high school students to use their stories and experiences to advocate for community-level change. In her support of educational equity, Ms. Colgan became a founding member of the Liberty City Community Collaborative for Change, a grassroots organization addressing poverty, food access, education, and violence in Miami's Liberty City community. The group supported projects that addressed barriers to access for community residents and developed public health solutions to tackle key community challenges. Ms. Colgan has a master's degree in public health and a culminating thesis on community-driven disaster risk reduction. Her research focus centered on autonomous and sustainable initiatives in Haiti, including the use of women's savings and lending groups as a means to reduce poverty and increase resilience to climate change. At Guidehouse, Ms. Colgan supports the National Security Segment's Justice, Equity, Diversity, and Inclusion Group as a pillar lead. She has a Diversity, Equity, and Inclusion Certification from Cornell University where she took coursework on DEI in the workplace, counteracting unconscious bias, improving engagement, and fostering an inclusive environment.

Real World Experience Bringing Equity into a Flood Management Plan Update Process

Chrys Bertolotto, King County Washington, cbertolotto@kingcounty.gov
Co-presenters: None

Abstract: This presentation will review real-world experiences and key insights gathered as King County Washington applies equity-focused community-engagement approaches in an update of its Flood Management Plan. After completing academic and community-based research and planning phases, the agency is now working to open conversations with those communities facing the greatest challenges in preparing for, adapting to and recovering from flooding.

Planned engagement strategies include funding community "ambassador" partnerships, attending local meeting and events, increasing access to King County-sponsored open houses, utilizing online surveys and addressing equity barriers in advisory boards. The implementation of this outreach is still underway. Despite that, community and institutional obstacles, cultural norms and blind spots are emerging. This presentation will review the main strategies in its community engagement plan, the obstacles

encountered, how approaches were modified to continue moving a pro-equity agenda forward and the resulting outcomes.

Biography: Chrys Bertolotto is a Project / Program Manager for King County Washington River and Floodplain Management Section. She has over 30 years in community engagement and natural resources program leadership, working in university, non-profit and municipal settings. For the past 10 years, she has initiated and grown programs to meet the needs of communities of color, covering a range of topics. As a social scientist, communicator, and pragmatist, Chrys brings research methodology, an adaptive mindset and a love of words into innovative outreach, engagement and behavior change programming. Chrys has an MA in Organizational Development and a BS in International Environmental Studies.

B6: Risk Assessments for Dams: Dams & Levees

Managing North Carolina's Flood Risk by Monitoring and Managing the State's Aging Dams

Tasnuva Mahjabin, PhD, Atkins, Tasnuva.Mahjabin@atkinsglobal.com
Co-presenters: Kenneth Hunu, Kenneth.Hunu@atkinsglobal.com; Tom Langan, Tom.Langan@ncdps.gov

Abstract: North Carolina has over 6,000 dams, many of which are classified as high-hazard dams. The failure of these dams may cause loss of life or serious damage to homes, industrial and commercial buildings, schools, important public utilities, primary highways, or major railroads. To improve public safety for those living downstream of a dam, North Carolina Department of Public Safety (NCDPS) in conjunction with the Natural Resources Conservation Service (NRCS) has started the development of the DamWatch tool. DamWatch is an interactive web-based application intended to provide real-time monitoring of rainfall, snowmelt, and streamflow that could pose potential threats to dam safety and provide alerts to essential personnel when dams are experiencing a critical event. Geospatial products that document flooding risk in the event of dam failure is an important component of the DamWatch Tool. ATKINS was tasked to execute simplified, cost-effective approaches for modeling dam breaches and create inundation maps and other dam risk products for all the high- and medium-hazard dams in North Carolina. Since the traditional approach to create inundation maps and other dam risk products could take years to complete and could be cost-prohibitive, ATKINS developed innovative technical approaches to complete these tasks at a fraction of the cost and time. This presentation will provide an overview of the innovative approaches developed to complete the tasks. Dam breach modeling was done using HEC-RAS and dam risk products including shapefiles and rasters were generated from HEC-RAS after the completion of the dam breach simulation. These mapping layers allow the end user to visualize the extents of flooding and the magnitudes of maximum depths, water surface elevations, and velocities in the inundated areas. In addition to the above, shapefiles of impacted roads and buildings with information about flooding depths, water surface elevations and the earliest arrival time of the peak flood wave were created. A series of arrival time cross-sections were also generated to document the arrival times of the peak breach flood wave as it travelled downstream. These dam risk products can provide essential information for identifying communities and infrastructure at risk in the event of a dam failure. Shapefiles of the impacted buildings were also populated with information about the depth of flooding and potential damage costs and provide a useful resource for calculating property insurance.

The array of dam risk products described above used in conjunction with the DamWatch interface enhances community preparedness and equips emergency managers and community leaders with vital information for emergency management and allocating resources during the aftermath of a dam failure.

Biography: Tasnuva Mahjabin is a Water Resources Engineer II at Atkins. She specializes in hydrologic and hydraulic analysis, floodplain modeling and mapping, 2D dam breach modeling, and geospatial data analysis. Tasnuva Mahjabin graduated from The Pennsylvania State University with a Ph.D. degree in Civil Engineering in May 2020. Her Ph.D. research focused on modeling virtual water trade network and it's impacts on sustainable resource management across water, food, and energy systems. She applied complex network theory, statistical modeling, environmental and economic metrics to conduct her research. She published eight peer-reviewed journals and presented at several national conferences.

Recognizing Risk – The Prioritization of High Hazard Potential Dams

Barrett Slate, EI, Freese and Nichols, barrett.slate@freese.com
Co-presenters: None

Abstract: The FEMA HHPD grant funding bases eligibility on whether a dam is high hazard, has an EAP, fails to meet minimum state dam safety standards, and poses unacceptable risk to the public. In FY21 these criteria still apply while FEMA has begun to further define what "unacceptable risk" really means. Freese and Nichols, Inc. conducted a screening level risk assessment using FEMA's new risk assessment tool, with changes to best fit North Carolina's specific needs, in order to prioritize NC's high hazard dams in a consistent manner. Freese and Nichols, Inc. assessed 73 dams by analyzing the total annual probability of failure and comparing this to downstream consequences to find the state's dams which required the most urgent action and funding. The process was completed as a "desktop" review using only existing data retained by NC Dam Safety to expedite the process. This presentation will explore this pilot study in depth, while also discussing its various benefits and challenges.

Biography: Barrett Slate is a project engineer for Freese and Nichols' dams and levees group. He has experience in hydrologic and hydraulic modeling and analysis, development of design plan sets for dam rehabilitation and repair, and assessment of the impacts of dams and levees on downstream environments.

Following the Advice of Albert Einstein for a Dam Break Study

Christine Suhonen, GZA, christine.suhonen@gza.com
Co-presenters: None

Abstract: Two dimensional dam break modeling, which is used to create inundation maps for emergency preparedness, can be performed with a wide variety of tools and software. Some of these software packages include DSS-WISE Lite and HEC-RAS. DSS-WISE Lite was funded by the Federal Emergency Management Agency and developed by the National Center for Computational Hydroscience and Engineering at the University of Mississippi's School of Engineering. The software is free and hosted online. HEC-RAS is a free software provided by the US Army Corps of Engineers. Both software solve the 2D shallow water equations. GZA has used these software to perform dam break modeling for multiple projects. After several projects' completion, we have reviewed the projects in the context of this advice from Albert Einstein: "everything should be made as simple as possible, but not simpler." We reviewed whether we had selected the best software for the assigned GZA staff and for the intended purpose of the analysis. We have additionally looked at whether the development of the inundation

maps could have been further simplified by removing the use of software altogether. Using empirical equations to compute dam break peak flow and a given cross section's water surface elevation, GZA compared the results from each software with hand calculations. This presentation will focus on an in-depth analysis for one dam, to illustrate these differences. Our evaluation showed that each approach has advantages and disadvantages that vary based on the size of the dam, the complexity of the dam's downstream area, and the modeling experience of the staff.

Biography: Ms. Suhonen is a Water Resources Engineer in the Dams and Water Resources Group at GZA. She joined GZA in 2012 with a bachelor's degree in environmental engineering from Tufts University. The majority of her work at GZA has been hydrologic and hydraulic analyses at dams, nuclear power plants, and other various riverine and coastal sites. Her work has also entailed preparing and updating dam emergency action plans, performing dam inspections, presenting dam safety training, performing natural hazard studies, and analyzing and presenting spatial data. Recently, she has begun working on smaller-scale flood issues particularly cellars throughout New York City. She currently is a Project Manager and helps train junior staff and manages project financials, schedules, and workflows. Some of the sites she has worked on include Battery Park in New York City, 8 streams in Westport, Connecticut, a coastal park in Glen Cove, New York, and dams owned by the Massachusetts Water Resources Authority (MWRA), Metropolitan District Commission (MDC), Great River Hydro, Massachusetts Department of Conservation and Recreation (DCR), and Aquarion Water Company.

B7: Nature-Based Solutions in Action: NBF

Developing watershed resilience with nature-based solutions

Garrett Altmann, M.Sc., Department of Forestry at Santa Clara Pueblo, galtmann@santaclarapueblo.org
Co-presenters: Chelsea Morganti, cmorganti@wittobriens.com

Abstract: Santa Clara Pueblo is a federally recognized Native American tribe located along the Rio Grande River in northern New Mexico, USA. Over the past 25-years, severe wildfires have cumulatively burned over 80% of Santa Clara forested lands. Compounding these disasters, post-fire flooding devastated the Santa Clara Creek and Canyon, an area historically relied upon for recreation, economic revenue, and spiritual sanctuary. The result is five Federal Presidential Disaster Declarations to date, over $200M in infrastructure damages, and 100% fish kill in this 31,481-acre watershed. Santa Clara Pueblo has embarked on a collaborative recovery strategy, prioritizing natural stream function in its flood mitigation and restoration approach. Utilizing indigenous traditional ecological knowledge (ITEK) and combining this with expertise from federal and state agencies, non-governmental organizations, and specialized consultants, the Tribe is able to implement 'a naturalistic approach to flood mitigation and watershed restoration.' This approach recognizes naturally occurring processes that mitigate disturbances, and then facilitates these nature-based processes to mitigate hazards and maximize ecosystem services. We will describe the specific techniques utilized by the pueblo, already showing progress to restore and maximize ecosystem services, increase biodiversity and freshwater habitat, increase resilience to future disasters, and support tribal and recreational use of area. We will also discuss the implementation of several successful collaborative efforts, including the 2022 Tribal Resiliency Summit hosted by Santa Clara Pueblo, and the grant funding opportunities leveraged to make

these events possible. Discussion will not only cover the FEMA Hazard Mitigation Assistance family of grants (BRIC, FMA, PDM, HMGP, and HMGP-PF) but also a variety of other programs that can be utilized to accomplish these and similar goals.

Biography: Garrett Altmann serves as the GIS Coordinator and Project Manager for the Department of Forestry at Santa Clara Pueblo. He attained a Bachelor's in Geography from UC Santa Barbara, and Master of Science in Natural Resources Management from the University of Alaska Fairbanks. He is responsible for coordinating collaborative watershed restoration with federal, state, tribal, and non-governmental organizations. His primary interest is to increase the adoption of nature-based solutions to maximize ecosystem services and increase resilience to climate variability.

Nature-based Solutions to Reduce Flood Risk: Comparing France and the United States

Anna Serra-Llobet, PhD, University of California, Berkeley, annaserrallobet@berkeley.edu
Co-presenters: Joana Guerrin, joana.guerrin@inrae.fr

Abstract: In this presentation, we explain how the term Nature-based Solution is being adopted and implemented in the United States and in France. In the context of flood risk management, Nature-based Solutions (NbS) can be seen as an innovative way to overcome the classical opposition between flood protection and river restoration projects. However, so far little is known about how this globally defined concept unfolds at national and sub-national scales. For example, in the US some agencies use this new concept interchangeably with existing concepts such as green infrastructure. In fact, NbS builds on and supports other closely related concepts, such as the ecosystem approach, ecosystem services, or green infrastructure. Well implemented NbS could potentially prompt positive changes integrating social and environmental goals under the same framework. However, some clarity and consistent language in statute and policy is urgently needed if this concept really has to bring new insights on how we should reframe the current approach to manage natural resources and mitigate risk at the same time. In short, NbS may help to bring out synergies among measures with diverse goals, or it may simply add to the confusion already generated by the proliferation of terms. Through interviews with stakeholders, surveys and the analysis of specific case studies, the project “Nature-Based Solutions from Theory to Practice” analyzes how this concept is being institutionalized in the US and in France and how NbS projects are implemented and evaluated in both countries. Preliminary results show that while in France this new concept makes a clear emphasis on biodiversity issues, in the US it seems to have a strong focus on mitigation strategies, especially regarding to flood risk reduction in the face of climate change, and as an alternative solution to aging gray infrastructure.

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 a researcher at the Center for Catastrophic Risk Management – Social Science Matrix, at the University of California Berkeley.

Stream Restoration: Nature-Based Solution for Flood Risk Mitigation and Watershed Resiliency

Josh Allen, PE, CFM, SWCA, SWCA, Environmental Consultants, joshua.allen@swca.com
Co-presenters: None

Abstract: Nature-based solutions (NBSs) are increasingly a requirement and/or focus of federal natural disaster recovery and mitigation funding programs. Further, they provide valuable tools toward resiliency of the affected communities and watersheds in the face of more frequent and intense weather-related disasters caused by climate change. However, federal guidance on NBS for flood risk mitigation and watershed resiliency in fluvial settings from the Federal Emergency Management Agency (FEMA) and the Department of Housing and Urban Development (HUD), the two primary federal funding agencies for flood disaster mitigation and recovery, has focused only on prescriptions external to the stream channels themselves, such as land conservation, wetland restoration, onsite stormwater management, regional stormwater parks, and floodplain reconnection/restoration. In 2021, the U.S. Army Corps of Engineers' Engineer Research and Development Center published "International Guidelines on Natural and Nature-Based Features for Flood Risk Management", which for the first time presents river/stream restoration as an appropriate NBS measure for fluvial flood risk management. However, even in this guidance, stream restoration is presented as one of many NBS prescriptions that should be considered in fluvial flood risk management, based on a holistic, watershed approach, and may not be emphasized or prioritized to the extent warranted for the alluvial systems that provide the primary drainage and flood control infrastructure for the majority of the U.S. cities. This presentation will present and discuss stream restoration's place within the current federal NBS guidance documents and make a case that stream restoration should be the highest priority in the use of NBS in flood risk mitigation and watershed resiliency efforts for a majority of U.S. cities. Examples of successful applications in various urban and suburban watershed settings will then be presented to support the position.

Biography: Josh Allen works for SWCA Environmental Consultants as a Principal Restoration Engineer. Based in SWCA's Charlotte, North Carolina office, he focuses on engineering and design support for ecosystem restoration projects across the country. HIs experience as a consulting civil/environmental engineer spans more than 15 years. Of note, he has served as project manager/lead design engineer for numerous fluvial geomorphological assessment and stream restoration, wetland restoration, stormwater quality, and flood control design projects spanning across North Carolina, South Carolina, Texas, Kansas, Vermont, Massachusetts, Washington, Idaho, and Oregon. These projects have been implemented in numerous physiographic settings across the country, including the mountain, piedmont, prairie, coastal and central plains, and estuarine provinces.

B8: Climate Change Tools and Impacts to Policy

A Community Flood Resilience Tool to Accelerate Equitable Adaptation Across the US

Frederique de Groen, Deltares, frederique.degroen@deltares.nl
Co-presenters: None

Abstract: Many tools enable visualization of climate risks, particularly related to coastal inundation, although there remains a large need for equity-driven, accessible tools to evaluate adaptation measures to mitigate these physical risks. A Community Flood Resilience Support System (CFRSS) has been developed to empower communities in testing adaptation measures based on risk-reduction benefits under changing conditions (sea level rise, population growth). The tool computes flood hazards,

damages, and risks for combinations of events, adaptation strategies, and future conditions by coupling models for compound flooding (SFINCS) and damages (Delft-FIAT). A graphical user interface interacts with these back-end models and allows non-expert end-users to define events, future projections, and adaptation strategies. Automatically generated GIS output allows for visualization of flood exposure and to assess effectiveness of adaptation strategies. Over the past two years, the Department of Homeland Security Science and Technology Directorate and Deltares USA collaborated with Charleston, SC to implement CFRSS for an initial, flood-prone community. Ongoing R&D on CFRSS includes further integration of equity into decision-making, including factoring in indicators for the social cost of carbon, to expand the equity component of CFRSS for additional communities and community needs. These community planning needs – facilitated by direct engagement with stakeholders - are being prioritized to guide further tool enhancements that may possibly include integration of drainage network improvements, nature-based solutions, cascading impacts, refined benefit-cost analysis outputs, and/or tipping points, to define when new adaptation measures will become necessary to continue to meet community planning objectives. This presentation will show examples of how the tool can answer typical questions like “what if Hurricane Ian’s track had been further to the east?”, or “how high should new development be elevated above base flood elevation?” Demonstrations will highlight the open-source tool’s utility and how attendees can explore its applications for their community.

Biography: Frederique de Groen is an expert on the quantification of natural hazard impact assessments and modelling human responses. She is involved in the continuous development of Delft-FIAT, RA2CE and the Criticality Tool, which are used to assess natural hazard impacts on buildings, road networks and critical infrastructures. Her interest also lies in the connection of the physical with the social, using for example Agent-Based Modelling to investigate human responses to climate change effects. With these kinds of methods, she contributes to a new research track within Deltares aiming at improving the understanding of relocation as adaptation strategy in coastal areas.

The climate crisis demands a national climate resilience and adaptation strategy to equitably and wisely invest in transformative adaptation measures nationwide.

Shana Udvardy, CFM, Union of Concerned Citizens, sudvardy@ucsusa.org
Co-presenters: None

Abstract: Despite the improvements in science and modeling and the nation being hit by climate change-fueled extreme weather and natural hazards year after year, the federal government has relied on the costly, business-as-usual disaster response and recovery funding model. The National Oceanic and Atmospheric Administration (NOAA) finds that disasters costing at least one billion dollars have increased over the last five years. These costs are more than just dollars and cents. The historically disadvantaged and low-income communities on the frontlines of extreme weather and climate change-related impacts are bearing the worst of the suffering given the lack of rainy-day funds to buffer against these impacts, the political will to target resources to these communities and the complexities involved in applying for federal disaster aid, to name a few challenges. Hazard mitigation measures for coastal, inland and compound flooding risks among climate risks, are often outdated and siloed. As federal agencies implement programs under the recent federal infrastructure investment laws, we must ensure federal agencies target 40 percent of certain federal spending to historically disadvantaged communities (Justice40), adopt transformative adaptation measures that bridge local, state and federal governments and sectors and implement projects that provide multiple benefits, not just benefits for those with

powerful congressional representatives or a high tax base. This presentation will provide an overview of the bipartisan call for a national climate resilience and adaptation strategy (NCARS) act and analysis of how such a strategy could improve flood risk mitigation, among other impacts. Done well, a national strategy could shape how, what, where, why and when the federal government prioritizes investments in adaptation measures while also reducing risk and improving safety. If enacted into law, NCARS could shift climate resilience and in particular, flood hazard mitigation, towards more transformative, climate resilience outcomes at all levels of government.

Biography: Shana Udvardy is a senior climate resilience policy analyst with the Climate & Energy program at the Union of Concerned Scientists. She conducts research and policy analysis to help inform and build support to increase resilience to climate change impacts. In her role, she advocates for actions at the federal and state levels to advance just and equitable adaptation measures to help safeguard communities from climate change-related risks and impacts. She has expertise in developing regulatory and legislative comments, testimony, and policy proposals relating to climate impacts such as extreme heat, flooding, and wildfires, as well as climate-ready infrastructure, climate science, and military resilience. Ms. Udvardy is a Certified Floodplain Manager, and holds a M.S. in conservation ecology and sustainable development from the University of Georgia's Odum School of Ecology, and a B.A. from Syracuse University's Maxwell School.

Rolling Conservation Easements: One Tool for Nature Based Retreat

Mary-Carson Stiff, Wetlands Watch, mc.stiff@wetlandswatch.org
Co-presenters: Madison Teeter, madison.teeter@wetlandswatch.org

Abstract: Wetlands Watch, a non-profit organization based in Norfolk, Virginia, is helping coordinate the recordation of the first private rolling conservation easement in the United States. In partnership with a local land trust, The Living River Trust, Wetlands Watch is working with the Elizabeth River Project to develop a rolling conservation easement that will be placed over the organization's new Resilience Lab headquarters. A rolling conservation easement "rolls" along with shoreline encroachment due to sea level rise, enforcing development restrictions that reflect the changing parcel characteristics. In addition to prohibiting new and future development, this legal instrument can help facilitate the migration of shoreline buffers, dunes, living shorelines, and wetlands, ensuring species survival and preservation of ecosystem services, such as erosion control, flood mitigation, habitat, and water quality. Recently featured in The Washington Post, "Meet the multimillion-dollar building deliberately built to drown," this legal instrument could provide one tool to help local governments plan for retreat as sea levels rise. In addition to being a planning tool, property owners who agree to a rolling easement could receive federal or state tax benefits. In this way, property owners can play a crucial role in how communities prepare for climate change, while also receiving financial benefits. This presentation will focus on the coordination between Wetlands Watch and various stakeholders to record the rolling conservation easement, and how this process can potentially work in other coastal communities. Additionally, this presentation will highlight lessons learned from recording the rolling easement, including the importance of transparency among all stakeholders involved. Finally, this presentation will explore how retreat planning and policies, such as the use of rolling easements, could be credited through the National Flood Insurance Program's Community Rating System.

Biography: Mary-Carson Stiff, CFM, JD 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 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.

B9: Building Resiliency: A unique, comprehensive, data-driven watershed program for Fayetteville, NC

- ***Introduction*.** Alicia Lanier, PE; Public Services Department City of Fayetteville, NC
- ***Prioritizing City-Wide Stormwater Needs to Deliver Strategic Flooding Solutions***. Morgan McIlwain, PE, PMP; FNI
- ***Developing datasets in real time! Collecting Dynamic Inventory Data while Modeling.*** David Key, PE, CFM; ESP Associates, Inc
- ***Evaluating Flooding Throughout Diverse City Watersheds.*** Matthew Jones, PhD, PE; Hazen and Sawyer
- ***Lessons Learned from Integrating 1D and 2D Riverine and Collection System Models.*** Scott Brookhart PE, Arcadis and Mark Van Auken PE, Arcadis
- ***HEC-RAS 2D model of the Little Cross Creek and Cross Creek Confluence.*** Jeffery Crump, PE, Moffatt & Nichol
- ***Model Validation and Use of the Representative Storm.*** Ken Trefzger, PE; HDR; Raleigh, NC
- ***Summary.*** Sheila Thomas-Ambat, PE, CFM, City of Fayetteville, NC

Concurrent Session C

C1: Advice for Local Floodplain Administrators: NFIP/Floodplain Management

Keeping Pace With Development in Riverine Floodplains
Marc Gold, PE, CFM, ATM, a Geosyntec Company, mgold@appliedtm.com
Co-presenters: Fran Way, fway@appliedtm.com

Abstract: Due to increasing population growth and development, acres of undeveloped land are being bought with plans for development. Many of these areas, although inland from the coast, are located along rivers or streams which can pose a significant flood risk during a 100-year storm. FEMA's riverine flood studies are not always updated at the same time their coastal studies and updated maps are

released, ~every 10 years. As a result, many of the FEMA floodmaps in inland areas with riverine flood hazards are based on models/data which can be several decades old and do not reflect physical changes and development that has occurred in the area over time. With increasing pressure by developers, new issues and conflicts in these areas are becoming more common but are still beyond the normal scope of operations of floodplain managers. Technical and regulatory guidelines and ordinances that cover development within FEMA-designated riverine floodplains are crucial for regulating best-practice construction in a riverine floodplain and ensuring favorable NFIP Community Rating System (CRS) eligibility. Often times, state and local codes and procedures cannot predict or consider every scenario, and issues concerning outdated models are becoming a more frequent challenge as development continues to spread to areas that have previously been given less attention from a flood risk mapping standpoint. This presentation will explore such scenarios, specific regulatory codes, technical guidelines, and legal and procedural items/issues that may affect municipal floodplain managers. An experienced engineer will provide perspective through several case studies of these scenarios throughout North and South Carolina as well as the outcomes.

Biography: Mr. Gold is a professional engineer with ATM, and specializes in the analysis of processes along coasts, wetlands and estuarine environments including sediment transport and nearshore hydrodynamics. His experience includes permitting, numerical modeling, statistical and time series analysis, and field data collection. He earned an MS in Coastal and Oceanographic Engineering from the University of Florida in 2015. Mr. Gold utilizes his coastal engineering background to perform assessments and design of coastal structures, FEMA flood zone and risk analysis remapping, beach nourishment design and monitoring, and coastal conditions assessments for various coastal and waterfront projects.

Respect the hazard – tools for floodplain managers in uncertain times

Dennis Dixon, CFM, Pierce County Planning & Public Works, dennis.dixon@piercecountywa.gov
Co-presenters: None

Abstract: Building a case for comprehensive floodplain management in a world of increasing uncertainty. From the perspective of 25 years as a local floodplain manager, this talk will explore ways to discuss uncertainty and design life to the skeptical applicant and identify local policies that can help manage development expectations. The current development process hierarchy (Zoning and Comprehensive Plan review / Plat, and Boundary Line Adjustment review / Health Department (OSS/Well) Plan review / Development (Site) Plan review / Building Plans review / Elevation Certificate review) often brings the floodplain manager in at the last step. Community decisions made at all the previous review levels have led to an outcome of a new structure in the flood hazard and expecting the floodplain manager to make this last step rectify the previous neglect. Respecting the hazard is about making floodplain management a primary concern that is addressed at every level of planning and review. This talk will help floodplain managers identify leverage points so they can be involved earlier in the development hierarchy and have a greater impact on developing a resilient community.

Biography: Dennis Dixon, CFM has worked for Surface Water Management at Pierce County Planning & Public Works for 25 years. He is the project manager for updating the county's flood maps; channel migration zone studies, floodway studies, and revising the site development regulations to meet FEMA standards. He is the CRS Coordinator of a Class 2 community and has been a community member of the CRS Task Force for the last seven years. He regularly works with engineers, surveyors, state & local

agencies and property owners in reviewing development proposals and helping them understand floodplain risks and regulations. Favorite off-work activities include restoring a 100-year-old beach house, paddle boarding, backpacking and skiing.

How a regional authority ensures effective floodplain management in Metro-Atlanta

Kevin Osbey, Clayton County Water Authority, kevin.osbey@ccwa.us
Co-presenters: Ann Houseman, PE, Hazen and Sawyer, ahouseman@hazenandsawyer.com

Abstract: Clayton County is located south of Atlanta and includes the cities of Forest Park, Riverdale, Morrow, Jonesboro, Lake City, and Lovejoy. Clayton County Water Authority (CCWA) entered into intergovernmental agreements to support floodplain management on behalf of these communities and unincorporated Clayton County. This presentation demonstrates CCWA's approach to the development and implementation of a comprehensive floodplain management program that is responsible for providing top-quality service across multiple jurisdictions.

As part of its floodplain management program, CCWA conducts compliance activities focusing on community collaboration, program comprehensiveness, and risk management. First, CCWA coordinated with the communities to ensure the most recent model floodplain ordinances from the Metropolitan North Georgia Water Planning District had been implemented. The coordination helped communities understand which parties are responsible for floodplain management procedures.

To further develop the program, CCWA developed a Floodplain Management SOP to provide internal staff with a functional understanding of floodplain management and guidance to support the communities with their floodplain management needs.

The ongoing flood warning and response plan project led by CCWA is also helping create a more comprehensive floodplain management program. This project will create a common resource for Clayton County communities to use as a guide to prepare for and respond to flooding at critical facilities and roadways. Improved awareness of critical facilities and infrastructure at risk of flooding will promote proactive planning for and response to flooding emergencies. Collaboration among various departments and jurisdictions will also be paramount to the success of the project.

In addition to flood protection and risk management, these projects provide a pathway for communities in the CRS program to improve their CRS scores. Communities that are not part of the CRS program but wish to join in the future will have systems in place to join and increase their CRS score.

Biography: Kevin Osbey currently serves at the Stormwater Program Director for the Clayton County Water Authority. He has held this position since 2006 when CCWA's Stormwater Utility was formed. Mr. Osbey has been an employee of Clayton County Water Authority since 2004. Prior to CCWA, Mr. Osbey served in a variety of roles with CH2M Hill-Atlanta in Construction Management and the Environmental Business Group. Mr. Osbey is also a Certified Floodplain Manager.

C2: Mitigating Risk to Infrastructure: Mitigation

Major Infrastructure in Major Cities: Challenges and Lessons Learned Navigating Flood Control Projects Funded through HMA

Jamelyn Austin Trucks, CFM, PMP, CGM, Atkins, jamelyn.trucks@atkinsglobal.com
Co-presenters: Ryan Wiedenman, AICP, CFM, ryan.wiedenman@atkinsglobal.com

Abstract: As one of the largest cities in the United States, the City of Houston metro encompasses a large geographic area that is mainly urbanized and includes a great deal of impervious surface area. In this urbanized environment, flooding has become a major issue throughout many areas of the city. Frequently, when major flood issues impact complex, urban environments a wide variety of unique, large-scale solutions are required. In recent years, as the Federal Emergency Management Agency has increased its emphasis on funding major infrastructure projects to address flooding issues in highly urbanized areas, the City of Houston has pushed to be a leader in implementing major infrastructure improvements. Through the Hazard Mitigation Grant Program the city has received approval of project applications for 4 major infrastructure projects to reduce the impact of flooding on homes, businesses, and other key resources. Phase I of these projects has required significant investments of time to design and develop technically feasible solutions that also reduce risk and remain in compliance with FEMA requirements such as showing cost-effectiveness through a FEMA-approved Benefit-Cost Analysis. As Phase I: Design is completed on phased projects, FEMA requires that the community demonstrate that the project will remain cost-effective before awarding Phase II: Construction dollars. In this session, presenters will describe the efforts taken to collect and document quantitative project benefits within a major urban area that included tens of thousands of structures using GIS tools and detailed spreadsheet calculations to demonstrate cost-effective projects. This session will include many of the challenges that the city faced as well as lessons learned and successes that were achieved through partnerships with the Texas Division of Emergency Management and FEMA Region 6 that led to award of Phase II and project implementation.

Biography: Jamelyn Austin Trucks, CFM, PMP has 27 years of experience in the areas of mitigation, disaster resilience, planning, project development, and business development. Her experience includes management of stakeholder engagement, financial analysis, budget development, contract negotiations, training, database testing, federal grant administration; and policy development and implementation. Ms. Trucks' understanding of federal, state, and local government policies and procedures in relation to federal disaster grant implementation, as well as her active involvement in Federal Disaster Response assists clients in applying best practices as well as developing improved methodologies.

Using BRIC for Utility Protection & System-Based Mitigation in North Carolina

Edward Fernandez, ICF, edward.fernandez@icf.com
Co-presenters: Rachel Bradley, CFM, ICF, rachel.bradley@icf.com; Robert G. Cloninger, III, robertcl@cityofgastonia.com; David DePratter, david.depratter@kci.com

Abstract: This presentation will discuss two case studies where municipalities successfully leveraged novel federal resilience funding for projects incorporating system-based mitigation and nature-based solutions to protect critical infrastructure in North Carolina. In 2020, the City of Hickory, North Carolina was awarded two Federal Emergency Management (FEMA) Building Resilient Infrastructure and Communities (BRIC) grants totaling over $8.9 million in Federal share. These projects will protect a wastewater treatment facility and a pump station from flood damage. In 2021, the City of Gastonia, North Carolina, was awarded over $5.9 million in BRIC funding to protect a vulnerable public utility,

municipal infrastructure, and at-risk properties from heavy rain events and significant erosion. The project will implement nature-based solutions in a disadvantaged community to restore and stabilize a stream bank and address growing climate risks. Both the Hickory and Gastonia projects mitigate impacts to multiple critical community lifelines and facilities and anticipate future conditions—key elements of FEMA's new programmatic focus on projects that incorporate system-based mitigation. Through these case studies, attendees will walk away with an understanding of system-based mitigation and how it can be incorporated into federally funded hazard mitigation projects. This presentation will also explore nature-based solutions, partnership engagement, and equity considerations and how they can be incorporated into a mitigation project's scope and design. These two projects exemplify the forefront of innovative hazard mitigation and resilience planning, generating beneficial outcomes in their communities.

Biography: Edward J. Fernandez, CFM, is a Vice President and Strategic Resilience Practice Lead at ICF, where he supports state, local, tribal, and non-profit organizations with planning, grant application development, and program management. Edward serves as project manager for several state-level mitigation initiatives and has significant experience with utility resilience for the water industry. He has extensive knowledge of FEMA's Hazard Mitigation Assistance programs, the FEMA Public Assistance Program, and HUD's Community Development Block Grant programs. Edward is passionate about floodplain management, economic impact analysis, and benefit-cost analysis. He has also developed post-disaster loss avoidance assessment methods recognized by the U.S. GAO in a 2021 report as a best practice for assessing program effects. Edward serves on the Board of Directors for the National Hazard Mitigation Association.

Ms. Bradley has over 10 years of diverse professional experience in the fields of hazard mitigation, program management, public affairs, and environmental policy. She has supported agencies in managing highly technical and complex projects from the national to the local level, including over six years supporting the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP). Ms. Bradley brings valuable experience of managing a national practice focused on FEMA policy, funding, program management, and implementation planning. With a background in public policy and program evaluation, Rachel advises clients on compliance with federal regulations and methods for enhancing program effectiveness and efficiency. Rachel has extensive experience with the FEMA Hazard Mitigation Assistance (HMA) programs, including the FEMA Building Resilient Infrastructure and Communities (BRIC) program. Rachel has used her experience in hazard mitigation, economic impact analysis, and benefit-cost analysis to analyze return on investment for flood, seismic, and wind hazard mitigation projects. She has led federal grant application development in the District of Columbia, Delaware, Virginia, Texas, and Pennsylvania, including for two competitively selected projects valued at nearly $50 million in BRIC's inaugural year. Ms. Bradley has also developed hazard mitigation plans and managed grants to implement diverse, impactful projects.

Southerly WWTP: A look at protection of critical infrastructure for the future

Chad Boyer, ms consultants, inc., cboyer@msconsultants.com
Co-presenters: None

Abstract: The Southerly Wastewater Treatment Plant, located in Columbus Ohio, was constructed in the early 1960's and has continued to expand through the subsequent decades. The treatment plant serves approximately two-thirds of the City of Columbus's and surrounding community's treatment needs with an average daily flow of around 114 MGD, and a peak of 330 MGD. Portions of the Southerly WWTP are currently located with the Special Flood Hazard Area for the Scioto River. The City is looking to make significant expansions to the treatment trains in the near future and in an effort to protect critical infrastructure, as well as create areas outside of the Special Flood Hazard Area, the City, selected ms consultants, inc. and their team to develop a Stormwater and Floodplain Management Master Plan, including an accredited levee, stormwater management controls, conveyance improvements and compensatory excavation to account for fill placed within the floodplain to mitigate flood risk to upstream properties. The project has currently wrapped up the preliminary engineering, and is moving into detailed design for the items need to protect this critical infrastructure into the future of the City of Columbus. This presentation will discuss the preliminary engineering completed to date, including floodplain management, hydrologic and hydraulic modeling, compensatory excavation, culvert improvements, stormwater peak discharge and quality management, as well as other aspects of this complex expansion into the City's future expansion.

Biography: Mr. Boyer is the Water Resources Technical Services Manager for ms consultants in Columbus, OH. At ms, Mr. Boyer manages a team of engineers and designing water resources projects. Specializing in floodplain management, stormwater management, and floodplain hydraulic and hydrologic analysis for the past 16 years, Mr. Boyer has worked on projects in Ohio, West Virginia, Indiana, North Carolina and Pennsylvania. Mr. Boyer has had the privilege of working award winning projects including the John R. Doutt Reservoir, which won two ACEC Engineering Excellence Awards in 2015, and a National Honor Award from ACEC National in 2015. Along with the John R. Doutt Reservoir Mr. Boyer also worked on the Southern Ohio Veterans Memorial Highway, which was recognized as a Best Project Award for the Midwest by the Engineering News Record in 2019. Mr. Boyer holds Bachelors of Science Degree in Civil and Environmental Engineering. He is a Certified Floodplain Manager and Professional Engineer, in the State of Ohio and Indiana. Mr. Boyer is the current Chapter President of the Ohio Floodplain Manager Association.

C3: Modeling for Mitigation: Modeling

Florida flood hazard modeling and vulnerability assessments – an innovative climate change focused approach

Justin Gregory, PE (Florida), Jones Edmunds & Associates, jgregory@jonesedmunds.com
Co-presenters: Gavin Lewis, Fathom, g.lewis@fathom.global

Abstract: Hurricane Ian was a devasting example of Florida's flood vulnerability. Extreme coastal flooding paired with rainfall exceeding 20 inches resulted in $112billion in damages. Projected changes to sea level and extreme precipitation will continue to increase Florida's flood risk. Since 2021, the Resilient Florida program has provided over $40million in funding to support communities planning for future flood impacts through flood vulnerability assessments and adaptation. Assessing and planning for expected flood hazard changes are critical to making Florida more resilient. Traditional flood hazard

mapping needed to support these flood vulnerability assessments can take years and cost millions. The models used to perform these assessments require frequent updates to account for changes in the landscape, availability of new high-resolution LiDAR-based digital elevation models, revised rainfall projections, and changes in boundary conditions. In addition, the different modeling platforms used to perform flood hazard assessments include inconsistencies that can affect the results of the vulnerability assessments. Fathom's US flood hazard maps provide national-scale coverage of both current and future flood scenarios in unprecedented detail. This presentation will demonstrate how we can apply the latest results from Fathom to assess countywide vulnerability to future flood risk for communities and critical infrastructure. This innovative approach considers Florida's most recent statewide LiDAR datasets and projected changes in extreme precipitation. Fathom's flood hazard maps for vulnerability assessments provides the potential for consistent analysis across the whole state, the evaluation of multiple future scenarios for inland and coastal flooding, the application of the latest research in flood modeling. Furthermore, this presentation will contrast this analysis with traditional flood modeling approaches to assessing future flood vulnerabilities.

Biography: Justin Gregory, PE is a vice president and senior manager at Jones Edmunds & Associates. He has 18 years of experience working on watershed-scale floodplain and stormwater modeling projects throughout Florida. Justin is passionate about developing more efficient approaches to regional-scale flood models that will help improve our understanding of flood risk.

Traveling to the Next Dimension of Flood Mitigation using 2-D HEC-RAS

Chris Shultz, PE, JEO Consulting Group, cshultz@jeo.com
Co-presenters: Becky Appleford, rappleford@jeo.com

Abstract: This presentation will offer a design modeling methodology case study highlighting the power of using 2-D modeling for flood mitigation actions. Design of large-scale flood risk reduction has historically been supported by 1-D hydraulic modeling. With the advancement of 2-D capabilities, when is it appropriate to re-analyze a project for residual risk? The Upper Prairie, Silver, and Moores (UPSM) Creek's watersheds northwest of the city of Grand Island, NE were subject to repetitive and significant flooding resulting in structural flood impacts to the City. These historical flood impacts gave momentum to implementation of a multi-year, multi-phase flood risk reduction project consisting of upland dry dams, a large lowland detention cell, and a levee. Construction of the project was substantially completed in early 2019. In March 2019, a region wide flood event tested the UPSM project. Due to the size and scale of the flood event, significant overtopping between the various watersheds occurred leading to higher flows than those that were simulated by the 1-D models developed during design of the project. While the UPSM project performed well, the 2019 flood illuminated areas of residual risk that 1-D hydraulic modeling could not predict. By leveraging PDM funding for the hazard mitigation plan, a flood risk analysis task was added to better evaluate residual risk and to identify feasible mitigation solutions. Using the new capabilities of HEC-RAS, a rain-on-grid 2-D model was developed for the entire UPSM project region to accurately determine flood risk and mitigation actions for the region. Beyond the modeling updates, a Flood Alert project was created as a response to the 2019 floods, which increased monitoring and modeling capabilities for real flood events.

Biography: Chris Shultz is a Water Resources Engineer at JEO Consulting Group. He received his B.S. from Kansas State University and M.S. from Colorado State University, both in Civil Engineering with an emphasis in water resources. Following school, Chris worked for three years at the Kansas Water Office,

the state's water planning agency as well as a wholesale public water utility of reservoir storage. Here, he operated and refined a reservoir drought model used for statewide drought operations and preparedness. Over the last several years, Chris moved from drought to flooding utilizing crossover knowledge and a background in programming to develop floodplains and perform analysis for flood mitigation.

Urban Area Considerations for Flood Protection and Phased Implementation Apple Branch Watershed Danville VA

Chris Rogers, Timmons Group, Chris.Rogers@timmons.com
Co-presenters: None

Abstract: Apple Branch, a FEMA regulated stream, is a tributary to the Dan River located in the heart of Danville, Virginia. Structural impacts to existing structures and roadway flooding occur during high intensity short duration and tropical storm events in this urban watershed. Challenges in maintaining stormwater conveyance come from the steeply sloped watershed of Apple Branch entering a fully developed broad flood plain of the Dan River that has resulted in extensive flooding which extends to adjacent buildings, parking lots and a divided primary collector street paralleling the Dan River. Grant funds for the engineering study were provided through the Pre-Disaster Mitigation Grant Program administrated by the Virginia Department of Emergency Management providing 75% of the total project cost. The engineering study included an evaluation of existing conditions of watershed pipe systems, channels, flood extents and the development of potential solutions to reduce flooding impacts throughout the watershed. The presentation will cover a brief overview of pipe system and two-dimensional hydraulic modeling completed and will focus on proposed solutions developed including detention creation with property buyout, pipe system backflow prevention and pipe/culvert system improvements using a phased approach to accommodate City funding and associated time frames. This presentation will provide information regarding recommended proposed improvements and priority phasing to maximize benefits. Proposed improvements to be discussed will include adjustable detention wall height recommendations incorporating a permanent wall structure with a temporary wall extension to contain both existing culvert and future bridge replacement conditions. Benefits of partial solutions will be explored that provide some level of flood relief to adjacent property owners until the full extents of the improvements can be made.

Biography: Chris is a project engineer with Timmons Group in Raleigh, North Carolina with over 8 years of experience in the design and implementation of stormwater infrastructure projects. Chris received a Bachelor of Science degree in Civil Engineering from NC State University and is a licensed Professional Engineer in North Carolina and Virginia. He has extensive experience performing flood studies using HEC-RAS for both FEMA and non-FEMA applications, and has experience producing No-Rise, CLOMR, LOMR, and local municipal floodplain analysis and mapping. Chris has extensive experience in watershed analysis using various technology and software tools such as USACE HEC-HMS, Autodesk HydraFlow, HydroCAD, and PCSWMM. Chris lives with his wife and three children in Youngsville, North Carolina.

C4: State Mapping Initiatives: Mapping

FEMA's CNMS Database as a Project Planning Tool – An Illinois Case Study

Tripp Spear, GISP, WSP USA Environment & Infrastructure Inc., tripp.spear@wsp.com
Co-presenters: Marni Law, marnilaw@illinois.edu

Abstract: The Coordinated Needs Management Strategy (CNMS) "is a FEMA initiative to update the way FEMA organizes, stores, and analyzes flood hazard mapping needs information for communities.", and is the sole source for tracking FEMA's NVUE percentage metric (the portion of flood studies which currently meet or exceed FEMA's minimum quality standards). The CNMS database is a combined repository of geospatial and attribute information detailing the geographic extents of existing flood hazard analyses and the methods by which they were studied, tracking ongoing studies and documenting areas of future study needs. The CNMS database can be leveraged as a powerful planning tool when a region proposes funding or evaluates a new or updated flood study scope. This presentation will present real-life case studies on how to create a business plan that is database driven with CNMS as the primary engine. Specific examples will be showcased including the Illinois Cooperating Technical Partner's uses for Discovery, planning and project status.

Biography: Mr. Spear, GISP is a Technical Professional III – GIS Analyst with WSP USA Environment & Infrastructure Inc. in the Topeka, KS office. He has a background in FEMA's Coordinated Needs Management Strategy (CNMS) and NFIP program. He specializes in CNMS processes and procedures, quality control and database management.

An Easy-Button for Statewide Future Precipitation Scenarios

Geoff Uhlemann, PE, PMP, CFM, Michael Baker, geoff.uhlemann@mbakerintl.com
Co-presenters: Terri Fead, terri.fead@state.co.us

Abstract: This presentation showcases how Colorado's Cooperating Technical Partner (CTP) program is preparing communities for potential future conditions. Communities are becoming increasingly aware of trends in severe weather and considering planning future development around a different climate and risk exposure. However, assessing future precipitation outcomes due to climate change for each specific project can be a rather involved effort. Therefore, Michael Baker and the Colorado Water Conservation Board (CWCB) are undertaking a statewide effort to develop precipitation scalars across a range of recurrence intervals and projected timeframes such that future Risk MAP studies can readily integrate future climate scenarios into the flood hazard analyses without performing the prior data-intensive legwork. We will overview the methodology to develop projected future intensity duration frequency (IDF) curves that can be easily resourced in future and ongoing studies across the State to plan, design, and build infrastructure to be more resilient to climate change. This effort involves intensive data processing of the CMIP6 global output with downscaling to arrive at a raster of precipitation ratios by frequency and timeframe. These rasters are then resourced in ongoing and future Risk MAP studies to readily modify future precipitation scenarios that can be efficiently modeled and presented to communities as non-regulatory information without involving a new climate analysis for each project. Efforts like these help advance toward FEMA's goal of producing climate informed products that drive resilient outcomes.

Biography: Geoff is a team leader at Michael Baker who manages fun projects and innovative initiatives. His primary focus is charting out rain-on-mesh best practices and graduated data. Basically, Geoff likes

working on cool sciency stuff with great coworkers and clients. He is also a proud father of five girls, happily involved at church, camps, and rock climbs.

Investigating the Fluvial Hazard Zone as a New Standard for Flood Risk

Laura Keys, Lynker, lkeys@lynker.com
Co-presenters: Bill Szafranksi, bszafranski@lynker.com; Ryan Spies, rspies@lynker.com; Graeme Aggett, gaggett@lynker.com

Abstract: Flood risk is typically identified as a function of riverine flooding, often through such regulatory zones as FEMA's Flood Insurance Rate Maps (FIRMs) that take into account the extent and depth of flood waters, though flood risk also comes in the form of avulsion and debris flows in mountainous terrain and alluvial settings. In Colorado the Fluvial Hazard Zone (FHZ) denotes areas that are at risk from flood waters as well as from sediment, debris flow, and channel instability. Lynker collaborated with the Boulder County Community Planning Division to evaluate new FHZ data that was generated as part of a pilot program for the State of Colorado. We compared several existing regulatory floodmaps (FEMA FIRMs, Floodway, setbacks) to FHZ data, calculating agreement between the different maps in their coverage of the record 2013 Boulder County Flood, and quantifying the number of structures considered "at-risk" based on the FHZ that would not have been categorized as such by other regulatory zones. We found that the FHZ provides sufficient coverage of the 2013 Flood extent; that the FHZ includes more "at-risk" structures than any other regulatory dataset; and that the 500-year FIRMs are the closest approximation to the FHZ but still leave out a portion of infrastructure and area, including structures that filed damage claims from the 2013 Flood. We also found that Boulder County streams are actively changing based on multiple LiDAR datasets, which questions the appropriateness of using only traditional flood maps to define flood-related hazards in Colorado. This presentation will highlight findings of our comparison of the FHZ to other regulatory floodmaps in Boulder County, CO, and make the case for community planners to take an integrated approach to flood risk planning that considers non-water hazards.

Biography: Laura Keys is a Water Resources Scientist for Lynker. Ms. Keys completed her MS degree in computer science at UC Berkeley and a MS in ecology (with a focus on water resources) from University of Georgia's River Basin Center, and is a PhD candidate in Natural Resources at the University of Jena Germany. She has over a decade of experience and expertise in water resources-related geospatial analysis, computational hydrology, and modeling. She has conducted research in water bodies around the world, ranging from the swamps of Louisiana to the high-altitude mountains of Tibet, with a focus on urbanization impacts to streams and the role of climate change on the hydrologic cycle. She maintains a close working relationship with NOAA's National Weather Service, utilizing the National Water Model to develop and evaluate near-real-time flood inundation maps. She volunteers her time as a member of Lynker's Diversity & Inclusion Committee and as a reviewer for NSF and numerous scientific journals.

C5: Innovative Risk Communications: Risk Communication

Risk Communication: A Campaign for Coastal New Jersey

Devon Blair, NJDEP, devon.blair@dep.nj.gov

Co-presenters: Danielle Bursk, New Jersey State Council on the Arts, danielle.bursk@sos.nj.gov and Amanda Archer, Jacques Cousteau National Estuarine Research Reserve, amanda.archer@marine.rutgers.edu

Abstract: The New Jersey Coastal Management Program has formed partnerships with the New Jersey State Council on the Arts and the Jacques Cousteau National Estuarine Research Reserve to work with New Jersey communities in creative ways to communicate their risk to flooding. The risk communication campaigns aim to increase awareness and understanding of the risk posed by coastal flooding through several outreach efforts – a community-based art grant program and social media campaigns. Each component aims to improve the methods and materials used by the state and local-decision makers, as well as community organizations and members, when communicating about the risk of coastal flooding. A series of community-based art installations allows close work with community organizations around the state to host and partner with artists to create a unique artwork. Events are held to engage communities around the artwork as a way to communicate flood risks and provide information about flood risk. A photo documentation application was created for New Jersey through MyCoast.org. MyCoast allows users to connect through tools used to document tides, storm damage, beach cleanups, and more. MyCoast New Jersey features four tools total; two photo documentation tools, called “High Water” and “Places You Love”, an education tool “Know Your Tides NJ”, and a story sharing forum “Rising Together NJ”. “Know Your Tides NJ” and “Rising Together NJ” were promoted through social media campaigns. This presentation will share the communication efforts, tools, and projects New Jersey Coastal Management Program is taking to communicate and better prepare our state for climate change. Through Risk Communication: A Campaign for Coastal New Jersey NJ CMP and our partners are able to share the importance of understanding flooding and how you can best protect yourself while communicating in a way that is understandable and welcoming to community members.

Biography: Devon is an environmental specialist in the Bureau of Climate Resilience Planning at the New Jersey Department of Environmental Protection where she works on communication efforts for the New Jersey’s Coastal Management Program. Devon’s work includes coordination of projects focused on risk communication, community outreach, and support for climate resilience planning efforts.

Alluvial Decoder: An Immersive Educational Floodplain Installation

Wayne Miles, PE, City of Raleigh, wayne.miles@raleighnc.gov
Co-presenters: None

Abstract: Alluvial Decoder is a site-specific education installation on the City of Raleigh’s greenway trail along the banks of Crabtree Creek that was commissioned by Raleigh Stormwater to raise awareness about the area’s floodplain. The project, which consists of several components including a mural, creative placemaking, and educational markers, is an excellent example of how public art and creative placemaking can educate the community and invite conversation surrounding critical issues. The display has already met the project goal of increasing awareness of the importance of floodplain management and communicating the risks of urban flooding. Local media, including newspapers and television stations have done multiple stories on the installation, including live broadcasts from the site during preparations prior to Hurricane Ian hitting the Carolinas. This presentation will discuss the details of the display's messaging and artistic elements as well as the creative process used by the design team, A Gang of Three, consisting of William H. Dodge, Lincoln Hancock, and Will Belcher.

Biography: Wayne Miles is the Program Manager for the City of Raleigh Stormwater Management Division where he has been for four years. He has over 33 years of water, wastewater, and stormwater engineering and utility management experience. As a consultant, he worked across the country assisting over 100 communities to develop and implement complex programs to address challenges including aging infrastructure, regulatory compliance, and utility funding. He has co-authored three Water Environment Federation Manuals of Practice on sewer and storm system operation and maintenance, asset management, and funding; and he has served on national committees to help set policies and provide guidance related to compliance with the Clean Water Act. He is a Professional Engineer, and he has both Bachelor's and Master's Degrees in Environmental Engineering from the University of Florida.

Love Your Levee – A Social Media Campaign to Celebrate Successful Partnering to Address Flooding

Brooke Magary, US Army Corps of Engineers, brooke.e.magary@usace.army.mil
Co-presenters: Rachel Lopez, rachel.l.lopez@usace.army.mil; Katie Noland, Katelyn.M.Noland@usace.army.mil

Abstract: Often in flood risk management, the dialogue is driven by what can or has gone wrong. This was the case for many years with the Wood River Drainage and Levee District and the USACE St. Louis District. Together, the two entities focused on the levee and understanding what could go wrong and how to avoid such events. However, the two found that focusing only on what could go wrong, and not on what had gone well, was a missed opportunity. Together, the levee district and USACE decided to partner and join forces with key members of the community to highlight the success stories surrounding the levees. This was done with a focus on public safety, promoting risk awareness and the need for continued investment. The intent of the campaign was to answer the "what's in it for me?" question for the public by using trusted community members to explain why they should care and remain informed about their levees. This session will focus on how USACE and the levee district worked together to craft a campaign recognizing the work that was done to keep the levee in good working order and improve emergency preparedness in the community. This social media campaign became an avenue to address challenging relationships and create a community dialogue about the levees and their role in managing the community's flood risk, and why we all should "Love Your Levee".

Biography: Ms. Brooke Magary received a Bachelor's Degree in Ecology, Evolution and Environmental Sciences from Southern Illinois University – Edwardsville in 2012 and a Master's Degree in Biological Sciences from Southern Illinois University – Edwardsville in 2019. Ms. Magary started her career with the St. Louis District as a park ranger at the Rivers Project Office in 2012. Ms. Magary worked at the Rivers Project for four years before accepting a position as a Public Affairs Specialist in the St. Louis District Office in 2016. In 2020, Ms. Magary accepted a position in the St. Louis District Dam and Levee Safety Section as a Risk Communication Specialist. In this position, she is responsible for planning, developing, and coordinating information and risk communication materials for the St. Louis District Dam and Levee Safety Programs. Ms. Magary resides in Highland, Illinois. Her hobbies include reading, party planning, and spending time with her husband, Jake, and two children, Jordan and Emma.

C6: Advancing Equity through Federal Programs: Equity

Advancing the Role of Equity in FEMA's Risk MAP Program

Johanna Greenspan-Johnston, Dewberry, jgreenspanjohnston@Dewberry.com
Co-presenters: Thuy Patton, hongthuy.patton@fema.dhs.gov;

Abstract: This presentation will summarize the historically allocated Regional resources for Risk MAP to establish a baseline for equity and to begin the dialogue on how to advance equity within the program in the future. Like many organizations, FEMA Region 8's Risk MAP program is working to advance equity in its program design and delivery. The Region is making programmatic changes, adjusting prioritization processes, and sponsoring equity-centered pilot projects. To serve as a foundation for this work, the Region, with support from STARR II, is establishing methods for defining, evaluating, and progressing equity in a way that makes sense for the specific geographic and socioeconomic context. At the onset of this effort, the team hypothesized that the Risk MAP program disproportionately benefits already well-resourced and politically connected communities. The team sought to test this hypothesis by establishing a process for evaluating how equitably the Region has historically allocated Risk MAP resources. This mechanism could also be used as a baseline to track future progress. Initial data-based explorations focused on understanding which communities have received more resources and seen more mitigation benefits from the Risk MAP program, and then how product coverage, quality, and use correlate with factors like social vulnerability and planning capacity. Findings from this effort are leading to a greater understanding of where inequities are present and how inequities may be perpetuated through existing prioritization and decision-making processes. Particularly in the context of Justice 40 and other national initiatives, this work is helping the Region 8 Risk MAP team drive program policy and decision-making in ways that better serve disadvantaged communities.

Biography: Johanna Greenspan-Johnston is a Senior Resilience Planner with Dewberry, a member of the STARR II team. Her areas of expertise include hazard mitigation and resilience planning, vulnerability and risk modeling, stakeholder engagement, and policy analysis. At Dewberry, she supports local, state, and federal resilience planning and policy efforts, including leading the development of comprehensive coastal resilience plans for both the City of Virginia Beach, VA and the Commonwealth of Virginia. She has also worked extensively with FEMA, including leading the development marketing and outreach campaigns for the National Flood Insurance Program (NFIP), facilitating stakeholder engagement with advanced technical topics and research initiatives under the Risk Mapping Assessment, and Planning (Risk MAP) Program, and supporting equity action planning and strategy efforts with Hazard Mitigation Assistance (HMA). She has a background in architecture and urban planning and joined Dewberry's Resilience Solutions Group after receiving her Master of City Planning from the Massachusetts Institute of Technology (MIT).

Mitigation in Action Strike Team – A New Approach to Equity

Cindy Wirz, FEMA R6 Mitigation, cynthia.wirz@fema.dhs.gov
Co-presenters: None

Abstract: When FEMA released the 2022-2026 Strategic Plan, the message was clear: as an agency we must find ways to reach out to make programs easier to access with a people first approach. To that end, Region 6 Mitigation developed the Mitigation in Action Strike Team or MAST. Specifically, small

communities often lack the capacity to interpret, access, or possess the knowledge on who to ask for assistance about mitigation programs. The MAST was piloted in Louisiana communities impacted by Hurricane Ida to address the issue of equity in support of the FEMA Strategic Plan. Mitigation used the Social Vulnerability Index, published by the Centers for Disease Control, and the Natural Risk Index, to identify underserved and underrepresented communities. Mitigation's Community Education and Outreach spearheaded the MAST project and developed a presentation using plain language, providing an overview of the Federal Emergency Management Agency, including Response, Recovery, Mitigation and Preparedness. The presentation drills down to hazard mitigation, outlining the Community Education and Outreach, Floodplain Management and Insurance, Hazards and Performance Analysis and Grants and Planning programs and how communities can access these programs to be more resilient. For MAST to be successful, the state became our partners to achieve the overall goal of MAST. This partnership strengthened the MAST position and allowed for the "warm introductions" to the identified communities. Besides education, MAST provides a point of contact for the communities to reach back to mitigation to access Subject Matter Experts who can provide general technical assistance on program intricacies. Communities responded favorably to MAST, achieving the objective of the FEMA Strategic Plan of removing barriers to FEMA programs through a "people first" approach. While the MAST is available in Region 6, the goal is for MAST to become a nationwide approach to equity to make mitigation programs easier to access.

Biography: Cindy Wirz has been the Community Education and Outreach Specialist for the Region 6 Mitigation Division since 2009. She has served as the Community Education and Outreach Group Supervisor for Hurricanes Harvey, Laura, Delta, Zeta, and Ida, bringing new and innovative ways to make Mitigation Recovery information accessible. Responsible for educating residents and communities alike, she has led the efforts to create State specific web pages, email addresses, and the Mitigation Helpline, 833-FEMA-4-US, to provide access to mitigation information on multiple platforms. She works in both disaster and non-disaster postures, acting as a conduit for residents and communities to find Subject Matter Experts to find answers to their questions.

Shelter from the storm: flood resilience with and for unsheltered communities

Jessica Ludy, San Francisco District, US Army Corps of Engineers, jessica.j.ludy@usace.army.mil
Co-presenters: Lindsay Floyd, Lindsay.L.Floyd@usace.army.mil; Alev Bilginsoy, Alev.Bilginsoy@usace.army.mil; Emily Marcil; emarcil@umich.edu

Abstract: More than ½ of a million people across the United States, and over 160,000 people in California experience homelessness today— many of them living in and along river corridors, channels, or adjacent flood risk management infrastructure. During intense storms, unsheltered people face significant risks to their health and safety, their belongings, and to long-term well-being and recovery. At the same time, infrastructure operators haven't historically had the support, training, or resources needed to both inspect and manage flood control facilities and ensure the well-being of unhoused individuals living near these facilities. Although issues of housing/homelessness and flood control are intertwined, they are often managed by very disparate organizations. With increasing housing insecurity and storm severity, integrated solutions are more important than ever. In 2022, the California US Army Corps of Engineers Silver Jackets team convened a series of interagency and interdisciplinary workshops to advance whole-community flood resilience with a focus on unsheltered households and communities. Flood risk management practitioners, health and human services professionals, personnel from public safety, and advocates for those experiencing homelessness came together for a series of

focused panel and brainstorming sessions. They began building a shared understanding of problems and identified tangible actions to give shape to a vision for care-informed flood risk management. This presentation will provide an overview of the challenges and risks associated with flood resilience, infrastructure, and unhoused communities. Participants will learn both about workshop outcomes and tangible actions that flood risk managers can take toward building a more compassionate and human-centered flood resilience practice.

Biography: Jessica Ludy is the Flood Risk Program Manager and Environmental Justice Coordinator for the US Army Corps of Engineers in the San Francisco District. She has over 14 years of experience and works with communities and other agency partners on water resources and other USACE technical assistance programs. Prior to her work for the government, Jessica spent a number of year in the private sector as a consultant (doing similar work), and a ~ 2 years in the Netherlands on a Fulbright fellowship. Jessica co-chairs the Association of State Floodplain Managers Task Force on Social Justice, the Flood Risk Communication and Outreach Committee, and she earned her Master's Degree in Environmental Planning from U.C. Berkeley.

C7: Nature Based Solutions in Stormwater Management: Stormwater

Using Nature Based Solutions to Improve Transportation System Resiliency

Hunter Freeman, PE, McAdams, freeman@mcadamsco.com
Co-presenters: Andrew McDaniel, ahmcdaniel@ncdot.gov; Lauren Kolodij, laurenk@nccoast.org

Abstract: Released in March, 2021, The North Carolina Coastal Federation with support from the Pew Charitable Trusts, released a statewide Action Plan for Nature-based Stormwater Strategies in North Carolina. The Plan was developed with input from over 60 work group members representing North Carolina state and local government agencies, businesses, universities, landscape architects, engineers, non-profits and other sectors. Nature Based Stormwater Strategies work with the landscape to aid in reducing flood related risks to the while adding ecosystem value and biodiversity. These sustainable planning, design, environmental management, and engineering practices weave natural features into the built environment resulting in more resilient communities. NCDOT played an important role in the development of the plan, particularly the transportation chapter. As the owner & operator of over 80,000 miles of roadway from the mountains to the coast, NCDOT relies on a wide array of nature based strategies to mitigate risks from rainfall, floodwaters, and other climate related events. Floodplain management for transportation systems is more than just mapping and modeling, it's a key component in every design and in the operation of our roadway network. Nature based stormwater strategies take on many forms of implementation, each of which have a direct connection to floodplain management. This presentation will offer ideas on how nature based solutions and strategies can be incorporated into the planning, design, construction, maintenance, and operation of linear transportation systems in ways that assist in reducing the risks posed by floodwaters. The presentation will include case studies from NCDOT and others on how transportation systems reduced their impact on flood prone areas as well as how transportation systems use nature based strategies to protect themselves from natural hazards.

Biography: Hunter leads the green stormwater infrastructure practice for McAdams in Raleigh, NC. He specializes in permitting and execution of innovative, holistic stormwater solutions including green

infrastructure, nature based design, and community planning strategies. In addition to his design work, Hunter is Past-President of the North Carolina APWA Stormwater Division and serves on the SESWA Communications Committee.

Climate Adaptation - Integrating Solutions into a Coastal Community for the Future

John Millspaugh, PE, PMP, Arcadis, john.millspaugh@arcadis.com
Co-presenters: None

Abstract: The City of Norfolk was awarded a $115 million grant from the Department of Housing and Urban Development to address flooding due to storm surge and high rainfall in the Ohio Creek watershed. The design approach included an integrated stormwater management system within a shoreline defense system. Moreover, the water-management activities were designed to improve the neighborhood by increasing neighborhood connectivity, adding new and improved natural habitat, and increasing resilience to future flooding. The constructed project, anticipated to be complete early 2023 will include 10,000 linear feet of berms and coastal protection to protect the community up to the 100-year coastal surge event with climate change considerations. Green infrastructure (bioretention and permeable pavement) and nature based solutions (living shoreline) played an important role in conveyance pump station sizing, meeting water quality requirements, and creating a resilient sustainable solution of alleviating flooding in one of Norfolk's oldest waterfront communities. The interior drainage system improvements will include replacement of existing grey infrastructure with 17,000 linear feet of new storm lines and two new stormwater pump stations for a greater capacity to meet the 10-yr 24 hr storm with climate change considerations. This presentation will focus on the implemented stormwater management system including green infrastructure, conveyance, and pump stations. A focus on incorporating the features within the project and residential constraints will be provided offering good practices and lessons learned for communities to consider in becoming more resilient into the future.

Biography: Mr. Millspaugh is a Water Resources Engineer and Project Manager specializing in project delivery on multidisciplinary engineering and resiliency projects. He has a successful track record of assisting clients pursue funding and implement their awarded projects to realize project benefits from interdisciplinary teams. He was the Deputy Project Manager for the Arcadis multi-sub consultant team that assisted the City of Norfolk in its successful Community Development Block Grant Disaster Recovery (CDBG-DR) grant award of $115 million from the National Disaster Resilience Competition (NDRC) and subsequent design and construction phase services contract. His water resources engineering experience includes a diverse portfolio of projects leading process mechanical, civil, and environmental engineering discipline projects. He has demonstrated agility to apply his project management and engineering skills to varying project scales, leading pump station projects ranging from capacities of 100 gallons per day to 120 million gallons per day. He has a bachelor's of science in Civil Engineering from the University of Virginia and a Masters of Engineering in Civil and Environmental Engineering from the Massachusetts Institute of Technology.

Alternative Procurement Strategies to Accelerate the Implementation of Green Infrastructure

Patrick Bradley, RES, LLC, pbradley@res.us
Co-presenters: None

Abstract: This presentation will outline innovative procurement methods and provide examples of where they're already being successfully implemented, with the aim of supporting and inspiring other communities to benefit from these opportunities. An increased frequency of high-intensity, high-volume storms has contributed to gaps in stormwater management practices relative to local rules and regulations. Given this, communities across the Midwest are re-evaluating how to adequately address changing precipitation trends in the region. If such a gap in stormwater management has been realized for your community, then what is the 'right' way to resolve the matter? Increased stormwater detention and conveyance capacity are standard-bearer solutions. However, space is often a limiting factor for these stormwater solutions. If this is true for you, then perhaps green infrastructure solutions may help your community advance their stormwater management needs. Moreover, is the traditional design-bid-build the only way to secure a better system, funded completely upfront by the community? Does the responsibility and challenges of implementation sit solely with the community to figure out? Alternative methods for procurement exist that can be transformative to advancing the construction and installation of stormwater solutions, many of which work particularly well with green infrastructure projects. These include open call programs (e.g. St. Louis MSD); stormwater volume trading (StormStore in Chicago through MWRD); and stormwater utility district fees & associated reimbursement grants (e.g. Philadelphia). Along with these different procurement structures, municipalities can shift upfront funding responsibilities to private developers who agree to identify, secure land agreements, develop preliminary design—all at their own risk—in exchange for the ability to recoup that cost through funding on the back end from the municipality. State revolving loan funds or federal infrastructure dollars may also offer a source of reimbursement for communities for stormwater management and flood resiliency projects.

Biography: Pat Bradley is the Director of Point Source Program Development for RES, the country's largest ecological restoration company. Prior to joining RES, Pat was Deputy Director of the Collection Systems and Regulatory Affairs Division for the City of Richmond, VA Department of Public Utilities. Pat has over 35 years of experience managing water quality related programs and previously worked for LimnoTech, USEPA and the Department of the Navy. Pat has a BS in Biology from the State University College at Plattsburgh, NY and a MS in Biology from the University of Texas at Arlington.

C8: Watershed-Based State Initiatives: Watershed Management

Approaches to Driving Watershed Management Decisions for Decades: Lessons from the Louisiana Watershed Initiative

Sarada Kalikivaya, PE, CFM, PMP, Atkins North America, Sarada.kalikivaya@atkinsglobal.com
Co-presenters: Billy Williamson, P.E., billy.williamson@la.gov

Abstract: Floodplain issues are managed within political jurisdictions, often without the mechanisms to consider the effects on other jurisdictions or the watershed on the whole. Current development practices in many areas lead to drastically increased runoff. This can lead to increased flood risk, both in magnitude and extent of flooding, on adjacent properties and downstream of the development. Areas considered to have low flood risk in prior years can find themselves flooding frequently due to land use practices outside of their jurisdiction. This presentation will showcase a case study in Louisiana to

examine consequences modeling approaches to assess the impacts of upstream development on downstream communities in a watershed. Louisiana has recently initiated a statewide flood risk assessment program called the Louisiana Watershed Initiative (LWI). This program will influence watershed management activities in Louisiana for decades along with supporting a long-term vision for statewide sustainability and resilience. The Louisiana Governor's vision for LWI has established six strategic areas to guide planning, projects, and policies toward long-term intended outcomes. These include data, engagement, standards, funding, capability and capacity, and integrated planning. This presentation will first explore LWI's goals and explain how they will direct watershed management in Louisiana. It will provide an overview of the state program and discuss the program goals, objectives, timelines, methodologies, and anticipated outcomes. It will then demonstrate that effective floodplain management requires a paradigm shift from independent jurisdictional boundaries to management within watershed boundaries.

Biography: Sarada Kalikivaya is a Project Director with Atkins North America working in the Dallas Office. She currently serves as the Principal in Charge of supporting the Louisiana Watershed Initiative Program. Also, she is currently involved in managing multiple Flood Risk studies and works with the FEMA HQ innovations team in developing, and implementing new technologies such as Future Flood Risk Databases, 2D modeling, and Cloud computing 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 states of Louisiana and Missouri.

A Texas Sized Planning Effort to Reduce the Risk and Impact of Existing and Future Condition Flooding

Reem Zoun, PE, CFM, ENV SP, Texas Water Development Board, reem.zoun@twdb.texas.gov
Co-presenters: Stephanie Griffin PE, CFM and Cindy Engelhardt PE, CFM, Halff Associates, Inc.

Abstract: In January of 2023, the fifteen river-basin based Regional Flood Planning Groups (RFPGs) in Texas generated the first sets of regional flood plans and delivered them to the Texas Water Development Board (TWDB). This is the first statewide comprehensive look at existing condition flood hazard, future condition flood hazard, exposure and vulnerabilities, how many buildings, people, critical facilities are at risk of flooding in a state the size of Texas. The plans identified and recommended needs for flood risk reduction solutions and potential costs for implementing them. Each recommended project required to demonstrate no negative impact and report associated benefit-cost.

This presentation will provide an overview of the processes and findings from Texas's first ever statewide regional flood planning efforts.

Biography: Reem Zoun, PE, CFM, is the Director of the Flood Planning Division at the Texas Water Development Board and is leading the effort for developing the statewide flood planning program and the delivery of the first sets of regional flood plans and the state flood plan for the State of Texas. She has over 22 years of private and public sector experience in engineering, flood risk reduction projects, modeling, mapping, capital improvement project portfolio management and delivery, management, and leadership. Prior to joining the TWDB in 2019, Reem worked for the City of Austin, AECOM, Pasminco Elura Mine, and Victoria Department of Natural Resources and Environment in Australia. Reem has multiple publications and presented in various conferences.

Reem has a MS in Civil Engineering from the University of Texas at Austin and an undergraduate degree in Environmental Engineering with First Class Honours from Royal Melbourne Institute of Technology in Melbourne, Australia. Reem received the American Society of Civil Engineers (ASCE) Austin Branch 2017 Civil Engineer of the Year award. In 2011, she was awarded as the Young Engineer of the Year by Texas Society of Professional Engineers Travis Chapter.

A runner and a gardener, Reem's favorite part of life is being the mother of her two boys, a thirteen-year-old and a nine-year-old.

Before the Flood: A state policy framework to reduce flooding and flood risks

Will McDow, Environmental Defense Fund, wmcdow@edf.org
Co-presenters: None

Abstract: As storms intensify and floods become more frequent, state leaders recognize they must do more than coordinate response and recovery efforts. To mitigate flooding, state government must coordinate across executive agencies and with legislative leaders to provide 1) science-based information on risks and solutions; 2) local capacity to develop watershed-scale solutions; and 3) funding directed to the most effective projects. Several states have implemented aspects of this framework. North Carolina is developing a Flood Resilience Blueprint to create a consistent state-wide modeling approach to know how much water will flow, where it will flow, and which strategies will effectively mitigate flooding. Iowa has implemented Iowa Watershed Approaches to provide capacity and technical assistance to develop watershed-scale solutions. And local governments like Charlotte-Mecklenburg, NC have decision support tools to fund effective, locally prioritized projects. No state has brought these elements together into a coordinated framework. This presentation will review existing efforts in several states to implement state policies and programs for flood mitigation and risk reduction with a focus on the Louisiana Watershed Initiative as a possible national model. The presentation will present emerging research findings and outline a state policy framework to guide elected and agency officials interested in developing a coordinated approach to watershed-scale flood solutions.

Biography: Will McDow, Senior Director on Environmental Defense Fund's Climate Resilient Coasts and Watersheds team, engages communities, farmers, businesses, public officials, and academics to develop shared and equitable solutions to increase climate resilience, particularly around issues of flooding. Will has over 20 years of expertise in federal and state policy development, environmental market design, and working lands and natural infrastructure programs. Since hurricanes Matthew and Florence devastated portions of North Carolina, Will has been committed to building flood resilience and mitigation for communities and rural landowners through science-based planning, watershed approaches to inform local solutions, and funding for natural infrastructure. Will has conceptualized and advocated for innovative policies and programs including North Carolina's Flood Resilience Blueprint, the Natural Infrastructure Flood Mitigation Program (NC DMS), and a Wildlife Present Use Value Tax program.

C9: Streamline Technologies Showcase: Real-Time Flood Forecasting

Hurricane Ian: Real-Time Flood Forecasting Pinpoints Flooding 1 to 3 days in Advance. Pete Singhofen, Streamline Technologies

Flood Risk Point Development: Automated Tools for Real-Time Flood Forecasting. Warren McKinnie, Streamline Technologies

Elevation Derived Hydrography: A Starting Point for Large-Scale Real-Time Flood Forecasting. Mark Topping, WGI Geospatial

Concurrent Session D

D1: Floodplain Management Compliance: NFIP/Floodplain Management

NFIP Compliance Audit Update

Sarah Owen, FEMA, Sarah.Owen@fema.dhs.gov
Co-presenters: Shawn Jackson, Shawn.Jackson@agriculture.arkansas.gov

Abstract: Next stop, implementation… FEMA has embarked on a multi-year journey to redesign the Community Assistance Contact (CAC)/Community Assistance Visit (CAV) process. The new National Flood Insurance Program (NFIP) Compliance Audit Program will increase resilience through increasing compliance. It will also increase transparency, consistency, and accountability in how a community's floodplain management program is evaluated and allow the ability to track and understand compliance changes over time. Last Summer, FEMA launched a pilot of the future audit process in 7 states to test out a series of new tools and to collect feedback. This session will cover the pilot process from implementation to conclusion, sharing insights gained and lessons learned from over 500+ stakeholder comments collected during the pilot. Federal, state, and local officials will also learn what to expect from the new audit program and how FEMA plans to rollout changes to the current CAC/CAV process. We encourage attendees to share their expertise and feedback to the revised process—leveraging lessons learned and best practices for promoting a sound floodplain management program in their community.

Biography: Ms. Sarah Owen works at FEMA Headquarters as an NFIP specialist and regional liaison who acts as a resource for regional regulatory support and national policy making. She led a team that created Policy #104-008-03 on Floodplain Management Requirements Agricultural and Accessory Structures. She also leads the Compliance Committee which aims to increase compliance with NFIP regulations on a national scale. Ms. Owen was a Natural Hazards Program Specialist with FEMA Region IX for over 10 years prior to working at HQ. She has experience with the interpretation and enforcement of NFIP regulations in arid regions, coastal zones, riverine areas, highly urbanized and extremely rural areas, including conducting mapping outreach, assisting communities with correcting NFIP violations, and coordinating with States to change laws that conflict with NFIP regulations. Ms. Owen has conducted multiple classes on Elevation Certificates, Substantial Damage/Improvement, NFIP Basics, and Coastal Regulations throughout Region IX. She has conducted Basic and Advanced NFIP classes at the Emergency Management Institute, as well as Train-the-Trainer classes, and was part of the national effort to redesign the national basic floodplain management class (E273). Ms. Owen has disaster experience on flood and hurricane disasters and post-earthquake Preliminary Damage Assessments in Region IX. Prior to joining FEMA, Ms. Owen utilized her B.S. in geology working for environmental consulting companies to conduct groundwater, soil, and soil vapor risk assessments, remediate sites contaminated by petroleum hydrocarbons, and characterize the effects of forest harvesting activities on

streams. Ms. Owen also served in the Peace Corps in Kazakhstan, teaching environmental studies to middle-school children.

Preparing for Your Next Compliance Audit: Approaches and Best Practices

Wade Weisman, PMP, CSP, Booz Allen Hamilton, Weisman_Wade@bah.com
Co-presenters: Jack Gleisberg, Booz Allen Hamilton, Gleisberg_Jack@bah.com

Abstract: Today, all eyes are on floodplain administrators. As climate change continues to inflict more billion-dollar disasters each year, floodplain administrators play a vital role in making certain that communities manage their development in a way that reduces flood losses, builds community resilience, and reduces disaster suffering. And with FEMA's future implementation of the new National Flood Insurance Program (NFIP) Compliance Audit program, communities should expect to see their floodplain management programs audited much more frequently. The demands facing floodplain administrators may feel overwhelming – how does one begin to prepare? Federal Auditing and Mitigation experts will share best practices for implementing a comprehensive approach to systematically detect, evaluate, and address potential issues that may arise with your floodplain management program before they become a major compliance problem. Learn tools for shifting from a reactive to forward leaning risk management posture (e.g., developing risk profiling indicators, using monitoring and accountability tools, etc.). You'll walk away with a proven framework to help avoid common pitfalls, like failing to follow standardized processes or collect documentation, to manage your floodplain management program more efficiently and effectively – helping to ensure you're prepared for the next compliance audit.

Biography: Wade Weisman has over 36 years of professional experience conducting audits for environmental and occupational safety and health programs across many Federal agencies. He has an in-depth working knowledge of policy mandates and understands the application of Federal, state and consensus standards for environmental management and occupational safety and health. He has hands-on experience with enterprise-wide environmental and safety and occupational health management system implementation, policy analysis and development and compliance and conformance auditing. He has served as an emergency responder and developed emergency response training, plans exercise scenarios and continuity of operations plans. He has instructed on technical ESH areas including Toxicology, Industrial Hygiene, Emergency Response, and Qualitative and Quantitative Risk assessment and has developed several risk-based assessment models for use by Federal Agencies in support of their environmental, safety, and auditing programs. He has a Master of Science in Public Health (Environmental Toxicology), is a Certified Safety Professional (CSP) and a Certified Project Management Professional (PMP).

Floodplain Management Compliance After a Disaster

Claire Jubb, AICP, CFM, Charlotte County, FL
Co-presenters: None

Abstract: Charlotte County, FL took a direct hit from Hurricane Ian in 2022 and although most of the damage to structures was from wind and not flooding or storm surge, floodplain management is still of critical concern. 40% of the county is within a Special Flood Hazard Area and around 60% of the structures, many of which sustained some level of damage. Navigating through damage assessments and substantial damage when damage was not caused by flooding is a difficult conversation but being

well prepared having clear procedures can help. Learn about how Charlotte County is ensuring compliance with substantial damage requirements and hear about some lessons learned.

Biography: Claire Jubb is the Assistant County Administrator for Charlotte County, FL. She earned a degree in public and private sector management from the University of Wales College Cardiff in the UK. After relocating to the USA, she started working for Charlotte County, FL in the Community Development Department rising to the role of Director in 2015. In 2020, Claire was promoted into her current role. As the Assistant County Administrator, Claire is part of a three-member executive leadership team responsible for the leadership and direction of all government operations for Charlotte County, Florida, a 650 square mile county on the southwest coast of Florida with an annual population of 185,000 rising to 250,000 seasonally.

Claire is a member of the American Institute of Certified Planners (AICP) and a Certified Floodplain Manager and has had oversight of both floodplain management and the community's participation in the Community Rating System for the past sixteen years.

Claire is active with the Association of State Floodplain Managers (ASFPM) and is currently the co-chair of the Floodplain Regulations policy committee. She is also involved with the Florida Floodplain Managers Association (FFMA) and holds the position of Associate Director of Legislation and Policy Champion. In these roles, her goal is to expand the understanding of the importance of regulations, policy, and legislation in floodplain management.

Claire was named Champion of Building by the Charlotte DeSoto Building Industry Association's Professional Women in Building Chapter in 2022, Civic Hero for Building Communities, by Accela Inc. in 2019, was a top ten finalist in the Route Fifty Navigator awards for Leadership in 2019 and was the recipient of the 2019 Florida Floodplain Managers Association Service Award.

D2: Building Codes and Standards as Hazard Mitigation: Mitigation

The Future of Building Codes – Federal Perspectives and the NIABC

Ed Laatsch, PE, FEMA, edward.laatsch@fema.dhs.gov

Co-presenters: None

Abstract: Building codes play a key role in disaster resilience as seen in the aftermath of Hurricane Ian. Communities adopting and enforcing hazard-resistant building codes bolster resilience, as shown in FEMA's Building Codes Saves Study. However, only 29 percent of tracked communities are considered flood resistant based on code adoption and National Flood Insurance Program (NFIP) participation. The lack of adherence to strong, resilient building codes drove the development of the FEMA Building Codes Strategy. In addition, FEMA has been engaged in the White House National Initiative to Advance Building Codes (NIABC), which supports state, local, tribal, and territorial (SLTT) governments adopt the latest building codes, enabling communities to be more resilient to extreme weather events that are intensifying due to climate change. Federal agencies are identifying opportunities to enhance financial and technical assistance and capacity building to SLTTs. These efforts prioritize the needs of underserved and vulnerable communities. This presentation will discuss national policy and program enhancements through the NIABC and FEMA Building Code Strategy implementation. It will review federal assistance programs such as Building Resilient Infrastructure and Communities and Community

Development Block Grant, to demonstrate how federal collaboration can support risk reduction. It will highlight FEMA partnerships with code and standard development organizations like ASCE to develop ASCE standards above the current FEMA's minimum requirements for floodplain management. Examples of efforts to improve codes and standards will be presented to allow design professionals and local officials to understand how following more restrictive provisions can improve resiliency for the buildings in their community. In closing the speakers will encourage the attendees to play a more active role in the codes process so that together we can build a more resilient community.

Biography: Edward Laatsch is the Director of the Planning, Safety and Building Science Division which leads FEMA's responsibilities under: the National Earthquake Hazards Reduction Program (NEHRP); the National Wind Hazard Impact Reduction Program (NWHIRP); the National Dam Safety and Security Program; the National Tsunami Hazard Mitigation Program (NTHM); high-wind, flood, earthquake, tornado, wildfire and other natural hazard mitigation activities in support of disaster-resistant building codes and standards, technical services, and post-disaster forensic engineering activities as well as technical SME support for the agency; and FEMA's mitigation planning activity. Other activities within this division include development of all-hazards technical and engineering guidance documents, training and tools for predictive risk analytics. Mr. Laatsch has over thirty-five years of experience in the building design and building sciences area. He holds an M.S. in Architecture from Virginia Polytechnic Institute and a B.S. in Civil Engineering from the University of Michigan, as well as being a licensed Professional Engineer in the State of Virginia.

The Envision Sustainability and Resilience Rating System

Karen Kabbes, PE, CFM, D.WRE, Kabbes Engineering, Inc, kckabbes@kabbesengineering.com
Co-presenters: None

Abstract: Recognizing a need for systemic changes in the planning, design, and delivery of sustainable, resilient, and equitable community civil infrastructure, the American Public Works Association (APWA), the American Society of Civil Engineers (ASCE), and the American Council of Engineering Companies (ACEC) came together to create the Institute for Sustainable Infrastructure (ISI), an education and research nonprofit (a 501c3). Working together they created the Envision rating system to provide third-party project verification of community infrastructure projects.

The Envision Rating system evaluates all types of public and private infrastructure projects. It provides a framework that includes 64 sustainability and resilience indicators. The indicators are organized in five different project evaluation categories: Quality of Life, Leadership, Resource Allocation, Natural World and Climate and Resilience.

These indicators look at a spectrum of possible performance starting with just beyond conventional practice to conserving and restoring communities and environments. The system encourages direct and frequent communication with community stakeholders, users, and other infrastructure agencies, which can result in more collaborate infrastructure solutions to better meet community needs.

Recognizing the need for a national standard or guidance for sustainable and resilient community infrastructure, ASCE is in the process of preparing a non-prescriptive performance-based standard or guidance for building more sustainable and more resilient community infrastructure.

Biography: Karen C. Kabbes is president of KEI, a water resources and environmental engineering firm with offices in North Carolina and Illinois. A former State of IL floodplain manager, she was the lead author of the Chicago metropolitan area floodway rules and oversaw the FEMA's Community Assistance Program for the region for approximately 300 communities. Ms. Kabbes was the first Lake County IL Stormwater Management Commission Chief Stormwater Engineer, responsible for development of a county-wide floodplain and stormwater ordinance and technical reference manual for. A member of both the IL and NC state associations, she has served as a Chapter Representative on the ASFPM Board, in addition to having held positions as co-chair of ASFPM's Mapping and Engineering Committee and Multiple-Objective Management Committee, ASFPM Technical Conference Chair and as a founding member and past chair of the IL ASFPM Chapter. She was the 2014 President of ASCE's 23,000 member Environmental and Water Resources Institute. A registered professional engineer in Illinois and North Carolina, Ms. Kabbes, is a Certified Floodplain Manager and a Diplomate of the American Academy of Water Resources Engineers. 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.

Encouraging Resilience through Zoning Regulations: New York City's Zoning For Coastal Resiliency

James P. Colgate, Esq., AIA, CFM, Bryan Cave Leighton Paisner LLP, james.colgate@bclplaw.com
Co-presenters: None

Abstract: This presentation will highlight New York City's recently enacted amendments to its zoning regulations to encourage resiliency, which could serve as examples for other jurisdictions. These include: allowing increased zoning height for flood-resistant design in the 0.2% floodplains; allowing stairs in front-yard setbacks; reducing side yard setbacks to encourage rebuilding; reducing minimum distance between curb cuts to allow car storage under elevated houses; exempting from maximum "floor area" for certain wet-floodproofed and dry-floodproofed spaces; allowing streetscape exceptions for elevated show windows and recessed facades for exterior ramps; requiring landscaping or other screening to ameliorate the effect of elevations; etc.

Biography: James P. Colgate is a partner at Bryan Cave Leighton Paisner LLP, where he serves primarily real estate development clients with regulatory compliance as well as special permit and variance applications. Prior to coming to Bryan Cave Leighton Paisner in November 2014, he was the Floodplain Administrator for New York City and the Assistant Commissioner for Technical Affairs and Code Development for the New York City Department of Buildings. He previously served as a member of the International Building Code – General Code Development Committee and is a member of the ASCE 24 Committee for Flood Resistant Design and Construction Standards. Mr. Colgate received a Bachelor of Arts degree from New York University, a Master of Architecture and a Certificate in Historic Preservation from the University of Pennsylvania, and a Juris Doctor from Fordham University School of Law.

D3: 2D Floodway Modeling: Modeling

The Saga of Gould Wash: A Challenging 2D Floodway Case Study

Matt Chaney, PE, CFM, AECOM, matt.chaney@aecom.com
Co-presenters: None

Abstract: An improperly modeled effective floodway set up a cascade of challenges during a Risk MAP update in Washington County, Utah. This presentation will recount the trials of identifying flood risk on Gould Wash, a unique study riddled with technical modeling and mapping challenges, conflicting FEMA guidance, and difficult decisions for community officials. The base flood model run resulted in a significant area of shallow flooding and multiple split flows in the overbanks. The presence of an effective floodway left the project team faced with either delineating a floodway through shallow flooding zones or downgrading the study and removing the floodway, both of which conflict with FEMA guidance. The solution was to present two potential (FEMA Region 8 approved) options to community officials, allowing them to choose how the floodway would be mapped through their community. Each option had challenging and unique floodplain administration implications that even the most experienced floodplain administrators find difficult to navigate. This presentation will discuss proper enforcement of floodplain ordinances for "regulatory" and "administrative" floodways, and obtaining community buy-in. We will also dip our toes in the technical details of 2D floodways such as split flows versus floodway islands, different evaluation line surcharge averaging methods, and a behind-the-scenes look at the iterative development of a complex 2D floodway.

Biography: Matt Chaney is a Water Resources Engineer with 9 years of experience on a wide variety of hydrologic and hydraulic modeling projects including bridge scour analysis, dam breach modeling, and floodplain mapping for the FEMA Risk MAP program. He has been heavily involved in developing cutting-edge modeling techniques including 2D Base Level Engineering, Probabilistic Flood Risk Assessment, and 2D Floodways.

FEMA 2D Modeling with Floodways: A case study - City of Ithaca, New York

Inger Sarappo, GISP, CFM, Stantec, inger.sarappo@stantec.com
Co-presenters: Patrick Dobbs, patrick.dobbs@stantec.com

Abstract: This presentation will be a case study of a complex 2D HEC-RAS Model with Floodways done for the City of Ithaca, NY. The model ended up being split into 3 models in order to stabilize it, which needed to be run in a series. 1D was used to model channels and floodways and 2D was used to model the overbank areas. A USGS model was our starting point and there was a levee in the area. This will be the first countywide digital study of the county and extra outreach was completed to prepare the communities for the upcoming preliminary issuance as we are flooding a large portion of the City of Ithaca. This is a complicated model and project with issued solved and we want to share our insights.

Biography: Inger Sarappo is a Project Manager at Stantec and has spent the last 15 years as a consultant working on Map Mod and Risk Map products.

Going Regulatory with 2D Modeling in Kansas

Joanna Rohlf, GISP, CFM, Kansas Department of Agriculture, Division of Water Resources, joanna.rohlf@ks.gov
Co-presenters: Ben Rufenacht, PE, CFM, WSP, ben.rufenacht@wsp.com

Abstract: The Kansas Department of Agriculture (KDA) began using 2D HEC-RAS modeling widespread with FY17 work for Zone A and Base Level Engineering (BLE) mapping. Through the use of 2D modeling in BLE, Kansas has funded and nearly completed BLE projects that cover areas of the state with little to no flood risk information and for areas where the information is out-of-date. As a result of these efforts, the goal was to create best available data for areas with no flood risk information, update outdated

mapping, look for areas of mitigation technical assistance needs, as well as to identify and provide countywide regulatory maps where needed. Most Zone A mapping in the state has moved forward with 2D modeling, however most Zone AE with Floodway had continued as 1D modeling. This presentation will discuss the Kansas 2D Statewide Initiative, and where 2D floodways are underway. This presentation will feature specific challenges when tying-in 1D Steady-State and 2D model areas and detail the move to modeling floodways in 2D. It will scrutinize the pro's and con's related to model data size, use in Letters of Map Revision and development projects, and accuracy of the methods. Finally, this presentation will preview the path forward with continued 2D modeling in Kansas.

Biography: Joanna Rohlf, GISP, CFM, is the Floodplain Mapping Coordinator with the Kansas Department of Agriculture. She waded into the floodplain world 14 years ago on the private side as a GIS Analyst. Joanna worked for nearly 10 years on the private side as a GIS Analyst before moving to the state 4 years ago. She has experience in every phase of the Risk MAP cycle and enjoys working with the public. She served as the election's co-chair for ASFPM for three years and has been a member of ASFPM since 2010. Joanna holds a B.S. in Geography from Kansas State University and a M.A. in Environmental Studies, with a focus on Public Administration, from the University of Illinois. Joanna lives in the country near Topeka, KS, with her husband, daughter and dog. She enjoys camping with her family and is an avid reader.

Ben Rufenacht PE, CFM has been working for WSP for the past 16 years in the Topeka, KS office specializing in surface water modeling for dam breach inundation modeling and emergency action planning; dam and levee assessment and design; FEMA floodplain studies; and stormwater assessment and design. Ben has been working with 2D modeling in HEC-RAS since the beta was released in 2014. Ben holds an BS in Civil Engineering from Kansas State University and an ME in Civil Engineering with an emphasis on Water Resources from Colorado State University.

D4: Transportation Risk Assessments and Inundation Mapping: Mapping

Leading Trends in Real Time Flood Mapping by Harris County

Ataul Hannan, P.E., CFM, HCFCD, ataul.hannan@hcfcd.hctx.net
Co-presenters: None

Abstract: With the increasing abilities provided to the hydrologist through the use of better technology, it has now become possible to link various programs to map flooding events in real-time. Harris County Flood Control District (HCFCD) developed an in-house tool for the purpose of monitoring flood events as they happen. The product includes links between rainfall information from gages, hydrologic and hydraulic models, and GIS mapping in an effort to transfer incoming rainfall data into expected flood inundation maps. It is the ultimate goal of this project to continuously update the hydrologic and hydraulic models used in this system to allow the HCFCD to identify the effectiveness of various flood control projects in the Houston metropolitan area. The purpose of this paper is to present information that can be gained from a near real time mapping program such as the one described, as well as to gain

understanding of the technology and capabilities that are currently available for the purpose of developing better floodplain management tools and practices.

Biography: Ataul Hannan, is working as the Planning Division Director for Harris County Flood Control District. Hannan brings more than 25 years of experience in watershed management and water resources engineering to the position. He was appointed as Director of Planning Division on April, 2015.

The Planning Division devises the plans that guide the District's CIP and identifies the projects that the District designs and constructs. Once risk areas are identified, this Division produces project-specific and/or watershed-based studies that recommend flood damage reduction strategies. In addition to identifying projects, the Planning Division also provides critical support for new projects and other District responsibilities by managing right-a-way acquisition, Buyout Program, environmental regulatory support, storm water quality, and coordination with FEMA. HCFCD's Model and Map Management Program, near real time inundation mapping tool, buyout program policies and MAAPnext project were developed under Mr. Hannan's leadership.

Prior to joining the District he provided technical support to FEMA's NFIP and Disaster Relief Program. He was the lead project engineer for Tropical Storm Allison Recovery Project (Harris County) and North Carolina Statewide mapping project. He managed numerous Flood Insurance Studies in many states. Mr. Hannan is the author of more than 100 papers and abstracts on variety of topics. Mr. Hannan has extensive experience in modeling as well as advanced 1D/2D software. He is registered as a Professional Engineer in the State of Texas and Virginia. He is also a Certified Flood Plain Manager.

Risk and Vulnerability Assessment Using VAST for North Carolina's US70 Transportation Corridor

Shane Parson, PhD, PE, CFM, AECOM, shane.parson@aecom.com
Co-presenters: None

Abstract: North Carolina is focusing on the goal of securing critical infrastructure from the threat of extreme weather, flood events and increased temperatures. Governor Cooper's EO 80 directed cabinet agencies to integrate climate adaptation and resilience into plans, policies, programs, and operations to support vulnerable communities. AECOM supported North Carolina Department of Transportation (NCDOT), Division of Transportation Planning (TPD) to conduct a Risk and Vulnerability Assessment (RVA) of the US 70 Strategic Transportation Corridor (STC). The AECOM team worked closely with NCDOT on conducting a multimodal vulnerability assessment and engaging key planning partners along the corridor. The 180-mile US 70 study runs from the Wake County east boundary and extends to the coast at the MCOLF Atlantic Air Force Base. The RVA includes infrastructure vulnerability using the FHWA VAST tool, stakeholder engagement, agency data, expertise, and resources. The study goals include identifying vulnerable, critical multimodal assets that connect with other modal facilities, military bases, and to assess emergency response, community lifeline and cost implications. This presentation will summarize the methods and results from the RVA. The key tasks included project coordination with the NCDOT Project Management Team, and technical strike teams. A Data inventory was developed of all asset and climate data needed to run tools with a data matrix with a gap analysis. A criticality assessment was conducted for the corridor and non-highway assets to align with the vulnerability assessment. The corridor assets were assessed for exposure, sensitivity and adaptive capacity to temperature, inland riverine flooding, and sea level rise/storm surge using the VAST

methodology. New limited detail fluvial regression equations were developed to model climate change impacts to inland riverine flooding. The equations were designed to utilized precipitation indicators from global climate change model data, specifically factors related to annual extreme and annual total precipitation.

Biography: Dr. Shane Parson, PE, CFM is a Natural Hazard and Climate Change Modeling Data Analyst with the AECOM Germantown, Maryland Office. His expertise is in applying modeling with data analytics to projects ranging from climate change modeling to benefit cost analysis to natural hazard simulations and risk assessment modeling. He is an Amazon Web Services Certified Cloud Practitioner, Certified Floodplain Manager, and recently completed the Google Data Analytics Certificate.

T-SURGE: Predictive Coastal Inundation Mapping for Road Networks during Hurricane Ian

Kurt Golembesky, North Carolina Department of Transportation, kpgolembesky@ncdot.gov
Co-presenters: Matt Dudley, mdudley@espassociates.com

Abstract: 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 Sr leadership that could not be readily answered. The NCDOT is developing T-Surge, a non-proprietary web application, with its contractor ESP, that can be used to provide predictive flood inundation and depths along roads. The application uses ADCIRC model results from UNC's RENCI center to develop detailed inundation mapping and road inundation products. These data are compiled using an automated workflow which kicks off following ADCIRC model result availability after the National Hurricane Center issues each published advisory during an active tropical system. This application was utilized for situational awareness and pre-event planning in September 2022 as Ian approached and made landfall along the North and South Carolina coasts. To better understand the reliability of the mapped results, land truthing using photographs, social media videos, collected high water marks was conducted. This presentation will overview the features of the web application and how it can be used for planning by emergency management officials prior to the onset of flooding conditions and an evaluation of its performance during Hurricane Ian.

Biography: Kurt Golembesky is an Engineer III at the North Carolina Department of Transportation. He has 18 years of experience in water resources both in private consulting and public service for the State of North Carolina. He graduated from NC State with a Master's in Civil Engineering. He has worked for the NC Floodplain Mapping Program focused on technical review lead of just under half of the state's counties. This also included managing the continued improvement of Flood Inundation and Alert Network (FIMAN). He has served in the State Emergency Operations Center during Hurricane Matthew as one of three Flood Captains. He is now working for NCDOT, where he is the technical manager for the progressive improvement of FIMAN-T and FIMAN-T Surge and as well as contributing to a number of transportation focused resiliency projects. Mr. Golembesky is a certified floodplain manager and North Carolina licensed professional engineer.

D5: New Tools & Engagement: Risk Communication

New Tools for Assessing and Communicating Sea Level and Coastal Flood Risk

Dan Rizza, Climate Central, drizza@climatecentral.org
Co-presenters: Kelly Van Baalen, Climate Central, kvanbaalen@climatecentral.org

Abstract: Floods already cause an average of over $5 billion in damages in the U.S. annually (FEMA 2022). With sea levels projected to rise about a foot and multiply the frequency of moderate flooding ten-fold by 2050 (NOAA 2022), it is more imperative than ever that floodplain managers have the tools they need to assess the risks posed by sea level rise and coastal flooding and communicate those risks to the public.

Climate Central provides many freely available online tools, maps, and visualizations, grounded in peer-reviewed research and informed by the needs of floodplain managers and other coastal stakeholders, for assessing and communicating sea level rise and coastal flood risk. These tools and visualizations have been shared by the news media thousands of times, used by millions of people, and featured at the UN climate conference.

Since we last shared our offerings at the 2022 ASFPM conference, we have released a number of new tools. Our FloodVision™ (go.climatecentral.org/floodvision) technology provides precise elevation measurements and photorealistic visualizations of potential future flooding. Our Sinking Tax Base tool (climatecentral.org/tools/sinking-tax-base) provides county-level assessments of the risk sea level rise poses to private properties and the local taxes they generate. Our Wetlands maps (coastal.climatecentral.org) project where wetlands can survive, expand, or recede, by decade, depending on coastal development, sea level rise scenario, and wetlands' rate of vertical growth.

This presentation will walk the audience through our new and established tools, provide examples of how floodplain managers and other coastal professionals have used or could use our tools and visualizations, and seek input from the audience regarding their needs to inform our next generation of tools.

Biography: Dan Rizza manages the Program on Sea Level Rise at Climate Central, an independent nonprofit of scientists and communicators who research and report the facts about our changing climate and how it affects people's lives. Climate Central's Program on Sea Level Rise strives to provide accurate, clear, and granular information about sea level rise and coastal flood hazards both locally and globally, today and tomorrow. Anchored in rigorous primary research, our work distinguishes itself by its user-friendly maps and tools, extensive datasets, and high-quality visual presentation.

Designing Approachable, Accessible, and Adaptable Flood Risk Communications: Updating the Community Officials Toolkit

Lisa Messano, CFM, Resilience Action Partners, lmessano@mbakerintl.com
Co-presenters: Craig "Julius" Lockhart, FEMA, Region 4, craig.lockhart@fema.dhs.gov

Abstract: The Community Officials Toolkit (Toolkit) is the result of a collaborative effort between the Federal Emergency Management Agency (FEMA) and Resilience Action Partners, FEMA's Community Engagement and Risk Communications (CERC) contractor. In 2019, the Toolkit was released as a public

gallery of information to help community officials better communicate flood risk and the need to update maps and data. The Toolkit includes guides and videos to support community officials in communicating flood risk effectively and efficiently across diverse audiences. While the Toolkit focuses on communicating flood risk and technical flood hazard information, it also provides a foundational level of knowledge that can be applied more broadly. This presentation will:

1. Recap the Toolkit and Resilience Video Series – why they were created, what guides are included, and what role they play in risk communications;
2. Showcase how risk communications can be approachable – general audience connection, plain language, format, and style;
3. Showcase how risk communications can be accessible – focusing on diversity, equity, inclusion, and accessibility (DEIA) and connecting to various people and communities;
4. Showcase how risk communications can be made adaptable and applied across the Nation and its territories – highlighting next steps for creating multi-hazard materials and an inventory of stories of resilience; and
5. Explore what's new and what's next for the Toolkit – detailing the Plain Language and Future Conditions guides, and building out stories of resilience for a variety of mediums.

Presenters are practitioners who have developed and worked with the Toolkit and are currently collaborating to update it through FEMA's CERC contract.

Biography: As a member of Resilience Action Partners, Lisa serves as the Change Management Deputy and also supports projects in several regions on FEMA's Community Engagement and Risk Communication contract. She has worked with other federal, state, and local clients since joining Michael Baker International in November 2001. During her 20+ years on the FEMA contracts she has developed and implemented communication strategies for flood hazard mitigation and planning-related efforts, including levee-related projects and coastal studies in California; led community-based story projects in several communities; co-led the development and roll out of FEMA's Flood Risk Communication Toolkit and videos for Community Officials; and co-developed resources to center equity considerations when implementing FEMA flood mapping projects.

Coastal Community Resiliency through Water Level Monitoring: "Old School" versus "New School"

Daniel Tomczak, Jacobs Engineering Group, daniel.tomczak@jacobs.com
Co-presenters: Nicole Elko, Ph.D. (nicole.elko@asbpa.org;

Abstract: Coastal communities are interested in being more resilient by better understanding tidal water levels and the extent to which they will impact roadways, properties, buildings, and other structures. Tools available for the communities to monitor the water levels can range from a simple staff gauge ("old school") to low-cost water sensors ("new school"). 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 high tidal events in coastal communities. Volunteers and citizen scientists submit their water level measurements collected from the NCKT gauging stations as well as photos and observations of high water using the Coastal Observer smartphone app. Observations by citizen scientists and community officials 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. The Southeast Coastal Communities Water Level Monitoring (SECCWLM) System includes the installation of affordable water-level sensors in communities along the Southeast coast of the United States. The water level sensors developed by Hohonu, Inc. have been set-up to collect wirelessly telemetered real-time, hyper-local data and tidal predictions to coastal managers' cell phones through a user-friendly web-app. The project engages local managers to ensure the placement of the sensors, the data and prediction tools, and usability of the app fit the localized needs of up to 40 communities. This presentation will discuss multiple means for citizens and community officials to obtain data that can be used to plan for and respond to flood emergencies and design resilience strategies for sea-level rise and projected increase in tidal flooding.

Biography: Daniel M. Tomczak, CFM, is a Project Manager and Certified Floodplain Manager (CFM) with Jacobs Engineering Group in the Cary (Raleigh), North Carolina office with over 24 year of experience (19 years with CH2M/Jacobs). He has managed environmental and water resources projects, including sediment assessment and dredging within riverine and coastal environments, as well as having interests in floodplain management related to hazard mitigation and community engagement. He is the Education and Outreach Chair for the North Carolina Association of Floodplain Managers (NCAFPM) and has been actively involved with the growth of the NCAFPM scholarship program and the North Carolina King Tides Project. Dan received his M.S. degree in Geological Sciences from Michigan State University.

D6: National Levee Safety Program: Dams & Levees

National Levee Safety Program: Framework for a State Model Levee Safety Program
Michael Bachand, PE, U.S. Army Corps of Engineers, michael.l.bachand@usace.army.mil
Co-presenters: None

Abstract: Levee systems play a critical role in managing flood risk for the Nation. Approximately 25,000 miles of levees reduce risk to over 17 million people that live and work behind them. They also reduce risk to $2.3 trillion in property value and much of our Nation's critical infrastructure. Managing those levees, however, poses challenges especially as levees continue to age, natural hazards become more frequent and intense, public awareness of flood risk remains low, and approaches to levee management vary. To help address those challenges, the U.S. Army Corps of Engineers (USACE) and the Federal Emergency Management Agency (FEMA) are co-leading the National Levee Safety Program – a program intended to support a more consistent approach to levee management in the U.S. with the goal of reducing impacts from flooding and improving community resiliency in areas behind levees. Since the program launch in December 2021, those who are responsible for, have an interest in, and are affected by levees and flood risk management activities have played a key role in providing input into development of the program. This interactive session will begin with a brief update to the National Levee Safety Program since its initial launch, including a summary of stakeholder feedback heard during Phase 1 scoping efforts, and transition to an audience feedback session on the proposed tiering structure for a model levee safety program. Key questions in this session will focus on initial steps and supporting resources needed by states to establish a levee safety program.

Biography: Mr. Mike Bachand is currently serving as a Technical Manager within the U.S. Army Corps of Engineers' Levee Safety Center supporting development of the National Levee Safety Program. Prior to

this assignment, Mike spent almost 10 years in the New England District serving in various roles including Chief of the Geotechnical/Water Resources Branch responsible for overseeing dam and levee safety program managers and as the Levee Safety Program Manager (LSPM) where he was responsible for overseeing administration of USACE's Levee Safety Program polices for over 60 levee systems in New England. Mike also completed an assignment as the Deputy Chief of Engineering and Construction Division at the Norfolk District as part of the Executive Leadership Development Program. During this assignment, he spent a considerable amount of time in construction working on the Arlington National Cemetery expansion. Prior to joining the U.S. Army Corps of Engineers, Mike spent 13 years working in private industry for CDM Smith where he served as a geotechnical engineer at the staff, project and principal level working on multiple national and international projects focusing on levees, floodwalls, impoundments (coal ash and aluminum tailings), dredging, sediment disposal areas, landfills, water/wastewater treatment plants, and pump stations for public, private, and federal sector clients.

National Levee Safety Guidelines: A Resource for Achieving Nationwide Consistency

Michael Bachand, PE, U.S. Army Corps of Engineers, michael.l.bachand@usace.army.mil
Co-presenters: None

Abstract: National Levee Safety Guidelines, comprised of voluntary best practices, will serve as an up-to-date resource designed to help achieve nationwide consistency in improving the reliability of levees and resiliency of communities behind levees throughout the United States. The guidelines are being developed with extensive stakeholder input and are intended to be used by a broad audience such as regulators, levee owners/operators, design and construction professionals, emergency management agencies, states/tribal/local governments, and floodplain managers. Topics in the guidelines range from basic concepts and terminology to consistent approaches for levee-related activities throughout the lifecycle of a levee. Strategies to reduce flooding impacts to people, property, and the environment, to include infrastructure projects, education and awareness, and natural or nature-based solutions are also addressed in the guidelines. This interactive session will begin with progress made on the National Levee Safety Guidelines since the initial launch of the National Levee Safety Program and transition to an audience feedback session. Key questions in this session will focus on several concepts presented in the draft guidelines including risk-informed decision making, public education and awareness, climate adaptation, and best practices related to nature-based solutions and engaging historically marginalized populations.

Biography: Mr. Mike Bachand is currently serving as a Technical Manager within the U.S. Army Corps of Engineers' Levee Safety Center supporting development of the National Levee Safety Program. Prior to this assignment, Mike spent almost 10 years in the New England District serving in various roles including Chief of the Geotechnical/Water Resources Branch responsible for overseeing dam and levee safety program managers and as the Levee Safety Program Manager (LSPM) where he was responsible for overseeing administration of USACE's Levee Safety Program polices for over 60 levee systems in New England. Mike also completed an assignment as the Deputy Chief of Engineering and Construction Division at the Norfolk District as part of the Executive Leadership Development Program. During this assignment, he spent a considerable amount of time in construction working on the Arlington National Cemetery expansion. Prior to joining the U.S. Army Corps of Engineers, Mike spent 13 years working in private industry for CDM Smith where he served as a geotechnical engineer at the staff, project and principal level working on multiple national and international projects focusing on levees, floodwalls,

impoundments (coal ash and aluminum tailings), dredging, sediment disposal areas, landfills, water/wastewater treatment plants, and pump stations for public, private, and federal sector clients.

National Levee Database & Data Collection: Supporting Levee Management Decisions

Brian Vanbockern, U.S. Army Corps of Engineers, brian.d.vanbockern@usace.army.mil
Co-presenters: Suzanne Vermeer, suzanne.vermeer@fema.dhs.gov

Abstract: Data underpins decisions made in every industry today – including levee management decisions. To help those who fund, construct, manage, and benefit from levees make decisions that promote reliable levees and resilient communities, the U.S. Army Corps of Engineers and Federal Emergency Management Agency are working together to improve levee data and promote widespread use of the National Levee Database. The National Levee Database provides a consistent set of data and information about levees in the U.S. including their location, general condition, and an estimate of the number of structures and population in the leveed area. As part of the National Levee Safety Program, efforts are underway to get a better understanding of levees in the U.S., the true cost of maintaining levees, and quantifying the Nation's flood exposure. This interactive session will begin with progress made on the National Levee Database and data collection efforts since initial launch of the National Levee Safety Program and transition to an audience feedback session. Key questions in this session will focus on data collection efforts, initial findings on the cost of levee activities, and potential updates to the National Levee Database.

Biography: Mr. Brian VanBockern has over 27 years of experience in geospatial analysis, surveying, information technology, planning, and intelligence. He spent the last 10 years as the National Levee Database technical manager overseeing the system's transition to new technology platforms and expansion to its new role as a National Levee Safety Program data platform. Brian also serves as team lead responsible for overseeing dam, levee and flood modeling applications deployed in the cloud for the U.S. Army Corps of Engineers. He spent the last 5 years integrating levee safety data processes with FEMA business processes and jointly collaborating on data and technology improvements. He also serves with the emergency management community providing flood modeling, dam, and levee data support for major disaster events and as an international trainer to NATO area countries. Prior to working for the U.S. Army Corps of Engineers, Brian served as an intelligence analyst, emergency management analyst, and planner for several federal agencies.

D7: Nature-Based Solutions and a New Era of Floodplain Management: NBF

Reimagining a Unified National Program for Floodplain Management: A federal framework to reduce flood losses and protect and restore floodplains

Eileen Shader, CFM, American Rivers, eshader@americanrivers.org
Co-presenters: None

Abstract: The United States is facing multiple crises directly related to the health of our nation's floodplains: a Climate Crisis resulting in increasing floods, droughts, and water scarcity that necessitates more resilient ecosystems; A biodiversity crisis of accelerating loss of species including declines of freshwater biodiversity at twice the rate of terrestrial or marine species; and a racial justice crisis in

which Black, Indigenous, and People of Color disproportionately harmed by polluted rivers, flooding and lack of clean water. Healthy, functioning floodplains are a key solution in the toolbox to address these challenges. But is our nation effectively utilizing the polcies and programs on the books to protect and restore floodplains in order to address these crises? The Federal Interagency Floodplain Management Task Force (FIFM-TF) was established in 1975 to carry out the President's responsibility to develop for Congress a Unified National Program for Floodplain Management which lays out a framework to achieve (1) a reduction in the loss of life, disruption, and damage caused by floods; and (2) the preservation and restoration of the natural resources and functions of floodplains. This presentation will provide an overview of the federal policy framework that supports the concept of a Unified National Program for Floodplain Management, and will suggest actions that the federal government can take to reinvigorate, reimagine, and recommit to this lofty and necessary approach.

Biography: Eileen Shader is the Director of River Restoration at American Rivers. She leads the organization's national Floodplain Program to build capacity for equitable, integrated, and nature-based floodplain management. Through this initiative she seeks reforms to local, state and federal floodplain management policies; fosters a nation-wide Community of Practice to support equitable, integrated and nature-based floodplain management; and builds institutional capacity to implement and manage floodplain restoration projects across the United States. Eileen works at the confluence of the river conservation and flood management fields to break down silos and foster integrated planning and management strategies that maximize the benefits that rivers and floodplains provide to communities. She has more than fifteen years of experience advocating for improvements to federal water resources policies to foster support for river restoration and the use of nature-based solutions. She serves as Co-Chair of the Natural and Beneficial Functions Committee, and Co-Chair of the Social Justice Task Force for the Association of State Floodplain Managers and leads the Natural Floodplain Functions Alliance and the Water Protection Network. Eileen is a Certified Floodplain Manager and has a M.A. in Natural Resources Policy from the George Washington University, and a B.S. in Environmental Science from Elizabethtown College.

Advancing the Integration of Clean Water Act Programs with Natural Hazard Mitigation Planning and Implementation

Ian Grosfelt, National Association of Wetland Managers, ian@nawm.org
Co-presenters: Marla Stelk, National Association of Wetland Managers, marla@nawm.org and Genevieve Moran, Association of State Floodplain Managers, jenna@floods.org

Abstract: Better communication and increased collaboration between state, Tribal, local, and federal water program managers and hazard mitigation managers can result in increased resiliency and improved environmental, social, and economic outcomes as a result of more integrated planning processes. The National Association of Wetland Managers and the Association of State Floodplain Managers are developing a national cohort training model around the intersection and integration of water quality and hazard mitigation planning to protect and restore impaired waters and reduce losses from natural hazards. The overall goal is to build the infrastructure and cross-sector collaborative relationships between levels of government that will strengthen the capacity to integrate water resource protection and hazard mitigation planning and implementation. This presentation will share

information regarding this new initiative and discuss opportunities for integration of Clean Water Act programs and natural hazard mitigation planning with a focus on nature-based solutions.

Biography: Ian is an Environmental Analyst with the National Association of Wetland Managers where he currently works on a variety of projects including a series of online beaver restoration learning modules, a wetlands professional mentorship program, and a national workshop series to integrate clean water programs with natural hazard mitigation programs. He has a BS in Agriculture from Cornell University and a Masters of Environmental Management from the Yale School of the Environment. Prior to starting with NAWM, Ian had a decade of experience working in agriculture and the environment starting as a Peace Corps Volunteer in Senegal and continuing with environmental education organizations throughout New England as a facilitator, school gardener, and trainer. For side projects you can find Ian trying his hand at woodworking, learning to ski for the first time as an adult, and finding new bike routes in Maine.

Policy Watch: Understanding Recent and Pending Federal Actions Impacting Floodplain Resilience

Jessie Ritter, National Wildlife Federation, ritterj@nwf.org
Co-presenters: None

Abstract: The United States is at a once-in-a-generation juncture for floodplain management. Within the last few years, there has been substantial legislative, regulatory, and policy movement to improve floodplain resilience and adaptation across numerous federal agencies, the White House, and Congress. Despite this progress, year and after year, flood losses stack up, floodplain development pressures continue, and community vulnerability only increases with a changing climate. Now, a historic influx of resources through the Bipartisan Infrastructure Law (BIL) and the Inflation Reduction Act (IRA) creates new opportunities for floodplain restoration and natural infrastructure efforts, and compels the urgent need for federal agency leadership to ensure that the hundreds of billions of dollars in pending infrastructure investments across sectors are designed and sited in a manner that is climate-resilient and protective of natural floodplains. Simultaneously, federal agencies including the Army Corps of Engineers, the Federal Emergency Management Agency (FEMA) and the Environmental Protection Agency (EPA) are revisiting key regulatory and policy questions – some for the first time in decades – with long-lasting and intersecting implications for floodplains, wetlands, water resources, and floodplain communities. This presentation will dig into the details of recent and anticipated agency actions and increased federal dollars, and explore the associated challenges and opportunities ahead.

Biography: Jessie Ritter is the Senior Director of Water Resources and Coastal Policy for the National Wildlife Federation. In this role, Jessie leads the development and execution of NWF's national water resources and coastal policy priorities. She oversees federal campaigns to protect clean water and wetlands and increase the resilience of communities and wildlife in the face of climate change and natural disaster events. Jessie has also worked with the U.S. Senate Commerce Committee and a number of national non-profits on federal and state policy issues ranging from fisheries management to coastal community resilience. Jessie holds a Master of Environmental Management degree from Duke University's Nicholas School, and a B.S. in Zoology from North Carolina State University.

D8: Using Technology to Innovate FPM Solutions: Tech & Tools

Satellite Data & Artificial Intelligence for Assessing Natural Disaster Impacts

Amy Kopale, CDM Smith, kopaleam@cdmsmith.com
Co-presenters: Caitlin Olson, CFM; olsoncm@cdmsmith.com; Manny Perotin, CFM, PE; perotinma@cdmsmith.com

Abstract: With natural disasters becoming more frequent and severe, finding effective ways to measure their impacts is as important as ever. Recent improvements in publicly available satellite data, artificial intelligence, and cloud-based computing platforms have helped spur new methods for measuring these impacts. This presentation will highlight two ongoing projects that use remote sensing, open-source programming, and Google Earth Engine to evaluate disaster-related land cover and environmental changes in the Gulf Coast. The first project uses these tools to apply an AI model that identifies new urban development in a disaster-affected area. These results can be used to support several post-disaster strategies, including the effectiveness of new building codes in reducing damage. The second project uses these tools to assess coastal vegetation at a national park pre- and post-hurricane. These results can be used to better understand environmental impacts, guide land management decisions, and improve future mitigation plans. Using these projects as examples, we will discuss different satellite data types and applications, analysis methods, and challenges and limitations. We hope this initial work will evolve into more robust remote sensing and AI/ML methods for disaster analysis in the future.

Biography: Amy is a GIS Specialist at CDM Smith with experience in geospatial analysis, remote sensing, and AI/ML. Her work often involves using publicly available data and open source software to better understand human-environmental relationships.

Applying Technology Solutions to Evaluate Flood Risk, Grants, and Program Compliance

Patrick Heck, CSM, SP, Guidehouse, pheck@guidehousefederal.com
Co-presenters: Megan Robinson, mrobinson@guidehousefederal.com

Abstract: Guidehouse is leveraging cutting-edge Natural Language Processing (NLP) algorithms, network analyses, and intelligent automation to help users gain predictive insights from vast amounts of documents, open-source text, and image data – as included in emergency action plan, CRS documentation, grant funding applications. Guidehouse Technology Solution experts will share use cases for NLP that will help FEMA and the ASFPM community extra relevant data to improve risk management, application evaluation, documentation review, and program compliance more efficiently. Further, the speakers will demonstrate capabilities that can help communities participating in the CRS to score their efforts across the 19 scorable activities in accordance with the CRS Coordinator's Manual and help state grant coordinators to pre-score grant applications to improve outcomes. NLP techniques are harnessed to reduce bottlenecks associated with ingesting large semi- and un-structured text datasets and optimize text analysis workflows (e.g., grant applications, CRS scoring). NLP analyses can significantly increase the efficiency of processing text data and consequently increase the ability of human analysts to automatically and rigorously extract information. To facilitate feedback between analysts and a NLP system, our team developed user interfaces (UI) that provide views of NLP data products, such as topic models, document summaries, and document classifier functions. This demonstration will provide ASFPM community members with trends in emerging technology, use cases

relevant to FEMA business processes that continue to evolve as a result of new funding, regulations, and program transformations like RR2.0, CRS Next, and BRIC.

Biography: Patrick Heck, CSM, is a Director at Guidehouse. advising clients in areas of strategic planning, change management, agile application development, and technology implementation to Federal clients. Mr. Heck is a leader in Guidehouse's Technology Consulting practice and has spoken at ASFPM on emerging technology trends impacting emergency management, mitigation, and community resilience. Megan Robinson, is an Associate Director in Guidehouse Technology Solutions practice. She currently supports advanced analytics across a portfolio of FEMA components, including Mission Support and Office of the Administrator where she oversees the application of NLP for external audit tracking and resolution.

AI-Enabled Coastal Field Reconnaissance for Coastal Hazard Studies

Arslaan Khalid, Michael Baker International, arslaan.khalid@mbakerintl.com
Co-presenters: Matheus Fagundes; mf99274@uga.edu; Muthukumar Narayanaswamy; mnarayanaswamy@mbakerintl.com; Celso Moller Ferreira; celso.mollerferreira@mbakerintl.com

Abstract: Reliability of the overland wave modeling using WHAFIS is highly dependent on the accuracy detailed data, along transects, that are critical to inform model inputs. Such information is not readily available and historically, survey crews are sent in the field to conduct detailed field observations. Recently, extensive high resolution street level data is accessible through tools such as Google Earth™. This data can be used to augment and inform field surveys there by increasing efficiency, accuracy, and lowering time and effort. One example of a key parameter required for coastal overland wave modeling studies are the First Flood Elevations (FFEs) of buildings along transects. An alternative approach is to use the digital panoramic photos captured by google earth street view to quantify FFEs. These images are georeferenced and using computer vision, they can help provide an estimate of FFE. In this presentation, we present a methodology to train a computer model to capture building heights using google street view panoramic images and provide validation using field reconnaissance data. Such an automated workflow can reduce the need for field survey and can be cost effective.

Biography: Dr. Khalid is experienced in coastal and riverine flood risk modeling/evaluation, geospatial analysis for flood mapping, estimation of risk using latest analysis techniques, and developing real time flood forecast/early warning systems. He has demonstrated these skills for problem solving across several water resources projects in research as well as industry. He obtained from his MS and PhD from George Mason University and currently he is working as a Senior Coastal Engineer from Michael Baker International.

D9: International Session on Flood Modeling (sponsored by the ASFPM International Committee): Modeling

Do recent advancements in 2D capabilities make 1D models obsolete?

Bo Juza, PhD, CFM, TUFLOW, bo.juza@bmtglobal.com
Co-presenters: Rusty Jones, russell.jones@bmtglobal.com; Chris Huxley, chris.huxley@bmtglobal.com

Abstract: Over past decades, advancements in Graphics Procession Unit (GPU) capabilities and relatively low costs have made them uniquely suited for parallel processing, significantly reducing runtime and increasing capabilities to process large datasets. Since the early 70's, numerical models have been used for flood and coastal studies, facing struggles between data availability, processing speed, project scale, numerical schema capabilities, model stability and other factors that influenced overall 1D, 2D or 3D schematization. While 1D models are still the backbone of large-scale flood modeling and real time forecasting, 2D models have become tools of choice for most flood inundation mapping and complex hydrodynamic modeling projects. The grid or element sizes used for a 2D hydraulic model can have a major bearing on the accuracy and defensibility of the model. Wrong schematization of the system could have a significant impact on project outcomes. If the 2D cell sizes are too coarse, the physical terrain and hydraulic complexity may be poorly represented leading to unacceptable inaccuracies and a high degree of uncertainty in the results. Conversely, 2D cell sizes that are unnecessarily fine result in excessively long simulation times and workflow inefficiencies, impacting project schedule and cost. Models that can experience the most acute inaccuracies due to mesh resolution are whole of catchment direct rainfall or rain-on-grid models, and riverine and urban surface water flood models where the primary flow paths are modeled using an overly coarse 2D resolution. This can cause substantial retention of water and poor conveyance as the flows down the waterways. Examples of various mesh size convergence tests for first order, second order and sub-grid sampled 2D schemes are discussed and presented. Comparison to 1D and 1D+ complex model schematization is being considered.

Biography: Dr. Juza has more than 25 years of experience in water resource and management field. Including coastal, riverine and urban hydrodynamic modeling. In past he worked as project and program manager on implementation of large-scale hydrological and groundwater modeling, rainfall runoff and flood forecasting, using 1D, 2D and 3D models. In addition to technical skills, Dr. Juza has deep knowledge and experience supporting federal agencies and local communities in pre and post disaster planning and management. Moreover, he served as International Committee co-chair for ASFPM. (2010-2018). At present he is serves as North America Lead for TUFLOW supporting clients in US and Canada.

Inland to Coastal Flooding and Everything in Between: A Perspective from Caribbean Islands

Felix Santiago Collazo, University of Georgia, fsantiago@uga.edu
Co-presenters: Luis Cordova-Lopez; Walter F. Silva-Araya

Abstract: Coastal watersheds are prone to the impacts of multiple flood hazards during compound flood events. These events can produce inundation from intense and prolonged rainfall and inland penetration of storm surges, thus exacerbating the flood hazard. The Caribbean Region is particularly sensitive to this combination of events due to frequent cyclonic events affecting small and steep coastal watersheds. Current practices have started to implement multi-hazard modeling techniques for inundation assessments. However, there are discrepancies on the "best" strategy to characterize compound floods, and the use of multi-hazard models in government agencies and consulting engineering firms has not been widely implemented. This presentation will highlight the best modeling practices for compound flood models that couple hydrologic and coastal processes. New modeling techniques and applications will be discussed that improve our ability to capture the complex interactions that characterize multiple flood hazards. Results from various case studies along the Caribbean will be discussed, including their application to other geographical areas such as the Gulf of Mexico and the US East coast. This research aim is to identify generalized flood transition zones and enhance the production of flood maps for varying regions in a coastal watershed, which are crucial in

flood risk assessments. The desire is a more holistic compound inundation model that can be a critical tool for decision-makers, stakeholders, and authorities by providing aid in disaster and evacuation planning to potentially save human lives and decrease property damage

Biography: Félix Santiago-Collazo is an Assistant Professor in Resilient Infrastructure for Sustainability and Equity at the School of Environmental, Civil, Agriculture, and Mechanical Engineering at the University of Georgia. Felix holds an M.S. and B.S. in Civil Engineering from the University of Puerto Rico at Mayagüez and a Ph.D. in Civil Engineering from Louisiana State University. Felix has a Professional Engineer (P.E.) license from the Puerto Rico Board and has more than eight years of experience in flood modeling. Felix's research interests include Multi-flood hazard assessments, Hybrid infrastructure solutions, Water equity, and Flood Resilience. He leads the Compound Inundation Team for Resilient Applications (CITRA) research lab, which develops and implements practical solutions to complex flood problems from inland to the coast. The CITRA Lab motto is the nexus between research and application. Felix enjoys spending time with his wife and two children, watching sports, biking, and walking his dog in his free time.

A Fast and Flexible Framework for Flood Damage Assessments

Frederique de Groen, Deltares, frederique.degroen@deltares.nl
Co-presenters: Kathryn Roscoe, Kathryn.Roscoe@deltares.nl

Abstract: Societies are struggling worldwide to cope with the impacts of many types of floods (pluvial, fluvial, flash, coastal, and groundwater). Recent improvements to process-based hydrodynamic models, including the ability to account for compound flooding events, has led to more accurate inundation predictions. Combining these improved inundation results with a rapid, reliable, and easy-to-use tool for assessing economic flood damages will lead to more accurate mapping of spatial flood risk, helping to identify priority areas for adaptation and mitigation investments. This presentation will describe the Delft Flood Impact Assessment Tool (Delft-FIAT), a state-of-the-art tool that calculates flood damages, risk, and risk-reduction benefits of adaptation or mitigation options. Delft-FIAT is flexible and transparent, allowing users to input their own flood maps and to define, view, and modify exposure data and depth-damage curves. It calculates damages at the asset level, including individual buildings, road segments, and utilities, and it outputs damages both at asset level and to user-specified aggregation scales (e.g., neighborhoods). The speed, flexibility, and tested reliability of Delft-FIAT makes it well suited for a variety of uses, such as evaluating adaptation and mitigation investment options, testing impacts of uncertainty in depth-damage curves or exposure data, and connecting with other software in decision-support systems. Delft-FIAT provides a consistent and reliable flood damage calculation framework that can be freely used in the flood mitigation and adaptation community. Collaboration with local, regional, state, national, and international agencies has inspired a research and development plan for Delft-FIAT that includes the processing of social vulnerability in damage assessments, automated uncertainty analysis, supporting wind and wave damage assessment, automated exposure model-building support, and automatically generated damage-output scorecards or dashboards. This presentation is intended to be interactive in exploring ideas for future development with the participants.

Biography: Frederique de Groen is an expert on the quantification of natural hazard impact assessments and modelling human responses. She is involved in the continuous development of Delft-FIAT, RA2CE and the Criticality Tool, which are used to assess natural hazard impacts on buildings, road networks and

critical infrastructures. Her interest also lies in the connection of the physical with the social, using for example Agent-Based Modelling to investigate human responses to climate change effects. With these kinds of methods, she contributes to a new research track within Deltares aiming at improving the understanding of relocation as adaptation strategy in coastal areas.

Concurrent Session E

E1: Hurricane Ian - Stories from the Epicenter: NFIP/Floodplain Management

Hurricane Ian - Stories from the Epicenter
Panel Participants:
Claire Jubb, AICP, CFM, Charlotte County, FL,
Billie Jacoby, CFM, Lee County
Wendy Then, CFM, Town of Lady Lake

Abstract: Hurricane Ian left a wide swath of damage across Florida. As numerous as were the counties impacted, so were the responses and stories of recovery and resilience. Listen to how the leaders in the most damaged areas leaned on their colleagues and volunteers to help with the long road or rebuilding and how they are building back with future storms in mind.

Biographies:
Claire Jubb is the Assistant County Administrator for Charlotte County, FL. She earned a degree in public and private sector management from the University of Wales College Cardiff in the UK. After relocating to the USA, she started working for Charlotte County, FL in the Community Development Department rising to the role of Director in 2015. In 2020, Claire was promoted into her current role. As the Assistant County Administrator, Claire is part of a three-member executive leadership team responsible for the leadership and direction of all government operations for Charlotte County, Florida, a 650 square mile county on the southwest coast of Florida with an annual population of 185,000 rising to 250,000 seasonally.

Claire is a member of the American Institute of Certified Planners (AICP) and a Certified Floodplain Manager and has had oversight of both floodplain management and the community's participation in the Community Rating System for the past sixteen years.

Claire is active with the Association of State Floodplain Managers (ASFPM) and is currently the co-chair of the Floodplain Regulations policy committee. She is also involved with the Florida Floodplain Managers Association (FFMA) and holds the position of Associate Director of Legislation and Policy Champion. In these roles, her goal is to expand the understanding of the importance of regulations, policy, and legislation in floodplain management.

Claire was named Champion of Building by the Charlotte DeSoto Building Industry Association's Professional Women in Building Chapter in 2022, Civic Hero for Building Communities, by Accela Inc. in 2019, was a top ten finalist in the Route Fifty Navigator awards for Leadership in 2019 and was the recipient of the 2019 Florida Floodplain Managers Association Service Award.

Lee County is split into seven municipalities. Billie has been the CRS coordinator for “unincorporated” areas of Lee County for 10 years. As CRS coordinator, she organizes and coordinates the Community Rating System activities and works with FEMA and the Insurance Services Office to document and verify involvement in the National Flood Insurance Program and Community Rating System to ensure that the jurisdiction meets particular responsibilities in order to maintain a Class 5 Rating (25% discount for flood insurance discount in the program). She is a voting member of the Local Mitigation Strategy working group and Disaster Advisory Council. She is also part of the Regulatory Review Supervisor Team for Lee County Department of Community Development which oversees compliance with floodplain management regulations.

Wendy works in Residential and Commercial projects to ensure the implementation of the Town's Land Development Code, the Town's Comprehensive Plan, Florida Statutes and Florida Administrative Code. Wendy started working for the Town in 2006 where she has held several jobs before landing the Senior Planner position. On a typical business day, Wendy researches and prepares specialized planning studies/reports/ordinances; reviews site plans and architectural design standards; and presents before various public board meetings and elected officials. A major component of her time is devoted to the administration of data and analysis of new and existing development within Special Flood Hazard Areas in the Town of Lady Lake for compliance with the NFIP. Wendy proudly serves as one of two FFMA Region 5 Regional Directors.

In 2010, Wendy received a Bachelor's in Arts in Business Administration at UCF and a Master's Degree in Public Administration with concentration in Urban Planning at UCF in 2016. Wendy became a CFM in 2011. Wendy also holds a Florida Real Estate License since 2017 and is a Florida Notary. Wendy also serves as the Town's liaison at the Lake-Sumter Metropolitan Planning Organization.

Wendy is a native of the Dominican Republic and a Florida Resident since 2001. Wendy currently resides in Marion County with her husband and three boys. When she is not spending time with her boys, she is serving as the Vice-chairperson of Hands of Mercy Everywhere, Inc., a non-profit serving teen mothers, pregnant teens, and at-risk population to human trafficking. Wendy also serves as the Vice-chairperson of Delorise Isham-Presley 320 Inc., a non-profit focusing on early childhood literacy support and intervention.

E2: Hazard Mitigation and Resilience Planning: Mitigation

Desert to Coast and In Between: Tailoring Flood Planning Approaches Across Texas
Tressa Olsen, CFM, Texas Water Development Board, tressa.olsen@twdb.texas.gov
Co-presenters: Morgan White, morgan.white@freese.com

Abstract: In 2019, in the wake of historic flooding in Texas, the Texas Legislature authorized and established the regional and state flood planning processes. As we near the conclusion of the first cycle of regional flood planning, we will reflect on how flood planning groups across Texas approached the planning process differently according to their region’s unique characteristics and needs. The Texas

Water Development Board (TWDB) will provide an orientation to the Texas regional flood planning program, including a brief overview of each planning task and how the regional planning process will come together to create Texas' first State Flood Plan in September 2024. Freese and Nichols will present case studies from their work in 12 out of the 15 flood planning regions to demonstrate how Texas' varying geographies, socio-cultural landscapes, and flood risk type and history have impacted regional approaches to planning tasks and activities, such as stakeholder engagement, goal setting, project identification, and flood risk analyses. The impact of varying levels of data quality and availability will also be discussed through case studies from select data-rich and data-limited areas. Attendees will hear how the TWDB created a regional flood planning framework that provided enough flexibility to meet each region's needs while ensuring the consistency required to compile all regional plans into a state-wide plan. This session is intended to be a companion to Reem Zoun's (TWDB), which will provide an overview of findings from Texas' first cycle of regional flood planning.

Biography: Tressa Olsen is the State Flood Planner at the Texas Water Development Board (TWDB). Tressa started at the TWDB as a regional flood planner, providing project management support to three out of the fifteen flood planning group responsible for developing regional flood plans, and has transitioned to leading the State's effort in developing the first-ever State Flood Plan in 2024. Tressa earned a Masters in Community and Regional Planning and a Bachelors in Biology - Ecology, Evolution, and Behavior from University of Texas at Austin. Tressa is passionate about equity, resilience, and sustainability.

Flood Risk in Nature's Wonderland: A Strategy for a Resilience in Buchanan County, VA

Christina Hurley, AICP, Stantec, christina.hurley@stantec.com
Co-presenters: Charlie Westbrook, cwestbrook@res.us

Abstract: This presentation will focus on a strategy developed to reduce flood risk in the hard-hit communities within Buchanan County, Virginia. The county has a history of devastating floods, including major events in 2020, 2021, and 2022.

Topics to be addressed include:

- Challenges around engaging stakeholders and the public in economically disadvantaged communities that have been repeatedly engaged for various flood mitigation efforts, all while recovering from destructive flood events;
- Topographical, environmental, and social complexities in assessing flood risk and considering potential actions to reduce risk, such as increasingly extreme rainfall events, a history of mining impacts, presence of endangered species, and steep slopes that limit most developable land to flood-prone areas;
- Understanding community capabilities and capacity to implement potential flood risk-reduction measures in a county where most officials balance multiple roles as several state and/or federal flood mitigation initiatives are underway; and,
- Developing flood-risk reduction strategies with a focus on nature-based project solutions with additional environmental co-benefits.

Biography: Christina Hurley is a Senior Resilience Planner with Stantec. She has been helping communities reduce their risk to natural hazards for almost a decade, with an emphasis on natural

solutions and climate change adaptation. She is passionate about helping communities at all levels and across all geographies find tailored solutions to enhance resilience.

Charlie Westbrook is an experienced leader in the ecological restoration industry focused on the creation of nature-based solutions for municipal and corporate clients. He is practiced in leading resiliency projects through the formation, implementation and management of turnkey projects that support key clients, channel partners and communities in the areas of:

- Climate adaptation & flood resiliency
- Coastal resiliency & living shoreline
- Environmental mitigation & markets
- Stormwater management & water quality

Planning for Progress: Developing Regional Resilience Portfolios for North Carolina's Eastern Counties

JaLeesa Tate, Tetra Tech, jaleesa.tate@tetratech.com
Co-presenters: None

Abstract: North Carolina's eastern coast is vulnerable to a combination of hazards anticipated to increase in frequency and intensity over the next 30 years. Assessing the adaptive capacity of the region provides a pathway for adapting to a changing climate. The community engagement aspect of the Regional Resilience Portfolio Program (the Program) sets it apart from traditional resiliency and flood risk reduction planning efforts as communications and outreach strategies are tailored to align with the actual vulnerabilities and risks within the community. The Program divides the eastern half of North Carolina into nine regions to focus on the unique characteristics and community composition of each region and develop recommendations and projects specific to each region. The Program prioritizes combining technical data with local knowledge and experiences to ground truth what is occurring in the State. With community engagement at the forefront of the effort, local leaders served as a decision-making body to guide the development of a vulnerability assessment and project portfolio. The vulnerabilities and weaknesses identified in the vulnerability assessment served as the basis for developing regional projects to address current and future hazards. To ensure actionable outcomes, each project was developed with a full implementation guide that identified responsible agencies, anticipated benefits, required permits and approvals, and anticipated permitting and legislative challenges. An equity lens was utilized to prioritize projects with considerations for vulnerable populations, environmental impacts, and socioeconomic benefits as part of the process. This presentation will use the Program as a case study to showcase how climate change impacts and adaptation can be addressed at a regional scale to build community resilience. This presentation will also highlight how community engagement and outreach strategies must be driven by community leaders to build buy-in for projects at the initiation of the effort rather than once it is shovel-ready.

Biography: JaLeesa Tate is experienced in hazard mitigation, floodplain management, and urban planning. She serves as a Senior Community Resilience Professional in Tetra Tech's TDR Division. Her hands-on experience in emergency management and urban planning has positioned her to be a leader in developing strategies and recommendations to build resilient communities. JaLeesa is a recognized

thought leader and has contributed to flood resilience initiatives with the Pew Charitable Trust and Urban Land Institute. She also provided national and statewide resilience guidance through her service as the mitigation committee co-chair for the Maryland Association of Floodplain and Stormwater Managers and chair of the State Hazard Mitigation Officer (SHMO) subcommittee for the National Emergency Management Association. She contributed to FEMA's policy and program development, as a member of FEMA's External Stakeholders Working Group. Prior to joining Tetra Tech, Inc., JaLeesa served as the SHMO and Hazard Mitigation Branch Manager for the Maryland Department of Emergency Management (MDEM). In this capacity, she spearheaded the development of the State's Hazard Mitigation Program and secured and managed over $100M for Maryland to invest in resilience activities. Additional prior roles include serving as the City of Baltimore's Coastal Resources Planner and the Environmental Planner for Wicomico County – City of Salisbury Department of Planning and Community Development. She worked on local water quality improvement and environmental land use in these roles. JaLeesa holds a Bachelor of Science in geography and geosciences from Salisbury University and is a CFM.

E3: Modeling Waves & Surge: Modeling

Application of a two-dimensional hydraulic model in a highway expansion design in Grand Cayman Island

Mostafa Razzaghmanesh, Ph.D. P.E., CFM, Remington and Vernick Engineering Inc., mostafa.razzaghmanesh@rve.com
Co-presenters: Stuart Gause, Start.Gause@rve.com; Joseph Pegnetter, Joseph.Pegnetter@rve.com; Steven Bolt, Steven.Bolt@rve.com; Denis Thibeault, denis.thibeault@nra.ky, Edward Howard, edward.howard@nra.ky

Abstract: Remington & Vernick Engineers (RVE) was retained to prepare a Hydraulic and Hydrologic (H&H) study for the proposed East-West Arterial Highway Extension (about 9 miles) by the National Roads Authority on Grand Cayman, Cayman Islands. Various rainfall data with different time steps were collected from the site. Data was analyzed and used to study the rainfall characteristics and preparing Intensity -Duration – Frequency (IDF) curves. The results of the Grand Cayman Island rainfall analysis and several land data were used to perform a two-dimensional hydraulic model. Three software packages including QGIS, HEC-HMS and HEC-RAS were used to perform the H&H study. The Hydraulic model was used to prepare inundation flood maps under various rainfall events or scenarios. The diffusion wave equation was selected for the two-dimensional (2D) studies in HEC-RAS. The 2D model was run for various 24-hours scenarios. A 2D area of almost 12 sq miles was defined over the study area. The 2D area mesh contained almost 152,000 computational cells. Additional information to run the HEC-RAS 2D model including land use, infiltration, and manning's coefficients. Inundation flood maps for a 2-year, 10-year, 25-year, 50-year, 100-year, and the Hurricane Ivan of September 2004 were prepared. In general, the results showed that, for the studied scenarios, the depth of the floods from a 2-year event to a 100- year event would be between 0.30 ft and 6 ft along the proposed highway. The simulated Hurricane Ivan event also showed a consistency with the Grand Cayman Hurricane Ivan Flooding map of September 2004. In order to design the EW arterial highway, the simulated flood elevations shall be considered. The locations for the proposed highway drainage improvement can be identified. Also, the

results of the coastal and surge analysis, performed by others, shall be taken into consideration for the design of the highway.

Biography: Mostafa has a Ph.D. in Civil Engineering. He is a professional Engineer in the state of New Jersey, Maryland, and District of Columbia. He is a certified flood plan manager and a certified municipal engineer in New Jersey. He has working as a project manager/engineers in multiple land development projects across New Jersey, Pennsylvania, and an international project in Cayman Island. He is supporting the civil engineering, municipal and infrastructure types of projects. In specific he has designed stormwater management systems, hydraulics, and hydrology studies, various agencies permitting (NJDEP, NJDOPT, PADOT and so on). He also functioned as a township and borough engineer in multiple township or boroughs in New Jersey. In terms of research, he has a number of publications, and he is a reviewer of a number of international scientific journals.

Storm surge and wave modeling of Guam/CNMI with evaluation of offshore swells

Michael Salisbury, PE, D.CE, Atkins North America, Inc., michael.salisbury@atkinsglobal.com
Co-presenters: Paul Carroll, PE, PMP, Stantec

Abstract: STARR II is supporting FEMA Region 9 in a Flood Insurance Study (FIS) to update the flood hazard information for the territories of Guam and the Commonwealth of the Northern Marianna Islands (CNMI). The storm surge and wave modeling for the region around Guam and The CNMI is unique, as compared with Atlantic Ocean and Gulf of Mexico, in that this area is affected not only by tropical storms, but also strong offshore swells originating from Northern Pacific, and the presence of fringing reefs surrounding most of the islands denoting a stark transition from deep water to shallow water in a relatively short distance. This presentation will describe a coupled two-dimensional (2D) water level and wave model (ADCIRC+SWAN) to simulate historical swells as well as typhoon events. The model was calibrated/validated for both water levels and waves using a total of four historical storm events. The model is sufficient for the purposes of updating coastal flood maps for Guam and CNMI. The methodology used to understand the relative importance of tropical storms and offshores swells to the flood hazard curve near Guam and CNMI will also be presented, which demonstrates that tropical storms dominate the frequency band of flood risk despite the existence of strong offshore swells near Guam and CNMI.

Biography: Mike Salisbury is currently a Senior Coastal Engineer and the Coastal Modeling Team Leader for Atkins North America, Inc. Throughout his 18-year career, he has served as a project manager and technical lead for studies involving the evaluation of coastal processes and flood hazards for climate resiliency, shoreline restoration, and flood mitigation projects. His particular area of expertise is in the development and application of high-resolution numerical models for evaluating coastal hydrodynamics, waves, sediment transport, and water quality. In his current position, he supports both public and private clients throughout the United States and abroad on projects involving climate change and resiliency, flood risk assessment, mapping, sediment transport, water quality analyses, and shore protection design.

Paul Carroll is a Senior Coastal Engineer with FEMA coastal modeling and mapping experience in Regions IV, V, and IX. He has been the technical lead for 20 coastal Risk MAP studies, leading modeling efforts and managing numerous production teams. He has coordinated multiple public outreach efforts,

including FER and CCO meetings. His technical skills include wave modeling, wave load analysis, coastal structure design, and coastal flood hazard analysis. He has also estimated site-specific Sea Level Rise inundation levels, assessed infrastructure vulnerability, and developed adaptation alternatives to assist communities with resilience planning.

Simulating Hurricanes Irma and Ian with a 2-D Coastal Flood Model

Noemi Gonzalez Ramirez, FLO-2D Software Inc / Riada Engineering Corp, noemi@flo-2d.com
Co-presenters: Karen O'Brien, karen@flo-2d.com

Abstract: Hurricane Ian in September, 2022 once again demonstrated how poorly prepared for storm surge flooding our coastal areas are. Sea level rise (SLR) will exacerbate hurricane flood hazards until mitigation measures are implemented on a city or county wide scale. This trend is already posing enormous challenges with storm drain systems. The importance of having detailed coastal urban flood routing models to design flood mitigation, ensure emergency access and create evacuation routes was forcefully illustrated by Hurricane Ian. Coastal flood prediction based on existing conditions is no longer valid. SLR will exacerbate flooding with a loss of storm drain capacity and rising groundwater levels. Comprehensive flood hazard prediction with a two-dimensional storm surge model combined with spatially hurricane rainfall runoff in a coastal urban area is discussed. Buildings, walls, street flow, drainage channels, and storm drain systems are simulated that add to the complexity of unconfined coastal flooding. The replication of Hurricane Irma and Hurricane Ian flooding in Naples, Florida will be presented. The model has more than 6.5 million cells divided into 4 subdomains. A total of 503 storm drain lines consisting of 6,500 inlets, 1,400 manholes and more than 6,600 conduits constituted the storm drain system. Main canals are simulated as 1-D channels in the model. Some areas are at risk solely by the storm surge while other areas are impacted by the combined rainfall runoff and storm surge. The modeling will support of flood mitigation plans in Naples coastal communities. The FLO-2D model is a two-dimensional flood routing and storm drain model that predicts spatially variable water surface elevations to capture complex flooding in urban areas. The hurricane storm surge is simulated with a time-stage relationship at the shoreline. Spatially varied rainfall and infiltration losses are simulated with hurricane NEXRAD rainfall data.

Biography: Dr. Gonzalez is a water resources engineer with 20+ years of experience developing and applying hydraulic and hydrologic models. She has written code for numerical models of flooding systems and hydraulic conveyance. Dr. Gonzalez has an extensive coding experience in in both finite element and finite difference models and their applications. She has been a project engineer for Riada Engineering, Inc. and FLO-2D Software for the last 15 years. Dr. Gonzalez is the developer of many of the specific tools and features in the FLO-2D model and supporting processor programs. She is the author of FLO-2D storm drain component and has conducted a number of project applications of this component.

E4: New Approaches in Risk Communication: Risk Communication

Flood Risk Communications on a Shoestring Budget: A Grassroots Approach to Community Engagement

Patrick Varga, CFM, Carroll County Government, pvarga@carrollcountymd.gov
Co-presenters: Necolle Maccherone, CFM, Atkins North America, n.maccherone@atkinsglobal.com

Abstract: The Maryland Association of Floodplain and Stormwater Managers (MAFSM) is an all-volunteer organization dedicated to educating the public and stakeholders about flood risk and promoting flood awareness. In June 2022, MAFSM hosted a community event commemorating the 50-year anniversary of Hurricane Agnes and its impacts in Carroll County, MD. Unique elements including trivia, music, and a flood-themed venue added to the event's success. The event engaged the community, educated them about flood risk, and promoted actions to reduce their risk. This session presents a project description, costs and measurable metrics on the reach of the event as well as tips to replicate it. The grassroots approach of hosting a community event on a shoestring budget proved to be effective in engaging the community, promoting flood awareness, and fostering relationships between local government, businesses, and MAFSM. The event reached a significant number of people through digital and in-person interactions, and the materials created for the event had continued use beyond the event timeframe. This low-cost and replicable approach can be adopted by others to spread flood risk awareness and mitigation messaging in their communities

Biography: Pat has worked for the Carroll County Government since 2006 after graduating from UMBC in 2005. He runs the Floodplain Management and CRS programs for the County and also provides GIS support for the Bureau of Resource Management for MS4 and NPDES compliance. His duties also include reviewing local permits, hydrologic and hydraulic analyses, and land developments. Pat also oversees the Forest Conservation, Water Resource Forest Conservation, and Landscaping programs for Carroll County.

Necolle has worked to increase public awareness of sound floodplain and stormwater management in her professional and volunteer work for many years. She has extensive experience communicating technical concepts to non-technical stakeholders. As a project manager for Atkins North America, she supports national policy and program efforts within FEMA's Risk MAP Program related to flood hazard mapping and community engagement. She has also worked on local mitigation planning and climate vulnerability assessment efforts in Maryland. Necolle is the immediate past Chair of the Maryland Association of Floodplain and Stormwater Managers (MAFSM) and a Board member of the Association of State Floodplain Managers (ASFPM).

Building Equitable Resiliency and Risk Communication Tools in Georgia with Online-Mapping Technology

Nick Jones, EADA, GISP, CFM, Dewberry, njones@dewberry.com
Co-presenters: Jarrett Mattli, GISP, CFM, Dewberry, jmattli@dewberry.com

Abstract: Effective flood risk data for rural Georgia areas can be sparse in coverage, outdated, or simply difficult to interact with for many communities. Recent online mapping innovations can provide more equitable access to comprehensive flood information. Georgia has taken advantage of these new technologies to improve data access via a variety of dashboards and web mapping applications. Georgia's BLE homepage provides a significant portion of its population with an opportunity to access extensive flood hazard data in areas where supporting information may not have been previously available. With Georgia's BLE Dashboard, community stakeholders have a more complete picture of

flood risks. This website provides users with the ability to navigate a wide swath of recently completed BLE analysis in Georgia, with more areas on the way. Users can access building footprint level flood hazard results; get at-a-glance reports on depths and water surfaces; see how flooding differs from effective maps; generate printable Lidar-based LOMA reports; and download supporting BLE datasets on the fly. Georgia's Resilience Blueprint website provides an equitable way to access flood risk assessment information through use of public online dashboards and story maps. These resources provide community officials and citizens with an opportunity to learn more about flood risks in their jurisdictions. This collection of dashboards and story maps are custom curated to support community mitigation and planning activities, as well as education and awareness. The Resilience Blueprint provides on-demand access to the following data: flood loss estimates, CRS statistics, soils data, future conditions analysis, freeboard boundaries, approximate dam inundation areas, inundated structures, CSLF statistics, and flood probability. This presentation will demonstrate GADNR's BLE Homepage and Resilience Blueprint sites, demonstrate their use and functionality, provide scenarios for their application, and explain how these sites are important for building equitable access to flood hazard information in Georgia.

Biography: Nick Jones is an experienced GIS specialist with extensive experience working to support hydrologic and hydraulic engineers. This experience includes the production of DFIRM data and maps. Mr. Jones is an expert user of Esri products for digital terrain modeling, Python tool creation, mapping, analysis, and AGOL website development.

Jarrett Mattli is a Senior Project Manager based in Dewberry's Atlanta office. He is a graduate of AuburnUniversity, with over 18 years' experience leading and managing GIS and water resource related projects. Much of his experience has been in support of FEMA's Risk MAP and CTP Programs, where he hasfacilitated flood study updates, conducted GIS analyses, created mapping products and technical reports,coordinated community outreach activities, and guided flood risk assessments.

From Translational to Transformational Flood Risk Communication: How USACE is Shifting its Communication About Dams, Levees, and Flooding

Katelyn Noland, U.S. Army Corps of Engineers, katelyn.m.noland@usace.army.mil
Co-presenters: Phoebe Percell, Phoebe.A.Percell@usace.army.mil; Aaron Smith, Aaron.O.Smith@usace.army.mil

Abstract: The U.S. Army Corps of Engineers (USACE) Dam and Levee Safety Programs are rich with technical knowledge and information about how dams and levees work, how they can fail, and what the impacts are if failure occurs. To date, the programs have placed emphasis on getting the details right and translating that information for public consumption. But often this translation process is arduous and still leaves the agency focusing more on what it wants to communicate instead of framing information and communication to promote action and collaboration to address flooding. This session will provide an overview of a 24-month study USACE completed with HDR-Gannett Fleming on how to improve its communication practice and integrate social and behavioral science-based approaches to engage communities and individuals in flood risk decisions. Presenters will discuss how USACE has updated its communication initiatives based on this study and explore approaches that may be relevant to others in the flood risk community.

Biography: Katie is the Strategic Communication Specialist for the U.S. Army Corps of Engineers (USACE) Dam and Levee Safety and Section 408 Programs. In this role, Katie is responsible for leading the direction of communication within these three programs and supports development of policy, resources, and training that support successful communication and engagement activities. Prior to this position, Katie was a Social Scientist, most recently with the USACE Levee Safety Center where she first got engaged in the Dam and Levee Safety Programs and identifying opportunities to tell the story of these structures and support internal staff in creating conversations about dams, levees, and flood risk management. Katie spent a majority of her USACE career to date working at the Institute for Water Resources (IWR), which is a forward-looking policy office part of USACE. While part of IWR, Katie supported a variety of mission areas with communication, writing, facilitation, policy, and program management support including flood risk management, emergency management, navigation, and other research related activities. Katie joined USACE in 2012 through the Pathways Program. She was a graduate student at George Mason University at the time pursuing a Master of Arts in English, Professional Writing and Rhetoric. Katie completed her degree in 2014, which included a thesis study where she examined risk communication within USACE and how organizational definitions of risk affect interactions with audiences and communication design. Katie completed her undergraduate study at Virginia Tech in 2010 with a Bachelor of Arts in English, Creative Writing.

E5: Nature-Based Project Success Stories: NBF

Naturalization of Fassnight Creek, An Urban Success Story

Eric Dove, PE, HDR, eric.dove@hdrinc.com
Co-presenters: Kirkland Preston, kpreston@springfieldmo.gov

Abstract: Our urban centers are plagued by a variety of concrete storm water conveyance structures. Originally intended for flood control, they have simply moved the flooding to downstream areas while degrading natural stream habitat. It's well documented that nature-based solutions mitigate stream habitat degradation, but can they also perform a vital flood risk reduction purpose in our urbanized neighborhoods? The naturalization of Fassnight Creek in the older Phelps Grove neighborhood is a great example of removing a concrete flood control channel while also lowering the flood stage at the existing Art Museum building and residential structures.

These projects can be challenging, and this project involved:

- Street Diet and a Permanent Closure
- Sanitary Sewer Relocation
- Integration with Art Museum campus masterplan
- Public Park Improvement
- Public Engagement
- Pedestrian Movement
- MoDOT funded Shared Use Path (Bike Trail)
- Complementary Bridge Aesthetics
- Native Plantings

- Natural Channel Design Approach
- Urban Hydrology with no upstream detention
- High flood velocities
- Accelerated Design Schedule
- FEMA Remapping
- Tight Budget with Value Engineering Approaches
- Multiple Bid Lettings and COVID supply chain impacts
- Wet Spring, Summer Drought and Flooding within weeks of completion

Despite the challenges, the results are impressive. Fassnight was recently recognized as an APWA Missouri Chapter Public Works Project of the Year because it demonstrated a functional solution to flood risk reduction which can serve many other beneficial purposes for the community. The naturalized channel is the new grand entrance to the Museum, an inspirational functional piece of living art. During the recent heavy rains, flooding outside of the project remained but the project performed well, and the Art Museum Director said he no longer needs to worry about these "flashy" storms. The ribbon cutting grand opening occurred October 15, 2022 with the Mayor, City Administrator, three Councilmen, the Art Museum director and the Art Museum board of directors presiding.

Biography: Mr. Dove is a Professional Engineer with Bachler's and Master's degree in Civil Engineering. He has nearly 30 years of water resources project experience that includes a significant amount of flood risk reduction projects including dams, levees, bridges, culverts, storm sewers, regional detention, and flood diversion channels. Mr. Dove also frequently works on green infrastructure projects such as stream restoration, and bioretention facilities. His projects frequently involve flood risk map updates, floodproofing (wet and dry), floodplain by-outs and a wide range of flood resiliency projects. His clients include US Army Corps of Engineers, National Parks Service, Department of Transportation for several states, Watershed Districts, Irrigation Districts, and various State, County and Municipal agencies throughout the Midwest. He is the office manager and central region stormwater lead for HDR in their Springfield Missouri office. Mr. Dove was appointed by the Governor to the State of Missouri Dam and Reservoir Safety Committee and has been serving this role for the past two years. Mr. Dove is the past committee chair for the Ozarks Watershed Committee which is a non-profit focused on protection of the water supply sources for the Springfield and Greene County area.

Progressive Design-Build Delivery is Saving Salmon and Reducing Flood Impacts

Alexander Keil, EI, Kiewit, Alexander.Keil@Kiewit.com
Co-presenters: Emily Fulton, Emily.Fulton@Kiewit.com;

Abstract: In March 2013, the U.S. District Court, on behalf of twenty-one northwest Washington tribes, found that the State of Washington has a treaty-based duty to preserve fish runs for native salmon and steelhead. Per a federal court injunction, the State is required to correct over 1,000 existing barrier culverts in Western Washington with 400 required to be completed by 2030. To streamline design and schedule, WSDOT is currently implementing its first Progressive Design-Build (PBD) project. The Coastal 29 project between Kiewit and the Washington State Department of Transportation (WSDOT) aims to correct twenty-nine of these barriers on the Olympic Peninsula as part of WSDOT's developing Fish Passage Program. Typically, these culverts were designed for conveyance only and are inadequately sized, too steep, or have developed sizable drops at their outfalls, blocking miles of critical fish spawning and rearing habitat and discouraging natural channel processes. This presentation will discuss the

unique solutions the Kiewit design team developed through the PDB delivery model in response to the need for low impact solutions to restore natural, dynamic channel processes while protecting necessary infrastructure in the Olympic Peninsula region. Due to the rapid growth of the WSDOT Fish Passage Program, the design team was challenged with developing and analyzing innovative geomorphic components to mimic natural channel complexity features that provide stability and habitat to the reconstructed reach. Through the use of two-dimensional hydraulic modeling software, the team designed complex channels, incorporating habitat elements, and performed floodplain analyses. The project alleviates backwater flooding effects, thus reducing inundation loss of roadways and adjacent properties. The Kiewit team's holistic design approach provides a resilient and sustainable engineered solution that minimizes impacts to both the built and natural environments while meeting the needs of the project and local community.

Biography: Alec Keil graduated from the University of Illinois at Urbana-Champaign in 2020 with a Bachelor of Science in Civil Engineering with a primary focus of study in Energy-Water-Environment Sustainability. He is a Water Resources and Drainage Engineer at Kiewit Infrastructure Engineers in Lone Tree, CO where he has worked on stormwater conveyance and stream design for various infrastructure projects. Through his experience Alec has become proficient in 1D and 2D hydraulic modeling and the principles of open-channel flow and river mechanics.

Geomorphic Approach to Addressing Flood Risk, Natural System Functions and Infrastructure Resilience at River-Road Crossings

Salam Murtada, MN DNR, Salam.Murtada@state.mn.us
Co-presenters: Kevin Zytkovicz

Abstract: Improving bridge and culverts designs at river intersections requires a transformative ecological system-based approach. As a result, the Geomorphic Approach applies geomorphic principles and incorporates local land measurements for designing these crossings through iterative analysis and hydraulic modeling. Specifically, it promotes both channel and floodplain connectivity through the roadway to establish a 'least impactful' design; improving safety and resilience; reducing maintenance while fostering river function and stability. By focusing only on water conveyance and ignoring sediment, the traditional design methods can impact our natural rivers in many ways. For example, confining all flows to a single channel and overlooking floodplain conveyance creates Flood Flow Confinement (FFC). FFC adversely impacts waterways and road infrastructure through scour, head-cuts, discontinuity of flow and sediment transport dynamics commonly resulting in increased structure maintenance and channel bank erosion. These impacts may further be exacerbated by both climate and land use changes. Thus, applying this natural systems-based design approach on a large scale is essential to safe transportation and resource resilience. The Geomorphic Approach to Infrastructure Design at Road-River Intersections requires a local site assessment to document key measurements based on existing natural conditions and serves as a basis for the proposed design. The assessment requires treating the channel and the floodplain as independent design entities. The design can be further optimized and refined in many ways. This presentation will provide a broad overview of the Geomorphic Approach and examples of applied projects in Minnesota.

Biography: Salam is a floodplain hydrologist working at Minnesota's Department of Natural Resources, Division of Ecological and Water Resources. He has two master of engineering degrees from West Virginia University, Morgantown, in Civil and Environmental Engineering, and Petroleum and Natural

Gas Engineering. He earned two undergraduate degrees in engineering from the University of Texas at Austin. His current projects include hydrological modeling using Gridded Surface Subsurface Hydrological Analysis (GSSHA) to evaluate the effects of land use and benefits of various BMPs on the hydrological system; applying floodplain connectivity and related geomorphic principles to designing river crossings; FEMA floodplain modeling and mapping; and review of FEMA's LOMR/CLOMR submittals. In addition, Salam is currently the VP for Institute Development for the American Institute of Hydrology. Before moving to Minnesota in 2008, Salam worked at North Carolina's Ecosystem Enhancement Program as water resource engineer. Salam enjoys attending and presenting at national and state conferences on topics related to watershed modeling, geomorphic approaches to designing infrastructure and stream restoration.

E6: State Lessons Learned Responding to Recent Disasters: Post-Disaster

Kentucky Division of Water's Eastern Kentucky Flood Response

Carey Johnson, CFM, Kentucky Division of Water, carey.johnson@ky.gov
Co-presenters: Mike Greene, mike.greene@stantec.com; Ben Conley, benjamin.conley@aecom.com

Abstract: Late July 2022, thirteen counties in Eastern Kentucky experienced catastrophic flooding. Kentuckians, who have lived on their land for generations, lost everything in a matter of hours. Ultimately 39 lives were lost because of the devastating record flooding that occurred. For those that remained, they were left with crippled infrastructure from essential facilities lost. Members of KDOW, KYEM, KYTC, and other state agencies as well as national entities including FEMA, EPA, and USACE came together to lend their respective expertise in transformative data sharing and analyses to assess and act swiftly to support Eastern Kentucky. DOW is responsible for helping citizens of the Commonwealth understand, prepare for, and mitigate potential flooding risk. Prior to the July 2022 Eastern Kentucky Flooding event, the state was in the process of updating the flood hazards across most of the impacted counties. In sharing these results with the partner agencies, the focus shifted to assess the impacted infrastructure under DOW's purview: the water and wastewater systems. Considering most of this infrastructure was buried, aged, and inadequate before the record flooding, assessing the impacts from the storm proved to be no simple task. DOW relied upon community disaster response evaluations, reported outages, GIS infrastructure mapping, and aerial imagery of impacts to intersect with the updated flood hazards. The resulting assessment was shared with the partner agencies in their response with local communities in their recovery efforts. A web map was compiled with all draft preliminary flood hazard data along with water surface elevations and building footprints. Following the disaster, DOW deployed personnel to aid in floodplain permit applications so local communities could begin building back their livelihoods. This presentation will show that Eastern Kentucky has always been a resilient community, and DOW's informed decision-making tools will help to make those community's mitigation efforts even greater.

Biography: Carey Johnson is Director of the Division of Water within the Kentucky Department for Environmental Protection in the Energy and Environment Cabinet. For the past 20 years, he has led Division efforts to meet Clean Water and Safe Drinking Water Act goals, manage and enhance resilience to natural hazards, and in developing and utilizing digital tools. He serves as the state lead for Kentucky

Silver Jackets collaborative efforts with the US Army Corps of Engineers and is a current member of the Technical Mapping Advisory Council (TMAC); a federal advisory committee established to review and make recommendations to the Federal Emergency Management Agency (FEMA) on matters related to the national flood mapping program. Carey is currently serving as the Immediate Past Chair of the Association of State Floodplain Managers (ASFPM).

Simplifying Substantial Damage Estimates (SDEs) for Rapid Deployment

Traci Sears, CFM, MT DNRC, tsears@mt.gov
Co-presenters: Maria Cox, Cox@dnr.sc.gov; Anthony Moritz, Anthony.Moritz@mt.gov

Abstract: It is critical for local communities to get SDE information as soon as possible, but the very thought of conducting SDEs after a large disaster can overwhelm most floodplain managers. In June 2022 Montana was impacted by historic floods. The State Montana with the assistance and guidance of South Carolina were able to provide rapid response and support to local communities. Presenters will provide information on responding to the local and state request for support and understanding the SDE process. Additional lessons learned include innovative spreadsheet that helped simplify the SDE process, how SDE teams were put together to maximize response time, utilizing reporting tools in the field, merging existing land use data, SDE tailored results for the local community and community follow-up.

Biography: Traci Sears is a CFM and the National Floodplain Insurance Program (NFIP) Coordinator for the State of Montana. She works with local communities, state, and federal partners on flood recovery, the CRS, mitigation, flood insurance, policy issues, and permitting to reduce flood losses and build community resilience. Ms. Sears is a founding member of the MT Silver Jackets Program, the MT Stream Restoration Committee, MT CRS Users Group, the National Hazard Mitigation Association (NHMA), and the Resilience Neighbors Network (RNN). She is a member and board liaison of the Association of MT Floodplain Managers (AMFM). She is actively involved in national flood policy issues and is the current ASFPM Region 8 representative. She recognizes the importance of advocacy for the states. She has been passionate about the association's transparency and marketing of accomplishments and services.

Making New York State more resilient to flooding and ice jamming

Mark Carabetta, PWS, CFM, SLR, mcarabetta@slrconsulting.com
Co-presenters: Mieke Scherpbier, SLR, mscherpbier@slrconsulting.com

Abstract: In the early 2010's, New York State was hit by a series of storms, including Hurricanes Irene and Sandy, causing widespread flood damage. In response, the New York State Department of Environmental Conservation created the Resilient NY Program, which has a goal of improving community resiliency to extreme weather events that result in flooding and ice jam formations. In this presentation we will provide an overview of the Resilient NY Program, discuss unique characteristics of the watersheds we've studied, share lessons learned about stakeholder engagement, and provide examples of hydraulic and ice jam analyses we've undertaken and flood mitigation strategies we've recommended through the course of our studies. The presentation will feature examples of successful flood mitigation projects that have advanced from the study phase, to engineering design, to construction.

Biography: As an Environmental Scientist with over 25 years of experience in the US and Canada, Mark specializes in the science of wetlands and rivers. He is a Professional Wetland Scientist and a Certified Floodplain Manager with degrees in Botany, Natural Resources Management, and Engineering. Mark lives with his family in the Hudson River Valley.

Mieke is a water resources engineer, working on flood mitigation studies and resilient design. She has experience in coastal and river engineering, having studied in the US and the Netherlands. She is a recent transplant to New York State and enjoys exploring the trails, streams, and towns in the area.

E7: Climate Change Models: Climate Change

Building a Web App for Future Climate Precipitation-Frequency Analysis

Thomas Williams, PE, WSP, thomas.williams3@woodplc.com
Co-presenters: None

Abstract: Due to climate change, the shape of future extreme precipitation likeliness is uncertain. This is problematic for floodplain managers, public works departments, transportation agencies, and other water resources stakeholders, because extreme event estimates drive risk planning and engineering design. However, using appropriate datasets and techniques, future extreme precipitation can be estimated. WSP developed a web application (ClimateEVA) for analyzing downscaled global climate model (GCM) future precipitation and current NOAA Atlas-14 data, producing future climate precipitation-frequency estimates that are relevant at a local scale. Currently leveraging the LOCA CMIP5 downscaling, this application covers the extent of Atlas-14 within the lower 48 states. Analysis is dynamic; time periods, climate model groups, statistical distribution types can be adjusted as necessary. Estimates are provided for both the RCP 4.5 ("intermediate") and RCP 8.5 ("no action") climate modeling scenarios. Resulting "future climate" precipitation-frequency curves can help inform long-term planning.

Biography: Thomas Williams is a water resources engineer and software engineer at WSP. His background is in hydrology, hydraulics, and GIS. He works on building applications related to flood alerts, climate change, and H&H modeling.

Climate Mapping for Resilience and Adaptation Assessment Portal: Informing Communities How Climate Change Impacts Our Nation

Jon Ordog, PMP, ABS Group, jordog@eagle.org
Co-presenters: Nathan Montague, nmontague@eagle.org

Abstract: In collaboration with NOAA, DOI, and ESRI, the Biden-Harris Administration released the Climate Mapping for Resilience and Adaptation (CMRA) portal that allows communities to view their exposure to extreme weather events in the face of a changing climate. The CMRA has a wealth of data that includes current and future climate conditions, social vulnerability, building codes, and social equity. Communities can use the CMRA's data to build climate resilience plans and obtain federal grant funding to build back better for homes and infrastructure. This presentation will showcase the

powerful tools within the CMRA portal, advanced use cases to determine climate change exposure across five hazards (Riverine Flooding, Coastal Inundation, Extreme Heat, Drought, & Wildfire), and how this platform can efficiently link climate risk with grant funding to increase a community's resilience. Through ABS Group's support to FEMA's Climate Change Response and Recovery Planning Guidance; RiskMAP Program, National Planning Branch, and National Hurricane Program, our team has utilized CMRA, the National Risk Index, Hazus, and other natural hazard and climate change tools to better inform communities of their risk exposure over time.

Biography: Jon Ordog is a recovering educator and international exchange coordinator turned project manager who supports FEMA and other federal government clients in everything from curriculum design and development to data creation to project management. Over the past five years, he has spent the majority of his time on risk analysis and mitigation projects related to the risk modeling software "Hazus", supporting the National Hurricane Program, and working with the US Coast Guard. Loath to get too far away from his teaching roots, he is currently pursuing an M.Ed. in adult education from NC State (Go Pack!).

Evaluating Impacts of Sea Level Rise at SR 30 Bridge over St Joe Bay Inlet

Rosemary Cyriac, Atkins, rosemary.cyriac@atkinsglobal.com
Co-presenters: Mike Salisbury, PE, DCE Email: Michael.Salisbury@atkinsglobal.com

Abstract: The National Cooperative Highway Research Program (NCHRP) Transportation Research Board developed the NCHRP 15-61 guidance document for incorporating climate change impacts into the design of transportation infrastructure projects. Specific to projects located near tidally dominated waters along the coast, the document provides guidance for incorporating sea level rise (SLR) into the design process to increase resiliency and mitigate against future climate change impacts. After the release of this document, the NCHRP engaged state Departments of Transportation to review the document and perform pilot studies to test the implementation of the new guidance. To this end, the Florida Department of Transportation (FDOT) Central Office Drainage Group requested that Atkins perform an example application of the procedures provided in NCHRP 15-61 to incorporate climate change (specifically SLR) for a coastal bridge project. The SR 30 (US 98) St. Joe Bay Inlet Bridge was used as an example case and the Relative Sea Level Rise (RSLR) over the design life of the project was estimated following the six-step procedure described in the NCHRP 15-61 guidance. A Level 2 analysis was then performed incorporating the RSLR value into the model setup and the design storm surge and wave scenarios were re-simulated. Results of the model simulations with and without RSLR included were compared and used to re-calculate wave forces on the bridge deck. Results of the revised wave force calculations indicate a significant increase in the wave loadings on the bridge structure. Finally, a probabilistic approach was implemented to estimate the impact of SLR on future extreme water levels at the location of the bridge. This analysis is less complex than a Level 3 analysis, which is a more robust assessment that requires a large number of model simulations to consider the joint probability of storm surge and SLR events. In the present work, an extreme value analysis was conducted on a set of combined water levels obtained by considering a superposition of storm surge and SLR effects and the result is a flood risk curve that better captures the potential risk to the bridge over the lifetime of the structure compared to deterministic methods. This presentation will describe an example application of incorporating climate change impacts in the design of coastal infrastructure and will demonstrate a unique probabilistic approach to compute future extreme water levels at a project site in the presence of future SLR.

Biography: Rosemary Cyriac is a Senior Engineer at Atkins and is a member of the Water Resources Team in Raleigh. She graduated with a PhD in Civil Engineering, with an emphasis on coastal modeling, from North Carolina State University in late 2018. In her last 3.5 years at Atkins, she has enjoyed working on building hydrodynamic models for hydrology and hydraulic analysis, assisting in coastal engineering projects and applying geospatial programming techniques for automating geospatial workflows and packaging deliverables.

E8: Stormwater Asset Management and Data-driven Decision Making: Stormwater

Going with the Flow: Developing Enhanced GIS Datasets to Support NPDES Compliance and Stormwater Initiatives

Neal Banerjee, PE, CFM, LJB, Inc., nbanerjee@ljbinc.com
Co-presenters: None

Abstract: Many communities in country have stormwater programs that are charged not only with the task of managing/addressing stormwater operations, maintenance, and program needs, but also complying with Municipal Separate Storm Sewer System (MS4) permit (associated with the EPAs National Pollutant Discharge Elimination System (NPDES)). One requirement of the permit is to maintain a map of the "major" outfalls. This has proved to be challenging for many communities as the definition of what constitutes a major outfall has been ambiguous and/or difficult to determine. ESP supported the City of Raleigh, NC in a recently completed initiative to identify outfalls not only for NPDES compliance, but also to support a number of general stormwater/water quality initiatives. ESP developed GIS workflows and performed evaluations to identify and classify over 2,700 outfalls. In addition, ESP developed several enhanced citywide data products (e.g. drainage area and %impervious aware networks) to support a variety of stormwater initiatives. This presentation will provide an overview the City's initiative and share workflows, lessons learned, and discussion on enhanced datasets.

Biography: Neal Banerjee is a Water Resources Department Manager for ESP in the Charlotte region. He has over 27 years of experience in water resources engineering and GIS supporting a wide variety of projects and clients. His experience includes FEMA/CTP flood insurance study updates, municipal master plans and drainage projects, flood mitigation planning, stream restoration, and data collection and GIS/database development for variety of projects. Banerjee holds a master's degree in Civil Engineering from the University of North Carolina-Charlotte, and bachelor's degrees in Civil Engineering and Anthropology from the University of Illinois. Neal has specialized expertise developing/integrating GIS workflows for use with municipal stormwater applications.

Resilient infrastructure. Great idea. Where do I start?

Joe Waln, PE, CFM, Barr Engineering Co., jwaln@barr.com
Co-presenters: None

Abstract: This presentation will show how communities can more efficiently invest in resiliency projects by using infrastructure vulnerability assessments based on qualitative risk assessments. We strive to

make our communities more resilient, but it is not always obvious which projects are the most impactful. Some infrastructure deficiencies may be highly visible, but the consequences of failure are small. Other problems may be hard to see, and the consequences of failure are severe. Using GIS datasets, asset management tools, and system modeling, communities can quantify failure risk as a function of the likelihood of failure and the consequences of failure. The complexity of these calculations can be scaled based on the available data. Risk of failure scores can be used to prioritize projects for replacement, repair, and maintenance. Potential projects can also be cross-referenced with other objectives such as water quality improvement, utility upgrades, and road repairs to achieve multiple objectives at the same time. This presentation will discuss the general principles for developing an effective infrastructure vulnerability assessment and highlight examples of how different public entities have used vulnerability assessments to prioritize investments in storm sewer systems, sanitary systems, and slope stabilization.

Biography: Joe Waln has 19 years of experience in civil and water resources engineering. He is a certified floodplain manager who frequently works on the study, design, and construction of flood risk reduction projects. Joe is the past board chair for the Minnesota Association of Floodplain Managers. Prior to his career in engineering, Joe spent three years teaching high school in Pensacola, Florida, and Santiago, Chile. Whether teaching, engineering, parenting, or coaching, Joe enjoys learning and helping others succeed.

Playing Favorites: City of Fort Worth's Channel Rehabilitation Project Development Program (CRPDP)

Mio Matsumura, P.E., CFM, Walter P Moore, MMatsumura@walterpmoore.com
Co-presenters: Justin Naylor, P.E., CFM, PMP, City of Fort Worth, justin.naylor@fortworthtexas.gov

Abstract: Asset management is an integral part in guiding capital improvement project planning. Since cities operate within budget restrictions, it is crucial that they develop a programmatic method to most effectively allocate funds. This presentation will provide an overview of the development of the City of Fort Worth's channel rehabilitation program. Steps for program development included the creation of a project charter, stakeholder involvement and development of channel rating criteria. Criteria was separated into Consequence of Failure and Probability of Failure categories to calculate the Business Risk Exposure for each asset. An alternatives analysis was prepared for the top ranked channels which included evaluation of various construction materials and phasing with consideration to USACE Section 404 permitting restrictions and cost-effective prioritization of critical repairs. Through this effort, a framework was developed to objectively select projects based on business risk to move forward to preliminary design.

Biography: Mio Matsumura is a Senior Engineer in Walter P Moore's water resources team with twelve years of experience. She has experience in both the public and private sector employment. Her projects include a breadth of engineering experience involving bridge and culvert hydraulic modeling, master drainage plan development, detention facility designs, channel modification, and hydraulic structure designs.

E9: Equity Considerations in Mitigation: Mitigation

Mining Equitable Hazard Mitigation Projects in Ohio's Socially and Flood Vulnerable Communities
Dan Blanchard, Ohio EMA, dpblanchard@dps.ohio.gov
Co-presenters: None

Abstract: The Biden Administration, under Executive Order 14008, has committed to investing in disadvantaged, marginalized, and underserved communities through the Justice 40 Initiative, which has a goal of directing 40% of Federal investment to disadvantaged populations. Two of FEMA's Hazard Mitigation Assistance (HMA) programs, Building Resilient Infrastructure and Communities (BRIC) and Flood Mitigation Assistance (FMA), were chosen to undertake the Justice 40 Initiative to maximize the benefits that are directed to disadvantaged communities. The Justice 40 Initiative Guidance asks agencies to consider appropriate data, indices, and screening tools to determine whether a specific community is disadvantaged based on a combination of variables. FEMA has selected the CDC's Social Vulnerability Index as the dataset to determine if a community is disadvantaged and has incorporated the Index into the BRIC and FMA competitive criteria in the 2021 and 2022 program cycles. FEMA's HMA division has identified barriers that may prevent underserved communities from applying for hazard mitigation grants which include the local cost share requirement and lack of capability when it comes to mitigation planning and project development and management. Understanding that disadvantaged communities may lack the resources to identify and develop HMA projects, Ohio EMA has set out to identify where socially vulnerable populations may be experiencing flood events with the aim to develop HMA projects and sub applications that benefit disadvantaged communities. This presentation will show OEMAs efforts in using State and Federal resources, tools, and knowledge to identify potential HMA flood mitigation projects that benefit socially vulnerable and disadvantaged populations in Ohio, review Ohio's past mitigation efforts to assess the level of benefits disadvantaged populations have received, and present how the coordination with local communities can proactively develop quality HMA sub applications. This presentation will review the tools and datasets used by the Ohio EMA team to identify locations experiencing social vulnerability and flood risk, which may be a useful model for other states and communities to follow.

Biography: Dan is a Hazard Mitigation Specialist with the Ohio Emergency Management Agency. With over 6 years in public service at the Ohio EMA and Ohio EPA, Dan has gained experience in hazard mitigation grants, project management, public finance, environmental planning, and State Revolving Loan Funds. In his current role, Dan assists Ohio communities in applying for HMA opportunities and has served on the BRIC National Qualitative Review Panel in 2021. Dan received an undergraduate degree from Ohio Wesleyan University and a Master's Degree in City and Regional Planning from The Ohio State University. His professional interests include floodplain management, hazard mitigation, and urban resilience.

Planning for Resilience Investments: Prioritizing Areas of DC By Equity and Risk

Andrea Limauro, District of Columbia Department of Energy & Environment, andrea.limauro@dc.gov
Co-presenters: Lily Cheng, lily.cheng@dc.gov; Katherine Duskin, katherine.duskin@arcadis.com; Adam Blumstein, adam.blumstein@arcadis.com

Abstract: In the current landscape of unprecedented amounts of Federal funding for resilience and flood mitigation, it is essential for communities to understand which areas have the greatest need for investment. The District of Columbia has developed a proactive approach to identifying areas that should be prioritized for future mitigation projects. Balancing considerations of flood risk, equity, and

potential for cascading impacts, this framework will allow the District to channel planning and implementation funding to areas where it is most needed. The DC Department of Energy and Environment (DOEE) and Office of Planning (OP) developed a Resilience Focus Area (RFA) Strategy as a guide for prioritizing future flood mitigation projects. The District defined RFAs as areas of high flood risk where future planning efforts should be focused to ensure resilience to flooding. Within the RFAs, the District will encourage the implementation of neighborhood scale and site-specific solutions, and will design guidelines and policies for a climate-adaptive city. The RFA strategy aligns with other District policies and plans centered around mitigation and adaption to climate change. DOEE and Arcadis evaluated the characteristics of each RFA based on various metrics, grouped into five major framework categories: Population, Flood Potential & Damages, Equity, Critical & Resilience Assets, and Actionability. A prioritization matrix was developed using various metrics calculated from GIS-based evaluation of available data within these categories. The matrix was used to tabulate scores within the six categories and to rank the RFAs. The goal of this presentation is to discuss the unique approach and methodologies used by the District to rank the RFAs and prioritize future flood mitigation projects. This presentation will summarize how DOEE has engaged various stakeholders throughout the process, discuss data driven strategies for development of the prioritization and scoring, and outline how the final rankings will be used to inform future decision making.

Biography: Andrea Limauro is a resilience expert and a city planner with over 15 years of experience leading community planning, sustainability, resilience and industrial strategies for local governments in Baltimore, MD and Washington, D.C. Most recently Andrea led the creation of the Resilience Focus Areas (RFAs) program for the District Department of Energy and Environment (DOEE) which seeks to create community-tailored flood resilience plans for all the areas at risk of flooding in the Capital. Andrea is currently managing the creation of the city-wide RFA Strategy which seeks to prioritize areas for flood resilience planning. Andrea is also leading the completion of the first RFA plan for the SW and Buzzard Point communities in Washington, DC and its first phase of implementation through a combined local/FEMA budget of $24 million. Prior his work with DOEE and, prior to that, with the DC Office of Planning, Andrea was a community planner for the Western District of the City of Baltimore for four years, worked on re-entry programs for ex-offenders in Chicago's west side, analyzed the effectiveness of rehabilitation programs for former child soldiers in Sierra Leone, and managed rural community development projects in war-ravaged Angola. Andrea holds a Master in Urban Planning and Policy from the University of Illinois at Chicago, where he was the recipient of the Provost Award for Graduate Research. Andrea holds a BA in Politics and Sociology from the University of Essex in the United Kingdom and a Graduate Diploma in International Cooperation and Development from the University of Padua in Italy.

The BRIC Wall: Capacity Gaps and FEMA Hazard Mitigation Grants

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

Abstract: FEMA's Building Resilient Infrastructure and Communities (BRIC) program, now in its third grant cycle, represents an important investment in pre-disaster hazard mitigation. However, while FEMA leadership has touted BRIC as a key part of the agency's shift to focus on equity—and while the agency has taken positive steps to improve program criteria and requirements—a lack of local capacity means that applying for funds is out of reach for many of the communities that most need assistance. This presentation will describe the results of a new analysis, which investigates the characteristics of counties

with successful and unsuccessful BRIC proposals. We find that BRIC subapplications (even ones that aren't selected) tend to come from areas with more expensive assets at risk, higher-capacity local governments, and fewer socially vulnerable communities compared to the nation as a whole. The presentation will summarize the equity and resilience implications for FEMA grant programs and discuss policy solutions to address the capacity gap.

Biography: Anna Weber's work seeks 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. Her areas of focus include home buyouts, the National Flood Insurance Program, and the distributional (in)equity of hazard mitigation grants. Prior to joining the Natural Resources Defense Council in 2018, she spent ten years at the Cadmus Group, where she supported U.S. Environmental Protection Agency contracts related to water infrastructure and environmental health. She holds a bachelor's degree in geology and a master's of public health with a concentration environmental health science and policy. She is based in NRDC's Washington, D.C., office.

Concurrent Session F

F1: State FPM Initiatives: NFIP/Floodplain Management

Best Practices for Floodplain Management Program Reviews: A State's Perspective
Yi Chan, CFM, Atkins, yi.chan@atkinsglobal.com
Co-presenters: Manuel Razo, manuel.razo@twdb.texas.gov

Abstract: This presentation will provide an overview of the tools and methods used to streamline the permit review and community evaluation process, as well as lessons learned and tips for implementing this in your own state. In Texas, there has been an effort to provide assistance and oversight of local community floodplain management programs by conducting a large volume of Community Assistance Visits (CAV), with a focus on high-risk communities that have been impacted by floods such as Hurricane Harvey in the last several years. The State of Texas and Atkins worked jointly to complete essential components of the CAV process for five communities in the span of a month. This work involved floodplain tours and development activity documentation using the ArcGIS collector app, a review of floodplain program documentation (including permits, elevation certificates, site plans, and LOMCs), identifying potential violations, and suggested CAV follow-up actions. This presentation includes an overview of the custom CAV assessment documentation tools developed during this effort, that efficiently documented and communicated findings and allowed for a seamless transition of information, so that anyone could get a clear overview of a community's potential programmatic deficiencies and continue to the next steps of the audit process. This project provides an example of how contracted services can successfully support a state's workload, while still allowing the state program staff to be present in the process and build and maintain relationships with the local communities. While the CAV process is changing, states can still use the tools covered in this presentation to help evaluate local floodplain management programs.

Biography: Yi Ling Chan is a Planner at Atkins. Prior to working at Atkins, she served as the State NFIP Coordinator of Texas, where she provided floodplain management, National Flood Insurance Program,

and Community Rating System support, education, and technical assistance to over 1270 floodplain administrators in Texas. She has a M.S. in Geography with a GIS Certificate from Louisiana State University, and a B.S. Mathematics/B.S. Geography from the University of Louisville.

Benefits of NCDOT's partnership with NCDPS: NFIP compliance, Mapping, Flood Monitoring and beyond.

Brian Radakovic, PE, CFM, NCDOT, bmradakovic@ncdot.gov
Co-presenters: Abhijit Patil, Ph.D, NCEM North Carolina Floodplain Mapping Program, abhijit.patil@ncdps.gov

Abstract: The mission of North Carolina Department of Transportation (NCDOT) is connecting people, products, and places safely and efficiently with customer focus, accountability, and environmental sensitivity to enhance the economy and vitality of North Carolina. North Carolina Department of Public Safety mission is to safeguard and preserve the lives and property of the people of North Carolina through prevention, protection, and preparation with integrity and honor and as a Cooperating Technical Partner (CTP) is delegated the responsibility 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 NCDPS recognized the need to function in a collaborative partnership in order to effectively deliver NFIP compliance for NCDOT's multi-modal transportation programs, ensure DFIRMS have the best available data and protect the safety of the traveling public from flooding hazards. This led to the 2008 signing of the MOA (recently updated in 2021), which allows for efficient use of both agencies' resources and has been developed in a manner to streamline project NFIP approval to maintain construction schedules in a cost-effective way, provide NCDOT funded positions within NCDPS to achieve shared goals, and to expand the flooding alert tools with North Carolina. NCDOT's Highway Floodplain Program and NCDPS's North Carolina Floodplain Mapping Program (NCFMP) work together to manage this MOA. This presentation will discuss how the MOA between NCDOT and NCDPS has served to mutually benefit both state agencies in fulfilling their respective missions and goals. 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: Brian M. Radakovic, PE, CFM has a BSCE and MSCE degrees from University of Florida and has over 14 years of experience in the NCDOT Hydraulics Unit. He is currently the Highway Floodplain Program Manager involved in coordinating FEMA NFIP compliance for NCDOT projects. He also 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 various data resources.

Florida Pilot Program to Advance Floodplain Management Compliance Among Communities

Conn Cole, Florida Division of Emergency Management, Conn.Cole@em.myflorida.com
Co-presenters: Kristabel Moore, kristabel.moore@em.myflorida.com

Abstract: Florida, like other States, implements State coordination of the NFIP using the Guidance for Conducting Community Assistance Contacts and Community Visits (FEMA F-776), which has historically been a cumbersome and inefficient process. The traditional CAV process limits the effective number of visits that States can conduct during the CAP-SSSE period of performance each year. CAVs may also

remain unclosed when local staff refrain from participating in training that would otherwise enable them to resolve potential compliance issues more effectively. Florida Division of Emergency Management Office of Floodplain Management's (FDEM OFM) created the State Coordinating Office Regional Engagement Community Assistance Visit (SCORE-CAV) Pilot Program to advance floodplain management compliance among communities by maximizing outreach, education, and field verification in a streamlined, efficient, and accountable manner. The SCORE-CAV process utilizes a three-tiered approach which consists of a floodplain field assessment of each community, a regional plenary interactive session, and an individual meeting with communities to discuss issues pertaining to each community's floodplain management program and compliance matters. This session explores how the SCORE CAV Process achieves notable successes, enabling communities to share their positive and adverse NFIP regulatory experiences, identify common solutions to identified problems, build a collective body of knowledge throughout the State, further the application of higher standards achieved through the Florida Building Code and State Model Flood Ordinance, boost CRS participation, and encourage implementation of Florida's Floodplain Management Performance Measures and Florida Post-Disaster Toolkit for Floodplain Administrators.

Biography: Conn Cole is a Certified Floodplain Manager with over 30 years of experience in public service, public administration, emergency management, and disaster mitigation. Conn currently holds the position of State Floodplain Manager and Florida National Flood Insurance Program State Coordinator with the Florida Division of Emergency Management. In this role, Conn serves as a resource for Florida communities participating in the National Flood Insurance Program by helping them manage their floodplain management programs and supporting their efforts toward becoming more flood resilient. Conn also oversees the Division's State Floodplain Management Program, which works with Florida's communities to help them successfully manage development in flood zones. Before joining the Division in 2018, Conn served in various positions at the state and local level in Georgia for 28 years. During this time, he's held the positions of Right-of-Way Coordinator, Interim Director of Roads & Bridges, Code Enforcement Officer, Erosion & Sedimentation Control Investigator, Erosion & Sedimentation Plan Reviewer, Deputy Director of Emergency Management, County Floodplain Administrator, Community Rating System Administrator, and Magistrate Court Judge. Conn is a graduate of Columbia Southern University, where he received a Bachelor of Science in Criminal Justice Administration and a Master of Business Administration/Public Administration. Conn is also an active member of the Association of State Floodplain Managers, the Florida Floodplain Managers Association, and the Building Officials Association of Florida.

F2: Mitigation Case Studies and Technique Spotlight: Mitigation

Elevation Implementation Q&A

Michelle Gonzales, CFM, Jefferson Parish, mgonzales@jeffparish.net
Co-presenters: Kim Reeves, kimreevescfm1031@gmail.com

Abstract: This presentation will follow a Q/A format where local hazard mitigation offices will ask experienced elevation contractors about the process of elevation as well as discuss many of the questions property owners may have when implementing their FEMA approved elevation grant.

Biography: Michelle has been working in the disaster recovery field since 2006. She started as a FEMA housing advisor with the individuals in FEMA trailers after Katrina, facilitated Severe Repetitive Loss applications throughout the State of Louisiana, managed hazard mitigation grants for 4 of the hardest hit parishes from Katrina, served as Director of Floodplain Management and Hazard Mitigation in Jefferson Parish, and is currently the Ecosystem and Coastal Management Director in Jefferson Parish. Michelle has counseled flood victims for years, however never knew the defeat a flood can bring until her childhood home flooded in the Baton Rouge area in 2016. Experiencing a flood personally has changed Michelle's approach to grants management and risk education and outreach. Michelle was the ASFPM Region 6 Representative for 4 years and currently serves as the Chair of the Louisiana Floodplain Management Association.

U.S. Army Corps of Engineers Nonstructural Case Studies

Danielle Tommaso, CFM, U.S. Army Corps of Engineers National Nonstructural Committee, danielle.m.tommaso@usace.army.mil
Co-presenters: Rachel Williams, CFM, rachel.c.williams@usace.army.mil; Lea Adams, P.E., D.WRE, lea.g.adams@usace.army.mil

Abstract: Nonstructural solutions including structure elevation, floodproofing, and buyouts are effective approaches to manage flood risk. They have been historically used by the U.S. Army Corps of Engineers (USACE) in small-scale projects, but larger projects have become more prevalent in recent years. In this session, the USACE National Nonstructural Committee will share case studies of USACE constructed projects and upcoming authorized projects that have used a variety of nonstructural solutions to achieve flood risk management. The USACE National Nonstructural Committee is a team promoting the evaluation and implementation of nonstructural solutions to water resource problems. It provides leadership and support for the consideration and construction of nonstructural flood risk management strategies in USACE studies and projects. The Committee member presenters are involved in many nationally important nonstructural projects, and will share their perspectives and experience during the session. This presentation will provide an overview of interesting case studies of U.S. Army Corps of Engineers nonstructural studies and projects from throughout the country. The presentation will feature inland and coastal case studies of varying scopes. Additionally, it will provide an overview of upcoming USACE nonstructural projects recently authorized and funded by the federal government.

Biography: Danielle Tommaso, CFM is the Executive Secretary of the U.S. Army Corps of Engineers (USACE) National Nonstructural Committee, a team promoting the evaluation and implementation of nonstructural solutions to water resource problems. The NNC provides leadership and support for the consideration and construction of nonstructural flood risk management strategies in USACE studies and projects. Danielle is a Senior Planner at the USACE New York District, where she manages large scale flood risk management Civil Works studies. Her work supports the coordinated federal response to Hurricane Sandy, and the long-term resilience of New York and New Jersey's communities.

Mitigation and Resiliency Strategies for Coastal Communities

Kelly Simpson, MPH, CPH, CFM, AC Disaster Consulting, LLC., ksimpson@acdisaster.com
Co-presenters: Ryan Wiedenman, Atkins Global, ryan.wiedenman@atkinsglobal.com

Abstract: Our session will analyze the elements of effective resiliency and mitigation for coastal communities, including how policy, hardened infrastructure, and nature-based solutions mitigate

against future damages and the impacts of climate change on coastal areas. This presentation will explore the role of federal, state, and local policy standards in the mitigation of flood risks, sea level rise, and climate change. In addition, this session will analyze how local communities can apply policy to achieve resiliency while also engaging input from stakeholders, property owners, and state/federal partners. Content will analyze both hardened infrastructure and nature-based solutions for flood mitigation. Finally, this session will utilize case studies from Hurricane Ian, Hurricane Michael, and Hurricane Harvey to examine various coastal resiliency and mitigation strategies. This presentation will provide multiple strategies and tools for mitigating coastal flood risks including health and safety, damage to property, and protection of critical infrastructure.

Biography: Kelly Simpson, MPH, CPH, CFM, is an Environmental and Public Health Specialist with ten years of experience in development coordination, floodplain management, land use, and code compliance review. Kelly obtained her bachelor's degree in linguistics at Georgia State University and her master's in public health and disaster management at the University of South Florida. She has experience with public health emergency response planning, BCA applications, and research and evaluation of environmental impacts of disaster events and environmental health safety in response efforts.

F3: Large Scale Modeling: Modeling

Evaluating Canada-wide Flood Hazard Model Performance: Supporting Flood Insurance Options Analysis

Robin Bourke, P. Eng, Public Safety Canada, robin.bourke@ps-sp.gc.ca
Co-presenters: None

Abstract: In 2020, Public Safety Canada launched a Canada-wide assessment of financial flood risk to residential properties to support the Flood Insurance and Relocation Project, an investigation into the viability of different flood insurance options for Canada. The Data Science and Engineering Team at the Emergency Management and Programs Branch of Public Safety Canada led this technical investigation, which involved evaluating and using three different Canada-wide flood hazard models, developing a high-quality residential address exposure data set from multiple sources, and four different damage estimation methodologies to generate event set losses and annual average losses for the whole country. The results were then provided to teams of actuaries and consultants to evaluate different flood insurance options for Canada, culminating in the publication of Public Safety Canada's "Adapting to Rising Flood Risk: A Report by Canada's Task Force on Flood Insurance and Relocation" report, released in August 2022. This presentation will cover the evaluation of three Canada-wide flood hazard models which are currently in use by the insurance industry, the financial sector, governments, and others requiring complete coverage of flood hazard at multiple return periods and flood generating mechanisms. In Canada, local flood hazard mapping (e.g. regulatory, or engineering-level mapping) is not universally available, can sometimes be outdated, and often lacks the suite of annual exceedance probabilities required to complete comprehensive financial analysis. The results of the analysis, including performance metrics such as agreement, over-prediction, under-prediction, and a combined performance score, will be discussed and presented. This presentation has relevance to anybody using large flood hazard models, professionals conducting financial or insurance analyses for large portfolios,

and practitioners responsible for assessing flood hazard and flood risk beyond areas covered by local flood hazard mapping.

Biography: Robin Bourke, P.Eng. is a Water Resources Engineer who joined Canada's federal government in 2017 after ten years as a consulting engineer focusing primarily on northern hydrology and mining projects. He is currently the Senior Engineering Advisor and Data Science and Engineering Team Manager at Public Safety Canada in the Emergency Management and Programs Branch. Robin leads technical initiatives for Public Safety Canada, including flood hazard, risk, and damage estimation analyses, and other key departmental and Ministerial mandate commitments. Most recently Robin's team completed an evaluation of three Canada-wide flood hazard models for Canada, and used the hazard models with different damage estimation methodologies and a consolidated exposure data set of residential addresses to develop average annual loss estimates for residential addresses across Canada in support of the Flood Insurance and Relocation Project.

The Intersection of Green Energy and Flood Risk

Byron Hinchey, PE, CFM, EVS, Inc., bhinchey@evs-eng.com
Co-presenters: None

Abstract: Green energy, particularly solar energy, projects in the United States have been growing rapidly in recent years. In the last decade alone, solar has experienced an average annual growth rate of 33%, and the fastest growth sector has been utility-scale solar. Utility-scale solar describes large solar power plants that produce electricity for the utility grid. As of 2021, the largest utility-scale solar project in the United States spans more than 3,200 acres. With the continual growth of green energy, several larger projects are under development. As with any large site development, utility-scale solar can require massive land areas. As with any large development, these power plants are generally sited where land is cheaply available. Consequently, these large developments are very often located in rural areas that have few stormwater regulations and lack FEMA flood hazard information. To evaluate flood risk for utility-scale solar projects, hydrologic and/or hydraulic models are developed at two critical phases: the due diligence phase for owners/developers during project development and the design phase for design-build contractors. The standard industry approach to determine flood risk for these projects involves watershed-scale two-dimensional (2D) hydraulic models that employ the rain-on-grid approach. Model scale can involve dozens, if not hundreds, of square miles. Flood risk products include inundation maps, water depth maps, velocity maps, and scour maps. This presentation will discuss the hydrologic and hydraulic modeling approach normally performed to define flood risk for large utility-scale green energy (solar) projects, the FEMA compliance for those projects, the opportunities for Floodplain Administrators to leverage model results, and regulatory policies that local officials should consider when one of these projects is proposed in the local Community.

Biography: Byron is a native of Tennessee and a graduate of Tennessee Technological University. Following 2-years with the US Geological Survey, he moved into engineering consulting and has spent more than 35-years providing a wide variety of stormwater and floodplain management consulting services to public and private clients. Byron is a Professional Engineer in eight (8) southeastern states. He is a Certified Floodplain Manager and is a member of six (6) ASFPM State Chapters. He has been active throughout his career in professional organizations and has served as an officer in local chapters of the American Society of Civil Engineers, the National Society of Professional Engineers, and the Society of American Military Engineers. Byron currently resides in Huntsville, Alabama as a remote

employee for EVS, Inc., which is a Minnesota Company that primarily focuses on renewable energy projects. He leads a group of practitioners that, among other things, perform watershed-scale hydrologic and hydraulic modeling to determine flood risk for utility-scale solar energy projects.

Out with the Old River: A New Approach to Statewide Modeling in Louisiana

Jim Keith, Freese and Nichols, Inc., jim.keith@freese.com
Co-presenters: Billy Williamson, LA Department of Transportation and Development, PE, billy.williamson@la.gov

Abstract: Freese and Nichols, Inc. (FNI) is working with the Louisiana Department of Transportation and Development (DOTD) for the Louisiana Watershed Initiative (LWI) Modeling Contract encompassing Region 2. The five-year, $18 million contract involves the development of calibrated 1-D/2-D HEC-RAS models for use in consequence and risk assessment, ultimately informing the implementation of flood risk reduction projects via watershed coalitions in coordination with parish, state and federal entities. Region 2 is made up of nine Hydrologic Unit Code-8 (HUC-8) watersheds covering approximately 9,500 square miles in the north central part of the state. Each HUC8 region is being developed using a tiered approach in terms of the spatial extent of the model (catchment size and channel network extent), the hydraulic modeling technique (1-D, 2-D, and/or hybrid 1-D/2-D), and spatial resolution (i.e., level of detail). The spatial resolution or level of modeling detail largely depends on extents of existing flooding and the potential consequences, with flood risk factors include population density, presence of infrastructure, and previously recorded flood losses in an area. Unique to Region 2 is the modeling of the Old River Control Complex (ORCC), a system of structures that control the diversion of flow from the Mississippi River to the Atchafalaya River, while also providing navigation between the Mississippi, Atchafalaya, and Red Rivers. The ORCC represents the most downstream end of our region and determines the downstream boundary conditions and backwater for the Lower Red and Black Rivers upstream. FNI staff received a guided tour of the ORCC from USACE staff to gain a better understanding of the operation and inform the modeling approach. This presentation will discuss the challenges of managing and executing a project of this magnitude, including the development of tools and processes that allowed for project teams distributed across multiple offices to consistently develop the H&H models. Additionally, the operation and modeling of the ORCC will be discussed.

Biography: Jim Keith is a Principal and Vice President with Freese and Nichols and currently serves as the Stormwater Manager for the Dallas office. He received his B.S. in Hydrology and Water Resources from Tarleton State University in 2000. Jim has over 20 years of technical and managerial experience in water resources planning and design projects including flood risk management, dam and levee evaluation, and flood warning systems. He is currently the project manager for an $18M watershed modeling effort supporting the Louisiana Watershed Initiative.

F4: Predictive Inundation Mapping: Mapping

Planning for the Future: Probabilistic Pluvial Flooding Predictions

Susan Marlow, GISP, Stantec, susan.marlow@stantec.com
Co-presenters: None

Abstract: Tennessee has experienced extreme weather events at an increasing frequency that have caused severe flooding, destruction, and the tragic loss of lives. Using funding from the U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant - National Disaster Resilience Competition (CDBG-NDR), the Tennessee Economic and Community Development Department (TNECD) partnered with Stantec, to integrate a new decision-support technology to strengthen its resiliency efforts against flooding. Flood Predictor, a proprietary product developed by Stantec, is a machine learning flood-risk technology based on FEMA Risk MAP data that provides Tennessee communities high-quality pluvial flood predictions to support disaster planning, response, and mitigation. TNECD has integrated Flood Predictor results into TNPlan web portal—an online repository of resilience data that gives government leaders, community officials, and emergency managers quick and efficient access to insights to flood risk when future disasters strike. This presentation will detail the methodology used to create probabilistic pluvial flood predictions, the TN Plan web portal, and how Tennessee is using these predictions to better prepare for and respond to rainfall events and ultimately save lives.

Biography: Susan is the Client Solutions Director for Digital Solutions and a Senior Principal at Stantec, Consulting located in the Nashville office. Susan has been in the information management and geospatial profession for over 25 years. She is passionate about helping clients solve complex problems with innovative ideas based on science and engineering principals. She is also passionate about helping women in the technology space attain their career goals in this complex field. Susan has been active in many national committees and panels such as Transportation Research Board, National Academy of Sciences past President MAPPS. She works locally with Urban Land Institute, Women Leadership Initiative, on the board of TennSmart and supports multiple resiliency efforts in the US.

Implementation of Forecast Flood Inundation Mapping for the Nation

Mark Glaudemans, PE, National Weather Service, mark.glaudemans@noaa.gov
Co-presenters: David Vallee, NOAA/NWS Office of Water Prediction/National Water Center, David.Vallee@noaa.gov

Abstract: The NOAA National Weather Service (NWS) has a mission to issue forecasts for the protection of lives and property, the delivery of impact-based decision support services, and the enhancement of the national economy. Partners across the nation have expressed an urgent need for more detailed flood forecasts and the resulting inundation information. There is a demand for event-driven flood inundation mapping (FIM) as a high value source of actionable information for emergency and water resource managers to prepare, mitigate, and respond to flood impacts. In response, the NWS National Water Center, in coordination with River Forecast Centers (RFC) and Weather Forecast Offices (WFO) and Federal and other partners, has developed high-resolution inundation modeling capabilities providing geo-referenced visualizations of forecast flooding extent at the continental scale. The NWS FIM methods deploy a model agnostic approach to map the inundation at a 10-meter horizontal resolution for rivers and streams in the National Hydrography Dataset network. Synthetic rating curves and the application of the Height Above Nearest Drainage method allow projection of the water surface elevation in the channel to neighboring cells in the digital elevation model. Through two Department of Commerce Agency Priority Goals, NOAA has demonstrated the FIM capability for over 20 million Texas residents and 95 million residents in the Northeast U.S. Over the next 4 years, NOAA will revolutionize water prediction capabilities by providing event-driven high spatial resolution forecast FIM for nearly 100% of the U.S. population. This presentation will highlight these demonstrations and the

initial rollout of services to 10% of the nation by September 2023 for areas in the Northeast and Texas. These FIM services include the hourly updated analysis and 5 day forecast FIM driven by the official NWS River Center Forecasts and by the National Water Model guidance.

Biography: Mark Glaudemans is the Chief of the Water Resources Services Branch with the Analyze, Forecast, and Support (AFS) Office in National Weather Service Headquarters. He is a registered Professional Civil Engineer and holds a Masters of Science degree in Civil Engineering, with a water resources emphasis. After 5 years as a hydrologic systems engineer in the private sector, he has worked for 34 years in the NWS flood prediction program, supporting software development and modernization of information technology, forecast operations and water resources service delivery, and policy and strategic planning. Previously, he worked for 5 years as the Geo-Intelligence Division Director for the National Water Center. Mark is the recipient of numerous awards, including Department of Commerce Gold and Bronze Medals.

Innovations in flood hazard mapping: Adaptation to a changing climate and an eye toward equity

Haley Selsor, student, University of Georgia, hks47033@uga.edu
Co-presenters: Matt Chambers; Scott Pippin

Abstract: Urban flooding is a growing threat due to land use and climate change. Flood risk is typically measured by physical impacts or damages in the form of a monetary value. However, floods can cause long-lasting, devastating consequences born by socially vulnerable communities that impede recovery as a result of historical societal and institutional influences. As urban populations are increasing alongside the threat of urban flooding, there is a need to incorporate the social implications of flooding when evaluating flood risk. In a case-study of Athens-Clarke County, we investigated the distribution of flood exposure and identified communities who are overexposed to flooding. We found that socially vulnerable communities have disproportionately greater flood exposure, reflecting similar patterns across the Southeastern United States. This work also investigates the variation in equitable exposure across flood magnitudes, and we found that the largest inequities occurred for the smaller events instead of the 100-year flood event. In order to do this analysis, we integrated the physical and social impacts of flooding into a single metric to quantify flood risk equity. In this presentation, we will demonstrate how this metric can be used to evaluate the social implications of engineering interventions to aid in the decision-making process.

Biography: Haley Selsor is a PhD Student in the College of Engineering at the University of Georgia. Her work is centered on flood risk equity and integrating the social impacts of floods with the physical. The historical influence of societal and institutional structures have led to a complex social landscape in which flood hazards occur. Haley is of the mind that by understanding the impacts of these larger influences, we can begin to meaningfully incorporate social impacts of floods in order to quantify and address equity of engineered interventions. Her other research interests include community engagement and nature-based infrastructure, and how these can be used to create more equitable and resilient communities.

F5: Data for Engagement and Decisions: Risk Communication

Data-driven Resident Flood Communication & Outreach

Susanna Pho, CFM, Forerunner, susanna@withforerunner.com
Co-presenters: None

Abstract: Resident communication and outreach are fundamental aspects of floodplain management. If done successfully, they can have cascading positive effects. Providing community members with actionable flood risk information can empower them to take individual action to mitigation and adapt, resulting in fewer compliance issues over time. More-informed residents can also mean a safer community overall, with open lines of communication helping to strengthen government trust. While effective communication is crucial, making it a priority can be difficult in communities where floodplain managers have competing important tasks and not enough time. Compounding this is the need for clarity and specificity – in communities with high rates of development, residents often seek detailed information about individual properties. It can be hard to provide nuanced data to a large public and even harder to keep track of that communication for internal record-keeping or programs like the CRS. Using the case study of Forerunner's work with a partner community, this session will outline how the community combines technology with robust outreach strategies to boost resident communication. We'll discuss how digital tools can help communities pull together disparate datasets and mobilize information for property-specific outreach to provide smarter resources to a variety of stakeholders. We'll explore how incorporating digital workflows into outreach can ensure faster response time, better compliance enforcement, and stronger data continuity. The presentation will also include suggestions on how other communities might be able to leverage data to strengthen their floodplain management programs.

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, from Jefferson Parish (LA) to Harris County (TX), to mobilize data for applications ranging from regulation enforcement to adaptation planning. Susanna is a Certified Floodplain Manager based in California with experience working with local government in research and community development capacities. She holds degrees from Harvard University's Graduate School of Design, MIT, and U.C. Berkeley.

Data-Driven Community Engagement: Rethinking and Rebuilding the Community Engagement Prioritization Tool to Meet Floodplain Manager Needs

Gregg Bowser, Ph.D., Booz Allen Hamilton, bowser_gregg@bah.com
Co-presenters: Jennifer Tylander, FEMA, Jennifer.Tylander@fema.dhs.gov

Abstract: The Community Engagement Prioritization Tool (CEPTool) is a geospatially enabled web application designed to assist floodplain managers at all levels in prioritizing National Flood Insurance Program (NFIP) engagements with their communities. After its version 2 release in late 2020, FEMA collected feedback from state and regional users to determine how the tool could better meet their decision-making needs. Armed with that feedback, FEMA embarked on the process of developing a new version of CEPTool in the winter of 2021. The result was a ground-up redesign of the application, with a focus on ease of use, automated data updates, new data integrations, and a new prioritization approach. This presentation will provide an overview of the CEPTool's new vision, design, and methodology, as well as plans for future improvements.

Biography: Gregg Bowser, Ph.D. is a Lead Scientist at Booz Allen Hamilton, specializing in data science and data visualization. During his time with Booz Allen, Dr. Bowser has supported the federal emergency management mission by providing insights and analysis for FEMA's Floodplain Management Division, National Exercise Division, and its Federal Exercise Branch. Previously, Dr. Bowser supported efforts by the National Preparedness Assessment Division (NPAD) to improve preparedness assessments and to better measure community capability in the face of hazards. Dr. Bowser has also worked extensively with state and local emergency managers in his career, supporting the development of infrastructure risk analyses and broader risk analyses for over a dozen state and local jurisdictions.

Jennifer Tylander is the Branch Chief for the Dissemination, Outreach, and Training Branch within the Floodplain Management Division, FIMA, at FEMA Headquarters. Ms. Tylander has over 15 years working with the National Flood Insurance Program and is currently overseeing the communication tools related to the Floodplain Management Division.

Communicating Flood Risk Using Enhanced Data Management Tools

Glenn Locke, Booz Allen Hamilton, locke_glenn2@bah.com
Co-presenters: Ryan Van Slyke, Booz Allen Hamilton

Abstract: The Interstate 29 (I-29) corridor runs nearly parallel to the Missouri River from Kansas City up to the Canadian border and floods frequently. In 2019, severe flooding closed the Interstate for 187 miles, setting a record for the longest stretch of interstate highway ever closed in U.S. history. The disaster's unprecedented size and scope created a major obstacle for emergency managers to effectively communicate and coordinate across state and local jurisdictions. Across the nation, communities will face similar challenges as the effects of a changing climate increase the number and severity of extreme weather events. In 2022, I-29 stakeholders utilized INFORM, the Infrastructure Operational Resilience Management solution, to improve their flood risk awareness and mitigate future risks. To accomplish this, INFORM visualized earth observation and flood data for the I-29 region, assigned flood risk ratings to sections of I-29, and highlighted associated recommendations for flood mitigation. Today, INFORM helps state and local community decision makers across all levels of government gain an enhanced awareness of flood risk and improve response coordination. This session will present a case study on INFORM, including how its geographic information system (GIS) dashboard mapping tools and risk-derived datasets can help communities identify flood risk and better predict and respond to potential outcomes – like how many road segments are expected to flood within a number of days. Attendees will learn how vast quantities of publicly available environmental and climate geospatial data can be integrated and centralized to glean insights and better respond to complex flooding events.

Biography: Glenn Locke is a program management and technical project delivery specialist with over 20 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 is experienced in providing technical expertise for Geospatial Information Systems (GIS), data analysis and visualization, and large- scale enterprise IT projects. He has a Master of Business Administration degree from Drexel University and an undergraduate degree in Computers and Information Systems from King's College.

Ryan Van Slyke is an Associate/Lead Data Scientist at Booz Allen Hamilton with over 9 years working with government, nonprofit, social enterprise, and international organizations on using data and policy tools to prepare, address, and scale solutions to complex issues in human and environmental security. Mr. Van Slyke has supported divisions at FEMA and DOT/FHWA, invested with the Duke University Endowment for climate-focused public equities, and has advised international organizations like UNICEF and UNDP on policy and stakeholder engagement on climate migration. Mr. Van Slyke is currently pursuing a Master of Business Administration (MBA) at Duke University's Fuqua School of Business and has an undergraduate degree in International Relations and Economics from Indiana University-Bloomington.

F6: Social Justice in Floodplain Management: How do we get there? Part 1: Equity

People Living in Encampments, Flood Risk Management, & Watershed Health: Strengthening Partnerships & Leveraging Resources

Sunny Simpkins, R.G., National Association of Flood and Stormwater Management Agencies, sunnys@nafsma.org
Co-presenters: None

Abstract: Even before the COVID-19 pandemic began, homelessness was increasing across the country. But there are rarely enough shelter beds. Where there are beds, some individuals experiencing homelessness are reluctant to stay in shelters due to concerns about safety, sanitary conditions, potential for mistreatment by shelter staff, or fears about their children's safety and well-being. Rather than stay in a shelter, homeless individuals create temporary housing in flood risk reduction systems and floodplains since they are in urban areas close to services but provide open space for camps. Public agencies that manage these flood risk reduction systems and floodplains are not social service agencies, have not been trained or equipped to address the complex issues of homelessness, and often have limited funds to be used for these purposes. Flood control and public works agencies have had to direct limited resources to address impacts of individuals camping near flood risk management systems and floodplains. Such impacts include debris, damage to the flood risk management system and floodplains, theft, and providing additional support and security. This redirection of resources can impact the ability of maintenance staff to focus on their mission of protecting life and property from flooding. To address this complex situation, the National Association of Flood and Stormwater Management Agencies (NAFSMA) has convened virtual mentoring sessions and in person discussions to bring flood risk management and public works agencies together from the across the country to share best practices and brainstorm about solutions that could work for their systems. This session will share the relevant legal framework and practical strategies that we have found are alleviating the impact of this issue and further the dialogue of how to address this complex issue.

Good Intentions and Unintended Consequences: Improve Climate Equity without Added Harms
Kristin Murphy, Fors Marsh, kmurphy@forsmarsh.com
Co-presenters: Ronne Ostby, rostby@forsmarsh.com

Abstract: Despite our best intentions, sometimes efforts to better understand and engage disadvantaged flood prone communities may, in fact, cause harm. Increased burden, stigma, opportunity costs, psychological impacts, and even direct harms that exacerbate flood hazards can result from efforts to pursue more equitable resilient outcomes in historically underserved communities. While there is broad and passionate support for efforts that focus on equity in disaster and climate resilience, many floodplain managers are concerned about added harm. This can ultimately keep them from taking meaningful action. This presentation will help floodplain managers take on significant equity efforts and manage the potential for unintended consequences at the same time. As a result of attending this presentation, conference attendees will: 1) understand evidence-based frameworks for assessing potential added harms; 2) compare a range of approaches for avoiding added harms; and 3) consider best practices and lessons learned from case examples of engaging disadvantaged communities to improve public health and safety outcomes.

Biography: Kristin Murphy is a business strategy and transformation leader who has spent the last two decades delivering integrated solutions in the mission spaces of disaster resilience, climate change adaptation, and sustainability. Ms. Murphy is a recognized thought leader and innovator who brings a fresh take on complex government programs and problems - applying her expertise in behavioral science, human centered design, and advanced analytics to transform how public programs serve the social good. Ms. Murphy has worked with the National Flood Insurance Program for the last 10+ years and currently leads climate resilience at Fors Marsh, a research-first consultancy dedicated to improving the systems that shape our society.

Biography: Sunny Simpkins is the Director of Government Affairs & Member Programs at NAFSMA, previously she was the Deputy Director at Multnomah County Drainage District (MCDD) in Portland, OR. At MCDD, she oversaw environmental programs, government relations, permitting, project management, human resources, policy, and finance. She has over 15 years of experience in environmental and engineering geology, flood control, environmental permitting, natural resources, and project delivery. Sunny received her B.S. in Geology from University of Texas at Austin and M.S. in Geology from Portland State University. Before joining NAFSMA as a staff member, she served as one of the co-chairs for Flood Management Committee and as a board member.

Mobilizing the Power of Women and Youth for Climate-Resilient Communities

Pamela Roach, Ogilvy, pamela.roach@ogilvy.com
Co-presenters: Kristen M Kirst, kristen.kirst@ogilvy.com

Abstract: Around the world, our communities' well-being relies on our collective "resilience" — the ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate. Local governments, particularly in low-income and/or frontline communities, must consistently prioritize current needs over emerging challenges, especially concerning complex and evolving climate change. So how might we start to close this critical capacity gap? We begin at home. For solutions, we must shift our dependence on traditional leaders and partners to leverage the skills of emerging leaders – women and youth – who are driving climate resilience in areas with significant challenges. During

this session, we will introduce you to women and young adults who did not wait for an invitation to help. They are already leading the way. This presentation will provide success stories of communities tapping emerging leaders in their communities to lead resilience efforts. It will offer attendees the opportunity to ask big questions to inspire innovative approaches and drive change in their communities and learn new ways to create and enable a sense of agency and self-efficacy.

Biography: A recipient of the Martin Luther King Advancing the Dream Award, Pam Roach has been a trusted leader in her community of Arlington, Texas for over 20 years. She is a Vice President in the Social Change Group of Ogilvy Washington D. C. In her current role, Pam serves as a senior PR strategist charged with leading risk communications and engagement programs in support of FEMA's Community Engagement and Risk Communications program. Pam is a purpose-driven PR professional, who for nearly three decades has helped public, private, and nonprofit organizations revitalize distressed communities. She accomplished this by facilitating award-winning partnerships and collaborations that funded multi-million-dollar redevelopment initiatives. In addition, Pam provided public relations and capacity-building services to advance human service-related economic and community-development programs. Partnerships included: -NGOs (Non-Governmental Organizations) - NeighborWorks America and the National Community Reinvestment Corporation. -GSEs (Government Sponsored Enterprises) - Fannie Mae. -Foundations - JPMorgan Chase Foundation, OneStar Foundation, Foundation for Community Empowerment, and the Enterprise Foundation. -Financial institutions - Bank One (later JPMorgan Chase) -Government agencies - Small Business Administration and Bank One, U. S. Department of HUD Recognized for her work by state and local leaders, Pam also spent 10 years providing outreach and engagement support to complex flood-mitigation projects where she bridged communication gaps and restored trust between municipal government, marginalized and affluent neighborhoods.

Kristen Kirst is a recognized marketing and communications professional and has served as a senior leader for more than twenty years to internationally renowned organizations in the corporate, international healthcare, higher education, and non-profit sector including the Clinton Foundation, St. Jude Children's Research Hospital, Texas Christian University, March of Dimes, Media Ventures Group, Medical Teams International, the Alliance for a Healthier Generation, the VFW, and Seattle University. She is a leader in brand building and innovative fundraising and visibility initiatives.

Kristen has a proven record of leadership and success in brand development, strategic marketing and communications, management and operations, campaign fundraising and corporate partner engagement. Kristen's experience includes cause marketing campaigns and strategies, as well as securing and managing major corporate partnerships including COORS Brewing Company, Buffalo Wild Wings, Roadway International, Lionsgate Media and Clear Channel Communications. She has dedicated her career to building relationships, teams and initiatives that result in passion, growth, recognized visibility and community support for outstanding organizations and missions.

Prior to joining Ogilvy, she served as the interim Vice President for Marketing and Communication at Salem Academy and College and shortly before that interim role, Kristen served as the Director of Strategic Communication and Engagement for Seattle University focused on promoting and strengthening the university's brand and reputation. During her tenure at Seattle U, Kristen served as a senior team member leading marketing and communications for key initiatives notably including their

historic $300 million comprehensive campaign. During her tenure, her team received multiple national awards for their marketing and communication work.

During her career, Kristen served as the Senior Vice-President for Media Ventures Group, a cause marketing agency in NYC, known for innovative marketing, entertainment and sports marketing, digital and social media, media partnerships, data optimization and mobile giving. She also served as Director of Development for Medical Teams International, an internationally recognized organization focused on disaster, conflict, and poverty, which raises $210 million in contributions and donations annually. At St. Jude Children's Research Hospital, Kristen was responsible for developing and securing several key national visibility campaigns.

Kristen received her undergraduate degree from the University of Arizona and her graduate degree from Texas Christian University.

She has served on several boards including the Alzheimer's Association, University of Arizona's Wildcats for Life and is a former Trustee of Seattle's Fulcrum Foundation, where she founded AMICI, the organization's Young Professional's Group. She also served as a Trustee, and was later elected as the national President, for the Sigma Kappa Foundation, which has granted more than $10 million in Alzheimer's disease research.

F7: Warning Systems: Warning Systems

Deploying the Power of Machine Learning for Near Real-Time Stream Stage Forecasting
Steve Godfrey, PE, CFM, Woolpert, steve.godfrey@woolpert.com
Co-presenters: Arash Karimzadeh, Ph.D., Woolpert, arash.karimzadeh@woolpert.com

Abstract: Forecasting stream flows and flood depths is an essential task in flood management and water resource planning. Hydrologic/hydraulic simulation models or data-driven approaches can be used to generate these real-time predictions. Modern advances in artificial intelligence and state-of-the-art machine learning (ML) techniques have provided new opportunities for quicker streamflow prediction processes with more efficient and accurate forecasts. In this presentation, we will dig into the use of ML to develop flow depth prediction models. Prediction models using different ML algorithms and various prediction settings are trained and validated based on the historic precipitation data and stream flow depth observations. These models apply different ML techniques, including multiple linear regression, support vector regression, random forest regression, artificial neural network multi-layer perceptron, long short-term memory and ensemble learning. Case examples will illustrate how radar and forecasted rainfall datasets can be applied to traditional H&H models and ML models to provide lead times of several hours or days in advance of a flood event. These forecasts can be critical for issuing flood warnings and the real-time operation of flood control systems.

Biography: Steve Godfrey is a modeling team leader with over 25 years of experience in solving stormwater problems for local municipalities and state agencies across the country. He specializes in

using hydrologic and hydraulic modeling for developing stormwater master plans, developing design alternatives to improve flood management, and working with near real time stream forecasting.

SC Flood IMPACT – Leader in Flood Warning Systems for South Carolina

Maria Cox Lamm, CFM, South Carolina Department of Natural Resources, CoxM@dnr.sc.gov
Co-presenters: Jennifer Housman; jennifer.housman@aecom.com

Abstract: This presentation will discuss the tools and features of the SC Flood IMPACT (Inundation and Mapping for Action) website. This website is a state-owned flood forecasting and real-time warning system created to assist local and state governmental agencies and their communities before, during, and after large-scale flooding events. The SC Flood IMPACT website contains a library of pre-run inundation scenarios using HEC-RAS 2D modeling. It also analyzes major factors that contribute to flooding such as precipitation, streamflow, tidal influence, and initial model conditions. From each of these factors, the website continuously analyzes data at multiple intervals throughout the day. This website provides state and local officials, as well as the public, with a reliable and accessible resource to communicate flood hazards and identify areas at risk of flooding. Our vision is for the citizens of South Carolina to have the most reliable flood information available to make informed decisions for their lives. In addition to providing an overview of this flood warning system, we will discuss advances in modeling, rainfall observation, mapping, and a future mitigation planning tool and how this information can benefit flood prediction and real-time warning systems.

Biography: Maria Cox Lamm is a Certified Floodplain Manager and serves as the program manager of the Flood Mitigation Program in the South Carolina Department of Natural Resources. The Flood Mitigation Program contains the Floodplain Management State Coordinating Office, Floodplain Mapping and the Flood Mitigation Assistance Grant program. She is responsible for the administration, coordination, and direction of all aspects of the Flood Mitigation Program. She has been with the agency since July 2004. Maria has over 22 years of experience in the field of floodplain management. Prior to joining the South Carolina Department of Natural Resources, she was employed by Wake County, NC. Where she worked in the Environmental Services Division; Erosion, Flood and Stormwater Section for just shy of 6 years. Maria graduated from North Carolina State University with a Bachelor of Science in Natural Resources in 1998. Maria served as Chair of the Association of State Floodplain Managers from May 2017 to May 2019.

Flood Early Warning System and Active Flood Management – City of Raleigh, North Carolina

Kelly Daniel, City of Raleigh, kelly.daniel@raleighnc.gov
Co-presenters: Scott Bryant, Scott.Bryant@raleighnc.gov

Abstract: There is a greater need for flood early warning systems (FEWS) that can provide lead-time and alert notification of impending flooding at specific locations and active flood management within urban areas because urban flooding is increasing. The City of Raleigh, NC is currently developing its own Flood Early Warning System (FEWS), where capabilities include advanced prediction of potential stream flooding and at localized hotspots, with increased lead time for road closures, evacuation, and emergency response. Operational flood modeling coupled with current precipitation estimates from Gauge Adjusted Radar Rainfall (GARR) form the basis for predictive flood modeling in near-real-time (NRT). Model output is configured to produce predictive inundation maps, stream stage and discharge, and notifications when critical thresholds are reached. Results from this program offer increased lead

time to notify first responders, and to help manage flood emergencies within the City before, during, and after the event. The City is also actively managing lake levels at area lakes such as Lake Johnson prior to larger storm events to help reduce the impacts of flooding downstream during storm events. This presentation will help the attendees understand the proactive steps the City of Raleigh, North Carolina, is taking to improve lead time needed for protection against flood risks, identify the tools and technologies that are available and being implemented by the City to develop an advanced modeling and warning system in an increasingly dynamic urban drainage setting, describe how results from the program will offer increased lead time to notify first responders and people in Raleigh about storm/flooding impacts, and understand how active flood management of area lakes is a key factor to reducing flooding during storm events.

Biography: Kelly Daniel has worked with the City of Raleigh for 24 years and the last 20 years with the Stormwater Management Division. In his time with the City he has served as a Housing/Environmental Inspector, Sediment & Erosion Control Inspector, Engineering Technician, Senior Engineering Technician, Business Services Manager for the Stormwater Division, and the for the past 2 years as the City's first Flood Early Warning System Engineer. He is a graduate of Wake Tech Community College with an associate's degree in civil engineering, is a Licensed Building Inspector and Residential Contractor.

F8: Watershed Management in North Carolina: Watershed Management

Fayetteville NC City-Wide Watershed Program – Challenges and Solutions

Alicia Lanier, PE, City of Fayetteville, AliciaLanier@FayettevilleNC.gov
Co-presenters: Sheila Thomas-Ambat; SheilaThomasAmbat@FayettevilleNC.gov; Morgan McIlwain; mdm@freese.com

Abstract: City of Fayetteville NC City-wide Watershed Master Plan program is now in its fourth year of development. In 2019 City leaders embarked on an ambitious $13M Watershed Master Plan program to better understand the magnitude and severity of flooding across the entire city and proactively develop flood mitigation projects. Leaders understood that a comprehensive evaluation would support resiliency by providing a pool of prioritized projects for both short-and long-term implementation. This effort will apply resources equitably, identify creative regional-scale projects, and leveraging inter-governmental and cross-departmental collaborations. The program is unique in that the foundation was established within four years, to include an intensive rebuild of the city stormwater geodatabase, a city-wide stormwater asset field survey, parallel 1D and 2D modeling efforts by several consulting teams, scoring and ranking concern areas, and development thus far of over 200 projects. Out of the 15 watersheds in the City, master plans for four watersheds have been completed for this Priority 1 phase with projects now under design, while master plans for four others are in development. The aggressive schedule, large team, and complex and ever-evolving program requirements have yielded remarkable successes, while understandably creating challenges. This presentation provides an overview of the program, the successes, and specific approaches taken to overcome the inevitable challenges. At the heart of being able to overcome the challenges is the continuous collaboration amongst all team members with steady involvement by the City. The success of the program relies on the ability to reflect at regular intervals in

order to communicate, adapt and respond to change; show continuous progress by delivering measurable results; and strive to honor the commitment to value people over process.

Biography: 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, Alicia focuses on supporting cross-collaboration of internal and external teams, and building intergovernmental and institutional partnerships.

Providing Holistic Flooding Solutions in Urban Areas: the Fayetteville NC Story

Mark Van Auken, PE, Arcadis, mark.vanauken@arcadis.com
Co-presenters: Scott Brookhart, Arcadis, Scott.Brookhart@arcadis.com; Alicia Lanier, City of Fayetteville, AliciaLanier@FayettevilleNC.gov

Abstract: Many communities across the U.S. suffer from routine and severe flooding due to a combination of riverine impacts and old, undersized stormwater collection systems, especially in urban areas. But how many communities have the opportunity to develop detailed hydrologic and hydraulic models of both systems on a watershed scale? How many also use these models to transform their downtown with holistic flood mitigation solutions that truly redefine urban drainage? The City of Fayetteville NC had the vision and financial commitment. A Master Plan was prepared for Blounts Creek watershed that included detailed 1D and 2D 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 using the modeling and field assessment results to inform required mitigation with new proposed drainage solutions. One of the proposed solutions that provides the greatest flood mitigation and risk reduction is the Person/Russell St Bridges Improvements and Stream Enhancement project. It is a large-scale primary system improvement that provides flooding relief to a significant number of low to moderate income homes, allows future secondary system improvements to meet level of service requirements, and provides an opportunity for community enhancements and nature-based solutions within the stream corridor to improve resiliency. This presentation will step through the overall program and vision of the City in establishing and implementing the watershed master plan program. It will discuss the process used to develop, validate, and integrate the 1D and 2D riverine and collection system models including several project innovations to improve efficiency and accuracy. It will also detail the process used and proposed project developed to cost effectively provide holistic improvements, mitigate stormwater flooding and improve livability in downtown Fayetteville.

Biography: Mr. Van Auken serves as Stormwater Practice Leader for Arcadis where he helps develop and lead stormwater work on a national level. He specializes in municipal stormwater management, with 34 years' experience in a variety of stormwater work. He has a BS in Civil Engineering from Michigan State University, is a Professional Engineer in multiple states including NC, Certified Professional in Municipal Stormwater Management, an Envision Sustainability Professional, member of Water Online's Water Intelligence Panel, and Co-Chair of WEF's Stormwater Innovation Committee.

Watershed Planning: Using Data Driven Modeling to Prioritize Protection and Mitigation

Jenny Fleming, VHB, jfleming@vhb.com
Co-presenters: Ivy Huang, PhD, EI; Courtney Carpenter, PE, CFM

Abstract: This presentation will demonstrate how the use of spatial modeling in ArcGIS can be used to evaluate the conditions of a watershed (e.g., water quality, habitat, hydrology), to link issues back to their underlying causes (e.g., indicators), and to recommend strategies to both preserve areas in good condition and to identify areas where mitigation action or water quality projects may serve the most benefit. The North Carolina Division of Mitigation Services (DMS) hired VHB to develop a Regional Watershed Plan (RWP) for parts of two 8-digit Hydrologic Unit Codes (HUCs) within the Cape Fear Watershed: The Haw River (03030002) and the Deep River (03030003). The study area covers approximately 620 square miles and twenty-two 12-digit HUCs. The objective of the RWP is to create a modeling strategy based on available data to evaluate the conditions of a watershed, link issues back to their underlying causes, and recommend strategies to preserve areas in good condition. Ultimately, this watershed plan will help DMS identify opportunities to mitigate sources of stressors to the three main functions of a watershed—hydrology, water quality, and habitat. In consultation with DMS, VHB developed a spatial modeling approach in ArcGIS using the best available data to evaluate the conditions of a watershed (e.g., water quality, habitat, hydrology), to link issues back to their underlying causes (e.g., indicators), and to recommend strategies to both preserve areas in good condition and to identify areas where mitigation actions may serve the most benefit. The focus of this presentation will be on the VHB's approach for identifying catchments with mitigation potential, called Focus Areas herein. These Focus Areas are often at-risk catchments, or catchments that may be in decline but where early action may improve current condition and prevent future losses.
https://ncdenr.maps.arcgis.com/apps/webappviewer/index.html?id=7a5751caf43d45168f77eb68a61f1fc9

Biography: As the Regional Water Resources Director for the Mid-Atlantic, Jenny has nearly three decades of experience in water resources planning and engineering. Jenny has managed large stream restoration/mitigation projects as well as managing the hydraulics design of large-scale transportation projects and bridge replacements. She has performed H & H analysis for the design of stream restorations, bridges, box, and pipe culverts in all three physiographic regions of North Carolina and has overseen development of dozens of Letters of Map Change (LOMR and CLOMR) and No-Rise Studies approvals for project permitting and completion. She served as Project Manager for the Cape Fear 02/03 Regional Watershed Plan for NCDMS including stakeholder engagement.

F9: Rainfall & Runoff Modeling: Modeling

NOAA Atlas 15: An Update to the National Precipitation Frequency Standard
Sandra Pavlovic, PE, NOAA, sandra.pavlovic@noaa.gov
Co-presenters: None

Abstract: The National Weather Service's Office of Water Prediction (OWP), of the National Oceanic and Atmospheric Administration (NOAA), has produced an authoritative atlas of precipitation frequency estimates as volumes of the NOAA Atlas 14 "Precipitation-Frequency Atlas of the United States". These estimates are published on a Precipitation Frequency Data Server with an interactive map interface and are the de-facto standard for a wide variety of design and planning activities under federal, state, and local regulations. For example, engineers use the Atlas 14 products to design stormwater management

and transportation infrastructure, develop design considerations for floodplain and watershed management, and perform hydrologic studies for reservoir and flood protection projects. . With support from the Bipartisan Infrastructure Law, OWP has received funding to update the precipitation frequency standard. This product will be referred to as NOAA Atlas 15 and will be presented in two volumes. The first volume will apply a consistent methodology that accounts for trends in observations. The second volume will apply future climate projections to generate adjustment factors for the first volume. This new update is anticipated to (1) develop a seamless spatial national analysis, (2) replace current Atlas 14 estimates based on historical data (historical estimates), (3) add new product features to account for future precipitation information (future estimates), (4) model non-stationary trends in the observational record as well as climate model ensemble outputs for the future, and (5) enhance service delivery via new Web visualizations and data services. This presentation will review the planning, and development efforts on the proposed NOAA Atlas 15 update. Methodologies that are planned will be discussed as well as additional research that is anticipated to complete product development with the help of the academic community. Progress on this collaborative effort in addition to the development timeline will be presented. Also limitations and the impact to engineering design applications of future nonstationary precipitation frequency estimates will be covered. These new estimates will provide critical information for the design of national infrastructure under a changing climate.

Biography: Sandra Pavlovic (P.E., M.S., M.B.A.) is a professional water resources engineer with 15 years of experience in the public and private civil and environmental engineering industry. She currently works at the National Weather Service (N.W.S.) Office of Water Prediction (O.W.P.), as an employee of the University of Maryland (U.M.D.) Earth System Science Interdisciplinary Center (ESSIC). At the N.W.S., she serves as the acting technical lead for the NOAA Atlas 14 projects. She holds B.S. and M.S. degrees in civil engineering from the University of Maryland at College Park and an M.B.A. from the Pennsylvania State University.

Bulletin 17B: Updated but not Outdated

Megan O'Donnell, PE, CDM Smith, odonnellm@cdmsmith.com
Co-presenters: None

Abstract: Since national flood flow frequency guidelines have been introduced 1967, many updates and revisions have been published. Bulletin 17B was published in 1981 (editorial corrections in 1982) and remained the lead guidance material on flood flow frequency analysis until its successor Bulletin 17C was published in 2018. However, as Bulletin 17C sought to update key shortcomings and approaches, specifically related gage analysis and to historical and systematic records, there are features of Bulletin 17B that were not updated nor covered within Bulletin 17C and remain useful and viable tools. For instance, techniques for confidence limits and synthetic statistics are provided in Bulletin 17B and are still applicable to this day. Such techniques serve to estimate the 1-percent-plus discharge for rainfall-runoff models, as required by FEMA. Often deriving the 1-percent-plus discharge is approached by multiplying the 1-percent event by a percent error factor, though there is more nuance to the 1-percent-plus value, what it represents, and how it can be derived for certain settings. This presentation will discuss pertinent features and techniques from Bulletin 17B that are often overlooked, provide examples of applicable uses, and identify common misconceptions and outdated information from the bulletin that were updated in publications outside of Bulletin 17C. This discussion will focus on the 1-

percent-plus, differences in PeakFQ software features between the Bulletins 17B and 17C, and generalized skew.

Biography: Megan O'Donnell is a water resources engineer with over six years of experience with flood insurance studies, flood mitigation, and hydrologic and hydraulic (H&H) computer modeling. Her modeling experience has helped her complete several hydrologic and hydraulic analyses aimed at determining flood risk. Megan participates in the Compass Technical Excellence Program (TEP) for 1D Hydraulics for Riverine Engineering. She has extensive experience conducting H&H modeling in support of Flood Insurance Studies throughout Regions I, III, and V.

High Resolution Land Cover Classification for Improved Hydraulics and Hydrology Modeling

Daniel Gwartney, WSP, daniel.gwartney@wsp.com
Co-presenters: Rehal Kharel, rehal.kharel@woodplc.com

Abstract: Land cover is used in hydrology and hydraulic (H&H) analysis to help define the characteristics of the terrain for runoff, routing, and infiltration. The National Land Cover Dataset (NLCD) is an open-source, free land cover raster dataset available for use across the United States and classifies land cover into multiple categories. This data is classified from 30m resolution imagery and is good for regional land cover characteristics, but H&H models at a local scale benefit much more from higher resolution imagery. As 2D hydraulic models are becoming ubiquitous, and with the ability of HEC-RAS to spatially vary manning's coefficient; high resolution datasets allow the models to retain the finer changes in land cover classification, enhancing model resolution. The USDA National Agricultural Inventory Program (NAIP) provides 1m resolution, four band (multispectral) imagery that across the country and is typically collected in 3-year cycles, sometimes bi-annually. The multispectral imagery consists of visible wavelengths (Blue, Green, and Red) and a band capturing near infrared (NIR) wavelengths of electromagnetic radiation. The NIR wavelengths enables high resolution differentiation between vegetated and non-vegetated features, as well as basic separation of some similar vegetated features (coniferous vs. broadleaf). H&H analysis does not require the feature separation detail available with more spectral bands, but the 4 bands coupled with higher spatial resolution yield more meaningful results by more accurately describing the surface with finer mapping units. Machine learning approaches can be used to classify NAIP imagery similarly to the NLCD layer. This presentation will focus on recent projects performed in the States of Missouri, Kansas, and Louisiana that used a supervised machine learning approach, along with their challenges and successes. The presentation will cover indices and algorithms used to prepare imagery, the process used for defining training samples, classifying the imagery, imagery post processing, and review criteria.

Biography: Daniel Gwartney, CFM, GISP is the GIS Group Lead and Associate Geospatial Scientist for the WSP Water Resources Kansas Operations. He has more than 15 years of experience in the GIS industry, with more than 10 years directly related to working with Remote Sensing and LiDAR data products. His technical expertise is in multi- and hyperspectral digital image analysis, LiDAR processing, spatial data and multivariate statistical analysis, and python scripting. His professional experience includes land cover analysis and statistical reporting for storm water applications, wildlife habitat identification and wetland classification through spectral analysis, plant species identification from hyperspectral imagery, and building footprint classification as well as advanced terrain modeling from LiDAR data analysis. He has extensive experience in hydrologic modeling for floodplain mapping, floodplain (re)delineation, and

the creation of DFIRM / Risk Map data products. He has developing web applications, web maps, and hosted feature services for public outreach and data collection.

Concurrent Session G

G1: Tools for Floodplain Management: NFIP/Floodplain Management

Substantial Damage Tracking Post-Hurricane Ida
Maggie Talley, CFM, Jefferson Parish, mtalley@jeffparish.net
Co-presenters: None

Abstract: Hurricane Ida hit as a Category 4 on the 16th anniversary of Hurricane Katrina and brought damaging winds and rain. Jefferson Parish conducted windshield assessments on its 160,000 structures in the weeks after the storm and identified over 1500 substantially damaged structures. As part of its recovery efforts, Jefferson Parish created a tool to capture substantial damage assessments and other related data to track the progress of these structures. This presentation will provide an overview of the damage assessment tracking and reporting tool, a breakdown of the various data sets compiled, and illustrate best practices for tracking substantial damage structures from the time of the disaster through the mitigation phase.

Biography: Maggie became a Certified Floodplain Manager in 2009 and is currently the Director of Floodplain Management and Hazard Mitigation for Jefferson Parish, Louisiana. She and her staff facilitate the CRS Program and CRS Users Group for Jefferson Parish. She oversees the management of the parish's Hazard Mitigation Programs and advises homeowners on their flood insurance, flood risk and mitigation options. Additionally, Maggie serves as a local community representative on the CRS Task Force.

Major Changes to FEMA's New Elevation Certificate

Shilpa Mulik, CFM, FEMA, Shilpa.Mulik@fema.dhs.gov
Co-presenters: Becca Fricke-Croft, CFM, becca.croft@atkinsglobal.com

Abstract: FEMA's Elevation Certificate (EC) is an important administrative tool of the NFIP. Although the EC is no longer *required* to obtain an insurance policy through the NFIP's new insurance rating methodology, Risk Rating 2.0 (RR 2.0), most participating communities—particularly those participating in the Community Rating System program (CRS)—still use them for documenting compliance and making floodplain management decisions, especially for development inside the Special Flood Hazard Area (SFHA). ECs can also document property details that may qualify the property owner to obtain lower insurance rates in any flood zone. In [November 2022], FEMA released a new version of the EC (Form #TBD) with a number of major changes to the form and its instructions to better align with RR 2.0. Many of the changes were intended to address common issues and errors that surveyors and community floodplain administrators make when completing the form. The most noticeable change is that there are two new sections, created to enable property owners to document the elevations needed for potential flood insurance savings under RR 2.0. In this presentation, we will highlight the major changes found in

the new EC form (and instructions) and answer common questions asked by surveyors, floodplain managers, and CRS communities.

Biography: Shilpa Mulik works for the Floodplain Management Division (FPMD) at FEMA HQ and has over 21 years of NFIP experience including both private sector and the federal govt. In the past she has supported various efforts at FEMA HQ to include serving as FPM SME and outreach, training, and communication lead for Risk Rating (RR 2.0), FEMA's Community Rating System Transformation effort, spearheaded the development and training for the National Violation Tracker, and the most recent revisions to the Elevation Certificate and the Floodproofing Certificate.

Elevation Certificate Missteps: Connecting Guidance to the Real World

Del Schwalls, Schwalls Consulting LLC, dschwalls@schwallsconsulting.com
Co-presenters: None

Abstract: This presentation will review the guidance related to some of the most commonly confused aspects of completing the FEMA Elevation Certificate (EC), including Building Diagram selection and how it applies to real world examples. This confusion is often due to conflicting direction issued by the numerous programs and agencies using the EC, including local governments, insurance agencies, CRS, and the NFIP. Given that the EC is a critical tool for ensuring buildings are constructed in accordance with floodplain management regulations, it is vital that the fundamentals and nuances are understood. While this presentation is not a review of all the updates in the new EC, the significant revisions to the instructions and alterations to the form itself will hopefully resolve some of the confusion. Therefore, relevant modifications will be discussed as well. The goal of the presentation will be to educate users on completing the EC so that it meets the needs of any program, and to understand the context behind the requirements.

Biography: Del Schwalls is President of Schwalls Consulting with more than 22 years of experience in water resources engineering, specializing in floodplain management, flood risk analyses and mapping, and NFIP regulations and policies. He conducts trainings around the country on the FEMA Elevation Certificate, and assists communities with implementing, managing, and improving their overall CRS programs. He conducts independent QA/QC of FEMA Flood Risk projects, and serves as a subject matter expert (SME) in HMA grants and FEMA benefit cost analysis for states and communities. Mr. Schwalls is currently the SME on Inland Flooding for the Florida Commission on Hurricane Loss Projection Methodology. He has developed numerous LOMRs and LOMAs across the US, and began his career reviewing LOMRs and Flood Studies for FEMA in Washington, D.C. 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.

G2: Floodproofing and Building Performance: Mitigation

Floodproofing for the Future - Challenges and Solutions

Aditya Bhagath, PE, CFM, PMP, Thornton Tomasetti, abhagath@thorntontomasetti.com
Co-presenters: Jennifer Mahan, Thornton Tomasetti, jmahan@thorntontomasetti.com

Abstract: Dry floodproofing is often related back to guidance provided in the FEMA TB3 and ASCE24. However, when the designer encounters non-standard building conditions, there are very few resources available. Thornton Tomasetti has implemented floodproofing solutions on multiple unique and challenging projects ranging from a warehouse originally constructed in the 1890s, a mission critical hospital facility, to a science research center. This presentation highlight a series of distinct projects where dry floodproofing challenges were encountered and the strategies that were implemented to ensure site-specific performance and design requirements were achieved. This presentation will arm participants with a wide-range of tools to apply performance-based dry floodproofing techniques to unique and challenging site-specific conditions.

Biography: Aditya Bhagath, P.E., CFM, WEDG, is an associate in Thornton Tomasetti's Resilience team and has experience providing flood resilience and structural engineering consulting services on a wide variety of healthcare, institutional, residential and commercial projects. His expertise includes multi-hazard climate risk and resilience assessments, flood resilience and adaption strategies, and performance testing of installed food resilience measures. His project experience also involves structural investigations of existing buildings, including repairs and alterations to buildings, litigation support, and forensic and emergency response for buildings damaged due to natural hazard events.

Innovations in Flood Mitigation

Tom Little, CFM, LIA, Floodproofing.com, tlittle@floodproofing.com
Co-presenters: None

Abstract: This presentation will examine the advancements in the available flood mitigation options for residential and commercial structures. As flood risk increases, the need for solutions that can withstand higher loads and impacts grows. We will look at a variety of product options, going over the strict standards and testing requirements along with the benefits of multiple solutions. The mitigation options discussed will be perimeter systems, door and window barriers, as well as multiple other active solutions, but there will be a strong focus on the use of passive systems in project designs.

Biography: Tom Little, CFM is Co-owner and President of Smart Vent Products Inc, Floodproofing.com, Smart Product Innovations and Risk Reduction Plus Group. Since 2004, Tom has studied the science of flood mitigation with a concentration on wet and dry floodproofing techniques, and their ability to not only protect structures against the devastating effects of flood waters, but also how these systems and approaches can reduce flood insurance costs for property owners. Taking this knowledge, Tom became a Certified Floodplain Manager and Licensed Insurance Broker to help him further lend his expertise. Today, he is proud to lead a diverse team that is passionate about creating more disaster resilient communities. The success of the Smart Vent product line helped the company see first-hand the opportunities and needs for more innovative products and services when dealing with flood disasters. Tom took this insight and was an integral part in creating Smart Product Innovations—an umbrella company specializing in flood resiliency and mitigation. This collection of companies was strategically created to focus on flood disasters, providing products and services that help with all aspects of flood mitigation and protection.

Building Flood Resistant Communities One Home at a Time

Matt Lyttle, Guidehouse, mlyttle@guidehousefederal.com

Co-presenters: Samantha Brann, FEMA Individual and Community Preparedness Division, samantha.brann@fema.dhs.gov

Abstract: This presentation will share simple household tips to build flood resilience one household at a time. Too often, flooding is seen as a problem for governments to solve through long-term mitigation efforts. While this is certainly needed, there is plenty that homeowners and renters can do to increase permeable surface, reduce run-off, and serve as better stewards of waterways and floodplains. Many homes can be retrofitted with emerging technologies that reduce one's flood footprint. Other activities can be accomplished with a run to a hardware store and few hours on a weekend. This session will share these simple solutions that jurisdictions can leverage to build community-buy in for flood risk reduction activities. Programs like FireWise USA and FEMA's Home Earthquake Retrofit Program are helping homeowners address other hazards - now is the time to boost community participation in flood mitigation strategies, as well. Attendees to this session will learn about low and now cost flood mitigation techniques, understand how to engage homeowners and renters through impactful outreach campaigns, and share their own successes in making residents part of the solution to reduce flooding in the United States.

Biography: Matt Lyttle is a Director in the Defense and Security Segment at Guidehouse. He supports federal clients in strategy, transformation, and communications projects. Before joining Guidehouse, he was Senate Homeland Security and Government Affairs Committee (HSGAC) staff, where he developed legislation on disaster resilience and emergency management. Matt has held several positions within FEMA's National Preparedness Directorate, including as the Acting Deputy Director of Individual and Community Preparedness. In those roles, he designed and launched several FEMA programs aimed at building Private Sector preparedness, such as FEMA's Ready Business program and You Are the Help Until Help Arrives. Matt is a Returned Peace Corps Volunteer, serving in Nicaragua and witnessing long-term effects of insufficient hazard mitigation throughout his service. He continues to build resilience in Latin America by introducing community preparedness initiatives to Bolivia, Chile, Honduras, and Mexico. He is a Security Fellow in the Truman National Security Project focusing on the intersection of climate change and national security.

G3: New Approaches & Techniques in Modeling: Modeling

A Seismic Shift in Model Maintenance - Incorporating Terrain Updates in RAS-2D Models

Todd Ward, PE, CFM, Harris County Flood Control District, todd.ward@hcfcd.org
Co-presenters: Ashley Poe, ashley.poe@freese.com; Brian Edmondson, brian.edmondson@freese.com

Abstract: As 2D modeling has become a mainstay in the H&H world helping to drive decision-making and support floodplain management, a new challenge has emerged associated with model maintenance – piecemeal terrain updates to reflect new development and projects completed after base lidar is flown. What standards, guidance, and considerations can help communities, regulatory agencies, engineers, and developers to anticipate potential issues, refine survey requirements, and plan for long-term model maintenance? In the forefront of navigating this challenge, the Harris County Flood Control District (HCFCD) acquired lidar in 2018 for the Modeling, Assessment, and Awareness Project (MAAPnext), a detailed county-wide floodplain study utilizing advanced watershed-wide 2D modeling techniques. Due to the long time span required to produce FEMA floodplain maps at such a scale,

HCFCD encouraged and accepted the incorporation of terrain updates through 2021 before models and flood risk products were finalized to capture the ongoing rapid changes in the county since the lidar was flown, which would also ultimately minimize the need for future updates including LOMRs. As one of the fastest growing counties in the United States still recovering from Hurricane Harvey, Harris County experienced significant land development and construction of flood mitigation projects within this time period, resulting in diverse types and scales of terrain update requests. This presentation will share insights from reviewing and incorporating terrain updates for two of the most dynamic and rapidly developing watersheds (Addicks and Cypress Creek), including key points from a comprehensive guidance document that was developed to maintain model integrity after the MAAPnext models become effective. Specific topics include considerations for what submittal requirements should be based on community needs, common pitfalls and their consequences, and a streamlined process for creating Digital Elevation Models (DEMs) that can be incorporated in a HEC-RAS model terrain.

Biography: Todd Ward is the Risk Mitigation Department Manager at Harris County Flood Control District and has more than 13 years of experience in H&H modeling, GIS analysis, and FEMA Cooperating Technical Partners projects involving updates to, management of, and communication of flood risk information.

Integrated Pluvial and Fluvial Flooding Assessment of an Urban Watershed in Fayetteville, NC

Matthew Jones, PhD, PE, Hazen and Sawyer, mjones@hazenandsawyer.com
Co-presenters: Alicia Lanier, PE; AliciaLanier@FayettevilleNC.gov

Abstract: The Cross Creek watershed in Fayetteville, NC, traverses assorted land uses across the City, including the downtown area, before discharging to the Cape Fear River. The watershed has a history of pluvial and fluvial flooding, including notable flooding in the downtown area associated with Hurricane Florence in 2018. As part of a comprehensive city-wide stormwater master planning initiative, the City is studying the Cross Creek watershed to better understand flooding concerns and develop proposed solutions to provide drainage and flood relief. Existing breached and intact impoundments are distributed throughout the watershed, posing unique opportunities to mitigate flooding of the downstream downtown area through upstream impoundment retrofits. A linked and dynamic modeling approach was essential to fully understand the storm dynamics through the watershed and effectively evaluate proposed solutions, especially given the implications of hydrograph timing and watershed detention characteristics on downtown flooding. Storm drainage infrastructure was evaluated through the use of a 1D/2D Infoworks ICM model, connected with a 2D unsteady HEC-RAS model of Cross Creek and its main tributaries. The HEC-RAS model built upon the FEMA steady-state, 1D HEC-RAS model and 2D model results were compared to those reported by FEMA. Pluvial flooding concerns in this watershed are primarily addressed through pipe upsizing, necessitating a consideration of downstream impacts due to reduced attenuation. Best practices were established through the course of watershed master plan development to effectively consider interactions between the creek, impoundments, and network of pipes and surface channels across both the HEC-RAS and Infoworks ICM model. This presentation will demonstrate how recent developments in 2D modeling tools for pipe networks and open channels support comprehensive flooding evaluations and optimized solutions in complex watersheds where understanding the dynamic interaction of hydrologic and hydraulic elements is crucial to providing effective drainage and flood relief.

Biography: Dr. Matthew Jones leads Hazen and Sawyer's stormwater practice group and offers national expertise in managing stormwater quantity and quality. Matthew received his PhD from North Carolina State University, where he researched, the design, functionality, and effectiveness of stormwater controls. He has designed hundreds of stormwater and watershed improvements, following many through their full lifecycle from initial concept through post-construction performance, and has worked with localities ranging from ultra-urban centers to small communities developing an initial stormwater program.

Easy as HEC: Case Studies in Maximizing New HEC-RAS Capabilities

Andrew Swynenberg, Freese and Nichols, Inc., andrew.swynenberg@freese.com
Co-presenters: Mark Pauls, PE, CFM; mark.pauls@freese.com; Gregory Mika, EIT, CFM; gregory.mika@freese.com

Abstract: In recent years, the timeline for new HEC-RAS releases has generally shifted from years to months. Since May 2021, the HEC team has moved from HEC-RAS v6.0 to v6.1, v6.2, and v6.3. Each release brings with it exciting new features that lead to new opportunities and new challenges. This presentation will provide specific examples of how Freese and Nichols, Inc. (FNI) modeling teams have quickly adapted approaches to take advantage of the latest HEC-RAS features, providing increased efficiency and precision to hydraulic model development. Entering data for 2D bridges is a notoriously tedious process. We'll discuss how to navigate HEC-RAS text files in order to transfer 1D bridge data into 2D models to save time, improve quality, and leverage modeling that's been previously completed. Hydrologic connectivity is critical in the context of rain-on-mesh 2D models. Defining hydraulic limitation in a hydrologic context can be a difficult skill to master without extensive experience. We'll show geospatial and terrain processing techniques that help standardize and automate this process, saving time and improving model quality. Model output as model input. HEC-RAS has added two key features that can be used synergistically to approach model uncertainty and produce better calibration without parameter hacking.

Biography: Andrew Swynenberg is a project engineer and Certified Floodplain Manager in Freese and Nichols' Central Texas Stormwater Group. He has professional experience with large-scale H&H modeling, stormwater master plans, design of flood mitigation alternatives, and automating H&H modeling and GIS processes.

G4: International Flood Mapping: Mapping

Scalability of flood mapping from street-level to state-level enables situational awareness ahead of, during, and after flood events

Kelsey McDonough, PhD, FloodMapp, kelsey@floodmapp.com
Co-presenters: Mark Slauter, mark.s@floodmapp.com; Juliette Murphy, juliette@floodmapp.com

Abstract: One of the key challenges before, during, and after a flood event is situational awareness about how a flood event is evolving and identification of the most heavily impacted locations. A common operating picture, or COP, enables the continuous delivery of critical information to provide situational awareness and evidence to support decision making, planning, and coordination of actions

taken. Varying stakeholders involved in all levels of emergency response can access a COP and receive the same information, regardless of whether their response is focused on the street-level, community-level, or across an entire state. FloodMapp partnered with Transport for New South Wales (NSW) to provide NowCast and PostCast flood mapping on the Unleash Live platform for the purpose of asset assessment and recovery. Displaying near real time and historical flood mapping at an accuracy comparable to industry-standard models, NowCast and PostCast provide a big picture overview of widespread flooding with inundation intelligence down to the asset level. Using FloodMapp's products on a COP ensured that Transport for NSW could understand the impact to their infrastructure across the state of NSW, communicate to customers, and subsequently plan asset inspections, recovery, and restoration activities. This enables efficient prioritization of assessment locations and tactical deployment of resources in support of on-the-ground teams who are evaluating flood-related impacts to assets and people, thus expediting the post-flood recovery effort.

Biography: Dr. Kelsey McDonough is a Senior Flood Engineer with FloodMapp. She is an expert in operational hydrologic modeling for flood early warning and emergency management purposes. Dr. McDonough is a graduate of North Carolina State University and Kansas State University, and an alumna of the U.S. Fulbright Program.

Case study: National-level multi-criteria analysis and prioritization for flood hazard mapping in Canada

Maxim Fortin, P.Eng., Natural Resources Canada, maxim.fortin@nrcan-rncan.gc.ca
Co-presenters: Brian Perry, brian.perry@nrcan-rncan.gc.ca

Abstract: Floods are the most frequent and costly natural hazard in Canada, causing over $1 billion in damages annually (IBC, 2018). Accurate flood hazard maps are essential tools to manage and mitigate flood risks, and various government initiatives carried out under federal-provincial agreements were instrumental in advanced flood mapping, along with many province or territory-led initiatives. Current data indicates that many areas in Canada are either covered by outdated flood hazard maps or not covered at all. Additional and continuous investment is required, and a new federal program is implemented to further advance flood mapping in Canada: the Flood Hazard Identification and Mapping Program (FHIMP). With a fixed amount of funding available and a substantial need across the country, it is essential to develop decision-support tools to ensure funding addresses higher-risk areas. A national-level multi-criteria analysis was implemented to identify priority areas for flood hazard mapping in Canada. This prioritization process took into account population exposure to flood hazards at various return periods, estimated flood damages, climate change, socio-economic vulnerability, and existing flood hazard map coverage. Each criteria was assigned a weight to evaluate an overall risk index at the municipality level, and municipalities were then prioritized within each province and territory. Results were reviewed with provincial and territorial counterparts through bilateral discussions, and adjusted to take into account jurisdictional priorities. This prioritization analysis will be maintained and updated as new data becomes available to be used as a decision-support and analysis tool as required by federal departments.

Biography: Maxim is a Water Resources Engineer with project experience in Canada and overseas in the following technical areas: fluvial/urban hydrology and hydraulics; flood modelling and mapping; drinking water production and distribution; and climate change adaptation. Over the last 10 years, Maxim worked in more than a dozen countries on various technical assistance and project management

assignments for clients including Global Affairs Canada, World Bank, African Development Bank, local governments and extractive industry partners. Since 2021 Maxim works as an Engineering Advisor with Natural Resources Canada (NRCan) and the Canada Centre for Mapping and Earth Observation (CCMEO) flood mapping team, where he acts as technical authority for the scoping, development and implementation of flood mapping projects under the Flood Hazard Identification and Mapping Program (FHIMP). This new federal program, led by NRCan, aims to advance flood mapping in higher risk areas in Canada in close collaboration with Provinces & Territories, Environment and Climate Change Canada (ECCC) and Public Safety Canada (PSC).

Increasing Canada's resilience to flooding: Introducing the Flood Hazard Identification and Mapping Program (FHIMP)

Brian Perry, EIT, MASc, Natural Resources Canada, brian.perry@nrcan-rncan.gc.ca
Co-presenters: Maxim Fortin, maxim.fortin@nrcan-rncan.gc.ca

Abstract: High quality flood mapping that is current and accessible will help governments, communities and individuals understand flood risks. Many parts of Canada are missing up-to-date flood maps that delineate flood hazard zones, which are essential for flood risk planning and mitigation. The Government of Canada is investing over $60M in its Flood Hazard Identification and Mapping Program (FHIMP) to help Canadians better plan and prepare for future flood risks. In this presentation, Natural Resources Canada (NRCan) will provide an update on Canada's Centre for Mapping and Earth Observation's current flood mapping activities. Of particular interest, they will share new information regarding major FHIMP activities, a joint initiative led by NRCan and supported by both Public Safety Canada and Environment and Climate Change Canada. This program aims to produce flood hazard data and maps for high priority areas across the country by collaborating with provincial and territorial jurisdictions to deliver mapping products that will be accessible to all Canadians. Updates will also be provided on the progress of various initiatives related to guidance, data and products for flood mapping with a Canadian specific lens.

Biography: Brian is a water resource engineer with 5 years of experience working for the federal government with projects focused on floodplain mapping, hydraulic modelling, hydrologic assessment, and river hydrokinetic energy extraction. He has a Master's of Applied Science in Civil Engineering from the University of Ottawa. As of 2021, Brian is an Engineering Advisor with Natural Resources Canada (NRCan) and the Canada Centre for Mapping and Earth Observation (CCMEO) flood mapping team, where he acts as technical authority for the scoping, development and implementation of flood mapping projects under the Flood Hazard Identification and Mapping Program (FHIMP). This new federal program, led by NRCan, aims to advance flood mapping in higher risk areas in Canada in close collaboration with Provinces & Territories, Environment and Climate Change Canada (ECCC) and Public Safety Canada (PSC).

G5: State Planning, Communication, and Mitigation Tools: Risk Communication

Managing Colorado's Flood Risk Using Enhanced Technology/Datasets for Outreach and Mitigation

Marta Blanco Castaño, GISP, CFM, Colorado Water Conservation Board,

marta.blancocastano@state.co.us
Co-presenters: Chris Ide, christopher.ide@wsp.com

Abstract: We will provide an overview on identifying flood risk using new advancements in geospatial technology combined with communication outreach and mitigation project assistance. Over the last few years, Colorado has developed a comprehensive terrain dataset with full statewide coverage. Using this data in conjunction with FEMA's stream inventory needs and status database, the Colorado Water Conservation Board (CWCB) has developed a strategy to focus mapping efforts for the future, including identification of fluvial hazards, 2D Base Level Engineering (BLE), and 3D flood data visualization. Not only are flood delineations across the entire landscape more accurate, but the data is driving enhancements to community outreach and mitigation. Leveraging statewide 2D BLE floodplains, WSP and CWCB have recently developed a web-based Flood Risk Information System (FRIS) pilot web-application that provides different risk components of flood hazards as well as exposures and vulnerability information by community. This pilot FRIS contains both public-facing and stakeholder-only accessible data. FRIS contains two modules. The first is a core FRIS page demonstrating potential flooding in a 3D environment, and the other is a "Real Time" data dashboard including: weather/flooding prediction and warnings, socioeconomic impacts of flooding, and other similar functionality focused on hazard mitigation, preparedness, and resiliency. CWCB and WSP have also partnered in the Mitigation Technical Assistance Pilot program, a CWCB initiative leveraging FEMA funding to aid communities in performing some technical aspects of investigating potential mitigation projects in their communities. These projects are typically stormwater related projects identified as Areas of Mitigation Interest either during the Risk MAP process or through a Hazard Mitigation Plan Update, and involves additional modeling and engineering analyses to identify potential alternatives to problem areas. This presentation will give an update on CWCB's program vision, and how statewide data is being used to drive mitigation in communities.

Biography: Marta has been with the Colorado Water Conservation Board (CWCB) for almost three years. She assists with the flood mapping program management as well as the LiDAR acquisition program. She especially enjoys the community engagement and technical coordination aspects of the job. Marta specializes in GIS data management, analysis, and technology applications, and has worked with hazard mitigation planning as well. Marta holds a BA in Geography and Environmental Studies, and a MS in Geographic Information Science. In her spare time, Marta enjoys various outdoorsy activities such as hiking, biking, camping, skiing, and climbing.

Delaware's Flood Planning Tool: A flood and coastal hazards reference tool

Jennifer Pongratz, CFM, DE Dept. of Natural Resources and Environmental Control, jennifer.pongratz@delaware.gov
Co-presenters: Gina Tonn, PhD, PE, CFM, gtonn@verdantas.com

Abstract: The Delaware Flood Planning Tool is an interactive web mapping application designed to aid in researching flood risk in the State of Delaware. It is intended to provide floodplain managers, insurance agents, developers, real estate agents, engineers, surveyors, local planners, and citizens with an effective means by which to make informed decisions about the degree of flood risk for a specific property. Map features are connected to geospatial databases that may be queried to obtain flood risk information. This presentation will give a brief history of how the tool was built and will highlight recent updates to the tool. It will walk through how to access and apply the information that is available

through the tool, such as floodplain maps, LOMAs, LOMRs, advisory flood heights, topographic contours, sea level rise inundation areas, hydraulic models and other state regulatory information.

Biography: Jennifer Luoma Pongratz is an Environmental Scientist 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 and is a member of the Dean's Advisory Council for the University of Delaware's College of Earth, Ocean and Environment. Jennifer is also the chairperson of the Community Planning Assistance Committee of the Resilient and Sustainable Communities League (RASCL). 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 24 years.

Outreach and Governance Best Practices Across Four Regions in Texas

Shonda Mace, Texas General Land Office, shonda.mace.glo@recovery.texas.gov
Co-presenters: Stephen Tolbert

Abstract: The Texas General Land Office (GLO) launched the River Basin Flood Studies (RBFS) in the 49 counties which received a presidential disaster declaration due to the impact of Hurricane Harvey plus 4 counties in the Lower Rio Grande Valley that received a presidential declaration for flooding in 2015. GLO's role is to connect communities susceptible to floods with experts, flood models, and mitigation grant opportunities to help prioritize and plan flood mitigation projects. Through community engagement and coordination across the RBFS regions in Texas, the GLO is aggregating data about flood challenges to deploy local and national resources to foster flood resilience in Texas. As the study progresses, the GLO has continued to evolve and refine its outreach strategies to help Texas' coastal communities. The study areas consist of diverse stakeholders including underserved communities, rural, urban, and a wide range of political landscapes. The study's stakeholders have unique needs and often juggle multiple priorities. The following best practices for stakeholder engagement were implemented:

- Expand Existing Community Relationships – The GLO has deep roots within the communities in each study area. By leveraging the existing relationships GLO has established, the RBFS teams have become known and trusted resources throughout coastal Texas.
- Maintain Stakeholder Momentum – Consistent stakeholder engagement is needed through each phase across the study. We have implemented strategies to continue engagement with stakeholders to maintain connections, sustain momentum, and constantly provide value to communities.
- Establish Community Driven Governance Groups – The effectiveness of the study is dependent on how successfully we partner with our stakeholders. Our team has built stakeholder advisory groups to help review and contribute to our modeling processes and mitigation strategies.
  The GLO and the team of outreach professionals want to share the new challenges encountered and best practices for maintaining stakeholder momentum during a multiyear, complex flood study.

Biography: Ms. Mace serves as the manager of Studies, Research, and Development with the Texas General Land Office's Community Development and Revitalization (GLO-CDR) program. During her tenure with GLO-CDR, Ms. Mace has assisted in the development of a regional planning studies program and Housing technology improvement and studies that utilize HUD's CDBG-DR funding to conduct large-scale studies in disaster-impacted areas to assist communities in their planning efforts. Prior to joining the GLO-CDR team, Ms. Mace worked for 10 years as an Architectural Historian, spending much of her time working as a consultant for TxDOT reviewing environmental documents and projects for compliance with NEPA, Section 106, and 4(f) requirements.

G6: Dam Safety and Planning: Dams & Levees

Dam Risks in Disasters: A Puerto Rico Case Study for Hurricane Fiona

Molly Finster, PhD, Argonne National Laboratory, mfinster@anl.gov
Co-presenters: Rosemarie Bradley, rosemarie.bradley@fema.dhs.gov; Carol Freeman, cfreeman@anl.gov ; Amanda Savitt, asavitt@anl.gov

Abstract: As the impact of climate change is felt across the United States, it's important that communities take steps to increase their resilience against extreme weather events, such as hurricanes. Part of this involves maintaining and improving key dam infrastructure, which are particularly susceptible to the excessive precipitation and flooding associated with these types of events. In September 2021, the FEMA National Dam Safety Program (NDSP) and National Integration Center (NIC) Technical Assistance Branch began a "Planning for Dam-Related Emergencies" Collaborative Technical Assistance (CTA) project in Puerto Rico, which focused on the Rio de la Plata Watershed. The CTA assisted communities at risk for flooding due to operational discharge or dam-related infrastructure failure gain a better understanding of the consequences of dam-related emergencies. Throughout the process, the CTA engaged participants in a facilitated process to build relationships, develop risk-informed plans, and collaborate with community partners to achieve the goal of increased preparedness to dam-related hazards. The Puerto Rico CTA was completed in August 2022, just prior to the devastation caused by Hurricane Fiona. In response to the hurricane and as a follow-up to the CTA, FEMA deployed an Incident Specific Technical Assistance (ISTA) in Puerto Rico. In addition to better understanding the impacts of Hurricane Fiona on the island's river systems and dams, including major rainfall and flooding in the Rio de la Plata Watershed, this session will walk attendees through a case study of how Puerto Rico responded to and dealt with the impacts of Hurricane Fiona. It will also investigate how the CTA process helped support local stakeholder planning and preparedness and identify what gaps may still exist. This post-CTA effort continues to help Puerto Rican communities at risk for dam-related emergencies better plan and prepare for future extreme weather events, thus improving overall resilience.

Biography: Molly Finster, Ph.D. is an Environmental Systems Engineer in the Decision and Infrastructure Sciences (DIS) Division at Argonne National Laboratory. She has worked on a variety of national programs and technical projects to solve complex environmental challenges, sustainably manage resources, increase resiliency of key infrastructure, address climate related challenges, and assure regulatory compliance. With a background in Environmental and Chemical Engineering, Molly has

conducted laboratory research, field studies, facility investigations, and computer-based modeling to advance both research and practice. Current areas of research include infrastructure vulnerability and resiliency analysis; dam safety planning and preparedness; resource management and sustainability; environmental impact assessment and compliance; and risk and community analysis.

The FM Area Diversion Project: Dam Operation to Minimize Project-Induced Floodplain Impacts

Joel Paulsen, PE, CFM, Metro Flood Diversion Authority, Paulsenj@fmdiversion.gov
Co-presenters: Greg Thompson, gthompson@houstoneng.com; Jun Yang, PE, PhD;

Abstract: The Fargo-Moorhead Area Diversion Project is designed to protect the cities of Fargo and West Fargo, ND, Moorhead, MN, and the surrounding communities during times of extreme flooding. The Metro Flood Diversion Authority is partnering with the US Army Corps of Engineers (USACE) in the first federal USACE project to ever be implemented using a Public-Private Partnership (P3) delivery method. The roughly $3 billion project consists of a 30-mile-long stormwater diversion channel, a 20-mile-long dam embankment, levees and floodwalls throughout the cities, and additional mitigation features. The dam is designed to retain approximately 150,000 acre-feet of floodwater within a 40-square-mile upstream mitigation area through operation of gates on two upstream rivers and at the inlet of the diversion channel. The diversion channel will collect floodwaters from six rivers and provide certifiable flood protection for approximately 240 square miles of land and approximately 235,000 residents in North Dakota and Minnesota. The diversion channel has the capacity to pass the 100-year flow by itself; however without the flood storage from the dam, it would send an impactful flood wave to downstream communities. Therefore, a dynamic operation plan was developed to strategically store water in the dam that de-couples the timing of the arriving flood hydrograph from the uncontrolled hydrograph of the diversion channel, thereby matching the existing conditions flooding downstream of the project. This presentation will provide an overview of the project need and main project components, and then dive into the details of how the project will operate.

Biography: Joel Paulsen, PE, CFM, serves as the executive director of the Metro Flood Diversion Authority (MFDA), which oversees the development of the Fargo-Moorhead Area Diversion Project. Through a P3 (public-private partnership), the project will provide permanent, reliable flood protection for Fargo, ND, Moorhead, MN, and the surrounding communities by its completion in 2027. When Paulsen joined the MFDA in September 2019, he brought 20 years of experience in engineering, civil works, and traffic-related projects. He previously worked as an engineer and office leader for Stantec Engineering, where he worked on utility replacements, transportation improvements, levee systems, and community planning. He earned a civil engineering degree from North Dakota State University in Fargo. Paulsen, a native of Moorhead, previously served on the Moorhead City Council as well as the Governor's Task Force focused on achieving permanent flood protection for the region. He is a certified FEMA Floodplain Manager and is certified as a stormwater pollution prevention plan designer. - - - Greg Thompson, PE, CFM, works as a principal and senior civil engineer for Houston Engineering, Inc. in Fargo, ND. He manages numerous water resources surface water modeling efforts to complement project designs across the company. Greg is a local consulting engineer project manager for the Fargo-Moorhead Area Diversion Project. In this role, he leads many of the hydrologic and hydraulic modeling components and coordinates other work-in-kind designs for the Metro Flood Diversion Authority and the US Army Corps of Engineers.

Dam Safety is a Shared Responsibility & The Nation's Infrastructure Depends On It

Kayed Lakhia, FEMA, kayed.lakhia@fema.dhs.gov
Co-presenters: None

Abstract: Dams are a critical part of the nation's infrastructure. Present in all 50 states, Puerto Rico, and Guam, dams provide many benefits to Americans, including bringing water, power, flood risk reduction, recreation, and economic opportunities to communities. Although the benefits of dams are many, there are risks associated with them which can be impacted by natural hazards, human-made threats, limited resources, and aging infrastructure while downstream and upstream populations are increasing. The average age of dams listed in the U.S. Army Corps of Engineers' National Inventory of Dams is 61 years old. While the age of a dam is not necessarily a direct indicator of its condition, it could indicate that it was not built to today's standards. FEMA as the lead coordinating agency for National Dam Safety has updated its Strategic Plan and priorities to combat our dam infrastructure challenges. This initiative guides national dam safety and risk management efforts. It captures the essence of what has been identified by federal, state, and industry partners as transformational activities that will help improve practices and actions within dam safety programs across the nation. This 5-year strategy for growth is focused on tangible results of the increased funding under the 2022 IIJA Act for the NDSP to reduce risks to life, property, and the environment from dam failure by guiding public policy and leveraging industry best practices across the dam safety community. The Strategy considers changing climatic conditions and builds the foundation for what the program will look like in 5 years. This presentation will highlight the gaps, strategies, and priorities of the National Dam Safety Program in hopes of engaging and collaborating with other industry leaders.

Biography:

G7: Accomplishing Natural and Beneficial Functions: NBF

The Olympics of Levee Setbacks: Qualifying Times, Hurdles, and Relays

Randall Behm, PE, CFM, BEHM Hazard Mitigation, LLC, floodfighter@q.com
Co-presenters: None

Abstract: Flood risk management in the United States, primarily along rivers and streams, has historically been conducted through the construction of levees to control flooding. In recent decades climate change has continued to evolve into dynamic weather patterns resulting in disastrous flooding from coast to coast. Just as traditional an action for constructing levees is for trying to control flooding, is the process of repeatedly repairing damaged levees to their pre-flood condition, only to repeat the process. During this presentation, Mr. Randall Behm will discuss why levee setbacks should be incorporated into the national satchel of techniques for reducing flood damage, increasing resiliency, and supporting environmental functions. This presentation will provide the audience with information regarding why levee setbacks are vital to current US policies for managing flood risk. The flood damage reduction benefits, environmental benefits, and reduction in reconstruction costs associated with setting at risk levees back from the river are critical to improving flood risk management policies which are archaic in their current status. This presentation encourages consideration of potential legislative language which requires the identification of and documentation of at-risk levee

systems through significant flood damage and reconstruction costs, as well as opportunities for federal agencies to collaborate on the planning processes for implementation of future levee setbacks.

Biography: Mr. Behm has 38 years of combined experience as a hydraulic engineer focusing on flood risk management and increased flood resiliency through the US Army Corps of Engineers and Behm Hazard Mitigation, LLC. For the past twenty years Mr. Behm has sought to reduce flood damages and increase resiliency to flooding through implementation of nonstructural techniques, including historic floodplain reconnectivity through modification of existing levee systems that are significantly damaged or fail during flood events and are continually reconstructed, at a significant cost to taxpayers. Mr. Behm was directly involved in a project to set a damaged federal levee back from the Missouri River after the 2011 flood event and has assisted The Nature Conservancy on documenting the successful process in forming unique partnerships in setting another Missouri River levee back from the river after the 2019 flood event. He has most recently assisted the Theodore Roosevelt Conservation Partnership on identifying the potential hurdles to and the opportunities in support of the implementation of future levee setbacks.

Greenways in the Floodway: Design Solutions for Flooding Trails in Urban Areas

Andrew Martin, PE (NC, SC, PA), CFM, ESP Associates, amartin@espassociates.com
Co-presenters: Gina Straga, gstraga@espassociates.com; Robert Billings, robert.billings@mecklenburgcountync.gov

Abstract: This presentation will focus on the benefits and challenges associated with building greenways adjacent to creeks. It will explore a case study of the existing Little Sugar Creek Greenway in urban Charlotte, North Carolina. A portion of the existing greenway is built through an existing culvert that experiences frequent flooding due to quick rising water levels in the area. Sediment build-up in the culvert barrels and the delayed reopening of the trail after rain have caused an increase in maintenance activities and a negative user experience. This presentation will explore a solution to help reduce the frequency of flooding on the greenway while balancing flood risk and meeting the requirements of the NFIP. The presentation will also explore collaborative opportunities between recreation uses and floodplain managers to reach mutually beneficial solutions.

Biography: Mr. Martin has over 25 years of engineering experience in project management, planning, and design for municipal infrastructure improvement and stormwater projects, including large capital improvement projects in highly urbanized areas. He is experienced in stakeholder involvement and public meetings, including presentations to councils and other government entities. Over his career, he has designed and managed municipal infrastructure projects with a cumulative value of over $300 million.

The Multiple Benefits of Floodplain Easements: An Assessment of Demand for Floodplain Easements in the Upper Mississippi River Basin

Olivia Dorothy, American Rivers, odorothy@americanrivers.org
Co-presenters: None

Abstract: American Rivers' recent report "The Multiple Benefits of Floodplain Easements" assesses the demand for floodplain easements in the Upper Mississippi River Basin and how USDA conservation easement programs often miss flood-prone acres. The Secretary of Agriculture has declared flood-related agricultural disasters annually across the five Upper Mississippi River Basin states, yet funding

for the USDA floodplain easement program has only been open to enrollment twice in the region. Our study found that significant new investments are needed in the Upper Mississippi River Basin to reduce agricultural damages from flooding. In the five Upper Mississippi River Basin states – Illinois, Iowa, Minnesota, Missouri, and Wisconsin – flooding is the most frequent and widespread cause of crop damage. Over the past decade, flood-related agricultural damages in the five Upper Mississippi River Basin states have exceeded $8 billion, while flood prevention funding over that same time was only $267 million. The Report links escalating flood damages and costs to climate change driven changes in precipitation and documents a clear need and desire for greater investments in flood prevention programs, like the USDA floodplain easement program. To reduce agricultural flood damages, Congress needs to open the floodplain easement program for annual enrollment and make other resources available for farmers to prevent flood damages.

Biography: Olivia joined American Rivers in 2014 and manages river restoration and protection programs in the Midwest, with a focus on restoring the Mississippi River. Prior to joining American Rivers, Olivia was the Upper Mississippi River Director for 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 is a Certified Floodplain Manager and has a Bachelor of Science in Natural Resources and Environmental Sciences and a Master of Arts in Environmental Studies from the University of Illinois.

G8: Local Stormwater Projects and Design Standards: Stormwater

Wilmette Neighborhood Storage Project - The Largest Capital Project in the Village's History

Darren Olson, PE, CFM, D.WRE, Christopher B. Burke Engineering, Ltd., dolson@cbbel.com
Co-presenters: Brigitte Berger-Raish, P.E, bergerb@wilmette.com; Matt Moffitt, PE, CFM, mmoffitt@baxterwoodman.com

Abstract: The Village of Wilmette is a northern suburb of Chicago and is located adjacent to Lake Michigan. There is a major watershed divide within the Village; one watershed drains east to Lake Michigan and the other west to the North Branch of the Chicago River. Runoff in the western watershed is collected by regional trunk line storm sewers that outfall to a large stormwater pumping station at the River. The historic storm sewer conveyance system is undersized compared to modern standards and the western portion of the Village regularly experiences widespread urban (non-riverine) flooding. The Village developed a Stormwater Management Plan from 2013-2015 to assess the significant flooding experienced in the western portion of the Village, analyzing several improvement options. Primary alternatives included several miles of large diameter storm sewer to increase conveyance capacity to the River, and three localized neighborhood underground stormwater storage basins, among others. After years of study, public participation, an independent value-engineering review and deliberation, the Village Board decided to move forward with the neighborhood storage option. The overall program was divided into 4 construction projects totaling nearly $64M. The project included a combined 40+ acre-ft of underground stormwater storage at three prominent parks with sports fields (one of them shared with two adjacent schools) within the Village and nearly five miles of large diameter storm sewers in dense residential neighborhoods with mature trees. In addition to the complex engineering, the project

required significant coordination with residents, the park district, and the school district. The presentation will discuss the project, beginning in 2013, through completion of the final phase of construction in November 2022; including the public engagement, Park District Intergovernmental Agreement, scheduling, safety-sensitive construction and other unique features of what was the largest capital project in the Village's history.

Biography: Darren Olson, PE, CFM, D.WRE Christopher B. Burke Engineering, Ltd. Darren Olson is a Vice President and Assistant Department Head of the Water Resources Department at Christopher B. Burke Engineering, Ltd (CBBEL) where he has 22 years of experience in the field of water resources engineering. Darren has his BSCE and MSCE from the University of Illinois at Urbana Champaign and an MBA from Northwestern's Kellogg School of Management. Darren is also active in the American Society of Civil Engineers (ASCE) and currently sits on the Committee for America's Infrastructure that recently released the 2021 ASCE Report Card for America's Infrastructure.

Digging Deep for Long-term Flood Relief: Phase 2 Tunnel Feasibility Study

Jason Becker, PE, CFM, Halff Associates, jbecker@halff.com
Co-presenters: Sam Hinojosa, PE, CFM, shinojosa@halff.com

Abstract: Harris County has experienced several major storm events within the last decade that have resulted in catastrophic flooding. The Harris County Flood Control District explored the use of deep, large diameter tunnels for stormwater conveyance to address existing flooding issues and reduce future flood risk. Based on the recommendations of the Phase 1 Study, the Flood Control District authorized a Phase 2 Study to perform a more detailed evaluation of the potential benefits, costs, and implementation challenges of tunnels as a major flood risk reduction solution. A key component of the Phase 2 Study was the watershed assessment and hydrologic & hydraulic (H&H) analysis completed to support the development of tunnel concepts and estimate benefits to compare tunnel alternatives. This presentation will discuss the methodologies and results of the Phase 2 Study evaluation and highlight the preliminary watershed screening, creation of proposed tunnel modeling, calculation of flooded structures and instances of flooding benefits, and evaluation of traditional solutions. Finally, a path forward will be presented that focuses on refinement of tunnel alternatives, additional data collection and engineering analysis, and updated H&H modeling to more accurately estimate impacts and benefits. The Phase 2 Study represents an important step in the continued investigation of stormwater tunnels as an innovative and effective long-term, regional flood risk reduction solution.

Biography: Jason Becker serves as a Water Resources Team Leader and brings more than 12 years of experience working on a range of multi-disciplinary civil engineering and water resources projects for both public and private clients. Jason has worked on site drainage/detention analyses and watershed planning/feasibility studies throughout the Houston region. His responsibilities have included the identification of stormwater management strategies, development of H&H modeling, and coordination of drainage design related items. Jason's past projects consist of drainage support for land/site development projects, transportation drainage impact analyses, and large watershed planning/engineering studies. He is an active member of the American Society of Civil Engineers and the Texas Floodplain Management Association.

No Stranger to the Rain: Economically Sizing Storm Structures in a Changing Midwest

Chris Shultz, PE , JEO Consulting Group, cshultz@jeo.com

Co-presenters: Patrick Hartman, JEO Consulting Group, phartman@jeo.com**,** Allison Atkinson, aatkinson@jeo.com

Abstract: The combination of changing weather patterns, limited financial resources for storm sewer implementation, and spatial constraints in cluttered urban areas creates an impetus for evaluating our stormwater design methodology. Properly sizing stormwater infrastructure begins with predicting appropriate and accurate flow rates, a challenge bounded by both stagnant municipal regulations, advancements in stormwater modeling, and growing public concerns about climate change. The City of Lawrence, Kansas, has taken a progressive approach to storm selection and rainfall distribution for their upcoming infrastructure projects. The City has partnered with JEO Consulting Group to model deficiencies and design improvements for a major stormwater trunkline in the Jayhawk Watershed in historic Old West Lawrence. Simultaneously, the City is evaluating appropriate NOAA Atlas 14 rainfall distributions to use as a future stormwater standards. This presentation examines the effects that different rainfall distributions have on CIP recommendations and the resulting economic impact to a municipal stormwater program. It examines the variations in deficiency identification based on different MSE distributions vs. SCS distributions, and how those differences correlate to real world observations from area residents. Observations imply that while choosing rainfall distribution standards based on economics may be appropriate for minor stormwater infrastructure, more conservative approaches should be considered for high-expenditure trunk lines.

Biography: Chris Shultz is a Water Resources Engineer at JEO Consulting Group. He received his B.S. from Kansas State University and M.S. from Colorado State University, both in Civil Engineering with an emphasis in water resources. Following school, Chris worked for three years at the Kansas Water Office, the state's water planning agency as well as a wholesale public water utility of reservoir storage. Here, he operated and refined a reservoir drought model used for statewide drought operations and preparedness. Over the last several years, Chris moved from drought to flooding utilizing crossover knowledge and a background in programming to develop floodplains and perform analysis for flood mitigation.

G9: State Mitigation Funding Programs: Mitigation

Vermont's Flood Resilient Communities Fund Mitigation Program

Rebecca Pfeiffer, CFM, State of Vermont Rivers Program, rebecca.pfeiffer@vermont.gov
Co-presenters: Stephanie Smith, stephanie.a.smith@vermont.gov

Abstract: While FEMA HMA grant opportunities have been successful at helping Vermont acquire and mitigate flood-prone properties, there are many homes and flood-prone properties that we have not been able to mitigate. In Vermont, many homes and buildings are at great risk of flood-related erosion (where streams may move or avulse during flood events) but are located outside of the FEMA-mapped SFHA. This type of flood damage often cannot be addressed through traditional FEMA HMA grants. With flood-related erosion, a stream may be within a few feet of a home or building, putting that building at risk of being washed away in the next flood. With the use of ARPA funding, the Governor and the Vermont Legislature identified the need for a more tailored flood mitigation program - one that would help bridge the gaps in our existing flood mitigation program. In the spring of 2021, the Flood Resilient

Communities Fund (FRCF) was created to allow for projects to: 1) fund the buyout of buildings at risk of flood related erosion or other flood-prone structures not eligible for FEMA HMA grants, 2) help facilitate the purchase of at-risk parcels before homes have been placed, and 3) help fund projects meant to protect, restore, or enhance natural floodplain functions to promote climate resiliency. The FRCF has also identified two additional key priorities: helping to facilitate relocation for socially vulnerable Vermonters, and to prioritize projects that support environmental justice and social equity. This presentation will introduce attendees to the type of flood mitigation projects highlighted by this new program. In addition, attendees will learn about the efforts and tools to help guide the program to promote the key priorities of social equity, supporting socially vulnerable Vermonters, and promoting climate resiliency. Please join us to learn more about our new mitigation program!

Biography: Rebecca Pfeiffer is Vermont's National Flood Insurance Program (NFIP) Coordinator at the Vermont Agency of Natural Resources (ANR). She manages Vermont's River Corridor & Floodplain Protection program, which is staffed with a team of five amazing floodplain managers. She and her team provide assistance to communities around the state, assist and consult on state permits regarding our unique approach which considers both inundation and flood-related erosion hazards, and implements the Vermont Flood Hazard Area & River Corridor permitting program. She coordinates with other State programs around the National Flood Insurance Program (NFIP). She has worked for the State of Vermont for 15 years in the floodplain management program. In addition, Rebecca is the Co-Chair of the ASFPM Natural & Beneficial Functions (NBF) Committee and has served in the past on the ASFPM Board of Directors as Secretary.

Proactive Mitigation: Funding Flood Protection Planning Projects in Texas

Malcolm Hamilton, PE, Texas Water Development Board, malcolm.hamilton@twdb.texas.gov
Co-presenters: Samantha Humphrey, PCED, Chambers County, Texas, shumphrey@chamberstx.gov; Matt Lewis, P.E., CFM, Freese and Nichols, matt.lewis@freese.com; David Rivera, PhD, PE, CFM, Freese and Nichols, Inc., David.Rivera@freese.com

Abstract: In the wake of historic flooding in Texas, the 86th Texas Legislature passed Proposition 8, a constitutional amendment providing for the creation of the Flood Infrastructure Fund (FIF) to assist in the financing of drainage, flood mitigation, and flood control projects. While many of the program's projects are continuing their important work, we will reflect on the grant management process and developing policies and procedures for a new state-funding program. The Texas Water Development Board (TWDB) will provide an overview of the FIF program and its goals with a focus on Watershed Studies, also identified as Category 1 projects, including The Flood Intended Use Plan, project eligibility requirements, and prioritization criteria. TWDB will present case studies from its 46 Category 1 projects to demonstrate the range of flood planning Scope of Works, such as data collection, stakeholder engagement, hydrologic and hydraulic modeling, and alternative project identification. This presentation will demonstrate how the results of FIF Category 1 projects will be integrated into TWDB's regional flood plans and into Texas' eventual state flood plan. This session is intended to be a companion to Reem Zoun's (TWDB), which will provide an overview of findings from Texas' first cycle of statewide regional flood planning.

Biography: Malcolm Hamilton is a Water Resources Engineer for the Texas Water Development Board's Flood Infrastructure Fund Program. He has worked for multiple government agencies in Texas and Washington State with a background in flood regulation and hydraulic and hydrologic studies.

State Resilience Revolving Loan Programs - The New Frontier of Flood Hazard Mitigation

Roderick Scott, Flood Mitigation Industry Association, roderick.scott75@aol.com
Co-presenters: None

Abstract: This presentation will cover the development and now deployment of a revolving loan for flood hazard mitigation. The nation has been using various tax payer funded grant funds for pre and post disaster for a few decades. These funds are dependent on appropriations. For 50 years the oldest high flood risk pre-FIRM buildings in FEMA flood zones enjoyed subsidized NFIP rates, which did little to stimulate retro fit elevation or dry flood proofing. Then in 2012-14 everything changed as we started to eliminate the subsidies. But there was no real effort to get the funding needed to get the buildings retro fitted. The flood mitigation industry and the banks agree there are 3-4 million pre-FIRM's in flood zones. The banks estimate the asset value at $1.5 Trillion. What we needed was a low interest long term loan program, like the 40 year old EPA Revolving Loan Program. Now we have the STORM Act, Safeguarding Tomorrow Revolving Loan Fund, a low interest long term loan program that can be used to provide the financing for flood hazard mitigation projects. States are now creating their own Resilience Revolving Loan Programs in order to take advantage of the STORM Act and any other forms of financing. These new state loan programs are identifying uses of the loans like making the required match for large Federal projects like USACE Flood Risk Reduction Projects and BRIC program projects as well as making individual property loans for flood mitigation projects. This program will review the model State Resilience Revolving Loan Program legislation and the various state programs in place in 2022 and share tips to get your state to create their revolving loan program.

Biography: Rod has over 30 years of contracting experience specializing in flood damage recovery, flood hazard mitigation and historic structures, coming to Louisiana post Katrina/Rita to elevate homes. Rod has an in depth knowledge of flood plain regulations, structural engineering requirements for the flood zones and building codes. In 2014 Rod became a Certified Floodplain Manager - CFM and has conducted flood hazard mitigation outreach programs for the survivors of Sandy, Irma and Harvey. In 2014 Rod won the ASFPM National Flood Proofing Award for the industry supported "Elevation 101" program, post Sandy. In 2018 Rod helped the International Association of Structural Movers publish the "Steps to Elevation – STE" for property owners. In April of 2020 Rod led a team to produce the "Home Raising Academy" a pilot HUD Resiliency project in Norfolk, VA. In 2020 Rod lead a group of private sector companies create the Flood Mitigation Industry Association – 501c3 and is serving as Board Chair. Rod has a private sector consulting company that provides education development programs, project management, assessment and estimating services for flood mitigation projects.

Concurrent Session H

H1: CRS: Improve Your Rating: NFIP/Floodplain Management

Efficiencies in Linking Resiliency Planning with the CRS Program

Erin Deady, AICP, Esq., Erin L. Deady, PA, erin@deadylaw.com
Co-presenters: Lori Lehr, Lori Lehr, Inc., lori@lorilehrinc.com

Abstract: As more local and state governments are starting to address vulnerability assessments and resiliency planning, many linkages can be made to the Community Rating System program for efficiency. The Community Rating System, Activity 452.b, provides points for developing watershed management plans and this is a pre-requisite to achieving a 4 Class Rating. Bridging the gap between a 5 and 4 Class Rating in the program has been challenging because of the types of modeling requirements for a watershed management plan. Additionally, for coastal communities, this means modeling future conditions for the 2100 NOAA Intermediate High sea level rise scenario. Many inland and coastal state and local governments are developing vulnerability assessments based on future flooding considerations. For efficiency in modeling and consistent analysis to develop response strategies, entities pursuing these strategies should perform an analysis on the emergency management, resiliency and floodplain planning efforts concurrently. One case study is in Florida, where the State Division of Emergency Management has developed a granting program to assist local governments in developing watershed management plans to meet the requirements of Activity 452.b in CRS for watershed management plans. This is simultaneous to the development of a new "Always Ready" resiliency granting program providing planning grant funds to local governments to conduct vulnerability assessments for both coastal and inland communities. Some communities are harmonizing these efforts while also meeting other aspects of emergency management planning such as updates to Local Mitigation Strategies. A key to the success in harmonizing these initiatives is accurate datasets, specifically for stormwater management structures, and this likely requires a recent or in-flight stormwater management plan. This session focuses on that interface between these types of planning initiatives with strategies, recommendations and case studies on how alignment of them can provide efficiency, cost savings and success!

Biography: ELD P.A. has been on the forefront of resiliency planning in Florida as the field has evolved. For the past 11 years, the firm has been a known expert in the fields of planning, sustainability, energy policy, resiliency planning and harmonizing technical, legal and policy approaches to assist local governments with pursuing their resiliency and sustainability goals. A core service has been securing grant assistance for local governments to further these efforts to plan for a more sustainable, resilient future. Ms. Deady has written over 73 resiliency grants in Florida and recently secured 8 planning grants for CRS watershed management plans. As an attorney and urban planner, she works to help communities plan for future flooding conditions with vulnerability assessments and resiliency plans, Code provisions and Comprehensive Planning policies. Lori Lehr, CFM is a widely known expert in the Community Rating System program having formerly worked for ISO and currently working with dozens of communities in their participation of CRS.

Applying the Business Acumen of Return on Investment to improve CRS participation and success.

Thomas McGroarty, CFM, tdmcgroarty@gmail.com
Co-presenters: None

Abstract: Since communities must make the best use of limited taxpayers funds, a tool, Return on Investment (ROI), helps local leaders determine whether the CRS activities are a prudent use of scarce resources. ROI equals the amount of income, or in this case; insurance premium savings for a community divided by the required capital expenditures. The four (4) CRS activities, nineteen (19) functions and one hundred and twenty-four (124) elements will be presented using the ROI paradigm based on current CRS communities record of success:

- High ROI (Projects that require limited effort to receive points) > 95%
- Medium ROI (Projects that require moderate effort to receive points) 85 -94 %
- Low ROI (Projects that require significant efforts to receive points) 50-84%
- De Minimums ROI (Projects that require exhaustive efforts to receive points) < 50 % The CRS program rewards prudent and sweeping activities by a community when planning, preparing, responding, and mitigating potential flooding threats. Hence, an effective approach to CRS and resiliency is following the ROI metric for strategic comprehensive floodplain management. In addition, this concurrent session will look at how flooding relates to all five mission areas of the National Preparedness Goal; as well an understanding of the new CDC Building Resilience Against Climate Effects (BRACE) Framework, to meliorate community resilience.

Biography: Thomas McGroarty is an all-hazards Emergency Preparedness and Response Coordinator for the Pennsylvania Department of Health. McGroarty previously was the mayor (CEO) of Wilkes-Barre, PA (NFIP community 420631), where he led the community's comprehensive floodplain management activities including the $ 250 million Wyoming Valley Levee Raising Project. Through his emergency management leadership Wilkes Barre is a CRS class Six (6) and a Fire ISO class Two (2). McGroarty has earned an associate degree in Emergency Management from Frederick Community College, a bachelor's degree from Bloomsburg University in Political Science. McGroarty is currently completing his master's degree at the Naval Postgraduate School, with a thesis research question, "How can FEMA increase Community Rating System participation in flood prone communities?" McGroarty has graduated from the FEMA National Emergency Management Advanced Academy; and is a FEMA Senior Floodplain Instructor for E 273 (NFIP) and E 278 (CRS).

A Floodplain Species Plan - Implementation Challenges and Solutions

Seamus Riley, Jefferson Parish, SMRiley@jeffparish.net
Co-presenters: None

Abstract: Jefferson Parish, Louisiana, contains abundant (albeit diminishing) natural habitat and incredible biodiversity. Among the substantial number of animal species with range in Jefferson Parish, twelve are currently listed as threatened or endangered under the Endangered Species Act. Jefferson Parish is experiencing the second-highest rate of land loss in coastal Louisiana due to the effects of sea level rise, subsidence, hurricanes, storm surges, disconnection of the Mississippi River from coastal marshes, oil and gas activity, and other human impacts. With a current land loss rate of 210 acres per year or three football fields per week, the need to assist in the conservation of and advocacy for threatened and endangered species within our floodplain was obvious. This presentation will cover the development and initiation of our Threatened and Endangered Floodplain Species Plan for all of unincorporated Jefferson Parish and two incorporated municipalities (the City of Gretna & the Town of Jean Lafitte). Special emphasis will be placed on potential challenges and solutions associated with recovery strategies and objectives we hope to accomplish as we endeavor to effectively and realistically benefit the threatened and endangered species in our floodplain.

Biography: Seamus Riley, originally from Washington D.C., is the Floodplain / CRS Specialist for Jefferson Parish, Louisiana, where he has worked for the last seven years. He has a Master of Science in Environmental Science & Policy and is a Certified Floodplain Manager. His experience is not limited to but includes regulatory permitting, coastal restoration, grant and project management, and the

Community Rating System. Seamus enjoys spending time with his family, gardening, being outdoors, flying drones, and getting his hands on any new gadget he can.

H2: Prioritizing Mitigation Actions: Mitigation

How to Find the Biggest Bang for Your Mitigation Buck: Mitigation Project Designer Update
Lawrence Frank, CFM, AICP, PMP, Atkins, lawrence.frank@atkinsglobal.com
Co-presenters: Richard Passarelli; richard.passarelli@atkinsglobal.com

Abstract: This session provides an update on the functionality and progress of FEMA's Mitigation Project Designer (MPD), an interactive decision-support tool for flood mitigation decision-making. MPD allows communities to weigh the Return on Investment (ROI) of various flood mitigation projects and quickly and iteratively answer the question, is it worth it? Using location-specific flood and structure data, MPD provides quick cost projections to help communities compare between projects, identify groupings of projects, and forecast the long-term savings of investments before disasters strike. Updates showcased in this session will include a web-based prototype with 3-D visualization capabilities, the automatic identification of mitigation clusters—locations where nearby projects get the best "bang for your mitigation buck"—and the ability to utilize different flood loss methods, including climate and Sea Level Rise projections, in the ROI calculations. The session is designed for community stakeholders and technical experts alike and will walk-through various uses cases of the tool, such as best leveraging a grant with a specific budget or assisting with outreach during the mitigation planning process. The session will also cover the future direction of the project, including efforts to include green infrastructure and improved building code scenarios, and will discuss how the tool will fit within the broader OpenHazus framework.

Biography: Lawrence Frank is a certified floodplain manager and professional urban planner that leads Atkins' Federal Planning, Resilience and Recovery group. With 28 years' experience in resilience, he has an extensive background assisting state, university, local, tribal, and territorial officials reducing their risk to natural hazards through plans and grants. Recently, Mr. Frank also has helped communities recover by implementing resilience plans after large hazard events like the City of Mexico Beach, Florida, after Hurricane Michael, and the State of North Carolina after Hurricane Matthew. He is working on a small team to develop the innovative Mitigation Project Designer tool for FEMA which assists communities in comparing mitigation project ideas and selecting ones with the higher Return on Investment. The tool leverages a variety of data sets and is envisioned to be part of Open Hazus where it will increase its functionality. Mr. Frank has been part of teams leveraging big data to help develop a blueprint for resilience including serving as project manager for the Atlanta Regional Commission (ARC) to better understand the vulnerability of the Atlanta region's transportation assets to climate change and extreme weather. Earlier, he assisted Boulder County with the development of a Resilience plan for its transportation system to help prioritize future investments to maximum effect.

Predicting Interior Flooding: Building an Integrated Flood Model for Washington, DC

Christine Estes, PE, PMP, CFM, AECOM, christine.estes@aecom.com
Co-presenters: Benita Lily Cheng, LEED AP, CPHD, DC Department of Energy & Environment, Lily.Cheng@dc.gov

Abstract: Washington, DC is uniquely situated at the confluence of two tidal rivers and is vulnerable to flooding from three different sources: riverine, tidal/coastal storm surge, and interior. In 2022, the DC Department of Energy & Environment (DOEE) with the AECOM Team started work on designing, building, and providing an Integrated Flood Model (IFM) for the District. This model will display the depth and extent of flooding from the three sources of flooding as a result of various scenarios. As the climate changes, all three types of flooding in the District are intensifying. Over recent years, the District has experienced more frequent short intense storms that produce greater rainfall than the city's stormwater pipe system can handle, causing significant interior flooding. DOEE is trying to better understand interior flooding risk throughout the city with the IFM, and better predict where this flooding will occur in the future. The IFM will provide District residents a better picture of their flood risk as well as help DOEE prioritize where flood mitigation efforts should be directed. The IFM will be used to design and test solutions to reduce flood risk throughout the city. In a later phase of the project, floodshed management plans will be developed to target neighborhood-level mitigation measures that can be taken to reduce flood risk. DOEE is looking for greener, more equitable, and economically sound flood risk reduction solutions. This presentation will review the goals and objectives of the IFM and describe the contracting approach, implementation plan, and technical approach. We will also present progress to date including the establishment of a Model Advisory Group, recommendations for model scenarios, and development of a system architecture document. Finally, we will discuss next steps and a timeline for the IFM.

Biography: Christine Estes is a Vice President at AECOM in Washington, DC. Christine has over 20 years of experience working in the civil engineering industry, with a focus in water resources. Christine's work has focused on floodplain and stormwater management, watershed planning, and hydrologic, hydraulic and coastal modeling. Prior to joining AECOM, Christine obtained an M.S. in Civil and Environmental Engineering from Virginia Tech and B.S. in Civil Engineering from University of Virginia.

Using Annualized Losses To Create A Flood Mitigation Capital Improvement Plan

Adam Reeder, CDM Smith, reederaj@cdmsmith.com
Co-presenters: Joshua Soper, soperjj@cdmsmith.com

Abstract: While owners may recognize that they have a flood risk to multiple buildings or facilities subject to different flood sources, it is often difficult to determine the prioritization of flood mitigation projects. This process becomes more daunting when climate change is altering flood risk over time. Although it is a common approach, evaluating just the 1% annual change flood may not provide an accurate understanding of the risk. Annualized losses likely provide a more complete picture of the more frequent, less severe events and the less frequent, more severe events. However, this can be a complex process and not easily understood by many owners. Budget limitations may also add an addition complication since cost and risk reduction must be balanced. Whether owners are considering self-funding or applying for grants to complete their mitigation goals, it is important that they can understand and appropriately plan for mitigation projects. The presentation will discuss an automated optimization strategy which maximizes risk reduction, while considering budget constraints. Consideration of the year-on-year change in risk is an important factor in determining whether or not to delay or expedite certain projects. The results from the proposed approach will provide owners with an initial capital improvement plan that will help them understand when various buildings should be mitigated and outline funding needs through the planning horizon. An optimization method allows owners to balance risk reduction and funding limitations as well as other constraints to tackle the

daunting process of planning for climate change. Examples and decision points will be discussed in order to help attendees understand the development of the methodology.

Biography: Mr. Reeder is a principal in CDM Smith's Raleigh office. Over the past 26 years he has gained experience in design, 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 and coastal flooding. To date Mr. Reeder has been a primary author on over a dozen FEMA Building Science Branch publications. Since 2010 he has been a lead instructor for FEMA's Coastal Construction Class and FEMA's Fundamentals of Building Science Class. 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.

H3: Modeling Coastal & Inland Interaction: Modeling

Over the Top: Technology to Model Wave Overtopping Improves Coastal Resiliency
Kevin Trainor, PE, Woodard & Curran, ktrainor@woodardcurran.com
Co-presenters: Katie Howes, PE, khowes@woodardcurran.com

Abstract: Coastal communities are tackling a myriad of climate change impacts, including extreme precipitation, storm surge, and sea level rise, all of which lead to persistent problems with flooding. On top of that, the development patterns of the past have filled salt marshes or cut off their connection to the sea. While it is common to assess surge and wave conditions on the seaward side of coastal infrastructure, like a seawall, and then assess precipitation impacts on the landward side of that infrastructure, the city of Quincy, Massachusetts is taking a more holistic approach. The City is working in coordination with the Army Corps of Engineers to quantify storm surges and wave overtopping impacts over the course of an extreme event, tailoring mitigation measures more closely to the risk. This approach allows the community to identify opportunities for building resilience in concert with restoring the ecological function of the area's salt marsh. This presentation will focus on the technology used to map flooding and the inclusion of the EuroTop approach used to incorporate dynamic wave overtopping flows. Presenters will share how the analysis of this area has helped inform projects to reduce incidence of flooding while balancing the goal of re-establishing hydraulic connection of marsh waters to the sea, a critical function for preserving and restoring habitat for native flora and fauna. Attendees will gain insight into how the modeling, data analysis, and projects can be applied in their own coastal communities to improve overall resilience.

Biography: Kevin is a versatile and experienced Technical Manager who focuses on drainage and utility infrastructure. He has over 10 years of experience working with communities on drainage analysis, stormwater and wastewater utility design, green infrastructure design, EPA-funded Brownfield redevelopment, and municipal infrastructure construction projects. Kevin has strong technical hydrodynamic modeling skills, from analyzing vulnerability of existing and proposed assets to heavy precipitation, storm surge, and climate change to designing mitigation solutions. He works directly with

clients and regulatory agencies to choose the right modeling tool, collect data, simulate existing and proposed conditions, and select an effective solution.

Flood Analysis Improvements from a Rain-on-Mesh Surge and Rainfall Compound Flood Model

Michael B. Kabiling, PE, CFM, Taylor Engineering, Inc., mkabiling@taylorengineering.com
Co-presenters: None

Abstract: The compound interactions of multiple flood drivers such as coastal storm surge and extreme rainfall events that occur simultaneously or sequentially during a storm worsen flooding in coastal regions. In response to widespread flooding during Hurricane Harvey in 2017, the Texas General Land Office is leading a multi-year river basin study to determine cost-effective flood mitigation and abatement strategies and increase community resilience. This pilot study for the Texas Central Region aims at finding best practices for cost-effective and more accurate coastal flood analysis involving coupling of inland watershed models (e.g., publicly available HEC-HMS and HEC-RAS modeling tools) with coastal models output (e.g., ADCIRC, STWAVE, SWAN, etc.). The pilot study developed a combined HEC-RAS 1D/2D surge and rainfall compound flood model for the Dickinson Bayou watershed—a watershed at high risk for flood related losses and high potential for mitigation action as it ranks first in National Flood Insurance Program flood damage claims relative to the other 57 watersheds in the area. The Dickinson Bayou watershed compound flood model improves the accuracy of hydrologic and hydrodynamic modeling in the coastal areas as it incorporates (a) more detailed topographic and bathymetric data than the Coastal Storm Modeling System (CSTORM) ADCIRC model; (b) bridge/culvert structures, roadways, and levees; (c) land cover and landuse databases derived spatially-varying bed resistance and imperviousness; (d) initial soil moisture and groundwater infiltration; (e) sub-grid numerical schemes for larger model mesh cell sizes and faster computation; and (f) temporally varying gridded rain-on-mesh. The model can also add inland wind forcing to better simulate wind-driven flooding. The modeling simulates well the observed highwater levels for both historical storms Hurricane Ike in 2008 and Hurricane Harvey in 2017. This presentation will inform how surge and rainfall compound modeling can expand and improve flood analysis accuracy in transition and coastal areas.

Biography: Dr. Michael Kabiling has more than 30 years of experience with advanced expertise in water resources, hydraulic and coastal engineering, numerical modeling, and climate change resiliency. He has a Master of Engineering degree in Water Resources Engineering and a doctorate degree in Hydraulics and Coastal Engineering. A Certified Floodplain Manager and a Licensed Professional Engineer in several states, his responsibilities at Taylor Engineering include providing project management, business development, leading engineering studies, and leading the numerical modeling practice area of the company. His experience includes the application of one-, two-, and three-dimensional hydrodynamic, advection-dispersion, sediment transport, morphology models such as the MIKE11/MIKE21/MIKE3 model suites, Delft3D model suites, ADCIRC, EFDC, CMS-Flow, HEC-RAS, HEC-HMS, RMA2, RMA4, and the MIKE21 Spectral Wave, Boussinesq Wave, and Nearshore Wave models, Delft3D-Wave / SWAN, ACES, STWAVE, REFDIF1, CGWAVE, and CMS-Wave wave models. He has applied these models on more than 40 hydraulics and scour studies in Florida, South Carolina, Louisiana, and Texas and more than 80 numerical modeling projects in hydrology, hydrodynamics, waves, riverine and coastal flood, dam break, water quality, contaminant transport, sediment transport, morphology, and sea level rise.

Resilient Stormwater Modeling and Planning for Highly Urbanized Coastal City Watersheds

Swamy Pati, Jacobs, swamy.pati@jacobs.com
Co-presenters: Jason Montminy, Jason.Montminy@jacobs.com

Abstract: This presentation will highlight the Jacobs' approach in developing comprehensive, sustainable, and resilient master plans for highly urbanized coastal watersheds utilizing the state of the art tools and models and adopting latest climate science. Jacobs is currently adopting in two of the Cities in Florida, including City of St. Petersburg (CoSP) and City of Key West (CKW) . The CoSP Watershed consists of 26 separate basins. Jacobs modeled highly urbanized watershed for floodplain development and to identify BMP projects to mitigate watershed flooding and improve water quality. Models developed included appropriate level of details of urbanized areas with efficient data collection and acquisition efforts to review more than 30,000 structures from stormwater infrastructure files, and 5,000 as-built planset and City's Atlas Sheets, along with reconnaissance and survey of approximately 3,000 stormwater structures. Water level data logger and rain gauges were installed across the City to collect data for model calibration and verification for most current conditions. Climate science was reviewed to update the current tidal boundary condition for current condition modeling and to estimate 2050 for sea level rise (SLR) and rainfall totals for future condition modeling. Modeling results is being used to evaluate sustainable solutions for flooding and water quality issues with a combination of traditional, non-traditional, and blue/green infrastructure solutions. The CKW is an island City at the most Southern tip of Florida. The City sits close to the sea level and the stormwater drainage relies on the stormwater pipes, gravity wells and pump stations. This planning effort included updating the model with appropriate level of detail based on the new development and topographic information. Climate science was reviewed to understand the impacts of SLR and future rainfall. Future conditions reflecting 30 year planning period used to simulate the models and develop projects to mitigate the flooding concerns.

Biography: Dr. Swamy Pati is a Professional Engineer with more than 16 years of experience as a technical lead, project manager and client service lead. Dr. Pati's technical expertise includes developing watershed management plans, climate change and sea level rise risk assessments to provide resilient infrastructure solutions, developing regional scale integrated water management plans, and providing sustainable solutions for flood risk management and stormwater system improvements. His diverse technical skill set include numerical modeling, master planning, stormwater design, public outreach, asset management, Geographic Information System (GIS) data management and groundwater modeling. Dr. Pati's project experience spans projects across the nation and a few international projects. Dr. Pati's current high-profile projects include, but not limited to, City-wide Stormwater Master Planning for the City of St. Petersburg, Cypress Creek Watershed Management Plan and City of Key West Stormwater Master Plan Update.

H4: Mapping and Risk Communication: Mapping

Advancing Usability and Impact through the Future of Flood Risk Data

David Bascom, FEMA, David.Bascom@fema.dhs.gov
Co-presenters: Johanna Greenspan-Johnston, jgreenspanjohnston@dewberry.com

Abstract: FEMA is progressing in its efforts to deliver flood hazard information that is more detailed, comprehensive, and flexible in support of a risk-informed NFIP. This vision is a key component of FEMA's Future of Flood Risk Data (FFRD) initiative which aims to empower a shift from binary (in/out) to probabilistic (graduated) hazard and risk analyses while also modernizing data management and delivery, empowering private and public stakeholders, and driving more risk-informed mitigation, planning, and insurance actions. Early stages of the initiative focused on probabilistic analyses approaches and potential applications that serve a wide array of stakeholders. As this presentation will showcase, recent efforts have taken this further to advance capabilities to package, visualize, and disseminate graduated data to serve the risk management community. FFRD aims to put rich and flexible hazard and risk data into the hands of users. However, while current FIRMs oversimplify the complex nature of flood hazards, FEMA recognizes that graduated datasets and the maps they generate could present the inverse challenge of being overly confusing and cumbersome for many users. Eventually, access to graduated data may be supported by an ecosystem of contributors creating tools for users across different disciplines and technical skill levels. In the near term, it is essential to have a starting point: intuitive presentation methods, data formats, and open-source tools to provide access to a wide variety of early-stage users and contributors. This will also be a steppingstone to empower meaningful early-stage stakeholder engagement and project piloting. This presentation will share efforts the FFRD team has taken to explore needs and opportunities to make graduated data products and services versatile and responsive to the range of stakeholder needs. Accessibility and usability are critical to ensuring that FFRD initiatives advance equity objectives by serving communities with varying levels of capacity and resources.

Biography: Mr. David Bascom serves as the Branch Chief for the Engineering Resources Branch within the Risk Management Directorate at FEMA Headquarters. David is currently guiding the strategic shift within the Flood Hazard Mapping Program to support a risk-informed National Flood Insurance Program (NFIP). This effort involves developing the methodologies, frameworks, and partnerships to support a modern NFIP and to fundamentally improve the Nation's understanding of flood risk through the the Future of Flood Risk Data (FFRD) initiative. David oversees a team of coastal, riverine, and levee technical experts, and mapping program experts who provide operational and strategic leadership. David has been associated with FEMA for over 15 years and holds a B.S. in Civil/Environmental Engineering from Virginia Tech.

National Water Prediction Service (NWPS) – An Upgrade to the National Weather Service (NWS) Hydrologic Web Presence

Megan Terry, CFM, National Weather Service, megan.terry@noaa.gov
Co-presenters: None

Abstract: As part of an effort to modernize hydrologic datasets available on National Weather Service (NWS) websites, a major upgrade to the accessibility and usability of NWS hydrologic observations and forecasts will be available in Spring of 2024 through the National Water Prediction Service (NWPS). Within an interactive mapping interface, users will be able to display and interrogate river, lake and precipitation data, flood inundation maps and streamflow prediction information from the National Water Model, all from one website. Hydrographs showing observed and forecast river data will be scalable in time, so the user is no longer confined to a set amount of past data that is currently provided in the Advanced Hydrologic Prediction Service (AHPS). Precipitation accumulation times will also be

scalable and can be sampled in real-time. This presentation will include a combination of still shots, animations and live web interaction that will be used to share NWPS enhancements in hydrologic services, and aid floodplain managers in their planning and mitigation activities.

Biography: Megan Terry is a Service Hydrologist (SH) and Meteorologist at the National Weather Service (NWS) in Springfield, Missouri. She oversees hydrologic operations, which includes sharing the latest research applications with NWS staff, and conducting flood safety outreach with the public. She coordinates with the U.S. Geological Survey, U.S. Army Corps of Engineers, and local Emergency Management Officials to enhance flood warning operations for area rivers and dams. Megan became a Certified Floodplain Manager in 2016 and is celebrating her 7th year as a CFM.

USGS Real-time Flood Impact Map (Pilot)

Athena Clark, US Geological Survey, athclark@usgs.gov
Co-presenters: None

Abstract: USGS products such as the National Water Information System (NWIS) and WaterWatch are the flagship products for displaying USGS streamgage data. Unfortunately, because the data is displayed in a technical format, the data can be misunderstood. What does "Gage height, feet" mean? What are the real-world impacts when "Gage height" reaches a certain foot? In order to increase the usefulness of the USGS streamgage, the USGS Next Generation Water Observing System (NGWOS) funded a project in FY21 to demonstrate an "Alternative Way of Delivering USGS Streamgage Data". The project deliverable was the USGS Real-time Flood Impact Map. The Real-Time Flood Impact Map displays the locations (called "Flood Impact Locations") where the USGS has measured the height of critical safety or infrastructure features that may be vulnerable to flood impacts. Some examples of flood impact locations include stream and river embankments; roads and bridges; pedestrian paths; buildings; and more. Flood Impact Locations are surveyed and associated with a nearby USGS real-time streamgage. When the streamgage water level (or gage height) exceeds the Flood Impact Location's surveyed height, its icon will display on the map, showing that this location may be currently flooded. When you click on the icon, the pop-up will display the current gage height and the Flood Impact Location height, so you can compare how close that location is to the current water level. Some Flood Impact Locations may be measured below the level of actual flooding to provide an early warning that flooding may be imminent. The following are the flood impact icon descriptions currently represented:

- Embankment Flooded – Flood waters are overflowing the stream/river channel and into the surrounding area.
- Path Flooded – Pedestrian greenway/trail/path is underwater.
- Road Flooded – Road is underwater.
- Bridge Flood at Risk – Water from the river or stream has reached the bottom of the bridge.
- Bridge Flooded – Bridge is underwater.
- Structures Flooded – Water from the river or stream has reached the lowest finished floor of the structure (FEMA Finished Floor Elevation, or FFE). FEMA 100-year BFE – The FEMA 100-year Base Flood Elevation (BFE) has been reached.
- Uncategorized – This Flood Impact Location is experiencing flooding. For more information about this location, open the icon's pop-up and look for the "Flood Impact Type" description. The white circles on the map represent all Flood Impact Locations that have been measured but

are not currently flooding. You can use the date picker to retroactively view Active Flood Locations of any 7-day period within the last calendar year.

Although this mapper is not a flood warning system, it can be used to convey immediate flood risks by showing the locations where flooding may be currently or soon occurring. This presentation will demonstrate an alternative way of delivering USGS streamgage data in a more useful format to convey flood risks and flood hazards to the general public and Emergency Managers.

Biography: Athena Clark is currently serving as the USGS Coastal Storm Team Leader, USGS Southeast Region Science Advisor and Tribal Liaison. Prior to her current role, Athena also served as the USGS Alabama Water Science Center Director and USGS Lower Mississippi Gulf Deputy Director. Athena has a MS in Environmental Engineering and a BS in Civil Engineering from Auburn University and a BS in Nuclear Medicine Technology from the University of Alabama-Birmingham and holds a Professional Engineer License in the State of Alabama. Prior to working for USGS, Athena served as an Environmental Engineer for the US Environmental Protection Agency – National Air and Radiation Environmental Laboratory and the Assistant City Engineer for the City of Montgomery, AL. Athena is the recipient of the US EPA Bonze Award for Commendable Service and the EPA National Notable Achieve Award.

H5: What Does the Research Say about Risk Communication?: Risk Communication

Converting Market Research & Metrics into Smarter Marketing and Outreach
Butch Kinerney, FEMA, Eugene.Kinerney@fema.dhs.gov
Co-presenters: None

Abstract: This presentation will inform State and local officials the potential for flood insurance policy growth based on market segmentation research and the results of the FY22 National Flood Insurance Program's (NFIP) Hurricane Season Marketing Campaign, specifically in North Carolina.

Over the last two years, the NFIP's Marketing and Outreach Branch (M&O) has developed a market segmentation methodology to better target consumers to purchase a flood insurance policy. This methodology, which includes data sets on flood risk and affordability, allows for M&O to plan for and execute marketing campaigns using the latest digital advertising tools and technology.

The Marketing Rule of 7 states that a consumer needs to "hear" or "see" the message at least 7 times before they take action. M&O's paid marketing campaign, in addition to other marketing tactics, is a public information program to raise consumer awareness of flood risk. The Rule of 7 is achieved by applying digital marketing as a risk communication tool.

For example, the FY22 Hurricane Season campaign launched in North Carolina garnered over 63 million media impressions from April 25 to September 28, 2022.

A media impression is every time a consumer "hears" or "sees" a FloodSmart Ad. However, there is still much needed partnership between State, local and the agent community to attain policy growth and resiliency in North Carolina.

This presentation will encourage attendees to explore partnerships and brainstorm additional marketing and outreach tactics to convert research and metrics to flood insurance policies.

Biography: Butch Kinerney is Chief of Marketing and Outreach for the National Flood Insurance Program within the Federal Emergency Management Agency. In that role, he oversees the multi-million dollar NFIP Marketing & Outreach initiatives as well as the new Digital Customer Engagement initiative to educate home and business property owners about the necessity of protecting themselves against the financial devastation wrought by floods. He also oversees all customer communications for the Federal Insurance Directorate.

Butch has served in many capacities since joining FEMA in 2004: as chief of strategic communications for the Federal Insurance and Mitigation Administration where he oversaw efforts to help communities and the public build safer, stronger and smarter to lessen the impact of natural and manmade disasters. He has served as spokesperson for the National Flood Insurance Program, spokesperson for FEMA's Mitigation Division and he received a battlefield appointment to FEMA Press Secretary during the 2005 hurricane season immediately following the departure of FEMA senior staff in the wake of Hurricane Katrina. He's also been a field disaster information officer for a number of hurricanes, tornadoes, floods and other events.

Worldwide Lessons and Insights from Flood Risk and Mitigation Communication

Christine Gralher, PE, CFM, Jacobs, christine.gralher@jacobs.com
Co-presenters: Paul Robinson, Paul.Robinson@jacobs.com

Abstract: It is essential to make flood risk information readily available to the public, especially as climate change threatens to increase flood losses. An important piece of resilience and preparedness planning is regularly evaluating flood data and communicating the associated risks. While focusing on hazards arising from big coastal storms and sea level rise, many overlook the risks of flooding from other sources. After Hurricane Katrina, thousands moved further inland and rebuilt their lives in Baton Rouge, only to be flooded by a storm dumping heavy rain almost exactly eleven years later. Communities in upland areas, such as Appalachia, might feel safe from flooding, however, the region's mountainous topography can put communities at risk of higher velocity flood flows. This can be exacerbated where the landscape is scarred by coal mining or wildfire, contributing to flash floods. This is why awareness and communication of flood risk is so important. In the United States, several online resources are available to the public, these however, require web access that might not be available to all demographics. For those that have access, many rely on FEMA's Flood Insurance Studies without being aware that these studies do not take future conditions, long-term erosion, or flood asset conditions into account. This presentation asks what innovations there are in other parts of the world and explores how flood risk data is publicly shared and explained to increase flood awareness, and support mitigation efforts that increase the resilience and preparedness of communities. It will highlight how outreach and flood risk education is done across different demographics and cultures and shares the obstacles and difficulties uncovered during the worldwide comparison. The lessons learned will offer insights into improvements we may make in the US as we seek to increase flood awareness and improve flood management planning.

Biography: Christine Gralher is a coastal and environmental engineer with ten years of experience. She has expertise in the numerical modeling of coastal processes to assess sediment transport, surge, wave, and hydrodynamic behavior in coastal environments. Over the past ten years, Christine has specialized in nearshore flood analyses (runup, overtopping, and overland wave propagation). She's participated in several county-wide studies for several FEMA regions along the Atlantic, Pacific, Gulf of Mexico, and the Great Lakes and has also been involved in projects with FEMA HQ. Besides flood risk analyses, Christine performs design of coastal structures, sea level rise studies, beach preservation planning, and coastal resilience. Christine is interested in nature-based solutions and passionate to help communities plan for and adapt to our changing climate so that they become more resilient to future conditions.

Understanding Behavioral Science and its Opportunities in Building Resilience

Griffin Smith, Ogilvy, griffin.smith@ogilvy.com
Co-presenters: Skye King; skye.king@ogilvy.com

Abstract: Behavioral science helps explain why individuals and communities make (or do not make) decisions to bolster their resilience. Natural hazards offer a powerful case to show how different behavioral biases can impact decisions.

By offering a lens to understand and support communities in making resilient decisions around natural hazards—behavior science can give us insights into how and why people choose to prepare in advance, proactively evacuate, rebuild things as they were or rebuild stronger, and to even consider relocating.

This talk will demonstrate ways in which behavioral science shapes decisions around resilience at large. It will also highlight the role of different biases in decision making processes and how to navigate around these biases to support individuals and communities to become more resilient. Attendees will leave better able to understand these biases and use them in their own work.

Biography: Griffin Smith directs behavioral science across Ogilvy's support of FEMA's Community Engagement and Risk Communication program, helping increase the efficacy of efforts to increase risk understanding and action in communities across the country. Before joining Ogilvy, Griffin worked for ideas42, where he led teams focused on issues including climate adaptation, public transportation, renewable energy, and government training. Prior to that, Griffin worked as a policy advisor at MIT where he developed climate mitigation policies in Malaysia. While at MIT, Griffin also created and taught courses on negotiation and impact assessment. Griffin spent a summer in Utah as an MIT fellow piloting methods of discussing climate change with rural communities. Griffin has experience as non-profit negotiation and mediation consultant and helped stakeholders reach consensus decisions on a range of policy issues. Griffin holds a masters from MIT and a BA from Grinnell College.

H6: Social Justice in Floodplain Management: How do we get there? Part 2: Equity

Balancing Multi-Benefit Criteria in a Capital Project

Dan Brubaker, PE, CFM, King County, jbrubaker@kingcounty.gov
Co-presenters: None

Abstract: Fort Dent is a city park along the Green River in Tukwila, Washington, south of Seattle in King County. Slope failures along the levee protecting the park led to authorization of a capital project by the King County Flood Control District. When considering alternatives, the project management team considered the District's policy of integrated floodplain management. This requires an examination of alternatives that address not just structural issues, but environmental stewardship, tribal government considerations, healthy communities, and social justice issues. This presentation will look at the District's Multi-Benefit policy and how it pertains to the County's capital projects in general, and how these considerations played out for several County projects, the Fort Dent project in particular. It will review the need for habitat restoration along the Green River, the need for recreational opportunities in a city with a relatively large historically-marginalized community, and how those needs will ultimately be balanced when the project is constructed. It will provide lessons learned to communities working to balance similar considerations within their capital projects programs.

Biography: Dan Brubaker, P.E., CFM is an Engineer III with the King County Rivers and Floodplain Management Section, where he has worked since June 2020. Dan manages capital projects related to floodplain management along King County's major river basins. Prior to that, Dan served as the National Flood Insurance Program Engineer and later State NFIP Coordinator for North Carolina. He graduated from the University of South Florida in 1991 and has enjoyed a diverse career in private consulting, serving with the U S Navy Civil Engineer Corps, and reviewing permits and managing capital projects for the City of Raleigh.

Index Overload: Making Sense of Vulnerability Indexes for Floodplain Management

Aaron Henderson, CFM, Arcadis Inc., aaron.henderson@arcadis.com
Co-presenters: None

Abstract: When it comes to social vulnerability it seems like everyone has an index, but what differentiates those indexes and how do you use them? Beginning with the source data, we'll explore several social vulnerability indexes and attempt to cut through the overload of options available to floodplain managers. An overview of US Census Bureau data products, and recent changes to obscure data in the name of privacy, will set the stage for further exploration of the vulnerability indexes that exist today. We will then take a deeper dive into some of the most widely used indexes including the federal government's new Justice40 criteria, FEMA's National Risk Index, EPA's EJ Screener, CDC's Social Vulnerability Index (SVI), and USDOT's Transportation Disadvantaged Communities. For each index we will look at what is being measured, what that measurement means, and how to use that information for floodplain management. We will also look at the weaknesses of each index and provide some cautionary points for what an index can't do. Finally, we will turn back to the underlying Census Data pairing that with additional datapoints to go beyond the indexes for considering social vulnerability in floodplain management. Events like Hurricanes Katrina and Harvey have shined a light on the impacts of development within flood prone areas and the disproportionate impact of those events on socially vulnerable populations has further illuminated the effects of historic development on at-risk communities. Furthermore, federal, state, and local funding has placed a priority on addressing the myriad of risks within socially vulnerable communities, including flood risk. Given the growing public and federal will to reduce impacts to socially vulnerable groups, it is more important than ever for floodplain managers to understand the tools available for measuring vulnerability and how those can be applied to better serve all members of our communities.

Biography: Aaron Henderson's primary interests lie in grant funding pursuit, management, and strategy; benefit cost analysis (BCA); risk and vulnerability assessments; and climate risk mitigation. He holds a master's degree in urban and regional planning from Florida State University and is an ASFPM Certified Floodplain Manager and LEED Green Associate. Mr. Henderson's grant management expertise has led to writing, submitting, securing, and managing over $3 billion in grants and low-interest loans.

Place-Based Inequity: Case Studies from Hurricanes Ian and Ida

Heather Hilliard, R Roan Enterprises, heather.hilliard@rre-llc.com
Co-presenters: None

Abstract: This presentation will review equity issues in heavily hit areas from Hurricanes Ian and Ida that apply to nearly every are of the United States. By reviewing not only the geographic "desirability" of the most devastated locations but also the limitations of community populations as a feature of historical bias, this session will highlight data sets that can be used before disaster strikes. For example, building codes are a significant tool of mitigation, but exacerbate rebuilding reality of resilient populations that frequently exclude vulnerable populations as showing in findings of studies that highlight wealth inequity increases post-disaster. As floodplain managers, CRS coordinators, grant administrators and the many other hats we wear, taking local facts and mapping how mitigation as well as recovery funding can help disadvantaged members of our communities is more than 'bonus points' for FEMA funding, to meet Justice40, or other requirements - it's how we bring inclusive action to our all of our neighborhoods and strengthen recovery, decrease costs of response, and lessen mental health trauma for responders and residents/businesses alike.

Biography: Heather Hilliard is an experienced homeland security and emergency management professional with more than 25 years of service. She has recently transferred from working at various levels of government in Louisiana to be Director of Solutions at Witt O'Brien's. She is an Adjunct Instructor for the George Washington University School of Medicine and Health Sciences in Clinical Research and Leadership. Heather is credentialed as an international Certified Emergency Manager and also a national Certified Floodplain Manager. Among her accomplishments, Ms. Hilliard has earned federal and local commendations in New Orleans for her contributions to the response of Hurricanes Katrina and Gustav and for her role in the Deepwater Horizon oil spill response. In addition, she has worked declared disasters such as flooding, F5 tornadoes, international typhoons, earthquakes, and public health epidemics including two pandemics. 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 word responds to catastrophe. Ms. Hilliard has published several industry articles - two most recently on Covid - and also written and edited textbooks. She has presented on crisis communications for numerous organizations and the federal government as well as spoken at national conferences to international attendees. She has spoken at state floodplain conferences and is a repeat presenter at ASFPM.

H7: Disaster Recovery Lessons Learned: Post-Disaster

Building Holistic Housing Recovery: Learnings from the Hampton Roads Regional Post Disaster Housing Recovery Project

Kelli Reddick, CFM, ICF, kelli.reddick@icf.com
Co-presenters: Rachel Bradley, rachel.bradley@icf.com; David Topczynski, dtopczynski@vbgov.com; Danielle Spach, drspach@vbgov.com

Abstract: The Hampton Roads Regional Post-Disaster Housing Recovery Project will create a housing recovery plan that serves 240,000 residents of Hampton Roads, as well as 7,000 residents with access and functional needs (AFN) that can be activated within 30 days of an incident. The outcome of this project is a Playbook that provides a framework for regional coordination and recovery activities necessary to provide temporary, interim, and long-term housing solutions after a catastrophic incident, such as a Category 3 Hurricane. The innovation of this project brings together extensive community engagement with robust hazard impact analysis to present an actionable plan for a region that requires unique post-disaster housing needs. The Playbook contents are driven by technical analyses and feedback collected from Hampton Roads municipalities and non-profit organizations based on the region's housing challenges and opportunities to improve housing resilience. In particular, the Playbook provides a guide for identifying resources and funding available to jurisdictions in the Hampton Roads region to assist with helping displaced residents, emergency home repair, and relocation assistance. Participants in this engaging presentation will walk away with an understanding of the regional housing recovery planning process and lessons learned on how to engage diverse stakeholders within a multijurisdictional project.

Biography: Kelli is a Senior Managing Consultant in Disaster Management and Mitigation practice. She brings eight years of experience in the hazard mitigation and resilience planning field, specializing in risk assessments, economic impact analysis, benefit-cost analysis, public outreach, and implementation of Federal Emergency Management Agency (FEMA) floodplain management and Hazard Mitigation Assistance programs. Early in her career, Kelli worked for an engineering firm to manage a national planning practice focused on FEMA policy, funding, program management, and implementation planning. Kelli is passionate about helping states, local governments, utilities, and special districts develop, fund, and implement resilience and hazard mitigation programs. She uses her expertise in FEMA's Building Resilient Infrastructure and Communities Program, Flood Mitigation Assistance Program, Hazard Mitigation Grant Program, and HUD's Community Development Block Grant Mitigation programs to develop funding strategies and implementation plans for hazard mitigation and resilience projects to bring those solutions to life. Throughout her career, she has provided economic analysis and risk and resilience planning support to resilience programs in urban areas, including Boston, New York, the District of Columbia, and San Francisco. She has led federal grant application development in Florida, Massachusetts, and California to identify over $225 million in eligible projects that address natural hazards, and she also managed grants and state programs to implement projects that range from property-based solutions to community flood protection projects.

Lessons in Land-use Planning & Disasters from the Pacific Northwest

Mitch Paine, CFM, FEMA, mitch.paine@fema.dhs.gov
Co-presenters: None

Abstract: In this presentation, I will discuss some success stories and lessons learned from some recent disasters and connect how the integration of floodplain management into traditional land use planning or lack thereof contributed to the recovery of communities. Since 2020, there have been a number of disasters that have affected communities in the Pacific Northwest – wildfires in 2020, flooding in 2020

and 2021, and a typhoon in 2022. Each of the 4 states in FEMA Region 10, Washington, Oregon, Idaho, and Alaska, have very different land use planning frameworks. A major lesson learned will be the inability to rebuild a destroyed 200-unit manufactured home park out of the floodway due to state planning restraints after the 2020 wildfires, resulting in 200 families purchasing homes back in the floodplain/floodway.

Biography: Mitch Paine is a Floodplain Management Specialist for FEMA. He works primarily with western Oregon and Alaska 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, where he helped a number of small towns recover from major disasters that affected homes and businesses in their floodplains. 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. Mitch and his wife have three big dogs and live south of Seattle.

New Orleans' Comprehensive Disaster Recovery Framework

Austin Feldbaum, City of New Orleans, afeldbaum@nola.gov
Co-presenters: None

Abstract: In 2022 the City of New Orleans developed its first ever local disaster recovery framework. The recovery framework addresses a major gap in disaster management practice, in which long-term recovery occurs across sectors and outside of the traditional purview of emergency managers. Disaster recovery can be a pivotal moment to reduce future risk, increase resilience and sustainability, and take steps to address pre-disaster inequities. The Recovery Framework establishes recovery as a distinct phase in the disaster management cycle and will support coordinated disaster recovery processes to achieve better recovery outcomes. The Hazard Mitigation Office worked with a community advisory committee to develop a flexible, scalable operational framework to guide future recovery operations. The framework integrates external partners with city recovery management teams to formalize sharing of information and resources. The framework also identifies desired recovery outcomes and metrics that can be used to track recovery progress, as well as continuous improvement processes to institutionalize lessons learned through recovery from successive disasters. This session will cover the planning process, key framework elements, and how the plan is integrated with existing plans and policies including the National Disaster Recovery Framework.

Biography: Austin Feldbaum is an ecologist and floodplain manager with expertise in watershed planning, stream and wetland restoration, and flood risk mitigation. He has managed planning, design and execution of flood risk reduction and ecological restoration projects ranging in scale from urban residential parcels to large coastal landscapes. With the City of New Orleans, Mr. Feldbaum coordinates the implementation of an all-hazards mitigation strategy to lessen the impacts of future disasters by taking action now to reduce risk.

H8: Local and State Responses to Climate Change: Climate Change

Planning at Sea: Nantucket's Coastal Resilience Plan Paves the Way for Action

Devon McKaye, CFM, Arcadis, devon.mckaye@arcadis.com
Co-presenters: None

Abstract: On Nantucket, an island about 30 miles off the coast of Massachusetts, coastal storms are increasing in frequency and intensity, bringing the impacts of storm surge to the front doors of Nantucketers. Erosion of the Island's bluffs, dunes, and beaches is becoming more rapid with sea level rise, threatening homes, infrastructure, and natural resources. To build a resilient future that embodies Nantucket's unique history and built heritage, supports healthy coastal and ecological resources, and bolsters thriving communities, a comprehensive, adaptable, and community-supported approach is necessary. During this presentation, the project team for Nantucket's first Coastal Resilience plan will share how the Town & County of Nantucket laid the foundation for an actionable resilience plan and how they've taken meaningful steps to reduce their flood risk since the plan was released. The presentation will highlight the innovative components of Nantucket's approach, including the meaningful consideration of managed retreat and relocation, and delve into the practical steps they've taken to build staff capacity, establish an advisory committee, engage State and private partners, establish a dedicated funding source, and prioritize resilience building projects. It takes more than a plan to become resilient. This presentation will tell the story of how, over time, Nantucket has built the community support, municipal capacity and technical resources needed to move from planning for resilience to taking action. Lessons-learned throughout this process are widely applicable to other communities navigating their way through how to tangibly build resilience.

Biography: Devon McKaye, CFM is a Resilience Planner at Arcadis and currently based out of the Boston area. She has over five years of experience specializing in resilience planning, risk communication and flood risk analysis. By leveraging her diverse background in climate science, communication, policy and planning Devon helps communities across the country make informed climate adaptation decisions. Devon strives to help her clients move from resilience planning to adaptation action.

Creating a call for action for Virginia's Coastal Resilience Master Plan

Brian Batten, PhD, CFM, Dewberry Engineers, Inc, bbatten@dewberry.com
Co-presenters: None

Abstract: Virginia's 6,700 miles of diverse coastline are subject to the highest rate of sea level rise on the east coast, the third highest in the nation, just behind Texas and Louisiana. Increased flood frequency and impacts are already tangible in many areas. With over 6 million residents and over 78% of the state's GDP in coastal areas exposed to increasing flood risk, the state needed to begin a coordinated effort to advance short- and long-term coastal resiliency. In 2021, Virginia completed Phase One of their Coastal Resilience Master Plan. The long-term effort seeks to bring a whole of government approach, equity, a broader viewpoint, and a funding strategy to address Virginia's coastal resilience needs. Phase 1 was the first step down the road to resilience. Building from an outline of long-term goals, objectives, and actions, the effort focused on a mix of technical and outreach activities to advance the program. Such activities included state-wide consistent existing and future condition flood hazard mapping, an impact assessment, a project and capacity-building need database and prioritization framework, and funding analysis. The state released the culmination of this work in December 2021 through an authoritative document cementing the need for sustained action and a web data portal to share data and support stakeholder needs. The presentation will help the audience understand how

Virginia is advancing support of coastal resilience needs, providing insights for a wide range of practitioners. The presentation will cover the background and major technical elements. Unique innovative approaches, such as using multi-frequency flood hazard data to produce graduated flood hazard mapping and impact products ,down-scaling demographic data to identify highly socially vulnerable communities with flood risk, and match-making project to funding sources will be highlighted. Lessons-learned and focus areas for future activities will be covered.

Biography: Dr. Brian Batten is a senior scientist and client manager with Dewberry. With over 20 years of experience, Brian has devoted his career to improving understanding of coastal hazards, resilience planning and decision-making for federal, state, and municipal clients. He has led multiple efforts for FEMA to understand the nuances of modeling and mapping future flood conditions, state-level assessments of sea level rise in both New York and North Carolina, and most recently, Virginia's first Coastal Resilience Master Plan. At the community level, Dr. Batten directed Virginia Beach's strategic response to sea level rise, and was recognized by the City for his dedicated leadership through a Consultant of the Year award by the mid-Atlantic APWA. He received his Doctorate in Coastal Oceanography and Master's in Marine Environmental Science from the State University of New York at Stony Brook, and holds a Bachelor's in Marine Science from Coastal Carolina University.

NJPACT REAL - Strategies and Challenges of Adopting Flood Hazard Regulations Addressing Climate Change

Vincent Mazzei, P.E., New Jersey Department of Environmental Protection, Vincent.Mazzei@dep.nj.gov
Co-presenters: Michael Sheehan, New Jersey Department of Environmental Protection, michael.sheehan@dep.nj.gov

Abstract: Known as New Jersey Protecting Against Climate Threats (NJ PACT) Resilient Environments and Landscapes (REAL), the New Jersey Department of Environmental Protection began an initiative in response to executive and administrative orders to integrate climate change considerations, including sea level rise and chronic flooding, into its regulatory and permitting programs, notably the Flood Hazard Area Control Act rules and Stormwater Management rules. While in the process of amending these regulations, New Jersey experienced unprecedented flooding as a result of the remnants of Tropical Storm Ida which prompted a new approach to the amending the regulations. This presentation will explore the strategies used to address increased flooding resulting from climate change and sea level rise and the challenges of regulating an uncertain climatic future.

Biography: Vincent Mazzei serves as New Jersey's first State Floodplain Administrator. A leading force in flood risk assessment and mitigation in the Garden State for nearly 35 years, Vince began his floodplain management career in 1988, following his graduation from Stevens Institute of Technology. A licensed professional engineer, Vince has worked to support environmentally responsible planning, design, and construction of thousands of projects throughout New Jersey. He most recently served as Assistant Commissioner for Watershed and Land Management, overseeing the Divisions of Land Resource Protection, Watershed Protection and Restoration, and Resilience Engineering and Construction. Vince authored New Jersey's Flood Hazard Area Control Act rules, which are the most stringent statewide flood hazard area and stream corridor protection regulations in the nation and has had a leading role in the development of NJPACT, a targeted regulatory reform initiative aimed at modernizing state's environmental regulations to protect against climate threats. He served as chairman of the New Jersey Association for Floodplain Management from 2019 to 2021, was named the 2018 Government Engineer

of the Year by the American Society of Civil Engineers (ASCE), North Jersey branch, and the 2016 Civil Engineer of the Year by the ASCE, Central Jersey branch.

H9: Modeling, Mapping & Planning: Modeling

Goldilocks and the Three Urban Flood Models: How to size it Just Right!
Elise Ibendahl, PE, CFM, PMP, F.ASCE, Jacobs, elise.ibendahl@jacobs.com
Co-presenters: Gavin Lewis, g.lewis@fathom.global

Abstract: The summer of 2022 continued the trend of increasing urban flood frequency due to extreme storm events. Urban areas are increasingly impacted by heavy rainfall, even when an open body of water is nowhere in sight. Yet urban flood potential and the interaction of pluvial risk with fluvial and coastal inundation areas is not widely mapped in the United States. Consequently, urban flood potential is not fully understood by the public and many stakeholders, and populations are left vulnerable to flood exposure. Increased impervious, deferred maintenance of catch basins, undersized sewer systems, sediment and debris in sewers, and too few catch basins are some of the major contributing factors to urban flooding. Historic practices of filling natural waterways without safe relief pathways have reduced overland flow conveyance opportunities, and historic practices such as redlining have increased the economically disparate impacts of urban flooding on our most vulnerable populations. Reduced physics modeling approaches, such as Fathom's dataset, quickly increase our understanding of urban flood potential by providing a first look at inundation risk for a range of extreme events with current and escalated climate conditions. This presentation will include case studies where "starter maps" like Fathom and FEMA have been coupled with historical flood complaint records to focus1D/2D modeling, planning, and mitigation prioritization efforts to a "just right" modeling approach and extent. Knowing where pluvial overland flow paths are likely to cause flood impacts allows our study teams to focus detailed 1D/2D modeling efforts that integrate pipe networks and surface overland flow. This in turn allows a more detailed understanding of overland flow paths and critical facilities at risk of flood damage and repetitive losses with refined 2D model extents. This modeling approach also allows for efficient 2D hydraulic modeling and an optimized balance between model resolution and runtime.

Biography: Elise Ibendahl, PE, PMP®, CFM, F.ASCE 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, and a Certified Floodplain Manager (CFM) and has over 25 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 90 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.

Clearing Hurdles After Harvey: HCFCD Tool Adapts FEMA Profiles for Unsteady Models

Mat Leclair, PE, CFM, CPESC, Freese and Nichols, mat.leclair@freese.com
Co-presenters: Todd Ward, Todd.Ward@hcfcd.hctx.net

Abstract: Harris County Flood Control District's (HCFCD) MAAPnext program faced a dilemma: a square peg (new and better data) and a round hole (a traditionally used, but incompatible program). What to do … brute force the square peg through the round hole … or create a square hole? Motivated to simplify the process, a new tool was created that works more seamlessly with the MAAPnext models and direction of future H&H for FEMA mapping efforts, is faster, more efficient, more user friendly. As a result of several flooding events in the Houston region in 2015, 2016, and Hurricane Harvey in 2017, the HCFCD, in partnership with FEMA, initiated the MAAPnext program - a countywide flood hazard assessment using the latest technology and data to produce the most comprehensive and complete set of flood hazard maps and information. A significant change from the previous remapping effort in the early 2000s is the switch from steady-state to unsteady-state 1D/2D hydraulic modeling to better capture flood risk in flat terrain along the Texas gulf coast. As is typical of large remapping studies, there was a subsequent update to the Flood Insurance Study (FIS), and notably, new flood profiles were required. However, an obstacle emerged – the traditional approach to FIS profiles (FEMA's RASPLOT program) only functions with steady-state hydraulic models while the new MAAPnext models are unsteady hydraulic models. Freese and Nichols developed a standalone tool to be used by all MAAPnext consultants with the overall goal of replicating RASPLOT output with better efficiency. The tool ensures consistency across a large user base and considers future users in the process with HCFCD's LOMR Delegation program. The presentation will focus on critical items within its development highlighting improvements to functionality, usability, and speed while maintaining consistency and standardization across many people and consulting engineering firms.

Biography: Mat Leclair is a Project Manager with Freese and Nichols in their Houston, TX stormwater group with more than 14 years of experience in civil engineering analysis and design. He is skilled in stormwater management, stormwater design, 1D and 2D H&H modeling, large and small scale drainage studies, flood mitigation, floodplain management, regulatory submittals, FEMA RiskMAP studies, regulatory and non-regulatory FEMA mapping products, coding, and mentoring junior engineering staff.

Grays Creek Watershed Masterplan with HEC-RAS 2-D Models

Yangbin Tong, PE, CFM, Yunxiang Fan, Quality Engineering & Surveying, LLC, ytong@qesla.com
Co-presenters: Jacob Murry, EI, Quality Engineering & Surveying, jmurrey@qesla.com

Abstract: With the release of HEC-RAS Version 5 in 2016, the application of two-dimensional hydraulic models has become increasingly common. However, after decades of one-dimensional models being the focus of watershed modeling, there is ample work to be done in converting these models from one-dimensional to two-dimensional. This was the focus of a Quality Engineering & Surveying project for a local drainage district in Livingston Parish, Louisiana. For 18.67 linear miles, Gray's Creek meanders throughout Livingston Parish, draining twenty-eight square miles of land, including most of the city of Denham Springs. In 2017, Quality Engineering & Surveying developed a watershed master plan for the Gray's Creek watershed based upon a 1-D, steady state model. However, after more than half a decade

of updates to and adoption of HEC-RAS two-dimensional modeling, Quality Engineering & Surveying recognized the need for a two-dimensional update to the model. In the case of Gray's Creek, a 2-D model was imperative to allow for a better understanding of the broad, flat floodplain of the channel. This presentation will focus on the reasons that Quality Engineering & Surveying and the drainage district moved forward with the conversion of the Gray's Creek watershed model, and the lessons learned through the process.

Biography: Yangbin Tong brings over nine years of experience to Quality Engineering & Surveying, where he leads the Water Resources Engineering group. Since obtaining a M.S. in Civil Engineering from Louisiana State University, Yangbin has worked within a wide range of civil and water resources engineering projects. While his work focuses on hydrologic and hydraulic modeling for public and private sector clients, his knowledge extends into the fields of stormwater management, roadway improvement, wastewater system design, data collection and conversion, road inundation analysis, and land development.

Jacob Murrey serves as an Engineer Intern within Quality Engineering & Surveying's Water Resources Engineering group. Since obtaining a B.S. in Environmental Engineering from Clemson University, Jacob has spent the last two years working within a variety of project types, with an emphasis on stormwater projects for local municipalities.

Concurrent Session J

J1: Floodplain Management Regulations: NFIP/Floodplain Management

Manufactured Homes: New York State Perspective.
Brad Wenskoski, CFM, NYSDEC, brad.wenskoski@dec.ny.gov
Co-presenters: Kelli Higgins-Roche, kelli.higgins-roche@dec.ny.gov

Abstract: This presentation will identify the applicable regulations and standards for manufactured home development in the Special Flood Hazard Area while focusing on steps New York State is taking to help ensure community officials, owners, and residents are aware of the unique challenges for manufactured homes located in the SFHA. In addition, we will briefly discuss coordination with other agencies regulating manufactured homes, explore recommended evacuation plan elements for manufactured home parks, and explain potential insurance implications of manufactured home placement. Finally, we will cover recommended measures to help reduce damages to development such as recreational vehicles and modular homes.

Biography: Brad Wenskoski is an Environmental Program Specialist with the New York State Department of Environmental Conservation's Division of Water (DOW) Floodplain Management Section and is an Association of Statewide Floodplain Management (ASFPM) Certified Floodplain Manager (CFM®), DOW Program Emergency Response Coordinator, New York State Floodplain and Stormwater Managers Association (NYSFSMA) Region 4 Director, and NYS Certified Code Enforcement Official (CEO). Kelli Higgins-Roche is a Licensed Professional Engineer, and a Certified Floodplain Manager with over 18

years of experience in floodplain management and flood protection at the New York State Department of Environmental Conservation. She is the NYS National Flood Insurance Program Coordinator managing both the floodplain management and mapping grant activities at the state level. Kelli currently serves on the ASFPM Board of Directors, representing New Jersey, New York, Puerto Rico and the Virgin Islands as the Region 2 Director.

A Flood Resilient Future: Developing the Data to Support the Federal Flood Risk Management Standard (FFRMS)

Andrew Martin, FEMA, andrew.martin@fema.dhs.gov
Co-presenters: None

Abstract: This presentation will focus on the benefits and challenges associated with building greenways adjacent to creeks. It will explore a case study of the existing Little Sugar Creek Greenway in urban Charlotte, North Carolina. A portion of the existing greenway is built through an existing culvert that experiences frequent flooding due to quick rising water levels in the area. This presentation will also explore approaches used on other recent greenway projects to meet the needs of the greenway while also meeting the requirements of the NFIP. The presentation will also explore collaborative opportunities between recreation uses and floodplain managers to reach mutually beneficial solutions.

Biography: Andrew has over 20 years of experience in natural hazard identification, risk analysis, hazard mitigation, and disaster recovery. He is currently working in FEMA Headquarters' Engineering Services Branch. Prior to this, he was the Chief of New York State's Public Assistance division and prior to that he served as the Risk Analysis Branch Chief for FEMA Region II. Andrew is committed to providing the highest level of service to communities and stakeholders and will strive to maintain existing and develop new robust working relationships with local, State, Tribal, and federal partners, non-profit organizations, and the private sector.

A State-of-the-Science Update for Projecting Future Riverine and Coastal Flood Hazards to Support the Federal Flood Risk Management Standard

Doug Marcy, NOAA Office for Coastal Management, doug.marcy@noaa.gov
Co-presenters: Robert Mason, rrmason@usgs.gov; Lauren Schmied, lauren.schmied@fema.dhs.gov; Jory Hect, jhecht@usgs.gov; Will Veach, William.C.Veatch@usace.army.mil

Abstract: In 2021, the reinstatement of the 2015 Federal Flood Risk Management Standard (FFRMS) required federal agencies and federally funded projects, including grants to States, to recognize potential increases in flood hazards over their design lives due to climate change or anthropogenic perturbations. Recognizing that the state-of-the-science had advanced since 2015, an interagency science review resulted in a report, which includes the creation of a conceptual workflow to guide the mapping and risk communication of projected future flood hazards in both riverine and coastal settings. This five-element workflow chains together climate, hydrologic, and hydraulic models, incorporates land and water management impacts and ongoing geomorphic changes, and can be tailored to the unique nature of different agency needs and resources. In addition, the report describes the latest science for estimating future coastal, riverine, precipitation, pluvial, and compound flooding. Both the conceptual workflows and updated science guidance provides a basis for a Climate-Informed Science Approach (CISA) implementation roadmap that identifies incremental steps for addressing the research and data

gaps. Finally, we identify key opportunities for interagency collaboration that would facilitate the rollout of the FFRMS in diverse riverine and coastal settings of the United States.

Biography: Douglas (Doug) C. Marcy is a Coastal Hazards Specialist at the NOAA Office for Coastal Management in Charleston, SC. He has been with the NOAA 20 years working on flooding and sea level rise geospatial mapping projects, storm surge assessments, and coastal hazards assessment projects contributing to more disaster resilient communities. Doug worked as a Hydraulic Engineer with the U.S. Army Corps of Engineers, Charleston District from 1999 to 2002, where he focused on flood control projects, H&H modeling, flood inundation mapping, shoreline change analysis, and coastal engineering. From 1997 to 1999 Doug worked at the South Carolina Office of Ocean and Coastal Resource Management. Doug has a M.S. in marine geology (1997) from the University of North Carolina at Wilmington and a B.S. in geology (1994) from the College of Charleston. Doug's current interests include using geospatial technology combined with meteorological, hydrological, and coastal modeling (including sea level change) to enhance inundation forecasting, mapping, and risk assessment.

J2: Risk Assessments: Mitigation

Enhancing the National Risk Index Inland Flood Hazard with FEMA Risk Rating 2.0 Data

Casey Zuzak, GISP, FEMA, casey.zuzak@fema.dhs.gov
Co-presenters: Matthew Mower, mmowrer@absconsulting.com; Benjamin Roberts, broberts@absconsulting.com; Anne Sheehan, anne.sheehan@fema.dhs.gov

Abstract: The FEMA National Risk Index is an online mapping tool that identifies communities most at risk to 18 different natural hazards and visualizes natural hazard risk metrics. The tool incorporates social vulnerability, community resilience, and natural hazard expected annual loss data, allowing communities to make risk-informed and data-driven decisions. The Risk Index produces a baseline assessment for natural hazard risk in the United States. The baseline riverine flood risk values in the National Risk Index have historically leveraged the FEMA National Flood Hazard Layer and NOAA's National Centers for Environmental Information Storm Events data to estimate annualized flood frequency. This provides users with a robust understanding of inland and riverine flood risk. In recent years, improvements made to the baseline hazard building exposure database has enabled the National Risk Index team to break down sub-exposure building and occupancy types to incorporate alternate flood hazard datasets. Risk Rating 2.0 average annualized loss values at the Census tract level for single family residential units provide a robust dataset that is easily ingested into the National Risk Index. In replacing previously estimated expected annualized losses based on a variety of sources, the Risk Rating 2.0 data can be aggregated and used for each Census tract and county, improving the quality of the National Risk Index – Inland Flood Hazard Risk Scores. This presentation will cover previous methods and acknowledge limitations, explore how foundational changes in building exposure data enabled the integration of Risk Rating 2.0 data, and will review and discuss results.

Biography: Casey Zuzak, GISP is a Senior Risk Analyst for Hazus and Natural Hazards Risk Assessment Program (NHRAP) in the Risk Management Directorate at the Federal Emergency Management Agency (FEMA) and Lead for the National Risk Index. The 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.

Leveraging Building-level Data to Improve Flood Risk Modeling in FEMA's Hazus

Doug Bausch, Niyam, dbausch@niyamit.com
Co-presenters: Jesse Rozelle, Jesse.Rozelle@fema.dhs.gov; Jennifer (Ross) Sims, jross@niyamit.com; Ashley Hoke, ahoke@niyamit.com

Abstract: FEMA's Hazus Program has provided a standard methodology and baseline datasets for modeling risk and estimating natural hazard impacts for over 20 years. This presentation will discuss how newly improved building, infrastructure, and demographic inventories, developed by FEMA and partners, improve flood risk modeling as well as modeling of other Hazus-enabled hazards. The 2022 Hazus 6.0 release incorporated building-level data from the U. S. Army Corps of Engineers National Structure Inventory (NSI), Homeland Infrastructure Foundation-Level Data (HIFLD), Lightbox, FEMA USA Structures, and Open Data DC aggregated into a national dataset and uses this data to improve the methodology for building replacement cost valuations. Methods were updated using data derived from 2022 RSMeans with a detailed assignment of regional modification factors and leveraged the use of building-level data attribution to provide more detailed building areas, basement data, and exterior wall types. Using the enhanced building-level data resulted in over a 44% increase in total national building replacement exposure per capita over the Hazus 5.1 national baseline data. The building level data were aggregated in new dasymetric Census blocks that refined the location of developed areas nationally. This ensures that flood losses only occur in areas that are developed as indicated based on building footprint, parcel, and land use data. We will present several case studies that demonstrate how the new data and methods have greatly improved our capabilities to measure risk. Next steps in leveraging these datasets to improve the vulnerability attribution of the national datasets will be outlined, including the incorporation of pre- and post-FIRM building distributions based on construction year, NFIP entry dates and foundation type data. Past methods have relied upon regional assumptions. However, using the building-level specific data provides the opportunity to more accurately determine losses and measure resilience for flood, as well as other hazards.

Biography: Doug Bausch helps manage FEMA's Hazus Program, which provides standardized methods for estimating loss from earthquakes, floods, tsunamis and hurricanes. Doug oversees development of risk assessment methods for the Hazus Program as well as planning for the future enhancements and development of external tools. Doug was with FEMA Region VIII for 14 years where he helped implement NEHRP, Hazus and provide national modeling and analytics for the agency. Mr. Bausch has more than 25 years of experience assisting states and communities, across the U.S. and abroad, in developing sound risk and vulnerability assessments to support all-hazard response, mitigation, recovery, and preparedness planning. He was recognized as one of FEMA's foremost Subject Matter Experts in risk analytics and loss modeling and was a leader of the FEMA Modeling Taskforce that directly supported the National Response Coordination Center (NRCC) for FEMA Level 1 events by providing rapid risk analytics in support of situational awareness and the delivery of disaster programs.

Methods for Natural Hazard Risk Assessments in Oregon: Flood Hazard Risk Assessments and Beyond

Matt Williams, Oregon Dept. of Geology, matt.williams@dogami.oregon.gov
Co-presenters: None

Abstract: Communities in Oregon need to understand their risk to natural hazards so that they can take steps to lower the risk to people and assets. The Oregon Department of Geology and Mineral Industries (DOGAMI), over the past 6 years, has developed methods for conducting natural hazard risk assessments for communities throughout the state of Oregon. Natural hazard datasets utilized in the risk assessments were produced at DOGAMI using advanced techniques and high resolution lidar data. We developed highly detailed building data from lidar-derived building footprints and county assessor data which were used in the risk assessment analysis. Hazards that were typically examined in DOGAMI's risk assessments include: earthquake, tsunami, flood (coastal and riverine), landslide, channel migration, volcanic lahar, wildfire, and coastal erosion. Risk analysis was conducted using Hazus-MH for earthquake and flood hazards and exposure analysis for other hazards. From these analyses, we identified high risk areas and determined potential vulnerabilities that were present in the building inventory (including critical facilities). Risk assessments are intended to assist local decision-makers to lower risk from natural hazards within their communities. This presentation will focus on methods used by DOGAMI to conduct natural hazard risk assessments. These methods include identifying the best available hazard data sources, developing a building database, and analyzing the risk to communities from the various natural hazards that are present. Finally and most importantly, the presentation will discuss how we communicate this risk to local stakeholders and decisionmakers.

Biography: After receiving a MA in Geography at Western Michigan University in 2005, Matt joined Sally McConkey's team at the Illinois State Water Survey as a GIS Analyst mapping and developing DFIRM databases for the map modernization program. In 2012, he took a position with the Oregon Department of Geology and Mineral Industries (DOGAMI) and continued working with flood hazard, as well as other natural hazards. Beginning in 2015 and with funding from RiskMAP, Matt has published natural hazard risk assessments for communities across the state of Oregon. Matt also enjoys playing the fiddle, hiking, cooking, reading, and long walks on the beach.

J3: Probabilistic & Statistical Analysis in Modeling: Modeling

Coastal Storm Surge Study Innovations – Statistical processing for FEMA Region II

Christopher Bender, Ph.D., P.E., D.CE, Taylor Engineering, cbender@taylorengineering.com
Co-presenters: None

Abstract: This presentation will share innovations related to the statistical processing of cyclone-generated water levels for the FEMA New York and New Jersey Coastal Restudy (NYNJCR). The NYNJCR developed updated water levels and waves for the NYNJCR project area with results applied in follow-on studies to produce updated Flood Insurance Rate Maps (FIRMs). The methods allow robust estimates of water levels for high-frequency to low-frequency levels, which is critical to estimating coastal risks. To develop the water levels, the NYNJCR included resolved hydrodynamic and wave modeling for both extra-tropical cyclone and tropical cyclone water level forcing. For the extra-tropical cyclone water level statistics, the study team developed and applied an approach that accounted for aleatory uncertainty from the historical record length and epistemic uncertainty from the surge model errors. The approach also included uncertainty related to the tidal forcing caused by the relatively large tide range in the region. The local tides interact with the long duration surge produced by extra-tropical

cyclones (often exceeding 12 hours, and sometimes 24 hours). The tide approach included a novel way of developing site-specific values for the non-linear deviation of tides and cyclone surge. The tropical cyclone water level statistics applied a Joint Probability Method Optimal Sampling (JPM-OS) Response Surface Method (RSM) that accounts for the nuances of the NYNJCR project area that features a large change in the shoreline orientation near Sandy Hook and Jamaica Bay along with open coast, back-bay, and riverine areas. The processing of the water level data from the JPM-OS RSM simulations applied a multi-dimensional interpolator across the five main cyclone parameters (central pressure, size, angle, forward velocity, and Holland B). The approach applied 268 JPM-OS synthetic simulations and developed results for a more complete parameter space with errors (mean and root-mean-square) calculated at each calculation node.

Biography: Christopher Bender a Vice President at Taylor Engineering in Jacksonville, FL where he leads the Coastal Engineering Group. Chris's work has focused on coastal processes analysis, beach design, and storm surge and wave modeling. Prior to joining Taylor, Chris obtained his master's and doctoral degrees from the University of Florida. Chris is certified as a Diplomate in Coastal Engineering by the ASCE and is a part-time faculty member at the University of North Florida.

Distributed Flood Frequency Analysis Using Stochastic Storm Transposition and 2D HEC-HMS

Gregory Karlovits, PE, PH, CFM, US Army Corps of Engineers, gregory.s.karlovits@usace.army.mil
Co-presenters: Eric King; eking@dewberry.com; Joshua Willis; joshua.r.willis@usace.army.mil; David Rosa; david.rosa@fema.dhs.gov

Abstract: Stochastic Storm Transposition (SST) coupled with 2-dimensional hydrologic modeling can be used to produce estimates of probabilistic flood hazard at any location within a watershed. Traditional design storm modeling approaches based on point precipitation frequency products have limiting assumptions that may be overcome using the SST-based approach. We applied SST to a 2-dimensional HEC-HMS model of a mixed agricultural-urban watershed in Iowa. We developed a storm catalog consisting of the most severe 72-hour rainfall accumulations over an area with the same size as the target watershed. Hourly storm grids from the period of record of the AORC precipitation dataset (Kitzmiller, et al. 2018) were used as the basis for the storm events. We simulated multiple realizations of 1,000-year traces to estimate flood flows and runoff depths from 1/2 to 1/1,000 annual exceedance probability. Each year within a realization contained a random number of storms drawn from a Poisson distribution, and each storm was randomly selected with equal probability from the storm catalog. Storms were randomly placed within the transposition domain, and then simulated in HEC-HMS. Peak streamflow and spatially-distributed maximum runoff depth were extracted from each event. The simulated annual maximum streamflow for key damage areas in the watershed were compared to regional peak streamflow regression equations. To aid communication of pluvial flood hazard, a spatially-distributed estimate of annual maximum precipitation excess was constructed. The results are expected to inform risk communication, graduated estimates of probabilistic flood hazard, and mitigation planning in support of FEMA's Future of Flood Risk Data Initiative. This presentation will demonstrate a data-driven modeling approach to estimating fluvial and pluvial flood hazard at any location within a watershed.

Biography: Greg is the Senior Technical Specialist for Statistical and Hydrologic Analysis at the US Army Corps of Engineers Hydrologic Engineering Center in Davis, CA. He is the current team lead for the Hydrologic Engineering Center's Hydrologic Modeling System (HMS) software. Greg has been with

USACE for 12 years, starting with the Rock Island District in 2011, Risk Management Center from 2014-2017, and HEC since 2017. His specialties are in statistical analysis, hydrometeorology, hydroclimatology, and hydrologic modeling.

National Scale Risk Modeling Foundational Data and Frameworks

Will Lehman, USACE, William.P.Lehman@usace.army.mil
Co-presenters: David Rosa, david.rosa@fema.dhs.gov; Christina Lindemer, Christina.lindemer@fema.dhs.gov

Abstract: The Hydrologic Engineering Center's Watershed Analysis Tool (HEC-WAT) is a framework for integrating scientific numerical modeling software programs through plugins. The framework facilitates the sequential running of these plugins, preserving the linkages of inputs and outputs for a user specified number of iterations. The iterations of the computation are used to perform Monte Carlo analyses to support risk assessments. HEC-WAT distributes the computational burden to remote processes to reduce the time required to complete the Monte Carlo analysis and other computational burdens. FEMA's Future of Flood Risk Data (FFRD) Initiative aims to facilitate the transition to a risk-informed National Flood Insurance Program through the generation of probabilistic, graduated flood hazard and risk information. Through FFRD, FEMA and USACE are developing the methodology to implement a national scale risk modeling effort. FEMA is currently leveraging HEC-WAT for a FFRD pilot study to facilitate the linking of statistical storm generation, hydrometeorological processes, reservoir operations, hydraulic modeling, and consequence estimation. The pilot will inform methodology and application to all basins in the United States and Territories. The FFRD initiative and the HEC-WAT modeling framework will utilize, as well as produce, foundational, national scale datasets. Initiatives like the 3D Elevation Program (3DEP) provide valuable datasets from which 2-Dimensional computational meshes can be generated. Likewise, datasets such as the National Levee Database and the National Inventory of Dams provide foundational data regarding the infrastructure that impacts the flow of water in our nations streams and rivers. Building on existing datasets and developing new ones requires interagency coordination. Identifying and addressing data gaps should be done in coordination to limit duplication, missed opportunities, and unidentified needs. This presentation provides an overview of the FFRD initiative and its planned use of HEC-WAT.

Biography: Will Lehman is a Sr. Risk Analyst at the Hydrologic Engineering Center USACE. He has a Masters in Risk Management from Notre Dame Maryland University and a Masters in Economics from Oklahoma State University. He has lead the Hydrologic Engineering Center's Watershed Analysis Tool (HEC-WAT) for the last 4 years and specializes in watershed wide risk analysis.

J4: Mapping Process Showcase: Mapping

Quality Reviews of SOMA Reports and Revalidation Letters

Jamie Hughes, GISP, CDM Smith, hughesjn@cdmsmith.com
Co-presenters: Bradley Binder, binderbj@cdmsmith.com

Abstract: The responsibility of a quality reviewer of SOMA reports and revalidation letters is to ensure that FEMA's established guidance for Letter of Map Change (LOMC) categorization and production of

the reports and letters has been implemented. There are many variables to consider when producing SOMA products. The quality reviewer needs to have a solid understanding of these factors to confirm that the mapping partner correctly understood and interpreted the current situation for a particular community. We will discuss a selection of factors such as availability of an effective revalidation letter, availability of LOMC documentation, accuracy of the effective revalidation letter, multi-county communities, history of Community Number (CID) changes, Letter of Map Revision (LOMR) impacts, and peculiarities and limitations of the MIP SOMA workbench. We will also discuss the elements of the current guidance document, Guidance for Flood Risk Analysis and Mapping: Summary of Map Actions and Revalidation Letters, and how the quality review process and checklists support that guidance. Topics will include production and quality review schedule, identifying valid vs invalid LOMCs for categorization, LOMC categorizations, partial map revisions vs all panel revisions, special considerations, and product creation and formatting.

Biography: Jamie Hughes has a master's in science for Geographic Information Systems from Pennsylvania State University. She has 15 years experience of experience in the geographic information systems (GIS) field. She has supported FEMA's RiskMAP for the past five years as an employee of CDM Smith with specialized skills in Summary of Map Action (SOMA) and revalidation production and review. Currently, CDM Smith is a member of the COMPASS PTS JV and Jamie has received two awards from the JV for her dedication to quality.

eLOMA – A Collaborative Tool for Licensed Professionals, Communities, and FEMA

David Mummert, Michael Baker International, 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 - David Mummert has over 20 years of National Flood Insurance Program (NFIP) 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 North Wind Resource Consulting (NWRC) eLOMA Coordinator for all 10 FEMA Regions, 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.

New Datums in 2025: What changes to expect and how to get prepared

Gary Thompson, NC Emergency Management, gary.thompson@ncdps.gov
Co-presenters: None

Abstract: The National Oceanic Atmospheric Administration (NOAA)/National Geodetic Survey (NGS) will replace the national horizontal and vertical datums of the United States in order to improve the National Spatial Reference System (NSRS). Based on new technologies and methods, NOAA/NGS will define new geometric and geopotential reference frames that will replace the North American Datum of 1983 (NAD 83) and the North American Vertical Datum of 1988 (NAVD 88). The new reference frames will rely primarily on the Global Navigation Satellite System (GNSS) and the new GEOID2022 geoid model. This session will provide an update on the modernization of the NSRS, impact to elevation certificates, and steps that you should take now to prepare for the reference frame change that will occur in early 2025. Information will be provided on transformation tools and the State Plane Coordinate System of 2022 (SPCS2022).

Biography: Mr. Gary W. Thompson is the Deputy Hazard Mitigation Chief and Chief of the North Carolina Geodetic Survey, North Carolina 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), a commission member of the ABET Engineering Technology Accreditation Commission, and serves on the National Geospatial Advisory Committee, National Space-Based Positioning, Navigation, and Timing Advisory Board, and Hydrographic Services Review Panel.

J5: Practical Messaging and Tips for Risk Communications: Risk Communication

Disaster Risk Tolerance and the Resilience Paradox

Ronda Nowak, CFM, CEM, Michael Baker International, ronda.nowak@mbakerintl.com
Co-presenters: None

Abstract: Flood risk communication often focuses on changing risk perception, with the goal of increasing disaster resilience. But are we solving the right problem? Resilience itself is a paradox, since people and communities are also resilient when they weather a storm without changing. Our goal as risk communicators is to empower adaptation or transformation—we understand the urgency of reducing risk in the face of changing future conditions. This presentation will present disaster risk tolerance as a more effective lens with which to view the decisions that people and communities are making about risk, and possibly a better tool with which to improve those decisions.

Biography: Ronda is a senior associate with Michael Baker International where she supports local, state and federal government in risk communication and hazard mitigation. Prior to joining Michael Baker she was the Hazard Mitigation Coordinator for the City of Lansing, MI for 21 years. She is a Certified Floodplain Manager (CFM) and a Certified Emergency Manager (CEM). She holds degrees in communication, emergency management and distance education, and is currently working on her Ph.D. in communication with a focus on risk communication. In 2015 Ronda was inducted into the

International Women in Homeland Security and Emergency Management (InWEM) Hall of Fame for her work on the www.do1thing.com emergency preparedness program.

Right Brain Storytelling for Left Brain Thinkers

Skye King, MS, MPH, EQCC, Ogilvy, skye.king@ogilvy.com
Co-presenters: Kristen M Kirst, kristen.kirst@ogilvy.com

Abstract: I vividly remember my first biostatistics professor walking into the room and yelling, “Show me the data!” in his best Jerry Maguire impression. Over that next semester we learned about the power and promise of what data could tell us about reality and behavior—what was working and what wasn’t with our interventions. This was our language. But, it was sometimes difficult to translate my excitement behind a correlation coefficient or a p-value to my mom during our weekend check-in. A bit later, GIS was my jam—showing where rates of lead poisoning overlapped with older housing and lower SES and being able to identify where we could focus our environmental justice and advocacy efforts. While I understood the data, I struggled to connect that information to the impact stories we needed to share in grants and during discussions with policy makers and the community members we worked with. They needed stories. They needed to see what was happening to act and advocate differently. I think we all inherently know that storytelling can be a powerful tool to help inspire and empower audiences to act. But many of us, as sometimes technical thinkers, may still dream in complicated data and facts. How do we translate all the information that data reveals to us in a way that those outside our “dataphile bubble” can still understand? I know this session is near the end of the conference, but I’m hoping the enticement of becoming an even more effective storyteller will bring many of you through the door. This interactive session will share:

- Techniques to help you use real-life examples to create personal and relatable narratives that resonate with any type of audience
- A self-assessment to help you identify your core storytelling strengths (everyone has them!)
- Space to practice a few skills to help next-level your storytelling game

Biography: Skye King is a communications expert with more than 20 years of experience in business strategy and communications. Applying behavior science, emotional intelligence, and storytelling to build relationships, communicate risk, and engage customers, Skye has led nationwide outreach and engagement campaigns for academic, nonprofit, government, and health organizations. Currently, Skye serves as the Product Integration Lead for Ogilvy's work with FEMA, driving more effective community engagement and risk communications for natural hazards. She has appeared on The Today Show and other broadcast media to discuss her work in global cultural diplomacy and building social wellbeing. Skye also has experience leading capacity-building and change management initiatives, conducting workshops, guest-lecturing, and authoring more than 100 articles on emotional intelligence, resilience, quality improvement, communications, and other topics. She holds an MPH in Epidemiology, Biostatistics and Communications from Tufts University School of Medicine, an MS in Interventions, Communication, and Behavior Change from Tufts University Friedman School, and a BS in Life Sciences from UW-Madison.

You're Only as Good as Your Words

Booz Allen Hamilton

Abstract: You're only as good as your words, so it's really important to say it right! Saying it right means creating and delivering the right messaging to your stakeholders. During this session, we'll share tools and innovative strategies to make sure the right words reach your stakeholders – whether those stakeholders are members in your community or your federal partners. Creating the right words through effective communications planning is usually an after-thought and not integrated into an organization's broader planning efforts. Proper communications planning will result in stakeholder engagement that enables your organization to meet its mission, goals and objectives. Through our interactive presentation, we'll show you how to break down and tie your organization's goals into a communications plan with key messages and delivery channels that will reach your stakeholders and drive action. Our methodology is based on years of experience successfully designing and delivering strategic and tactical communications for multiple federal agencies including FEMA, Centers for Disease Control and Prevention, Veterans Affairs, and others. We'll show you how to apply critical thinking to ask the right questions and leverage tools that work in virtual and in-person planning sessions to create and deliver words you can stand by!

Biography:

J6: Nature-Based Solutions in Action, Part 2: NBF

Case Studies for Creating High Functioning, Lower Maintenance Stream Corridors
Drew Beck, PE, CFM, PMP, Matrix Design Group, drew.beck@matrixdesigngroup.com
Co-presenters: None

Abstract: Incorporating the natural and beneficial functions of floodplains in project planning, design, and construction doesn't have to be a battle. Presented here are two case studies of floodplains which were preserved, re-designed, and adaptively managed in collaboration with the developer, local municipality, and the Mile High Flood District. The primary goal of each project was to create high functioning systems that created resilient infrastructure, thriving ecosystems, and recreational corridors. In addition, a long-term vision of a lower maintenance, and primarily self-maintaining system was established to benefit residents and the maintenance entity for years to come. The Preble Creek floodplain was designed to be contained within a Stream Management Corridor (SMC) including a bankfull channel, flood terrace and flood bench. The flood bench was designed to manage 100-year flows while also incorporating regional/water-quality detention, open-space, and recreation amenities as a linear park through the community. In addition, the SMC is also a designated pollinator corridor which aims to enhance the overall ecological benefit. The existing stream corridors throughout the Sterling Ranch development varied greatly in their condition. This required a thoughtful approach in determining the design approach for the overall system. Some corridors were completely rehabilitated, while others preserved, instead relying on an adaptive management plan to provide stability, while others used a combination of these two approaches. This presentation will demonstrate to attendees how they can incorporate the natural and beneficial functions of floodplains into development projects and how creating collaborative teams with shared goals and visions from the onset of the project is vital for project success. Development projects from inception through construction don't have to be a

constant battle between agencies and developers. Providing streams with the space that they need, beyond flood conveyance, leads to better overall outcomes and thriving ecological infrastructures.

Biography: Drew is the director of water resources and a senior project manager for the Matrix Design Group water resources group and has over 20 years of engineering experience. He has a bachelor's degree in civil engineering from Santa Clara University and a master's degree in hydrology from the Colorado School of Mines. Drew is a licensed civil engineer in three states, a Certified Floodplain Manger, and a Project Management Professional. Drew currently serves as the Board Chair for the Colorado Association of Stormwater and Floodplain Managers. He embraces collaborative and sustainable solutions for his projects and considers himself an ambassador for resilient watersheds.

Changing what we mean by infrastructure: Natural and nature-based features to address 21st century challenges

Ben Carswell, University of Georgia, Carl Vinson Institute of Government, Planning and Environmental Services Unit
Co-presenters: Brian Bledsoe; Haley Selsor; Matt Chambers

Abstract: This presentation will discuss the Network for Engineering with Nature's policy work with USACE to identify and address specific barriers to incorporating NNBFs into water resource projects in USACE Civil Works planning, its permitting process, and in the funding of natural and nature-based features (NNBFs) projects. Incorporating NNBFs, such as levee setbacks, into the USACE's water resource projects can provide a myriad of benefits such as infrastructure services, environmental services, recreational opportunities, public health benefits, and other social goods that contribute to overall community resilience. However, the current planning and regulatory regime relies on processes and procedures developed to address traditional single purpose projects. As the technology and capacity to design and build natural and hybrid-infrastructure system advances, the social, legal, and policy mechanisms for developing infrastructure systems has to adapt to effective address a new type of project – multi-faceted projects that address multiple societal needs and that can have restorative or regenerative impacts instead of strictly negative environmental consequences. This is a particularly timely and relevant as Congress increasingly directs USACE to implement more NNBFs, and USACE engages in an effort of overhaul its planning procedures.

Biography: Ben serves in the Planning and Environmental Services Unit as a Resilience Professional focusing on coastal military installations and surrounding communities. He is primarily tasked with harnessing a broad array of resources aligned with the Network for Engineering with Nature, a partnership founded by UGA and the US Army Corps of Engineers, to advance infrastructure projects that support climate resilience and military readiness while generating social, environmental and economic co-benefits.

Prior to joining the Institute of Government in 2022, Ben established the Conservation Department at the Jekyll Island Authority and directed the program for over a decade. He also serves on the UGA Marine Extension and Georgia Sea Grant Advisory Board and was a Sea Grant Knauss Marine Policy Fellow in 2011 supporting the NOAA Office of Response and Restoration.

Quantifying the performance of Natural and Nature-Based Features

Matt Chambers, University of Georgia, mc44756@uga.edu
Co-presenters: Brian Bledsoe; Scott Pippin; Haley Selsor

Abstract: A common criticism of nature-based solutions is the lack of quantified performance data for natural and nature-based features (NNBF). This work demonstrates how performance can be quantified with the example of a levee setback realignment in an agricultural area on the main stem of the Lower Missouri River. Two types of benefits are considered. The first is a reduction in flood risk as determined by a change in the likelihood of levee failure. The second is an improvement in water quality and results from the opportunistic use of borrow pits, created during levee construction, or other floodplain depressions, such as scour holes, to engineer wetlands and reduce diffuse pollution runoff from agricultural fields. Levee-crossing edge-of-field farm ditches are routed through engineered wetlands and supply field drainage as well as polluted runoff. Water quality improvement is quantified as a reduction in nitrogen loading to the Lower Missouri River. Our approach demonstrates two simple methods for quantifying the performance of NNBF. Future work will investigate the quantification of other hypothesized benefits, such as economic benefits, and refinement of the considered benefits through incorporation of additional levee failure modes into system response curves and additional water quality measures.

Biography: Matt Chambers is a Ph.D. Student in Civil and Environmental Engineering and Research Professional III at the University of Georgia. He is receiving his academic training from Dr. Brain Bledsoe. His engineering background includes a B.S. in Mechanical Engineering from Georgia Tech, a M.S. in Mechanical Engineering from Stanford University, and two years of professional experience as a consulting engineer. Matt's research investigates the use of natural infrastructure to improve the resiliency of riverine flood mitigation infrastructure.

J7: Water Quality and Funding Considerations in Stormwater Management

A Better Rainy Day - Find Flooding and Funding with Maps

Anisa Pjetrovic, SMU, Pjetrovic.Anisa@epa.gov
Co-presenters: None

Abstract: Maps will show location of projects that have involved flooding and the projects funding source to explain, how to incorporate stormwater goals into city projects that positively impact stormwater quality and design. This presentation will speak of stormwater projects that have been funded nationally and new ideas. Funding various project types that improve water quality from all directions, can greatly benefit ecosystems and how the environment connects to habitats and animal life. Online links to filters that can identify funding will be reviewed.

Biography: Anisa Pjetrovic has a BA in Environmental Studies and a MA in Sustainability and Development. During college she has researched storm water quality including species of migrating birds to stormwater impoundment areas. Her interests and research involve project management funding and community development, habitats, water quality, drinking water, communicating environmental law with culture and arts/videos, sustainable design and human health and the environment. Current interests involve the design of green bridges, real time water sensors, and drinking water quality. Anisa works with the EPA State Revolving Fund as a Project Officer.

Cornell Lift Station and Storm Water Quality Retrofitting

Colton Smith, PE, CFM, J-U-B Engineers, Inc., csmith@jub.com
Co-presenters: None

Abstract: Water quality of storm water is a concern for many communities within the country. Retrofitting existing storm water systems with natural and/or mechanical treatment is a popular method to meet the State of Utah discharge water quality requirements while utilizing the current storm water infrastructure. However, retrofitting existing systems can be a challenging, complex, and often costly endeavor. The presentation will focus on the Cornell Lift Station Retrofit in Salt Lake City, Utah that is located along the Jordan River. The Jordan River is an impaired Utah water body with low dissolve oxygen and elevated levels of phosphorus. Salt Lake City was interested in a natural retrofit that would remove the phosphorus from the storm water and increase the dissolved oxygen before it entered the Jordan River. We will present on the project development, design, construction, recent water sampling results (if available), and discuss the lessoned learned from the project, both the good and the bad.

Biography: Colton is a professional engineer and a CFM at J-U-B Engineers. He has experience in hydrologic and hydraulic modeling and water resources engineering. This includes site runoff modeling, culvert analysis, watershed Risk Map studies, FEMA floodplain mapping, flood protection, watershed planning, master planning, and stream stabilization. Colton enjoys working on projects that include planning, modeling, design, and construction management. He is proficient in a variety of software packages that include Watershed Modeling System (WMS), HEC-HMS, HEC-RAS, Surface-water Modeling System (SMS), InfoSWMM, and HY-8.

An Ugly Index for Stormwater Fees

Warren Campbell, Ph.D., P.E., CFM, Western Kentucky University, warren.campbell@wku.edu
Co-presenters: E. Gracie Davis, emily.davis774@topper.wku.edu

Abstract: Ugly is in the eye of the beholder. For a developer, anything that threatens the bottom line is ugly. For a politician, any fee that threatens reelection is ugly. Residents want no fee or one that is equitable. We chose to emphasize equity because a fee that is not equitable is more likely to be challenged successfully in court. The impervious area (IA) of a parcel is a widely accepted surrogate for stormwater production. IA or hard surface includes building footprints, sidewalks, driveways, and parking lots. Fee systems range from the very simple flat fee, that is, the same fee for every parcel, to the fee used by Arvada, Colorado. Arvada has estimated the IA for every parcel in town and the fee charged for each parcel is proportional to that parcel's IA. This is as fair as any IA-based fee can be. A flat fee is highly inequitable because a small bungalow with 500 square feet of IA pays the same as a big box store with 1,000,000 square feet. Any index should reflect the difference between a flat fee and an Arvada-style fee. Our index begins with a required income for a given level of service. Then for any fee system, the base fee is set to achieve that income. Our ugly index is the ratio of the base fee for the fee system in question to the corresponding Arvada base fee. An index less than 2 qualifies as beautiful, while one greater than 4 as ugly.

Biography: Warren Campbell is the Hall Professor of Civil Engineering at Western Kentucky University. He has studied stormwater utilities for more than 20 years and is the publisher of the Western Kentucky University Stormwater Utility Surveys. His database of utilities contains data on more than 2000 stormwater utilities across the U.S. and Canada. Many communities, companies, and NGOs have used

these surveys published annually since 2007 to promote the development of these utilities. He served on the ASFPM Certification Board of Regents for 10 years and was the CFM Exam Workgroup Chair.

J8: Watershed Management Case Studies: Watershed Management

Impacts of Watershed Specific Release Rates on Disproportionately Impacted Communities in the Greater Chicago area

Nikhil Sangwan, CFM, ISWS, sangwannikhil@gmail.com
Co-presenters: None

Abstract: Marginalized communities are often disproportionally impacted by floods, and this inequity in flood risks is likely to increase even further without proper management. Identification and determination of the inequities in existing flood management policies and regulations is key to devising more equitable action plans. The Metropolitan Water Reclamation District of Greater Chicago (MWRD) recently implemented watershed-specific release rates to attenuate peak runoff rates with volume control and detention basin requirements. This study evaluates the relative impacts of these release rates on marginalized communities/disproportionately impacted areas (DIA) in terms of detention storage requirements and flood risk mitigation. Existing hydrologic and hydraulic models were modified to simulate current and future development scenarios; detention storage requirements and flood mitigation levels were then extracted from these models and analyzed. An improved understanding of the impact of release rates on DIAs enable policy makers and watershed managers to better evaluate whether policies address prevalent inequities in flood risk. This presentation will provide information about the relative impacts of watershed-specific release rate regulations on the marginalized and disproportionately impacted communities in Cook County, Illinois.

Biography: Nikhil Sangwan is a Hydrologic and Hydraulic Engineer at the Illinois State Water Survey. He received his Master of Science in Civil Engineering (MSCE) and Master of Science in Environmental & Ecological Engineering (MSEEE) from Purdue University. The primary focus of his academic and professional career has been advancing the understanding of flood risk among communities. He has authored several peer-reviewed journal articles and FEMA's Flood Risk Products.

Opportunities of the NRCS Watershed and Flood Prevention Operations Program

Matt Pillard, AICP, HDR, Inc., matt.pillard@hdrinc.com
Co-presenters: Ashley Knudson, ashley.knudson@hdrinc.com

Abstract: Natural Resource Conservation Service (NRCS), under the authority of Public Law 83-566 and 78-534, provides watershed planning, design, and construction services under the Watershed and Flood Prevention Operations (WFPO) program. Through the WFPO program, the NRCS cooperates with local sponsors to identify watershed problems and opportunities that fit into the eight identified project purposes. The NRCS provides financial and technical assistance for planning, design, and construction. The NRCS assistance limits and sponsor requirements will be presented. The various project purposes will be explained and examples of the types of watershed issues that apply to those purposes. The NRCS guidance (National Watershed Program Handbook and Manual), will be explored in relation to National Environmental Policy Act (NEPA), National Economic Development (NED) account, and Section 404 of the Clean Water Act requirements. This session will provide an overview of the WFPO planning process, through the completion of a Watershed Plan and Environmental Document (Plan-ED), using a case study

of the WFPO planning process. The case study is the Spring and Buffalo Creeks watershed. The Spring and Buffalo Creeks watershed is located in Central Nebraska in Custer and Dawson Counties, near Lexington. The watersheds are being studied as two separate project areas within the same Plan-EA. The Spring and Buffalo Creeks watershed has experienced numerous historic and recent flooding events that caused substantial damage in the watershed. Major and minor flood events over the decades have caused substantial economic loss. This case study will demonstrate the environmental analysis and hydraulic and hydrology modeling efforts needed to support the project need, the alternatives analysis, and ultimately the economic benefits that would be realized (and demonstrated in the economic analysis) from alternative implementation.

Biography: Mr. Pillard is experienced in multiple aspects of environmental and resource management. He has 25 years of experience at HDR Engineering, Inc. Mr. Pillard holds a BS in Natural Resources and MS in Community and Regional Planning with a focus on watershed planning and management from the University of Nebraska-Lincoln. His area of expertise includes managing Section 404 of the Clean Water Act permitting and general environmental permit compliance, execution of the NEPA process for multiple federal agencies, and watershed planning related to integrated resource management.

Adaptive optimisation: Making robust decisions in the face of uncertainty

Richard Crowder, Jacobs, richard.crowder@jacobs.com
Co-presenters: Dr Joe Clarke MCIWEM C.WEM, joe.clarke@jacobs.com

Abstract: The Oxford-Cambridge Arc (OxCam), in the south of England, is home to 3.7 million people and supports 2 million jobs. It has been identified as an important area of economic growth for the UK, with up to one million new homes expected over the next 30 years, alongside major infrastructure investment. However, there is great uncertainty in the effect of climate change and the shape and scale of development, creating a challenge in understanding how best to investment in flood resilience. The OxCam Flood Risk Investment Study sought to understand the 'optimum' level and timing of investment in the flood protection elements of flood resilience across three major catchments, but crucially doing so in a way that is mindful of future uncertainty and adaptive to different future scenarios. We used Flood Platform, Jacobs' high throughput cluster computing and model data management platform, to automate the process of building 700 flood models and running 45,000 simulations, which fed into a comprehensive impact analysis. Using an innovative "simulation library" of outputs and novel code to interrogate it, we were able to represent 27 possible future scenarios spanning a range of possible climate change and development scenarios, along with billions of combinations of flood risk interventions. We developed a first-of-its-kind "adaptive optimisation", which explored a highly complex decision tree of billions of possible investment paths to identify investment decisions that are robust across futures and identify where and when to invest. This presentation will outline the project background, technical appproach and findings, and will explore the transferrable lessons learned about how adaptive planning and technology and data-driven optimisation can be brought together to understand future risk and investment.

Biography: Richard is an internationally recognised flood risk management professional with more than 25 years of experience. His history in the industry is one of innovation and doing things differently. He is a business leader with experience spanning research, innovation, project delivery, client management, sales, and operational management. He is known for taking on challenging projects and using innovation and digital delivery to solve problems and deliver projects in new and more efficient ways.

This covers the full range of flood risk management disciplines including appraisal, environmental services, engineering design, asset management, and hydrological and hydraulic modelling. He joined Halcrow (now Jacobs) in 2002 and has held senior leadership roles including Regional Business Development Director (Europe) for the water sector, and framework manager delivering engineering and environmental services to the Environment Agency (England). He is currently part of Jacobs' Water Catchment Management (Europe) leadership team and framework director for the Mapping and Modelling to the Environment Agency.

J9: ASFPM Showcase: