2019 CONFERENCE
SPEAKER ABSTRACTS & BIOGRAPHIES

Lessons Learned in Hampton, VA

Lucy Stoll & David Imburgia, City of Hampton, VA

The City of Hampton began their resilience effort in 2015. Resilient Hampton is a city-wide initiative to bolster our community's inherent strengths in order to alleviate chronic stresses and enable recovery from extreme events and shocks in ways that make the community even stronger than before. Resilient Hampton tackles these issues in such a way that it is also improving residents' quality of life, economic viability, and environmental health. This is accomplished through the implementation of solutions that also have multiple benefits and fit to place. The City of Hampton will discuss their process to achieving coastal resiliency, including their work to understand the forces of water impacting communities, the different approaches needed based on neighborhood character and culture, and how the City established goals, guiding principles, and values that define a Resilient Hampton.

Lucy Stoll, AICP, is a Senior City Planner and has been with the City of Hampton since 2014. There she is involved in a large variety of long-range and current planning activities including bike and pedestrian planning and Master Plan implementation. Lucy is a key leader of the interdisciplinary team forwarding Hampton's resilience initiative, which is a city-wide effort to develop a coastal city that not only meets the challenges of the future, but grows a thriving community connected to the water and its heritage. Prior to joining the City of Hampton, Lucy received an undergraduate degree in Economics with Environmental Studies from Kenyon College, followed by a master's degree in Community Planning from the University of Cincinnati. David Imburgia serves as the Environmental & Sustainability Manager / Senior Project Coordinator for the City of Hampton where he directs and coordinates the development of environmental and sustainability policies. He is a principal member of an interdisciplinary team forwarding Resilient Hampton, a city-wide initiative meeting the challenges of recurrent flooding and sea level rise with solutions that embrace a close cultural connection to water and lead to a more vibrant, resilient coastal community. As Senior Project Coordinator, David also serves with the Development Services Center where he coordinates major development projects, acting as the single point of contact for the developer's team and city departments. As staff to the Hampton Wetlands Board, David is responsible for administration of the Board and he evaluates wetland impact proposals and formulates recommendations for Board actions on projects submitted through the Joint Permit Application (JPA) process. Prior to joining the City of Hampton in 2009, David was an environmental scientist with a private sector environmental consulting firm. He earned his degree in environmental science from Virginia Tech with a concentration in aquatic resources and a minor in watershed management.

Documenting Coastal Flooding and Storm Impacts Using the MyCoast App

Janet Freedman, RI Coastal Resources Management Council

MyCoast is a free app for iPhone or android platforms which allows citizen scientists to quickly submit photos of coastal events. Three tools within the app are used to document nuisance flooding due to extreme high tides, storm damages after tropical and extra-tropical storms, and impacts to coastal ecosystems that may diminish community resilience to storms and sea level rise. The app allows users to quickly and easily upload images taken on a smartphone to a central database where photographs are automatically geo-located and assigned metadata, including concurrent meteorological and tidal conditions. A report is generated on the MyCoast.org website that displays the photos, weather, and tidal information. In addition, the report links to the STORMTOOLS maps. MyCoast photos highlight current conditions in the Rhode Island Coastal Zone and are indicators of future trends. The photographs and underlying metadata are important in order to visualize the impact of coastal hazards and to enhance flood awareness of community decision-makers and citizens. Data that is collected is currently being used to ground truth STORMTOOLS inundation maps and models, and to determine thresholds for coastal flooding advisories put out by the National Weather Service. As more data is collected it will be an important repository that can be used to determine increased frequency and duration of coastal flooding. This workshop will introduce participants to MyCoast with instructions on how to use the app and access information on the website. The workshop will also show examples of data application, particularly comparisons of STORMTOOLS sea level rise scenarios with actual flood levels.

Janet Freedman is a Coastal Geologist with the R.I. Coastal Resources Management Council. She has worked collaboratively with partners at URI, RI Sea Grant and Eastern Connecticut State University on developing the Shoreline Change Special Area Management Plan (BeachSAMP) to examine the combined effects of shoreline erosion, sea level rise, and storm surge. She is currently working to incorporate the BeachSAMP into

CRMC regulations in order to increase coastal resilience under changing conditions. She is the state administrator for MyCoast, and is currently exploring using MyCoast to document the efficacy of nature-based infrastructure projects throughout the state.

Underwater: Rising Seas, Chronic Floods, and the Implications for Rhode Island's Real Estate and Our Coasts

Shana Udvardy, Union of Concerned Scientists

As sea levels rise, high-tide floods are becoming more frequent and reaching farther inland. Hundreds of US coastal communities, including many in Rhode Island, will soon face chronic, disruptive flooding that directly affects people's homes, lives, and properties, and communities in Rhode Island will be left footing the bill of these climate impacts. Yet property values in most coastal real estate markets do not currently reflect this risk and most homeowners, communities, and investors are not aware of the financial losses they may soon face. Federal, state and local policies, while originally well intentioned, mask risk and create incentives that reinforce the status quo or even expose more people and property to risk. As the risks of sea level rise grow, Rhode Island is asking who should be responsible for the damages and is seeking to recover a portion of the associated costs from fossil fuel companies. The Union of Concerned Scientists' (UCS) analysis looks at what's at risk for US coastal real estate from sea level rise—and the challenges and choices we face now and in the decades to come. The presentation will describe the implications of chronic inundation for Rhode Island (the number of homes, the value of these homes, and their contribution to in annual property tax revenue) in the next 30 years and at the end of the century. UCS can also share research quantifying the sea level rise traced to global warming emissions from the products of particular fossil fuel companies, which can inform Rhode Island's case for the industry to pay its fair share of climate costs.

Shana Udvardy is a climate resilience 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. Prior to joining UCS, Ms. Udvardy provided consulting services on climate adaptation and flood risk management policy. She was also the climate adaptation policy analyst at the Center for Clean Air Policy, director of flood management policy for American Rivers, and water program manager at the Georgia Conservancy. Ms. Udvardy also worked at the Smithsonian Institution's Monitoring and Assessment of Biodiversity Program and was a Peace Corps volunteer in Nicaragua. 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.

Gateway to the Future: Lessons in Green Infrastructure at the Newport Visitor Center

Victoria Howland & David Potter, Pare Corporation

In 2012, Hurricane Sandy ripped through the Northeast inflicting approximately $71 billion of damages, some of which were felt locally in Rhode Island. The Newport Gateway Visitors Center, which is located entirely within the limits of the 100-year floodplain, experienced damages both from the floodwaters and wind speed. In discussions of rebuilding the site, emphasis was made on implementing solutions that provide resiliency and longevity to the site. Aside from the floodplain, the site had additional constraints that required creative design solutions in order to meet the project's intent. The final design incorporated a variety of green infrastructure elements that were designed for resiliency. Construction was completed in Fall 2017. Since then, the project has been highlighted by the Green Infrastructure Coalition and was awarded the Grow Smart RI 2018 Outstanding Smart Growth Award. Now that the site has been operational for over a year, we are able to see how the installed systems are working. The session will review green infrastructure and resiliency strategies that were applied at the site from a design, construction, and operations aspect. The solutions presented and lessons learned from the Visitors Center project are grounds for any future development within the floodplain.

Victoria Howland currently serves as a Project Engineer of the Civil Division at Pare Corporation with seven years' experience in design and construction of site civil projects. Ms. Howland's experience spans a multitude of projects ranging from educational, institutional, commercial, and public facilities. She also serves on Pare Corporation's Sustainability Committee and is a mentor in the ACE Mentor Program of RI. David Potter currently serves as a Managing Engineer of the Civil Division at Pare Corporation. Mr. Potter has 20 years of experience designing and managing civil and environmental engineering projects. He is especially proficient in the areas of stormwater management, utilities, roadway, and site design for a wide variety of educational, recreational, institutional, commercial and public facilities.

Coastal Storms in Connecticut: Should I Evacuate and How do I Prepare?

Juliana Barrett, Connecticut Sea Grant & Emily Wilson, UConn Department of Extension, Center for Land Use Education and Research

Connecticut towns have made a strong effort, particularly following Storms Irene and Sandy, to provide information on town websites regarding storm preparedness. This presentation is focused on augmenting town information and reaching residents with the importance of evacuating when asked to do so. This project builds on the research findings of Marlon et al. 2015 in which they found:

- 70% of coastal residents surveyed were either unsure or did not think they lived in an evacuation zone (when in fact all those surveyed were in an evacuation zone).
- 74% of coastal residents surveyed had not seen a local evacuation route map.

Given the large number of both residents and transients (vacationers/weekenders) in Connecticut's coastal communities, it is imperative to provide accessible, digital evacuation maps with shelter or respite locations. Working with four pilot communities, we have developed an ESRI Story Map to increase awareness of the need to evacuate when requested and provide information on where to go. Using historical photographs from the Hurricane of 1938 to show the extent of damage from a powerful storm hitting the Connecticut coast, we provide information on how and why people should prepare for coastal storms. Numerous resources related to weather and emergency preparedness planning for both people and pets are included.

Juliana Barrett is an Associate Extension Educator and Coastal Habitat Specialist with the University of Connecticut Sea Grant College Program and the Department of Extension. Her responsibilities focus on developing outreach and tools pertaining to climate change adaptation and coastal habitat management in coordination with Connecticut's municipalities, NGO's and state and federal partners. Emily Wilson is a Geospatial Educator at the University of Connecticut Center for Land Use Education and Research (CLEAR) within the Department of Extension. Emily works on a variety of remote sensing and GIS projects and websites with the goal of providing easy access to geospatial information and maps in support of decision-making.

ResilientMA: Developing and Implementing a First-of-its-Kind Integrated State Plan

Aaron Weieneth, AECOM

The 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) is an innovative, first-of-its-kind statewide plan that fully integrates a traditional hazard mitigation plan with a climate change adaptation plan. The plan expands upon previous State planning efforts, and it integrates information and planning elements for 14 natural hazards that could affect Massachusetts with the following four climate changes: changes in precipitation, sea level rise, rising temperatures, and extreme weather. Projected climate changes will alter these natural hazards, in most cases increasing their severity, duration, or frequency. The SHMCAP fulfills two important requirements: It updates the 2013 Massachusetts State Hazard Mitigation Plan and fulfills the statewide climate adaptation plan required by Governor Charlie Baker's Executive Order 569, Establishing an Integrated Climate Change Strategy for the Commonwealth. This innovative plan encompasses the results of a multi-step planning process with a robust outreach and engagement program to incorporate diverse stakeholders across the Commonwealth in all phases of plan development, including identification of risks and vulnerabilities as well as goal setting and action development. The planning process was managed through a close partnership among the Executive Office of Energy and Environmental Affairs and the Massachusetts Emergency Management Agency and involved a Project Management Team composed of technical specialists from several key state agencies. The SHMCAP serves as a hazard mitigation and climate adaptation planning resource for all of the Commonwealth's municipalities and state agencies. It also serves as a model for integrating climate change impacts and adaptation strategies with hazard mitigation planning that can be used by other states. This presentation will provide an overview of the SHMCAP stakeholder engagement process and emphasize natural hazards and climate change considerations that are of particular importance to flood mitigation. An update on the SHMCAP implementation will also be provided.

Aaron is an environmental planning specialist with over 18 years of experience in hazard mitigation planning, climate change adaptation and resilience, socioeconomic and demographic analyses, water resources planning, and environmental assessments. Aaron serves as AECOM's New England Manager of Climate Change and Resilience and coordinates with technical staff across business lines to integrate climate change and resilience considerations into a variety of infrastructure and planning projects. Aaron has a BA in Environmental Science from Simpson College (Indianola, IA) and a MS in Geography from the University of Massachusetts, Amherst. He is also a member of the American Institute of Certified Planners.

The AIA Disaster Assistance Handbook - The Big Circle of Preparedness, Response, Recovery, and Mitigation

Kenneth J. Filarski, FILARSKI/ARCHITECTURE+PLANNING+RESEARCH

The session will introduce the American Institute of Architects "Disaster Assistance Handbook", 3rd edition, March 2017, as a resource for the participants and the basis of engaged discussion among the participants. Disaster Assistance is often seen, regarded, and experienced as a onetime reaction to natural and human triggered disaster events. In fact, true disaster assistance occurs continuously over time and is comprised of many elements and phases, ideally all part of an effective continuum in practice. The Handbook covers the continuum of preparedness, response, recovery, and mitigation. The Handbook provides valuable narratives and useful information and references covering a wide range of resources and actions from many professions, organizations, and government entities. The presenter is a member of the collaborative AIA team that developed the Handbook and encourages all conference attendees and certainly those attending the session to access the Handbook beforehand, bringing their perspectives and thinking to the group. https://www.aia.org/resources/71636-disaster-assistance-handbook.

Ken is the is the principal of FILARSKI/ARCHITECTURE+PLANNING+RESEARCH, an award winning, integrated architecture and planning, ecology studio and design research workshop. Founded in 1976 the studio has been recognized with national, regional, state awards in architecture, planning, urban design, and sustainable building/ecological systems. Ken is a Fellow of the American Institute of Architects, a LEED Fellow, an AICP Certified Planner, a LEED Building and Design Accredited Professional, one of the first SITES Accredited Professionals in the world, a Certified Floodplain Manager, a nationally Certified Disaster Assistance Trainer and a nationally Certified Disaster Responder. He is only one of 34 in the world who are an AIA Fellow and a LEED Fellow. Ken is a founder and the Chair of the U.S. Green Building Council RI, chaired the LEED-ND Regionalization Task Force, serves on the LEED Location and Planning Technical Advisory Group, and is a LEED and SITES Faculty Member. He is a member of the "Flood Resistant Design and Construction" ASCE/SEI 24-14 and 24-20 national committees. Ken served on the National AIA Board of Directors, chaired three national AIA Committees, developed the AIA "Disaster Assistance Handbook", and is the National AIA Disaster Assistance Coordinator for Rhode Island. Ken is a founder and President of the RI Architects and Engineers Emergency Response Task Force 7.

On the real-time forecasting of coastal and inland flooding in Rhode Island

M Reza Hashemi, University of Rhode Island Department of Ocean Engineering

Real-time forecasting of a coastal/inland flooding events is of great importance for emergency response, preparedness, and flood management. Further, in some extreme events, coastal and inland flooding events can occur simultaneously, so called compound flooding events (e.g., Harvey in 2017). Some areas such as buildings/infrastructure near estuaries can be affected by both types of flooding. Therefore, ideally, forecasting tools for inland and coastal flooding should be discussed together, and integrated in coastal regions. In this presentation, after a short review about existing tools (provided by USGS, and National Hurricane Center), we will summarize the results of two local projects that focused on development of numerical tools that can be used for detailed flood forecasting purposes in RI. The first project (sponsored by NOAA Coastal Resilience Program), developed a coastal flooding forecast tool for RI in collaboration with NECOFS (Northeast Coastal Ocean Forecasting System). A set of programs were designed for automating the coupled, with very high-resolution wave and hydrodynamic model (SWAN+ADCIRC) of RI for prediction of waves and storm surge. The system was tested during Nor'easter Stella in March 2017. Modeled storm parameters were then passed to a coastal environmental risk index (CERI) assessment tool. This tool generates spatial structural damage estimate maps on an individual structure basis in a real time. In term of inland flooding (second project, sponsored by HUD Community Development Grant Program and coordinated with the RI CRMC), a state of the art, spatially distributed model (Hec-HMS/Hec-Ras) was developed for the Pawtuxet River watershed. The model includes river/watershed structures (reservoirs, historical dams, and bridges), and it can map the flood extent continuously in the river floodplain within a GIS-web-based platform. The model was tested for the March 2010 event. A discussion about coupling coastal and inland flooding tools will be provided at the end.

M Reza Hashemi was appointed as a faculty member of the URI in January 2015. He was a research fellow at the School of Ocean Sciences of Bangor University, UK, during 2011-2014. He was awarded a PhD in Civil Engineering from Shiraz University in 2006 and awarded another PhD in Physical Oceanography from Bangor University. Hashemi's research interests are coastal engineering and coastal oceanography focusing on coastal resilience and ocean renewable energy. His research areas are listed as follows: Hydrodynamics and sediment transport in the nearshore zone; Coastal food risk assessment: impacts of coastal storms on coastal infrastructures; Ocean Renewable Energy; Applications of mathematical/numerical modeling and artificial intelligence in engineering; and the interaction of riverine and coastal hydrodynamics/morphodynamics. Hashemi has worked on several projects funded by state and federal agencies regarding coastal resilience and inland flooding.

Stormwater Management Enters the Third Dimension

Peter M. Hanrahan, E. J. Prescott, Inc.

Three-dimensional thinking has changed the landscape in flood mitigation and stormwater management. Many of our traditional practices have resulted in serious problems that we must confront. For many years stormwater has been treated as a waste product, being sent downstream as quickly as possible. In downstream areas, receivers of this stormwater must deal with higher volume flows and the nutrients and sediment carried by that stormwater. Three dimensional thinkers have developed a very full toolbox for the design professionals. Evolving technology and best management practices have resulted in solutions that remove pollutants, store and filter stormwater, and, most importantly, result in sustainable solutions for site planning. Case studies and relevant examples will be discussed in detail.

Peter M. Hanrahan, CPESC is currently Erosion Control and Geoproduct Manager at Everett J. Prescott, Inc. of Gardiner, Maine. His industry experience spans more than 40 years. He served four terms as President of the Northeast Chapter of the International Erosion Control Association, and currently serves on the Senior Advisor Committee for EnviroCert. He has presented at national events for many organizations, including the American Water Works Association, the International Erosion Control Association, the Land Improvement Contractors Association and the International Management Council.

Invisible Flood Protection: How one town prevents catastrophic flooding and maintains its riverfront views

Ken Ryder, IBS Group

A small and well-preserved city on the Danube river in Austria, Grein is set against a natural backdrop of beautiful landscapes and rich history. Faced with the threat of ever more numerous and severe floods, the city arrived at a solution to both protect itself and maintain the beauty of, and access to the riverfront in this very popular tourist destination. In 2012 the city installed a demountable flood wall system. The 'invisible' wall, with a length of 850 meters and a height of 15' is only installed when the threat of flooding exists, otherwise it is stored in a nearby warehouse, ready for rapid deployment. During a single deployment in 2013, it is estimated that the damage prevented by the wall would have been in excess of four times the cost of the total project The presentation will cover the project from inception thru completion, including a case history of the Grein project (complete with video footage of the system being deployed and preventing flooding), an introduction to the technology, and advantages and challenges of utilizing demountable floodwall systems. https://www.youtube.com/watch?v=0wE52NDzN7Y

Planning for Sea Level Rise

Robert Rulli, Town of Warren, Director of Planning & Community Development

The Towns of Warren and Barrington had the good fortune of having students from the graduate program in City and Regional Planning at UPenn look at areas in both towns which are at risk to sea level rise and not immediately designed for coastal resiliency. The end product of their analysis is a thought-provoking approach to how both communities as well as the State should consider the impacts of both of these risks.

Robert Rulli is the Town of Warren's Director of Planning & Community Development.

Lessons Learned from Stormwater Retrofit Projects: Optimizing Benefits while Balancing Constraints

Celicia L. Boyden, Fuss & O'Neill, Inc.

Identify the topics that best align with the content of your presentation. Retrofitting stormwater management measures into the built environment is becoming more of a necessity to address flooding in urbanized areas. Failing infrastructure and increasing development require communities to seek opportunities for flood mitigation, but these opportunities are often scarce. Highly developed areas with extensive utility networks limit locations for effective flood mitigation. It is therefore important for communities to implement novel planning practices to maximize benefits when addressing flooding. Retrofits require a unique approach rooted in community engagement, project prioritization and data collection. Each aspect of this approach is a fundamental lesson learned. Community engagement seeks to solve flooding problems by soliciting input from community members and managing their expectations from the onset of the process. Productive communication with the community benefits the project by building partnerships with stakeholders who are impacted by flooding. These partnerships may lead to shared resources with organizations such as watershed councils, private

property owners and action groups. Partnerships also allow planners an opportunity to understand the full extent of the problem and better inform prioritization. Informed prioritization evaluates flood mitigation measures holistically. Perhaps the most beneficial project comprises several micro-projects throughout the watershed that provide incremental benefits over time. Prioritization is further informed by available funding and data collection of existing site conditions. Data collection is important to minimize risks of unknown site conditions (e.g., shallow bedrock or unrecorded utilities). Retro□t projects are unique in that they require an adaptive approach based on site constraints. Understanding existing conditions through data collection and work previously done in the community, decreases the risks with unknown conditions and therefore, unexpected costs. While the benefits of retro□t stormwater projects may be obvious, the mechanism for success might be less obvious. Through engaging local community members, prudent project prioritization and managing risk though data collection, the opportunities become attainable.

Celicia joined Fuss & O'Neill, Inc. in 2015 after working 3 years at the U.S. Geological Survey (USGS). As a Water Resources Engineer based out of the company's Providence, RI office, Celicia draws on her applied science and engineering-based education to implement ecological improvements throughout New England. Her projects are focused on stormwater management, flood mitigation and water quality improvement. While working full-time at Fuss & O'Neill, Celicia is simultaneously pursuing a master's degree in the Environmental Engineering and Science for the Professions Program at Johns Hopkins University. She brings a positive attitude that augments her technical strengths and diverse work experience. Outside of work and graduate school, her free time is primarily spent outdoors (backpacking, rock-climbing, etc.) or napping.

Critical Infrastructure Flood Hardening During 2018 Storms Grayson and Riley

Gary R. McAllister, GZA & Richard Costa, National Grid

Of the natural hazards, flooding represents the most-costly in terms of human life and economic impact. Resiliency (i.e., the ability to anticipate, resist, absorb, respond to, adapt to, and recover) against damage such as flooding is a single, yet interdependent component to our need for reliable, cost-effective, and sustainable energy. Unprecedented events like Hurricane Katrina and Superstorm Sandy proved that minimizing electrical outages and shortening recovery during natural disasters helps mitigate the devastating effects of natural disasters. National Grid, one the world's largest energy companies, has 450 substations in New England, many of which were constructed decades ago within low-lying and coastal areas prone to flooding. The presentation will illustrate key elements of planning, design, implementation, and O&M of flood hardening systems implemented by National Grid at their most flood-vulnerable substations in New England. The presentatiInvisibon will also illustrate the storm forecasting and system activation implemented in
advance of Winter Storms Grayson (January 2018) and Riley (March 2018) at six coastal substations from Nantucket to Newburyport. Despite record storm tides, the hardening systems allowed substation operators to continue to run the substations without concern for shutting down the facility to protect energized equipment from water intrusion.

Gary McAllister has 29 years of experience including the latest 12 years with GZA, currently as Principal and Sr. Vice President. He leads GZA's Power and Oil and Gas Sectors, providing senior technical and management leadership in support of GZA's energy projects. Mr. McAllister also leads civil and geotechnical programs for GZA's top energy clients. His areas of specialization are geotechnical engineering with emphasis on deep foundations, as well as flood mitigation for critical infrastructure. He earned his BS and MS in Civil Engineering from the University of Maine. He is a professional engineer licensed in 8 states with project experience in 27 states.

An Evaluation of Aboveground Storage Tank Vulnerability utilizing STORMTOOLS and Parameterized Fragility Functions for Planning Future Mitigation Strategies

Christopher Walusiak & Josh Sargeant, Rhode Island Department of Environmental Management

The Rhode Island Department of Environmental Management Office of Customer and Technical Assistance (OCTA) has been utilizing STORMTOOLS and fragility functions to assess the vulnerability of aboveground storage tanks (ASTs) to hurricanes and flood exposure. STORMTOOLS is a geographic information system (GIS)-based coastal planning tool suite developed by the University of Rhode Island and Rhode Island Coastal Resources Management Council. The fragility functions were developed by Rice University for estimating resilience indicators for ASTs subjected to hurricanes and storm surge. By combining these resources, the objective of this project is to identify and prioritize AST facility flood exposure and individual AST vulnerability within Rhode Island. Department records and GIS software were used to develop a detailed AST data layer, which included details such as tank construction, contents, and location. This data layer was then used to extract location-linked storm surge and inundation calculations from various STORMTOOLS

scenarios. These details of AST conditions and STORMTOOLS surge data were input into fragility functions to approximate the probability of tank failure. The result is a graphical representation of the probability of failure for the individual AST. The ultimate goals of the project are planning future mitigation strategies, informing AST facility managers of the potential impacts from future hurricane and flooding events, and encouraging additional technical studies that may result in capital improvements.

Christopher Walusiak and Joshua Sargent work for the Rhode Island Department of Environmental Management in the Office of Customer and Technical Assistance. Christopher is a Principal Civil Engineer, has a degree in Civil and Environmental Engineering from the University of Rhode Island, and is a Registered Professional Engineer in the State of Rhode Island. Joshua is an Environmental Planner and has a Master of Environmental Science and Management degree from the University of Rhode Island.

Risk Reduction for Small Business Resiliency in Rhode Island

Gabrielle G. McGrath, RPS Ocean Science | Roberta Groch, RI Division of Statewide Planning | Pam Rubinoff, University of RI Coastal Resources Center | Keri Cronin, President of Warren Town Council and Small Business Owner

The Rhode Island Division of Statewide Planning and the Rhode Island Office of Community Development are funding a project to help small businesses become more resilient to extreme weather events. The project, launched in August of 2018, will be completed in June of 2019. The ultimate goal is to create Risk Reduction Guides tailored specifically to the needs of the state's small businesses. To begin the project, an Exposure Analysis was conducted to determine what areas of the state are most vulnerable to flooding events and power outages. The project's Steering Committee, made up of state community leaders, used this analysis to select four Pilot Areas where a Vulnerability Analysis would be conducted. The Pilot Areas chosen were Warren/Bristol, Newport/Middletown, the Woonasquatucket River Corridor from Providence through Smithfield, and the South Coast including Westerly, Charlestown, and South Kingstown. In order to gauge the vulnerabilities and the lessons learned from past extreme weather events, the Project Team performed over 100 vulnerability assessments with small business owners in each of the Pilot Areas. In addition, outreach was conducted statewide with 83 individuals from small businesses, local trade organizations, and Chambers of Commerce. The input collected during the Outreach and the Vulnerability Analysis tasks was used to inform the creation of useful Risk Reduction Guides to bene t small businesses statewide. These guides used the lessons learned from actual extreme weather events that impacted Rhode Island to provide the best possible advice to other small business owners on actions to take to improve resiliency.

Gabrielle McGrath works as a Senior Scientist with RPS Ocean Science. Prior to beginning her position with RPS in July, she served for 26 years on Active Duty in the United States Coast Guard before retiring in 2018. She earned her bachelor's degree in Biological and Physical Oceanography from the U.S. Coast Guard Academy and her master's degree in Physical Oceanography from the University of Rhode Island Graduate School of Oceanography. Gabrielle's Coast Guard career included positions as the Chief of Marine Environmental Response at Marine Safety Office San Francisco, as the Chief of Planning at Marine Safety Office Boston, as the Commanding Officer of the International Ice Patrol, and as the Assistant Commandant of Cadets and Cadet Training Officer at the U.S. Coast Guard Academy. She also served as the Planning Section Chief in Mobile, Alabama for the Deepwater Horizon oil spill response in 2010.

Overview of the Beach SAMP Risk-based Permitting System

Janet Freedman, RI Coastal Resources Management Council

The RI Shoreline Change Special Area Management Plan (Beach SAMP) was initiated by the RI Coastal Resources Management Council, in partnership with the University of Rhode Island, in 2012 before Superstorm Sandy landed on Rhode Island. The Beach SAMP evaluated all 420 miles of Rhode Island's coastline for coastal erosion patterns, storm surge exposure, and sea level rise. The Beach SAMP document (http://www.crmc.ri.gov/samp_beach.html) was approved by the RI CRMC Council in June 2018 as a guidance document and regulatory changes to the Coastal Resources Management Program (RICRMP, aka "Red Book") were approved by the Council in October 2018. The Beach SAMP is the first of its kind in the U.S., positioning Rhode Island as a leader in implementing coastal adaptation measures to increase long-term resilience of its coastal communities. The effort resulted in three innovations for coastal management planning in Rhode Island:

1) High resolution maps hosted online as RI STORMTOOLS - illustrating sea level rise and storm surge scenarios for all 420 miles of Rhode Island's coastline;
2) A coastal permit process requiring applicants within RI CRMC's jurisdiction to complete a coastal hazards risk assessment as part of the permit application; and

3) STORMTOOLS Design Elevation (SDE) maps that can be used in concert with FEMA floodplain maps to project future design elevations that reflect risk of flooding from storms with sea level rise scenarios modeled.

This session will offer an overview of the Beach SAMP, including a summary of climate change science and trends, the exposure pro le of Rhode Island's coast, the coastal hazards application guidance to be required by CRMC, how CRMC's process can extend to other state agencies and coastal municipalities, and conclude with a summary of adaptation strategies to be considered in planning and design to minimize risk of losses from coastal hazards.

STORMTOOLS: Design Elevation (SDE) Maps for RI with Demonstration and Case Examples & Risk and Damage App

Malcolm Spaulding, University of Rhode Island Department of Ocean Engineering

In support of the Beach Special Area Management Plan (SAMP) risk based permitting system, base flood elevation (BFE) maps for the 100 yr return period storm, including the effects of sea level rise, have been developed for coastal areas of the state of RI under the STORMTOOLs initiative. These maps were developed to support the design for structures and infrastructure in the state and have been formally adopted by the RI Coastal Resources Management Council as part of their permitting process. The maps are based on predictions of the coupled surge-wave models from the US Army Corp of Engineers, North Atlantic Comprehensive Coastal Study (NACCS) (2015), enhanced with local predictions of waves and coastal erosion for flood inundated areas. Maps are available for 0, 0.6, 1.0, 1.5, 2.1, and 3.1 m of sea level rise (SLR), reflecting NOAA SLR estimates for the study area through 2100. The maps are accessible via ArcGIS for both Narragansett Bay and the southern RI shoreline (https://crcuri.maps.arcgis.com/home/index.html). Training sessions on the use of the maps for state permitting agencies and planners, building officials and engineers were held in late in 2018 (http://www.beachsamp.org/stormtools-design-elevation-sde-maps/). The goal of this two-part presentation is to provide an overview of the SDE maps (Part 1) and then a demonstration of their practical application to selected cases (Part 2).

Professor Emeritus, Ocean Engineering at the University of Rhode Island. Leader of the STORMTOOLS initiative including flood mapping, coastal environmental risk index (CERI), and design elevation maps. Senior advisor to the Beach SAMP. Extensive publications in coastal flood modeling issues in the last five years. Selected as American Society of Civil Engineers Fellow 2018, in part in recognition of contributions in coastal flooding. Invited presentation for the US Army Corp of Engineering, Coastal Engineering Research Board annual meeting in Providence, RI in 2018. Leading efforts on application of CERI to southern RI communities and to develop an app that will allow risk and damage estimates for structures in coastal areas of RI.

Application of the Coastal Environmental Risk Index (CERI) to Barrington, Bristol, and Warren (RI)

Annette Grilli, University of Rhode Island Department of Ocean Engineering

The Coastal Environmental Risk Index (CERI), a method to assess the risk and damage to structures and infrastructure in the presence of storm surges including the effects waves and sea level rise, has been under development since 2016, with initial applications to Warwick, and Charlestown, Rhode Island (RI) (Spaulding et al. (2016, 2017a,b), Grilli et al. (2017) and Schambach et al. (2018). We propose to present here the most recent application of CERI to the coastal communities of Barrington, Bristol, and Warren. These towns were selected for application given the very low-lying topography of the area and its exposure to storm flooding. This work was recently highlighted in recent ProJo article (https://www.providencejournal.com/news/20190128/ri-researchers-project-future-ooding-in-barringtonbristol-and-warren). In this application the hazard is represented by the annual 1% probability of exceedance event (100-year Storm) combining storm surge, waves and sea level rise. The method used to de ne the representative 100-y storm is described in earlier work (Spaulding et al. 2016, 2017a,b; Grilli et al., 2017). The 100-y Synthetic-Design Storm (SDS) is designed based on the output of the U.S. Corps of Engineers' North Atlantic Coast Comprehensive Study (NACCS; Jenssen et al., 2017) at local save points and is propagated in shallow water and across the shoreline in the inundation zone using the Steady State Spectral Wave model (STWAVE), a phase-averaged wave model. The risk associated to the 100-y storm is assessed at the residential scale combining the modeled hazard represented by the SDS propagating across the shoreline in the inundation zone for different SLR scenarios (2,3,5,7 and 10 ft) and the residential vulnerability as assessed by fragility curves developed for specific building types by the U.S. Corps of engineers (NAACS study; Simm, 2017). Results are available through a GIS based viewer/tool, STORMTOOL developed at URI. http://www.beachsamp.org/stormtools/stormtools-coastalenvironmental-risk-index-ceri/.

Annette Grilli is associate research professor in Ocean Engineering at the University of Rhode Island. She holds a B.S in Geography and a M.S. in Physical Oceanography from the University of Liège, Belgium, and a Ph.D. in Climatology, from the University of Delaware. Her current research interests focus on the numerical modeling of wave propagation and coastal erosion.

RI's Beach SAMP: Community Engagement for Coastal Adaptation

Teresa Crean, University of Rhode Island Coastal Resources Center

Understanding risk and tools to assess risk is an important first step for decision makers to develop sound policies and strategies for adaptation. The Beach SAMP developed tools and policies to enable a variety of audiences to address long-term resilience to changing coastal conditions expected from erosion, storm surge, and projected sea-level rise. This session will offer an overview of the stakeholder engagement process employed to develop the Beach SAMP tools and policy document. Public meetings, focus groups with targeted stakeholders, information exchange with state agencies and municipal departments, and training education sessions were all employed to ensure tools and policies were accessible for a variety of decision-making audiences.

Teresa Crean, AICP, is a community planner and extension specialist with the Coastal Resources Center (CRC) and Rhode Island Sea Grant at the University of Rhode Island's Graduate School of Oceanography. Teresa facilitates projects in Rhode Island that address coastal adaptation to climate change and sea level rise at the state and local level. This work involves applying decision support tools that communicate challenges and opportunities to targeted stakeholders while collaboratively considering policies and projects that may increase resiliency in the face of potential impacts from coastal hazards. All work employs a research and planning process that integrates the best available science with open input and involvement from a broad range of stakeholders, decision makers and the public. Teresa earned a Master of Landscape Architecture (M.L.A.), SUNY College of Environmental Science and Forestry at Syracuse, and a B.S. in Environmental Policy/Natural Resource Management, University of Michigan.

Outreach to Residents on Property-related Climate risks: What's working, what isn't, and where do we go from here?

Laura Bozzi, RI Department of Health & Pam Rubinoff, University of Rhode Island Coastal Resources Center

With a collaborative roundtable format, participants are invited to share their agency/organization's successes and barriers encountered when doing outreach to residents about property-related climate risk. What are organizations, businesses, municipalities and state agencies doing now to educate and disseminate information on this topic? Participants will share and discuss elements including the issues are being covered, what communication modes are being utilized, what are the pros and cons of current messaging, and what are the pitfalls, such as who is potentially being forgotten in current outreach efforts? The session will conclude with ideas and suggestions regarding next steps enhancing efforts for positive outcomes.

Laura Bozzi is the Climate Change Program Manager at the RI Department of Health. Pam Rubinoff is the Associate Coastal Manager at the URI Coastal Resources Center.