MONDAY, FEBRUARY 11, 2019

7:30 a.m. to 5:00 p.m.

Cambridge Hall

REGISTRATION CHECK-IN

7:30 a.m. to 5:00 p.m.

Pembroke

SPEAKER READY ROOM

8:30 to 11:30 a.m.

Windsor A

S01. SPECIAL INTEREST MEETING: 3D NATION

3D Nation is the federal elevation data theme, consisting of the topography-focused 3D Elevation Program (3DEP) and the bathymetry-focused Interagency Working Group on Ocean and Coastal Mapping, with synergistic interests at the coast. This session provides a venue to learn about the activities and products of 3D Nation and an opportunity to provide feedback to agencies on current and future elevation needs.

Windsor B

S02. SPECIAL INTEREST MEETING: EXPLORING CROSS-PROGRAM GEOSPATIAL SOLUTIONS IN NOAA'S CORAL JURISDICTIONS

The NOAA Office for Coastal Management's Geospatial Solutions Program and Coral Reef Conservation Program generate and publish a wide range of spatial data and applications. These products often have significant overlap in their geographic scope, as well as in the research topics and management issues that they can be applied to. Given these intersections, there may be opportunities to align resources and develop data services and tools that would greatly enhance the work being done throughout NOAA's seven coral reef management jurisdictions in the Pacific, Atlantic, and Caribbean.

This special interest meeting will begin a discussion among NOAA programs, partners, and coral jurisdiction stakeholders to explore common ground and needs for geospatial data services and applications. With the range of programs conducting work related to coral ecosystems, the conversation has considerable potential for expansion from both an organizational and geographic perspective, and would be relevant to additional programs, including the National Centers for Coastal Ocean Science (NCCOS), Coastal Zone Management (CZM), National Estuarine Research Reserve System, and Fisheries Science Centers.

Examples of cross-program geospatial applications in coral environments may be shared to guide the discussion, including recent instances in the Pacific in which Coral Reef Conservation Program and CZM projects leveraged NCCOS benthic maps, the Coastal Change Analysis Program, and the Office for Coastal Management's participatory mapping guidance to implement coastal and marine spatial planning.

Windsor C

S03. SPECIAL INTEREST MEETING: High-Resolution Land Cover Mapping Now and Tomorrow

Current, accurate land cover and change information is a common foundational data set that can be used to address a wide range of management issues, from flooding risk and natural infrastructure to policy evaluation and land use planning. Knowing what exists on the ground gives managers and planners more information, and the better the data, the better their understanding.

This session will focus on discussing 1) recent advancements in mapping technology (including artificial intelligence), 2) the current state of NOAA's Coastal Change Analysis Program (C-CAP) mapping efforts, 3) several example land cover products (hands-on exploration), 4) uses of local-scale land cover information, and 5) needs expressed from those attending the workshop (through interactive polling and group discussion).

Somerset

S04. SPECIAL INTEREST MEETING: Data Discovery and Dissemination During Disasters

NOAA and our emergency response partners around the nation need to be in the best position possible to respond to coastal threats quickly, safely, and effectively. Although proper situational awareness is essential for an effective response operation, access to key spatial data can be difficult during rapidly evolving events. To help prepare for future responses, session speakers will focus on planning and training, field data collections, access to existing data portals, and lessons learned from past incidents.

1:00 to 4:00 p.m.

Windsor A

S05. SPECIAL INTEREST MEETING: DEVELOPING DECISION-SUPPORT TOOLS FOR NOAA'S WATER INITIATIVE

Too much water, too little water, or water of poor quality endangers life, property, economies, and ecosystems. In response, NOAA has come together, with all levels of government, stakeholders, and academic, nongovernmental, and private-sector organizations to implement the NOAA Water Initiative. Central to this cross-agency effort is the provision of timely, accurate data and information to support water-related decisions.

This special interest meeting will introduce efforts to provide data and information products through the National Water Model and decision-support tools from the NOAA Office for Coastal Management. Through interactive demonstrations, participants will learn how these products work and how communities can leverage and apply the information from these efforts. Participants will then be engaged in a facilitated dialogue to identify opportunities to support these efforts through the development of new decision-support products and services that address water-related issues (i.e. flooding, drought, and water quality) in the coastal zone.

Windsor B

S06. SPECIAL INTEREST MEETING: Open Source Software for GIS and Remote Sensing

In today's realm of GIS and remote sensing, professionals have several software packages available to use, including both licensed and open source software. Both provide advantages and disadvantages unique to themselves. This special interest meeting is intended to introduce beginner to intermediate GIS and remote sensing users to the world of open source software and to demonstrate how to integrate open source software solutions into their own workflows.

Windsor C

S07. SPECIAL INTEREST MEETING: Technical Training for Improving the Application of CMECS Data to Coastal Management

This special interest meeting will engage the audience in an interactive discussion with coastal management and training staff members from Oregon, NOAA, and other partners about developing educational resources that help build capacity for Coastal and Marine Ecological Classification Standard (CMECS) applications in regional and national habitat management.

The meeting will have three elements:

1. Oregon Coastal Management Program and South Slough Research Reserve coastal training staff members will recap Oregon's process for providing a CMECS training, with a close look at the rationale, materials, consideration of audience needs, and ways CMECS GIS data and web mapping applications were confidently applied in a regulatory application through this training.
2. Participants will explore ways in which future CMECS training and education can be incorporated into an expanded or extended version of the Oregon process for other regions or national applications. For example, the U.S. Army Corps of Engineers will use CMECS to revise its national 20-year dredged materials management plan in the Pacific Northwest to inform the disposition of sand dredged and mitigate habitat loss along the shore zones of the lower Columbia River.
3. A final element will include audience-driven discussions on information needs for CMECS application. This will leverage the CMECS Community of Practice Confluence site as a way to build a network of expertise.

The outcome of the meeting will be to strengthen the CMECS user community's capacity to support each other and to improve the coastal manager's ability to apply CMECS to coastal management decision-making.

Somerset

S08. SPECIAL INTEREST MEETING: Unmanned Aircraft Systems for Coastal Resource Management

Unmanned aircraft systems (UAS) provide a range of remote sensing solutions for observing and mapping in the coastal zone. These technologies offer new insights into real-world

phenomena at scales that are difficult to observe using either traditional field-based approaches or aircraft- and satellite-based observing systems. UAS allow us to bridge this gap and acquire data in a more flexible and user-defined manner . . . or do they? Participants in this special interest meeting will share their experiences with UAS and learn about the challenges and successes of using these exciting and innovative technologies for coastal management.

Hampton

S09. SPECIAL INTEREST MEETING: Digital Coast Resources to Jump-Start Open Space Preservation Analysis for Community Rating System Credit

Through FEMA's Community Rating System (CRS) program, communities can increase their resilience to flooding while lowering flood insurance rates by engaging in activities that exceed minimum floodplain management requirements. This interactive session primarily focuses on the application of GIS tools to support Activity 420 Open Space Preservation within the CRS program, where communities have the potential to earn up to 2,870 CRS credits by preserving open space and maintaining or restoring the natural functions of floodplains.

Through hands-on exercises, participants will learn how to use the Association of State Floodplain Managers and Coastal States Organization's Green Guide, NOAA's open space preservation how-to and GIS workflow, and The Nature Conservancy's Community Rating System Explorer. Attendees are encouraged to bring their own community GIS data and software. They will have the unique opportunity to have experts guide them through best practices to maximize their community's participation in the CRS program, perform Open Space Preservation GIS analyses, and explore decision-support tools to help guide their CRS planning process so they achieve economic and ecological benefit.

5:30 to 7:30 p.m.

Kensington D, E, F

EXHIBITOR RECEPTION

TUESDAY, FEBRUARY 12, 2019

7:30 a.m. to 5:00 p.m.

Cambridge Hall

REGISTRATION CHECK-IN

7:30 a.m. to 5:00 p.m.

Pembroke

SPEAKER READY ROOM

8:00 a.m. to 3:00 p.m.

Kensington D, E, F

EXHIBITS

8:00 to 8:30 a.m.

Kensington D, E, F

COFFEE

8:30 to 10:00 a.m.

Kensington G

WELCOME AND KEYNOTE PLENARY

Moderator and ASFPM Welcome: Chad Berginnis, Executive Director, Association of State Floodplain Managers (ASFPM)

South Carolina Welcome: The Honorable Tom Rice, U.S. House of Representatives, South Carolina District 7 (Invited)

NOAA Welcome: Nicole L. LeBoeuf, Acting Assistant Administrator, NOAA National Ocean Service (Invited)

Keynote Address: The Dramatic Pace of Innovation in Geospatial Analytics for Land, Sea, and Space
Anne Hale Miglarese, Chief Executive Officer, Radiant Earth

The speed of innovation occurring in the geospatial profession is mind-numbing. From the exponential number of Earth observation satellites in orbit to machine learning and autonomous drones, the amount of data and the tools we use to analyze this information is growing daily. While disruptive to our workflows and many existing business models, the opportunities to generate meaningful insights into the problems we are trying to solve have never been more possible.

10:00 to 10:30 a.m.

Kensington D, E, F

BREAK

10:30 a.m. to Noon

CONCURRENT SESSIONS

Windsor A

Mapping Benthic Habitats: Part 1

A01. Extending the Value of Topo-Bathymetric Lidar Datasets for Benthic Habitat Mapping

Colin Cooper, Quantum Spatial; Stephen White, NOAA; Mischa Hey, Quantum Spatial

Topo-bathymetric lidar data from the NOAA National Geodetic Survey's (NGS's) Coastal Mapping Program (CMP) is collected to support national shoreline mapping and nautical charting. As part of the Interagency Working Group on Ocean and Coastal Mapping (IWG-OCM) and the Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX), NOAA has co-developed standards for data collection and delivery. The growing volume of standardized topo-bathymetric lidar data sets collected through these programs is creating an invaluable resource available to coastal user groups. The value of these data is further enhanced by deriving intelligent products that form the basis for downstream analytics such as benthic habitat classification and submerged aquatic vegetation mapping. Using data collected in Chesapeake Bay and Florida Keys with the Riegl VQ-880-G sensor, we will explore the potential utility of derivatives including seabed reflectance, structural signatures, and total propagated uncertainty (based on methods developed collaboratively by NOAA NGS, Oregon State University, and University of New Hampshire) to classify benthic habitat features through development and application of customized object-based extraction routines. This exploration will be geared towards extending the value of topo-bathymetric lidar data to more effectively meet the application goals of the broader coastal research and management community.

A02. Hi-Resolution Local Ecological Marine Units

Keith VanGraafeiland and Kevin Butler, Esri

To maintain a healthy ocean and support sustainability, it is necessary to have a baseline for understanding the ocean's ecosystems and a framework for detecting change. Ecological Marine Units (EMUs) are global, 3D, long-term mapped ecosystems that can help meet these goals. However, they are sometimes too temporally and spatially coarse to be useful in bays, estuaries and nearshore waters. Learn how the same workflow workflow used to create global EMUs can be leveraged to build, visualize, analyze and share highly localized EMUs using data from both NOAA's World Ocean Database and your local in situ observations.

A03. Using CMECS for Collaborative Benthic Habitat Mapping

Kate Rose, Northern Gulf Institute, Mississippi State University

This application of the Coastal and Marine Ecological Classification Standard (CMECS) Geoform Component (GC) demonstrates integration of high-resolution deepwater bathymetry data with an existing, lower-resolution geomorphic basemap of greater geographic extent. The CMECS GC units and hierarchical structure provide a framework for combining classified features derived from different types of source data, resulting in a full-coverage, more accurate and informative map of varying spatial resolution and descriptive detail. This "enhanced basemap" will provide examples for habitat data classification with CMECS and will be used to encourage other data collectors and mappers to contribute

additional existing and newly-collected geomorphic data to the map. Future work to assist potential contributors will include development of an atlas-type publication that incorporates detailed definitions of the CMECS units and habitat reference images, and a web-based map and data discovery application. This work supports development of comprehensive habitat characterizations that are fundamental to assessment and monitoring of marine ecosystems, and the management of energy and natural resources sector impacts on those ecosystems.

A04. Implementing CMECS for the Long Island South Shore Estuaries Benthic Habitat Mapping Effort

Chris Griesbach, Dewberry Engineers Inc.; Mark Finkbeiner, NOAA Office for Coastal Management; Keith Patterson, Dewberry Engineers Inc.

Assessing habitat trends and the impact of storm events like hurricane Sandy is an important part of overall coastal management. These projects are most successful when conducted in partnership with local agencies that collaborate from the initial phases of project planning and data collection. Such was the case when NOAA partnered with New York's Governor's Office of Storm Recovery and contracted Dewberry Engineers Inc. to collect digital multi-spectral imagery and create digital benthic habitat data from this imagery for the South Shore of Long Island, New York. This process relied upon community engagement in order to help determine optimal flight windows for collection of digital imagery. Local partners also provided field logistics in support of ground-truthing efforts that have helped inform photo-interpretation and habitat classification activities using the CMECS classification schema. This presentation will provide an overview of the habitat mapping processes used to support change analysis and facilitate estuary monitoring in both regional and local geographies of the Long Island South Shore.

Windsor B

Federal Data You Can Use

A05. NOAA's National Geodetic Survey's Coastal Data and Tools

Douglas Graham, NOAA National Geodetic Survey

The National Oceanic and Atmospheric Administration (NOAA) collects a variety of remote sensing data using both traditional and emerging technologies for shoreline vectors, nearshore bathymetry, and for emergency response including oblique before and after images to serve maritime navigation and NOAA homeland security and emergency response requirements. The methods currently used by the National Geodetic Survey (NGS) within NOAA, to delineate the shoreline include stereo photogrammetry using tide-coordinated aerial photography, commercial satellite imagery, and topobathy lidar. Aerial photography may have limitations, especially in harsh weather environments and areas with large tidal ranges where topobathy may provide a more efficient and cost effective method of acquiring shoreline. NOAA has been testing alternative technologies for shoreline mapping, including the use of unmanned aerial vehicles for use in specific mapping applications such as small areas with recurring survey needs. The National Geodetic Survey has developed and uses tools including VDatum and NGS Coordinate Conversion and Transformation Tool (NCAT) that are publicly available for data processing. The data-gathering process results in a vector database of the national shoreline and Continually Updated Shoreline Product, high-resolution digital photographs, orthoimagery, and coastal lidar data sets.

A06. Partnerships to Support the USGS 3D Elevation Program

Darcee Killpack and Walter Kloth, USGS National Geospatial Technical Operations Center

This presentation will focus on the USGS 3D Elevation Program (3DEP) and how USGS works with NOAA and many different federal, state and local agencies to support the Program. This presentation will focus on partnership development and the importance of meeting partner needs. It will also explain USGS' tools for lidar acquisition, including using the Geospatial Products and Services Contract (GPSC), Cooperative Agreements (COOP), and partnership development through the Broad Agency Announcement (BAA). Examples of current coastal projects and collaborations with NOAA will also be highlighted.

A07. Leveraging Coastal Data: The Development of a Coastal Multifrequency Geospatial Catalog

Christopher MacDougall, AECOM; Rafael Canizares, Federal Emergency Management Agency; Michael DelCharco, Taylor Engineering; Elena Drei-Horgan, AECOM

FEMA understands the benefit of having multi-frequency flood elevation data and is driving the development of this data in many areas, including for coastal hazards. As part of Recommendation 10 from the Technical Mapping Advisory Committee (TMAC) 2015 annual report regarding structure-specific flood frequency determinations, TMAC noted that multi-frequency data are in some cases already available. To begin addressing this recommendation, an important step is to understand and document what multi-frequency data is available from modern, detailed coastal studies. Coastal studies may employ different methodologies or limiting assumptions, may currently be in different stages of production, and may be implemented over large geographical areas. Therefore, it is important to record the characteristics of these coastal datasets in a manner that addresses TMAC Recommendation 10 while best serving the needs of FEMA's coastal program. This presentation will walk through the vision, development, and uses of a Coastal MultiFrequency Geospatial Data Catalog that was created to document the availability of such data in order to better understand data limitations, and to identify where additional multi-frequency data can be created by expanding other products. The Catalog is enabled on the FEMA GeoPlatform to leverage relationships with other FEMA datasets such as CNMS and the Coastal Tracker. This Catalog provides a tool that can benefit FEMA and external stakeholders by providing a point-and-click interface that could be used for a variety of applications. If multi-frequency data are created, a mapping tool like this one could potentially allow users to identify a structure and obtain a sense of not just the 1-percent-annual-chance flood event, but a spectrum of return periods. This multi-frequency data may be used to drive actions to reduce the risk of loss of property and life, and to support communities as they address risks stemming from current and future coastal flood hazards.

A08. Extracting Geomorphological and Environmental Parameters to Support Coastal Analysis

Eve Eisemann, Lauren Dunkin, Molly Reif, Michael Hartman, and Jennifer Wozencraft, U.S. Army Corps of Engineers

The coastal zone is a dynamic environment, with changes occurring due to wind, waves, and currents under both fair-weather conditions and extreme storm events. Geomorphological and environmental characteristics on sandy beaches, like dune height and vegetation, influence breaching susceptibility. Along coastlines with bluffs or cliffs, like the Great Lakes, bluff erosion both provides much of the sediment available to the nearshore and poses a threat to land owners. All of these features vary significantly along the coast on sub-kilometer scales, but influence coastal resilience on a regional scale. In order to understand this interplay, methods must be developed to map and quantify these elements. Given the large spatial extent of the U.S. coastal zone, remote sensing data is uniquely suited to support such a regional analysis. This feature detection work utilizes remotely sensed data collected as part of the U.S. Army Corps of Engineers' National Coastal Mapping Program. Parameters such as dune peak and toe, beach and barrier island width, slope, volume of the barrier island, impervious surface, and dune vegetation were derived from lidar elevation data and hyperspectral imagery along the sandy shorelines of Texas. Along the bluff coastlines of the Great Lakes, bluff crest and bluff toe were extracted. These datasets can be used to better understand coastal storm impacts and the influence of coastal erosion on near shore sediment budgets. Dune and sandy coastline parameters can be ranked and weighted based on relative importance to produce a final product, illustrating areas of greatest or least concern. Bluff crest and toe data can be used to map bluff retreat and quantify sediment volume contributions. Coast-wide assessments such as these are broadly applicable and allow for the consideration of small-scale coastal features on a regional scale.

Windsor C

Power of Mother Nature: Flood and Erosion Protection

A09. Are Living Shorelines Suitable Here? Are They Feasible? Answering Shoreline Management Questions "Smartly" Using a Geospatial Approach

Vidya Balasubramanyam, Tridec Technologies/New Hampshire Department of Environmental Services; Kirsten Howard, New Hampshire Department of Environmental Services

Did you know that 70% of New Hampshire's Atlantic Coast and 12% of its estuarine shoreline is hardened? This is of concern because with rising seas and intensifying storm surges, armored shorelines will impede marsh migration, negatively impact shoreline stability and habitat condition, and potentially fail during major storms if built or maintained poorly. Recognizing the need to transition to softer approaches for shoreline protection, the NH Department of Environmental Services Coastal Program (NHCP) and its partners embarked on the New Hampshire Smart Shorelines project. This is a two-pronged geospatial modelling effort which asks two questions for any given site along the NH tidal shoreline: 1) Will a living shoreline project be suitable for this site given its biophysical conditions? 2) Is a living shoreline project actually feasible to implement for this site given its sociopolitical conditions? Borrowing from geospatial site suitability modelling approaches in Maine, Connecticut, Maryland, North Carolina, and Florida, the NH model crunches data on hydrodynamic, geophysical, ecological, and sociopolitical characteristics of NH's entire 326-mile tidal shoreline. It even attempts to incorporate characteristics unique to the northeast such as the effects of ice, nor'easters, and a large tidal range. Each shoreline segment was scored on a scale of 1-6; 6 being most likely suitable for soft stabilization, and 1 being least likely suitable for soft stabilization (it also politely suggests to

the user when not to mess with a particular section of the shoreline at all!). In this presentation, we will share technical details about the iterative modelling process, as well as information on how we engaged stakeholders and end-users in developing the model using a variety of techniques such as stakeholder meetings, one-on-one interviews with experts, site walks, and solicitations for "problem sites" through living shoreline workshops.

A10. Prince George's County Living Shoreline Site Assessment GIS Tool

Anthony Dowell, AECOM

Working for the Prince George's County (Maryland) Department of the Environment (DoE), AECOM is supporting an ongoing effort to design and construct living shoreline sites throughout the County, including a county-wide site search. To aid in the identification of potential living shoreline project locations across the County's extensive tidal shoreline, AECOM developed a living shoreline site assessment methodology and custom geospatial tools to score, rank and map sites based on a variety of criteria, including land ownership, erosion trends, bank height, vegetation, predicted sea level rise and constructability, among many others. This tool was developed in Python and packaged as a Script Tool and Toolbar that can be used within ArcGIS Desktop. To provide a more user-friendly solution that is available to a wider audience within the Department of the Environment, this tool was also made accessible through the County's ArcGIS Online-based Clean Water Map platform as a custom widget.

A11. Using Benefit Indicator Tools to Assess Wetlands Restoration and Conservation Based on Who Benefits from Reduced Flood Risk

Justin Bousquin, U.S. EPA Office of Research and Development; Kristen Hychka, University of Maryland Center for Environmental Science

Flooding is among the most common and costly natural disasters in the United States and has been on the rise as flood mitigating habitats are lost, development places more people and infrastructure at risk, and changing climate increases flood frequency. Many communities are recognizing the value of flood mitigating habitats and employing green infrastructure alternatives (e.g., restoring some of those natural systems) to increase their resilience. Freshwater wetlands have long been recognized as one of the natural systems that can reduce flood damages by retaining and detaining surface water. Although small-scale community studies can capture the flood reduction benefits from existing or potentially restored wetlands, the scalability of these high resolution and data intensive studies is often limited. We present a new high resolution nationally consistent dataset that can be used to inform regional and local decisions on where to restore or conserve freshwater wetlands. We demonstrate how indicators from the Rapid Benefits Indicators approach can be evaluated using this new dataset. The indicators evaluated prioritize restoration for the most flood risk reduction benefit and identify who is likely to receive those benefits.

A12. Assessing Tidal Marsh Resilience at the Landscape Scale

Suzanne Shull, Padilla Bay National Estuarine Research Reserve/Washington Department of Ecology; Nate Herold, NOAA Office for Coastal Management; Rachel Stevens, Great Bay National Estuarine Research Reserve/New Hampshire Fish and Game Department

Tidal marshes are under significant pressure from the effects of climate change and rising sea levels fueling an urgent need to evaluate the resilience of these marshes. Assessments of marsh resilience are fundamental to informing effective and relevant research, monitoring, restoration, and marsh management plans at multiple scales. However, tools to support "apples to apples" comparisons of marsh conditions across large geographic areas have been limited. The National Estuarine Research Reserves (NERR) have partnered with NOAA's Office of Coastal Management (OCM) and the University of New Hampshire (UNH) to assess current marsh condition, vulnerability to sea level rise, and potential for adaptation metrics derived from a combination of Digital Coast Coastal Change Analysis Program (C-CAP), Sea Level Rise (SLR), Environmental Sensitivity Index (ESI) and other national datasets including Soil Survey Geographic Database (SSURGO), National Hydrography Dataset (NHD) and Hydrologic Unit Code (HUC). The protocol provides standardized comparisons of marsh conditions over large areas (HUC 12 scale) with broadly similar land use, land cover, and hydrology characteristics, along the coasts and within the National Estuarine Research Reserve System (NERRS). Used in tandem with other NERRS-based marsh assessment tools, it can provide an integrated continuum of assessment to inform efforts to study, restore, or protect tidal marshes at the local, state, regional and national scale.

Somerset

Habitat Vulnerability and Change

A13. Visualizing a Marsh Monitoring Inventory among Research Partners in the Chesapeake Bay

Taryn Sudol, Maryland Sea Grant; Jay Howard, NOAA National Geodetic Survey

The Chesapeake Bay Sentinel Site Cooperative (CBSSC) generated a GIS map that displays over 400 SET sampling stations and the SET-calculated rates of elevation change across the Chesapeake Bay, providing a useful tool for spatial analysis of wetland elevation trends. The map is based on a long collaborative process through several stakeholders. CBSSC is a regional collaborative network of scientists, coastal managers, decision makers, and community liaisons whose aim is to assess how changes in sea level could affect the Chesapeake Bay. Sentinel sites are discrete locations across the Chesapeake Bay where researchers conduct intensive studies and sustained observations to detect and understand changes in coastal ecosystems. Seven sentinel sites and several additional locations are using Surface Elevation Tables (SETs) to measure how marshes accrete or lose sediment elevation. Elevation trends relative to local sea level are an indicator of marsh health. Scientists among the sentinel sites began meeting in 2011, with a core group forming a working group in 2016. Through numerous webinars, conference calls, and in-person workshops, the group produced the CBSSC Data and Infrastructure Summary Report and a framework for analyzing SET data. Once parameters for the analysis were designed and agreed upon, scientists contributed summary metadata from the 400+ SET sampling stations to a data repository. A web-based map was created using the JavaScript library Leaflet. The data is formatted so the user can perform queries based on multiple attributes. The map can be used to analyze current data holdings as well as data gaps. Coastal managers can access the SET trends most relevant to them and their local and regional strategic planning endeavors. We will highlight the capabilities that access to this

newly available data allows and described lessons learned from this effective collaborative team science project.

A14. Evaluation of Wetland Community and Species Habitat Impacts Due to Changes in Hydrology Using a New Tool in Esri's Arc Hydro

Sandra Fox, St Johns River Water Management District, Department of Water Supply Planning and Assessment; Dean Djokic, Esri; Will Ohlenforst and Andrew Sutherland, St Johns River Water Management District, Department of Water Supply Planning and Assessment

Water management involves the balancing of multiple demands on this precious resource. Florida established its five water management districts to ensure the long-term supply of drinking water, and to protect and restore the health of the state's water bodies. Several of the St Johns River Water Management District's (SJRWMD, in northeast Florida) programs have made use of a "simple" geospatial modeling tool dubbed the "Hydroperiod Tool" (HT). The tool is simple in that it makes use of common data (digital elevation models – DEMs, and stage values) and routine functions in ArcMap (interpolation, raster math, raster reclassification, etc.). The DEMs used as input are primarily based on lidar-derived elevations, corrected for vegetation as needed and enhanced with bathymetry data taken from a variety of sources. The HT makes use of the geoprocessing power of ArcMap, iterating through multiple time steps allowing for rapid comparisons of the effects of different stage levels on resources such as lakes and wetlands. Examples from the SJRWMD will be presented: the HT was used as part of a water supply impact study for the St Johns River, demonstrating the wetland area historically inundated by the River that would not be inundated under a set of scenarios; and the Minimum Flows and Levels program has made use of the tool to evaluate both the area of inundation and impacts to specific habitats. The tool recently went through an upgrade and is now part of the Arc Hydro toolset.

A15. Using Decision Support Tools to Build a More Resilient Georgia Coast: A Camden County Pilot Project for Flood Risk Awareness, Community Planning, and Conservation

Ashby Worley, The Nature Conservancy, Georgia Chapter

As coastal communities experience an increase in population and economic growth in combination with an increase in coastal hazards such as coastal storms, tidal/riverine flooding and sea level rise, due to climate change, The Nature Conservancy recognizes that both natural and human communities are becoming more vulnerable. This has highlighted the need to build resilience in these coastal landscapes that includes communicating flood risk to assist with future landuse planning and exploring natural solutions that can be implemented that provide both hazard protection and essential habitat. Camden County, Georgia was selected as the pilot community by The Conservancy for targeted resilience building. Working alongside local and state partners, The Conservancy is engaging the local community on identifying their resilience needs and working collaboratively to bring solutions that help protect both human and natural communities. The Conservancy is working with Camden County in addressing community identified resiliency needs via a custom decision support tool that is scalable to other communities across the entire Georgia and South Atlantic coasts. This work focuses on using climate science data about coastal hazards to inform 1) community planning such as local land use and policies 2)

convey flood risk awareness to the general public in a user-friendly way and 3) prioritize ecological preservation/restoration actions in flood-prone regions that can help communities become more resilient to coastal hazards. This work builds off a strong foundation of recently completed resiliency projects, regional trainings and workshops and established networks by Camden County, its community members and partners.

A16. Using an Esri Story Map to Engage with Stakeholders about the Vulnerabilty of Coastal Habitats to Climate Change and Other Human Impacts

Sean Duffey, Tridec Technologies/Massachusetts Office of Coastal Zone Management

The Massachusetts Office of Coastal Zone Management (CZM) works to understand the state's coastal habitats and associated ecosystem services in order to inform effective protection and restoration of these valuable resources. Much of this work involves investigating the impacts of climate change and other human activities on these ecosystems. As part of a National Oceanic and Atmospheric Administration (NOAA) Coastal Management Fellowship project, CZM is conducting an assessment of the vulnerability of coastal habitats to current and future threats and stressors using a state recognized critical environmental area as a test case. The goal of the project is to develop recommendations and actions for a variety of stakeholders to implement to improve the sustainability and resiliency of coastal habitats through time. As opposed to a lengthy report, the final product for this project consists of two components: a recommendations document and an ESRI Story Map. The recommendations document contains action steps for stakeholders to undertake to alleviate stressors and threats impacting coastal habitats, while the Story Map explains the important habitats in the area and provides examples of some of the threats to the long-term resiliency of the ecosystem. The Story Map also functions as a source of additional relevant content provided by state agencies and other organizations with links throughout the map to more detailed information and data access opportunities on the subject matter. By disseminating the final results of this project into an interactive tool, which can be used to inform and provide further data resources, and a document that provides stakeholders and practitioners with options for improving coastal habitat resiliency, a larger diversity of potential audiences can be reached.

Noon to 1:30 p.m.

Kensington D, E, F

EXHIBITOR LUNCHEON

1:30 to 3:00 p.m.

CONCURRENT SESSIONS

Windsor A

MAPPING BENTHIC HABITATS: PART 2

B01. Creating Continuous Marine Benthic Habitat Maps Using Relationships among Species Occurrence, Depth, and Bottom Types

Claire Enterline, Ivy Ozmon, and Thomas Trott, Maine Coastal Program

Multibeam sonar surveys were completed for a 257 mi^2 area in Midcoast Maine to create high resolution bathymetric maps and to collect backscatter intensity data for the region. Benthic sampling was conducted to ground truth surficial sediment classifications made from interpretations of the bathymetric and backscatter maps and to collect infauna and epifauna information to inform benthic habitat classification. Individual sample sites were classified per the Coastal and Marine Ecological Classification Standard (CMECS). Classifications of habitat were based on characterization of benthic infauna and epifauna, water column temperature and salinity conditions, and seafloor terrain features including substrate composition and type of seafloor geomorphology. Habitat quality for each site was evaluated using univariate community summary metrics: total infauna density, total Families, Shannon-Wiener biodiversity index, Margalef's species richness index, Pielou's species evenness and species rarefaction. Relationships between benthic species assemblages and environmental variables were explored with multivariate statistical analyses to determine if abiotic factors could explain community distribution patterns across the area surveyed with the multibeam sonar. Bathymetric and backscatter data explained the greatest proportion of variability in observed community distributions. Benthic community relationships to bathymetric and backscatter data thresholds were used to reclassify bathymetric and backscatter maps to generate bottom-up potential habitat maps for benthos in unconsolidated seafloor sediment habitat across the study area. Additionally, the CMECS substrate component classification map generated with a geostatistical textural model was combined with bathymetric data reclassified into three depth strata to generate an abiotic surrogate based potential habitat map predicting distribution of the biological communities associated with an abiotic surrogate, defined a priori by combined substrate and depth strata.

B02. The Coastal SAV Mapping/Monitoring Community of Practice: A Tool for Sharing Best Practices

David Wilcox, VIMS College of William and Mary; Mark Finkbeiner, NOAA Office for Coastal Management; Kris Kaufman, NOAA Office of Habitat Conservation; Robert Orth, VIMS College of William and Mary

Submersed aquatic vegetation (SAV) serves an important role in the coastal zone by providing key environmental services and as an indicator of system health. For that reason, SAV is mapped and monitored by many organizations globally. The Coastal SAV Mapping/Monitoring Community of Practice (CoP) is being established to support people doing this work. It will have tools to facilitate information exchange and maximize collaboration potential by providing a mechanism for connecting experts and practitioners around the country. This includes a broadcast email address and a spreadsheet of contacts with affiliations, and areas of expertise. The CoP will help members take advantage of efficiencies by providing information on current or planned activities that would allow others to collaborate or benefit from project outputs, especially new data collections. It will foster application of appropriate mapping/monitoring technologies. This would include strengths, weaknesses, skill requirements, private sector vendors, and general costs or drivers of costs. It will optimize data quality by serving as a location for best practices manuals and documents related to mapping/monitoring. It will provide access to relevant grey literature, reports, and other documents outside the traditional journal publications. It will improve advocacy efforts for SAV mapping/monitoring.

B03. Getting a Good Close-up: Drop Camera Video Analysis for Habitat Maps in the U.S. Caribbean

Will Sautter, CSS Inc. at NOAA National Centers for Coastal Ocean Science;
Tim Battista, NOAA National Centers for Coastal Ocean Science

Since 2004, the National Center for Coastal Ocean Science (NCCOS) has been conducting seafloor mapping and benthic habitat assessments to support marine spatial planning, natural resource monitoring, and to fill critical information gaps across the US Caribbean. The shallow and mesophotic coral reef ecosystems (10-100m deep) of the Insular Shelf, a broad carbonate platform between Puerto Rico and the US Virgin Islands, is the area of interest for many fisheries management and habitat conservation efforts that have utilized seafloor characterization tools from the Marine Spatial Ecology (MSE) division of NCCOS. While the classification methods for these assessments has evolved since NCCOS began making habitat maps, the ground validation methods have consistently relied on underwater video analysis. Using small vessels, compact HD underwater drop camera systems, and handheld GPS units, the MSE team has collected ground validation and accuracy assessment data at hundreds of sampling sites across the Insular Shelf that may be too shallow for large NOAA research vessel ROV and AUV operations, or too difficult and time consuming for SCUBA diver surveys. The drop camera videos from these habitat assessments have also been critical for the MPA management of the Northeast Puerto Rican Reserves in 2015, damage assessments from recent coral bleaching events, identification of endangered acropora coral locations, and as baseline data for coral reef and seagrass habitat health prior to the disaster of Hurricane Maria in 2017. This talk will focus on the underwater video data acquisition and processing methods, the ground validation analysis and accuracy assessments for the different types of benthic habitat classifications, and the tools that MSE has developed to present these products to marine resource managers, coral reef researchers, and the people of the US Caribbean Islands.

B04. Measures of Erosion of Fish Habitat in the Former Tidewater Rice Fields of the Lower Cape Fear Estuary, North Carolina, using Lidar

James Kapetsky, Eagles Island Coalition

Among the most widespread alterations of the aquatic habitat of the Lower Cape Fear was tidewater rice farming. Beginning three centuries ago the swamp forest was cleared and the ground leveled, canalized and embanked. Rice farming began declining in the 1860s and abandoned rice fields gradually reverted to forested shrub wetlands and marshes. Along with their canal systems, they encompass 2,750 ha today. The former rice field-canal system overlaps or is adjacent to Primary Nursery Areas for fishes and shellfishes that, in turn, supports recreational and commercial fisheries locally and offshore. Erosion is taking place in the former rice fields and is evident as ponding in marsh vegetation that dies off seasonally. The seasonal die off of marsh in eroded areas carries the threat that further loss will impact fisheries productivity by becoming permanent. The overall objective was to characterize erosion in terms of expanse, depth, and rate of advance as related to the seasonality of marsh die off. 2014 lidar was used to inventory the otherwise invisible former rice fields and canals under the forested/shrub canopy as well as to estimate eroded area and depths of erosion of the former rice fields. Using 2001 and 2014 lidar change in eroded areas, locations, and rates of erosion over the 13-year period were defined. Aerial photos and satellite imagery were used to trace the progression of ponding in eroded marsh from its first appearance in 1949 to 2001, and to derive an erosion rate for the 52-year period as

a comparison with the more recent 13-year rate. Finally, the duration of seasonal die off of marsh was studied using Google Earth, NAIP, Landsat 8 and Sentinel 2 imagery.

Windsor B

Federal Tools You Can Use

B05. Providing Weather, Water, and Climate Data Access with Spatial Data and Interactive Maps

Kari Sheets, Stephen Gilbert, Andrea Hardy, Nipa Parikh, and Donald Rinker, National Weather Service Office of Dissemination

Over the last decade, the National Weather Service (NWS) partners have requested NWS products and services be provided in Open Geospatial Consortium (OGC) standard web service formats, so they could leverage weather, water, and climate information in communicating with their stakeholders. Over the last four years NWS has worked to create an operational environment for hosting these services and to serve as the back-end for maps generated by the NWS when communicating with our stakeholders. NWS through the Integrated Dissemination Program (IDP) currently has one operational application (the National Ocean Service's (NOS) nowCOAST viewer) and 3 operational platforms (NOS nowCOAST web services, ArcGIS web services, and Geoserver Web Services) for serving geospatial web services. The data available through these platforms include, but is not limited to, watches/warnings/advisories, Air Quality gridded forecasts, select NDFD elements, NWS RIDGE radar, Climate Prediction Center outlooks, and National Hurricane Center forecasts and outlooks. NWS recently chartered a cross-organizational team to work on consolidating front end applications to leverage this back-end architecture to enable more consistent geospatial communication of integrated decision support services (IDSS) across the NWS and weather enterprise. NWS is developing a 2nd application to be hosted on IDP. This application will be a web based viewer focusing on Weather Ready Nation mission needs for an interactive map. This map will include user interfaces tailored to NWS mission service areas while leveraging the existing NWS data as OGC web services already operational on IDP. This talk will discuss some of the lessons learned in operationalizing weather, water, and climate web mapping services while highlighting current and future information communication projects building on this service based operational foundation

B06. IOOS Data and Applications in Support of Coastal Geospatial Analyses and Coastal Resource Management

Tiffany Vance, Kathleen Bailey, and Micah Wengren, NOAA US IOOS Program; Kelly Knee, RPS Ocean Science; Stacey Buckelew, Axiom Data Science

The US Integrated Ocean Observing System (IOOS) is committed to meeting the Nation's needs for ocean, coastal, and Great Lakes information through observations, data management, data analysis, and user-driven products. Our Mission is "To produce, integrate, and communicate high quality ocean, coastal and Great Lakes information that meets the safety, economic, and stewardship needs of the Nation." IOOS is a national-regional partnership working to provide observations and new tools and forecasts to improve safety, enhance the economy, and protect our environment. Integrated ocean information is available in near real time, as well as retrospectively. The IOOS Enterprise is expanding our focus on end-user experiences. Creating tools and services to make our data easily available to communities such as the coastal geospatial community is a focus of

our work. In contrast to the Marine Cadastre, IOOS focuses on real-time observational and model data for timely decision making, as opposed to more static layers for longer term planning. This talk will describe a number of tools or services that make our data available in standardized, documented, discoverable ways. The IOOS Model Viewer (eds.ioos.us) is a map-based environment that presents integrated model output from nonfederal and federal sources, and allows users to perform time-series comparisons between models and observations. The Environmental Sensor Map (https://sensors.ioos.us/) presents near real-time sensor observations in a spatial view and has capabilities to download data, create curated data views, and to compare data from a number of sensors. The IOOS Catalog exposes the data from the IOOS Regional Associations to human and machine searches in a standardized format. The IOOS Regional Association Portals support the need for integrated data that are critical for timely action, decisions, and response for everyone from world leaders responding to crisis to a surfer headed out to catch some waves.

B07. Playing in Your Sandbox: ERMA's (Almost) Universal Interoperability

Chander Ganesan and Robb Wright, NOAA

The Environmental Response Management Application, ERMA, is a piece of critical IT infrastructure that has played a major role during and after some of the largest environmental events within the last decade. From Deepwater Horizon to wildfires to hurricanes, ERMA makes it possible to take data from a wide range of sources and integrate them all into a unifying viewer and decision support tool that allows local, state, and federal agencies to interoperate with each other effectively. Much of this nearly universal interoperability is what has fueled the success of ERMA over the last decade, but providing that interoperability effectively also poses a swath of technical challenges. In this session, we'll explore some of the tools and techniques that the ERMA team uses to provide this functionality, including a peek into:

- How ERMA can consume and display raster graphics from a wide range of sources.
- How ERMA works with services like ArcGIS server to consume Survey123 data - and make it usable in our unified map viewer.
- How ERMA can interact with external - even protected - services; services that are slow to respond (slow services); and third party data services.
- How ERMA makes use of RESTful Application Programming Interfaces to allow developers to "push" data into the tool.
- How ERMA makes it easy to navigate and understand complex data sets.
- How ERMA leverages the Amazon cloud to provide high availability and scalability for these services.

B08. Tips for Using NOAA's Emergency Response Viewer

Maryellen Sault and Mike Aslaksen, National Geodetic Survey

The 2017 Atlantic hurricane season was extremely active. Hurricanes Harvey, Irma and Maria were three of the costliest hurricanes in U.S. history affecting Texas, Florida, Puerto Rico and the U.S. Virgin Islands. The 2018 Atlantic hurricane season was also active with major Hurricane Florence making landfall in North Carolina and major Hurricane Michael making landfall in Florida.

NOAA's National Geodetic Survey acquired approximately 55,500 aerial images over the course of the 2017 hurricane season and over 38,400 images in the 2018 hurricane season. Within hours of landing the plane, the imagery was distributed through NOAA's Emergency Response Viewer to aid first-responders, local governments, and the public. Furthermore, NGS monitored an email address to assist with technical questions and/or website issues during the responses. These questions spanned a wide range of topics and were answered as soon as possible. This presentation will cover the major questions received following the responses and tips on using the emergency response viewer. Imagery applications and the role of social media will also be discussed.

Windsor C

Surge and Flood Risk Modeling

B09. Flood Risk Modeling to Inform Coastal Planning

Hilary Stevens, Coastal Risk Consulting

In the US and around the world, individuals, businesses and communities are facing the challenges of rising waters. Flooding due to overflowing rivers, storm surge, and heavy rainfall, exacerbated by sea level rise, is becoming more frequent and more intense. Coastal Risk Consulting has developed a flood risk assessment tool that accurately models risk at various scales and communicates that risk in a highly visual and understandable reports. Our model utilizes publicly available data from government agencies including NOAA, FEMA and USGS, along with proprietary algorithms. Coastal Risk's mission is to accelerate resilience by enabling better-informed risk mitigation decisions about flooding and other natural hazards. Coastal Risk worked with Miami Shores Village, Florida, to help local leaders plan for sea level rise and climate change. Coastal Risk generated maps detailing infrastructure at the neighborhood scale and the various inundation scenario risks. Coastal Risk worked with village staff to develop levels of service to guide adaptation projects. In collaboration with a civil engineering partner, Coastal Risk developed adaptation recommendations to address the flooding, such as road and roadbed improvements, stormwater conveyance upgrades, and converting septic systems to sanitary sewer. This project provided local officials with the information they needed to develop budgets and plan for improvements over the coming years. A second example of the application of Coastal Risk's technology is its engagement by a large commercial developer on a $750 million waterfront resort project on the Florida Gulf Coast. Coastal Risk applied its automated tool to help set flood-resilient elevations for various structures based on risk scenarios, including storm surge, heavy rainfall, and tide flooding with sea level rise. Coastal Risk also provided the client with important recommendations to deal with flood hazards that might impact construction, which is likely to span three hurricane seasons.

B10. The Storm Surge of Hurricane Florence, What Was, and What Could Have Been

Jeff Gangai, Brian Batten, Joel Plummer, and Catherine Bohn, Dewberry

Hurricane Florence in September of 2018 made landfall as a category 1 hurricane, however, early forecasts had Florence coming ashore as a Category 3 storm. An assessment of the predicted storm surge impacts was made at each advisory and modeled forecast to assist in the preparation of disaster support activities. Various modeled storm surge estimates were evaluated, including the PSURGE data from NOAA's National Hurricane Center (NHC) using the SLOSH model and the Coastal Emergency Risks Assessment (CERA) data using

the ADCIRC model. We will look at some of the early forecasts and “what-if” storm surge scenarios that could have happened. Once Florence made landfall, peak surge measurements were collected from many sources, including USGS stream gages, NOAA water level stations, and the State of North Carolinas own gages. The measured data was collected by customized scripts to pull data from the various sources and at various times to track where the storm surge was rising throughout Florence’s approach and to create a single attributed GIS point layer. The CERA and NHC viewer web sites were used to make quick evaluations before downloading the storm surge data. All the storm surge data was collected and processed in GIS format for quick comparisons to the measured data. Modeled storm surge elevations were compared to measured data to select the data that best matched what the storm surge impacts were on the ground after landfall by geographic areas. Comparisons will also be made to collected high water marks and the USGS rapidly deployed sensors, once all data has been collected to validate selected modeled data and resultant products.

B11. Quantifying Risk for Data-Driven Coastal Storm Risk Management

Mark Zito, CDM Smith ; Dag Madara, US Army Engineer District, New York; Frannie Bui, CDM Smith

The U.S. Army Corps of Engineers (USACE) New York District is conducting a comprehensive Coastal Storm Risk Management (CSRM) feasibility study for the New York - New Jersey Harbor and Tributaries (NYNJHAT) region in response to historical storms impacting the area, most notably Hurricane Sandy. The NYNJHAT Study builds upon the North Atlantic Coast Comprehensive Study (NACCS) which was completed by USACE in 2015. The NACCS used a tiered approach to identify areas of high risk based on the exposure of the built and natural environments in combination with the vulnerability of these areas to coastal flooding. Tier 1 was completed at a regional scale while Tier 2 was accomplished at a State scale and both applied to the entire North Atlantic Coast. This paper will focus on an Enhanced Tier 2 analysis conducted specifically for the NYNJHATS area, covering the New York Metropolitan Area, including the most populated city in the United States and the six most populated cities in New Jersey. The study involved a collection of detailed GIS data covering Infrastructure, Population, Social Vulnerability, Employment, Building Value, Cultural, Environmental Resources and Habitat. This data was compiled and weighted to create individual exposure indices and loaded into a decision-support tool along with flooding vulnerability data. The vulnerability is based on the 10%, 1% plus 3 feet and 0.1% annual-chance flooding and the extent of such flooding takes into account planned and in-progress resiliency projects. The decision-support tool provides the flexibility to adjust the exposure weighting based on the user’s preference. This flexibility provides a method to quickly and easily evaluate the relative importance of the weighting scheme. The result of this study identifies areas of high risk relative to the study area and is being used to evaluate potential coastal risk management measures in the NYNJHATS area.

B12. USGS Coastal Storm Modeling System (CoSMoS): Assessing Vulnerability due to Storm and Sea Level Rise on the U.S. West Coast

Amy Foxgrover, Andrea O’Neill, Li Erikson, Patrick Barnard, Sean Vitousek, and Jessica Lovering, USGS Pacific Coastal and Marine Science Center; Patrick Limber, Coastal Carolina University

In the face of a changing climate, it is more important than ever that scientists work to provide emergency responders, local communities, and regional planners with reliable flood

hazard projections. The Coastal Storm Modeling System (CoSMoS) is a sophisticated numerical modeling system that was developed to assess coastal flooding resulting from combinations of both sea level rise (SLR) and storm events. CoSMoS projects total water levels driven by Global Climate Models (GCMs), to local scales via a suite of regional and fine-scale models simulating coastal hydrodynamics in response to storm surge, waves, river flow, tides, and SLR. Model results are applied to high-resolution Coastal National Elevation Database (CoNED) DEMs to identify areas susceptible to coastal flooding. For future SLR scenarios, DEMs are modified to incorporate projections of future coastal change, such as erosion to sandy beaches and cliffs. The broad range of SLR scenarios (0-2 m in 25 cm increments, plus 5 m) and storm scenarios (representing annual, 20-yr, 100-yr events, and daily-average [no storm] conditions) enable planners to assess a broad range of potential outcomes over various time horizons. Outputs include flood extent, depth, duration, and uncertainty, along with wave heights and current speeds, as well as projections of shoreline change and coastal bluff erosion. The model outputs are available for direct download or visualization through interactive web tools. We will present an overview of the components that makes up CoSMoS, and results from our most recent studies in Southern and Central California.

Somerset

Natural Resource Sensitivity Models and Tools

B13. Expediting ESA Section 7 Consultations with NOAA GeoPlatform and ArcGIS Online Web AppBuilder

Dean-Lorenz Szumylo, Lynker Technologies at NOAA Fisheries GARFO

To improve and streamline the Endangered Species Act (ESA) Section 7 (S7) consultation process for federal actions, the NOAA Fisheries Greater Atlantic Region used NOAA GeoPlatform and ArcGIS Online Web AppBuilder to build a simple spatial search application with very low overhead. The ESA Section 7 Mapper hosts a newly-built dataset locating where S7 consultations are recommended, and generates a report detailing which vulnerable ESA-listed species life stages could overlap a user-drawn action area. This tool has improved the quality, completeness, and relevance of S7 consultation requests for the agency.

B14. Evaluating Important Fish Resource Areas using 37 Years of Trawl Data and Esri's Space Time Cube

Samantha Coccia-Schillo and Todd Callaghan, Massachusetts Office of Coastal Zone Management

The Massachusetts Office of Coastal Zone Management (CZM) is updating the current 2015 Massachusetts Ocean Management Plan, a blueprint for protection and sustainable use of state ocean waters. CZM has been tasked with re-evaluating state-designated important fish resource areas (IFRA). The existing IFRA is a temporally static management framework in a region experiencing rapid temperature increase. We utilized Esri's Space Time Cube toolbox to examine spatial and temporal trends across all 37 years of spring and fall trawl data collected by the Massachusetts Division of Marine Fisheries (DMF). Twenty-two recreationally and commercially important species were selected for the analysis. The Space Time Cube allowed us to analyze this very large dataset by aggregating the data into

temporal and spatial bins, and running a Mann-Kendall trend statistic to look for patterns in biomass. Viewing the trend analysis in 3D (x, y, and time) allowed us to visualize those patterns of distribution and abundance over time. The results from the Emerging Hot Spot Analysis broke down hot and cold spots of biomass into eight different categories such as oscillating, consecutive, or new hot/cold spots. The results provide managers a deeper understanding of spatial and temporal abundance patterns at a finer scale and allow for IFRA to be redrawn based on statistical thresholds for both current and long-term importance.

B15. Coastal Barrier Resources System Validation Tool

Paul Comlish, US Fish and Wildlife Service

Congress enacted the Coastal Barrier Resources Act (CBRA) in 1982, which established the Coastal Barrier Resources System (CBRS). The U.S. Fish and Wildlife Service (Service) is responsible for maintaining the official CBRS maps. Within the CBRS, most new Federal expenditures and financial assistance, including Federal flood insurance through the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP), are prohibited. Federal agencies may require documentation indicating whether or not a property or project site is within the CBRS before they approve Federal funding or financial assistance in areas that contain CBRS units. The "CBRS Validation Tool" is an automated tool accessible through the CBRS Mapper that allows any user (e.g., surveyors, property owners, insurance agents, real estate agents, Federal agencies, etc.) to select a particular location and produce a document entitled "CBRS Mapper Documentation" which indicates whether that location is within or outside of the CBRS. For locations within the CBRS, the documentation produced by the tool indicates the flood insurance prohibition date and the System Unit establishment date (where applicable). This documentation can be used to either obtain flood insurance through the NFIP for eligible structures or to otherwise document a location's status within or outside of the CBRS for other purposes (e.g., real estate transactions or applications for Federal financial assistance).

B16. Weighted Environmental Sensitivity Model for Offshore New York

Marc Koopman and Katie Guttenplan, Ecology and Environment, Inc.; Greg Lampman, New York State Energy Research and Development Authority; Jenny Mogavero, Ecology and Environment, Inc.

Ecology and Environment, Inc. (E & E) with support from New York State Energy Research and Development Authority (NYSERDA), developed a weighted sensitivity model to compare the potential impacts to selected marine resources from activities that may occur during pre-construction, construction, and post-construction of offshore wind facilities in New York as part of the state's Offshore Wind Master Plan studies. The overall approach was to fi¬rst conduct a literature synthesis and risk assessment, which identified risk and potential impacts to each selected marine resource. Based on the risk assessment, regulatory context, permitting requirements, Bureau Of Ocean Energy Management (BOEM) recommendations, seasonality, and other additional factors, sensitivity weight value were determined for the identified receptor groups for each phase of offshore wind development and applied using a weighted sum geospatial analysis model to produce maps of relative sensitivity throughout the Area of Analysis (AoA). GIS data sources included predictive marine mammal density models, predictive sea turtle density models, bird abundance richness models, models for benthic species likelihood, essential fish habitat, and core

biomass richness models. The high-level sensitivity mapping analysis identified seasonal shifts in regions of relatively higher or lower sensitivity.

3:00 to 5:00 p.m.

Kensington A, B, C, and G

TOOLS SHOWCASE

T01. Immersing Yourself into the Floodplain: Use of Mixed Reality to Highlight Flooding Risks

Scott Aldridge and Brian Caufield, CDM Smith

The social, economic, and environmental impact of flooding on surrounding communities can be effectively addressed through the use of immersive mixed reality. Mixed reality brings the flooding extents out of the screen and provides users the ability to interact with design data more intuitively. Immersion into the floodplain overlain onto the real world provides a rich environment that supports decisions and enables efficient community collaboration. Using immersive mixed reality 3D visualization enhances collaboration and provides teams with the ability to experience flooding at scale in the world around you. Furthermore, these applications could increase public participation in the planning and development process through home use of these devices for virtual town halls. The ability of the public to visualize policy impacts in a three-dimensional world could have significant implications for public outreach efforts associated with floodplain management projects. At CDM Smith, we're harnessing the power of Microsoft's HoloLens, a mixed reality technology, to help our clients design, build and operate their infrastructure assets faster and more efficiently. For the architectural, engineering and construction (AEC) industry, this signifies a new working environment, where architectural design collides with reality, and construction teams transform digital content into physical objects. Using this immersive mixed reality platform enables CDM Smith teams to interact with 3D design models including hydraulic model results at scale using Microsoft's HoloLens wearable holographic computer, creating new ways to visualize, identify, share and manage information and changes on even the most complex projects.

T02. Resilience Modeling with City Simulator

Stephen Bourne, Atkins

Coastal communities face myriad challenges as they peer into a climate-change impacted future. A warming earth continues to wreak havoc with larger storms, more severe heat waves, longer droughts, and rising sea levels. Paradoxically, people continue to flock to the coasts seeking better jobs and higher quality of life. How can communities increase their resilience and clear the way for safe growth in the future? They are starting to realize that understanding the potential impacts needs to be done in a combined way, where the interdependencies between urbanization and severe weather are brought to light. Atkins' R&D group has developed City Simulator to help communities tackle this problem. City Simulator is a GIS-based tool that simulates growth of a community over time. Using an agent-based approach, it creates a virtual human population that matches the real population statistically in the base year. Then it adds the necessary built environment to support the virtual population as it grows over a 30 to 40 year time frame. As new urbanization occurs, the tool evaluates the impact to the ecosystem, evaluating shifts in floodplains, wetlands, ecosystem services, and carbon footprint. To capture the impact of climate change, the simulator uses daily time-step rain and temperature forecasts based on

general circulation model projections and historic local data to hit the community with storms, droughts, and heat waves that carry the climate change signal. Using existing disaster models, like FEMA flood models, the tool evaluates which infrastructure is impacted when these events occur and simulates them recovering over time based on the city's preparedness. Atkins is helping community stakeholders use the tool in workshops, as they design their own adaptation scenarios and stress-test them with simulation. This tool showcase will allow users to build adaptation scenarios and run them in real time.

T03. Enhancing Decision Support Services for Coastal Flooding in Alaska

Jonathan Chriest, Edward Plumb, Karen Endres, and Victor Proton, NOAA National Weather Service

Coastal flooding in Alaska is a major hazard for many remote coastal communities. As Arctic sea ice declines and the length of the open water season increases, these communities are increasingly vulnerable to the impacts of storms. Several communities are considering relocating entirely due to eroding shorelines and the increasing threat of serious inundation. Forecasts and decision support for these events must be accurate and issued with significant lead time for communities to take actions and evacuate by air if necessary. In collaboration with the Alaska Division of Geological and Geophysical Surveys (DGGS), the National Weather Service Alaska Region has developed a Coastal Flood Guidance (CFG) tool to equip meteorologists with more robust guidance and procedures to forecast and disseminate flood threat information to impacted communities. The CFG tool allows for a conversion from model output storm surge levels into real world impacts that are easily understood by forecasters, emergency managers, community members, and other stakeholders. Configurable components allow for information including observations, forecasts, inundation maps, and impact decision support slides to be generated, viewed, and handled all within one base interface. Built as a web application in ArcGIS Online, updates to existing communities and new communities can easily be added when new elevation data becomes available from the DGGS. The CFG tool optimizes coastal flood event management and allows meteorologists to provide NWS partners and stakeholders with improved forecasts and decision support services, helping to build a Weather-Ready Nation by making Alaska communities better prepared and more resilient to coastal storms.

T04. The ShoreZone Coastal Imaging and Habitat Mapping System

Sarah Cook and Kalen Morrow, Coastal and Ocean Resources

ShoreZone is an aerial imaging, coastal habitat classification and mapping system used to inventory alongshore and across-shore geomorphological and biological attributes of the shoreline. The georeferenced, oblique, low altitude aerial imagery is acquired during the lowest tides of the year and then used to classify habitat attributes into a searchable database. This data is used for coastal planning, identification of vulnerable resources, oil spill response planning, habitat modeling, recreational planning and scientific research. This online, publicly accessible coastal geotool currently covers over 120,000 km of coastline from Oregon to the Alaskan arctic and is a unique cross-boundary dataset. The standardized ShoreZone protocol could be applied to any coastline as a way to provide baseline data and potentially as a tool to monitor change over time.

T05. Making Forecasts Smarter: Exploiting GIS to Produce Georeferenced Harmful Algal Bloom Forecasts

Edward Davis, NOAA Center for Operational Oceanographic Products and Services

The NOAA Harmful Algal Bloom Operational Forecast System (HAB-OFS) was created to help monitor and mitigate the harmful effects of HABs. Stakeholders want to know the location, intensity, trajectory, and potential impacts of the bloom. The HAB-OFS uses geographic information system (GIS) to produce their HAB forecasting products. ArcGIS software provides the flexibility to integrate different types and sources of data, from emerging HAB monitoring technologies to region-specific partner observations. The flexibility of the system is designed to allow for customized forecast products that meet the specific needs of their subscribers. The ArcGIS-based infrastructure is used to create georeferenced PDFs in the Gulf of Mexico and Lake Erie. This infrastructure allows the team to create forecasting products that contain queryable metadata such as HAB sample concentration and location. These tools also allow simultaneous creation of multiple map products for a single forecast region, allowing the team to tailor products to address different user needs without investing additional work. For Lake Erie, this includes a general public forecast as well as customizable maps for municipal water managers and public health officials. In the Gulf of Mexico, the team is able to provide a public facing general forecast, as well as a detailed forecast that is sent directly to HAB stakeholders.

T06. USGS Coastal-Marine Hazards and Resources Program GIS Tools: Total Water Level Forecast Viewer and Coastal Change Hazards Portal

Kara Doran, Heather Schreppel, Xan Fredericks, and Richard Snell, USGS St. Petersburg Coastal and Marine Science Center; Emily Himmelstoss, USGS Woods Hole Coastal and Marine Science Center

The U.S. Geological Survey (USGS) Coastal-Marine Hazards and Resources Program (CMHRP) focuses on understanding coastal change, geologic hazards and catastrophic events, ocean resources for America's needs, as well as coastal and marine ecosystem science through a variety of technologies, data, mapping products, and tools. GIS is used to support the program's research themes and facilitate resource management by means of portals, by conducting gap analysis to aid in data acquisition prioritizations, and by the visualization of the data and derived products. The Coastal Change Hazards Portal, for example, is a GIS portal developed by CMHRP, built using open-source GIS solutions, GeoServer and PostGIS, that provides direct access to coastal hazard information and products. Additionally, the program has developed the Total Water Level Forecast Viewer, which is a continuously updating web-based tool built using Leaflet and SQL. This experimental operational model combines NOAA wave, tide, and surge predictions with a USGS wave runup model that incorporates beach slope observations to provide detailed forecasts of total water levels every 500m along the coast. Predicted timing and magnitude of water levels at the shoreline are compared with beach topography to forecast potential impacts to coastal dunes. These tools can assist those working to protect resources, identify risk, and help prevent economic losses along the nation's shorelines.

T07. Maryland Coastal Atlas Planning Tool

George Edmonds, Maryland Department of Natural Resources

The Coastal Atlas is an online mapping and planning tool that allows state and local decision-makers to visually analyze and explore data for coastal and ocean planning activities. Use this platform to visualize, query, map, and analyze coastal data to better manage Maryland's marine and estuarine resources. Available data supports decision-

making for future ocean, near-shore and estuarine activities by highlighting current uses, resources, and risks. The following coastal datasets are available for viewing and analysis:

- Ocean Use and Resource Data– View ocean data to understand and balance multiple ocean uses, including shipping, offshore renewable energy, recreation and fishing.
- Coastal Hazard and Shoreline Data – Understand coastal risk by accessing state coastal hazard data, including storm surge inundation, sea level rise predictions, and historic shoreline erosion data.
- Near-shore and Estuarine Data- Target conservation, restoration, and enhancement activities by identifying critical tidal and near-shore habitat areas such as tidal wetlands, priority finfish habitat and submerged aquatic vegetation.

The ESRI Web Application Builder (WAB) if the platform used to build and customize the Maryland Coastal Atlas. The Maryland iMap hosts ESRI REST map services from a Enterprise GIS that can be easily consumed by a WAB based map application.

T08. BeachPro® System: Bringing Beach Profile Monitoring to Smartphones

Monica Febles Alvarez-Icaza, Juan Carlos Osegueda Morales, and Luis Angel Esteban Jimenez, Axis Ingenieria, S.A. de C.V.

Nowadays it is estimated that erosion in coastal zones has impacted 70% of beaches around the world (Vazquez Botello, 2008). Because of this, effective monitoring and analysis of morphological changes that can provide accurate characterization of coastal zones has become imperative to provide adequate coastal management solutions (Papakonstantinou et al. 2016; Vugteveen et al. 2014). Since 2014, AxisIMA ®, with financial support from the Mexican Council of Science and Technology (CONACYT), started an initiative to integrate an innovative and cost-effective tool for monitoring beach profile evolution, this with the main objective of getting society directly involved in coastal management tasks. The tool is based on the enhancement of a simple method for measuring Beach Profiles (Andrade and Ferreira, 2006), combining it with state of the art, yet simple telemetry technologies such as a user friendly mobile application (APP) for data logging and a World Wide Web (WWW) visualization platform for data broadcasting. This resulted in the development of the so called “ProfileApp System” (Gonzalez Leija et al., 2014). In the last years AxisIMA ® has been continuously working on both, the improvement of most of the system components, and on the scientific and social divulgation of the monitoring tool (Solis et al., 2015; Osegueda et al., 2015). By the end of 2015, the system acquired the trademark registration under the name of BeachPro™. As a result of the mentioned efforts, the BeachPro™ system has been implemented successfully in real environment monitoring tasks. Showcase of this tool will include demonstration where potential BeachPro™ users will be able to test systems capabilities and to prove by themselves how convenient is its use in terms of simplicity and efficacy for monitoring tasks.

T09. Decision Support with Visual Comparisons of Chesapeake Bay Watershed Model Output using ArcGIS and SQL

Andrew Fitch, U.S. Geological Survey Virginia and West Virginia Water Science Center/Chesapeake Bay Program Office; Olivia Devereux, Devereux Consulting, Inc.; Jessica Rigelman, J7 LLC

The Chesapeake Bay Program’s (CBP) Chesapeake Assessment and Scenario Tool (CAST) is used to model nutrient (nitrogen and phosphorus) and sediment loads delivered to the Chesapeake Bay and its tributaries. CAST users can set input parameters that represent the

implementation of pollution-reduction practices and land-use changes (collectively referred to as a "scenario") throughout the Chesapeake Bay watershed, and CAST provides nutrient and sediment loads for each of the 2,058 segments of CAST's watershed segmentation scheme. These modeled loads vary based on the scenario used for each run of the model. The Scenario Comparison Mapping Tool supports decision-making by allowing users to visualize and compare, both geographically and temporally, the pollution loads resulting from various CAST scenarios. These visual comparisons help users target the implementation of pollution controls, and which controls may be the most effective. Based on ESRI technology, the tool queries the CAST database for pollution load data for commonly used scenarios and joins these data to a spatial table of model segments using SQL. The full visualization of each scenario requires multiple comparison maps for each pollutant, so this direct connection to the database is vital to reduce application maintenance burdens as scenarios are added and revised. The demonstration of this tool will include an explanation of the technologies used, the rationale for various development decisions, lessons learned, and potential future enhancements.

T10. NOAA's National Water Model: The Evolution of Water Prediction Tools

Trey Flowers, NOAA, National Weather Service, Office of Water Prediction

Implemented into National Weather Service (NWS) operations just over two years ago, the National Water Model (NWM) provides seamless 24x7 guidance on streamflow conditions and other water budget fields such as soil moisture, snowpack, runoff and evaporation. Version 2.0, scheduled for implementation in early 2019, will build on prior capabilities to provide vital hydrologic guidance to NWS River Forecast Centers (RFCs), Weather Forecast Offices (WFOs), NCEP Centers, the Federal Emergency Management Agency (FEMA) and other Federal, private and academic end users. As with prior versions V2.0 is underpinned by a network of 2.7 million vector-type river reaches for river routing, a 1km land surface grid for land surface modeling, and a 250m grid for surface and subsurface routing of runoff. However, departing from previous versions, the new model will feature notable upgrades including use of NWS River Forecast Center (RFC)-based precipitation in a new extended analysis cycle, the addition of Hawaii to the modeling domain, a new medium range ensemble configuration, and improved forcing downscaling and parameter calibration. Beyond NWM V2.0, subsequent versions will provide the foundation needed to support a variety of additional activities within the NWS and broader hydrologic community. These include a machine learning-based enhancement to better capture the impact of stream regulation, a model extension to simulate combined impact of freshwater and coastal flooding, and an improved shallow groundwater model. Hyper-resolution modeling will support the ability to model flooding in areas of urban coverage or high terrain and NWM-based regional flood inundation mapping efforts will expand to the continental scale to support emergency responders across the Nation. This Tool Showcase will demonstrate the National Water Model and innovative visualizations of its forecast output, including flood inundation forecast mapping techniques.

T11. Public Outreach Web Tool for Beach Construction

Jessica Garland, Martin County Board of County Commissioners; Alexandra Carvalho, CMar Consulting, LLC; Kathy Fitzpatrick, Martin County Board of County Commissioners

Located on the southeast coast of Florida in Martin County, Bathtub Reef Beach is a favorite spot to locals, tourists, and habitat to more than 500 marine creatures, including

endangered sea turtles. During summer, absent impacts from hurricanes, the Sabellariid worm-reef sitting offshore breaks incoming waves, creating a “bathtub effect.” During the spring and summer calmer seas, the emergence of sandbars creates favorable conditions for recreation.

Fall nor’easter storms often arrive in conjunction with the highest tides of the year. The worm-reef is neither tall nor sturdy enough to break up this wave energy, offering little protection to the beach. The reef’s height can however prevent sandbars formed with eroded beach sand from moving back onshore when the seas subside. The result is a thin beach where continuing effects of erosion threaten infrastructure and valuable habitat. The County regularly schedules beach restoration work mitigate erosion.

To avoid sea turtle nesting season, beach restoration work occurs when beaches are typically crowded with tourists in Florida. To help with the public outreach efforts, the County created the “Bathtub Beach Betty” character. She is the “face” of Bathtub Reef Beach in social media, Web, news, and has its own GIS web application.

The ArcGIS Online Bathtub Beach Betty application was first launched February of 2016 and was also active during construction activities in 2017 and 2018. The tool includes information about beach and park access closures, work areas, sand placement progress along beach sections, location of equipment on the beach and in waterways (i.e. dredge vessel and pipeline location) and is updated daily.

This presentation will show case the Bathtub Beach Betty web GIS application and the related public outreach strategies adopted by the County to promote the application in social media and keep beach and waterway users informed.

T12. The Georgia Wetlands Restoration Access Portal (G-WRAP)

Tony Giarrusso and Sheldon Leiker, Georgia Tech Center for Spatial Planning Analytics and Visualization

The Georgia Wetlands Restoration Access Portal (G-WRAP - http://geospatial.gatech.edu/G-WRAP/) is a publicly- available geospatial gateway to wetland-specific interactive maps, data, and resources for coastal Georgia. Created through funding made available by the EPA, Georgia’s Coastal Resource Division uses G-WRAP to actively manage their wetland resources. Built using ESRI online tools (Web App Builder and Story Maps), G-WRAPs provides access to map applications containing over 25 wetland-related datasets for coastal Georgia. G-WRAP contains a customized site summary widget in addition to standard tools available through ESRI’s Web App Builder. Two ESRI Story Maps are also available, one of which is a detailed tutorial on how to use the main G-WRAP application, while the other provides background information on previous geospatial wetlands’ initiatives in Georgia.

T13. Sea Level Scenario Sketch Planning Tool

Crystal Goodison and Reginald Pierre-Jean, University of Florida GeoPlan Center

The Sea Level Scenario Sketch Planning Tool is a set of public mapping tools and data to help identify transportation infrastructure vulnerable to current and future flood risks. The tool analyzes and visualizes current flood risks (100-year and 500-year floodplains and

hurricane storm surge zones) as well as future flood risks using sea level rise (SLR) scenarios from the U.S. Army Corps of Engineers and the National Oceanic and Atmospheric Administration. The Tool includes (1) a map viewer to help visualize infrastructure vulnerable to flooding, (2) GIS data layers available for download, and (3) an ArcGIS calculator tool for creating GIS layers of SLR inundation.

T14. Dashboard Uncovers Great Lakes Wave and Surge Modeling Insights

Ayman Halaseh, CDM Smith

As part of a Federal interagency initiative for the Great Lakes Coastal Forecasting System (GLCFS), FEMA's mapping partner, STARR, performed a flood hazard analysis including basin-wide wave and water level modeling study using an ADvanced CIRCulation (ADCIRC) model coupled with a Simulating WAves Nearshore (SWAN) model. The lake wide output results from model was used in nearshore wave setup, runup, overtopping and overland wave propagation engineering analysis. The flood hazard engineering analysis output was used in developing the Flood Insurance Rate Maps (FIRM). A response-based flood frequency analysis was used to determine the 100 year total water elevation (TWEL), which involved running 150 events. The historical record of storm surge and wave observations in Lake Michigan, Superior and Huron was used to identify 150 events for use in basin wide storm surge and wave models. STARR developed tools to extract the results from the storm surge and wave model and other tools to identify map coastal flood hazards along the coastline of the three lakes. This presentation will highlight and demonstrate three data analysis tools that was developed to help enhance the study quality and efficiency, the three tools includes (1) the lake wide model node selection and data extraction, visualization and QAQC process, (2) Wind event separation tool that was used to separate wind data time series into events and separate them. (3) Coastal mapping decision tool that compiles transect input and output data and analyze them to mapping decision sheet.

T15. Gulf TREE, a Resource for Climate Resilience Tools

Mikaela Heming, Northern Gulf of Mexico Sentinel Site Cooperative, Mississippi State University, Mississippi-Alabama Sea Grant; Kristin Ransom, The Baldwin Group at the NOAA Office for Coastal Management

Gulf TREE (Tools for Resilience Exploration Engine) is a filter-based search engine designed to match users with relevant climate resilience tools quickly, easily, and confidently. With over 100 tools relevant to the Gulf of Mexico (and more being added all the time), Gulf TREE sorts through all these options to match users with a climate resilience tool that meets their criteria. The new web resource, released February 2018, was created by the Northern Gulf of Mexico Sentinel Site Cooperative, the Gulf of Mexico Alliance, and the Gulf of Mexico Climate and Resilience Community of Practice. Gulf TREE is relevant for users of all experience levels and across a wide variety of sectors, such as research, community planning, natural resource management, and many more. Input from nearly 200 prospective end-users across the climate resilience spectrum was sought to understand which specific issues stakeholders are tackling, questions and needs for tool suitability, and to ensure an intuitive, user-friendly website. The result is a powerful and capable resource for Gulf of Mexico stakeholders and a solution to common obstacles faced by stakeholders interested in climate resilience. This approach and the product, while created in and for the Gulf of Mexico, is relevant to other regions and can be replicated. Come try out the site at the Tool Showcase and at www.gulfTREE.org!

T16. Digital Shoreline Analysis System (DSAS) 5.0: A Comprehensive Tool for Calculating and Analyzing Shoreline Change

Emily Himmelstoss, Amy Farris, Rachel Henderson, Meredith Kratzmann, Ayhan Ergul, Ouya Zhang, J.L. Zichichi, and E. Robert Thieler, U.S. Geological Survey

The Digital Shoreline Analysis System (DSAS) is a free ArcGIS desktop (10.4 or 10.5) add-in that computes rate-of-change statistics from historic shoreline vector data. It provides an automated method for establishing alongshore measurement locations, performs rate calculations, and provides the statistical data necessary to assess their robustness. DSAS 5.0 is the latest release of the software and is compatible with both Windows 7 and 10. The add-in generates orthogonal transects from a user-provided reference baseline to establish measurement locations used when calculating regression rates. Updates include: 1) DSAS now generates transects on both sides of the reference baseline, which is no longer required to be entirely landward or seaward of the shoreline data; 2) transect length is autodetected and scaled to the shoreline data extent, with an option for users to define a varying maximum length alongshore; 3) rates are saved in a symbolized feature class with the option to visualize results according to a default binning standard or by scaling to the data extent; 4) a beta model of shoreline forecasting using the Kalman filter has been added that generates 10- and/or 20-year shoreline horizons and uncertainty bands as feature classes; and 5) an option to generate a summary text file with averages for the calculated rates. The DSAS add-in is a central component of the U.S. Geological Survey's Coastal Change Hazards project, providing a robust suite of regression rates with a standardized and easily repeatable method that can be executed on large volumes of data collected at regional and national scales. Federal and state agencies as well as international governments and organizations have and continue to use DSAS in support of critical coastal decision-making and policy.

T17. Enhancing Coastal Water Level Forecasting to Support the Protection of Life and Property

Laurie Hogan, Brian Miretzky, Kimberly McMahon, Jason Elliott, Jonathan Lamb, Chad Schafer, Michael Dutter, and William Goodman, NOAA National Weather Service

The demand for authoritative forecasts of water level and coastal inundation information due to surge, tides and waves continues to increase as population and property becomes located closer to the water. In 2017, the National Weather Service (NWS) Eastern Region embarked on a project to have all offices produce and disseminate, via multiple outlets, total water level forecasts for many different locations. These forecasts are tied into impacts for coastal areas including connections with possible inundation. It is the goal of this project to be able to communicate this needed information at all times, not only when tropical cyclones are present. These total water forecasts are based on official NOAA surge guidance, and are refined using local office climatologies, wave run up guidance, and bias calculations. We will present our preliminary verification information and highlight some recent efforts that will improve the efficiency of forecaster tools and the clarity and consistency of warning messages to the public. These official forecasts are presented to the public on the NWS AHPS web pages (water.weather.gov) and also utilize the NWS AWIPS Graphical Forecast Editor application to ensure consistency between the forecast hydrographs on AHPS and any coastal advisories, watches, warnings. Examples from recent high impact coastal events will be presented during the meeting.

T18. ArcGIS Citizen Science and Crowdsourcing Configurable Apps

Charmel Menzel, Esri

Which ArcGIS application is best suited for your citizen science or crowdsourcing project? Each application is unique in terms of requirements. For example, does the app need to be released tomorrow, do you want to collect photos, request comments from the public, or work disconnected. We will show you the various data collection apps available including Survey 123 for ArcGIS, Collector for ArcGIS, Citizen Science Reporter, Crowdsource Polling and GeoForm. While project application data collection requirements are unique, citizen science and crowdsourcing projects have commonalities, the need to analyze data and share results. Stop by to better understand additional viewing, data management and sharing ArcGIS applications to support your project.

T19. The Who, What, How, and Why of Using Story Maps to Enable Resilient Post-Disaster Recovery

Alaurah Moss, Dewberry

This tool showcase will highlight the suite of data products and tools that were developed to support Hurricane Maria and Irma recovery efforts. In the aftermath of the devastating 2017 hurricane season, Dewberry supported the Federal Emergency Management Agency (FEMA) in developing flood hazard advisory data and tools to enable a more resilient recovery. Advisory Base Flood Elevations (ABFEs) provide information on the elevations communities should build to in order to reduce mitigate future flood hazard risk and guide recovery in areas impacted by hurricanes. Dewberry developed ESRI Story Maps for Puerto Rico and the US Virgin Islands to support data accessibility and stakeholder outreach. These Story Maps provide guidance for federal, state, local officials, business and homeowners, real estate and insurance professionals, builders, architects and engineers, and others on how best to use the advisory data and products. Topics covered include:

- What are advisory products and how were the ABFEs developed?
- How do I access and apply the ABFEs?
- What are the implications of the use of ABFEs and advisory maps on floodplain management and insurance?
- How do ABFEs fit into mitigation and disaster grant and assistance programs?
- What are other available mitigation and recovery resources?

Contained within the Story Maps are tools that provide quick and easy way to access advisory flood hazard information for any location. Software engineers at Dewberry designed the ‘What’s My ABFE Tool’ to allow users to query locations to obtain the following information:

- Advisory flood zone
- Advisory Base Flood Elevation (ABFE)
- Advisory depth of flooding
- Advisory storm-induced erosion area
- Advisory 1% annual chance flood hazard erosion area
- Current effective flood zone
- Current effective Base Flood Elevation (BFE)

T20. Adopting Stormwater Management for Coastal Floods

Josh Murphy, Maria Honeycutt, and Doug Marcy, NOAA Office for Coastal Management

Stormwater management is an essential function of communities large and small. Through plans, policies, and regulations and an integrated system of engineered structures and natural features, runoff is collected, stored, and ultimately transported via gravity or pump through an outfall into a receiving water body. In many coastal communities, this water body is tidally influenced, and thus subject to inundation from tidal and storm surges. When outfalls are partially or completely inundated, stormwater is unable to travel out of the system, causing backups that could lead to flooding within the community. Rising sea levels are increasing the frequency and duration of coastal inundation, thus increasing the chances that a community may face flooding from heavy precipitation that occurs during a coastal flooding event. These combined flooding events pose significant challenges to low-lying coastal communities. To effectively tackle this complex issue, communities need to know when they should expect to see coastal flooding, how long it will last, and how it may impact their ability to effectively manage stormwater. “Adapting Stormwater Management for Coastal Floods” is a web-based decision-support resource, available through NOAA’s Digital Coast platform, that provides timely and relevant information to address these concerns. Developed for stormwater and floodplain managers, as well as land use planners, this interactive website incorporates tools and methods to derive critical coastal water level thresholds and assess the potential impacts on stormwater infrastructure, and facilitates linkages to various planning, policy, on-the-ground, and funding actions that can be taken to address the issue. An integrated “My Report” function provides the ability to document and share what users learn as they navigate through the resource. This proposed Tools Showcase session will showcase the “Adapting Stormwater Management for Coastal Floods” website and outline opportunities for future enhancements.

T21. Analyzing Sea Turtle Entrainment Risk Decision Support Tool (ASTER)

Douglas Piatkowski, BOEM; Alexa Ramirez, Quantum Spatial, Inc.

BOEM’s Marine Minerals Program seeks to minimize adverse environmental effects related to project specific dredging operations through deliberate planning efforts and the implementation of relevant and effective mitigation measures. The inability of the MMP team to easily access and analyze various spatial data sources inhibits the ability to make fully informed decisions. A new mapping and analysis product, the Analyzing Sea Turtle Entrainment Risk (ASTER) decision support tool, has recently been developed and deployed for beta testing by BOEM employees. Information gathered from both dredge industry and turtle expert groups is used to identify data and generate a standardized geographically and temporally based report that assesses project-specific dredging entrainment risk for use by practitioners in the Atlantic and Gulf region. More informed decisions may minimize impacts to sea turtle species while also decreasing dredging costs. For additional information, check out the following “Story Map:” http://arcg.is/298s5BO.

T22. Economic Impacts of Hurricane Storm Surge in Galveston Bay at Local and National Scales

David Retchless and William Mobley, Texas A&M University at Galveston

An innovative tool for exploring economic impacts of hurricane storm surge in Galveston Bay is presented. In addition to allowing users to explore how impacts will vary spatially across a number of storm scenarios (Hurricane Ike and 10-year, 100-year, and 500-year surge events), the map-based tool presents options for the effects of economic

development (present-day or projected for 2080), coastal protection (construction of the "coastal spine," a surge barrier), and sea level rise (2.4 ft in 2080). Unlike many other decision support tools, this tool allows users to explore economic impacts across geographic scales: a local view shows flood depth and property damage in the Galveston Bay area, while a national view shows effects of the selected storm surge scenario on state-level economic indicators (GDP, Welfare, and Income) for the entire U.S. For the local view, flood depth and property damage can be filtered by city or county, or to show only areas with specified levels of population density or social vulnerability. For the national view, economic impacts can be filtered by shutdown time for affected industries, sector, or state. Both local and national views use the ArcGIS JavaScript API to map selected impacts and summarize these impacts via an accompanying chart (local charts use justgage.js to show total property damage or average flood depth within the map view area; the national chart uses Chart.js to show a line graph of how economic impacts will change over the next 50 years under different coastal protection scenarios). This showcase will include a demonstration of the fully functional tool, with the opportunity for attendees to use the tool and ask questions about its functions.

T23. The Northeast Ocean Data Portal: Data and Maps for Ocean Planning

Emily Shumchenia and Nicholas Napoli, Northeast Regional Ocean Council; Kelly Knee, Jeremy Fontenault, Jenna Ducharme, and Stephen Sontag, RPS; Peter Taylor, Waterview Consulting; Marta Ribera, The Nature Conservancy

The Northeast Ocean Data Portal (Portal) was established in 2009 as a centralized, peer-reviewed source of data and maps of the ocean ecosystem and ocean-related human activities in New England, and serves as a common resource for practitioners working in various agencies or institutions on diverse topics and at various scales. Users can launch interactive thematic maps, view any combination of layers using the data explorer, share maps, and download data. A series of video tutorials describe how to use various features of the portal and how to access and interact with particularly robust datasets such as marine life and vessel traffic data. For nearly 10 years, the Portal has been used to support regulatory, management, and business decisions, stakeholder engagement, and educational and research activities. An integrated and growing case studies page documents some of the uses of portal data by entities in the region, as well as how the portal itself is used as a tool to engage decision-makers and stakeholders in collaborative analysis and interpretation of ocean data. Recent updates to the portal include:

- Addition of vessel traffic (AIS) data for 2015, 2016, and 2017 including maps of vessel transit counts, new categories for fishing and please craft vessels, and a time-slider allowing users to explore how activity varies by month throughout the year.
- Updated marine life maps that include recent observations, new species, new species groups and a new tool for accessing individual species data within the data explorer
- Addition of commercial fishing data for 2015 and 2016; the portal now contains fishing vessel activity over a decade-long period for five fisheries multispecies, monkfish, herring, scallop, and surfclam/ocean quahog.

The tools showcase will allow conference attendees to meet members of the Portal Working Group, explore the portal, and provide an opportunity for attendees to gain an increased understanding of the available data, potential uses in management and regulatory decision-making, and plans to update and maintain the Portal over the next several years.

T24. Marine Cadastre.gov National Viewer

David Stein, NOAA Office for Coastal Management; Anna Verrill, The Baldwin Group at NOAA Office for Coastal Management; Christine Taylor, Bureau of Ocean Energy Management

The MarineCadastre.gov National Viewer provides direct access to authoritative ocean data from federal sources. The data viewer provides baseline information needed for marine planning, particularly those efforts that involve finding the best location for renewable energy projects. The MarineCadastre.gov National Viewer is also a helpful tool in the permit review process. With the National Viewer, potential conflicts can be identified and avoided early in the planning process. The viewer operates as a stand-alone web-GIS or can be customized through the MarineCadastre.gov Data Registry using a “shopping cart” feature. The viewer has recently been updated to improve layer display, feature identification, web service access, and printing.

T25. JALBTCX Data Discovery, Access, and Use through Web Services

Charlene Sylvester, U.S. Army Corps of Engineers, JALBTCX

USACE, NAVO, NOAA and USGS partner to collect high-resolution, high-accuracy topographic and bathymetric lidar and imagery data through the Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX). Formed in 1998, the partners execute operational data collection programs in the U.S. and overseas. They also advance research and development in airborne lidar bathymetry and complementary technologies through partnerships with industry and academia. USACE operations are conducted under a National Coastal Mapping Program (NCMP), which is funded by Headquarters to provide these data along sandy shorelines of the U.S. on a recurring basis. The standard NCMP data products include lidar point clouds, digital surface and terrain models, elevation contours, and imagery mosaics. The data products are delivered to USACE engineers and scientists, to JALBTCX partners USGS and NOAA, and to others by request. NOAA’s Digital Coast provides web-based access to these data products. JALBTCX is testing state-of-the-art cloud computing technologies, cloud-based data storage, and web services for improving discovery of NCMP datasets and broadening access to NCMP operations information. The cloud-based architecture includes instances of Microsoft SQL Server and ArcGIS Server in Microsoft Azure. The architecture supports an enterprise geodatabase for data storage, and the development of web services for data discovery and use. The enterprise geodatabase meets DoD requirements for SDSFIE data standards. The vector layers are attributed to ensure interoperability with other DoD geospatial data, support NCMP field operations and facilitate collaborative Federal mapping initiatives. We will showcase JALBTCX web services that enable users to view NCMP data acquisition plans, understand the status of mapping areas in progress, discover completed mapping projects and locate the authoritative data at Digital Coast. We will also highlight dashboard and story map applications that we have developed as planning tools for program managers and as communication tools for project stakeholders.

T26. U.S. Ocean Reporting Tool

Christine Taylor, Bureau of Ocean Energy Management; Dave Stein, NOAA Office for Coastal Management

BOEM and NOAA announce the release of the Ocean Reporting Tool (ORT), a web-based, automated spatial analysis tool for US ocean activities. This web application allows users to draw or select a location of interest and quickly obtain over 80 unique infographics calculated on-the-fly, to determine if an ocean space is suitable for an activity. The tool

allows users to select infographics of interest, explore ocean data, share results, and print reports for various permitting processes. Infographics are organized into categories including a general site profile, energy and minerals, natural resources and conservation, transportation and infrastructure, biophysical and oceanographic (including Esri EMU data), and economics and commerce. The ORT draws from the largest compilation of US ocean data to-date, encompassing a wealth of data layers which have been processed for optimal spatial and temporal resolution. To use the ORT visit *https://marinecadastre.gov/ort/* or come to the Tools Showcase.

T27. Marine Minerals Information System: Offshore Sediment Data

Lora Turner, Bureau of Ocean Energy Management; Alexa Ramirez, Quantum Spatial; Kerby Dobbs, Bureau of Ocean Energy Management

Over the last 4 years, Bureau of Ocean Energy Management (BOEM) has been developing a GIS, known as the Marine Minerals Information System (MMIS), a tool to interact with historical and current collections of non-spatial and geospatial marine minerals data to support Outer Continental Shelf (OCS) sand resource decisions. The system is designed to integrate BOEM partner's geospatial data into a uniform data model. Data includes: interpreted sediment samples, bathymetry, seismic, and side scan sonar surveys; NEPA, dredged, and sand resource data. The culmination of this effort is the MMIS viewer which allows public access to an interactive support tool with data and information relevant to the offshore mineral resources throughout the U.S. Atlantic, Gulf and Pacific OCS. The viewer also utilizes publicly available web services (mostly via MarineCadastre.gov) that are critical to identifying multi-use conflicts. Functionality within the viewer includes MMIS web services which can be used within ArcGIS Online or a desktop mapping application, the ability to locally download selected data and related tables, access to a blank template schema of the MMIS, and access to a data dictionary. The goal of this viewer is to act as a resource for state partners to view sand resources and other relevant geological data within the OCS that may be of used for coastal infrastructure and /or nourishment projects. With access to templates and supporting documents, partner agencies can also ensure that data exchanges between them and BOEM are seamless. The MMIS Viewer is important resource for information and a tool to coastal communities and a guide for the responsible resource stewardship.

T28. The Mid-Atlantic Ocean Data Portal

Karl Vilacoba, Monmouth University Urban Coast Institute

The Mid-Atlantic Ocean Data Portal (portal.midatlanticocean.org) is a free and publicly accessible mapping and information site focused on ocean areas from New York through Virginia. The Portal offers a selection of over 4,000 interactive maps depicting commercial fishing hot spots, marine life habitat, shipping vessel concentrations, Naval training zones and many other human activities and natural processes taking place at sea. The Portal is being developed by the Mid-Atlantic Regional Council on the Ocean (MARCO) — a partnership of the governors of Delaware, Maryland, New Jersey, New York and Virginia — with a project team that includes the Monmouth University Urban Coast Institute, Rutgers University, The Nature Conservancy and Ecotrust. The technology is designed to help policymakers and regulatory agencies make science-based decisions that promote healthy marine ecosystems and sustainable ocean use, as well as provide the public and stakeholders with readily accessible spatial data and the best information available about ocean environments and economies. The Portal has grown in importance as an ocean

planning tool, particularly for its ability to illustrate where there are possible conflicts and compatible uses at sea. Examples of recent Portal uses include government agencies determining areas suitable for offshore wind farms; submarine cable developers designing alignments that avoid bottom-tending fishing and other threats; and conservationists conducting research and outreach on areas around New York Harbor where vessel traffic poses the greatest hazard to whales. The Portal also served as the chief information source and a key public outreach tool for a first-of-its-kind Mid-Atlantic Ocean Action Plan produced in 2016 by a Regional Planning Body composed of representatives from states and federal agencies, tribal entities, and the Mid-Atlantic Fishery Management Council. Karl Vilacoba is the Monmouth University Urban Coast Institute's communications director and the communications lead for the Mid-Atlantic Ocean Data Portal. Prior to the UCI, Karl worked for the North Jersey Transportation Planning Authority, where he oversaw a variety of public outreach efforts and served as managing editor of a national transportation magazine. Karl previously spent a decade as a journalist at newspapers in the Jersey Shore area and USA Today's Manhattan Bureau. A lifelong Shore resident, Karl also served for several years as a member of the Lake Como (N.J.) Planning Board and the borough's Environmental Commission.

T29. FRF Data Portal: A Web-based Platform for Visualization and Analysis of Coastal Geomorphology Data

Nathan Vinhateiro, Robert Fratantonio, and Kelly Knee, RPS Ocean Science;
Michael Forte, U.S. Army Corps of Engineers Field Research Facility

Monitoring programs that collect long-term information on beach morphology are fundamental to understanding how processes such as storms and sea level rise shape the coast. One such program, maintained by the U.S. Army Corps of Engineers (USACE) Coastal and Hydraulics Laboratory, includes a 38-year record of beach profiles, nearshore bathymetry, and meteorologic and oceanographic measurements collected at the Field Research Facility (FRF) in Duck, NC. The records have been used to study seasonal and interannual trends in beach profile changes, quantify erosion during storms, and to characterize subsequent beach recovery. Although the dataset is in the public domain, a limiting factor in its use has been rapid, reliable access to the profiles and associated oceanographic data. The FRF data portal (https://frfdataportal.erdc.dren.mil) is a web-based platform developed by the USACE Mobile District Spatial Data Branch and RPS, which allows interactive exploration and analysis of coastal geomorphology data and coincident oceanographic observations (e.g., water level, currents, waves). The platform includes both a data management system and a suite of visualization and analysis tools. The system allows map-based display of beach profiles and lidar data and includes on-the-fly plotting functions to visualize changes in these data over time. It also provides tools for performing a variety of basic analyses, such as calculation of beach cross-sections or extraction of shoreline positions from profile data. Most importantly, the relationship between coastal morphology and environmental forcing can be examined at a variety of timescales, providing greater understanding of the evolution of sandy beaches due to both short-term (storm) events and longer-term (climatic) trends. The platform utilizes a modern web technology stack with a Javascript-based user interface and a Python back end to provide Representational State Transfer (REST) web services.

WEDNESDAY, FEBRUARY 13, 2019

7:30 a.m. to 5:00 p.m.
Cambridge Hall
REGISTRATION CHECK-IN

7:30 a.m. to 5:00 p.m.
Pembroke
SPEAKER READY ROOM

8:00 to 10:30 a.m.
Kensington D, E, F
EXHIBITS

8:00 to 8:30 a.m.
Kensington D, E, F
COFFEE

8:30 to 10:00 a.m.
Kensington G
20th ANNIVERSARY PANEL: BUILDING ON THE PAST TO CREATE A BETTER FUTURE

Moderator: Miki Schmidt, Division Chief, NOAA Office for Coastal Management

Panelists: Anne Hale Miglarese, Chief Executive Officer, Radiant Earth
Allison Hardin, Planner, City of Myrtle Beach, South Carolina
David Hart, Assistant Director for Extension, University of Wisconsin Sea Grant Institute
Zsolt Nagy, Senior Manager, Geospatial Services Business Development, AECOM
Linda Wayne, Principal, GeoMaxim

Celebrate the history of Coastal GeoTools with conference veterans as they share their memories and provide their vision for the next 20 years of geospatial decision-support tools.

10:00 to 10:30 a.m.

Kensington D, E, F

BREAK

10:30 a.m. to Noon
CONCURRENT SESSIONS

Windsor A

3-D Elevation Programs and Products

C01. Step-by-Step Guide to Statewide Lidar Acquisition Planning

Lynda Wayne, National States Geographic Information Council, GeoMaxim

The National States Geographic Information Council (NSGIC) has coordinated with the US Geological Survey (USGS) National Map 3D Elevation Program to develop a guide to statewide lidar acquisition planning. The guide outlines a step-by-step process for identifying and coordinating stakeholders, building the project team, enlisting champions, soliciting funding, and developing the plan. A template of plan components is provided complete with best practices for adhering to technical specifications, specifying products, identifying resource requirements, coordinating with federal acquisition efforts, and planning for data maintenance and distribution. Join us to learn more about the guide and efforts to coordinate the development of statewide lidar acquisition plans in support of national efforts to develop nationwide lidar data coverage (IfSAR in Alaska) by 2023.

C02. The USGS Coastal National Elevation Database (CoNED): Integrated Topobathymetric Models for the U.S. Coastal Zone

Jeffrey Danielson, U.S. Geological Survey, Earth Resources Observation and Science (EROS) Center

The USGS Coastal National Elevation Database (CoNED) Applications Project develops enhanced topographic (land elevation) and bathymetric (water depth) datasets that serve as valuable resources for coastal hazards research. These datasets are used widely for mapping inundation zones from riverine flood events, hurricanes, and sea-level rise and for other Earth science applications, such as sediment transport, erosion, and storm impact models. As part of the vision for a 3D Nation, the CoNED Project is working collaboratively with the USGS National Geospatial Program, the National Oceanic and Atmospheric Administration, and the U.S. Army Corps of Engineers through the Interagency Working Group on Ocean and Coastal Mapping to build integrated elevation models in the coastal zone by assimilating the land surface topography with littoral zone and continental shelf bathymetry. CoNED topobathy development is focused in select regions around the U.S. coast, such as the Northern Gulf of Mexico, the eastern seaboard from New England to North Carolina, California, the Pacific Northwest, the North Slope of Alaska, and select western Pacific islands and atolls. Current topobathy work will be highlighted in California and Puget Sound along with complete accuracy assessment results. The CoNED methodology improves and implements techniques for the integration of coastal topobathymetric mapping data, such as with land water masking algorithms and complex geospatial multitemporal frameworks. The strategy to create spatially explicit topobathy DEM uncertainty grids to accompany the seamless integrated offshore-onshore CoNED topobathymetric models will be presented. Future development plans include expanding

CoNED topobathymetric modeling activities to northern California and the Pacific Northwest outer coast.

C03. The 3D Elevation Program National Terrain Model

Cindy Thatcher and Vicki Lukas, U.S. Geological Survey

As part of the U.S. Geological Survey (USGS) 3D Elevation Program (3DEP) strategic objectives, the USGS is preparing to build the National Terrain Model, a continuous topobathymetric surface derived from high resolution elevation and bathymetry, integrated with 3D hydrography data. 3DEP is partnering with the USGS Coastal National Elevation Dataset (CONED) project to begin producing integrated topobathymetric models for inland water bodies. The USGS plans to use topobathymetric lidar, where appropriate, to map submerged topography in rivers. The coastal mapping community's wealth of expertise and knowledge with topobathymetric lidar provides a foundation for expanding this technology to inland riverine environments. Coastal lidar survey results will help USGS develop recommendations on collection parameters for inland water bodies related to river bottom type, albedo, water turbidity, and depth. 3DEP has also begun compiling information on existing inland bathymetry data from acoustic surveys, GPS, and other sources for potential inclusion in the elevation models. The National Terrain Model concept supports the 3D Nation vision of continuous elevation data from ocean depths to mountain tops, enables 3D topographic maps, and links with 3D geologic models to visualize data in new ways. It will also support the National Oceanic and Atmospheric Administration (NOAA) National Water Model, the USGS National Water Census, drought studies, and fisheries conservation applications. USGS has begun conducting pilot studies to commercially contract topobathymetric lidar surveys, and is co-leading the 3D Nation Study with NOAA which will help identify requirements from federal and state agencies and other organizations for inland bathymetry data.

C04. Mapping the Intertidal Zone: Topographic or Bathymetric Lidar, or All of the Above?

Diane Eldridge, US Geological Survey, National Geospatial Program

The inclusion of tidal coordination as a capture condition for coastal U.S. Geological Survey 3D Elevation Program (3DEP) lidar projects is a topic of current debate, as it increases the cost of lidar acquisition projects. None question the requirement to capture the topography of the vital and dynamic intertidal zone. Is the intertidal zone best captured using a tide-coordinated topographic lidar project, or is the sensible solution to add a topobathymetric lidar collection to the project and integrate the datasets together? This presentation will define and include visuals of how a shoreline would be delineated with and without tidal coordination. We will also explore the costs and benefits of a simultaneous topobathymetric acquisition to acquire data to support critical work within our nation's coastal zone.

Windsor B

Datums and DEMs

C05. Earth Centered Earth Fixed Tidal Datums for Alaska's Coastal Communities

Nathan Wardwell and Erik Oppegard, JOA Surveys, LLC; Jacquelyn Overbeck, Alaska DNR DGGS; Richard Buzard, Alaska DNR DGGS and NSGIC, NOAA Coastal Fellow

The State of Alaska Division of Geological & Geophysical Surveys (DGGS) works to provide rural Alaskan's with mapped products to communicate about flooding before and after coastal storm events. A foundational dataset necessary for providing these communication products is a vertical datum conversion between modeled storm water levels and local elevations. For most coastal regions outside of Alaska these conversions are performed using NOAA's Vertical Datum Transformation (VDatum) tool. In Alaska there is no VDatum coverage and many communities lack authoritative tidal datums let alone tidal datums that are tied to a global reference frame. Through NOAA's Coastal Geospatial Services Contract JOA Surveys, LLC was sub-contracted to collect 90 days of water levels to NOAA's standards at three locations in central and western Alaska. The data will be used to establish authoritative tidal datums at each community. The standard practice for the installation of a NOAA tertiary tide station is to tie the sensor into a local network of tidal benchmarks using Second Order Class 1 geodetic leveling and tie one tidal benchmark into the National Spatial Reference System using a single static GPS observation of at least 4 hours. Having an understanding of the importance of the tie to a global reference frame the project team developed a scope of work that included repeat simultaneous GPS observations of two tidal benchmarks and data processing with the National Geodetic Survey's online GPS processing tool OPUS-Projects. The water level data and tidal datums resulting from this effort will not only play a significant role in DGGS' efforts towards coastal hazard assessment and preparedness at these communities, it will assist in NOAA's efforts to establish an Alaska based vertical datum transformation tool.

C06. NGS Onward to 2022: Replacing NAD83 and NAVD88

Scott Lokken, NOAA National Geodetic Survey

Discuss the need to replace NAD 83 and NAVD 88 with the North American Terrestrial Reference Frame of 2022 (NATRF2022) (and other plate-specific reference frames) and the North American-Pacific Geopotential Datum of 2022 (NAPGD2022). Discussions will include common customer concerns, recent decisions, adopted naming conventions and blueprint documents. Also included will be the anticipated effects of the datum changes and some suggestions about user preparation.

C07. Constructing Regional Topobathymetric Elevation Models using Custom ArcGIS Tools, Part II

Dean Tyler, U.S. Geological Survey

The Coastal National Elevation Database (CoNED) Applications Project of the U.S. Geological Survey Coastal-Marine Hazards and Resources Program leads efforts to partner with a number of federal agencies including the National Geospatial Program, the National Oceanic and Atmospheric Administration, the U.S. Army Corps of Engineers, and a number of non-governmental organizations. As part of a 3D Nation, CoNED's role is integrating coordinated light detection and ranging (lidar) data across the shoreline and the littoral zone with topographic (land elevation) and bathymetric (water depth) information. Accurate seamless cross-shore integrated topobathymetric data developed from multi-source information are needed to establish building set-backs, inventory wetland and agricultural land resources, identify flood inundation hazard zones, and to develop hydrodynamic,

sediment-transport, and storm surge models. While much of the geospatial processing to create topobathymetric models is accomplished with built-in ArcGIS tools, there are some tasks that have either been automated or made more efficient by custom scripting and combining tools and algorithms. This presentation will highlight a number of the custom geospatial tools and describe their use. Some of the generic and topobathymetric-centric tools that will be discussed include: 1) Converting among NOAA NOS hydrographic data (a93), xyz files, and geodatabase feature classes; 2) A generic front-end tool for simplified creation of mosaic datasets and rasters from tiled rasters; 3) A tool to report the existence of internal NoData in a raster; 4) Simplified tools to convert between valid raster data and NoData; 5) A tool to perform a raster Erase, similar to a vector Erase; and 6) A DEM-based method to make a detailed water mask from slope for misclassified lidar data.

C08. Manned and Unmanned Airborne Depth Corrected Structure from Motion for Shallow Water Bathymetry

Charles Wayne Wright, NOAA National Geodetic Survey

UAS and manned aircraft Structure from Motion high overlap photography and topobathymetric lidar were collected over a shallow coral reef environment at the Buck Island National Monument in the U.S. Virgin Islands during spring and summer of 2018. The UAS was outfitted with a dual frequency Post Process Kinematic survey grade GNSS receiver and fixed lens camera and controller, and the manned aircraft configured with gimbal mounted 80 & 100 megapixel medium format cameras with fixed metric lens suitable for Structure from Motion processing (SFM). The high overlap / sidelap photography was processed using Agisoft Photoscan and the resulting bathymetric point clouds were corrected for the refraction using a rapid first order correction method and the results compared to the topo-bathymetric lidar collected during the same timeframe. We present here the methods and workflow used to generate depth corrected SFM point clouds, and the results when of the comparison with lidar.

Windsor C

Modeling for Flood Risk

C09. Jupyter Notebooks: The Right Tech at the Right Time

Seth Lawler, Jeff Gangai, and Tyler Miesse, Dewberry

Notebook technology is rapidly becoming the go-to standard for software development, testing, and scaling across industries. Boosted by the pioneering work of data scientists at academic institutions (e.g. U.C. Berkeley, Harvard) partnering with industry giants (e.g. Netflix, Capitol One) and open source sponsors (e.g. Anaconda, NumFocus) the Jupyter ecosystem is challenging traditional workflows and creating opportunities for improvement at a remarkable pace. This presentation will demonstrate the power and flexibility of notebook technology as applied to coastal flood hazards modeling and assessment. Two use cases will be discussed: 1.A step by step presentation demonstrating how Jupyter notebooks were used to retrieve input data, develop models, and manage simulations to recreate the inland flooding resulting from Hurricane Harvey in Houston, and 2. Examples of how notebooks are being applied to manage storm surge modeling using ADCIRC + SWAN on a High Performance Computing cluster. Throughout the talk, emphasis will be placed on OS-independent, open source alternatives for GIS, data processing, and data visualization tools equally suitable for a Desktop PC or HPC/cloud computing environments.

C10. Uncertain Seas: Probabilistic Mapping of Future Flood Risk

Christopher Amante, CIRES and NOAA NCEI

The National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information (NCEI) develops digital elevation models (DEMs) to support the modeling of coastal processes including tsunami, storm surge, and sea-level rise inundation. Deviations in elevation values from the actual seabed or land surface constitute errors in DEMs. The magnitude and spatial distribution of the errors are typically unknown, and the lack of knowledge regarding these errors represents the uncertainty in the DEM. DEM uncertainty should be considered in the modeling of coastal processes, such as sea-level rise inundation. This study implements a Monte Carlo technique to incorporate the DEM uncertainty, as well as the uncertainty of present-day storm surge risk and future sea-level rise projections, to map the future flood risk in the Tottenville neighborhood of Staten Island, New York City. Generated statistical products, such as the probability of inundation by a given year, are visualized on an interactive web map, UncertainSeas.com, and indicate the spatially- and temporally-varying future flood risk in Tottenville. The statistical products indicate that future flood risk varies both spatially and temporally because of the uncertainty in the input data sources, as well as the terrain variability within the Tottenville neighborhood itself. The uncertainty of future flood risk is larger in low-lying areas of Tottenville with smaller terrain slope because small changes in relative water levels result in large changes to the areas at risk of flooding. There is also larger uncertainty in future flood risk in later decades due to increasing uncertainty in sea-level rise projections over time. The methods and results of this study provide decision-support tools that can inform coastal planning to mitigate potential loses and support resilient coastal communities.

C11. Modeling Extreme Rainfall in New York City

Rebecca Fischman and Peter Adams, New York City Mayor's Office of Recovery and Resiliency; Kevin Hanley and Alan Cohn, New York City Department of Environmental Protection; Jennifer Cherrier, Brooklyn College, Earth and Environmental Sciences Department

Rainfall poses a set of interwoven challenges to New York City that require coordinated solutions. Improving water quality benefits communities, protects ecosystems, and reduces United States Environmental Protection Agency penalties. Control of urban flooding increases safety and limits damage to both public and private property, and must be integrated with preparation for coastal surge events like Hurricane Sandy. Integrated stormwater management can address both concerns through a planning and implementation approach for long-term resiliency and reliability that meets both community and ecosystem needs. Significant work in this area is underway, but a better understanding of the city's Hydraulic and Hydrologic ("H&H") systems is needed to coordinate and strengthen initiatives, across agencies, between the public and private sectors, and between resiliency and sustainability initiatives. The NYC Department of Environmental Protection and Mayor's Office of Recovery and Resiliency are addressing how existing hazards may be aggravated by climate change, including increases in the intensity of extreme precipitation, coastal flooding, and sea level rise. Working with a largely academic team led by Brooklyn College, the City has prepared for the first time a combined, citywide

H&H model to model urban flood risk and support integrated stormwater management planning. The project leads will describe the development of the model, and how it is being applied to direct policy and infrastructure development in NYC.

C12. Developing First Floor Elevation Data for Coastal Resilience Planning

Ashley Gordon and Benjamin McFarlane, Hampton Roads Planning District Commission

Southeastern Virginia is particularly vulnerable to the impacts of flooding and sea level rise due to its coastal location, low-lying topography, and significant level of residential, commercial, industrial, and military development. Improving resilience to coastal hazards is a priority of many of the region's local governments and its regional planning organization, the Hampton Roads Planning District Commission (HRPDC). One of the main areas of interest is the development of benefit-cost analyses to prioritize construction of flood mitigation or other adaptation projects. A key component of estimating the benefits (or avoided costs) of adaptation projects is a structure's first floor elevation. Unfortunately, this information is not widely available, and what information is available is primarily accessible only through paper or digitized copies of FEMA elevation certificates. To address this data gap, the HRPDC, with funding from the Virginia Coastal Zone Management and NOAA's Office for Coastal Management, is currently developing two data products that will be used to improve the region's resilience planning efforts. The first of these products is the collection and processing of nearly 2,000 local elevation certificates into a geodatabase containing the key building heights required by FEMA. Using the geodatabase as a sample, the HRPDC is testing and evaluating predictive methods, such as multivariate regression analysis, to develop the second product, estimated first floor elevations for structures without elevation certificates or other observed elevations. Building attributes such as the foundation type, year built, and flood zone were tested as predictors of first floor elevations. The results of this analysis highlight the need for more detailed information regarding building foundation type and strategic surveying of first floor elevations. Both the existing elevation certificate geodatabase and the estimated elevations will support local and regional vulnerability assessments and improve damage estimates under various flooding scenarios.

Somerset

Improving State Coastal Zone Management through Data Availability

C13. Vulnerability of Oregon Intertidal Rocky Habitats to Sea Level Rise: Area and Slope Computations using Lidar Topobathy

Patrick Clinton, USEPA Office of Research and Development

On March 26, 2018, the Oregon Coastal Management Program (OCMP) issued a data request to help with the update of the Oregon Territorial Sea Plan (TSP) Rocky Shores Management Strategy. Aware of the upcoming data call and in consultation with program staff, a research effort into the vulnerability of intertidal rocky habitats to sea level rise (SLR) using LiDAR topobathymetric data began in December 2017.

Methods used in the analysis were developed in earlier research of such vulnerability at an ecoregions scale of the US continental west coast for the Coastal Biogeographic Risk Analysis Tool (CBRAT). As in the CBRAT study, potential loss of rocky intertidal habitat due

to SLR is examined. A defining difference is that this effort analyzed data at site-specific, albeit statewide, scale. Another difference is that an analysis of potential change in intertidal slope was conducted after consultation with OCMP staff. A total of 85 named rocky shore sites were analyzed.

Coastal topobathy LiDAR affords a detailed analysis of intertidal elevation. The Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX) acquired topobathy data along the entire Oregon coast in 2009 and 2011. We used 3-meter resolution digital elevation model (DEM) data derived from the LiDAR acquisition to analyze the rocky intertidal zones of the Oregon Coast.

We calculated non-planimetric surface areas, providing a more accurate measure of rocky intertidal habitat area because the rocky substrate supporting flora and fauna can be vertical, horizontal or at any angle. In mapping the results, area loss thresholds were adopted from CBRAT and slope change thresholds were adopted from Moorlock et al., Universidad de Puerto Rico.

These methods are well-documented in this research effort, and the methods developed could be applied wherever topobathymetric LiDAR has been collected, which currently includes the entire shoreline of the US.

C14. Proactively BUILDing Awareness: Using Decision-Support Tools to Promote the Beneficial Use of Dredged Material in Maryland

Jackie Specht, Maryland Department of Natural Resources

In 2001, Maryland passed the Dredged Material Management Act and defined Maryland's "beneficial uses" of dredged material, including habitat restoration, beach nourishment, and shoreline stabilization. These beneficial uses increase coastal resiliency while dramatically reducing the financial costs of dredge disposal and coastal restoration projects. Though these beneficial uses have been defined and the benefits have been identified, there is still a need to optimize beneficial use opportunities in Maryland. Through a two year NOAA Coastal Management Fellowship project, the Maryland Department of Natural Resources' (MD DNR) is pursuing opportunities to better align dredging and restoration projects to achieve the financial, environmental, and community resilience co-benefits. To achieve this goal, MD DNR has developed an online mapping tool, "Beneficial Use: Identifying Locations for Dredge (BUILD)" to better locate beneficial use of dredged material opportunities. Through the use of Geographic Information System (GIS) technology, BUILD enables quick spatial identification of beneficial use opportunities to promote dredged material placement where it will be both environmentally- and economically-sound. To optimize BUILD, MD DNR collaborated with Mahan Rykiel Associates Inc. in the summer of 2018 to develop a beneficial use site suitability model. This model will enable MD DNR to proactively identify dredged material placement sites, furthering Maryland's beneficial use initiative. MD DNR recognizes that tools like these must be developed with feedback from and use by the public in order to achieve the long-term goal of building community and ecological resilience. To accomplish public awareness, MD DNR is also utilizing story maps to promote the use of BUILD and to further the understanding of beneficial use of dredged material options. This talk will demonstrate how these tools and story maps are being used, and will discuss the wide-scale impacts they will have on coastal planning and decision-making.

C15. Ohio Coastal Atlas: A Hands-On Decision-Support Tool . . . Literally

Brian George, Ohio Department of Natural Resources, Office of Coastal Management

Lake Erie is Ohio's greatest natural resource. Understanding how human interactions and economic activities affect the Lake Erie environment makes it possible to build greater awareness, make informed decisions and become better coastal stewards. The Ohio Coastal Atlas print publication was developed by the Ohio Department of Natural Resources, Office of Coastal Management. It was first published in 2005. The 2018 Third Edition is a fully-updated document that illustrates and explains many of Lake Erie's historical, cultural, physical and natural resources using colorful maps and descriptive text. The Ohio Coastal Atlas is intended to serve as an educational tool for coastal and community decision makers, elected officials, resource managers, professionals, non-profits, educators, researchers, residents, and all other stakeholders with a vested interest in Lake Erie and its natural resources. The concerted efforts of all who share a stake in the conservation, protection and restoration of Ohio's Lake Erie coastal region will help ensure long-term sustainability, quality of life and economic vitality for future generations. This presentation will discuss the history, development and goals of the Atlas, as well as successes and challenges.

C16. CT ECO: Geospatial Data and Tools for Coastal Connecticut

Emily H. Wilson and Cary Chadwick, University of Connecticut

Connecticut's coastal geospatial layers are available to users of all types through the Connecticut Environmental Conditions Online website (CT ECO, cteco.uconn.edu), primarily in the form of interactive map viewers and web services. CT ECO is used by the public and private sectors, non-profits, educators, and residents for everything from information-gathering, decision-making, storm preparation and the permitting processes. Three coastal-focused viewers are available on CT ECO. The first is the Aquaculture Mapping Atlas, which provides data and tools to support local shellfisheries managers, as well as state and federal agencies charged with protecting aquaculture resources and enforcing regulation. The second is the Coastal Hazards Viewer which includes shorelines every decade since 1880 along with transects that quantify the losses and gains, sea level rise scenarios and Storm Sandy layers. The newest addition to the viewer collection includes marsh migration modeling for 2055, 2085 and 2100 for 21 of Connecticut's largest tidal marshes as well as coastal road flooding. Also on CT ECO are statewide and coastal aerial imagery and Lidar layers which are part of the Aerial Imagery Viewer and the Elevation Viewer among others. CT ECO is a collaborative effort between the University of Connecticut Center for Land Use Education and Research (UConn CLEAR) and Connecticut Department of Energy and Environmental Protection (CT DEEP) to provide user-friendly access to the state's natural resource geospatial information.

Noon to 1:30 p.m.

Kensington A, B, C

NETWORKING LUNCHEON

1:30 to 3:00 p.m.

CONCURRENT SESSIONS

Windsor A

COASTAL BATHYMETRY

D01. A Bathymetric Sounding Density Analysis to Inform Ocean Mapping Strategies

Meredith Westington, NOAA Office of Coast Survey; Jesse Varner and Mike Sutherland, Cooperative Institute for Research in Environmental Sciences, University of Colorado and NOAA National Centers for Environmental Information; Andrew Armstrong, NOAA Office of Coast Survey, Joint Hydrographic Center, University of New Hampshire; Jennifer Jencks, NOAA National Centers for Environmental Information

In 2017, NOAA debuted a gap analysis of the openly accessible, bathymetric data holdings at NOAA's National Centers for Environmental Information (NCEI) and Office for Coastal Management. Multibeam echosounder, singlebeam echosounder, and bathymetric LiDAR data were analyzed. In 2018, crowdsourced bathymetry, a new and expanding data offering at NCEI, was incorporated into the analysis. This analysis results in a series of 100-m resolution sounding density grids that are used to assess how well a particular area has been mapped. To account for different definitions of mapped, the number of measurements associated with a particular 100-m grid cell is divided into two categories—1 to 2 soundings per cell, which represents minimally mapped, and 3 or more soundings per cell, which represents better mapped. The goals of this ongoing project are to determine and compute the areas mapped within U.S. waters and to provide a visual representation of those areas to support the planning of integrated ocean and coastal mapping campaigns to fill the gaps by 2030. Early computations indicate that approximately 41% of U.S. waters have been mapped with at least 1 sounding per 100-m cell and 34% of U.S. waters have been mapped with 3 or more soundings. This presentation will explore the latest version of the gap analysis and highlight mapping deficiencies across U.S. coastal waters. With a target percentage to map and a visualization product to guide the discussion, the opportunity for states, researchers, private sector and other partners to begin mapping and/or sharing existing data holdings in a strategic manner is apparent.

D02. IOCM Coordination to Support Mapping Initiatives

Ashley Chappell and Paul Turner, NOAA Integrated Ocean and Coastal Mapping

Federal ocean mapping agencies are committed to the Integrated Ocean and Coastal Mapping (IOCM) principle of "Map Once, Use Many Times." In practice, this means coordinating and collaborating on data acquisition, ensuring that data collected is then stewarded most effectively to be accessible to the public, and finally developing tools and services that help users find and incorporate the data into their own projects, plans and decisions. In 2017, NOAA performed a baseline analysis of bathymetric data holdings and calculated that less than 50% of U.S. waters has been mapped This talk will provide an update on what federal agencies and partners are doing to fill this gap and meet higher level goals to map 100% of the seafloor by 2030. Open-ocean mapping collaborations like EXPRESS and ASPIRE, prioritizations of coastal and ocean areas for mapping, data

cataloguing and inventory efforts, and crowdsourced bathymetry developments are among the topics to cover.

D03. NOAA NCEI Continuously Updated Digital Elevation Models (CUDEM)

Michael Sutherland, Christopher Amante, Kelly Carignan, and Matthew Love, Cooperative Institute for Research in Environmental Sciences, University of Colorado and NOAA National Centers for Environmental Information; Kelly Stroker, NOAA National Centers for Environmental Information

In 2014, the NOAA National Centers for Environmental Information (NCEI) created a framework to guide the development of seamless, multi-resolution, tiled topographic-bathymetric digital elevation models (DEMs) that incorporate the latest coastal and marine elevation data. Since that time, national coverage of high-resolution (spatial resolution <= 10 m) DEMs has expanded, with recent projects completed for Puerto Rico, the Southeast Atlantic and Washington coasts. A new effort, referred to as the Continuously Updated Digital Elevation Models (CUDEM) Project, seeks to ensure these high-resolution depictions of the Earth's surface are used to update existing coarser-resolution DEMs at the regional (e.g. NOAA Coastal Relief Model) and global scales (e.g. ETOPO1), thus enforcing data consistency across the entire NCEI DEM product line. This presentation will highlight new processing workflows to facilitate the update of antiquated DEMs, as well as other improvements to NCEI DEM development.

D04. Rapid Coastal/Shallow-Water Mapping with World's First Airborne Multibeam Bathymetric Lidar Maping System

Don Ventura, FUGRO

Since airborne Lidar bathymetry has become a technically and commercially viable technique to map the coastal and nearshore environments, the contemporary technology on which it has relied to date has always faced a serious challenge regarding data density and point accuracy sufficient to satisfy many agencies' requirements. Relatively high-energy output systems have sought to penetrate the water column sufficiently to create useable coverage to a depth where traditional acoustic technology can achieve parity in terms of efficiency (swath width) and cost per unit area. In so doing, they have typically created data densities that do not meet International Hydrographic Organization (IHO) standards for target detection on an initial pass and therefore fail to meet IHO Order 1a criteria. The advent of the lightweight 'topo-bathy' systems, combining the 532nm green laser of a bathy system with a topographic lidar design approach (low-power output, high density data), partially addresses some of the limitations of the 'deep' systems but at the expense of water penetration and consistent coverage, making their utility limited in areas of marginal water clarity and variable bathymetry. Fugro has sought to address these limitations and, in partnership with system manufacturer Arete, has adopted a completely new design paradigm and created the world's first multibeam bathymetric Lidar, the Fugro Rapid Airborne Multibeam Mapping System (Fugro RAMMS). RAMMS is now an operational system and realizing the design goals which were set to attain accurate bathymetric data, at a density exceeding that required to achieve IHO Order 1a and the associated target detection criteria. This presentation describes the benefits of this technical approach, how it differs from contemporary bathymetric Lidar technology and the considerable advantages it provides to the end-user.

Windsor B

GeoTools Grab Bag

D05. A Novel Data Management Framework to Improve Accessibility of Coastal and Ocean Data through Metadata Standards

Robert Fratantonio, Brian McKenna, and Kelly Knee, RPS

The creation, validation, and management of metadata records can be arduous and time consuming. To support increased accessibility and discoverability of datasets, as well as interoperability with a growing suite of open-source community tools for analysis, a novel framework has been developed for management of datasets in an informative, clear and discipline-specific manner. A robust backend validates metadata against standards and provides services for crosswalk between multiple standards. These services ensure that accurate metadata is associated with each dataset, whether parsed from the dataset itself or modified by the responsible party from an easy-to-use web-based user interface. The user workflow is designed to encourage metadata completeness. For example, in the case of gridded model data, the inclusion of metadata can yield visualization via the popular WMS or data access through various Data Access Protocols (DAP). The result is an easy-to-use web interface whereby the more metadata a user provides, the more services are made available for that dataset. A web-based user interface allows users to upload data and guides them through the process of providing compliant metadata. The tool uses the ACDD 1.3 standard for metadata and CF 1.6 for correctly defining variable attributes. A user management system controls who can load data and an administration console is provided for defining user privileges. Uploading data requires completion of four metadata categories: general information, attribution information, data extents, and variable information. Each metadata field is labeled as ‘required’, ‘recommended’, or ‘suggested’ and includes an information icon that contains a plain language description of how to populate the field. Wherever possible the fields are populated automatically with user account details (such as organization) or information from the uploaded file (such as geospatial bounds). This system is being developed for numerous projects including the United States Army Corps of Engineers Field Research Facility Data Integration Framework, the Integrated Ocean Observing Systems’ (IOOS) Coastal and Ocean Modeling Testbed (COMT), and the IOOS National Glider Data Assembly Center (GliderDAC).

D06. The USGS Coastal and Marine Geology Data Catalog: Using Controlled Vocabulary Keywords for Filters

Frances Lightsom, USGS Woods Hole Coastal and Marine Science Center

The USGS Coastal and Marine Geology Data Catalog, (https://data.usgs.gov/cmgp/), offers more than 4000 data sets through a geographical search interface using both an interactive map and lists of place names, which also offers filtering by keyword, data source, and author. The keyword filters use three controlled vocabularies that include terms relevant to coastal and marine research: Data Categories for Marine Planning (https://pubs.usgs.gov/of/2015/1046/), the USGS Thesaurus (https://www2.usgs.gov/science/about/), and a set of topics developed for the Marine Realms Information Bank, which was an early version of

the catalog (https://pubs.usgs.gov/fs/2007/3025/). With the filters, data seekers can focus their search on a subset of the collection specific to their area of interest. Controlled vocabulary filters avoid the familiar problem of free-text searching where records tagged with synonyms or alternate spellings of the search terms are not found. A team of USGS data specialists is reviewing the metadata records contained in the catalog to add controlled vocabulary keywords. The new catalog was created and is maintained by the USGS Science Data Catalog team, which ensures that all of the data listed in it are also available through the more general USGS Science Data Catalog (https://data.usgs.gov/) and Data.gov (https://www.data.gov/). Controlled vocabulary filters to assist in finding data in the larger collections of interagency catalogs could be implemented by creating mappings across commonly-used controlled vocabularies.

D07. Communicating Science and Complex Data through Interactive 3D Presenations and High Resolution Video Using QPS Fledermaus

Samantha Bruce, QPS-US

Modern topo and bathy surveys produce a deluge of data, but complex raw data sets can be difficult to understand and interpret. Having efficient tools and techniques to present survey data to your audience are critical for conveying ideas and outcomes effectively. In this presentation, attendees will be introduced to the latest developments of QPS Fledermaus that enable the creation of compelling communications experiences from a full range of marine survey data. Emphasis will be placed on the power of using Fledermaus in scenarios that require the user to move quickly from acquisition to data presentation in order to promptly disseminate results and inform decision-making.

D08. Where Can Aquaculture Benefit People and Nature? A Global Spatial Analysis Reveals Priority Ecoregions for Restorative Practices

Seth Theuerkauf, CSS, under contract to NOAA NCCOS MSE and TNC; James Morris, NOAA NCCOS MSE; Robert Jones, The Nature Conservancy, Global Oceans Team; Lisa Wickliffe, CSS, under contract to NOAA NCCOS MSE; Heidi Alleway, The Environment Institute, University of Adelaide

Habitat loss, nutrient pollution and other stressors have diminished coastal ecosystem health globally, but bivalve and seaweed aquaculture present significant opportunities to aid their recovery. For example, while oyster reefs worldwide have declined by over 85% in the past two centuries, oysters cultivated through aquaculture may provide similar benefits as natural oyster reefs once did, such as water quality enhancements and provision of habitat for fish and invertebrates. Knowledge of where bivalve and seaweed aquaculture has the potential to provide the greatest ecosystem health enhancement (e.g., in areas of known nutrient pollution and/or degraded habitat) and societal benefits (e.g., improved food security) can inform global prioritization of aquaculture development. Within an ArcGIS framework, we conducted a global-scale suitability analysis of where bivalve and seaweed aquaculture expansion may aid in ecosystem health recovery and provide societal benefits. Specifically, we synthesized and integrated global spatial datasets on the extent of eutrophication, estuarine habitat degradation, overfishing, ocean acidification, and other relevant factors to identify priority marine ecoregions for “restorative” bivalve and seaweed aquaculture. The outcome of our spatial analysis provides a global perspective on the magnitude of the opportunity for bivalve and seaweed aquaculture expansion to improve outcomes for both people and nature.

Windsor C

Flood Risk and Real Estate

D09. Using Geospatial Tools to Advocate for NFIP Policyholders and Property Owners in Coastal Communities

Sarah Braddy and Jana Green, FEMA

The Office of the Flood Insurance Advocate (OFIA) advocates for the fair treatment of policyholders and property owners by providing education and guidance on all aspects of the National Flood Insurance Program (NFIP), identifying trends affecting the public, and making recommendations for program improvements to FEMA leadership. The OFIA is often contacted by residents of coastal communities who have utilized existing NFIP resources but are still seeking assistance with complex NFIP issues. Data analytics coupled with geospatial tools enable OFIA staff to research and respond to inquiries from coastal communities ensuring accurate identification of trends and making targeted recommendations. The outcome of which has stopped home foreclosure, correctly applied flood insurance policy program initiatives, and provided monetary benefits. This presentation provides an overview of the types of inquiries that the OFIA receives from policyholders and property owners in coastal communities, explains how inquiries are escalated to our office, and describes how collaboration with, and close proximity to, Program Area Offices has resulted in positive outcomes for NFIP customers. Variables examined include: Flood Insurance, Mapping, Floodplain Management, and Hazard Mitigation Assistance.

D10. Visualizing Changes in Flood Insurance Rate Maps

Michelle Terry, AECOM

Effectively communicating flood risk to stakeholders in coastal communities is a challenge. Flood Insurance Rate Maps (FIRMs) are a prominent source of flood risk information, informing flood insurance rates, local building codes, and community actions to mitigate flood risk. However, many communities are currently undergoing FEMA-initiated updates to their FIRMs. In some cases, storm surge modeling techniques, elevation data, and other critical elements of the flood risk assessment are decades old. Updates to these outdated elements inevitably lead to changes in flood zone mapping, both in zone delineation and changes in the Base Flood Elevation (BFE). Communicating these changes presents an additional challenge. As part of FEMA's Risk MAP program to provide data beyond just FIRMs, one dataset often provided to communities in a geospatial database is a summary of differences between older FIRMs and the new study data in the "Changes Since Last FIRM" (CSLF) layer. The integration of this layer with additional datasets available in the Effective and new FIRM databases can enhance the ability to effectively communicate changes that may have significant impacts on community residents. This presentation will demonstrate effective ways to visualize the CSLF dataset and show how this information can be combined with other datasets such as building footprints to better understand and effectively communicate FIRM changes.

D11. Community-Level Mapping of Chronic Flooding Due to Sea Level Rise and the Exposure of Coastal Real Estate

Kristina Dahl, Erika Spanger-Siegfried, Rachel Cleetus, Astrid Caldas, and Shana Udvardy, Union of Concerned Scientists

In order to implement sound coastal adaptation measures, communities and local decision makers need to know how much time they have before sea level rise causes frequent flooding of local homes, businesses, and critical infrastructure. Importantly, long before portions of communities are permanently underwater--meaning underwater at every high tide--they will begin to experience more frequent flooding during above average high tides, such as those that occur during new and full moons. This chronic flooding has the potential to transform communities and force significant investment in adaptation measures. Most national-scale sea level rise mapping tools to date have allowed users to visualize changes to the coast in terms of how different amounts of sea level rise (e.g. 1 ft, 2 ft) will change the mean higher high water (MHHW) level. Building on the concept of tools such as NOAA's Sea Level Rise Viewer and Climate Central's Surging Seas, the Union of Concerned Scientists has developed two interactive mapping tools. "When Rising Seas Hit Home" allows users to explore the extent of chronic flooding, defined as 26 or more high-tide floods per year, along the coasts of the lower 48 for several discrete time periods between the 2030s and the end of the century using two different sea level rise projections. Our "Underwater" tool builds upon the areas mapped in "When Rising Seas Hit Home" by showing the number of homes at risk of chronic flooding both in the near-term (2045) and the long term (2100), again using two sea level rise projections. Together, these tools provide communities with answers to the question of when sea level rise will bring transformative change at the local level. With these tools in hand, communities can better assess their exposure to sea level rise and their options for adapting to the changes ahead.

D12. Modeling Property Abandonment Driven by Recurrent Flooding in a Coastal Locality

Pamela Braff, Virginia Institute of Marine Science

Over the past few decades, coastal communities have experienced increasingly frequent and severe storm surge and precipitation-driven flooding. In some areas, the recurrence of flooding is reaching levels that cause property owners to reassess their commitment to remain in place, and also diminish the interest of home buyers. One outcome is a growing number of property abandonments with implications for local property tax bases. A multidisciplinary graduate clinic at William & Mary, involving students in marine science, law, and public policy, investigated the impacts of recurrent flooding and potential tax base implications of flooding-driven property abandonment in a coastal locality in the Hampton Roads metropolitan area. We assessed the potential for flooding-driven property abandonment by evaluating the flooding risk to every individual property based on flood frequencies over the past 18 years, combined with regional sea level forecasts for the next 50 years. We also developed a road network flood analysis to identify which properties and neighborhoods would be isolated by various flood events. Abandonment potential was characterized by the frequency and duration of flooding of the property, the building on the property, and the roads serving the property. We then analyzed census data at the tract level to identify socioeconomic factors across the county that may increase or decrease a property's risk of abandonment due to recurrent flooding. By comparing current property values with risk of abandonment under future sea level scenarios, we were able to provide county officials with a sense of potential future impacts to the property tax base absent significant mitigation efforts.

Somerset

Community Economics

D13. Gathering Economic Data in the Pacific: A Story Map of the Marine Economics of Hawaii and the Pacific Island Territories

Kate Quigley, NOAA Office for Coastal Management; Camille Martineau, The Baldwin Group on contract at NOAA Office for Coastal Management

Due to their isolated geography and unique cultures, the Pacific Island Territories and Hawaii have marine economies that differ significantly from the U.S. mainland. Because of this, their marine economies are not always represented or accurately estimated in measurements of the marine economy. For example, in small communities like those of the islands, businesses are frequently involved in multiple industries, and so don't fall into a single industrial classification which can cause underreporting in official datasets. NOAA teamed up with Eastern Research Group (ERG) to conduct interviews on all of the islands in search of local economic insight and advice on where to look for data. This story map will take you on a tour through the Pacific as we begin to piece together their unique economic stories.

D14. Estimating Local Marine Economics: A Comprehensive Training for Coastal Communities

Camille Martineau, The Baldwin Group on contract at NOAA Office for Coastal Management; Kate Quigley, NOAA Office for Coastal Management

Economics: National Ocean Watch (ENOW) data report annual marine economy statistics for four economic indicators at the national, state, and county levels. However, using county statistics is not always indicative of the economic activity taking place in individual communities within that boundary. To help communities begin to estimate their marine economies at a local scale, NOAA's Office for Coastal Management (OCM) developed a comprehensive training that combines a full-day facilitated workshop and optional second day technical assistance with a self-paced online web tutorial that guides users through downloading and organizing economic data. These methods are being used in several arenas, from helping to plan for coastal resilience to teaching about marine spatial planning concepts in the classroom.

D15. Focus Group Evaluation of Web Map Tool for Exploring Economic Impacts of Storm Surge Flooding in Galeveston Bay

David Retchless and Ashley Ross, Texas A&M University at Galveston

Results from a focus group evaluating the effectiveness of a web-based tool in communicating storm surge flooding in the Houston-Galveston area to local officials and stakeholders are presented. The focus group divides participating stakeholders (including coastal planners, emergency managers, businesses, and homeowners) into teams based on their role in the community. Each team works together to use an online, interactive web map of storm surge risk in the Galveston Bay area to complete several training and insight tasks related to assessing storm surge risk. After each task, each team writes a one paragraph summary of their findings and complete a NASA Task Load Index (TLI) questionnaire to evaluate the mental load placed on participants during task completion. After completing these tasks, the teams convene for a full-group discussion of their experience using the tool, with topics including: sharing each team's insights from map use; any ways in which these insights may change planning, preparedness, or other behaviors; what worked well on the website, and what did not; how effective coastal protections shown on the web map

are likely to be; and other takeaways from use of the web map. After this full-group discussion, participants individually complete a post-focus group survey re-evaluating their risk perceptions for storm surge in Galveston County to determine how this has changed; the survey also allows participants to provide individual, written feedback on the usability of the web map. In this oral presentation, results from the focus group and pre-post survey will be discussed, with specific emphasis on the relationship between the design of the tool and its effectiveness for decision support across stakeholder groups.

D16. Assessing User Conflict within the Saipan Lagoon

Rich Salas, Bureau of Environmental and Coastal Quality-Division of Coastal Resources Management

The Commonwealth of the Northern Mariana Islands (CNMI) Bureau of Environmental and Coastal Quality-Division of Coastal Resources Management (BECQ-DCRM) developed the Saipan Lagoon Use Management Plan (SLUMP) as a strategy to follow for better management of the lagoon and its diverse number of uses. The lagoon is one of the most revered economic, environmental, and culturally significant resources in the CNMI. The SLUMP is updated frequently in an attempt to address increasing socioeconomic and environmental impacts. Such impacts vary from concerns regarding water quality, degradation of coral reef systems, increase in the number of users, and shoreline change. As part of the effort involved with 2017 update, user trends within the lagoon were assessed and recommendations were developed to guide regulatory decision making. Lagoon uses in the CNMI are diverse which vary from conventional commercial uses such as motorized marine sports to traditional fishing practices and innovative in-water uses. In order to establish balance among the various uses and ensure resource conservation, the BECQ-DCRM team conducted several marine spatial planning workshops utilizing ArcGIS software and eBeam technology to assess current lagoon use. The information obtained from the participatory mapping workshops was then used to develop a spatial plan with the objective to reduce conflict and ensure overall safety and enjoyment for all lagoon users.

3:00 to 3:30 p.m.

Cambridge Hall

BREAK

3:30 to 5:00 p.m.

CONCURRENT SESSIONS

Windsor A

ADVANCES IN LIDAR

E01. Topographic and Topobathymetric Lidar Mapping in the Commonwealth of Puerto Rico

Amar Nayegandhi, Dewberry

In 2016 Dewberry and its partners took on the monumental challenge of producing high resolution lidar data for the Commonwealth of Puerto Rico when the United States Geological Survey tasked us to acquire and process over 3,500 square miles of topographic lidar data. Whereas previous surveys were concentrated on the coast, this survey provides the first complete coverage of Puerto Rico's mainland and outlying islands. In addition,

NOAA's National Geodetic Survey tasked us with processing approximately 500 square miles of topobathymetric lidar data that NGS' Remote Sensing Branch acquired in 2014 and 2016. Acquiring airborne lidar data in Puerto Rico is no easy task. Dynamic weather, rain forests, restricted airspaces, along with mountains that quickly rise from the coast are just some of the challenges that must be overcome when performing an airborne lidar survey in Puerto Rico. These challenges also carry over into data processing where added care must be taken to produce an accurate and seamless elevation dataset. The data produced for these projects proved to be vital to the response efforts for Hurricane's Irma and Maria that devastated Puerto Rico in 2018. Since then, the USGS has tasked Dewberry to go back to Puerto Rico to collect topographic lidar data that will support the recovery efforts that are underway along with other initiatives. NOAA has also tasked Dewberry to conduct topobathymetric lidar surveys along the coasts of USVI and Puerto Rico. Dewberry and its acquisition partner Leading Edge Geomatics are working to produce over 4,000 square miles of topographic lidar data for Puerto Rico and the U.S. Virgin Islands. The topographic lidar survey was conducted with two RIEGL 1560i sensors and bathymetry data will be acquired using the Riegl VQ880G sensor. This presentation will detail the data acquisition and processing of the topographic lidar data collected in 2016-2017 and provide insight to the lessons we learned working in this rugged, tropical landscape. It will also provide an overview of the current topographic lidar project currently underway for USGS.

E02. Challenges of Collecting Aerial Data in the Pacific Region: Big Island Hawaii Lidar Collection

Eric Cole, Woolpert, Inc.

In 2018 Woolpert was tasked by both NOAA and USGS with the responsibility of collecting QL1 (Quality Level 1) lidar data for the entire Big Island of Hawaii. The project included field surveying to collect ground control and quality check points, performed by both Woolpert and NOAA as well as lidar data collection and lidar data processing by Woolpert. This presentation will discuss the challenges of first getting to the island and getting stationed and ready to acquire data, challenges presented by the terrain, weather and in some cases even the general public and residents of the island. In conclusion we will discuss the results of the project, current status and the plan for project completion going forward.

E03. NGS Topographic-Bathymetric Lidar Data and Derivative Products

Hilina Tarekegn and Craig Morton, DST at NOAA National Geodetic Survey; Gretchen Imahori, Stephen White, and Jamie Kum, NOAA National Geodetic Survey

The National Geodetic Survey (NGS) is responsible for mapping the national shoreline. Over the past 10 years, NGS has incorporated topographic and bathymetric (topobathy) lidar with Photogrammetry to derive the official shoreline as well as ancillary products. Advances in Topobathy lidar sensors and the frequent collection of aerial imagery help NGS efficiently fulfill NOAA's need to update the Nation's shoreline. Topobathy lidar data collected by NGS supports numerous coastal and nearshore area projects such as providing nearshore depths to aid Coast Survey's efforts to update NOAA Nautical Chart products, benthic habitat mapping, storm surge and coastal flood modeling and much more. This presentation will discuss the recent progress and efforts RSD has made with its topobathy sensors internally and through contracting, as well as future capabilities. In addition, it will include where the lidar and imagery data are available for download and for what purposes this data can be useful.

E04. Airborne Topo-Bathy Lidar as an Environmental Disaster Mapping Tool

Viktor Feygels, Vinod Ramnth, Robert Marthouse, Jennifer Aitken, and Hieu Duong, Teledyne Optech

The Teledyne Optech CZMIL (Coastal Zone Mapping and Imaging Lidar) is an integrated lidar-imagery system that includes:

- Lidar – is a hybrid scanned-flash system employing a 10-kHz laser with a segmented detector enabling simultaneous recording of high-density topo/bathy data.
- Hyperspectral imager
- High-resolution areal frame camera

The CZMIL system in conjunction with the Optech HydroFusion software suite within a data fusion paradigm, makes CZMIL an integrated lidar-imagery system for the highly automated generation of physical and environmental information products beyond topographic and bathymetric mapping. These products include benthic classification, water column and bottom type characterization, 3D imaging of water column inhomogeneities, detection of submerged hazardous objects, etc. Its system capabilities are the reason why CZMIL has been applied to various environmental surveys aimed at the detection of distributed pollutions (oil spills, industrial leaks) or discrete targets (plastic debris, sunken objects, etc.) in the water column as well as bottom disorders (silt or sandy sediments). In this presentation we will discuss several examples of CZMIL and its predecessor (SHOALS) engaging in environmental disaster surveys:

- Detection of 3D imaging of leak from a sewer pipeline in Ft. Lauderdale, Florida
- 3D visualization of BP oil spill in Gulf of Mexico
- Coastal zone change detection and its implications after Hurricanes Sandy and Matthew
- Detection and volume estimation of floating and submerged debris in North Pacific Garbage

Windsor B

Mapping with Unmanned Aerial Systems

E05. Geodesign and Sea Level Science: Integrating Drone Mapping, Ecosystem Models, and Green Infrastructure Alternatives for Coastal Resilience

Thomas Allen, Old Dominion University

Coastal communities witnessing sea level rise and increasing coastal flooding impacts are challenged to envision future consequences and make important policy and planning decisions. Sea level science has advanced to the state of providing increasing accuracy and precision for coastal water level rise and subsidence, even if long-range uncertainty persists. Geodesign, as a set of concepts and methods, has also evolved to invite collaboration and empower the identification of alternatives and optimal future built and natural environments. Seeking to integrate geodesign and sea level science, this pilot project sought to demonstrate the state of the art in unmanned aerial vehicle (UAV) image and surface modeling, wetland response modeling, storm surges, and geovisualization in order to provide communities a salient and scientifically robust vision of alternative futures. Using case study sites in Hampton Roads, Virginia, the project focuses on the integration of fine-scale drone imagery, 3D modeling, and modeled wetland responses to future sea level

rise. The products of the project demonstrate that alternative future states of the coast will depend on communities' planning and policy decisions in the face of short, medium, and long-term sea level changes and variable degrees of adaptation, mitigation, and strategic retreat.

E06. sUAS Applications for Coastal Geologic Research and Coastal Zone Management: A Case Study from Western Lake Michigan, Great Lakes, USA

Jenny Bueno, University of Illinois at Urbana Champaign; Cesar Gutierrez, University of Illinois at Chicago; Katherine Braun, University of Illinois at Urbana Champaign; Max Spehlmann, Lake Forest College; Ethan Theuerkauf, University of Illinois at Urbana Champaign

High-resolution topographic data must be collected frequently to capture and comprehend dynamic coastal geomorphic changes. These data are requisite for proactive and cost-effective coastal zone management. Acquiring coastal topography data at an appropriate temporal and spatial resolution for scientific and management purposes can be costly and time-consuming. Recent remote sensing advances have made it possible to use small unoccupied aerial systems (sUAS) to carry out topography surveys more efficiently and at a lower-cost than conventional methods (e.g. GPS or LIDAR). Here, we describe the use of sUAS to monitor coastal topography along Western Lake Michigan. The methods of data acquisition and processing as well as the protocol for sharing data with coastal managers and stakeholders will be discussed. Since November 2017, we have utilized sUAS to repeatedly gather beach, dune, and bluff topographic data along the Illinois Lake Michigan coast in collaboration with the Illinois Department of Natural Resources (IDNR). These data are collected to: (1) conduct coastal geomorphology research; (2) generate rates of shoreline and bluff retreat; (3) guide management actions and shore protection design; and (4) educate stakeholders on coastal processes. A quadcopter carrying a gimbal-mounted camera was deployed to collect high-resolution (1-2cm/pixel) aerial photography at study sites in coastal Illinois. Sites were mapped seasonally as well as before and after storms. Structure-from-motion photogrammetry was exploited to convert these images into a dense XYZ point cloud. Point clouds were georeferenced with RTK-GPS-surveyed ground control points and then used to generate digital elevation models (DEMs). Erosion and accretion rates were derived from the DEMs and provided to IDNR to assist with coastal management and engineering. The DEMs were also used to study the link between hydrodynamic processes and coastal geomorphic change. This case study indicates that sUAS are powerful coastal zone monitoring tools for scientific and management purposes.

E07. Advancing UAS Methods for Monitoring Coastal Habitat Geomorphology

Justin T. Ridge, Alexander Seymour, Anna Windle, Sarah Poulin, Kelly Dobroski, Alexandra DiGiacomo, Claire Atkins-Davis, and Virginia Pan, Duke University Marine Lab; Molly Bost, University of North Carolina at Chapel Hill; Julian Dale and Everette Newton, Duke University Marine Lab; Antonio B. Rodriguez, University of North Carolina at Chapel Hill; and David W. Johnston, Duke University Marine Lab

The Marine Robotics and Remote Sensing Lab is testing the ability of Unoccupied Aerial Systems (UAS) to enhance coastal monitoring methods through increased efficiency and accuracy. One key component we are examining for coastal habitats is the ability for UAS to accurately measure the geomorphology of the environment. In addition to creating high-

resolution mosaics from UAS imagery, structure from motion (SfM) processing can recreate environmental structure with precision (centimeter scale) depending on sensor payloads. While SfM has been effective in sparsely vegetated habitats, the typical solution for remote sensing ground surfaces in densely vegetated environments has been lidar, which is expensive to collect and infrequently obtained for broader mapping efforts. As an alternative, our work indicates that the fusion of multispectral and high-resolution RGB imagery can generate highly accurate classified point clouds through SfM to extract ground surfaces and canopy heights in densely vegetated habitats like saltmarshes. Generally, multirotor aircraft are preferred for precision imaging, but recent advances in fixed-wing technology have greatly increased their capabilities and application for fine-scale (decimeter-centimeter) measurements. Here, we describe the capabilities of different aircraft (fixed-wing and multirotor) and sensors (RGB and multispectral) to rapidly quantify and assess critical coastal habitats including barrier islands, saltmarshes, and oyster reefs. Concurrently, we test the accuracy of UAS platforms and image analysis tools against traditional high-resolution mapping equipment (GPS and terrestrial lidar) to conduct error analysis of UAS orthoimagery and SfM processing.

E08. Drone-Based Lidar and Imagery in the Marsh: Results

Kirk Waters, NOAA Office for Coastal Management; Jamie Carter, The Baldwin Group at NOAA Office for Coastal Management; Jared Lewis, San Francisco Bay National Estuarine Research Reserve

Monitoring habitat and ecosystem change is a perennial task within the National Estuarine Research Reserve System, and there is always a need for new tools. We began a project in 2016 to examine the capabilities and advantages that unmanned aircraft systems (UAS) could bring to the reserves, with a focus on imagery and lidar. Flights were conducted by the private sector in 2017 at Jacques Cousteau, Grand Bay, and San Francisco Bay reserves, with NOAA and reserve staff members conducting fieldwork to assess spatial accuracy and habitat ground-truth points. The reserves were chosen to provide a variety of ecosystems with increasing complexity, varying from the relatively simple dunes of New Jersey to the Gulf of Mexico salt marsh in Mississippi to the estuarine salt marsh in California. We expected mapping difficulty for both lidar and imagery to increase with that complexity. This talk will focus on our results and the unexpected lessons learned when using UAS for mapping.

Windsor C

Future of Flood Risk

E09. Modeling Beach Change Risks from Future Sea Level Rise Scenarios using Non-Traditional Assumptions and Methods

Keil Schmid, Geoscience Consultants, LLC

The effects of SLR on shoreline change, which may have a dramatic effect on many recreational-based coastal economies, is increasingly being studied. This study introduces a new, non-traditional method that accounts for both erosion and accretion on managed beaches. This includes renourishment, which has been difficult to incorporate in many ‘trend based’ or numerically modeled shoreline change studies. To accomplish this requires topographic data covering decadal change. Fortunately, this is

common in coastal areas where lidar has been collected since 1996. The Shoreline Risk Technique (SRT) produces 2D stochastic results instead of a deterministic vector shoreline representation. Each pixel has a value that reflects the chances of the shoreline being landward of it and is based on the elevation, tide level (i.e., MHHW), morphology of the pixel (change), and, for future predictions, potential changes in SLR and trends occurring there. The inherent assumption is that the past several decades (10 to 20 years) is a gaussian representative of both natural and human changes within the 'beach envelope'. In a growing number of locations this is a fair assumption; many beaches have a semi-regular renourishment schedule to maintain the asset. Another assumption is that beach sampling dates are random; a data set collected one year before another has the potential to be as similar as one collected 10 years earlier. These assumptions are unique to SRT, counter to most traditional views of shoreline change, and would limit use in study areas defined primarily by trends – i.e., purely natural beaches – where other techniques are more applicable. This technique is for the growing number of 'urban beaches' which, like roads that serve them, are maintained essentially as infrastructure. Although unfortunate, this is a new reality for many coastal towns, so results and potential use in planning and budgeting are discussed.

E10. Exploring Future Conditions Modeling and Mapping through the FEMA Florida Sea Level Rise Pilot Study

Joel Plummer, Brian Batten, and Alaurah Moss, Dewberry; Emily Dhinga, AECOM; Mark Crowell, FEMA

Increasing awareness and planning for future coastal flood hazards in light of projected sea level rise is critical for long-term resilience. The Federal Emergency Management Agency (FEMA) has recognized the potential implications of sea level rise (SLR) to coastal flood hazards, losses, flood insurance, and community planning. FEMA is evaluating strategies, approaches, and considerations for future conditions sea level rise and long-term erosion based on recommendations from a Technical Mapping Advisory Council mandated by the Biggert Waters Flood Insurance Reform Act of 2012.

As part of this initiative, FEMA has engaged in a series of pilot studies to develop future condition products reflecting hazards from sea level rise and long-term erosion. In order to better inform resilient floodplain management, FEMA's efforts have focused on the 1-percent annual chance hazard and concepts for a future Flood Insurance Rate Map (FIRM).

As FEMA has assessed approaches to developing future flood hazard products, consideration has been given to the tension between the desired product quality and production costs. Modeling and cartographic mapping for a tradition FIRM product is time-intensive. If a product similar to a FIRM is desired, does it need to be derived to full FIS standards?

Through a FEMA pilot study of SLR mapping in Hillsborough and Pinellas Counties, Florida, we explored an alternative approach for future FIRM production. Using geospatial techniques, we developed a prototype future FIRM product that allowed a five-fold reduction in production time while resulting in a reasonably accurate depiction of flood zone cartography, high hazard areas, and base flood elevations. Our presentation will inform attendees on how future coastal flood hazard products can leverage FEMA investments in modeling to allow for semi-automated, efficient production of future coastal hazard layers that include overland wave hazards and depiction of high hazard zones.

E11. GeoCoast: 3D Inundation Visualization and Decision-Support System

John Cartwright and John VanderZwaag, Mississippi State University, Geosystems Research Institute

The Geosystems Research Institute at Mississippi State University has developed an interactive, web-based tool to allow decision-makers to simulate sea level rise along the Mississippi coast. GeoCoast is a publicly accessible website allowing users to visualize sea level rise impacts in both two-dimensional (2D) and three-dimensional (3D) environments. In each of viewers users can identify the impacts of sea level rise on critical infrastructure, such as government and medical facilities. GeoCoast (2D/3D) has traffic routing capabilities allowing users to view these impacts on local road networks for various, user defined, inundation levels. The base inundation model in GeoCoast uses a simple linear superposition approach built on QL2 lidar data collected in 2015. This base model allows users to visualize buildings and roadways by depth of inundation (up to 15 feet) with a simple map slider. Recent data additions to GeoCoast includes NOAA's sea level rise data from the digital coast and storm surge/flooding data based on ADCIRC model runs. The ADCIRC runs include hind cast data for hurricane Katrina and other significant tropical systems affecting the northern gulf coast. Sea level is estimated to rise up to two meters in the next century. This coupled with the increasing possibility of tropical system frequency and intensity puts the nation's coastal communities at risk.

E12. An Introduction to FEMA Floodplain Mapping: Developing an Interactive Resource to Improving Decision-Making

Bradley Dean, Krista Conner, and Devon McGhee, Resilience Action Partners/ Michael Baker International

Flooding is the costliest and most common natural disaster in the United States. Local planners and other decisions makers can face tough choices in prioritizing mitigation steps to help their communities withstand flood events. Effectively communicating the value of planning and mitigation initiatives and available resources to diverse audiences is a challenge. However, by leveraging new technologies, we have the ability to increase engagement and interaction to foster greater understanding and empathy and, ultimately, inspire action. FEMA is working diligently to dramatically enhance their data communication and visualization techniques to encourage mitigation action across the country through highly accessible, visually-appealing online products like Esri story maps. FEMA's interactive story map, An Introduction to FEMA Coastal Floodplain Mapping, helps floodplain managers, local officials, and other stakeholders interpret Flood Insurance Rate Maps (FIRMs) that consider coastal hazards. Using approachable language, interactive tutorials, and engaging illustrations, this story map explores coastal hazards and the unique features of flood maps in coastal areas. The tool was developed for a primary audience that includes floodplain managers experienced with riverine FIRMs but, it can also be used to help community officials and property owners better understand coastal hazards and the necessity of mitigation. FEMA's growing suite of engaging and accessible story maps can be easily shared across platforms, making it easier to get information to the intended audiences and inform flood mitigation and resilience. During this presentation our team will discuss how we designed and developed infographics, created targeted mapping resources, explored dissemination planning, and leveraged existing NOAA and FEMA resources to help demystify complex coastal concepts. Working collaboratively with FEMA engineers, communications specialists, creative and GIS professionals our interdisciplinary team helps FEMA create products that provide maximum value to the end user.

Somerset

Ocean Planning and Visualization

E13. Automatic Identification System (AIS) Data and Tools for Understanding Marine Transportation Vessel Traffic

Jeremy Fontenault, RPS; Daniel Martin, The Baldwin Group at NOAA Office for Coastal Management; Tim Giguere and Matthew Bernardo, RPS

In 2002 the U.S. Coast Guard implemented the Nationwide Automatic Identification System (NAIS) program to improve maritime security, navigation safety, search and rescue, and environmental protection. Using Automatic Identification System (AIS) transceiver, vessel traffic can be monitored in real-time or their travel patterns can be analyzed using annual archives containing billions of vessel positions. Over the past 10 years, RPS has supported MarineCadastre.gov by developing tools to filter, process, and analyze AIS data, and by compiling AIS data products for visualization and analysis. MarineCadastre.gov is an information system developed by the National Oceanic and Atmospheric Administration (NOAA) Office for Coastal Management and the U.S. Department of the Interior's Bureau of Ocean Energy Management (BOEM) that provides these data and tools to the public to support ocean planning. This presentation will highlight the processes and tools used to prepare data products, including loading and filtering the data into a SQL Server Database, preparation of open data formats, and creating vessel track lines and vessel transit count grids. It will also detail the latest tools developed for this data processing, including filtering, conversion and exporting tools, the AIS Track Builder tool, and the AIS Transit Counter tool.

E14. Announcing the Ocean Reporting Tool: A Web-Based Automated Spatial Analysis Tool for U.S. Ocean Industries

James Morris, Jr., NOAA National Centers for Coastal Ocean Science; Christine Taylor, BOEM Geospatial Services Division, Office of Strategic Resources; Dave Stein, NOAA Office for Coastal Management; Lisa Wickliffe, CSS, Inc. for NOAA National Centers for Coastal Ocean Science; Seth Theuerkauf, CSS, Inc. for NOAA National Centers for Coastal Ocean Science and The Nature Conservancy

Planning for ocean-based industries such as energy production, shipping and transportation, aquaculture, fisheries, and seabed mining demands spatial science to navigate conflicting uses, environmental considerations, and assess economic opportunity. To assist with ocean commerce planning, BOEM and NOAA recently released the Ocean Reporting Tool (ORT), a web-based, automated geospatial tool for analyzing and visualizing U.S. ocean space. The ORT allows users to select an ocean space and instantaneously obtain over 80 unique infographics containing analyses of the location, its energy and minerals, natural resources, transportation and infrastructure, the oceanographic and biophysical conditions, and the local ocean economy. Users can select infographics of interest, explore pertinent ocean data through interactive pop-ups and visualizations, toggle each layer related to infographic content, share results, and print reports to inform various permitting processes. The Ocean Reporting Tool was developed from the largest known compilation of U.S. ocean data to-date, encompassing over 100 essential data layers, which have been processed for optimal spatial and temporal resolution within an interactive tool. To explore U.S. ocean space and the Ocean Reporting Tool, visit *https://marinecadastre.gov/ort/*.

E15. Envisioning a Future Long Island Sound: Collecting, Transforming, and Presenting Data for Marine Spatial Planning Decisions

Emily Hall, Tridec Technologies, Inc., Connecticut Department of Energy and Environmental Protection

In 2015, the Connecticut legislature passed Public Act 15-66, which authorized the "Blue Plan," a marine spatial planning process for Long Island Sound (LIS). The Blue Plan's goal is to protect natural resources and traditional human uses, while allowing for compatible future uses of the Sound. The foundation of this process is having accurate, representative, and relevant spatial data that can be transformed and presented into a usable, informative format for stakeholders and decision makers. This talk will illustrate how the Blue Plan process has acquired, organized, and utilized data with limited resources and under a strict deadline. (The final draft Blue Plan is due by statute on March 1, 2019.) The process consisted of five distinct steps: 1) Relevant data to LIS was gathered and reviewed from external sources like the Northeast and Mid-Atlantic Ocean Data Portals, the New York Geographic Information Gateway, and the Marine Cadastre. 2) To fill gaps, additional data sources were explored; in some cases data had to be translated into a spatial format or participatory mapping exercises were conducted with stakeholders. 3) With the final datasets available and in spatial form, they then had to be organized into significant areas of resources or uses. These areas, Ecologically Significant Areas (ESAs) and Significant Human Use Areas (SHUAs) were designed to coordinate with Blue Plan policies. 4) Each significant area was assigned an associated map(s) so that applicants or planning entities can identify where ESA/SHUA policies apply in the Sound. 5) To assist in the general planning process, ESA and SHUA maps were clustered into a "heat" map, so that applicants and stakeholders can view the highest concentrations of significant areas. UConn CLEAR's CT Eco platform will act as the primary delivery mechanism, with sharing out to the portals listed in 1) above.

E16. Discovery Tool for Information used in Decision Support

Jonathan Blythe, Bureau of Ocean Energy Management; Adam Bode, The Baldwin Group at NOAA Office for Coastal Management

Federal agencies are required under the National Environmental Policy Act (NEPA) to use the best available science to consider the impacts of their activities to the natural and human environment. Availability of scientific information is partially determined by the accessibility of publication outlets, such as the peer reviewed or gray literature that is in the public domain. However, another aspect of availability is the ease with which accessible information is searchable, and NEPA provides exceptions from consideration of public information that is difficult to find. Internet publishing and web search provides a solution for this kind of problem, because technology is making it much easier to find relevant information on the web. In this presentation, we will discuss improvements to web search that are being implemented in the Bureau of Ocean Energy Management's Environmental Studies Program Information System, in collaboration with the NOAA Office of Coastal Management under the umbrella of the Marine Cadastre platform. An analysis of user experience will be conducted for the period of time preceding and after the deployment of search improvements, using google analytics. Success will be defined by user sessions that more frequently result in successful outcomes, such as downloading a BOEM final report, or a reduction in the number of searches that result in dropped sessions or other non-constructive terminus. Discovery will continue to be the subject of future improvements to

ESPIS, but once ESPIS search has been optimized, BOEM will be able to focus much more deliberately on managing the vast body of knowledge within to ensure its consistent and reliable use supporting BOEM regulatory process, improving the management of ocean resources, and support the informed agency decision making on ocean energy and marine mineral development.

7:00 to 10:00 p.m.

Kensington D, E, F, G

SPONSOR RECEPTION: 20TH ANNIVERSARY 80S STYLE

THURSDAY, FEBRUARY 14, 2019

8:00 a.m. to 12:30 p.m.

Cambridge Hall

EVALUATION COMPLETION AND TOWEL PICK-UP

8:00 to 11:00 a.m.

Pembroke

SPEAKER READY ROOM

9:00 to 10:30 a.m.

CONCURRENT SESSIONS

Windsor A

HIGH RESOLUTION VEGETATION MAPPING

F01. Remote Sensing Technology to Map Vegetation: Support for Coastal Planning and Monitoring

Molly Reif, U.S. Army Engineer Research and Development Center, Joint Airborne Lidar Bathymetry Technical Center of Expertise; Glenn Suir and Christina Saltus, U.S. Army Research & Development Center, Environmental Laboratory; Katherine Brodie, U.S. Army Engineer Research and Development Center, Coastal & Hydraulics Laboratory

Updated coastal vegetation or habitat mapping is often required to address critical data needs or gaps in project planning and management as well as research applications. Current land cover information and vegetation maps are used in a variety of ways across many federal and state agency mission areas, such as model input for flood risk management, management and monitoring of mitigation areas, management and control of invasive species, ecosystem restoration planning and monitoring, and evaluation of project alternatives in feasibility studies. Updated habitat data often form the basis for understanding impacts to essential ecosystem functions or processes as a result of a project or management activity. If data lacking sufficient detail or outdated data are used, project impacts may be incorrectly assessed and can be costly in terms of time, funding, and reaching defined project goals. While some readily available data products exist to assist with these tasks, they may not meet specific project or research objectives. Furthermore, the suitability of various sensors and platforms for meeting specific project goals is continually evolving; thus, managers and researchers should consider the variety of remote sensing technologies that currently exist to help meet their goals. This presentation will highlight several research projects in which various remote sensing platforms and sensors are being used to support U.S. Army Corps of Engineers Civil Works projects with broad applicability to many agency needs related to coastal vegetation mapping and subsequent analytical capabilities. The project examples will explore a range of platforms, including satellite, airborne and Unmanned Aircraft Systems, as well as a variety of

applications, such as characterizing coastal vegetation types and monitoring vegetation changes.

F02. Petascale Coastal Wetlands and Habitats Maps for the Great Lakes

Brian Huberty, U.S. Fish and Wildlife Service; Laura Chavez, Michigan Tech University; Keith Pelletier, University of Minnesota; Brian Brisco, NRCAN Centre for Mapping and Earth Observation; Jim Klassen, SharedGeo

Given the Great Lakes makes up nearly 20% of the planet's available surface freshwater, it is very important to understand the water and wetland systems which make up the Great Lakes Basin. Wetlands in particular are one of the most vulnerable landscape systems subject to climate change. Satellite and aerial views are an essential, cost effective, scientific and management tool to track and observe wetland and associated habitat changes over time. These 'remote sensing' views or images are the 'maps' that depict the landscape at any given point in time. These images can come from a variety of sensors such as MAXAR's WorldView and Radarsat satellites. To cover the Great Lakes Basin, this requires petascale computing to ingest and process derived products such as using the National Science Foundation's, Blue Waters supercomputer. What is unique in this project is the ability to repeatedly show with the optical and radar sensors how these wetland and associated habitats change across the Great Lakes coastal zone and basin with seasonal optical and monthly radar satellite imagery. What will be shown are some examples from a binational, multi-organizational collaboration to begin ingesting and delivering coastal wetland and associated habitats maps for the Great Lakes. For example, all available sub-meter optical satellite imagery for the coastal zone have already been processed to create two meter surface canopy vegetation models. This initial collaboration includes the University of Minnesota, Michigan Tech University, SharedGeo, the Minnesota Department of Natural Resources, Canada's Centre for Mapping and Earth Observation, and Environment & Climate Change Canada. This Great Lakes Restoration Initiative project is supported by a grant administered by EPA.

F03. High Resolution Land Cover: Faster, Cheaper, Better

Nate Herold, NOAA Office for Coastal Management; John McCombs and Chris Robinson, The Baldwin Group at NOAA Office for Coastal Management

Current, accurate land cover and change information is a common foundational data set that can be used to address a wide range of management issues, from flooding risk and natural infrastructure to policy evaluation and land use planning. Knowing what exists on the ground gives planners more information, and the better that data, the better our understanding. For almost two decades, NOAA's Office for Coastal Management has been producing standardized land cover and change information for the coastal U.S through its Coastal Change Analysis Program (C-CAP). More recently, NOAA has been working to establish an operational higher-resolution land cover product line, bringing the national C-CAP framework to the local level and allowing for more site-specific, local applications. This presentation will highlight the results of recent high-resolution data development efforts, several recently released data sets, the vision and schedule for upcoming efforts, and how these data are being used.

F04. Measuring Irrigated Landscapes in California: A Systematic Approach to Moving from Land Cover Class to Land Use Class

Andrew Brenner, Quantum Spatial; Peter Brostrom, California Department of Water Resources; Aron Boettcher, Quantum Spatial

The State of California needs to manage its water wisely. One significant loss to the hydrologic system is landscape irrigation. There are around 9 million single family residences in California most of which have some degree of landscape irrigation demands. California Department of Water Resources (CADWR) working with Quantum Spatial and Eagle Aerial Solutions has developed an approach that allows the mapping of irrigated and irrigable areas in a consistent manner across the state, which when combined with climate data can provide an estimate of required evapotranspiration for that landscape. This estimate provides a fair and equitable assessment of water requirements for individual water districts. The approach utilized a combination of object based image analysis and innovative statistical techniques to estimate the irrigated and irrigable areas for each parcel across the state. The classification system was developed to capture land management associated with irrigation use. The presentation will cover the approach taken, the critical components of the approach and initial results of the analysis. Although developed for irrigation management the approach can be applied to any classification where land use rather than land cover is required.

Windsor B

WATER IN THE LANDSCAPE

F05. Preparing Your Stormwater System for the 21st Century Coastal Total Water Levels

Kenneth Hunu, Atkins North America, Inc.; Doug Marcy, Joshua Murphy, and Maria Honeycutt, NOAA Office for Coastal Management; Stephen Bourne, Atkins North America, Inc.

Rising sea levels and the changing frequency and size of extreme storm events will have a significant impact on coastal cities as the century progresses. NOAA's Office for Coastal Management is developing a decision support tool to help communities prepare for these changes. This presentation will take a look at the tool's analytical methods for 1) estimating the total water levels communities can expect and 2) estimating the potential impacts higher water levels will have on their stormwater systems. In designing stormwater facilities, a key concept is that of the "design storm." This is an extreme storm that the modeler simulates with proposed storm control structures in place, to ensure that floods will be controlled. In the case of coastal communities, the design storm is more complex. Instead of a single rainstorm, the design storm includes multiple concurrent events that combine to influence sea level as well as overland flows. Specifically, these events include tides, storm surges, regional and seasonal phenomena such as El-Nino, wave set-up and run-up, sea level rise, and in-land rainstorms. Within the tool, three levels of analysis are proposed: Basic, intermediate, and Advanced. The methods within each level range from heuristic approaches that a planner or engineer can do with hand calculations and publicly available websites to complex numerical models that require significant skill and computational resources to use. While the detail, degree of complexity, accuracy, and development cost increase with each level, the degree of uncertainty in the results decreases. In this presentation, we will explore the basic and intermediate analysis approaches by way of a

case study focused on the City of Charleston, South Carolina. Through the case study, we will illustrate important conclusions and relationships we discovered, including:

- Basic analysis is well-suited to broad-scale planning, and for pin-pointing where more in-depth analysis should be undertaken.
- Intermediate analysis at a minimum is needed if you'd like to identify specifically where your city is vulnerable and where to work first.
- For design of critical facilities such as pump stations, more advanced analysis is always needed.
- Often, introduction of flood control devices like tidal backflow prevention valves can help a great deal, but as sea level rises, they will become less effective.

F06. Integrating 30 Years of Chesapeake Bay Data into a New Decision Support Framework for Watershed Implementation Plan Development

John Wolf, U.S. Geological Survey, Lower Mississippi-Gulf WSC; Emily Trentacoste, U.S. Environmental Protection Agency

The Chesapeake Bay Program (CBP) Partnership has developed a new set of consolidated tools to help support development of restoration strategies and plans at both the State and local level. The wealth of over 30 years of monitoring, modeling and research in the Chesapeake Bay watershed and tidal waters presents a unique challenge. Decision support tools must provide not only access to this scientific information, but also understanding and guidance on how to use the data they present. As part of the Bay's mandated "pollution diet", states have been developing Watershed Implementation Plans that describe efforts to be put in place between now and 2025 to reduce nitrogen, phosphorus and sediment entering local waters and the Bay. As part of these Plans, states are engaging local areas to develop local-area goals, requiring finer-scale information than previously written plans. Here we present a new suite of tools developed by the CBP Partnership to support and inform restoration management decision making at multiple scales. These tools organize the enormous amount of scientific information into interactive modules. Beyond simply providing the data, an imperative component of these tools was guidance that navigates a user to the module that will help inform specific decisions or answer specific questions. During the development of these tools we gathered feedback from many different groups: we worked with scientists to determine the information that should be included and develop the guidance; we conducted user research to inform the navigation and organization of the tool; and we solicited feedback from managers on what information would be most useful. Here we present this suite of tools and the importance of the development process. We describe what we learned during this process, and the common messages we received from our users that could be useful to other estuary groups developing decision-support tools.

F07. Lake Superior Region Community of Practice to Develop Joint Culvert Database Using Cloud-Based Geospatial Platforms

Jim Giglierano, Wisconsin Department of Administration; Joe Dwyer, Rhode Island Emergency Management

Wisconsin Coastal Management Program was awarded a 2018 Project of Special Merit grant to explore an innovative professional networking approach to address coastal hazard and mapping issues. We will create a community of practice (COP) in the northern Lake Superior region of Wisconsin. The purpose of this COP is to better coordinate the mapping

and planning efforts of the organizations in this region. Using adaptive management techniques, we plan to use the mapping and modeling of culverts in the region as the first case study to demonstrate the value of the COP approach. The focus is on culverts because: 1) after the severe flooding event of 2016 (repeated in 2018), many organizations in the area took it upon themselves to better inventory culverts in their area and create enhanced hydro models that will better predict potential future damages; and 2) there is very little coordination among the dozens of groups taking on this work, both in the region and across the state. We found during a scoping meeting and online survey that each organization was creating their own methodology and data. We recognized that for true policy and maintenance changes to be achieved in the future, it is necessary to organize these members to produce a uniform methodology and dataset; thus the COP. To facilitate activities of the COP, we are investigating cloud-based geospatial platforms where mapping professional from all levels of government (tribal, municipal, state, county, regional and federal) can share data, code, expertise, training, and server resources within a common workspace. As many agencies consider moving their IT resources to cloud infrastructure in the future, we are hoping the COP approach will improve the ability of workers to collaborate and solve problems affecting communities.

F08. High Res Impervious Cover Data in Connecticut: Well Worth the Investment

David Dickson, Cary Chadwick, Emily H. Wilson, and Chester Arnold, University of Connecticut, CLEAR

In 2017, new stormwater regulations in Connecticut required municipalities to identify, calculate, and track areas of high impervious cover. However, available 30m land cover data was too coarse for this purpose. In collaboration with the CT Department of Energy and Environmental Protection (CT DEEP), the University of Connecticut Center for Land Use Education and Research (UConn CLEAR) acquired statewide, 1-foot impervious cover data. The thematic raster was made available on Connecticut Environmental Conditions Online (CT ECO), a website that provides user-friendly access to Connecticut's geospatial information. It is available for raster and vector download as well as a map service and used in several interactive map viewers, including one developed specifically to respond to the new regulation (cteco.uconn.edu/projects/ms4). The impervious cover data and other layers are being used by municipalities to meet the requirements of the stormwater regulation, but have also been used for other purposes that have already saved the state hundreds of thousands of dollars and proving, once again, that investing in base data layers the foundation for all sorts of further data development. This presentation will highlight why the data was required, how it was created, and how it is being used.

Windsor C

Unique Tools for Risk Management

F09. Interpolating Flood Reach from Multi-Criteria Scoring of Resident Damage Claims and Observed High-Water Marks

Micah Shane Taylor, University of Georgia

Increased frequency and severity of storms has increased flood risk to coastal communities in Southeast Georgia. Planning for mitigation of wind and water damage from future storms requires spatial information about the extent of past flood water incursion so that accurate

predictions can be made about the reach of future storm-driven flooding. Traditional methods of setting flood-lines have traditionally relied on elevation-based watershed-analysis with little reference to ground checked information from known flood events. This paper explores the use of resident-sourced damage claims and recorded seed and stain line locations, combined with high a resolution digital elevation model to perform multi-criteria scoring of flood locations to interpolate a 'estimated flood reach' (EFR) for the purposes of informing flood mitigation decisions such as structural alterations, evacuation mobility, or migration. Seed and stain line data, which is the visual presence of water lines on walls, was gathered by the USGS for both Hurricane Matthew and Irma. Resident reported damage was collected as part of a secondary analysis of interviewee data from Orland and Welch-Divine's research on the experiences and perceived risk of coastal Georgia residents who experienced Hurricane Matthew and Irma. EFR derived in this way will better inform mitigation decisions than traditional flood line estimates in two ways: 1) EFR reflects time-of-storm flood evidence that captures the complexity and dynamism of wind and water movement during a storm while traditional methods assume linear and steadily incremental movement, and 2) The data has spatial and temporal validity reflecting current-condition elevation, spatial planning and land use.

F10. Next Generation Flood Hazard Risk Communication Website

Tonda Shelton, North Carolina Department of Public Safety, Emergency Management Division

North Carolina's investment in providing digitally assessable flood hazard data, models, maps, risk assessments has been further enhanced by the release of a new public website, www.flood.nc.gov. This new website is a complete overhaul of the previous website this mapping partner was using to communicate to the general public about the floodplain mapping efforts in North Carolina. Feedback from focus groups was incorporated into the website design to create building-specific flood insurance rates on-the-fly, various pages for the NFIP and mitigation programs, and floodplain mapping program documents. It only takes 10 seconds for a user to type in a building address and then decide what information they want to see about flood hazard risk for a building: level of hazard, financial impacts, estimated insurance premium, possible mitigation options, and nearby real-time stream gauge reporting. All of this information is displayed on an easy to use dashboard Statewide. For each property, a "dashboard" will be shown that walks users through discovering their risk and presents mitigation options such as flood insurance, mitigation and ultimately directs users to the State's flood warning application FIMAN. The "Hazard" section of the dashboard allows users to understand what Flood Insurance Study their building is included in. The "Impacts" and "Insurance'" sections allows users to customize the building information so that estimated costs to repair and insurance coverage options can be calculated to be as realistic as possible. The "Mitigation" section provides cost effectiveness ratios for up to 7 common actions a building owner can implement to reduce flood risk (i.e. wet flood proofing and elevation). This presentation will show how North Carolina leveraged its robust next-generation mapping program to more effectively share and distribute flood risk information to the general public in a user-friendly, dynamic website.

F11. Creating and Using Inundation Pathways to Assess Flooding Resilience for Buildings in Coastal Virginia

Julie Herman and Jessica Hendricks, Center for Coastal Resources Management, Virginia Institute of Marine Science

Resilience to storm-driven flooding is improved by the presence of natural and nature-based features (NNBFs) such as wetlands, wooded areas, living shorelines, and beaches.

For a NOAA-funded project to protect and increase the use of these features, we developed a method using GIS to link NNBFs with coastal buildings that are at risk.

Inundation pathways (IPs) were created that represent the lowest areas where rising waters would begin to flood onto the land and approach buildings. The pathways were based on elevation data (lidar bare-earth dems), and were generated for primary buildings at elevations less than 3m (10 ft) in the coastal areas of Virginia. There are more than 190,000 buildings that meet the criteria and over 350,000 polygons representing NNBFs, in an area of about 4400 km^2 (1700 mi^2). The magnitude of the data and large spatial extent challenged the GIS effort.

The IPs allow us to create metrics for coastal flooding protection potential. To assess how well buildings are protected by NNBFs, the number and types of NNBFs intersecting the IPs for each building will be counted. To determine the relative importance of each NNBF based on the number of buildings it protects, the number of IPs crossing each NNBF will be counted. Results will be provided to local governments (45 in coastal Virginia) to aid in resource management and better utilize hazard mitigation programs, such as the National Flood Insurance Community Rating System, the Chesapeake Bay TMDL program for nutrient and sediment load reductions, and the Virginia stormwater management program.

F12. SERA and FIMAN: Innovative Tools for Emergency Managers and First Responders

David Key, ESP Associates, Inc.

This presentation will cover new and existing tools developed by NC Emergency Management (NCEM) to assist in providing situational awareness to Emergency Managers and First Responders. The presentation will cover two GIS-based web applications: Application #1: State Emergency Response Application (SERA) for Dam Inundation: In 2017, NCEM initiated a project to develop an online tool for first responders called the State Emergency Response Application (SERA). SERA is a secure, GIS-based web application that is used by local first responders when responding to natural disasters and other emergencies and threats. SERA securely displays critical information about critical assets such as K-12 public schools, community colleges, universities and prisons. In 2018, NCEM added high hazard dams to the growing list of critical facilities included in the SERA database and application. This new added functionality to SERA displays information about hazard dams such as Emergency Action Plan (EAP) information, type, spillway information, contact information, breach inundation mapping, impacted buildings including building location, depth, timing and damage estimates. Also included is details on expected road impacts and closings. Application #2: Flood Inundation Mapping and Alert Network (FIMAN) – Tested Again with Hurricane Florence: This presentation will provide an overview of NC's FIMAN application for real-time and forecasted flood inundation events. The application and data were a critical component to the State of North Carolina's response during the flooding following Hurricane Florence in September 2018. This presentation will show how the tool was used to provide important situational awareness for first responders and assist in developing metrics used for FEMA disaster declarations. We will highlight several comparisons (or ground truthing) of actual flood extents compared to the predicted inundation levels from FIMAN.

Somerset

Partnerships for Geospatial Collaboration

F13. NOAA and Water: Connecting End User Needs with Technical Tool Development

Brenna Sweetman, The Baldwin Group at the NOAA Office for Coastal Management; Karen Bareford, National Water Extension Program

As water-related crises become increasingly common and complex, society is confronted with developing and implementing strategies to better manage water resources and build more resilient communities. The NOAA Water Initiative (NWI), a collaborative effort across NOAA line offices, is working to enhance existing—and when necessary, develop new—tools to assist communities and individuals in making more informed decisions regarding water and water-related events. In coordination with the NWI, the National Water Extension Liaison, as the National Water Extension Program (NWEP), and a social scientist from NOAA's Office for Coastal Management are working toward the goal of transforming how the country thinks about and plans for water. The goal of the NWEP is to facilitate the delivery of tools that will allow communities and organizations to accurately and efficiently make vital short- and long-term planning decisions regarding the safety and security of their citizens and water resources. A key element of this effort is focused on evolving relationships and increasing engagement between tool developers and end users to ensure that tools are user-driven rather than data-driven. This shift in developing and delivering water-related decision-support tools marks a transition toward a new era of actionable intelligence that will allow decision makers, communities, and stakeholders to make better, more informed decisions about water security, long-term community resiliency, and the safety of individuals. This presentation will provide an overview of current and future efforts of the NWI and the NWEP to develop and deliver enhanced water-related decision-support tools.

F14. Geospatial Technologies to Understand and Communicate Coastal Hazards

David Hart, University of Wisconsin Sea Grant Institute

Since 1995, Wisconsin Sea Grant and partners have developed several geospatial applications to better understand and communicate the impacts of dynamic Great Lakes coastal processes. These include maps to explore shore characteristics, oblique photos and details about how coastal communities address hazards, along with tools to visualize coastal bluff erosion processes and the need for coastal development setbacks. This presentation will: 1) provide a retrospective of 25 years of research and outreach at the Wisconsin Sea Grant addressing geographic information science and coastal hazards; 2) showcase maps, tools and learning resources about coastal resilience topics featured in the Wisconsin Coastal Atlas (http://wicoastalatlas.net/); and explore new geospatial applications that are being developed as part of a NOAA-funded regional coastal resilience grant in southeastern Wisconsin.

F15. Spatial Prioritization Widget: Collaborative Planning for Data Collection

Ken Buja, NOAA National Centers for Coastal Ocean Science

Globally there is a lack of resources to survey the vast areas of the seafloor in need of even basic mapping data. Consequently, smaller areas must be prioritized to address the most urgent mapping needs. To address this, we developed a systematic, quantitative approach and Web AppBuilder widget to gather mapping suggestions from a group of stakeholders. Inputs are standardized into a GIS framework using a grid overlaid on the area and through pull-down menu choices that enabled participants to convey the types of mapping products that they need and the rationale used to justify their needs. This enables different groups of respondents to identify common interests and potential collaborations and more effectively invest limited mapping funds to achieve common goals. The approach can be easily scaled and customized to accommodate much larger geographic areas and numbers of participants.

F16. HRGEO – A Regional GIS Data Initiative for Hampton Roads, Virginia

Sara Kidd, Hampton Roads Planning District Commission

The Hampton Roads Planning District Commission (HRPDC), in partnership with the Hampton Roads Sanitation District (HRSD), and the Hampton Roads Transportation Planning Organization (HRTPO), has recently launched a new open GIS data site called HRGEO (Hampton Roads Geospatial Exchange Online). HRGEO currently houses over 30 regional GIS layers covering the 17 jurisdictions of southeastern Virginia regarding planning, environmental topics, recreation, transportation, water resources, and coastal resiliency. Additionally, the HRPDC worked with local jurisdictions to develop a process for constructing “collaborative” layers. Collaborative layers are generated on the HRGEO server by reading published map services from each locality, standardizing the attributes to a regional data schema through scripts in FME, and publishing a single map service containing the data from all localities which is made available on HRGEO for download. The regional data schemas were developed through discussions with various stakeholders but are only used for generating the collaborative layers – the localities are not required to alter their existing data. HRGEO is now the primarily method for sharing regional GIS data in Hampton Roads and in the future will be the platform upon which other regional initiatives and applications can be built and supported.

10:30 to 11:00 a.m.

Cambridge Hall

BREAK

11:00 a.m. to 12:30 p.m.
CONCURRENT SESSIONS

Windsor A

Hurricane Forecasting and Response

G01. Advanced Forecasting and Mapping of Catastrophic Flood Inundation in South Carolina Coastal Communities

Jason Currie, AECOM; Maria Cox-Lamm, SCDNR, Flood Mitigation Program

In 2016, Hurricane Matthews brought record levels of precipitation and flooding to communities in the Pee Dee River watershed in the Carolinas.The magnitude of this event, reaching close to 1,000 year rainfall totals, caused state and local emerg ency managers and disaster response agencies to rethink what was possible regarding the scale and devastation potential of flooding in the area. Nearly 2 years later, these same communities were once again devastated by yet another record setting precipitation and flooding event in the form of Hurricane Florence. The precipitation totals and associated flooding that followed during Florence caused even more widespread flooding, resulting in damage to private properties, public infrastructure, and loss of life as flood waters inundated populated areas. Advances in the availability and understanding of 2D modeling techniques that occurred in recent years have provided federal and state agencies with tools that enable proactive decision making in advance of the storm's landfall. Specifically, these forecast models allowed state and local agencies to develop and disseminate worst case scenario inundation forecasts, facilitating interagency coordination in the staging and deployment of personnel and resources needed for the disaster response effort. Additionally, South Carolina Department of Natural Resources (SCDNR) deployed a public-facing web portal to provide information to private citizens to help communicate the degree of inundation that could be expected based on information available. SCDNR posted periodic updates and revisions throughout the event to provide the most current information in a timely manner. This public outreach effort helped to minimize the need for rescue activities by communicating the need for evacuations in at-risk areas. This presentation will explore the methods used to develop forecast models and mapping data, as well as the public outreach tools used to update and disseminate the ever-evolving information in a complex and dynamic event.

G02. Models, and Models, and Models Oh My! Timeline of Hurricane Florence Flood Models

Catherine Bohn and Jeff Gangai, Dewberry

Hurricane Florence caused significant flooding across the Carolinas. Even before the storm made landfall, the question was asked, "What will the impacts be?" After landfall, as the storm slowed and resulted in heavy rainfall, the question was asked, "Where will the flooding occur?" Many different models across several federal and state agencies to include North Carolina, South Carolina, U.S. Geological Survey, National Oceanic and Atmospheric Administration, Pacific Northwest National Laboratory, U.S. Army Corps of Engineers, NASA, and the Federal Emergency Management Agency, provided answers to these questions. This presentation will follow the timeline of Hurricane Florence to discuss when the models were used, the model differences, and how they were used for actionable decisions.

G03. Development of Long-Term Erosion Hazard Areas to Aid in the Post-Maria Recovery of Puerto Rico

Brian Batten, Dewberry; Andrew Martin, FEMA; Joel Plummer, Dewberry

In September 2017, Hurricane Maria made landfall on Puerto Rico as a Category 4 storm. Wind, storm surge and waves from Maria resulting in extensive damage to buildings and infrastructure. The extent of damage was catastrophic and best described by NOAA as the "most destructive hurricane to hit Puerto Rico in modern times" with damage estimates for both Puerto Rico and the USVI on the order of $90 billion (Pasch et al. 2018). Wind damage was widespread, and waves riding over the storm surge caused damage around the

perimeter of the island, especially to structures exposed due to beach erosion. In the wake of this devastation, Puerto Rico must recover and rebuild. The recovery process must consider and improve awareness of natural hazards to ensure resilience in new construction. To assist, FEMA, with the support of the Puerto Rico government, undertook a host of actions, including damage assessments to inform structural design, as well as updates of coastal and riverine flood hazards and mapping. Review of existing products indicated that limited geospatial data were available depicting areas subject to long-term coastal erosion hazards. In response, a unique geospatial product was developed to fill this gap in hazard awareness. Our presentation will provide an overview of how a coastal erosion hazard area layer was developed by FEMA to aid the Puerto Rico recovery process. We will provide highlights and lessons-learned from development of the layer under tight time constraints. Topics will include the shoreline change calculations, ground-truthing of results, treatment of results for mapping, considerations for the final cartographic representation of the hazard, and limitations of the final product. We will also share how the government and communities of Puerto Rico are utilizing this information to support the recovery and how FEMA is considering long-term beach erosion in related efforts.

G04. Rapid Response Change Detection and Analysis following Hurricanes

Christopher Macon and Jennifer Wozencraft, U.S. Army Corps of Engineers, JALBTCX

The Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX) has surveyed hurricane-impacted coasts for the past two decades. The first post-hurricane survey was collected in 1995 at East Pass, Florida after Hurricane Opal. Later survey efforts shifted focus from quantifying project-level impacts to quantifying regional impacts of storms after the hurricane seasons of 2004 (Charley, Frances, Ivan, Jeanne), 2005 (Dennis, Katrina), 2006 (Wilma), and 2009 (Gustave, Ike). From these experiences JALBTCX developed a capability to collect post-hurricane lidar data and to deliver maps and quantities of change in elevation, shoreline position, and beach volume caused by storms, on time scales relevant to the emergency response community. The first requirement for rapid collection and delivery of data (within days) along with elevation, shoreline, and volume change analyses came in 2012 in the aftermath of Hurricane Sandy. JALBTCX identified a number of operational, processing, analysis and delivery challenges during execution of the post-Sandy work. JALBTCX evolved operations, processing, delivery and communications to address these challenges, and had an opportunity to test them in the aftermaths of Hurricanes Matthew (2016) and Irma (2017). Final, bathy-topo lidar point clouds, first-return DEMs, bare earth DEMs, aerial photography, shorelines, and metadata, were delivered within a week of collection. Web services were employed to communicate the progress of collection, processing, change analyses, and delivery. Challenges that remain are schedule and consistency of pre-event data. Despite common standards, classification of lidar data and development of DEM deliverables are inconsistent among providers and can cause artifacts in change detection products that invalidate the results and often require rework of data. This presentation will briefly describe the evolution and current state of the JALBTCX emergency response coastal lidar mapping capability, products, delivery mechanisms, remaining challenges and proposed solutions.

Windsor B

Data and Tools for Water Management

G05. Change Detection in Coastal Geomorphology Using Lidar Data

David McKittrick, Blue Marble Geographics

Technology improvements over recent years have seen the cost of 3D point cloud data acquisition decrease and consequently, the coverage and availability expand dramatically. Hardware miniaturization has given rise to on-demand data collection with UAVs taking the place of manned fixed-wing or rotary aircraft in the collection process. As a consequence, point cloud data is increasingly used as the raw material for precise measurement and visualization of change over time. Nowhere is this process more evident than in coastal areas where shifting patterns of erosion and deposition can have devastating effects on shoreline communities. In this presentation, we will examine an area on the coast of the state of Maine in the U.S. that has been subject to significant beach erosion. Using point cloud data collected over a five-year time period, we will explore the procedure whereby the raw data can be processed to create precise bare-earth models and how the difference between these surfaces can be calculated and visually represented to show areas of significant erosion or deposition.

G06. Sinkhole Delineation Using ArcGIS Tools

Maria Kottermair and Romina King, University of Guam

Sinkholes are prominent, and often dominant, landforms in nearly all karst environments. In Guam, they are exceedingly common in all karst areas, especially the northern Guam plateau. Besides their important hydrologic role as entry points to dissolutionally widened fractures and karst conduits that represent rapid routes to the aquifer, sinkholes are also geomorphologically significant because they pose serious challenges to urban development. To delineate the sinkholes of Northern Guam, we use the ArcGIS 10.5 software with the ArcHydro extension. The model is based on a 1-meter by 1-meter digital elevation model (DEM) derived from the 2012 raw lidar point cloud. In addition to the ArcHydro model, a Topographic Positioning Index (TPI) is run to filter out sinkholes within depressions. The results include the location of the sinkholes along with geometric characteristics such as depth, area, volume, total drainage area. The final product of this study is a sinkhole atlas of Guam in PDF format which includes overview maps and specific information on major sinkholes with all their attributes, location map, profiles, 3D-representations, as well as guidelines on how to access and utilize the full data set using GIS. This will be a very useful product for natural resource managers and developers alike to quickly visualize potential effects of development projects or pollutant transfer in respect to the aquifer.

G07. Waterway Asset Management: Bridging the Gap between Field and Office Staff through Map-Based Decision Support Tools

Sierra Davis, Tridec Technologies, Inc./Delaware Department of Natural Resources and Environmental Control; Jesse Hayden and Ashley Norton, Delaware Department of Natural Resources and Environmental Control

Obtaining a real-time working knowledge of waterway management issues such as storm impacts to channel shoaling, the loss or displacement of navigational markers, identification of obstructive debris, or dredge operation progress can be difficult from the office. In an effort to bridge the gap between field observations and desktop analysis by office staff, Delaware's Department of Natural Resources and Environmental Control (DNREC) is

working toward monitoring and managing waterway assets (e.g. buoys, channel markers, channel conditions) through map-based decision support tools built in the Arc Explorer, Arc Online, and Survey123 environments. There are key advantages to these methods, including the elimination of paper-based data collection to encourage transparency between field crews and office staff for monitoring and maintenance needs. Additionally, location data and corresponding notes are kept in an organized digital format, allowing for rapid internal data sharing and enabling a more efficient response. Presented here are the pilot phases of tools developed by DNREC in the above-mentioned ArcGIS platforms for waterway asset management in Delaware as well as a preliminary assessment of their effectiveness for communication between the field and the office staff. Methods are currently being tested with internal government staff. Our adaptive management strategy for the tools and long term goals, such as launching the tools for broader stakeholder use and waterway maintenance prioritization, will also be presented.

G08. Using ArcGIS to Forecast Harmful Algal Blooms

Jaclyn Ludema and Edward Davis, NOAA CO-OPS

Toxin-producing algae exist in virtually every body of water. During rapid growth, “blooming,” algae is potentially harmful to humans, animals, local ecology, and the economy. In 2014, Toledo, Ohio declared a state of emergency because their finished drinking contained unsafe levels of algal toxins. June 2018, Florida declared a state of emergency in Lee County because an unprecedented 150 miles long bloom of Karenia brevis (commonly known as red tide). The National Oceanic and Atmospheric Administration’s (NOAA) established the Harmful Algal Bloom Operational Forecasting System (HAB-OFS) in order to produce decision support tools for members of the public and responding authorities in areas affected by HABs. HAB-OFS is ArcGIS enabled, ensuring all available bloom data is incorporated into forecasts and analysis. ArcGIS readily georeferences dissimilar data types from multiple sources. Georeferenced data can be easily visualized as layers, allowing for simultaneous assessment of bloom conditions while reducing the potential for error in forecasting. NOAA has developed custom, Python-based ArcGIS toolboxes to incorporate the data layers necessary for analysis such as satellite imagery, water samples, real-time beach observations, wind forecasts, and current data; all of which go into the creation of operational forecast products. These tools are flexible enough that they can be modified to incorporate future input, like real-time, in situ sample data.

Windsor C

Understanding Risk Exposure

G09. Low Cost, Computationally Efficient Approach to Hydrodynamic Modeling of Barrier Islands and Tidal Inlets as a Decision Support Tool

Kenneth Hunu, Atkinsglobal

Coastal cities are usually characterized by barrier beaches and islands with tidal inlets. Upland, backwater areas consist of estuary with low-lying marsh areas, tidal rivers and wetlands. Overtopping and erosion (and possible breaching) of the barrier beach/islands as well as flow through the tidal inlets are often the primary cause of flooding of the islands and beach areas as well as the upland areas during extra-tropical and tropical cyclone storm flood events. The hydrodynamics of flooding in these types of geomorphological environments is quite complex and are a function of the flow hydrodynamics as well as the

storm characteristics (translational speed, size, intensity, etc.), in particular the effects on the shape of the storm surge hydrograph. Understanding and predicting the complexity of flooding in these environments is a necessary component of efficiently and cost-effectively developing coastal resiliency. In this presentation, a low cost, less computationally intensive, alternative approach to modeling coastal barrier islands and tidal inlets is proposed. The approach involves the use of two-dimensional, localized, high resolution hydrodynamic models to evaluating the flood risk of the Long Island Beach and upland, backwater areas. The flood risk is characterized for several different return periods (up to 1000-year). The coastal model output (using synthetic hydrographs). The results of the model simulations aided in decision making and were highly informative as to the cause and effect of both the beach and backwater, upland flooding and clearly indicated where flood mitigation measures would be most effective. The results were used to establish the flood design basis for the design and construction of new critical infrastructure in the area, as well as design flood mitigation measures. The models were also used to evaluate the performance of natural and nature-based features (NNBFs) as a cost effective and ecologically desirable way to create coastal resiliency.

G10. Coupled Coastal and Riverine Risk Mapping for The Nature Conservancy's North Coast Resilience Project: Mitigating Flood Risk through Nature-based Solutions

Keil Schmid, Geoscience Consultants, LLC; Joy Brown, The Nature Conservancy

The North Coast project in Georgetown and Horry Counties (SC) grew from TNC's Coast Summit in 2016 where riverine flooding was highlighted as a problem that held opportunity for nature based mitigation solutions. Geoscience Consultants was hired to provide an understanding of localized flood risk at present and under future climate change. This information will help community stakeholders identify locations where nature based solutions can be used to mitigate increasing flooding issues. Four separate products were developed to inform the stakeholders in each county. Hindcasted flooding maps from Hurricanes Joaquin and Mathew depicted the extents of flooding that played a large part in developing the needs of the project. The 'historical' flooding extents were developed from high resolution elevation data and empirical data collected during these storms. Predicted and projected future flooding risk maps built on the empirical data and included time series information from tide and stream gages along with projections for sea level changes and extreme rain events. This information was analyzed using a z-score technique originally developed for use in NOAA's SLR Viewer. The extents of the risk envelop are similar to FEMA's special flood hazard zones but the technique provides results in discreet scores adding context. To help inform project ideas a 'hydro land cover' product was developed that includes flooding pathways and habitats where flooding is likely now and in the future. Finally, for emergency management, a storm surge risk product was developed from 64 Category 1 SLOSH outputs. This is a significant amount of information for stakeholders to digest and use in developing 'shovel ready projects'. To help, TNC is holding county-wide stakeholder meetings and has included it in their online mapping portal. This presentation will focus on specific development processes, outputs of these models, and how they can inform other studies.

G11. Inundation Exposure Assessment for Majuro Atoll, Marshall Islands Using a High-accuracy Elevation Model

Dean Gesch, Jeffrey Danielson, and Monica Palaseanu-Lovejoy, U.S. Geological Survey

Low-lying island environments, such as Majuro Atoll in the Republic of the Marshall Islands, are particularly vulnerable to inundation (coastal flooding), whether the increased water levels are from episodic events (storm surge, wave run-up, king tides) or from chronic conditions (long term sea-level rise). Land elevation is the primary geophysical variable that determines exposure to inundation in coastal settings. Accordingly, coastal elevation data are a critical input for assessments of inundation exposure. Previous research has demonstrated that the quality of data used for elevation-based assessments must be well understood and applied to properly model potential impacts.The vertical uncertainty of the input elevation data controls to a large extent the increments of water level increase and planning horizons that can be effectively used in the assessment. When properly characterized, the vertical accuracy of high-resolution, high-accuracy elevation data can be used to generate maps and report results with the uncertainty stated in terms of a specific confidence level or likelihood (probability) category. A quantitative analysis of inundation exposure was conducted for Majuro Atoll, including rigorous accounting for the cumulative vertical uncertainty in the input geospatial data (elevation model) and data processing (datum transformations). The project employed a recently produced and validated digital elevation model (DEM) derived from structure-from-motion processing of very high resolution aerial imagery. Areas subject to marine inundation (direct hydrologic connection to the ocean) and low-lying lands (no direct hydrologic flowpath to the ocean) were mapped and characterized for different inundation levels. An example episodic inundation event, in this case projected high wave run-up, has also been mapped using deterministic and probabilistic approaches. Other widely available, less accurate global DEMs were analyzed to demonstrate the substantial value of high-resolution, high-accuracy DEMs for assessing inundation exposure of low-relief islands and the enhanced information from accounting for vertical uncertainty.

G12. Development of a Geomorphology-Driven Habitat Vulnerability Model for Great Lakes Coastal Zone Management

Ethan Theuerkauf and Katherine Braun, University of Illinois at Urbana-Champaign; Eric Cole, Woolpert; Francis Wiese and Ryan Cooper, Stantec

Shoreline erosion drives the destruction of coastal habitat and leads to the loss of ecosystem services. This feedback is widely recognized; however, few studies have mechanistically linked geomorphic processes to the loss of ecosystem services. This lack of process-based research hinders accurate modeling of the future of ecosystem services and robust coastal habitat valuation for management purposes. In this talk we present preliminary results from a study to develop a geomorphology-driven coastal habitat vulnerability model for Illinois Beach State Park (IBSP); a beach ridge and swale complex in Western Lake Michigan. This model accounts for dynamic coastal processes, such as erosion and overwash, that result in habitat loss and is motivated by a need for state and federal coastal managers and stakeholders in this region to have a data-driven tool for prioritizing investment in shore protection. This study leverages a range of expertise and capabilities through a collaboration between academia, private consultants, and federal and state agencies. Beach and dune topography and nearshore bathymetry were collected repeatedly to characterize geomorphic changes at IBSP in response to physical processes, such as waves and fluctuating water levels. Physical processes were measured with an acoustic wave and current profiler deployed in the nearshore. Coastal geomorphic change

data will be coupled with measurements of soil carbon to quantify the impacts of erosion and accretion on coastal carbon storage. These data are one component of a complete coastal habitat ecosystem service valuation performed in this study. The field data will be coupled with the ecosystem service valuation to build the habitat vulnerability model. This model, which is the first of its kind in the Great Lakes region, will provide managers with a quantitative understanding of present and future habitat vulnerability as a function of habitat value, coastal geomorphic, and hydrodynamic processes.

Room 12/13

Accessing Public Knowledge

G13. Integration of Geographic Information System (GIS), Coastal Pollution Management (CPM), and Public Participation (PP) in the Management of Litters and Waters in the Coastal Region of Guyana

Temitope D. Timothy Oyedotun, Department of Geography, Faculty of Earth and Environmental Sciences, University of Guyana

Many parts of Guyana's coastal and beach areas have the potential of benefitting from the huge growing Caribbean coastal tourism. The ability of the Nation in managing its beach litters and wastes is very crucial in attracting tourists and her increasing coastal population to explore these areas for recreational activities. Therefore, the importance of building an appropriate waste, litter, and pollution management system which facilitates the involvement of the public in the management process is highly crucial and vital. The aim of this project is to propose, design and seek the implementation of a Volunteered Geographic Information System (VGIS) for Guyana beaches and coastal areas. This project is achieved through the integration of methods and concepts from the Geographic Information System, the established Coastal Pollution Management (CPM) plans and Public Participation (PP) with a pilot site at Georgetown coastal areas of Guyana. For this pilot study, visitors to the beach areas, residents and users of the coastal areas volunteered to observe and report the observable litters or wastes at the areas along the beach where they have visited. The reported information served as data input for the system. The progress observed in this project has shown that the utilisation of VGIS in monitoring coastal wastes, litters and pollution is vital in improving the public consciousness of the health, development, safety and aesthetic of the coastal areas, especially beaches that are used for tourism and recreational activities. It is hoped that the results from this project would be highly useful to local, regional and national coastal managers/planners who may need the system in sound management and policy decision making.

G14. Developing a Recreational Data Mobile Crowd-Sourcing Application: Tell Us Where and How You Play!

Jeff Herter, New York Department of State, Office of Planning, Development and Community Infrastructure; Alex Kuttesch, Tridec Technologies, Inc./New York Department of State, Office of Planning, Development, and Community Infrastructure; Katie Budreski, Stone Environmental

The NY Department of State, Office of Planning and Development (OPD), in partnership with Stone Environmental Inc., has developed two applications for gathering recreational use

and conditions data from recreators in New York State. These applications will provide OPD with historically difficult to capture recreational use data that can be incorporated into offshore, coastal, and inland decision making and planning efforts. Conference participants will learn about app development processes, functionalities, and data uses. OPD has developed two ways of capturing recreation data: 1) a downloadable mobile app that is contributed to, and populated by, recreation users in New York. Users are able to tag their location and fill out a short survey regarding their recreation activity and experience and upload images and videos, and; 2) opportunistically harvesting location and attitude ("mood") data from public social media posts on Facebook and Instagram. Both data products will be publicly available recreational use datasets on OPD's Geographic Information Gateway (Gateway) as well as a recreational "Mood" map viewer on the Gateway's Latest Conditions page. Crowd-sourced recreational use data will also be used in OPD planning and development efforts. Presentation attendees will hear about the applications development process beginning with identifying OPD data gaps and user surveys to inform mobile application development, design and beta testing. Attendees will experience demonstrations of the applications and their functionalities. Examples of how OPD will use this data in planning efforts will also be discussed.

G15. How We Badgered, er, *Enticed* People to Submit 6,500 Storm Damage and King Tide Reports

Wesley Shaw, Blue Urchin LLC.

Since 2012, MyCoast has been helping people submit reports on coastal incidents including storm damage, king tides, beach cleanups, abandoned boats, shoreline change, and even fog. Through our time working on this project, we've evolved from a system based on telephone calls and scraps of paper to PDFs to a framework of webservers and mobile apps. In its current iteration, MyCoast allows users to quickly submit photos from the field via our mobile apps. Our servers augment reports with meteorological and tidal data, and then present the information in various formats based on users' needs. You can read more about MyCoast at mycoast.org. We've always had a set of broad goals: 1) Inform better short and long-term decisions (from emergency response to planning); 2) Help with coastal hazard and sea level rise outreach and engagement efforts; and 3) Provide hard data for ground-truthing oceanographic and meteorological models. And based on these goals, we set the following priorities (in this order): 1) Maximize the amount of data we get; 2) Maximize the data quality; and 3) Maximize the data's utility; The topic for this talk will be to ask the simple question: with over 6,500 reports and 12,000 photographs, how are we doing at meeting our goals and priorities and what have we learned along the way? What might we be able to tell from stepping back and looking at this mass of data holistically?

G16. Multidisciplinary Knowledge Integration to Support Louisiana Coastal Indigenous Communities' Response to Natural and Technological Disasters and Adaptation to Climate Change

Tara Lambeth, University of New Orleans Center for Hazards Assessment, Response and Technology (UNO-CHART); Jessi Parfait, Louisiana State University and Louisiana Sea Grant; Matthew Bethel, Louisiana Sea Grant

The project team is collaborating with two United Houma Nation communities to document how environmental stressors affect the livelihoods of these communities and shape the mitigation strategies they use. The researchers, in collaboration with the tribe, make use of traditional ecological knowledge and current mitigation efforts in order to understand the tribe's adaptive capacities. We will produce a story-map based resource that can be used by the UHN and other indigenous communities facing similar challenges. This work may encourage other mitigation and adaptation planning efforts and increase communication between communities and policymakers.

Goals and Objectives

- Goal 1: Integrate policy, science and local knowledge to aid the UHN in adapting to chronic and acute environmental stressors
- Goal 2: Analyze the adaptive capacity of the UHN using physical science, social science, and TEK
    - Objective: Examine and compare structural and nonstructural mitigation measures implemented in the area by the tribe and policymakers
- Goal 3: Assist the tribe in honing its adaptive capacity to adapt to chronic and acute environmental stressors
    - Objective 1: Prepare a timeline of historical events in collaboration with the tribe
    - Objective 2: Share the analysis with the tribe so that the tribe can hone its adaptive capacity for future chronic and acute environmental stressors and influence mitigation policy implemented to lessen those stressors
- Goal 4: Engage local agencies in the adaptive capacity analysis and disseminate the results beyond the case study communities

So far:

- We've interviewed 5 out of 5 TEK experts, and conducted follow up interviews with 3 of them.
- Creating a timeline of stressors in order to track adaptations over time.
- Acquiring and processing historical aerial and satellite image data of areas of interest that emerge from the analyses of the TEK expert interviews to include in the story map resource.
- Contents will be used to create an online tool, to help with future adaptation efforts.