2025 Coastal GeoTools Presentations

Monday, January 27, 2025
Special Interest Meetings

9 a.m. to Noon	
Salon D: Advancing Science and Service with NOAA's New Flood Inundation Maps, Economic Data, and the Coastal Inundation Community of Practice	Abstract
Salon E: The Future of the U.S. Mapping Coordination Site	Abstract
Salon F: FutureScape Resilience Simulation	Abstract
9 a.m. to 2:30 p.m. ***(Lunch Break - Noon to 1:30 p.m.)***	
Salon C: Overview of National Geodetic Survey Tools and the Modernized National Spatial Reference System	Abstract
1:30 to 4:30 p.m.	
Salon D: Uncrewed Aircraft Systems for Coastal Research and Management	Abstract
Salon E: Navigating Various Changing Water Level Tools	Abstract
Salon F: Tribal and Indigenous Technical Assistance Coordination and Planning	Abstract

Only the person presenting at the conference is listed, the entire list of project partners is included with the presentation abstract.

Tuesday, January 28, 2025
11 a.m. to 12:30 p.m.

Salon A: Engaging Users in Data and Tool Development		
Community-Driven Coastal Resilience: From Restoration to Adaptation	*Carla Avila-Martinez, Surfrider Foundation*	Abstract
Digital Coast Act: Accomplishments and Reauthorization	*John Palatiello, U.S. Geospatial Executives Organization, Miller Wenhold Capitol Strategies, and Digital Coast Partnership Advocacy Coalition*	Abstract
Public Perceptions of Nature-Based Coastal Solutions in the United Kingdom	*Avidesh Seenath, Environmental Change Institute, University of Oxford*	Abstract
Creating Better Coastal Resources GIS Viewer Experiences for the Nonprofessional User	*Nicholas Wellbrock, AECOM*	Abstract
Salon B: Short and Sweet - Benthic Characterizations		
Discover Your Data's Depth: ArcGIS Bathymetry and its Role in Seafloor/Habitat Classification	*Meredith Payne, Esri*	Abstract
Improving Seafloor Characterization via Grain Size Analysis with Low-Cost Imagery	*Mark Borrelli, University of Massachusetts, Boston*	Abstract
Coastal Ecosystem Map Application Platform (CEMAP)	*Stefan Claesson, Nearview*	Abstract
Updating the Coastal and Marine Ecological Classification Standard (CMECS)	*Kate Rose, Northern Gulf Insitute, Mississippi State University*	Abstract
Application of the Coastal Marine Ecosystem Classification System (CMECS) to Create Benthic Geologic Habitat Maps for Portions of Acadia National Park, Maine	*Bryan Oakley, Eastern Connecticut State University*	Abstract
Seascapes of the Gulf of Maine: Automated Geomorphon Classification of the Seabed	*Matt Dornback, NOAA Office for Coastal Management*	Abstract
Pilot Framework for Fish Habitat Assessments Across Tidal and Nontidal Waters in the Patuxent River Basin	*Hannah Nisonson, Consolidated Safety Services*	Abstract

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Salon C: Remote Sensing of Wetlands		
Mapping Coastal Marshlands with Topobathymetric LiDAR	*Evan Carlson, Whiteout Solutions*	Abstract
Remote Sensing in Support of Ecosystem Restoration Monitoring: A Case Study at Two Wetland Restoration Sites in Coastal Louisiana	*Molly Reif, U.S. Army Corps of Engineers*	Abstract
Developing a Protocol to Enhance Tidal Wetland Vegetation Monitoring with Drones	*Justin Ridge, North Carolina Coastal Reserve and National Estuarine Research Reserve*	Abstract
High-Resolution Remote Sensing for Connecticut's Marshes	*Emily Wilson, University of Connecticut*	Abstract
Salon D: Discussion - Building Capacity for Climate Resilience in Coastal Plain Tribal Communities		
Building Capacity for Climate Resilience in Coastal Plain Tribal Communities	*Panelists:* • *Beth Roach, Nottoway Indian Tribe of Virginia, Sierra Club, and Tribal Coastal Resilience Connections* • *Jocelyn Painter, Winnebago Tribe of Nebraska, Duke University* • *Kullen Bell, Coharie Indian Tribe, Great Coharie River Initiative* • *Giancarlo Richardson, Haliwa-Saponi Indian Tribe, Tribal Coastal Resilience Connections Team*	Abstract

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Salon E: Discussion - Digital Coast Connects		
Digital Coast Connects—Hazards, Flooding, Underrepresented Communities*	*Panelists:* • *Vidya Balasubramanyam, Coastal States Organization* • *Rebecca Roth, National Estuarine Research Reserve Association* • *Kari Hagenow, The Nature Conservancy* • *Rebecca Ellin, North Carolina National Estuarine Research Reserve*	Abstract
Salon F: Short and Sweet - Elevation Data and Tools		
Mapping Hidden History with Coastal Lidar: A Story from the Island of Tinian	*Robbie Greene, Pacific Coastal Research and Planning*	Abstract
Enhancing Advanced Circulation (ADCIRC) Modeling in American Samoa and Guam: A Methodological Approach to Derived Digital Elevation Models (DEMs)	*Kathryn Smith, U.S. Army Corps of Engineers*	Abstract
Using U.S. Geological Survey Elevation Data in the Chesapeake Bay Watershed for Climate Adaptation	*Eliza Gross, U.S. Geological Survey*	Abstract
Coastal National Elevation Database (CoNED) Difference/Threshold Masking Tool+	*Taylor Hansen, U.S. Department of the Interior, U.S. Geological Survey, and KBR, Inc.*	Abstract
National Centers for Environmental Information's Seafloor Science Information Center (SSIC) – Advances in Digital Elevation Model Development and Validation	*Matthew Love, Cooperative Institute for Research in Environmental Sciences, NOAA's National Centers for Environmental Information*	Abstract
Uncrewed Aerial Vehicle (UAV) Coastal Reconnaissance for Understanding and Mitigating Flooding Impacts on Surface Transportation Networks	*George McLeod, Old Dominion University*	Abstract
Automated Generation of an Urban Synthetic Elevation Checkpoint Network	*Alexander Seymour, U.S. Geological Survey*	Abstract

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Tuesday, January 28, 2025
2 to 3 p.m.

Salon A: High-Resolution Land Cover		
A Next Generation Coastal Land Cover	*Nate Herold, NOAA's Office for Coastal Management*	Abstract
Bridging the Gap in Coastal Hazard Resilience Through High-Resolution Mapping	*Thomas Peck, Ecopia AI*	Abstract
Harmonizing Hydrography, Wetlands, and Land Cover Data for Better Informed Decision-Making: The Wisconsin "OneMap" Project	*Jim Giglierano, Wisconsin Department of Administration*	Abstract
Salon B: Short and Sweet - Climate Adaptation Strategies		
Opportunities for Protecting Future Wetlands and Migration Corridors*	*Will Collins, The Nature Conservancy*	Abstract
Quantifying Coastal Squeeze: Sea Level Rise and Marsh Migration Potential in Coastal Virginia	*Thomas Allen, Old Dominion University*	Abstract
Beaufort County Adapts: Sea Level Rise Impacts on Groundwater and Septic Systems	*Landon Knapp, South Carolina Sea Grant Consortium, College of Charleston*	Abstract
Building Resilient Coastal Communities: The Role of GIS in Adaptive Housing Strategies	*Claire Babineaux, The GEO Project*	Abstract
Mapping Environmental Justice Priorities Across the U.S. Coastal States and Territories	*Natalie Cross, Coastal States Organization*	Abstract
Salon C: Climate Change and Conservation Decision Support Tools		
U.S. Geological Survey Products and Data to Support Coastal and Resource Management	*Darcee Killpack, U.S. Geological Survey*	Abstract

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GIS for the Ocean: Transforming Ocean Data into Actionable Knowledge	*Mimi Diorio, NOAA's Office of National Marine Sanctuaries*	Abstract
Marshes for Maine's Future: A Collaborative Science Model for Transferring Geospatial Science	*Chris Feurt, Wells National Estuarine Research Reserve*	Abstract
Salon D: Discussion - Resilient Land Use Planning		
Resilient Land Use Planning*	*Panelists:* • *Jack Smith, Nelson Mullins and Urban Land Institute* • *Josh Murphy, NOAA's Office for Coastal Management* • *Kaylan Koszela, City of Charleston, South Carolina* • *Jacob Lindsey, Lowe Real Estate Development*	Abstract
Salon E: Coastal Management Policy in the Great Lakes		
Coastal Hazard Regulations in Great Lake States*	*Alan Lulloff, Association of State Floodplain Managers*	Abstract
Enhancing Great Lakes Coastal Resilience Through Local Capacity Building and Nature-Based Engineering Design Solutions	*Sue Hoegberg, Dewberry*	Abstract
Ohio's Lake Erie Scenic Vistas: Developing the Program, Designating Sites, and Building Local Partnerships	*Brian George, Office of Coastal Management, Ohio Department of Natural Resources*	Abstract
Salon F: New Federal Datasets for Sea Level Rise and Flooding		
Taking Stock – Building Stock Datasets Used in Assessing Coastal Hazards	*Brian Caufield, CDM Smith*	Abstract
Planning for Coastal Climate Change Hazards with the U.S. Geological Survey's Coastal Storm Modeling System and HERA Web Tool: Geographic Expansion, End User Engagement, and Use Case Examples	*Maya Hayden, Pacific Coastal and Marine Science Center, U.S. Geological Survey*	Abstract
The Power of Community Modeling: Bridging Gaps in Historical Water Level Observations with NOAA's Coastal Ocean Reanalysis (CORA)	*Analise Keeney, NOAA's Center for Operational Oceanographic Products and Services*	Abstract

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Tuesday, January 28, 2025
3 to 5 p.m.

Exhibit Hall: Tool Showcase		
The West Coast Ocean Data Portal's Marine Planner Visualization Tool: An In-Browser Mapping Solution for Ocean Data Exploration and Decision-Making	*West Coast Ocean Data Portal*	Abstract
The Mid-Atlantic Ocean Data Portal	*Mid-Atlantic Regional Council on the Ocean*	Abstract
The Northeast Ocean Data Portal and Offshore Wind and Wildlife Research Planning Map	*Northeast Regional Ocean Council and Regional Wildlife Science Collaborative for Offshore Wind*	Abstract
NOAA's Sea Level Calculator	*NOAA's Office for Coastal Management*	Abstract
Visualizing Future Wetlands and Coastal Squeeze Using 3D WebGIS, Sea Level Rise Affecting Marsh Model (SLAMM), and NOAA's Digital Coast	*Old Dominion University*	Abstract
Mote Marine Laboratory's Beach Conditions Reporting System: Protecting Public Health Through Community Science	*Mote Marine Laboratory*	Abstract
South Carolina Coastal Atlas: Using ArcGIS StoryMaps to Explore the History, Tools, Services, and Initiatives of the South Carolina Coastal Management Program	*South Carolina Department of Environmental Services / Bureau of Coastal Management*	Abstract
U.S. Geological Survey Total Water Level and Coastal Change Forecast Viewer	*St. Petersburg Coastal and Marine Science Center, U.S. Geological Survey*	Abstract
Leveraging and Expanding a Data Ecosystem to Support Decision-Making	*Mid-Atlantic Regional Association Coastal Ocean Observing System*	Abstract
Improvements to the U.S. Geological Survey's Digital Shoreline Analysis System (DSAS)	*U.S. Geological Survey*	Abstract
Mapping Baylands Resilience: A Metrics Framework in San Francisco Bay	*San Francisco Estuary Institute*	Abstract
NOAA's High Tide Flooding Outlooks Help Users Plan for Future Flood Risks	*NOAA's Center for Operational Oceanographic Products and Services*	Abstract
CorpsCam: Monitoring Federal Beach Projects at High Spatial and Temporal Resolution	*Engineer Research and Development Center, U.S. Army Corps of Engineers*	Abstract

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Modernizing Grant Management: North Carolina Coastal Access Grant Dashboard	*North Carolina Division of Coastal Management*	Abstract
Federal Flood Standard Support Tool	*NOAA's Office for Coastal Management*	Abstract
The U.S. Geological Survey's Hazard Exposure Reporting and Analytics (HERA) Web Tool	*Pacific Coastal and Marine Science Center, U.S. Geological Survey*	Abstract
Accessing Geodetic Control and Datum Transformations	*National Geodetic Survey, NOAA*	Abstract
NOAA CoastWatch Data Portal	*NOAA's National Environmental Satellite, Data, and Information Service, STAR, Satellite Oceanography and Climatology Division*	Abstract
NJRESTORS – A Custom ArcGIS Web Application to Visualize Areas and Projects for Wetland Restoration	*Rutgers, The State University of New Jersey*	Abstract
Toolkit for Assessing Sea Level Rise Impacts and Adaptations on Coastal Pavements	*University of New Hampshire*	Abstract
Coastal Risk Finder: Climate Central's New All-In-One Tool for Assessing, Communicating, and Responding to Coastal Flood Risk	*Climate Central*	Abstract
GeoCoast3D: Visualizing the Impact of Inundation on the Gulf Coast	*Mississippi State University*	Abstract
Regional Coastal Data Analysis Using the JALBTCX Toolboxes	*Coastal and Hydraulics Laboratory, U.S. Army Engineer Research and Development Center*	Abstract
Deriving Island Shorelines from Low-Resolution Satellite Imagery	*Massachusetts Institute of Technology*	Abstract
The National Risk Index: Future Risk—Helping Build Hazard Resilience in a Changing World	*Federal Emergency Management Agency*	Abstract
The Coastal and Marine Ecological Classification Standard (CMECS) Catalog Discovery and Access Tools	*Northern Gulf Institute, Mississippi State University*	Abstract
A Bird's-eye View: Coastal Wetland Geospatial Products from the U.S. Geological Survey	*U.S. Geological Survey and the Woods Hole Coastal and Marine Science Center*	Abstract

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Wednesday, January 29, 2025
11 a.m. to 12:30 p.m.

Salon A: Sea Level Rise Data and Management		
Predictive Sea Level Rise Models for a Regulatory Framework: Navigating the Legal Landscape	*Alan Clinton, County of Kauai Planning Department*	Abstract
An Automated Vertical Datum Transformation Workflow for Coastal Data Products	*Joan Herrmann, Lynker at NOAA's Office for Coastal Management*	Abstract
Recalculating Shoreline Mileage for the Nation	*Maryellen Sault, NOAA's National Geodetic Survey*	Abstract
Salon B: Ocean Planning–Part 1		
Marine Life Distribution and Abundance Models: Updates and Future Work	*Sarah DeLand, Marine Geospatial Ecology Lab, Duke University*	Abstract
3D Habitat Mapping of the Rocky Intertidal and Drone-Based Kelp Mapping on the California Coast	*Abreanna Gomes, Kashia Band of Pomo Indians*	Abstract
Improving AIS Vessel Identification through an Innovative AIS Vessel Validation Database	*Jeremy Fontenault, Tetra Tech*	Abstract
Developing Methods for Determining If and Why Dredging Vessel Sensor Data Is Anomalous	*Jesse Hall, U.S. Army Corps of Engineers*	Abstract

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Salon C: The Use of Drones in Coastal Management		
Deploying Uncrewed Aerial Vehicle (UAV) Technology to Assess Typhoon Impacts in Vulnerable Communities in Guam	*John Borja, Micronesian Area Geospatial Information Center (MAGIC) Lab, University of Guam*	Abstract
Using Uncrewed Aerial Vehicles to Estimate Surface Flow	*Conor O'Hara, EA Engineering, Science, and Technology, Inc., PBC*	Abstract
Demonstrating Effective Integration of Unmanned Aircraft Systems (UAS) with Hydrological and Geochemical Monitoring for Mapping Coastal Marshes	*Jin-Si Over, U.S. Geological Survey*	Abstract
Unmanned Aircraft Systems (UAS) Data Collection Methods for Coastal Vulnerability Monitoring in Folly Beach, South Carolina	*Eric Kencel, AECOM*	Abstract
Salon D: Discussion - Empowering Tribal Communities through GIS		
Empowering Tribal Communities Through Geographic Information System (GIS) Training: A Collaborative Partnership Between Mississippi State University and the Bureau of Indian Affairs (BIA)	*Panelists:* • *Dixie Cartwright, Geosystems Research Institute, Mississippi State University* • *John Cartwright, Geosystems Research Institute, Mississippi State University* • *Claire Babineaux, Geosystems Research Institute, Mississippi State University* • *David Vogt, Bureau of Indian Affairs*	Abstract
Salon E: Discussion - Harnessing Partnerships for Coastal Innovation		
Harnessing Partnerships for Coastal Innovation—Driving Data Access and Resilience Through State and National Collaboration*	*Panelists:* • *Leslie Jones, State of Alaska Geospatial Office* • *Kim Jackson, Florida Geographic Information Office* • *Natalie Lee, Georgia Geospatial Information Office* • *Colleen Kiley, North Carolina Center for Geographic Information and Analysis*	Abstract

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Salon F: Topobathy Mapping		
The U.S. Geological Survey's Coastal National Elevation Database (CoNED): Integrated Topobathymetric Models and Applications for the U.S. Coastal Zone and Inland Areas	*Jeffrey Danielson and Matt Cushing, U.S. Geological Survey*	Abstract
From Tropics to Tundra: Topographic/Bathymetric Lidar Data Acquisition in Remote Areas	*Megan Blaskovich, Woolpert*	Abstract
Offshore Topobathy Lidar Mapping in the Gulf of Mexico Waters of Florida	*Stephanie Padilla, Dewberry*	Abstract
Tips on Modeling Sea Level Rise Inundation at Landscape Scales with Local Resolution Elevation Data on Your Laptop	*Doug Newcomb, U.S. Fish and Wildlife Service*	Abstract

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Wednesday, January 29, 2025
2 to 3:30 p.m.

Salon A: Development of Regional Resilience Metrics		
Creating Geospatial Coastal Climate Resilience Indicators: Challenges and Best Practices	*AnnaClaire Marley, ERG*	Abstract
Developing Regional Data Products for Climate Adaptation	*Ben McFarlane, Hampton Roads Planning District Commission*	Abstract
Navigating Resilience: Using a Parcel-Level Resilience Analytics Framework to Address Coastal Flooding and Water Quality Challenges in South Florida	*Erin Rothman, Mareak Labs LLC*	Abstract
Addressing Vulnerabilities Along the Ribault and Trout Rivers in Duval County, Florida: Using GIS Tools and Data-Driven Methodologies	*Ashley Johnson, Jacksonville University*	Abstract
Salon B: Short and Sweet - Ocean Planning–Part 2		
Comparing Vessel Traffic Data for Marine Spatial Planning in the U.S. Central Atlantic	*Kendall Barton, Marine Geospatial Ecology Lab, Duke University*	Abstract
What Ocean Characteristics Drive Exclusion and Suitability in Offshore Wind Siting Models?	*Issac Keohane, CSS Inc. at NOAA's National Centers for Coastal Ocean Science*	Abstract
Exploring the U.S. Integrated Ocean Observing System (IOOS) Model Viewer: A Comprehensive Tool for Ocean Observations and Predictions	*Brenna Vanderplow, NOAA's Integrated Ocean Observing System*	Abstract
Building the Marine Cadastre Hub: Your Trusted Source for Ocean Geospatial Data	*Jacob Mark, Dewberry*	Abstract
Mapping, Monitoring, and Prioritizing Large Marine Debris Removals in Micronesia: A Brief Tour of Wrecks on Reefs	*Robbie Greene, Pacific Coastal Research and Planning*	Abstract

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The West Coast Ocean Health Dashboard Kelp Indicator: Creating Coast-Wide Regional Data Products to Understand Canopy-Forming Kelp Status and Trends	*Laura Bliss, West Coast Ocean Data Portal*	Abstract
Mapping Small-Scale Fisheries: Using Synthetic Aperture Radar (SAR) to Develop a Commercial Fisheries Footprint of the U.S. Caribbean	*Sophie Moyer, Marine Geospatial Ecology Lab, Duke University*	Abstract
Salon C: Bathymetric Mapping and Data Management		
CZMIL SuperNova Performance, Results, and Innovations in a Freshwater Environment	*Ben Babbel, Tetra Tech*	Abstract
Data Pipeline for Consolidation and Management of Seafloor Data	*Jenna Ducharme, Tetra Tech*	Abstract
Bathymetric Lidar Specifications, Expectations, and Reality	*Christopher Macon, U.S. Army Corps of Engineers*	Abstract
Automated Model for Improved Mapping of Country-Scale, High-Resolution Coastal Bathymetry	*Matthew McCarthy, Oak Ridge National Laboratory*	Abstract
Salon D: Discussion - NOAA Climate Resilience Regional Challenge		
NOAA Climate Resilience Regional Challenge: Leveraging partnerships to advance climate resilience	*Panelists:* • *Margaret Morrison, NOAA's Office for Coastal Management* • *Jessica Eason, NOAA's Office for Coastal Management* • *Anastasia Dulskiy, NOAA's Office for Coastal Management* • *Bradley Romine, Hawaii Sea Grant College Program* • *Wendy Stout, Virginia Tech University* • *Richard Buzard, Alaska Native Tribal Health Consortium*	Abstract

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Salon E: Discussion - Pathways to Access		
Pathways to Access—Conversations with Users on Building Useful and Usable Coastal Management Tools*	*Panelists:* • *Lian Plass, American Planning Association* • *Nicole Cropper, NOAA's Office for Coastal Management* • *TBA*	Abstract
Salon F: Coastal Erosion and Shoreline Change–Part 1		
Where's the Beach?	*Nathan de Ropp, AECOM*	Abstract
The JALBTCX Toolbox Framework: User's Guides and Use Cases	*Scott Spurgeon, Engineer Research and Development Center, U.S. Army Corps of Engineers*	Abstract
Geospatial Tools for Characterizing Storm-Driven Geomorphic Change on Sandy Estuarine Beaches	*Aleksandra Ostojic, Engineer Research and Development Center, U.S. Army Corps of Engineers*	Abstract
Geomorphic Characterization of the Lakeshores of Lake Michigan, Lake Ontario, and Lake Superior from Regional Topobathy Lidar Datasets	*Charlene Sylvester, Engineer Research and Development Center, U.S. Army Corps of Engineers*	Abstract

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Wednesday, January 29, 2025
4 to 5 p.m.

Salon A: Wetland Habitat Mapping		
Restoring the San Francisco Baylands: A Framework for Mapping Habitat Progress and Resilience	*Alex Braud, San Francisco Estuary Institute*	Abstract
High-Resolution Salt Marsh Habitat Mapping for New England National Estuarine Research Reserves Using Machine Learning	*Chris Robinson, NV5 Geospatial*	Abstract
Geospatial and Convening Support for Supporting the Development of System Resilience Indicators for Wild Rice in Lake Superior, Lake Michigan, and Lake Huron Great Lakes Restoration Initiative Project	*Renee Walmsley, Tetra Tech*	Abstract
Salon B: Short and Sweet - Using Imagery in Coastal Management		
The Next Generation of Landsat	*David Brostuen, National Geospatial Directorate, U.S. Geological Survey*	Abstract
Benchmarking Novel AI Models for Shoreline Detection	*Tishya Chhabra, Massachusetts Institute of Technology*	Abstract
Species Identification in Coastal Marshes of Chesapeake Bay Using Commercial Satellite Imagery	*Nicole Bartlett, NOAA's National Marine Fisheries Service*	Abstract
Analysis of Recreational Beach Use and Ecosystem Health at Narragansett Town Beach	*Christopher Small, EA Engineering, Science, and Technology, Inc., PBC*	Abstract

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Salon C: Coastal Adaptation Planning		
Implementing Coastal Resiliency Plans	*J.D. Hines, VHB*	Abstract
Water Rises, Water Falls: Scenario Planning for Changing Lake Levels and Climate Change*	*Jenna Moran, Association of State Floodplain Managers*	Abstract
Coastal Community Resilience Immersive Training Program: Reflections on Process, Outcomes, and Next Steps	*Rebecca Ward, Coastal Resilience and Sustainability Initiative, North Carolina State University*	Abstract
Salon D: Discussion - Infrastructure Adaptation		
Infrastructure Adaptation*	*Panelists:* • *Lindsay Brugger, Urban Land Institute* • *Chris DeWitt, VHB* • *Nancy Gassman, City of Fort Lauderdale*	Abstract
Salon E: Natural Disaster Risk Assessments		
FEMA's Coastal Future of Flood Risk Data (FFRD)—Innovative Dataset Conceptualization and Visualization	*Eric Kencel, AECOM*	Abstract
New Assessment of Annualized Tsunami Losses for the United States	*Anne Sheehan, Federal Emergency Management Agency*	Abstract
Using a Tsunami Transfer Function and Hazus 6.1 to Calculate Average Annualized Building Losses for Pacific States	*Christopher Siverd, Moffatt & Nichol*	Abstract

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Salon F: Coastal Erosion and Shoreline Change–Part 2		
Hard Stabilization Structures Along Lake Erie's Coast: High-Resolution Analysis of the True Extent of Shoreline Armoring in Ohio's Coastal Counties	*Emma Bouie, Office of Coastal Management, Ohio Department of Natural Resources*	Abstract
Tools for a Sustainable Coastal Ecosystem Restoration	*Syed Khalil, CPRA*	Abstract
Integrating Behavioral Science with Spatial Modeling to Target Nitrogen Fertilizer Reduction Programs	*David Dickson, Center for Land Use Education and Research, University of Connecticut*	Abstract

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Thursday, January 30, 2025
9 to 10:30 a.m.

Salon A: Data, Models, and Tools for Sea Level Rise, Coastal Flooding, and Erosion Vulnerability–Part 1		
Regional Innovations in Resilience: Leveraging GIS for Effective Flood Management in the Tampa Bay Region	*Samuel Amoako-Atta, Halff*	Abstract
Assessing Flood Vulnerability for Road Network Asset Management in Coastal Georgia	*Alexander Boland, University of Georgia*	Abstract
The North Carolina Department of Transportation's Coastal Resilience Initiatives and Innovations—Focus on Sea Level Rise Impacts on Wave and Scour Impacts to Bridges	*Kurt Golembesky, North Carolina Department of Transportation*	Abstract
A Tool to Estimate and Communicate Coastal Probabilistic Flood Damages and Losses	*Jeff Gangai, Dewberry*	Abstract
Salon B: Geospatial Tools in Coastal Management		
Monitoring Coral Reef Ecosystems with ArcGIS Field Maps and Dashboards	*Ken Buja, NOAA's National Centers for Coastal Ocean Science*	Abstract
The Urban Sea: A StoryMap About the Long Island Sound Watershed and Its People	*Cary Chadwick, Center for Land Use Education and Research, University of Connecticut*	Abstract
Integrating Google Earth Engine with ArcPro for No-Code Geospatial Analysis	*Zhifei Dong, Tellus Consulting LLC*	Abstract
The Great Marine Minerals Migration: Reforging the Back and Front Ends of an Established GIS in the Cloud and ArcGIS Online (AGOL), Respectively	*Emily Sandrowicz, NV5 Geospatial*	Abstract

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Salon C: Marine Spatial Planning		
Insights from Regional Spatial Data Development Workshops for Marine Spatial Planning	*Jessica Carlton, CSS Inc. at NOAA's National Centers for Coastal Ocean Science*	Abstract
Proactive Planning: Using Spatial Modeling to Inform Future Offshore Wind Energy Transmission Planning in Stellwagen Banks National Marine Sanctuary	*Alyssa Randall, CSS Inc. at NOAA's National Centers for Coastal Ocean Science*	Abstract
Challenges and Opportunities of Colocation of Offshore Aquaculture and Offshore Wind Farms in the United States	*Dr. Jessica Couture, CSS Inc. at NOAA's National Centers for Coastal Ocean Science*	Abstract
Marine Cadastre: The Foundational Data Platform for Marine Spatial Planning	*Daniel Martin, CSS Inc. at NOAA's Office for Coastal Management*	Abstract
Salon D: Discussion - Resilience Partnerships Matter and It Matters How We Measure Resilience		
Resilience Partnerships Matter and It Matters How We Measure Resilience	*Panelists:* • *Rebecca Beavers, U.S. Department of Transportation* • *Kevin Zhang, U.S. Department of Transportation* • *Christine Addison Buckel, NOAA's National Centers for Coastal Ocean Science* • *Heidi Stiller, NOAA's Office for Coastal Management* • *Chief Devon Parfait, Environmental Defense Fund and Grand Calliou/Dulac Band of Biloxi-Chitmacha-Choctaw*	Abstract

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Salon E: Discussion - Turning the Tide: Collaborative Efforts to Strengthen Alaska's Coastal Resilience		
Turning the Tide—Collaborative Efforts to Strengthen Alaska's Coastal Resilience*	*Panelists:* • *Leslie Jones, State of Alaska Geospatial Office* • *TBA, Alaska Native Tribal Health Consortium* • *Alex Nereson, U.S. Geological Survey's Pacific Coastal and Marine Science Center* • *Maya Hayden, U.S. Geological Survey's Pacific Coastal and Marine Science Center* • *Nathan Wardwell, JOA Surveys*	Abstract
Salon F: Discussion - Enhancing Coastal Management Application with InSAR Vertical Land Motion Data		
Enhancing Coastal Management Applications with InSAR Vertical Land Motion Data	*Panelists:* • *Mike Aslaksen, NOAA's National Geodetic Survey* • *Jamie Carter, NOAA's Office for Coastal Management* • *Sara Del Conte, TRE ALTAMIRA* • *Simone Fiaschi, TRE ALTAMIRA*	Abstract

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Thursday, January 30
11 a.m. to 12:30 p.m.

Salon A: Mapping and Monitoring Shorelines		
Examples of Restoration Stewards Utilizing Survey Techniques and Indigenous Knowledge to Drive Conservation in Hawaii	*Andrew McGowan, Lynker at NOAA's Office for Coastal Management*	Abstract
Determining Shoreline Migration Rates with a Change-Point Detection Model	*David Forrest, William & Mary's Batten School of Coastal & Marine Science and the Virginia Institute of Marine Science*	Abstract
Advancing Shoreline Interpretation and Intertidal Zone Monitoring with Capella Synthetic Aperture Radar (SAR) Imagery Using Cutting-Edge Geospatial Tools	*Kyle Goodrich, TCarta*	Abstract
Looking Below the Surface: An Update on Benthic Habitat Mapping in the Great Lakes	*Lara O'Brien, Lynker at NOAA's Office for Coastal Management*	Abstract
Salon B: The Use of Visualizations and Virtual Reality in Risk Communication and Conservation		
Developing More Effective Visualizations for Communicating Storm Risk	*DJ Bromley, Pennsylvania State University*	Abstract
Collaborating for Resilience: Flood Visualizations and Community Conversations in Wilmington	*Dan Rizza, Climate Central*	Abstract
Using Augmented Reality to Communicate Risks: Example Applications to View Flood Events	*Al Souid, WSP USA*	Abstract
Using Virtual Reality to Teach Habitat Conservation: Expanding Access to Global Ecosystems	*Ryan Walker, Mississippi State University*	Abstract

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Salon C: Artificial Intelligence and Deep Learning		
Geospatial Applications of AI for Object Detection in Remotely Sensed Imagery	*Cassidy Barkalow, Blue Marble Geographics*	Abstract
Using Deep Learning to Extract Hydrographic Features from Lidar Data	*Colin Flynn, Dewberry*	Abstract
Designing a Large Language Model to Support Dredging Activities	*Ross Winans, NV5 Geospatial*	Abstract
Open Discussion on AI Development for Coastal Applications	*Moderator: Brandon Krumwiede, NOAA's Office for Coastal Management*	-
Salon D: Data, Models, and Tools for Sea Level Rise, Coastal Flooding, and Erosion Vulnerability–Part 2		
I-ADAPT: A Tool to Mitigate Flooding, One Property at a Time in Delaware*	*Jordana Cutajar, Delaware Department of Natural Resources and Environmental Control*	Abstract
Coastal Hazard Modeling and Risk Assessment for Adaptation Planning	*Cheryl Hapke, Fugro*	Abstract
Updating a Parcel-Scale Quantitative Sea Level Rise Vulnerability Assessment for Puget Sound, Washington State	*Ian Miller, Washington Sea Grant*	Abstract
Leveraging Federal Datasets to Assess Inundation Vulnerability of US-1 in the Florida Keys	*Sarah Woolard, Dewberry*	Abstract
Salon E: Short and Sweet - Infrastructure Vulnerability		
Creating GIS Datasets of Transportation Infrastructure Vulnerability for Hazard Mitigation Planning in Low-Capacity Communities	*Kevin Autry, Clemson University*	Abstract
An Interactive Tool to Communicate the National Flood Insurance Program's (NFIP) New Pricing Approach to Property Owners in Hampton Roads	*Emma Corbitt, Hampton Roads Planning District Commission*	Abstract

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Only the person presenting at the conference is listed, the entire list of project partners is included with the presentation abstract.

Use of Geospatial Applications in Enhancing Resilience of the Coastal Forestry Sector	*Kate Grala, Mississippi State University*	Abstract
Streamlining a Flood Impact Assessment Using GIS, PostgreSQL, and Open-Source Tools	*Jesse Nelson, Dewberry*	Abstract
Mapping Nuisance Flooding Days – Simple but Effective Information	*Keil Schmid, Geoscience Consultants, LLC*	Abstract
U.S. Geological Survey: Tools for a Changing World	*Michael Slattery, United States Geological Survey*	Abstract
The Economy and Flood Vulnerability for Essex County, Massachusetts	*Charlotte Tierney, Lynker at NOAA's Office for Coastal Management*	Abstract
Salon F: Short and Sweet - Community Engagement in Coastal Management		
Coordinating Diverse Stakeholder Groups to Improve Coastal Hazard Forecasting and Prevention	*Mary Ford, Mid-Atlantic Regional Association Coastal Ocean Observing System*	Abstract
Addressing Barriers to Coastal Resilience: Stakeholder Engagement on Nature-Based Solutions	*Shu-Mei Huang, South Carolina Sea Grant Consortium*	Abstract
Enhancing Coastal Resiliency: Integrating Geospatial Data and Stakeholder Insights in the Texas Coastal Resiliency Master Plan	*Nathalie Jung, AECOM*	Abstract
Design Science-Based Tools for Coastal Resilience	*Dave Michelson, National Environmental Modeling and Analysis Center, University of North Carolina Asheville*	Abstract
Won't You Be a Good Neighbor? Advancing Floodplain Management Resources for Coastal Communities*	*Allie Pouliot, Association of State Floodplain Managers*	Abstract
We Tried to Do Ten Things with AI. Some of Them Worked.	*Wes Shaw, MyCoast*	Abstract
Implementation of a Jurisdictional Socioeconomic Field Data Collection Program to Inform NOAA's Coral Reef Conservation Efforts	*Alexander Swain, Eastern Research Group*	Abstract

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Special Interest Meetings

Advancing Science and Service with NOAA's New Flood Inundation Maps, Economic Data, and the Coastal Inundation Community of Practice

NOAA scientists are striving to better understand both the flood inundation mapping capabilities and the economic effects of coastal flooding to build resilience and improve delivery of services to the public and businesses. This special interest meeting will introduce participants to potential applications of new social science datasets, visualization tools, and the coastal inundation community of practice as a network for continuous engagement. First, this session will provide an overview of the real-time flood inundation mapping (FIM) services from the National Weather Service hosted on the new National Water Prediction Service site. These maps are event-based, graphic depictions of forecasted flood waters and intended to address the need for flood information for a variety of decision-makers with upcoming expansion to coastal regions. Second, we will describe the new Employment in Coastal Inundation Zones dataset and visualization tool rolled out in November 2024. Lastly, this session will share an overview of the Coastal Inundation Community of Practice, a national network of practitioners that facilitates peer-to-peer learning, information exchange, and collaborative engagement to advance coastal flooding science, knowledge, and solutions and allows for continued future engagement with NOAA on flooding challenges and gaps.

The Future of the U.S. Mapping Coordination Site

Ocean and coastal mapping data (e.g., seafloor characteristics, depth, topography, bottom type, geology) are critical to ensuring safety of navigation, assessing the impacts of coastal hazards, improving our understanding of ocean resources, and supporting the conservation, management, and balanced use of our oceans. These data are fiscally and logistically challenging to collect, often requiring collaboration on funding and priorities from multiple entities. NOAA's Integrated Ocean and Coastal Mapping (IOCM) program champions coordination and partnership across the entire mapping lifecycle, including funding, survey planning, data acquisition, data processing, data management, and data sharing for maximum use under the driving theme of "Map Once, Use Many Times."

The U.S. Mapping Coordination site is a central resource for interagency and external stakeholder mapping data needs and requirements, mapping priorities, and mapping data acquisition plans. The site will be moving away from the Seasketch platform in early 2025 which presents opportunities for the ocean, coastal, and Great Lakes mapping communities, especially those associated with regional mapping campaigns, to shape the site's future and functionality.

In this session, NOAA's Integrated Ocean and Coastal Mapping team will provide an overview of the current site and some of its functionality and content. The team will then facilitate a discussion among participants about potential improvements to help inform the future of the U.S. Mapping Coordinate site. We will look at examples of other mapping coordination tools as well as discuss current mapping coordination challenges that the revamped website will address. Attendee feedback will influence the site redesign, and attendees will walk away with a clearer understanding of potential pathways to improve mapping coordination across all stakeholder groups.

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FutureScape Resilience Simulation

FutureScape is a serious game designed to elicit human behavior in the face of climate change and simulate real-world policy deliberations under conditions of imperfect information, limited resources, and pressing time constraints. Players navigate future scenarios informed by real scientific data and models. FutureScape implements the Resist-Accept-Direct (RAD) framework, a decision-making tool adapted from real-world strategies to address ecological changes.

FutureScape was designed by an interdisciplinary team of coastal resilience and geospatial scientists, coastal planning specialists, and engagement and storytelling experts. The game debuted at an April 2024 workshop titled "Envisioning Transformations in North Carolina's Coastal Plain," which brought together experts from academia, state government, and nongovernmental organizations to collectively envision a just, sustainable, and resilient future for North Carolina's coastal plain.

Overview of National Geodetic Survey Tools and the Modernized National Spatial Reference System

In the next few years, the coordinates for every survey, map, lidar point cloud, aerial image, digital elevation model, and other critical geospatial dataset and product will be outdated. For the first time in over 30 years, NOAA's National Geodetic Survey will release a modernized version of the National Spatial Reference System, the authoritative system that defines latitude, longitude, heights, and the national shoreline and serves as the foundation for all U.S. federal maps and geospatial products. Not only will the modernized system provide benefits worth billions of dollars through increased accuracy, national consistency, workflow efficiency, and data interoperability, federal law requires that federal agencies comply with this type of accepted scientific standard. This change will have far-reaching implications for the use of federal funds for surveying, mapping, and production of geospatial products. Evaluating and addressing the impacts of these changes for existing data, products, and geospatial workflows will require time and resources, so now is the time to plan for the transition to the modernized system.

Uncrewed Aircraft Systems (UAS) for Coastal Research and Management

Uncrewed Aircraft Systems (UAS) provide a range of remote sensing solutions for observing and mapping the coastal zone. Advancements in UAS technologies offer unprecedented opportunities for capturing data in a flexible and user-defined manner. Sensors, platforms, navigation systems, mission-control software, and post-processing tools continue to improve and expand our ability to map a wide range of coastal contexts, from urban settings to natural beaches, bluffs, dunes, and marshes. Lidar sensors are smaller, more powerful, and now capable of returning bathymetry data, in addition to topography, enhancing our ability to conduct marsh restoration projects where it is important to reveal microtopography and model tidesheds. Optical sensors allow us to acquire multispectral imagery and generate orthoimagery for feature detection or media campaigns; however, successful application of these technologies requires a nuanced understanding of its requirements, capabilities, and limitations. As small-scale UAS data collection grows, it is important that we connect with others to understand various collection and processing methods and data storage and sharing solutions. Participants will hear from practitioners who have successfully applied UAS to coastal projects around the country. Then, participants will share their experiences with UAS, so others can learn about the best practices, challenges, and successes of using these exciting and innovative technologies for coastal research and management.

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Navigating Various Changing Water Level Tools

Learn about new water level–related data products, tools, and web resources in an interactive format during this special interest meeting, hosted by subject matter experts from NOAA's Office for Coastal Management and Center for Operational Oceanographic Products and Services (CO-OPS). This session will demonstrate recent improvements on climate services focused around sea level change and coastal flooding that will support coastal communities with planning and risk assessment. This will be a three-hour interactive session using the newly released U.S. Sea Level Change site and Sea Level Calculator as a jumping off point to help users explore more in-depth resources on tidesandcurrents.noaa.gov and the Digital Coast. The session will include short presentations and demonstrations on tools and resources with follow-up exercises for users to explore the tool or resource and ask a few questions or complete tasks specific to their location. Attendees are encouraged to bring a laptop to fully participate in the activities. Other tools that may be presented include the Sea Level Rise Viewer, Lake Level Viewer for the U.S. Great Lakes, Coastal Inundation Dashboard, High Tide Flooding Outlooks, Extreme Water Levels, and CO-OPS API Builder.

Tribal and Indigenous Technical Assistance Coordination and Planning

Though many state and federal groups have improved their support of Tribal and Indigenous nations in recent years, Tribal and Indigenous nations remain generally underserved by these agencies. One glaring need is improved coordination between these various funding and technical assistance groups, so they can learn from Tribal and Indigenous nations, share lessons learned, and work together to increase the amount and improve the quality of technical assistance provided to Tribal and Indigenous nations. This session will bring together key actors in the coastal management community to discuss past technical assistance, share successes and failures, provide suggestions from Tribal and Indigenous partners, and brainstorm a path forward for improving technical assistance and coordination in the future. This will be a learning and brainstorming session andalso a gathering place for attendees interested in this issue to further develop relationships and create a stronger, more well-connected community.

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Engaging Users in Data and Tool Development

Community-Driven Coastal Resilience: From Restoration to Adaptation

Carla Avila-Martinez and Alex Mignogna, Surfrider Foundation

Coastal ecosystems and communities face unprecedented threats from climate change, including rising seas, coastal erosion, habitat degradation, and extreme weather events. In response, the Surfrider Foundation has developed a multi-faceted, community-driven approach that equips local communities to take meaningful action through grassroots restoration and complex coastal adaptation planning projects.

This presentation will explore Surfrider's Climate Action Program, fostering community-led habitat restoration projects. In its first year, Surfrider's Climate Action Program had already engaged volunteers in over 100 coastal restoration efforts—restoring dunes, mangroves, and other critical ecosystems. These grassroots efforts are led by local communities, including residents, students, and businesses, and serve as a key strategy for enhancing coastal resilience against the impacts of climate change. Carla Avila-Martinez will share lessons learned from these hands-on restoration efforts, highlighting how community engagement and partnership building are critical to sustaining long-term resilience along our coasts.

Zooming out, we will also discuss Surfrider's approach to large-scale coastal adaptation planning. Traditional adaptation efforts often overlook the importance of deep community involvement from the onset, treating engagement as a formality rather than a pillar of success. Surfrider's approach prioritizes a radically inclusive dialogue with diverse stakeholders—including Tribal representatives, preservation groups, and state and federal agencies—to build trust and foster collaboration. Drawing from successes at Surfers' Point in Ventura, CA, and current efforts at San Onofre in San Diego, CA, Alex Mignogna will highlight how early and meaningful involvement of local communities has transformed historically contentious coastal management planning into shared, actionable visions for resilient coastlines.

Combined, these efforts create a replicable framework for practitioners, policymakers, and stakeholders, offering insights into how community-led restoration and adaptation can work in tandem to protect coastlines and ensure that the wants and needs of local communities are prioritized with environmental preservation.

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Digital Coast Act: Accomplishments and Reauthorization

John Palatiello, U.S. Geospatial Executives Organization, Miller Wenhold Capitol Strategies, and Digital Coast Partnership Advocacy Coalition; Jeff Lovin, Woolpert

The Digital Coast Act, Public Law 116-223, passed Congress and was signed into law on December 18, 2020. This legislation elevated the Digital Coast activity from a NOAA Office for Coastal Management project to a fully Congressionally authorized constituent-driven program to provide a digital information platform capable of efficiently integrating coastal data with decision-support tools, training, and best practices and to support collection of priority coastal geospatial data to inform and improve local, State, regional, and Federal capacities to manage the coastal region, and for other purposes. The law authorized the program through fiscal year 2025 and will therefore expire on September 30, 2025. This presentation will highlight some the successes and accomplishment of Digital Coast over the past four years, the benefits to partners and stakeholders, as well as the activities and services performed by private sector geospatial firms in support of the program, and provide a preview and discussion on reauthorization legislation that Congress will consider to extend the program beyond 2025.

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Engaging Users in Data and Tool Development

Public Perceptions of Nature-Based Coastal Solutions in the United Kingdom

Avidesh Seenath, Environmental Change Institute, University of Oxford; Scott Mark Romeo Mahadeo, University of Portsmouth; Jade Catterson, Coventry University

Coastal scientists are increasingly advocating for nature-based coastal solutions (NBCS) to ensure long-term coastal sustainability. Implementing NBCS will change coastal landscapes, necessitating consultation with the wider public as such changes directly affect the socio-cultural values of coastal zone residents and users. We, therefore, investigate public willingness to support, preferences, and perceived effectiveness of coastal management solutions, nature-based and otherwise, focusing on the UK as a case study. We do this through an online survey of >500 UK residents, capturing their demographics, place of residence, and coastal management perceptions. We apply inductive coding, statistical, and geospatial techniques to analyse our survey data. While we find consensus on the need for coastal management, there is divergent coastal management preferences and perceptions: NBCS are most preferred while hard defences are considered most effective. We find that people with coastal management and/or engineering experience are more convinced by NBCS effectiveness, while coastal residents believe in hard defences. Although NBCS may have several environmental benefits (e.g., coastal protection, carbon sequestration, greater biodiversity), we find that public knowledge on their likely effectiveness is limited. We, hence, argue for more local stakeholder engagement on NBCS, through systems mapping, towards developing more robust and inclusive coastal management policies.

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Engaging Users in Data and Tool Development

Creating Better Coastal Resources GIS Viewer Experiences for the Nonprofessional User

Nicholas Wellbrock, AECOM

Public-facing GIS viewers used to distribute information on coastal resources and resiliency projects provide a valuable tool for both the general public and resource managers, enabling data exploration and decision-making potential. However, the variable and complex components of modern-day coastal management projects often throw less experienced users into the deep end, with little guidance on the individual meaning of the data and its broader context among other coastal datasets. Being able to properly contextualize this information in today's world of quickly changing climates and environments is crucial to increasing awareness for coastal resiliency efforts. Our team frequently experiments with a storytelling approach combined with GIS data viewers to provide the necessary context within the ever-growing field of coastal resiliency. This method avoids overwhelming less experienced users or excluding data for advanced users, while providing a primer on the topic. Much of our current approach involves a brief, summarized, layperson-friendly narrative to provide essential information so that a wider audience can utilize the data to their benefit, whether that be a citizen seeking to inform themselves on a project at their favorite beach, or a resource manager driving decision-making efforts within their area of interest. This presentation will demonstrate how the integration of a thoughtfully constructed narrative, typically derived from resource management plans and documents, onto platforms like ArcGIS Experience Builder and StoryMaps can facilitate an improved user experience and better understanding of both region wide and location specific coastal resource projects. In addition, we will further discuss the dos and don'ts of storytelling process, inclusion of contextual information, and targeting the necessary audiences without excluding other. With this pairing, we aim to continue producing users who are educated on their topic and can interpret the data they are exploring correctly, thus avoiding misconceptions, and enabling better decision-making when necessary.

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Short and Sweet: Benthic Characterizations

Discover Your Data's Depth: ArcGIS Bathymetry and its Role in Seafloor/Habitat Classification
Meredith Payne, Esri

ArcGIS Bathymetry offers a geo-enabled, scalable, user-friendly solution for managing bathymetric data. It supports multiple data types, provides intuitive interfaces, and the ability to customize metadata, allowing for quick creation of custom bathymetric surfaces and on-the-fly data extraction for applications such as seafloor mapping. Here we will present an overview of ArcGIS Bathymetry and demonstrate the advantages of adding auxiliary data alongside bathymetric data in a Bathymetric Information System (BIS).

We will show a potential use case where data are extracted to compose a custom bathymetric surface for use in seafloor classification and habitat mapping in a region of the Florida Keys. Various classification methods will be explored and reviewed. Classification results will be compared with ground truth observations, and implications discussed.

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Short and Sweet: Benthic Characterizations

Improving Seafloor Characterization via Grain Size Analysis with Low-Cost Imagery

Mark Borrelli and Sean Terrill, University of Massachusetts, Boston; Agnes Mittermayr and Bryan Legare, Center for Coastal Studies

Bottom grab samplers have long been the standard to describe nearshore marine habitats both qualitatively and quantitatively. However, all small, sediment samplers are designed to collect specific grain sizes and therefore have biases towards those sediments. Here we discuss seafloor characterizations based on grain size analysis alone vs grain size analysis augmented with quantitative benthic imagery. We also use both datasets to inform a prevalent benthic habitat classification system. The Coastal and Marine Ecological Classification Standard (CMECS) was used to test this hypothesis. Photography has been utilized for many decades in benthic ecology but have rarely been employed in habitat classification using CMECS. The objective of this study is to classify a roughly 1 km2 subtidal area within Herring Cove in Provincetown, MA with CMECS, and to quantify the benefit of augmenting classification with low-cost imagery.

A benthic habitat survey of the study area included grab sampling for grain-size analysis and invertebrate taxonomy, benthic imagery, water quality sampling at 24 sampling stations, as well as acoustic mapping of the study area. Results showed that benthic imagery improved classification and mapping of CMECS components. Furthermore, the classification of habitats and biotopes were improved using benthic imagery data. These findings imply that the incorporation of low-cost benthic imagery is warranted in coastal benthic biotope classification and mapping studies and should be regularly adopted. This study has implications for coastal benthic ecologists classifying benthic habitats within the CMECS framework.

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Short and Sweet: Benthic Characterizations

Coastal Ecosystem Map Application Platform (CEMAP)
Stefan Claesson, Nearview

The Coastal Ecosystem Map Application Platform (CEMAP) is an open-access, online application designed to explore and analyze coastal and intertidal ecosystems and resources. It provides a range of features and data to support coastal communities, resource managers, conservation organizations, marine industries (such as wild seaweed and shellfish harvesting, aquaculture, and marine insurance), as well as researchers and scientists in making accurate assessments and informed decisions. This presentation will showcase the various components of CEMAP, including how to quickly access coastal ecosystem data across different geographic scales, explore dynamic graphs and data through dashboards, and interact with spatial data in map views. Specifically, we will demonstrate how to navigate three modular interfaces: 1) intertidal and farmed seaweeds, 2) site suitability for coastal nature-based solutions, 3) high-resolution shorelines (HAT, MHHW, MHW, MLLW, MLW).

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Short and Sweet: Benthic Characterizations

Updating the Coastal and Marine Ecological Classification Standard (CMECS)

Kate Rose, Northern Gulf Institute, Mississippi State University; Matt Dornback, NOAA's Office for Coastal Management

The Coastal and Marine Ecological Classification Standard (CMECS) provides a common language and data classification framework that enables consistent and comprehensive ecological characterizations across a complete continuum of the aquatic system, from coastal zones to the depths of the oceans. This approach can be universally applied to all types of data, and has been used for over a decade by individual projects and programs to meet a variety of objectives. Ultimately, the utility of CMECS is the framework's ability to facilitate a broader understanding of aquatic ecosystems through data classification and sharing, which can inform research and resource management.

CMECS has been endorsed by the U.S. Federal Geographic Data Committee (FGDC) as the national ecological classification standard since 2012, and is undergoing a recommended periodic review and update. This ensures that CMECS will remain relevant as data collection and analysis technologies evolve, and as new discoveries about marine environments and organisms are made. Improvements proposed by the CMECS user community have been evaluated by expert work groups and reviewers, resulting in the adoption of several changes to the Substrate, Biotic, and Geoform Components and Modifiers. These changes range from minor editorial corrections and clarifications to adding, modifying, and rearranging units. We will present an overview of these changes, the process and rationale for adopting or rejecting proposed changes, introduce new tools and resources, and provide guidance for how to use and reference the new versions.

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Short and Sweet: Benthic Characterizations

Application of the Coastal Marine Ecosystem Classification System (CMECS) to Create Benthic Geologic Habitat Maps for Portions of Acadia National Park, Maine

Bryan Oakley, Eastern Connecticut State University

The Coastal and Marine Ecological Classification Standard (CMECS) was applied to four portions of Acadia National Park, USA, focusing on intertidal and shallow subtidal rocky and tidal flat habitats. The four study areas varied in relative wave energy and benthic habitat characteristics. Side-scan sonar coupled with multi-phase echo sounder bathymetry are the primary data sources used to map the seafloor, coupled with underwater video imagery and surface grab samples for grain size and macrofaunal analysis. The CMECS Substrate, Geoform, and Biotic components were effective in describing the study areas. However, integrating the CMECS components to define Biotopes was more challenging due to the limited number of grab samples available and because the dominant species within a given map unit is largely inconsistent. While Biotopes ultimately could not be defined in this study, working within the CMECS framework to create statistically significant biotopes revealed the complexity of these study areas that may otherwise have been overlooked. The overall results demonstrates the effectiveness of the CMECS classification, including the framework's ability to be flexible in communicating information, however the focus of this presentation will be on the interpretation of the substrate and geoform components.

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Short and Sweet: Benthic Characterizations

Seascapes of the Gulf of Maine: Automated Geomorphon Classification of the Seabed

Matt Dornback, NOAA's Office for Coastal Management; Mary Jo Watson, Tetra Tech; Mark Finkbeiner, NOAA's Office for Coastal Management; Joanna Hobson, Tetra Tech

The Gulf of Maine is experiencing an increase in demand for ocean-related projects. The number of proposed projects that cross multiple state jurisdictions continues to grow. To help people make the best decisions possible when it comes to this important natural resource, NOAA's Office for Coastal Management funded and coordinated the development of a mapping product that can help inform the planning process. The seascape map was developed using the seamless BlueTopo data from NOAA's Office of Coast Survey, a compilation of existing bathymetric surveys. Together, these map products show how interrelating seafloor components and habitat areas across the region are distributed.
This presentation will delve into the process of making the Seascape geomorphon maps using ArcGIS Pro, the bathymetry- and reflectivity-based estimator for seafloor segmentation (BRESS), the Coastal and Marine Ecological Classification Standard (CMECS), and regional expert inputs. A comparison of some of the benefits and pitfalls of the methods used for the Seascape project versus alternative methods will also be discussed. This will highlight the growing options available in automated geomorphon classification.

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Short and Sweet: Benthic Characterizations

Pilot Framework for Fish Habitat Assessments Across Tidal and Nontidal Waters in the Patuxent River Basin

Hannah Nisonson, Consolidated Safety Services; Alexander Kiser, U.S. Geological Survey; A.K. Leight, Cooperative Oxford Laboratory, NOAA; Benjamin Gressler and John Young, Eastern Ecological Science Center, U.S. Geological Survey

Fish habitat assessments attempt to relate past, current, or future landscape conditions to the state of fish species occurrence, distribution, abundance, or community and habitat condition in streams, rivers, or estuaries. In this project, National Oceanic and Atmospheric Administration (NOAA) and U.S. Geological Survey (USGS) researchers created a seamless freshwater to tidal spatial framework to allow assessments that integrate influences on fish habitat for the entirety of the watershed. This effort began when the Chesapeake Bay Program's Fish Habitat Action Team expressed interest in a Baywide fish habitat assessment spanning tidal salt, tidal fresh, warm non-tidal, and cold non-tidal waters. However, the complexity of implementation details to consider when developing such an assessment necessitated the need for a tributary-specific pilot assessment. To conduct this pilot assessment, the NOAA/USGS joint partnership was formed with cooperation and support from the Chesapeake Bay Agreement and Chesapeake Bay Fish Habitat Action Team (FHAT). The developed spatial framework in this project bridges both tidal and non-tidal environments. The promising results from the pilot assessment shows that this framework could potentially serve as a powerful tool in whole watershed assessments.

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Remote Sensing of Wetlands

Mapping Coastal Marshlands with Topobathymetric Lidar

Evan Carlson, Whiteout Solutions

In Spring 2023, Whiteout Solutions embarked on an ambitious and ecologically significant project to map over 14,000 acres of Connecticut's protected coastal marshlands with UAS and helicopter based topobathymetric LiDAR. The project objectives were to establish a baseline elevation dataset for monitoring and validation habitat restoration techniques crucial for maintaining biodiversity in these sensitive areas.

Bird species such as saltmarsh sparrow are declining, and declines of other species are expected as marshes flood more frequently and marsh vegetation changes. Habitat transitions occur along a very shallow elevation gradient in tidal marshes, and because sea level rise is predicted to occur at rates of ~3 mm per year in New England, elevation data needs to be of high precision to understand how future conditions may alter the plant communities of tidal marshes.

At the heart of the data collection process was the Riegl VQ840 GL topobathymetric LiDAR scanner. This scanner provided detailed topobathymetric data, 200 elevation points per square meter of the marsh, intertidal zones, and channels. Complementing the LiDAR scanner was a hyperspectral line scanning sensor capturing detailed spectral information, enabling the identification of various marshland vegetation types and conditions.

The final data products will include high resolution terrain models that showcase microtopography and vegetation land cover maps to be used for habitat assessments. These will serve as invaluable tools for environmental scientists, conservationists, and policy makers, aiding in ongoing efforts to monitor, preserve, and restore Connecticut's precious coastal marshlands. Continued innovations in remote sensing and unmanned aerial systems, are giving us the ability to conduct timelier and high resolution surveys and soon may translate to highly impactful solutions for resiliency.

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Remote Sensing of Wetlands

Remote Sensing in Support of Ecosystem Restoration Monitoring: A Case Study at Two Wetland Restoration Sites in Coastal Louisiana

Molly K. Reif, Aaron N. Schad, Justin L. Shawler, Aleksandra Ostojic, Lynde L. Dodd, Katie L. Vasquez, Christopher L. Macon, and Joseph H. Harwood, U.S. Army Corps of Engineers, Engineer Research and Development Center, Environmental Laboratory, Coastal and Hydraulics Laboratory, and Joint Airborne Lidar Bathymetry Technical Center of Expertise

Monitoring ecosystem restoration is critical for determining whether restoration goals, including habitat improvement, have been met as planned and designed. Monitoring plans are typically developed to aid in adaptive management decision-making with defined project performance criteria. They include plans to assess restoration performance through the characterization, measurement, assessment, and quantification of metrics describing the condition of vegetation, geomorphology, hydrology, wildlife, etc. Yet, monitoring remains challenging, especially considering responses to hazards, disturbances, and management or operational activities. Traditional field-based survey methods are often used in restoration monitoring, although they face challenges in dynamic wetland and coastal habitats. Such challenges include limited site accessibility, large or complex sites, and remote locations, which can result in field surveys that are limited to accessible areas only. Such spatially-limited and discrete data may not accurately capture conditions within and surrounding a project footprint. Thus, restoration practitioners are seeking ways to use remote sensing technology to augment and complement field-based methods. Such technology can be used to comprehensively monitor project changes and quantify environmental or habitat benefits and impacts across expansive and hard-to-access project sites. However, given the inherent temporal and spatial complexities with project monitoring and challenges with adapting new technologies, remote sensing technology may go underutilized for this application. This presentation will highlight the use of unmanned aircraft system (UAS) and other remote sensing data for characterizing U.S. Army Corps of Engineers (USACE)-prioritized coastal geomorphic and vegetation metrics at two ecosystem restoration sites in coastal Louisiana. More specifically, it will showcase technical methods for evaluating and comparing field survey and UAS data and analysis to: 1) assess site elevation, shoreline position, and shoreline classification; 2) conduct virtual vegetation plot surveys to identify vegetation growth form, species, and cover; and 3) evaluate image classification and machine learning to identify vegetation types.

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Remote Sensing of Wetlands

Developing a Protocol to Enhance Tidal Wetland Vegetation Monitoring with Drones
Justin Ridge and Kerryanne Newman, North Carolina Coastal Reserve and National Estuarine Research Reserve; Cristiana Falvo, Ramboll; Charles Deaton, North Carolina Division of Marine Fisheries; Brittany Morse, University of North Carolina Wilmington; Erik Smith, University of South Carolina; Brandon Puckett, NOAA's National Centers for Coastal Ocean Science

The National Estuarine Research Reserve System (NERRS) has emphasized the long-term monitoring of wetlands through its System-wide Monitoring Program (SWMP). Over the past few decades, this wetland monitoring has been accomplished through conventional field-based surveys at m2 permanent plots. Remote sensing through Uncrewed Aircraft Systems (UAS, drones) is an emerging tool with the potential to provide high quality data for traditional ground-based wetland monitoring metrics at landscape scales. We conducted a regionally coordinated effort in tidal wetlands in six NERRs across the Southeast and Caribbean to assess the accuracy and precision of UAS for generating critical tidal wetland monitoring metrics including: elevation models, vegetation canopy height, vegetation percent cover, ecotones and above-ground biomass. Accuracy was assessed relative to field-based measurements. Precision was assessed as reproducibility of results generated by different team members. UAS-based measurements produced varying levels of accuracy for different measures (e.g., digital elevation models and canopy height estimates were found to be inaccurate, while NDVI values were well correlated with above ground biomass of Spartina alterniflora). As part of the project we developed a UAS-based wetland monitoring protocol to guide the collection, processing and analysis of UAS imagery. This project served as a critical first step for the integration of UAS-based wetland monitoring into the SWMP toolkit. The protocol is now being tested at several other NERR sites around the nation for further refinements and expansion.

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Remote Sensing of Wetlands

High-Resolution Remote Sensing for Connecticut's Marshes

Emily Wilson, University of Connecticut; Min Huang, Connecticut Department of Energy and Environmental Protection

Recently, Connecticut collected extremely high resolution remotely sensed data for 120 tidal marshes covering almost 18,000 acres along the Connecticut coast. The objective is to establish a baseline dataset of the topographic and land cover features in the coastal and riverine marshlands at a high enough resolution to provide a benchmark to measure and track changes over time.

Both drones and low altitude helicopter collected the 3 cm spectral imagery (10 bands) and topobathy lidar (minimum of 100 points/sq m with RMSE of 3.5 cm or better). From those, derived products include five spectral indices, land cover, a digital terrain model, a digital surface model, and contours.
The collected datasets have many uses. For one, they support science like understanding changes to habitats due to sea level rise and identifying degraded marshes. Second, they can inform planning and monitoring for conservation and resilience projects. They also enable research such as assessing tidal marsh conditions and the impacts of restoration efforts along with modeling future conditions. Finally, the datasets can assist local governments. All of Connecticut's coastal municipalities contain tidal marsh and can benefit by incorporating the information into their decision making.

However, simply collecting top notch data is not enough. Project success will be realized when there is broad use by different sectors and stakeholders which requires outreach efforts, easy access, and clear help and explanation. The presentation will explain these efforts along with the online tool developed by Whiteout Solutions which allows viewing, visualization, download, measurements, and more.
The project is administered by the CT Department of Energy and Environmental Protection with Whiteout Solutions, LLC.

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Discussion: Building Capacity for Climate Resilience in Coastal Plain Tribal Communities

Panelists:

- Beth Roach, Nottoway Indian Tribe of Virginia, Sierra Club, and Tribal Coastal Resilience Connections
- Jocelyn Painter, Winnebago Tribe of Nebraska, Duke University
- Kullen Bell, Coharie Indian Tribe, Great Coharie River Initiative
- Giancarlo Richardson, Haliwa-Saponi Indian Tribe, Tribal Coastal Resilience Connections Team

This session will provide a forum for the Tribal Coastal Resilience Connections team (TCRC) to overview the activities conducted during Phase 1 of the Tribal Resilience Project, and detail ongoing Phase 2 initiatives. The team will highlight the following during an interactive session and panel discussion:

- Identify and acknowledge unique cultural perspectives and Indigenous traditional ecological knowledge regarding climate and anthropogenic stressors on native communities that may not be addressed in traditional government or academic-led resilience planning processes.

- Share outreach to Tribal communities with present day and ancestral ties to the coastal plain of North Carolina and Virginia to gain Indigenous perspectives and insight on climate resilience topics and impacts to regional waterways.

- The team will share an interactive map that highlights the current and historic ties various Indigenous peoples have to the Carolina sounds region. The map is intended to be a tool to prompt discussions during engagement with Tribal communities on climate resilience planning.

- A study conducted to assess climate resilience planning and implementation projects by tribal governments and other tribal or inter-tribal organizations throughout the United States.

- Provide recommendations on best practices for agency representatives and resilience practitioners to engage Tribal communities in climate resilience and adaptation planning, through better understanding of considerations, perspectives, and traditional ecological knowledge unique to native communities.

- Discuss strategies to build capacity for tribal communities to build long-term resilience to impacts from natural hazards and climate change impacts or conduct their own resilience planning via information sharing, network building, and connecting communities to resources.

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Discussion: Digital Coast Connects—Hazards, Flooding, Underrepresented Communities*

Panelists:

- Vidya Balasubramanyam, Coastal States Organization
- Rebecca Roth, National Estuarine Research Reserve Association
- Kari Hagenow, The Nature Conservancy
- Rebecca Ellin, North Carolina National Estuarine Research Reserve

Connecting communities to digital coast tools and resources requires critical partnerships and people in order to improve resilience to flooding and hazards. Through NOAA's Office for Coastal Management, many Digital Coast partner organizations were given funding and an opportunity to reach underrepresented communities. Digital Coast partners, the National Estuarine Research Reserve Association, and the Coastal States Organization will spotlight several stories and lessons learned.

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Short and Sweet: Elevation Data and Tools

Mapping Hidden History with Coastal Lidar: A Story from the Island of Tinian

Robbie Greene, Pacific Coastal Research and Planning

The island of Tinian in the Commonwealth of the Northern Mariana Islands played a pivotal role in the Pacific Theater of WWII, hosting the atomic bombs as well as the world's busiest and largest airport in 1945. Over the last half century, many coastal sites with historic significance, including the atomic bomb assembly buildings, an entire war cemetery, Japanese-era relics, and even an ancient Chamorro latte stone arrangement have been reclaimed by nature, some becoming entirely hidden from both ground and aerial view. As geopolitical tensions in the region escalate, the U.S. Department of Defense is making efforts to heighten military activity and infrastructure on the island. This left community members, government agencies, and local organizations with a compressed timeline to preserve many of the important sites, promote their international significance, and enhance public access to them. The Northern Marianas Humanities Council partnered with Pacific Coastal Research and Planning, the Tinian Mayors Office, and the Island's resident Historian to formally map over twenty sites, and delineate a precise, accurate boundary for a proposed revision to the National Historic Register. In order to include the hidden sites in a comprehensive historic landmark package and map set, NOAA coastal topographic lidar and historic aerial imagery were used to generate custom hillshades and derivative products, guiding the field team through dense vegetation along elevation signatures detected in the bare-earth data. The resulting map products have enabled the Humanities Council to present the National Park Service with a cohesive National Historic Landmark proposal, and provided the local government with the geographic data necessary to begin opening access to the sites.

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Short and Sweet: Elevation Data and Tools

Enhancing Advanced Circulation (ADCIRC) Modeling in American Samoa and Guam: A Methodological Approach to Derived Digital Elevation Models (DEMs)

Kathryn Smith and Scott Spurgeon, U.S. Army Corps of Engineers

This project presents a novel methodology for creating derived digital elevation models (DEMs) aimed at enhancing ADCIRC modeling efforts for American Samoa and Guam areas of interest. ArcGIS Pro and data from PACIOOS and NOAA were utilized by systematically creating a data inventory, acquiring data, conversion of file formats, creation of source mosaic datasets, quality assurance and control, creation of a derived mosaic dataset, and manual edits to resolve seamlines. The results of this work include near-seamless DEMs that match the requirements of the ADCIRC model, spatial metadata shapefiles, a detailed data inventory, and documentation of all manual editing.

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Short and Sweet: Elevation Data and Tools

Using U.S. Geological Survey Elevation Data in the Chesapeake Bay Watershed for Climate Adaptation

Eliza Gross, U.S. Geological Survey

The U.S. Geological Survey (USGS) National Geospatial Program (NGP) provides a foundation of accurate and consistent publicly available elevation data through its 3D Elevation Program (3DEP). Through the 3DEP, a baseline of high-resolution quality level 2 (QL2) lidar elevation data has been collected across much of the contiguous US, with QL2 baseline data nearing completion in the Chesapeake Bay Watershed. Collection of the next generation of 3DEP (Next Gen 3DEP) lidar data is occurring in some areas of the Watershed, and these projects include either: (1) an additional and more recent QL2 lidar acquisition, or (2) an improved-resolution QL1 lidar acquisition. These baseline and Next Gen 3DEP lidar data are being leveraged to characterize climate adaptation across the Watershed in different ways. For example, the data are used for updated mapping of stream and floodplain geomorphometry, coastal flood and inundation forecasts, and to assess interior flooding of urban areas. This presentation briefly highlights the most recently collected and upcoming QL2 or better lidar acquisition projects within the Watershed and touches on several ways the data are used to inform regional climate adaptation.

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Short and Sweet: Elevation Data and Tools

Coastal National Elevation Database (CoNED) Difference/Threshold Masking Tool+

Taylor Hansen, U.S. Department of the Interior, U.S. Geological Survey, and KBR, Inc.

Climate change affects both the natural and human components of coastal landscapes. Assessments and monitoring of vulnerable coastal lands are particularly important in locations where coastal populations are increasing, along with increasing risk from climate-change-intensified sea-level rise, inundation, and storm surge.

The availability of higher spatial resolution elevation source data is a core component of coastal/climate research-oriented applications ranging from developing integrated seamless topobathymetric digital elevation models (DEMs), coastal erosion, coastal wetland mapping, sea level rise inundation-exposure modeling, and designing and implementing multi-temporal applications focused on elevation change detection.

Consequently, the development of the U.S. Geological Survey Coastal National Elevation Database (CoNED) 1-meter topobathymetric DEMs was created to spatially integrate disparate elevation data from topography and bathymetry that align both horizontally and vertically into the same reference system. A key challenge in generating coastal DEMs is data collection and integration often introduces large amounts of errors and anomalies that significantly affect the model's accuracy. Some errors or anomalies include depth bias offsets or water surface values that are not accurate representations of the topography for a particular area compared to other corresponding geospatial datasets.

To mask these anomalies, a Python-based geospatial matrix algorithm was created to identify a variability threshold. Pixels in this threshold are considered an anomaly and will be masked to clean the data for vertical integration. This threshold and masking tool allows for fast identifying and editing of irregular datasets, while maintaining the integrity of the internal DEM elevation values. This presentation will highlight an overview of the development process for CoNED and the steps required for the threshold/masking tool process. This tool has applicability outside of this project and can be valuable for other coastal datasets containing irregular or anomalous pixels.

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Short and Sweet: Elevation Data and Tools

National Centers for Environmental Information's Seafloor Science Information Center (SSIC) – Advances in Digital Elevation Model Development and Validation

Matthew Love, Michael MacFerrin, Elliot Lim, Christopher Amante, Kelly Carignan, and Barry Eakins, Cooperative Institute for Research in Environmental Sciences, NOAA's National Centers for Environmental Information; Kelly Stroker, NOAA's National Centers for Environmental Information

The NOAA National Centers for Environmental Information (NCEI) established the Seafloor Science Information Center (SSIC) in FY24 to advance the stewardship of seafloor data, develop useful products, create software tools, and enable public access to data and products. These data include multibeam and singlebeam bathymetry, along-track sub-bottom profiles, gravity, and magnetics.

The NCEI Digital Elevation Model (DEM) Team, as part of SSIC, focuses on new product development and migrating services to the cloud to support a wider range of users. NCEI's Continuously Updated Digital Elevation Model (CUDEM) framework generates DEMs from local to global scales using free and open-source software (FOSS), with open access to the code repository. These models are essential for determining coastal inundation timing and extent, improving community preparedness, and enhancing event forecasting and warning systems.

In FY24, NCEI produced both local high-resolution DEMs and a regional-scale coastal relief model (CRM) of the U.S. Central Pacific Coast (CA/OR). To improve DEM quality, we developed code to filter anomalous values from NCEI's multibeam bathymetry database, incorporating data that would otherwise be discarded. To assess the vertical accuracy of NCEI's DEMs, we developed the cloud-based ICESat-2 Validation of Elevations Reporting Tool (IVERT). IVERT queries photon-counting LiDAR data from NASA's ICESat-2 to compare against topographic and shallow bathymetric DEM values globally. It automates horizontal and vertical datum transformations, data filtering, DEM masking, and outlier identification to provide robust validation statistics. These advancements are publicly available in the NCEI/CIRES DEM Team's GitHub repository.

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Short and Sweet: Elevation Data and Tools

Uncrewed Aerial Vehicle (UAV) Coastal Reconnaissance for Understanding and Mitigating Flooding Impacts on Surface Transportation Networks

George McLeod and Thomas Allen, Old Dominion University; Blake Steiner, Center for Geospatial Science, Education and Analytics (GeoSEA), Old Dominion University

Sea level rise, increased rainfall, storms, and subsidence can increase both the risk and degree of flood-related damage of surface transportation networks (STN). Coastal localities need to increase flooding resilience of STNs through a wide array of techniques, including nature-based solutions (NBS). However, exactly how STN degradation is related to recurrent flooding is not well understood. Therefore, new coupled flood and pavement modeling techniques are being tested to predict the degrading effects of sea level rise on STNs with and without NBSs. Extremely high-resolution imagery that captures time-series condition of STN pavement condition is critical to degradation model development. Uncrewed aerial vehicles (UAVs) offer a cost-effective opportunity for obtaining both current high-res imagery and digital elevation models necessary for model development and validation. Creation of true-color orthomosaics, digital surface and elevation models, was accomplished using a Wingtra One Gen II UAV with a 20 mm Sony a6100 payload. More than 8,500 images were collected across six intensive study areas (ISAs) in southeastern Virginia. Positional accuracy of these data was increased via utilization of ground control points and post-processing kinematic corrections. UAV-acquired image data were processed in Esri Drone2Map and ArcGIS Pro software. Developed DEMs highlighted areas of potential flow, particularly at the Larchmont site in Norfolk, VA. Damages on side and main streets were found with true-color mosaics at most sites. The imagery offered timely identification of road damage and hotspots to direct pavement deflection testing for areas with cracks and crevices ~2 cm in width or larger. Next steps will entail the application of machine learning for automated water-detection and capture the king tide for model validation.

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Short and Sweet: Elevation Data and Tools

Automated Generation of an Urban Synthetic Elevation Checkpoint Network

Alexander Seymour, U.S. Geological Survey

Lidar and structure from motion-derived digital elevation and surface models have widespread application. Consideration of a topographic model's vertical root mean squared error (RMSEz) and systematic directional bias is important for many of these applications, particularly landscape change detection and measurement. Due to logistic, resource, and time constraints, wide area remotely sensed topographic surveys are not always accompanied by an in situ checkpoint network for validating and characterizing survey error. Here we describe and test a method for automatically generating synthetic elevation checkpoints in bulk across hundreds of kilometers using a publicly available lidar-derived DEM time-series, road vector network, and landcover classification map. Our method produced 6,000-10,000 synthetic checkpoints across the developed barrier island coastline of North Carolina. These checkpoints characterized vertical error metrics in a statistically similar way as in situ checkpoints when assessing the vertical accuracy of a contemporary lidar-derived DEM and produced RMSEz metrics an average of 0.018 m from the RMSEz of historical lidar DEMs published with tested accuracy metrics. This new method has the potential to A) lower the cost and time required to validate new remotely sensed topographic surveys by reducing or eliminating the field work associated with in situ checkpoint surveys, B) provide a means of retroactively assessing the absolute vertical accuracy and systematic bias of historical topographic datasets that were not published with tested accuracy metrics, and C) generate reference networks to assess and correct spatially variable patterns of vertical bias in topographic datasets.

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High-Resolution Land Cover

A Next Generation Coastal Land Cover

Nate Herold, NOAA's Office for Coastal Management

In January of 2024 NOAA's Office for Coastal Management (OCM) released the first phase of a new high resolution (1-meter) land cover for coastal areas nationwide. The production of this data leveraged advances in AI technologies, as well as private sector expertise and capacity, in order to map impervious surfaces, tree and shrub canopy, and water features at a 1-meter spatial resolution.

Come learn more about how these data were created, how they can be used, and work being done to build upon that foundation to create a next generation Coastal Change Analysis Program (C-CAP). This short talk will cover an evaluation of those initial phase products, what it takes to move from those data to a complete C-CAP scheme, and NOAA's current plans to make that happen. Attendees will leave with a better understanding of what that data can (and can't do) for them, and whether a complete C-CAP land cover might be of interest to them for use in their work.

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High-Resolution Land Cover

Bridging the Gap in Coastal Hazard Resilience Through High-Resolution Mapping

Thomas Peck, Ecopia AI

As coastal hazards intensify, understanding vulnerabilities is crucial for effective planning and mitigation. In response, Ecopia AI has partnered with NOAA to produce 1-meter resolution land cover data—covering impervious surfaces, water, shrub, and tree canopy—across the U.S. coastal boundary through the Coastal Change Analysis Program (C-CAP). This data offers essential insights for governments, NGOs, educational institutions, and local communities to better prepare for the increasing risks posed by coastal hazards. Additionally, many governments have taken this a step further, integrating Ecopia's 6-inch land cover solution with 16+ detailed vector classifications, further enhancing their utility for local planning and mitigation.

This presentation will explore the application of high-resolution land cover data to support hazard preparedness, featuring key success stories where it has made a measurable impact. A notable case study conducted by Ecopia, examining the relationship between flood and urban heat risks and income disparities across major coastal metropolitan areas will also be presented. This analysis highlights how data-driven insights can guide effective resilience strategies in areas most vulnerable to climate risks. By making this data openly accessible, we aim to bridge the climate resilience gap, particularly for underserved and low-income communities that face disproportionate risks but often lack resources for adequate preparation. Open access to this data empowers these regions to develop effective strategies, ensuring a more equitable distribution of resilience tools and resources.

Ensuring that high-quality data is available to everyone is a critical step in building a more resilient and equitable response to the growing threats posed by coastal hazards.

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High-Resolution Land Cover

Harmonizing Hydrography, Wetlands, and Land Cover Data for Better Informed Decision-Making: The Wisconsin "OneMap" Project

Jim Giglierano, Wisconsin Department of Administration; Jeff DuMez, Brown County Planning and Land Services Department; Andrew Brenner and Chris Robinson, NV5 Geospatial

The One Map Project, funded by the Wisconsin Coastal Management Program using NOAA Bipartisan Infrastructure Legislation (BIL) grants, has created a set of "harmonized" hydrography, wetlands and land cover datasets from recent high-resolution lidar and imagery for three of Green Bay's HUC10 coastal watersheds. The aim of the NOAA funding is to assess and rank candidate sites for future habitat restoration and conservation competitive grants. The local project partner, the Brown County's Planning and Land Services Department, has contracted with NV5 Geospatial to produce the three harmonized datasets using their extensive experience with the USGS 3D Hydrography (3DHP), USFWS National Wetlands Inventory (NWI) and NOAA Coastal Change Analysis Program (C-CAP) one meter land cover. In the past, these layers were generated separately by different state, local and federal agencies at different times, using varying source data and rarely with consistency between the same features mapped by the other products. In the One Map process, the draft layers are compared to each other early enough to adjust differing interpretations of the same feature, as well as catching any missing or logically incongruent elements. The addition of the one meter, level two C-CAP land cover, as well as the level three detailed agriculture and forest classes, has provided a previously unavailable ability to consider a ecosystem-wide perspective that vastly improves the interpretation and usefulness of all the layers. In this presentation, we will give an overview and highlight examples of the data development and harmonization process, along with early applications of the new layers to coastal habitat, watershed and climate resilience efforts in the Green Bay region.

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Short and Sweet: Climate Adaptation Strategies

Opportunities for Protecting Future Wetlands and Migration Corridors*

Will Collins, The Nature Conservancy

This project seeks to align potential future wetlands and marsh migration corridors with land protection opportunities. A key aspect will be encouraging and aiding inland coastal municipalities with conserving wetlands—important ecological spaces and valuable flood overflow areas—as they plan for increased development. This discussion will explore the different opportunities TNC and other Digital Coast partners can pursue to map, protect, and encourage others to protect future wetland space. For example, under FEMA's National Flood Insurance Program, municipalities can earn Community Rating System points to lower insurance premiums by conserving floodplains under the Open Space Preservation (OSP) program. Aligning these possible floodplains with inland migration spread may be a way to increase interest in preserving marsh corridors. Another opportunity includes the NRCS Wetland Reserve Easements (WRE) under its Agriculture Conservation Easement Program (ACEP), which encourages the protection of degraded agricultural lands through restoration and conservation easements. TNC's Resilience Coastal Sites data also offers valuable insights into which areas in the Gulf Coast and Southeastern regions would be effective spaces for future wetland protection and conservation. For TNC, successful wetland conservation could have large impacts on both its land conservation and human benefits goals.

Scoping the project requires meeting with a variety of internal and external stakeholders, and other environmental leaders, organizations, and agencies. This discussion would be an exploratory meeting to brainstorm overlap and connections with the TNC project and other Digital Coast Partnership projects.

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Short and Sweet: Climate Adaptation Strategies

Quantifying Coastal Squeeze: Sea Level Rise and Marsh Migration Potential in Coastal Virginia

Thomas Allen, Old Dominion University

Accelerating sea level rise raises concerns over coastal squeeze—a phenomenon where tidal marshes are "squeezed" between rising sea levels and human-built environments or other topographic barriers. Coastal provide essential ecological functions but are susceptible to the effects of coastal squeeze. Several studies have explored the suitability of coastal uplands for future tidal marsh migration, highlighting benefits such as new habitat creation and reduced shoreline erosion. However, such migrations can also pose challenges, including impacts on infrastructure, declining property values, and the risk of forced relocation. Quantifying the effects of tidal marsh migration on coastal communities is, therefore, essential. This study evaluated the impact of coastal squeeze in twelve watersheds in coastal Virginia for a 2050 sea level rise scenario utilizing geospatial data (NOAA Digital Coast LiDAR, C-CAP land use/land cover, and FWS National Wetland Inventory, and 2020 Census.) Marsh migration, property and population data, and hypsometric analyses were used to calculate an index quantifying the degree of coastal squeeze in each watershed. Results indicate that watersheds on the eastern coast of the Eastern Shore and in the Back Bay area of Virginia Beach susceptible to higher degree of coastal squeeze, primarily owing to properties situated in low-lying areas that would otherwise provide open space for tidal marsh migration. This presentation will showcase the novel framework, analysis and visualization techniques for assessing coastal squeeze, offering insights that can support coastal management and help communities adapt to the challenges posed by sea level rise.

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Short and Sweet: Climate Adaptation Strategies

Beaufort County Adapts: Sea Level Rise Impacts on Groundwater and Septic Systems

Landon Knapp, South Carolina Sea Grant Consortium, College of Charleston

Beaufort County Adapts brought together scientists, residents, and decision-makers to prepare for sea level rise impacts on local groundwater and infrastructure in Beaufort County, South Carolina. The project was designed to develop science-based maps and tools to identify infrastructure and social services that are vulnerable to sea-level change in order to develop actionable timelines for proactive decision-making across the county. The project team is a collaboration between the College of Charleston, University of South Carolina, the South Carolina Sea Grant Consortium, and Beaufort County, SC planning department.

Focusing on septic systems, this project developed maps of present day and future depth to groundwater surfaces at a parcel scale. These high-resolution groundwater maps were found to match baseline groundwater elevations, established using shallow monitoring wells, to within 0.5 meters across the county. Maps of properties with septic systems were developed for the county and the types of septic systems used across the county were identified. Using 1.5 years of well data, baseline GW elevations and rain event GW elevations were used to develop formulas for the number of expected days of impairment for the various types of septic systems. Maps were made for the three time horizons of 2024, 2050, and 2100 allowing parcels with likely impaired septic systems to be identified in each time horizon.

This project demonstrates the power of topographically constrained groundwater models for developing high resolution depth to groundwater surfaces at county-wide scales. Combining these surfaces with rainfall information as well as well data and monitoring with an understanding of the depth of sensitive buried structures, the number of days that these systems could be compromised was calculated. This has allowed the county government to begin to take direct action and plan for future actions due to sea levels rise. The techniques developed in this project are transferable to other coastal counties across the United States.

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Short and Sweet: Climate Adaptation Strategies

Building Resilient Coastal Communities: The Role of GIS in Adaptive Housing Strategies

Claire Babineaux, The GEO Project

Coastal communities face increasing threats from climate change, including rising sea levels, more frequent and intense storms, and severe flooding. These challenges, compounded by population growth and aging infrastructure, underscore the critical need for resilient housing solutions. Geographic Information Systems (GIS) play a pivotal role in addressing these issues by enabling detailed spatial analysis, risk assessments, and land-use planning that inform decision-making. By integrating complex environmental variables, demographic data, and community-specific factors, GIS helps coastal communities identify high-risk areas and develop tailored strategies for resilience.

The Geospatial Education and Outreach (GEO) Project exemplifies the power of GIS in fostering adaptive and sustainable solutions. Through a resilient housing risk assessment conducted in Foley, Alabama, the GEO Project has collaborated with local stakeholders to develop innovative strategies that address climate-related challenges. This integrated approach ensures that solutions are not only community-specific but also applicable to other coastal regions facing similar environmental risks.

This presentation will highlight the GEO Project's work in Foley, highlighting how GIS technology supports the development of resilient housing plans and promotes long-term safety and adaptability. By emphasizing both localized and broader applications, the presentation will show the transformative impact of GIS in creating thriving, resilient coastal communities.

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Short and Sweet: Climate Adaptation Strategies

Mapping Environmental Justice Priorities Across the U.S. Coastal States and Territories

Natalie Cross, Coastal States Organization

Environmental justice is an integral part of coastal management, as access to the coast is often essential for subsistence, healing and recreation, and systemic factors such as racism and income inequality exacerbate the impacts of coastal climate hazards. Furthermore, decision-making processes regarding the distribution of resources for coastal adaptation have typically been inaccessible to communities that are marginalized due to race, income, gender and English-speaking proficiency (just to name a few factors).

This session will focus on the process of developing a policy at the nexus of environmental justice and coastal management. As the non-profit entity representing the US's state- and territory-level Coastal Zone Management Programs, my fellowship placement at the Coastal States Organization has uniquely positioned me to be able to convene these 34 programs and develop a consensus-based policy representative of their environmental justice priorities.

I will provide a short and sweet overview of the policy recommendations that have emerged from each region. The session will be organized around the non-traditional communication method (likely a zine) that will be created to further amplify these environmental justice recommendations. Both this session and policy are meant to serve as a starting point, sparking inspiration for how tools such as consensus-based policymaking and creative communication can be leveraged to further integrate environmental justice into the field of coastal management.

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Climate Change and Conservation Decision Support Tools

U.S. Geological Survey Products and Data to Support Coastal and Resource Management

Darcee Killpack, U.S. Geological Survey

This presentation will highlight foundational data and products the U.S. Geological Survey (USGS) delivers to support science and decision makers. These include geologic and critical mineral mapping, high performance computing, protected areas database and the American Conservation and Stewardship Atlas, modern topographic maps, and more.

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Climate Change and Conservation Decision Support Tools

GIS for the Ocean: Transforming Ocean Data into Actionable Knowledge

Mimi Diorio, NOAA's Office of National Marine Sanctuaries; Keith VanGraafeiland and Dan Pisut, Esri

Introducing GIS for the Ocean, an innovative NOAA/Esri collaboration designed to transform complex ocean data into intuitive insights that support a thriving blue economy. Harnessing the combined power of NOAA data and Esri technology, the GIS for the Ocean (GIS4O) initiative strives to democratize access to actionable information, empowering users—from researchers and policymakers to coastal communities and businesses—to more easily understand ocean patterns and trends. The foundation for the initiative is the Ocean and Coastal Information System (OCIS), a curated suite of ocean and coastal datasets from NOAA and beyond that inform a wide range of critical marine issues. Leveraging Esri's ArcHub platform, these data are presented through user-friendly visualizations and case studies that range from conservation and sustainable fisheries, to marine planning and future climate scenarios. Promoting a replicable workflow, the project underscores the value of interoperable datasets that can be utilized across various applications to inform policy and planning. Intended primarily as a model to demonstrate the transformative power of data integration and accessibility, GIS4O has added emphasis on storytelling and knowledge transfer with compelling narratives and technical guidance intended to resonate with users and inspire action. GIS for the Ocean presents a replicable blueprint for translating data into actionable knowledge, by packaging it in creative and intuitive ways, and fostering partnerships and collaborations that help inform and inspire. Ultimately, the GIS4O concept will not only enhance a broader understanding of ocean issues, but also serve to educate future ocean stewards and support more sustainable, resilient blue economies.

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Climate Change and Conservation Decision Support Tools

Marshes for Maine's Future: A Collaborative Science Model for Transferring Geospatial Science

Christine Feurt, Wells National Estuarine Research Reserve

The Wells National Estuarine Research Reserve (NERR) collaborated with Maine salt marsh managers and representatives from the USGS Woods Hole Coastal and Marine Science Center to apply three USGS U.S. Coastal Wetland Synthesis Applications to projects in Maine. The USGS geospatial tools provided a scientific framework for supporting decision-makers who actively research and manage climate-induced changes in marsh resilience and vulnerability. The three USGS geospatial products are designed to link landscape integrity with coastal hazards to sustain salt marshes and the ecosystem services they provide. The *unvegetated-vegetated ratio* (UVVR); and associated sediment-based *Marsh Lifespan Calculator* have proven useful for evaluating marsh condition and restoration feasibility in salt marsh systems across the US. The *Coastal Change Likelihood* product merges all coastal land classes with storm and SLR hazards to estimate the likelihood of geomorphic change over near-term timescales. The Marshes for Maine's Future project developed a series of virtual and in person Knowledge Sharing Workshops where the USGS creators of geospatial products could interact with salt marsh professionals working on marsh resilience projects that could benefit from applying the tools. Examples of scenarios where the USGS geospatial tools could be applied included efforts to prioritize locations for marsh conservation, identifying sites for marsh migration pathways and evaluating restoration strategies. Alignment of this project with Maine's climate action plan goals *Maine Won't Wait*, Maine's tidal crossing project *Coastwise*, and priorities developed through the stakeholder driven Regional Resilience Plan for Climate Ready Coast Southern Maine further amplified the impact of the transfer of geospatial products by addressing unmet needs for science to support strategies that build marsh resilience. The Collaborative Learning based model for geospatial science transfer developed for this project will be shared across the NERR System and will be a focus of this presentation.

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Discussion: Resilient Land Use Planning*

Panelists:

- Jack Smith, Nelson Mullins and Urban Land Institute
- Josh Murphy, NOAA's Office for Coastal Management
- Kaylan Koszela, City of Charleston, South Carolina
- Jacob Lindsey, Lowe Real Estate Development

Resilient Land Use Planning relies on the management of development in areas that may be subject to flooding, heat or other climate changes. The ability to be resilient starts fundamentally in the development community with the rules and regulations which control what can be developed and where. The City of Charleston, beginning with its working with the Dutch Dialogues, has developed and just released the Charleston Water Plan. The Charleston Water Plan in concert with the City's Comprehensive Plan and in the changes being made to its Zoning and Land Development Regulations put the issue of water and its ability to ignore jurisdictional lines and what have been historically fairly stable flood lines into a perspective that allows management and prevention of development in areas subject to the increasing risk of coastal storms and more precipitation than experienced in history. This hour-long panel, with support of the American Planning Association and the Urban Land Institute will present this comprehensive look at land use planning and its ability to provide resilient planning tools to cities, counties and developers for enabling development that will survive as well as recover from natural climatic events as we navigate our changing climate.

The one-hour panel is proposed to be moderated by a member of ULI or APA with panelists being from the City of Charleston, and from membership of the ULI and APA in the area. A panelist from NOAA to present potential Digital Coast tools relative to such planning efforts and the data needed to guide their development on the ground would also round out the session. The focus and takeaways for the panel will be the best practices and the changes made in the standard comprehensive plans, zoning and land development regulations and the principles in the unique Charleston Water Plan that focus on the ability to prevent development in certain areas, preserve areas that can help absorb and reduce flooding, and prevent activities which can increase flooding issues, such as filling of low lying areas for development. The best practices and tools available from these resources can guide other communities in their efforts to be more resilient in their approach to the fundamentals of land use planning, and in concert with tools available through the Digital Coast platform and the tremendous data available from NOAA to excel in making changes that respond to the expected increasing trends of flooding and storms in coastal areas in particular. Takeaways may also help influence those communities subject to riverine flooding and for those who are looking at infrastructure replacements or improvements to accommodate larger storm events than current infrastructure was previously built to accommodate. Resources from the Digital Coast, APA and ULI will be referenced and made available to participants in the session. The effects of resilient land use planning in the decision-making of financial institutions and investors can also be described as referenced in the publications that can be made available to participants.

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Coastal Management Policy in the Great Lakes

Coastal Hazard Regulations in Great Lake States*

Alan Lulloff, Association of State Floodplain Managers

The Great Lakes shores are fundamentally different from ocean shores in a number of ways. First, the water is fresh, making the lakes a desirable source of drinking water. Second, while the tides are much smaller (~ one inch), depending on wind conditions and ice cover, periodic seiches can be significant (up to 10 feet). Third, unlike ocean coasts, where sea level is gradually trending higher, Great Lakes water levels vary annually and over multi-decade cycles. Varying water levels have a fundamental influence on the portion of the shore face that is exposed to wave energy and the exposure of bluffs to wave attack.
In conjunction with their public trust responsibilities and land use management authorities, several coastal states have enacted programs to address coastal hazards. This document is a summary of noteworthy coastal hazard regulations that states have enacted on the Great Lakes. Regulations enacted include coastal development setbacks as well as restrictions associated with shore protection structures to ensure those structures do not adversely impact neighbors or the environment. In addition, some states have passed regulations protecting dunes, bluffs, sensitive habitat, and viewsheds.

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Coastal Management Policy in the Great Lakes

Enhancing Great Lakes Coastal Resilience Through Local Capacity Building and Nature-Based Engineering Design Solutions

Sue Hoegberg and Tyler Hackett, Dewberry

The Great Lakes shorelines have seen increased damage in recent years from flooding and erosion due to historically high lake levels, severe storms, and climate change. Cities are on the frontlines facing these issues and the most vulnerable communities often have even fewer resources to address them. This presentation will provide an overview of work sponsored by the National Oceanic and Atmospheric Administration and the Great Lakes and St. Lawrence Cities Initiative and funded through the Great Lakes Restoration Initiative.

This presentation will share the municipal engagement approach that has been successfully used for communities along Lakes Michigan, Superior, Huron, St. Clair, and the Detroit River to solicit project proposals. We will also highlight several examples of completed engineered shoreline designs using innovative nature-based solutions with multiple co-benefits, including habitat restoration for high priority species in the region, as well as the status of several other projects that are in progress.

Geospatial data including topography and bathymetry are critical components of coastal engineering projects, providing valuable input to numerous design elements including wave modeling, slope evaluation, erosion management, flood hazards, siting and design of structural elements, benthic habitat types, sightlines for public enjoyment, and planting choices.

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Coastal Management Policy in the Great Lakes

Ohio's Lake Erie Scenic Vistas: Developing the Program, Designating Sites, and Building Local Partnerships

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

To promote the many beautiful public access areas, scenic overlooks, and scenic amenities along Ohio's 312-mile Lake Erie coast, the Ohio Coastal Management Program has initiated the Lake Erie Scenic Vistas program. The goal of the program is to identify — through a list of standardized criteria — locations that exhibit outstanding qualities ideal for Lake Erie scenic views. The benefits of enjoying Lake Erie's scenic resources are abundant and extend beyond its natural splendor. Scenic Vistas promote restorative qualities, provide opportunities for rest, relaxation, and reflection, and help establish a sense of place. They also serve as economic drivers for local communities through their regional or national appeal.
This presentation will discuss the impetus to develop the program; project methods; fieldwork and designation procedures; and geodatabase and StoryMap development. Fostering local participation and partnerships will also be discussed. Moving forward, the Ohio Coastal Management Program will continue to work with local communities to help promote the Lake Erie Scenic Vistas program and install signage.

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New Federal Datasets for Sea Level Rise and Flooding

Taking Stock – Building Stock Datasets Used in Assessing Coastal Hazards

Brian Caufield and Marlee Newman, CDM Smith

Awareness of coastal risk is important at many levels. Communities perform vulnerability analysis to identify what parts of their community are at risk during planning processes. These vulnerability analyses can also be leveraged when coastal communities seek grant moneys to show that their projects are cost effectively mitigating damage. While there are building stock datasets out there, there is often essential information lacking that requires supplementation through local knowledge. This presentation will look at the damage functions used in vulnerability analysis and what types of data are used and are available to identify building stock.

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New Federal Datasets for Sea Level Rise and Flooding

Planning for Coastal Climate Change Hazards with the U.S. Geological Survey's Coastal Storm Modeling System and HERA Web Tool: Geographic Expansion, End User Engagement, and Use Case Examples

Maya Hayden and Patrick Barnard, Pacific Coastal and Marine Science Center, U.S. Geological Survey; Nathan J. Wood, Western Geographic Science Center, U.S. Geological Survey

Across the U.S., coastal communities face increasing threats from flooding, erosion, and rising groundwater due to accelerating sea level rise and changing storm patterns. The USGS Coastal Storm Modeling System (CoSMoS) is a dynamic modeling approach that allows for more detailed predictions of multiple coastal hazards (surface flooding, erosion, and rising groundwater) due to both future sea level rise and storms. CoSMoS models all the relevant physics of a coastal storm (e.g., tides, waves, and storm surge), which are then scaled down to local hazard map projections of coastal hazards for use in community-level coastal planning and decision-making. Multiple storm scenarios are provided under a suite of sea-level rise scenarios, allowing users to manage and meet their own planning horizons and specify degrees of risk tolerance. Hazard maps are provided as downloadable geospatial data, and viewable on the Hazard Exposure Reporting and Analytics (HERA) web tool. The HERA tool also provides socioeconomic exposure metrics (e.g., number of residents, miles of roads) to help communities understand how these coastal hazards could impact their land, people, infrastructure, and livelihoods. The CoSMoS modeling and HERA web tool have expanded to include the Southeast Atlantic, California, Hawai'i and Pacific Island Territories, and are beginning to roll out in Washington and Alaska. CoSMoS products and web tools were developed in collaboration with the decision-making audience that it was intended to support, including federal, state, and local land use planners. We will discuss expanding outreach and engagement efforts, and highlight case study examples of how the products have been used to support coastal climate adaptation planning and coastal resilience.

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New Federal Datasets for Sea Level Rise and Flooding

The Power of Community Modeling: Bridging Gaps in Historical Water Level Observations with NOAA's Coastal Ocean Reanalysis (CORA)

Analise Keeney, NOAA's Center for Operational Oceanographic Products and Services

NOAA's Center for Operational Oceanographic Products and Services (CO-OPS) maintains and operates the National Water Level Observation Network (NWLON), which provides real-time and historic water level observations at over 200 locations across U.S. coastlines. Though NWLON stations provide critical data and observations for coastal managers, insights are limited to the immediate vicinity, making it difficult to account for the range of coastal flooding impacts between stations, which can be up to 100 miles at some locations. Gaps in coverage can make it especially difficult for underserved communities to access necessary information for monitoring flooding near their specific location. NOAA's Coastal Ocean ReAnalysis (CORA) seeks to bridge these observation gaps by combining existing water level measurements with community-supported modeling. ADCRIC and SWAN are used to produce high-resolution historical water level information to more equitably provide information to these underserved coastal communities. Historical monthly means are assimilated into water level and wave models to produce a 40+ year time series of hourly water levels every 500m. An assessment of the performance of CORA conducted by the University of Hawaii's Sea Level Center (Rose, et al, 2024) found that the CORA-derived hourly and monthly water levels largely replicate the NWLON observations in the Gulf, Atlantic, and Caribbean. CORA datasets are publicly accessible through NOAA's Open Data Dissemination (NODD) platform, and available in multiple, geospatially-compatible formats to support both research and product development. Next steps will focus on integrating CORA datasets into prototype flood risk assessment and mitigation services, to equitably provide coastal communities with valuable historical information for coastal planning.

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The West Coast Ocean Data Portal's Marine Planner Visualization Tool: An In-Browser Mapping Solution for Ocean Data Exploration and Decision-Making

Laura Bliss and Andy Lanier, West Coast Ocean Data Portal; Ryan Hodges, Ecotrust; Tanya Haddad, Oregon Coastal Management Program, Oregon Department of Land Conservation and Development

Ocean and coastal management and decision-making often rely on disparate geospatial information layers at different scales. The West Coast Ocean Data Portal's (WCODP) Marine Planner Visualization Tool is an in-browser mapping solution that can be used for collaborative decision-making through flexible display, curation, sharing, and customization. To overcome the challenges of group collaboration and communication on geospatial conflicts or incompatibilities, the WCODP has developed the capacity to view a comprehensive catalog of ocean data via a single map viewer instance while providing the user with the flexibility in how they want to use and share curated map views. WCODP's mapping tool provides a collection of base map layers over which the user can select and display information related to the biological, physical, and human uses in the ocean at the scale of the U.S. West Coast. The information resources available come from a collection of data source providers across the region through web maps and data catalog services. Layers are selected, harvested, and curated in the map tool by WCODP staff. Regular harvesting ensures our layers, which are hosted and maintained by the authoritative West Coast data source providers, are kept up-to-date. As an open-source project, the system can share tool infrastructure enhancements and bug fixes with other regional data portals. This session will highlight the unique capacities of the WCODP Marine Planner, which made it an excellent choice as a facilitation tool for a May 2024 passive acoustic monitoring workshop for scientists with private or draft data to collaborate in real-time with West Coast offshore wind developers. The workshop utilized our system capabilities for viewing private data, creating a private group for the workshop, manually harvesting password-protected layers within a private account, and saving bookmarked information displays at specific scales to facilitate collaborative discussion and decisions.

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The Mid-Atlantic Ocean Data Portal

Avalon Bristow and Nick Napoli, Mid-Atlantic Regional Council on the Ocean; Karl Vilacoba, Urban Coast Institute, Monmouth University

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 over 6,000 interactive maps depicting offshore wind energy proposals and infrastructure, commercial fishing grounds, marine life distributions, shipping vessel traffic patterns, Naval training zones, and many other human activities and natural features at sea. The Portal is maintained 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 members from Duke University, Ecotrust, Monmouth University, Rutgers University, and the New York Department of State. The Portal helps those in ocean management roles make decisions based on the best available science and provides the public and stakeholders with readily accessible spatial data depicting ocean environments and economies. The site continues to grow in importance as an ocean planning tool, particularly for its ability to illustrate where there are potential conflicts and compatibilities among ocean users. Examples of how it has been used include analyses of offshore wind farm proposals; the design of submarine cable alignments; research to aid the development of a regional ocean acidification network; and studies by the Coast Guard to design shipping safety fairways and other routing measures to accommodate future marine traffic. Tools showcase attendees can stop by the booth to view data and tool enhancements completed recently and under development. Participants will also be able to view a new Offshore Wind & Wildlife Research Planning Map maintained by the Regional Wildlife Science Collaborative for Offshore Wind (RWSC), which is co-hosted by MARCO and the Northeast Regional Ocean Council.

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Tools Showcase

The Northeast Ocean Data Portal and Offshore Wind and Wildlife Research Planning Map

Emily Shumchenia, Nicholas Napoli, and Samantha Coccia-Schillo, Northeast Regional Ocean Council and Regional Wildlife Science Collaborative for Offshore Wind; Kelly Knee, Jenna Ducharme, Jeremy Fontenault, and Stephen Sontag, RPS–Tetra Tech; Peter Taylor, Wat

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 from New York through the Gulf of Maine by the Northeast Regional Ocean Council (NROC). For over 15 years, the Portal has been used to support regulatory, management and business decisions, stakeholder engagement, and educational and research activities. A major update this year provides users with the ability to explore data by human dimensions, marine life, and environmental topics by using the data explorer as a home-base to activate layers, share maps, download data, and read brief synopses of common data uses. Recent ocean data updates provide examples of the Portal's partnerships with government agencies and the private sector including the Marine Cadastre, U.S. Environmental Protection Agency, NOAA Fisheries, offshore wind companies, and research institutions. NROC is also supporting and cohosting the Regional Wildlife Science Collaborative for Offshore Wind (RWSC) with the Mid-Atlantic Regional Council on the Ocean (MARCO) to maintain a new Offshore Wind & Wildlife Research Planning Map funded by the Bureau of Ocean Energy Management (BOEM) that provides a dedicated platform for agencies, offshore wind companies, and research institutions to collaborate, plan, and execute research activities offshore. Activities on the map include ocean observing, passive acoustic monitoring for large whales, aerial survey tracks, and wildlife tag receivers/antennas. The tools showcase will allow participants to virtually meet members of the Portal Working Group and RWSC, explore the Portal and Research Planning Map, and provide an opportunity for participants to gain an increased understanding of the available data, tools, potential uses in management and regulatory decision-making, and plans to update and maintain the platforms over the next several years.

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Tools Showcase

NOAA's Sea Level Calculator

William Brooks and Doug Marcy, NOAA's Office for Coastal Management; Megan Treml, Lynker at NOAA's Office for Coastal Management; Tigist Jima and John Callahan, NOAA's Office for Operational Oceanographic Products and Services

NOAA's new Sea Level Calculator is a game-changer for climate services, providing authoritative historical, current, and future sea level information in multiple formats based on the expressed needs of users who are responding to present and future inundation challenges in coastal communities around the country. It consolidates the functionality of existing tools and adds new functionality not previously available. Users can generate automated, location-specific information that incorporates data, maps, and visualizations. In addition to future projections, the tool also provides information about current and past conditions. This approach makes the information more accessible and more applicable for practitioners planning and implementing both gray and green resilience measures in coastal communities.

The calculator includes five "quick views"—pre-packaged information regarding the most commonly asked questions about sea level data. These are 1) future mean sea levels, 2) changes in flood frequency, 3) extreme water levels, 4) observed mean sea level trends, and 5) seasonal variation. Each quick view presents data in multiple formats (e.g., map, chart, table), all the visuals can be tailored by users (e.g., turning on/off different sea level rise scenarios, setting a flooding threshold, changing the datum), and the visuals can be copied to use in reports and presentations. All the underlying data are available for users to download and use in their own technical tools.

This tool showcase will provide a hands-on demonstration of the calculator and allow users to enter in their own location to get relevant local sea level and coastal flooding information.

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Visualizing Future Wetlands and Coastal Squeeze Using 3D WebGIS, Sea Level Rise Affecting Marsh Model (SLAMM), and NOAA's Digital Coast

Nicole Carpenter, Thomas Allen, Yin-Hsuen Chen, and George McLeod, Old Dominion University

Tidal wetlands play a crucial role in coastal resilience and are heavily relied upon for their ecosystem services, yet are increasingly threatened by rising sea levels and urbanization. The Hampton Roads, Virginia, metropolitan area is particularly seized with this issue. A case study area focused on Salters Creek, City Newport News, as an example of a waterfront where coastal development has impacted wetlands and may reduce future wetland migration. Faced with accelerating Relative Sea Level Rise (RSLR), more heavily urbanized areas such as these are likely to experience a phenomenon known as "Coastal Squeeze," where wetlands migrate inland in an attempt to survive complete inundation but are halted by the built environment. To communicate and address this issue, we developed an interactive, 3D web mapping application that visualizes current to projected future RSLR using NOAA Digital Coast LiDAR, wetland habitat cover, and Mean Higher High Water (MHHW) levels at Salters Creek. Utilizing the Sea Level Rise Affecting Marsh Model (SLAMM v. 6.7), marsh migration potential was simulated every ten years from 2000 to 2100 under the NOAA (2017) Intermediate-High RSLR scenario integrating local tidal data. Analysis results were visualized as an interactive ArcGIS Online 3D Viewer application, presented in 3D diorama style with a time-slider widget and informative pop-ups, aiming to enhance public understanding of the complex impacts of sea level rise and the issue of coastal squeeze. The tool demonstrates the utility of visualizing these changes with an interactive 3D platform and contextual environmental information, offering planners, researchers, and the public a dynamic way to explore how these future scenarios may drastically change the landscape. This approach underscores the importance of scientific communication of complex climate change impacts and offers a model for similar urban coastal environments.

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Mote Marine Laboratory's Beach Conditions Reporting System: Protecting Public Health Through Community Science

Aspen Cook, Mote Marine Laboratory

Mote Marine Laboratory's Beach Conditions Reporting System (BCRS) is a volunteer-based program providing conditions reports for participating locations on the BCRS website (visitbeaches.org) and mobile applications. The BCRS aims to protect public health and enhance the beach-goer experience by providing information to aid in informed decision-making.

BCRS Beach Ambassador reports include the following: flag color, water temperature, and color, weather, and surf conditions, drift algae, jellyfish, wind speed and direction, rip currents, crowds, debris, respiratory irritation, and dead fish.

This data is collected and shared on the website and app to inform the public. The data is also shared with our partners such as FWC, and NOAA to help create models and further the understanding of the environment's health. The data collected on the BCRS can be shared for further knowledge of what is occurring on the day-to-day as well as help in mitigation and predictive models for scientific purposes. The BCRS is now operating in 78 locations across 8 states - Florida, Georgia, South Carolina, North Carolina, Alabama, Louisiana, Texas, and California - with more locations being recruited. Knowing beach and environmental conditions can be of benefit in numerous ways. The technology is also being continuously improved to add more layers that will increase data accessibility to assist the public in informed decision making.

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South Carolina Coastal Atlas: Using ArcGIS StoryMaps to Explore the History, Tools, Services, and Initiatives of the South Carolina Coastal Management Program

Lyndsey Davis, Bureau of Coastal Management, South Carolina Department of Environmental Services

The South Carolina Coastal Management Program was established in 1977 and in the past 40+ years has experienced many changes and updates. The Coastal Program provides many services, products, and tools to the public, including a variety of web applications.

It can be challenging to highlight a program's history, services, and tools in a captivating and succinct way through a traditional website. Typically, many clicks, searches, and/or browser windows are needed to find what you are looking for when navigating a government website.

The South Carolina Coastal Program decided to utilize ArcGIS StoryMaps to overcome some of these challenges. The South Carolina Coastal Atlas StoryMap was developed as a public outreach tool to tell the story of the Coastal Program, highlight services offered by staff, and demonstrate the various products and tools developed by the program that are available to the public. ArcGIS StoryMaps provides a unique platform which integrates text, photos and videos with web maps and applications in a visually appealing and streamlined fashion that is simple to navigate and customize. The result is an engaging and interactive tool that brings a story to life.

This presentation will showcase the South Carolina Coastal Atlas and demonstrate some of the features utilized such as sidecars, map tours, and embedded applications. The South Carolina Coastal Program plans to build on this initial StoryMap and create a StoryMap Collection to include more targeted topics such as living shorelines, coastal hazards, and permitting.

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U.S. Geological Survey Total Water Level and Coastal Change Forecast Viewer

Kara Doran, Michael Slattery, Richard Snell, and Meg Palmsten, St. Petersburg Coastal and Marine Science Center, U.S. Geological Survey; Li Erikson and Alex Nereson, Pacific Coastal and Marine Science Center, U.S. Geological Survey

USGS has long been a trusted source of important coastal data resources for the scientific, private, and public sectors. Our data have driven important steps forward in research in coastal hazards; empowering public stakeholders with the ability to rapidly respond to changing threats from climate, storms, and floods. The data produced has also been used as a foundational or supplemental driver in a myriad of important research applications. To enhance these data resources, USGS has generated a number of user-friendly tools that stakeholders can access to visualize and download critical data sets. The Total Water Level and Coastal Change Forecast Viewer is an interactive map interface that allows users to assess regional or local coastal threats related to erosion. The tool is particularly applicable to local communities, coastal planners and emergency responders for identifying potentially threatened resources and expedite post-event response. Using local topography (beach slope and coastal elevations), winds, tides, surge, and wave conditions (including wave set-up and swash), the USGS, in cooperation with NOAA, provides hourly forecasts for up to six days of potential dune erosion, overwash, and coastal inundation. The animated water level viewer component enables quick, visual analysis of water levels with respect to local beach elevations to visualize erosion impacts. The forecast's raw data output is accessible for download in three common formats (JSON, XML, and CSV) via an API. Data from prior events for comparison with recorded erosional impacts is available as well, dating back to 2016 for some locations.

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Tools Showcase

Leveraging and Expanding a Data Ecosystem to Support Decision-Making

Mary Ford, Mid-Atlantic Regional Association Coastal Ocean Observing System

MARACOOS OceansMap is a dynamic data visualization tool integrating near real-time observational assets and model forecasts that contribute to ocean monitoring in the Mid-Atlantic region. OceansMap is the flagship ocean data portal of MARACOOS, one of the eleven US IOOS regional associations that are certified by the federal government for the quality of the data they serve. MARACOOS OceansMap enables stakeholders, partners, and the public free and open access to high quality data and information products to support decision making on our waters and along our coasts and estuaries in the Mid-Atlantic region, from Cape Cod, MA to Cape Hatteras, NC.

By working with stakeholders and partners, MARACOOS OceansMap has evolved into into a key tool used for decision making in the Mid-Atlantic. Through specialized instances of MARACOOS OceansMap, users can explore the different themes to find data relevant to a specific topic. To further improve data useability, the next generation of MARACOOS OceansMap has been created in close collaboration with NOAA CO-OPS, and with significant input from stakeholders and partners working within the maritime sector, offshore wind development, and the National Weather Service's regional Weather Forecast Offices. By engaging users across the nation to provide input and feedback on OceansMap, we will reduce barriers to data use by providing a more intuitive, tailored, and accessible interface that focuses on turning data into insight. This new, updated, and mobile friendly version of MARACOOS OceansMap will enhance stakeholders' ability to prepare, manage, and respond to changing conditions in the Mid-Atlantic to protect lives and property, public and environmental health, jobs and our economy, and the overall well being of the 79 million people residing in the Mid-Atlantic region.

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Improvements to the U.S. Geological Survey's Digital Shoreline Analysis System (DSAS)

Rachel Henderson, Marie Bartlett, Amy S. Farris, and Emily A. Himmelstoss, U.S. Geological Survey;
Meredith G. Kratzmann, Cherokee Nation System Solutions contracted to the U.S. Geological Survey

The Digital Shoreline Analysis System (DSAS) is now a standalone application that calculates the rate of change of a shoreline (or other boundary) over time. The DSAS software is designed to facilitate shoreline change calculation by providing an easy-to-use interface and accessible help resources. After the user provides shorelines and baselines, DSAS generates transects normal to the baseline. DSAS also calculates rate-of-change information with estimated uncertainties. DSAS is suitable for any project that tracks positional change over time, such as glacier limits, river edge boundaries, or land-cover changes.
This year DSAS underwent a major transformation from an ESRI ArcMap extension to a standalone application that can be used alongside any geographic information system (GIS). The first phase of development (DSAS version 6.0) was focused on meeting basic user requirements as a result of the U.S. Geological Survey mandated transition from ArcMap in 2024. This first phase of the update retained essential features (all rate calculations, summary report, FDGC-compliant metadata) to ensure a minimum viable product was available at the transition deadline. Currently, development continues into its second phase (version 6.1) and anticipated updates include reinstating DSAS capacity for shoreline forecasting, and the application of the proxy-datum bias. Additional improvements include a more streamlined data management workflow, compatibility with shapefiles as well as GeoJSON files, editing options, improved layer display, advanced options for calculation (e.g., time range selection) and enhanced data visualization options. The final phase of development (version 6.2) looks to build upon 6.1 and incorporate additional improvements based on user needs.

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Mapping Baylands Resilience: A Metrics Framework in San Francisco Bay

Alex Braud, Ellen Plane, Jeremy Lowe, and Annie Sneed, San Francisco Estuary Institute

The San Francisco Estuary Institute (SFEI) and Bay Area partners are developing a framework to quantify baylands resilience through measurable metrics tied to key ecosystem services. This initiative aims to define what constitutes resilience for services such as wildlife support and flood attenuation, translating those concepts into geospatially mappable metrics. By establishing a clear baseline of baylands resilience, this framework enables the tracking of changes over time and informs decision-making for sea-level rise adaptation and ecosystem restoration.

Key components of the framework include the development of resilience metrics like “connectivity within the complete marsh,” “diversity and complexity of channel networks,” and “wave attenuation,” which serve as indicators for ecosystem health and functionality. These metrics are then used to support practical decision-making processes, such as the US Army Corps of Engineers' (USACE) Regional Dredged Material Management Plan, to prioritize beneficial use of dredged sediment from San Francisco Bay navigation channels. The mapping of these metrics helps to identify sites for actions such as sediment placement, ranging from existing marshes to potential restoration areas in diked baylands.

By coupling regional context with site-specific design, this framework supports the strategic implementation of nature-based solutions and the broader resilience of bayland habitats. The Baylands Resilience Framework advances a practical approach to baylands resilience, providing tools and quantitative metrics that enhance adaptation efforts and allow community partners to make informed decisions on protecting and enhancing ecosystem services in the San Francisco Bay Area.

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NOAA's High Tide Flooding Outlooks Help Users Plan for Future Flood Risks

Karen Kavanaugh and Analise Keeney, NOAA's Center for Operational Oceanographic Products and Services

Business closures, overflowing storm drains, and longer commutes are just some of the short-term disruptions coastal communities experience due to minor flooding, commonly referred to as high tide flooding (HTF). As global sea levels continue to increase, high tide flooding is becoming more frequent and severe within coastal communities. NOAA's Center for Operational Oceanographic Products and Services (CO-OPS) has translated recent scientific advancements into a suite of web-based high tide flooding products to help communities mitigate and adapt to rising sea levels on multiple timescales. NOAA Annual Outlooks support inter-annual planning by providing visualizations of projected high tide flood frequencies at 98 long-term CO-OPS water level stations for the next meteorological year, May to April. Past flood days are also shown to illustrate how flood frequencies vary from year to year due to large-scale changes in atmospheric and ocean circulation patterns, including the El Niño Southern Oscillation (ENSO). Civil engineers, city planners and emergency managers can incorporate this flood frequency data into their critical infrastructure evaluations and budget decisions. On the subseasonal timescale, NOAA Monthly Outlooks illustrate when and where high tide flooding is likely to occur at 67 long-term CO-OPS water level stations up to a year in advance. Seasonal flooding data is also shown, allowing users to see what months typically have the greatest flood risk. The Monthly Outlook helps local planners time the allocation of response staff and resources to areas with the highest flood risk, and provides meteorologists with additional data for making accurate flood forecasts. For deeper analysis, the underlying data for each outlook are shared via CO-OPS APIs and GIS services. Across subseasonal to annual time scales, NOAA's high tide flooding outlooks readily provide public and private sector users with actionable data that bolster resilience to regional flooding and sea level rise impacts.

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CorpsCam: Monitoring Federal Beach Projects at High Spatial and Temporal Resolution

Charlene Sylvester, Brittany Bruder, and Mike Forte, Engineer Research and Development Center, U.S. Army Corps of Engineers

The US Army Corps of Engineers (USACE) requires technology to enable the monitoring of the state of federal beach projects at higher spatial and temporal resolution and lower cost relative to existing methods. Coastal imaging in combination with image rectification procedures can provide high frequency shorelines, currents, and bathymetry measurements that are important for monitoring the performance of beach projects. Oblique images of the shoreline are being acquired using various camera technologies including Argus, trail cameras and cell phones under an initiative known as CorpsCam. Site by site variations in technology, image capture rates and image products exist. A common set of attributes across all sites, however, define a schema that supports the discovery, visualization, and access of this imagery via web-based feature services and web applications. This presentation will provide live demonstrations of the web viewers that have been built to support the CorpsCam initiative and will exchange technical knowledge and lessons learned in establishing automated workflows for the provisioning of this imagery via web applications.

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Modernizing Grant Management: North Carolina Coastal Access Grant Dashboard

Rachel Love-Adrick, North Carolina Division of Coastal Management

The North Carolina Division of Coastal Management's Public Beach and Coastal Waterfront Access Program, established in 1981, has provided crucial funding for local governments to acquire land and develop public access sites along the coast. Over its 40+ years, the program has supported projects ranging from small, local access areas to larger regional sites featuring amenities such as parking lots, bathrooms, and picnic shelters.

However, for much of its history, the program lacked a centralized database. Record-keeping was manual, with handwritten ledgers eventually replaced by Excel spreadsheets. This disjointed system made it difficult for staff to manage grants efficiently and required extensive time to respond to inquiries from local governments or the media about past projects.

In response, the Division developed the NC Coastal Access Grant Dashboard, an interactive map that consolidates 44 years of grant data, making information easily accessible. The map not only tracks the number of grants awarded, total funding, and land acquired but also links to digitized grant files stored in LaserFische, significantly improving staff efficiency.

This powerful tool showcases the impact of the grant program and has been utilized in several important ways:

- Supporting funding requests by providing detailed statistics and visualizations that highlight the program's achievements and future needs.
- Identifying underserved communities, allowing staff to improve outreach and expand access in areas lacking sufficient public beach and waterfront facilities.
- Pinpointing sites nearing the end of their useful life, enabling staff to plan for necessary repairs or replacements and ensure continued public access.

By leveraging this tool, the Division of Coastal Management has been able to make data-driven decisions that enhance both the effectiveness and reach of the Public Beach and Coastal Waterfront Access Program.

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Federal Flood Standard Support Tool

Doug Marcy and William Brooks, NOAA's Office for Coastal Management; Andrew Martin, Federal Emergency Management Agency; Megan Treml, Lynker at NOAA's Office for Coastal Management

The Federal Flood Standard Support Tool (ffrms.climate.gov) helps federal agencies and their non-federal partners and grantees determine if a federally funded project will be located within a FFRMS floodplain. It includes FFRMS floodplains using the climate informed science approach where there is available and actionable data. This website is a resource to assist federal agencies, their non-federal partners, and grantees in the floodplain review. It provides a methodology and tool to identify if a federally funded project is in the FFRMS floodplain (step 1 of the 8-step process). This website also provides information to inform other parts of the 8-step process, including background and resources for the incorporation of natural systems, ecosystem processes, and nature-based approaches (referred to throughout this website as "nature-based solutions" or NBS) when developing alternatives to federal actions.

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The U.S. Geological Survey's Hazard Exposure Reporting and Analytics (HERA) Web Tool

Alex Nereson and Maya Hayden, Pacific Coastal and Marine Science Center, U.S. Geological Survey;
Nathan J. Wood, Western Geographic Science Center, U.S. Geological Survey

The USGS Hazard Exposure Reporting and Analytics (HERA) web tool helps communities understand how coastal hazards could impact their land, people, infrastructure, and livelihoods. HERA provides maps, graphics, and data dashboards to help visualize community exposure to three types of hazards that come from the USGS Coastal Storm Modeling System: (1) coastal flooding related to different storm intensity and sea level rise scenarios, (2) changes in groundwater depths due to sea level rise, and (3) shoreline change related to sea level rise, storms, and differing coastal management strategies. With these web tools, we aim to provide communities with data that may help them reduce unacceptable risks, raise awareness of the factors that influence coastal hazards, and identify places that may need more local studies. The HERA toolset is always growing to include new geographies and now incorporates parts of the southeastern U.S., California, Washington, and the Pacific islands of Hawaii, American Samoa, Guam, and the Northern Mariana Islands. At this showcase, we will demonstrate how HERA's tools map the areas affected by hazards and estimate the number of people and assets that are in a specific hazard zone. The asset classes we will discuss include parcel values, roads, railways, and critical facilities like fire and police stations, hospitals, and schools. We will also make comparisons between communities and across a range of sea level rise, storm intensity, and coastal management scenarios.

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Accessing Geodetic Control and Datum Transformations

Galen Scott and Mike Aslaksen, National Geodetic Survey, NOAA

Join National Geodetic Survey staff to explore two foundational tools for working with geodetic control and making geospatial data sets more interoperable. VDatum (https://vdatum.noaa.gov) is a free software tool being developed jointly by NOAA'sNational Geodetic Survey (NGS), Office of Coast Survey (OCS), and Center for Operational Oceanographic Products and Services (CO-OPS). VDatum is designed to vertically transform geospatial data among a variety of tidal, orthometric and ellipsoidal vertical datums - allowing users to convert their data from different horizontal/vertical references into a common system and enabling the fusion of diverse geospatial data in desired reference levels. The NGS Map (https://geodesy.noaa.gov/datasheets/ngs_map) is an ArcGIS Online Web Map Application that enables users to view datasets provided by the National Geodetic Survey, including NGS Datasheets, OPUS Shared Solutions, and the NOAA CORS Network. This application not only allows users to plot these datasets and interact with the features to view attributes but provides many other features including: a search tool, a measure tool, basemap selector, a feature selection and exporting tool and an attribute table to view and filter attributes.

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NOAA CoastWatch Data Portal

Michael Soracco and Veronica Lance, NOAA's National Environmental Satellite, Data, and Information Service, STAR, Satellite Oceanography and Climatology Division

Coastal environmental managers often need data for a given place for specific time periods. Earth observing satellites can provide useful and fit for purpose data. These data, however,are not always easy to locate, view or subset. The NOAA CoastWatch Data Portal is a tool designed to visualize data coverage and facilitate data access across multiple satellites and sensors. CoastWatch provides access through its portal to NOAA and non-NOAA (e.g., Copernicus Program, and Canada Radarsat Constellation Mission) data and products. Using the portal, a user can perform a geospatial-temporal search to view preview images and access URL for NetCDF datasets. In addition, mapped datasets can be viewed to ascertain coverage (regional to global), resolution (10m to 25km), and suitability for an application of interest. The data portal also has toolkits such as the Estuary toolkit implemented to support the Environmental Protection Agency where sea surface temperature means and standard deviation are pre-calculated for 83 estuaries (defined by the ...model) around the coastal United States. Annual, monthly, by month, and daily calculations are available to aid in coastal management decisions, such as fisheries, seagrass, and water quality. The CoastWatch Data Portal has many more features and can be a useful tool in assessing and acquiring satellite data for coastal applications.

Disclaimer: The scientific results and conclusions, as well as any views or opinions expressed herein, are those of the author(s) and do not necessarily reflect those of NOAA or the U.S. Department of Commerce.

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NJRESTORS – A Custom ArcGIS Web Application to Visualize Areas and Projects for Wetland Restoration

Michelle Stuart, Rutgers, The State University of New Jersey; Richard Lathrop, Center for Remote Sensing and Spatial Analysis, Rutgers, The State University of New Jersey

When planning a wetland restoration project, it is important to consider the needs of the target area, what other projects have been done or are planned for the area, what issues are of high priority in the area, and what techniques or approaches will be most likely to achieve the goals of the project. The New Jersey Restoration Tool Organization Suite (NJResTOrS) is an ArcGIS web tool suite that guides a user through a decision tree to answer these important questions. The web application assists in coastal planning and identification of locations where climate change-related impacts would benefit from restoration efforts. The suite guides users through three main questions: Where work is needed, what issues need work, and how to approach remediation. This session will demonstrate how these tools work together to help planners achieve their goals, focusing on increasing community resilience, ecosystem health, and carbon sequestration.

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Toolkit for Assessing Sea Level Rise Impacts and Adaptations on Coastal Pavements

Wei Sun, Jo Sias, and Eshan Dave, University of New Hampshire

Roads in the coastal communities are increasingly vulnerable to sea level rise (SLR), facing challenges such as inundations during high tide, reduced load bearing capacity with rising groundwater levels, and more frequent and severe washout damage. These impacts necessitate an urgent, and proactive approach to pavement planning and management. Supported by a NOAA Emerging Sea Level Rise (ESLR) program grant, this research has developed an advanced planning toolkit to evaluate and predict the effects of SLR on pavement lifespan. Utilizing a combination of physical and AI-based models, the tool generates dynamic life curves for pavement damage, based on the current empirical design practice in the field. The tool's input parameters include pavement configuration, traffic conditions, SLR scenarios, and soil properties, allowing for a comprehensive evaluation of the potential damage. Moreover, the toolkit is designed to be able to assess different adaptation strategies and their impacts on the pavement damage process, this can be accomplished by updating the effects of adaptation alternatives on input parameters and in turn refining predictions of the road life curves. It also features advanced functionalities to address the inherent uncertainties in SLR projections, providing stakeholders with a range of probable outcomes to better manage risk. This web-based tool, which will be launched with instructional videos and detailed documentation, enables users to visualize scenarios effectively and make well-informed decisions aimed at enhancing the resilience and sustainability of coastal roads. This session will demonstrate the tool's capabilities in creating detailed scenarios, visualizing outcomes, and aiding in strategic decision-making for sustainable coastal road management.

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Coastal Risk Finder: Climate Central's New All-In-One Tool for Assessing, Communicating, and Responding to Coastal Flood Risk

Kelly Van Baalen, Climate Central

With sea levels projected to rise a foot and multiply the frequency of moderate flooding ten-fold by 2050 (NOAA 2022), it is more imperative than ever that coastal professionals have the resources they need to analyze, communicate, and adapt to the risks posed by sea level rise and coastal flooding.

Coastal Risk Finder is a forthcoming interactive web tool that allows users to customize their sea level rise and coastal flood scenario, learn who and what is at risk, and share localized maps, statistics, and graphics for any state, county, municipality, congressional district or state legislative district in the contiguous United States, Alaska, and Hawaii. The tool also provides information and resources about adapting to coastal flood risks, as well as curated lists of coastal resilience efforts in each state.

For the past decade, Climate Central has provided publicly available online tools, maps, reports, and visualizations, grounded in peer-reviewed research and informed by the needs of coastal stakeholders. These resources have been shared by the news media tens of thousands of times, used by more than ten million people, and featured at the UN climate conference. Now, based on the findings of a year-long needs assessment involving interviews with over 100 stakeholders we are redesigning our flagship tool, the Coastal Risk Finder.

This session will preview Coastal Risk Finder, provide examples of how coastal resource management professionals and others use our tools, and seek feedback from the audience to inform their continuous improvement.

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GeoCoast3D: Visualizing the Impact of Inundation on the Gulf Coast

John van der Zwaag and John Cartwright, Mississippi State University

GeoCoast3D, part of the GEO Project's GeoCoast suite of tools, is a 3D, web-based application that allows users to interactively explore the impact of inundation from sea level rise or storm surge on the Gulf Coast. It uses topography and 3D buildings generated from LiDAR to visualize the effect of rising water levels on structures and road networks. Different methods of inundation can be selected such as a basic elevation-based bathtub model, NOAA's sea level rise data, hindcast ADCIRC storm surge models, or NOAA's Effects of Sea Level Rise model. Built using Esri's Experience Builder, it provides geospatial tools such as routing and service area widgets that allow users to analyze the impact to critical infrastructure and transportation. Custom widgets allow access to other GeoCoast tools within the GeoCoast3D application. These tools include GeoPanorama, a virtual reality visualization in a 360° panoramic environment, and GeoInundation, a 3D birds-eye view at several locations along the Gulf Coast. Both of these tools enhance the capabilities of GeoCoast3D by providing realistic, interactive imagery of familiar landmarks.

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Regional Coastal Data Analysis Using the JALBTCX Toolboxes

Jennifer Wozencraft, Scott Spurgeon, Ashley Elkins, and Aleks Ostojic, Coastal and Hydraulics Laboratory, U.S. Army Engineer Research and Development Center

Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX) released a suite of GIS tools for regional coastal data analysis. One set of tools walks a user through the steps required to compute sediment volume change from lidar-derived Digital Elevations Models (DEMs) in alongshore segments. Another set of tools guides the user through steps to extract geomorphological features like dune height and width, beach width and slope, sand bar crests and troughs, and bluff heights from lidar-derived DEMs. Another tool combines some of these geomorphological features with authoritative water level data from NOAA and wave data from US Army Corps of Engineers (USACE) to compute a Coastal Engineering Resilience Index (CERI). USACE and Industry engineers and scientists developed and have been evolving these tools for over a decade to meet internal data analysis needs for several projects. The volume change toolbox has been used extensively to compute volume of sand lost to beaches after hurricanes and sediment volume changes for regional sediment budgets. Outputs from the feature extraction toolbox have informed a barrier island “breachability” index in Texas and a nearshore geomorphic vulnerability index in the Great Lakes. CERI is used to identify areas of the coast that may be less resilient than others and therefore good candidates for beneficial placement of dredged sediment and used to identify resilient beach profiles to inform design of more resilient beach and dune systems. This past year we have packaged a publicly releasable version of the JALBTCX Toolboxes, along with training material and sample datasets. This tools showcase will demonstrate how the toolboxes work using some of the project examples listed above, and provide details on where to download the toolboxes, training materials, and example datasets.

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Deriving Island Shorelines from Low-Resolution Satellite Imagery

Walter Zesk, Skylar Tibbits, Peter Stempel, and Tishya Chhabra, Massachusetts Institute of Technology

Tracking and monitoring shoreline evolution is critical for coastal management, particularly as climate change and human intervention disrupt existing sediment transport patterns. The accessibility of Satellite data offers an opportunity for communities to remotely observe the evolution of their shorelines. In a 2023 Benchmarking study, Vos et al. compared four methods of shoreline extraction and found shorelines derived from public satellite imagery (Landsat and Sentinel-2) achieved 10m accuracy at microtidal sites with accuracy degrading as the tidal range increased. These derivation methods rely upon consistent radiometry at the shoreline and are undermined by cloud cover and other occlusions. When deriving a sequence of shorelines to track shoreline evolution over time, occlusions render a percentage of images unusable, creating gaps in the resulting time series. Closing these gaps is particularly important for low lying islands and other contexts where coastal planning must reflect shoreline change occurring at small temporal and spatial scales.

An improvement to the accuracy or robustness of shoreline derivation therefore contributes an important improvement to the fidelity of the resulting shoreline evolution data, which in turn supports informed planning and decision making. This demonstration will present a more robust pipeline to derive shorelines from Satellite imagery using an open source toolset. The methods presented adapt and extend the widely used Coastsat (“CoastSat,” 2019) code base, with two modules:

1. Updated and fine tuned initial image segmentation
2. Updated shoreline refinement (post segmentation processing)

The presentation will walk through the full process from downloading imagery to exporting the resulting shorelines. All relevant code will be provided to participants as a Google Colab Notebook.

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The National Risk Index: Future Risk—Helping Build Hazard Resilience in a Changing World
Casey Zuzak, Emiliano G. Santin, and Katherine Landers, Federal Emergency Management Agency; Patrick McGuire and Jon Kidder, ABS Consulting

The prototype National Risk Index-Future Risk is an innovative tool designed to enhance the National Risk Index (NRI) by projecting the impacts of future scenarios for natural hazard risks. Developed by FEMA, the NRI is a comprehensive assessment tool that evaluates the risk of eighteen natural hazards across the United States, considering factors such as exposure, historical loss, and vulnerability.

The tool focuses on five key hazards: Coastal Flooding, Drought, Extreme Heat, Hurricanes (Wind only), and Wildfires. These hazards were selected based on their data availability, relevance, and significant impact on the NRI. By incorporating nationwide statistical downscaling from major climate models, it provides a forward-looking perspective on how these hazards might evolve under changing conditions.

A pivotal feature of the Future Risk Index is the Hazard Multiplier, which represents the anticipated changes in hazard intensity or frequency. This factor modifies traditional risk calculations, offering a more dynamic and climate-responsive assessment. The multiplier serves as a critical transfer function within the Future Risk Index, depicting the physical changes of hazards associated to future conditions. It allows for the scaling of current estimated annual losses and projects them within various temperature scenarios, providing a comprehensive monetary view of potential future natural hazard impacts.

The ultimate goal of Future Risk Index is to equip communities with a tool that visualizes how their risk profiles and estimated annual losses may shift under various future scenarios over different timeframes. This empowers better hazard planning and preparedness, ensuring that strategies are resilient and adaptive to future scenarios.

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The Coastal and Marine Ecological Classification Standard (CMECS) Catalog Discovery and Access Tools

Kate Rose, Northern Gulf Institute, Mississippi State University; Matt Dornback, NOAA's Office for Coastal Management

The Coastal and Marine Ecological Classification Standard (CMECS) Catalog is the encoded representation of the CMECS ecological units and classification framework. As CMECS is undergoing a recommended periodic review and update of its scientific content and classification framework, stakeholders need to be able to refer to these changes in order to update analytical processes or crosswalk between different versions of data and products if needed. A process incorporating FAIR principles (Findable, Accessible, Interoperable, Reusable) for recording changes in the CMECS Catalog has been developed, and open-source platforms such as GitHub, the NOAA Institutional Repository, and the Zenodo archive are leveraged to provide linked access and supporting documentation for the collection of CMECS resources. We will demonstrate how to navigate the CMECS resources and provide the status of new tools and update activities.

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A Bird's-eye View: Coastal Wetland Geospatial Products from the U.S. Geological Survey

Zafer Defne, Katherine V. Ackerman, and Neil K. Ganju, U.S. Geological Survey and the Woods Hole Coastal and Marine Science Center

Understanding the vulnerability of coastal wetlands to sea-level rise and other stressors requires a multi-faceted approach. Though traditional field-based methods yield valuable insight at smaller spatiotemporal scales, remote-sensing methods can provide standardized data on regional and national scales for multiple stakeholders. The U.S. Geological Survey (USGS) and partners have produced several geospatial products for coastal wetlands across the United States using a variety of satellite, aerial, and field observations. The U.S. Coastal Wetland Geospatial Collection houses three key wetland datasets for the contiguous US at 30-meter resolution: the UnVegetated-Vegetated Ratio (UVVR), wetland biomass, and relative tidal elevation (Z*). These three metrics are widely used to gauge wetland health, trajectory, and vulnerability. The Collection provides both visualization and download access for all three metrics, as well as a collection viewer which allows overlay of all three datasets. At the regional scale, the U.S. Coastal Wetland Synthesis Applications Geonarrative provides a deeper dive into applications of higher-resolution salt marsh vulnerability data in select areas. These include mapping of novel salt marsh geomorphic units across the Northeastern US, computation of sediment-based marsh lifespan, and synthesis of vulnerability data with land acquisition potential in the Southeastern US to guide management. This collection of geospatial data and applications represents the combined efforts across multiple disciplines to provide critical information for managing coastal wetlands across the United States.

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Sea Level Rise Data and Management

Predictive Sea Level Rise Models for a Regulatory Framework: Navigating the Legal Landscape

Alan Clinton and Kaaina Hull, County of Kauai Planning Department

The County of Kaua'i has initiated and adopted a number of climate hazard zoning ordinances that utilize the data from scientific studies to determine where or how construction can occur.

The purpose of this session is to go over how scientific modeling for climate change can be utilized in the drafting and implementation of built environment regulations. Regulatory standards for design and siting of structures around hazards is traditionally based on historic events, such as those regulations adopted under the national floodplain management program. However, climate change induced sea level rise in conjunction with increased intensity and frequency of storms and flooding events, will expand the extent of hazardous zones to previously unaffected areas. So how can zoning and building policies continue to allow development and construction in areas that will be impacted by climate change induced hazards without incorporating mitigating standards?

Climate scientists are generating a wealth of studies and projections on climate change's array of impacts. Can planners and policymakers use this information beyond just broad policy positions and visions and instead use these studies to physically regulate an area's built environment? Are there legal issues utilizing scientific projections to determine property rights?

Ka'aina Hull, the County of Kaua'i Planning Director, and Alan Clint, the County of Kaua'i Administrative Planning Officer, will present on the Kauai Coastal Erosion Study and how a scientific study of Kauai's coastal erosion rates dictate building setbacks in one of the country's most progressive shoreline setback ordinances. They will also present on the State of Hawai'i's Sea Level Rise (SLR) Viewer that models coastal erosion, passive flooding, and annual high wave flooding impacts, and how Kaua'i has recently adopted a Sea Level Rise Zoning District Overlay with SLR design elevations required for all construction and development within this projected area of impact.

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Sea Level Rise Data and Management

An Automated Vertical Datum Transformation Workflow for Coastal Data Products

Joan Herrmann, Lynker at NOAA's Office for Coastal Management; William Brooks and Doug Marcy, NOAA's Office for Coastal Management

To ensure geodetic rigor, a coastal project or decision support tool must have datum consistency between its geospatial datasets. Datums (both horizontal and vertical) vary across datasets due to the area's specific topography and the availability of the most up-to-date modeling (e.g. geoids). GIS software can perform only horizontal transformations, making an external workflow required for vertical inconsistencies. The topic of this abstract is the creation and execution of a vertical transformation workflow developed by the team from NOAA's Office for Coastal Management who is responsible for one of the agency's most popular tools, the Sea Level Rise Viewer. While the VDatum program is the primary mechanism for vertical transformations, the team leverages VDatum's underlying modeled data to perform national-scale transformations outside of the program. VDatum's "roadmap" guided this work's theoretical framework to vertically transform the tidal grids from an orthometric datum based on the National Geodetic Survey's experimental geoid to the target reference of the Sea Level Rise Viewer; North American Vertical Datum of 1988 (NAVD88). This workflow was applied to tidal surfaces for Alaska, Washington, Oregon, and California, reflecting the workflow's diverse applications. A post-processing accuracy assessment compared the alternate workflow result with those of the VDatum program for selected points. The results indicated the difference between the program and the alternative workflow are negligible as it is within the VDatum's inherent uncertainty (<10 cm). For the purposes of the Sea Level Rise Viewer, the alternate workflow provided significant time-savings compared to transforming through the VDatum program, without a loss in accuracy. Given the rise of long-term and large-scale coastal projects, coastal projects will face the challenge of wanting to use multiple data sources with varying datums. The presented workflow serves as a resource for coastal projects to address vertical datum transformation requirements given their unique circumstances.

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Sea Level Rise Data and Management

Recalculating Shoreline Mileage for the Nation

Maryellen Sault and Mike Aslaksen, NOAA's National Geodetic Survey

NOAA's National Geodetic Survey embarked on an ambitious project to recalculate shoreline mileage for the United States and its territories using digital shoreline and modern GIS techniques. This new calculation marked the fifth time that NGS and its predecessor agencies assessed and calculated shoreline mileage. In the recent recalculation, a modified version of the Continually Updated Shoreline Product (CUSP) was used in GIS software to digitally calculate mileage. This presentation will cover the history of shoreline mileage calculations at NOAA and the methodology used for the current recalculation.

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Ocean Planning – Part 1

Marine Life Distribution and Abundance Models: Updates and Future Work

Sarah DeLand, Jesse Cleary, Ei Fujioka, Jason Roberts, Debbie Brill, Ben Donnelly, and Corrie Curtice,
Marine Geospatial Ecology Lab, Duke University

The Marine Geospatial Ecology Lab (MGEL) at Duke University is currently engaged in multiple collaborations to generate, collate, and distribute spatial data products that are critical inputs to ocean planning, management, and decision making. MGEL has worked with regional ocean councils and government agencies to support specific planning efforts and to integrate data products between these projects toward a consistent set of baseline data and models.

In 2014, the Mid-Atlantic Regional Council on the Ocean (MARCO) and the Northeast Regional Ocean Council (NROC) began a partnership with the Marine-life Data and Analysis Team (MDAT) led by MGEL. With partners in NOAA NCCOS, NMFS, The Nature Conservancy and USN NUWC, MDAT generated a comprehensive library of marine life data products for 30 species of cetaceans, 49 species of seabirds, four species of sea turtles, and 82 species of fish along the U.S. Atlantic coast. MGEL is also collaborating with Fisheries and Oceans Canada on transboundary models for North Atlantic right whales to model their distribution across their entire range. Additional North Atlantic right whale models are in development with support from NOAA and BOEM to produce near-real-time predictions of right whale distribution.

MGEL is also contributing to offshore wind planning efforts through engagement with the Regional Wildlife Science Collaborative (RWSC) and Project WOW (Wildlife and Offshore Wind). MGEL also hosts marine mammal models and detailed documentation for multiple US Navy training areas (US East Coast, Gulf of Mexico, US West Coast, and the Arctic) on the OBIS-SEAMAP model repository.

These collaborative efforts provide consistent models and data products that support ocean planning efforts and decision-making processes integrated across multiple agencies, ocean uses and geographies.

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Ocean Planning – Part 1

3D Habitat Mapping of the Rocky Intertidal and Drone-Based Kelp Mapping on the California Coast

Abreanna Gomes and Elyas Scott, Kashia Band of Pomo Indians

The Kashia Band of Pomo Indians of Stewarts Point Rancheria's (KBPI) is a partner in the Tribal Marine Stewards Network (TMSN), which is an alliance of Tribal Nations working collaboratively to protect and revitalize our seascapes. The TMSN leverages cutting edge technologies with Indigenous and Euro-centric sciences to implement coastal habitat mapping projects along the coast of California that support climate resiliency. Each Tribal Nation of the TMSN leads synergists and unique initiatives within their territories that support the collective work and goals of the network. Within Kashia territory, KBPI leads 3D habitat mapping of the rocky intertidal using high resolution imagery and drone-based kelp mapping.

Coastal ecosystems like the rocky intertidal and kelp forests are culturally and ecologically important places where Tribes continue to gather for subsistence and ceremony. The Tribal Intertidal Digital Ecological Surveys (TIDES) project aims to evaluate the current state of rocky intertidal ecosystems and assess how projected sea level rise will impact these important communities. Using high resolution imagery of the rocky intertidal zone, the TMSN is leading work to create 3D habitat models that provide a digital record of species presence and abundance which can be used to track annual and seasonal changes, as well as impacts of climate change along the California coast. Along with pursuing aquaculture, KBPI is also using aerial drone surveys to assess current conditions and identify areas for potential restoration of kelp beds. As part of the TMSN, KBPI leads research that will support our community now and into the future.

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Ocean Planning – Part 1

Improving AIS Vessel Identification through an Innovative AIS Vessel Validation Database

Jeremy Fontenault, Tetra Tech; Jesse Brass and Daniel Martin, CSS Inc. at NOAA's Office for Coastal Management

The U.S. Coast Guard manages the Nationwide Automatic Identification System (NAIS) program to improve maritime security, navigation safety, search and rescue, and environmental protection. Using Automatic Identification System (AIS) data, vessel traffic can be analyzed. NOAA's Office for Coastal Management and the Bureau of Ocean Energy Management (BOEM), with the support of RPS/Tetra Tech, compile AIS data products for visualization and analysis, and share these data through the Marine Cadastre.

Data quality, accuracy, and completeness are important for AIS data to support related applications and analysis. Beginning in 2015, the Authoritative Vessel Identification Service (AVIS) was used to correct select fields that had either missing or outdated values. However, this data has not been updated or supported since 2017. As new AIS devices are deployed or swapped, the accuracy and completeness of this database has diminished, and the value it adds to AIS data products also decreases.

RPS/Tetra Tech and Marine Cadastre recently finalized development of the new AIS Vessel Identification Database (AVID) using the latest information from a variety of sources. Vessel information collected from these sources cataloged, standardized, and ranked before being used to populate this new database. The development of this vessel validation database provides a more extensive list of vessels than AVIS, includes validation tests for accuracy, allows for tracing vessel information back to the original source, and was built in a manner that will facilitate faster and more frequent updates in the future. AVID was integrated into the standard AIS data product workflow beginning in January 2024, replacing the aforementioned AVIS database.

The presentation will describe the development of AVID and highlight the innovative advantages of this new resource. Additionally, examples will be shown to demonstrate some of the validation work completed and highlight improvements in the most recent AIS products.

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Ocean Planning – Part 1

Developing Methods for Determining If and Why Dredging Vessel Sensor Data Is Anomalous

Jesse Hall, Rhonda Lenoir, and Andrew Keith, U.S. Army Corps of Engineers; Ross Winans, Athena Liu, and Gabe Sataloff, NV5 Geospatial

The US Army Corps of Engineers Dredging Quality Management (USACE DQM) Program receives thousands of data points from dredging vessels each hour from a series of onboard sensors in the USACE Databricks environment. To more efficiently and accurately perform quality assurance checks on the sensor observations, USACE DQM partnered with NV5 to develop a series of statistical and machine learning methods to identify dredge states and flag anomalous data from raw sensor observation data. Attributes from the sensor data, such as dragarm's depth, the vessel speed, and the vessel's movement, were validated using a series of rulesets that run early during data ingestion. Validated data is used to train machine learning models that can identify the dredging vessel's operational state, such as dredging, turning, traveling, and more.

To further add context to the reporting of potential data anomalies, USACE DQM and NV5 developed data pipelines that enrich the raw data using meteorological and oceanographic data from several authoritative data providers, such as NOAA and USGS. Knowing the operational conditions of a dredging vessel in the field can help to remove false positive detections of faulty sensors. To ensure the data pipelines are performant, all data is indexed to an Uber H3 spatial index that covers all navigable US waters.

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The Use of Drones in Coastal Management

Deploying Uncrewed Aerial Vehicle (UAV) Technology to Assess Typhoon Impacts in Vulnerable Communities in Guam

John Borja and Keanno Fausto, Micronesian Area Geospatial Information Center (MAGIC) Lab, University of Guam; Romina King, NASA Guam Space Grant, Pacific Islands Climate Adaptation Science Center, University of Guam; Jonelle Sayama, Kaya Taitano, Dong Won Lee, Frank Lujan, and Danielle Hagen, Micronesian Area Geospatial Information Center (MAGIC) Lab, University of Guam

The U.S. territory of Guam is threatened annually by high-intensity storms and typhoons due to its location in the western Pacific Ocean. The island's infrastructure – buildings, roads, and utilities – bear the brunt of typhoon damage, which in turn affects public health, the economy, and natural resources. Traditionally, these impacts have been observed via satellite, radar, and official weather stations. Damages are assessed in the aftermath of the typhoon with a manual, on-the-ground approach led by the National Weather Service (NWS). This is often exhaustive and time-consuming for the assessment team. Observations from the ground can inadvertently create data gaps on damage assessments due to inaccessible areas caused by vegetative and construction debris, and flooded roads and pathways. This may not capture many impacts eligible for local or federal assistance. To address these data gaps and augment damage assessments, the University of Guam (UOG) Drone Corps program aims to assist local and federal government agencies (e.g., utility companies, public health, emergency services, and natural resource management) by collecting high-resolution aerial imagery to help prioritize and allocate limited resources. This presentation highlights the results of this novel collaboration of UOG, NWS, Guam Homeland Security (GHS), and the Office of the Governor of Guam in the creation of the damage assessment of Typhoon Mawar, which ravaged Guam on 24-25 May 2023. Following the typhoon, UOG worked with NWS to identify and capture imagery of vulnerable sites (also informed by Paulino et al. (2021)) that were heavily impacted. This presentation will also share how UOG Drone Corps' data was disseminated among other agencies as supplemental data for natural disaster recovery efforts. The presentation will conclude with a summary of the UOG Drone Corps program model as a resource for developing resiliency strategies for vulnerable island communities using advanced and emerging technologies.

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The Use of Drones in Coastal Management

Using Uncrewed Aerial Vehicles to Estimate Surface Flow

Conor O'Hara and Michael Durbano, EA Engineering, Science, and Technology, Inc., PBC

Unmanned aerial vehicles, commonly referred to as drones, have had an increasing role in monitoring environmental conditions. We performed a pilot study to characterize reach-scale stream dynamics using large-scale particle image velocimetry (LSPIV) techniques on a video recording captured from a drone. The open-source python library pyOpenRiverCam was used to perform the analysis and post-process the results. Utilizing high-resolution aerial video-imagery, surveyed ground control points, and free open-sourced python libraries we were able to test and evaluate a methodology for capturing and quantifying data on water flow patterns, velocity, and discharge volume. Stream flow velocity estimates obtained from the LSPIC approach were compared to those obtained from a Marsh-McBirney flowmeter and USGS float method. Preliminary results suggest that the LSPIV approach provides estimates of stream flow velocity that are comparable to traditional methods. In addition, this study demonstrates several benefits compared to traditional hydrologic measuring techniques. For example, the drone's capability to record stream flow without having to enter the stream provides a safer and likely more cost-effective method of data collection compared to wading in the stream. Our findings demonstrate the effectiveness of drones in detecting changes in flow direction, velocity, and discharge. This innovative approach has significant implications for environmental monitoring by providing a tool to understand surface flow patterns and surface flow velocities at base-flow and after storm events.

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The Use of Drones in Coastal Management

Demonstrating Effective Integration of Unmanned Aircraft Systems (UAS) with Hydrological and Geochemical Monitoring for Mapping Coastal Marshes

Jin-Si Over, Seth Ackerman, Jennifer Cramer, Sandra Brosnahan, and Meagan Eagle, Wood Hole Coastal and Marine Science Center, U.S. Geological Survey

Coastal marshes are critical ecosystems that provide essential services such as habitat for wildlife, carbon sequestration, and flood protection. Mapping these environments accurately is vital for effective management and conservation. In this work, we show how leveraging a variety of sensors for uncrewed aerial systems (UAS) can enhance marsh mapping and increase data utility, such as complimenting on-the-ground geochemical measurements to better understand changing marsh condition. Marsh Island, our case study, is a newly restored coastal salt marsh in New Bedford Harbor and is part of a restoration effort by the city and the Buzzards Bay Coalition to turn the former granite quarry into public wetland. The U.S. Geological Survey is participating in a long-term study that includes the integration of geochemistry and streamflow measurements with remote sensing data collected using UAS with LiDAR (YellowScan Mapper+), multispectral (Altum-PT), and thermal sensors (Skydio X10). Data has been collected since October of 2023; LiDAR provides high-resolution topographical data, enabling detailed analysis of marsh structure and elevation changes. Multispectral imaging facilitates the assessment of vegetation health and diversity, while thermal sensors offer insights into hydric conditions and temperature variations. We also examine how different sensors compare when collecting similar data, such as imagery for structure-from-motion products and how that compares to LiDAR derived surfaces. This research demonstrates that UAS can provide large and detailed datasets but also that the technology requires knowledge sharing with partners in other disciplines to develop a comprehensive description of the structure and processes of marsh restoration.

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The Use of Drones in Coastal Management

Unmanned Aircraft Systems (UAS) Data Collection Methods for Coastal Vulnerability Monitoring in Folly Beach, South Carolina

Eric Kencel, AECOM

With the increasing threat that climate change and sea level rise pose to coastal environments and communities, data collection and analysis methods to support coastal vulnerability monitoring are becoming more and more important to understand the evolving hazards impacting these areas. Regular interval and post-storm data collection can provide valuable insights into the changes over time as well as the immediate impacts of a storm on a coastal area and can lay the groundwork to highlight areas that are vulnerable to future coastal hazards such as erosion or flooding. Compared to traditional aerial data collection methods, UAS data collection can require less planning, less notice ahead of time, and can produce high resolution data at a lower cost while maintaining comparable accuracy.

This session explores the benefits, feasibility, and coastal vulnerability analysis potential for coastal data collection via Unmanned Aerial Systems (UAS), i.e. drones, by walking through examples of data collection and analysis focused on Folly Beach, South Carolina. Multiple flight plans were delineated and flown for aerial data collection with a relatively low cost UAS over three different areas of Folly Beach, each highly susceptible to coastal hazards including flooding and erosion. This presentation will explore the benefits and uses of UAS-based data products such as pre-storm and post-storm orthomosaic aerial imagery, demonstrating the value in high resolution, accessible, and feasible UAS data collection for coastal vulnerability monitoring.

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Discussion: Empowering Tribal Communities Through Geographic Information System (GIS) Training: A Collaborative Partnership Between Mississippi State University and the Bureau of Indian Affairs (BIA)

Panelists:

- Dixie Cartwright, Geosystems Research Institute, Mississippi State University
- John Cartwright, Geosystems Research Institute, Mississippi State University
- Claire Babineaux, Geosystems Research Institute, Mississippi State University
- David Vogt, Bureau of Indian Affairs

Tribal communities across the United States face unique challenges and opportunities in today's rapidly changing landscape. In an era where data-driven decision making is paramount, empowering these communities with GIS skills cannot only enhance community development and resource management, it can help ensure their cultural preservation. To empower these communities with essential GIS skills, Mississippi State University (MSU) and the Bureau of Indian Affairs (BIA) have partnered to offer a flexible suite of online geospatial training courses. Supported by the NOAA Regional Geospatial Modeling Grant, these self-paced courses provide tribal participants with foundational knowledge in digital mapping and spatial analysis.

This interactive group discussion invites attendees to learn how this partnership between MSU and BIA has provided a flexible and cost-effective solution to meet the growing geospatial education needs of BIA and tribal communities. And, how it has enabled larger class sizes and more specialized training than previously possible, significantly enhancing access to quality geospatial instruction. Since spring 2023, over 750 participants stretching from Alaska to Florida have taken advantage of this educational opportunity and enrolled in courses.

Additionally, participants will hear how MSU and BIA are building on the success of this partnership in 2025 with the expansion of in-person training courses. As BIA works to transition to an on-demand training model, scheduling courses throughout the year and diversifying beyond a single software system, we will share how this approach incorporates various software platforms and specialized areas of training, with potential for vendors to develop custom courses tailored to specific tribal needs.
Join us to hear how this evolving partnership aims to continually improve and adapt the geospatial training landscape for BIA and tribal communities, and how we are working to empower tribal populations with the geospatial knowledge and skills needed for more informed decision-making.

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Discussion: Harnessing Partnerships for Coastal Innovation—Driving Data Access and Resilience Through State and National Collaboration*

Panelists:

- Leslie Jones, State of Alaska Geospatial Office
- Kim Jackson, Florida Geographic Information Office
- Natalie Lee, Georgia Geospatial Information Office
- Colleen Kiley, North Carolina Center for Geographic Information and Analysis

Data is the foundation for decision making. Partnerships are the foundation for creating and accessing actionable data.

Learn how State Geospatial Offices and coordinating councils are leading state and national efforts to make data F.A.I.R – Findable, Accessible, Interoperable, and Reusable - supporting coastal hazards, climate adaptation, and management decision-making. Don't know about State and National Spatial Data Infrastructures? Join us in this session.

State of Florida is in the midst of a $100 million dollar project to map the entire coast from near shore to offshore by the end of 2026. Learn how the State of Florida is building successful partnerships to support prioritization, data accessibility, and requirements to meet end-users needs. Hear about the emerging technologies used for this project and see examples of use cases from Resilience to Coastal Hazards and Ocean Planning being supported through this Statewide Initiative.

State Geospatial Councils are built on the belief that all sectors play a role in advancing our State and National Spatial Data Infrastructures. Learn from one of the best! North Carolina's Geographic Information Coordinating Council will showcase new data releases and the value of partnerships to provide critical information that supports resiliency planning, floodplain risk, and environmental justice applications.

State of Alaska will add a different perspective to why partnerships are so important. Learn how Alaska's unique challenges require strategic partnerships and thinking out of the box solutions. Highlights will include challenges associated with data planning and prioritization, collection, production, and accessibility. We will highlight the value of cross-sector coordination to inform feasible approaches and solutions.

Want to get more involved in state partnerships? Learn from the State of Georgia about the National States Geographic Information Council and our partnership with Digital Coast in providing the human infrastructure to coordinate and progress national issues.

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Topobathy Mapping

The U.S. Geological Survey's Coastal National Elevation Database (CoNED): Integrated Topobathymetric Models and Applications for the U.S. Coastal Zone and Inland Areas

Jeffrey Danielson, Monica Palaseanu-Lovejoy, W. Matthew Cushing, Dean Gesch, Jeffrey Irwin, and Cynthia Miller-Corbett, U.S. Geological Survey

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 on select regions around the U.S. coast, such as the Northern Gulf of Mexico, the eastern seaboard from New England to Florida, California, the Pacific Northwest, the North Slope of Alaska, and select central Pacific islands and atolls. Ongoing integration work in Florida and the Pacific Northwest will be highlighted along with a pilot National Topography Model (NTM) development in Southeast Texas. One critical challenge in creating regional topobathy models is locating bathymetry data to fill gaps that occur along the land/water interface. As a potential solution, satellite-derived bathymetry (SDB) methods are being investigated to support coastal wave and inundation modeling. Example SDB results from the Florida Keys, Puerto Rico, and Guam using Landsat 8, Sentinel-2, and WorldView imagery will be highlighted where physics-based and photogrammetric methods were compared.

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Topobathy Mapping

From Tropics to Tundra: Topographic/Bathymetric Lidar Data Acquisition in Remote Areas
Megan Blaskovich and Grant Twilley, Woolpert

Acquisition in difficult and remote areas. These surveys support the provision of data for shoreline mapping, natural disaster response, and infrastructure, among a myriad of other potential downstream uses. Such differing environments each posed their own obstacles to successful data delivery: this presentation will highlight some of the Woolpert team's challenges and adaptations for acquisition and production in reference to this wide range of coastal environments.

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Topobathy Mapping

Offshore Topobathy Lidar Mapping in the Gulf of Mexico Waters of Florida

Stephanie Padilla and Emily Klipp, Dewberry

In 2023, Dewberry was awarded a Task Assignment from the Florida Dept of Environmental Protection (FDEP) as part of the Florida Seafloor Mapping Initiative (FSMI) project to collect topobathymetric lidar over the Gulf of Mexico within the Panhandle, Big Bend, and Southwest Gulf Regions. These awarded regions account for 24,624 km2 of topobathy lidar seafloor data in the Gulf of Mexico along the coast of Florida from 0-m to 20-m depths. In June 2024 FDEP awarded Dewberry an additional 9,513 km2 area, extending topobathy lidar collection and processing beyond the 20-m isobath, for a total of 34,137 km2 of topobathy lidar. A deep channel topobathy lidar system capable of reaching 3 secchi depth was required for these projects. To meet capacity needs, Dewberry used 3 CZMIL SuperNova systems for acquisition. The combination of large project area, data acquisition with multiple waveform resolving deep channel sensors, and unusual Fall/Winter weather patterns created several unique experiences and challenges. In this presentation Dewberry will provide a brief overview of these projects and will discuss successes and challenges experienced along the way.

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Topobathy Mapping

Tips on Modeling Sea Level Rise Inundation at Landscape Scales with Local Resolution Elevation Data on Your Laptop

Doug Newcomb, U.S. Fish and Wildlife Service

With the advent of gridded sea level rise model data representing different models and scenarios, along with LiDAR – based coastal elevation data, it is now possible to create inundation surfaces from the model data and intersect this data with fine scale coastal elevation data to perform bathtub modeling operations for response planning to temporal sea level changes. While the elevation data sets are relatively large (18 to 54 billion pixels), this presentation will show that inundation data and elevation data can be easily processed in the background for areas such as all of coastal North Carolina against 3m and finer resolution elevation data using existing open source GRASS GIS software on a standard GIS laptop with a simple workflow to reduce storage needs, and produce simple inundation outputs for refuge and species management planning purposes.

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Development of Regional Resilience Metrics

Creating Geospatial Coastal Climate Resilience Indicators: Challenges and Best Practices

AnnaClaire Marley and Lindy Lowe, ERG; Tom Bowen, Mathematica; Alyssa Mann, The Nature Conservancy

There has been a growing demand for geospatial coastal climate resilience indicators to support decision-making on, prioritization of, and tracking progress toward climate adaptation and mitigation goals. Many projects include the creation of dashboards and geospatial mapping applications that display indicators of resilience to inform decision- makers and communicate progress to the public and funders. While geospatial indicators can be very powerful, there are currently very few standardized approaches to selecting metrics and displaying and communicating them. Challenges to selecting geospatial indicators of coastal climate resilience include identifying available data, setting baselines, combining complex multi-sector geospatial datasets, and ensuring the resilience indicators selected reflect the needs of the local community, and more. Due to these challenges, the indicators and tools developed can vary greatly. For instance, some geospatial tools simply depict points on a map to indicate the number and types of resilience projects in a community, whereas others present more robust information related to the amount of risk reduced along shorelines due to wetland restoration or other green infrastructure projects. This presentation will review challenges, best practices, and opportunities in developing geospatial coastal climate resilience indicators. We will focus on recommendations for developing tools and indicators that can inform decision-making and tell a clear and powerful story of climate progress.

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Development of Regional Resilience Metrics

Developing Regional Data Products for Climate Adaptation

Ben McFarlane, Hampton Roads Planning District Commission

Southeastern Virginia is presently vulnerable to flooding, which will only become more of a challenge as sea level rises and precipitation increases and intensifies due to climate change. Developing and implementing policies to address these challenges requires action at the local, regional, state, and national scales. Since 2020, the Hampton Roads Planning District Commission (HRPDC) has been working with its member local governments to develop regional resilient design standards for stormwater management and floodplain management. This has included identifying the best available data and information tools for pluvial, fluvial, and coastal flooding and adapting those to inform local and regional decision-making.

Developing regional standards is helpful for several reasons. It provides consistency across jurisdictional boundaries, it reduces duplication of effort, and it enables communities with lower capacity to develop policies internally to benefit from the expertise of their neighbors. However, regional action requires overcoming significant challenges, including data inconsistencies and gaps, additional time needed for coordination, and political disagreements. For the Hampton Roads Regional Design Standards, the HRPDC staff identified the best available flood risk data for each of its seventeen member jurisdictions, including HEC-RAS models from the U.S. Army Corps of Engineers and Federal Emergency Management Agency (FEMA) contractors, FEMA Flood Risk Database (FRD) products, and products created by Virginia state agencies. These products were then processed and knitted together to create regional data products for both coastal and riverine flooding. These current risk products were then combined with climate projections from NOAA and others to develop both current and future risk products. These products are made available to local governments, consultants, and others in Hampton Roads through an online ArcGIS Hub, with accompanying training for locality staff and others.

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Development of Regional Resilience Metrics

Navigating Resilience: Using a Parcel-Level Resilience Analytics Framework to Address Coastal Flooding and Water Quality Challenges in South Florida

Erin Rothman and Doug Wurst, Merak Labs LLC

South Florida, is home to many vibrant coastal communities facing significant environmental stressors from both urban development and climate change. This presentation focuses on strategies to address complex flood risks and water quality degradation, using the Miami Urban Area as a case study for balancing resilience, sustainability, and public health.

Through collaboration with Miami Waterkeeper, we applied geospatial tools and data-driven analyses to evaluate how sea level rise, storm surge, and urban flooding intersect with stormwater infrastructure and water quality issues. One of the key challenges in the Miami area is the widespread presence of failing septic systems, which contribute to nutrient pollution, enterococci contamination, and surface water quality threats—exacerbating the risks to vulnerable communities. This presentation will showcase a comprehensive assessment of these risks, emphasizing the interconnectedness of coastal and urban flood hazards with declining water quality.

Participants will gain insights into adaptation strategies that integrate green stormwater infrastructure, hybrid solutions, and targeted infrastructure investments to mitigate these risks. We will illustrate the value of spatial prioritization in identifying high-risk areas and assessing the benefits of various interventions. Attendees will learn how these approaches not only protect public health and enhance water quality but also promote more sustainable, climate-resilient development patterns.

This work demonstrates how geospatial analysis, community engagement, and multi-benefit strategies can be combined to support informed decision-making and help build resilient communities in coastal regions like Miami.

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Development of Regional Resilience Metrics

Addressing Vulnerabilities Along the Ribault and Trout Rivers in Duval County, Florida: Using GIS Tools and Data-Driven Methodologies

Ashley Johnson, Jacksonville University

The Ribault and Trout Rivers, tributaries of the St. Johns River in Jacksonville, Florida, are the site of significant environmental, socioeconomic, and infrastructural challenges. Spanning 12,000 acres and housing over 53,000 residents, residents in these areas grapple with water pollution, aging infrastructure, and socio-economic disparities. This project leverages Geographic Information Systems (GIS) to analyze these issues comprehensively and propose targeted interventions to enhance community resilience. The methodology involved extensive spatial analysis using GIS to identify and prioritize vulnerable areas. Key steps included geocoding environmental and infrastructural data, mapping pollutant levels and septic system distributions, and analyzing heat index values and social vulnerability scores. The First Street Foundation's Flood Factor model was used to project flood risks for 2050, incorporating multiple flooding scenarios. The GIS analysis revealed several critical areas needing intervention, particularly those with high pollutant levels, failing septic systems, and significant social vulnerabilities. Recommendations include accelerating septic-to-sewer conversions, enhancing water quality monitoring, leveraging federal funds under the Justice40 initiative, and developing long-term resiliency plans to address climate change impacts. This study demonstrates the power of GIS in identifying and addressing complex environmental and socioeconomic issues within the lower St. Johns River basin. By integrating various datasets and indices, GIS tools provided a comprehensive view of the area's vulnerabilities, guiding targeted and effective interventions. This approach ensures that resources are directed where they are most needed, ultimately enhancing the resilience and quality of life for the residents of Jacksonville's most vulnerable areas.

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Short and Sweet: Ocean Planning – Part 2

Comparing Vessel Traffic Data for Marine Spatial Planning in the U.S. Central Atlantic

Kendall Barton, Marine Geospatial Ecology Lab, Duke University; Bryce O'Brien, CSS Inc. at NOAA's National Centers for Coastal Ocean Science; Jesse Cleary, Sarah DeLand, and Patrick Halpin, Marine Geospatial Ecology Lab, Duke University; James A. Morris, Jr., NOAA's National Centers for Coastal Ocean Science

As offshore wind development in the US mid-Atlantic accelerates, marine spatial planning to reduce conflict with the many ocean uses, including commercial fishing, shipping and recreation, is crucial. Current National Centers for Coastal Ocean Science (NCCOS) marine spatial planning for wind lease sites uses shore-based Automatic Information System (AIS) vessel transit count data to account for vessel traffic, but this data has gaps and lacks reliability as distance from receivers increases. Concerns remain that building wind farms will lead to increases in vessel traffic, but gaining a clear picture of that traffic remains challenging due to data gaps. This presentation will include preliminary analysis of vessel traffic data in the US Central Atlantic region. This will involve multiple types of spatial vessel traffic data including AIS data from both shore-based and satellite-based receivers, as well as Synthetic Aperture Radar (SAR). By analyzing this data, we will examine how these detection methods capture vessel traffic differently and compare the data produced. The advantages, drawbacks and gaps in each type of vessel traffic data will be discussed, exploring the potential roles for each in marine spatial planning.

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Short and Sweet: Ocean Planning – Part 2

What Ocean Characteristics Drive Exclusion and Suitability in Offshore Wind Siting Models?

Isaac Keohane and Brian Free, CSS Inc. at NOAA's National Centers for Coastal Ocean Science; James A. Morris, Jr., NOAA's National Centers for Coastal Ocean Science

The deployment of offshore wind energy plays a crucial role in an emerging blue economy and advancing our Nation's renewable energy goals. Effective spatial modeling is important for determining the least conflicted locations for wind energy that best protect marine ecosystems, environmental and cultural resources, fisheries, and other industries. Spatial models used for offshore wind siting include a multitude of input data spanning various sectors. The complexity of these models reflects the diverse and interconnected nature of coastal ecosystems and industry. A robust understanding of the factors driving these models, and how decisions in the modeling process affect the results, is crucial for maximizing their effectiveness, transparency, and consistency. We conducted an extensive suite of controlled sensitivity analysis and scenario tests, uncovering how different input layers interact, which factors most influence final suitability, and where model performance excels or requires improvement. This provides a stronger foundational understanding of how these siting models work, which is crucial as they are integral in major policy decisions. This discussion around testing and analyzing for sensitivity also extends beyond these specific siting models and aims to resonate with anyone interested or engaged in spatial modeling.

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Short and Sweet: Ocean Planning – Part 2

Exploring the U.S. Integrated Ocean Observing System (IOOS) Model Viewer: A Comprehensive Tool for Ocean Observations and Predictions

Breanna Vanderplow and Kathleen Bailey, NOAA's Integrated Ocean Observing System; Sheri Schwartz and Kelly Knee, RPS/Tetra Tech

The U.S. Integrated Ocean Observing System (IOOS) is a coordinated network of federal and non-federal partners that provides critical ocean observations by maintaining ocean instruments including moorings, buoys, high-frequency radar stations, sub-surface gliders, shore stations, webcams, and water level sensors. The collected data are integrated and made accessible through programs and tools designed by the IOOS Office and the Regional Associations to support weather forecasting, maritime safety, and ocean and public health. IOOS operates through eleven certified Regional Associations, which work closely with local stakeholders to develop regionally tailored products and services. IOOS and RPS host the IOOS Model Viewer, a visualization and analysis platform that enables users to explore observed and modeled variables in a map-based interface and generate time-series plots from the data. The Environmental Data Server (EDS) harvests model output, converts and normalizes it into CF-compliant NetCDF output files, and provides data access through a THREDDS server, which is integrated into the Model Viewer. Observations and model outputs are aggregated from both NOAA and the eleven IOOS Regional Associations, offering a comprehensive, user-friendly platform. Although the IOOS Model Viewer was primarily developed for the marine science community, it is also designed for accessibility by the general public, allowing a wide variety of stakeholders to explore real-time ocean data and model predictions. This presentation will showcase the platform's diverse capabilities and demonstrate how it serves as a critical resource for ocean data and coastal hazards across the United States.

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Short and Sweet: Ocean Planning – Part 2

Building the Marine Cadastre Hub: Your Trusted Source for Ocean Geospatial Data

Jacob Mark, Dewberry; Dave Stein, NOAA's Office for Coastal Management

With more than 150 data layers in its catalog, Marine Cadastre is the premier source for authoritative and trusted ocean geospatial data. The initiative was established in 2007 by NOAA and BOEM in response to the growing need for spatial data and tools to support offshore renewable energy. Fast forward to today, Marine Cadastre continues to work closely with national, regional, and industry partners to develop and provide direct access to the best-available data and tools to meet the needs of the ocean planning community. In 2024, the Marine Cadastre team partnered with Dewberry to build a Marine Cadastre Hub through the ArcGIS Hub platform. The intent behind this effort was to make the Marine Cadastre data and tools more accessible to the public. The Hub's content management system, cataloging, and map tools were a good fit for the next generation of Marine Cadastre products. After numerous design and content iterations, the team has finalized the engaging and interactive site that is ready to be explored today. https://hub.marinecadastre.gov/

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Short and Sweet: Ocean Planning – Part 2

Mapping, Monitoring, and Prioritizing Large Marine Debris Removals in Micronesia: A Brief Tour of Wrecks on Reefs

Robbie Greene, Pacific Coastal Research and Planning

The Micronesia Region encompasses over 2.5 million square miles of U.S.-affiliated exclusive economic zone. Hundreds of islands and atolls in this area share a space characterized by a variety of commercial fishing operations and roughly one-third of the world's tropical cyclones. This results in a substantial amount of large marine debris scattered throughout small communities that have little capacity for removal. Efforts to respond to unwieldy debris such as abandoned vessels and derelict fishing gear have been relatively fragmented across the Region, limiting the degree to which resources can be pooled for removals. In 2023, with the support of NOAA's Marine Debris Program, a multi-jurisdictional collaboration turned to geospatial technology to address this fragmentation. A location-aware field survey and removal prioritization framework was developed and deployed by Mariana Islands-based Pacific Coastal Research and Planning and Palau-based Coral Reef Research Foundation. The survey enables partners to collect standardized information related to vessel and buoy wreckage, the biophysical environment, and hazards posed to human safety. Data are then used to gauge the importance of removal from both an ecosystem and community perspective, and estimate the difficulty of removal. Survey information and field imagery are being synchronized as spatial data services over a shared mapping platform, allowing for the visualization of large marine debris hotspots and priority removal sites. This presentation highlights results of the effort to date, including a brief tour of successful removal sites in the islands of Palau, and offers a glimpse of the tool's potential adoption in communities from Anguar to Ailinglaplap.

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Short and Sweet: Ocean Planning – Part 2

The West Coast Ocean Health Dashboard Kelp Indicator: Creating Coast-Wide Regional Data Products to Understand Canopy-Forming Kelp Status and Trends

Laura Bliss and Andy Lanier, West Coast Ocean Data Portal; Christina Frieder and Steve Weisberg, Southern California Coastal Water Research Project; John Hansen, West Coast Ocean Alliance

The federal, state, and tribal government members of the West Coast Regional Ocean Partnership, the West Coast Ocean Alliance (WCOA), have advocated for a West Coast-wide Ocean Health Dashboard to facilitate the use of common language and metrics to discuss and report changes in ocean health on the West Coast at different scales. WCOA members identified sixteen indicators of ocean health to be part of the West Coast Ocean Health Dashboard. Kelp canopy cover was identified as one of the initial pilot indicators for development. To begin indicator development, a "science team," a group of 12 subject-matter experts from Washington, Oregon, and California, was convened. This science team worked together to decide which data and measurement metrics to use to communicate the annual status and trends of kelp along the entire West Coast to a legislative and coastal management audience. Through a consensus-based decision-making process, the science team agreed upon an indicator definition and the approach to evaluating that indicator across the region. The West Coast Ocean Health Dashboard kelp indicator is based on kelp canopy coverage from satellite data and defines the status as the percentage of current kelp canopy compared to the 40-year maximum extent. Finally, disparate data sources were combined to calculate kelp status into 360 geospatial segments, 5–10 km in length, along the entire west coast. The creation and visualization of kelp data products allow WCOA members to view and share high-level qualitative results for annual kelp status in their region with a two-pager, informational web pages, and an interactive web mapping function, empowering them to explore the data and results in various user-friendly ways. The development of the Ocean Health Dashboard indicators and their associated data products can help provide regional context to understanding changes in our West Coast ocean habitats at multiple scales.

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Short and Sweet: Ocean Planning – Part 2

Mapping Small-Scale Fisheries: Using Synthetic Aperture Radar (SAR) to Develop a Commercial Fisheries Footprint of the U.S. Caribbean

Sophie Moyer, Marine Geospatial Ecology Lab, Duke University; Jennifer Au, CSS Inc. at NOAA's National Centers for Coastal Ocean Science; Patrick Halpin, Jessie Cleary, and Sarah DeLand, Marine Geospatial Ecology Lab, Duke University; James A. Morris, Jr., NOAA's National Centers for Coastal Ocean Science

The commercial fisheries of Puerto Rico and the US Virgin Islands are largely comprised of small, local operations fishing close to shore. Due to the nature of these vessels and the areas in which their target species are found, these fisheries are challenging to monitor using conventional methods like automatic identification systems (AIS). While this issue is not unique to the US Caribbean, the lack of spatial data on these operations becomes particularly problematic in the context of expanding plans for ocean use within US territorial waters. This presentation will cover ongoing efforts by the National Centers for Coastal Ocean Science (NCCOS) to develop a spatial extent of commercial fishing operations within the US Caribbean, also known as a fisheries footprint, in support of future marine spatial planning projects in this region. To fill these data gaps, we are using remote sensing data, specifically synthetic aperture radar (SAR), which provides real-time, all-weather imaging of ocean spaces. This presentation will also discuss the strengths and limitations of SAR data in monitoring a fishery of this scale, highlighting the aspects of fishing activity that remain unaccounted for and require further research to identify the best monitoring approaches.

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Bathymetric Mapping and Data Management

CZMIL SuperNova Performance, Results, and Innovations in a Freshwater Environment

Ben Babbel, Tetra Tech

Tetra Tech partnered with NOAA's Office for Coastal Management (NOAA OCM) to acquire topobathymetric LiDAR over Lake Superior near Bay Mills, MI. This project was in support of NOAA OCM's continued efforts to update and analyze benthic habitat models in the Great Lakes region. Tetra Tech employed its newly acquired CZMIL SuperNova to map approximately 175 km2 of bathymetry for this endeavor. The CZMIL obtained excellent coverage and depth penetration, which contributed to the successful mapping of bathymetric bottom for the majority of the project site despite difficult environmental conditions. For this project, Tetra Tech applied a novel method for this sensor that involves the removal of the NIR filter to improve water surface detection. While the project was successful, it was not without some difficulties and learning opportunities. This directly resulted in the development of new workflows within Tetra Tech's bathymetric LiDAR team and, through its close relationship with Teledyne, updates to the CARIS BASE Editor software.

The objective of this presentation is to discuss the performance of the CZMIL SuperNova over a freshwater environment and share the project results brought about by Tetra Tech's efforts on both the hardware and processing side to obtain sufficient bathymetric bottom coverage. Challenges and lessons learned will also be discussed in order to provide advice and perspective on conducting subsequent surveys in similar environments.

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Bathymetric Mapping and Data Management

Data Pipeline for Consolidation and Management of Seafloor Data

Jenna Ducharme, Tetra Tech; Emily Shumchenia, Northeast Regional Ocean Council and Regional Wildlife Science Collaborative for Offshore Wind; Andy Nguy and Kelly Knee, RPS/Tetra Tech

NROC, MARCO, and Tetra Tech have released a data pipeline to further efforts for consolidation and management of seafloor data collected by the offshore wind energy industry. The elements of this pipeline include:

1) Data Upload: the data upload tool guides the user through creation of compliant metadata necessary for sharing data. Users upload a data file that is read by the tool and used to pre-populate the upload tool metadata fields. The tool then highlights fields with missing required metadata and guides the user through providing that metadata. The tool accepts a range of data types such as GEOTIFF, BAG, Shapefile, and CSV.
2) Data Store: to allow the data pipeline to scale as well as take advantage of cloud-native tools and technologies in the future, the data store leverages Amazon S3 object storage on the cloud.
3) Data Catalog: each dataset uploaded to the data store will appear in a user-friendly data catalog that allows users to browse available datasets, review metadata, and access all available services for the datasets. Datasets can be appropriately tagged so that the data catalog can be filtered, either by the user or programmatically. Data can also be made available for download from the data store through the data catalog.
4) Data Services: data services can be created for datasets in the data store. At a basic level, these services include ESRI web services but can be expanded as necessary to meet stakeholder needs.

This presentation will walk through the design, development, and implementation of the Seafloor data pipeline. It will also offer a discussion of how this flexible framework can be translated to other use cases for data upload, data storage, and data cataloging.

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Bathymetric Mapping and Data Management

Bathymetric Lidar Specifications, Expectations, and Reality

Christopher Macon and Nicholas Johnson, Joint Airborne Lidar Bathymetry Technical Center of Expertise, U.S. Army Corps of Engineers

A common specification for bathymetric lidar has been in progress for a few years and has been released at the 23rd JALBTCX Airborne Coastal Mapping and Charting Workshop (22-24 October 2024). This specification was formulated by the JALBTCX Partners Organizations (USACE, NAVO, NOAA, USGS) with input from the bathymetric lidar community. The goal was to bridge the gap between the topographic and hydrographic specifications while also addressing the nuances associated with the bathymetric lidar technology. While the specification was being written, it was realized that an education piece was needed to aid new users in understanding these nuances and their interactions with the various aspects when using the specification. The ASPRS Bathy Working Group was formed to fulfill this requirement. The Working Group has expanded the user base and highlighted areas to focus their efforts. This discussion session is designed to provide an overview of the bathymetric lidar specification, bring to light how the nuances of this technology doesn't always provide what the user expects, and gather new questions/perspectives to better inform our growing community.

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Bathymetric Mapping and Data Management

Automated Model for Improved Mapping of Country-Scale, High-Resolution Coastal Bathymetry

Matthew McCarthy, Oak Ridge National Laboratory; Ishan Joshi and Dariusz Stramski, Scripps Institution of Oceanography; David Hughes, Oak Ridge National Laboratory; Rick A. Reynolds, Scripps Institution of Oceanography

Accurate and up-to-date maps of coastal bathymetry are critical for a variety of sectors from vessel navigation to port construction and are increasingly vital to inform coastal infrastructure management amid accelerating sea-level rise and more frequent and severe storm-surge events. The primary challenges to accurate and efficient bathymetric mapping from optical remote sensing are: accurately modeling light attenuation in both the atmosphere and water column; and inefficient data processing pipelines for high-resolution satellite imagery. To address the effects of light attenuation within the water-column we have developed a novel physics-based bathymetry model that accounts for variations in water-column inherent optical properties on a pixel-by-pixel basis in optically-shallow aquatic environments, which represents a major advancement. For applications to satellite imagery, we have developed a software package that automatically applies the robust 6S atmospheric correction algorithm, estimates the bottom depth from the physics-based bathymetry model, which corrects for attenuation by suspended particulate matter and colored dissolved organic matter in the water column on a pixel-by-pixel basis, and leverages high-performance computing for rapid application to region-scale (e.g., CONUS) 2-meter resolution imagery datasets. Our approach is tailored to sensors that collect data at two-meter resolution with high return times for frequent updates. We mapped 591 WorldView satellite images for Florida, North Carolina, and Alaska and validated the maps against LiDAR-derived bathymetry data. Results show median RMSE of 1.75, 1.59, and 2.67 meters, respectively. By combining the strengths of Oak Ridge National Laboratory in high-performance computing and remote-sensing science with the water-column modeling expertise of Scripps Institution of Oceanography we advance the state of bathymetric mapping capability.

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Discussion: NOAA's Climate Resilience Regional Challenge—Leveraging Partnerships to Advance Climate Resilience

Panelists:

- Margaret Morrison, NOAA's Office for Coastal Management
- Jessica Eason, NOAA's Office for Coastal Management
- Anastasia Dulskiy, NOAA's Office for Coastal Management
- Bradley Romine, Hawaii Sea Grant College Program
- Wendy Stout, Virginia Tech University
- Richard Buzard, Alaska Native Tribal Health Consortium

The Climate Resilience Regional Challenge (CRRC), an Inflation Reduction Act-funded program administered by NOAA, is focused on collaborative projects that increase the resilience of coastal communities to extreme weather and other climate change impacts, including sea level rise and drought. The $575 million dollar program is funding 19 projects across 14 states and territories that will bring together new and existing partners to invest in collaborative, region-based approaches for climate resilience.

In this panel, project leads from 3-6 CRRC projects will come together to discuss how each project is leveraging partnerships in their region to advance climate resilience. The CRRC grant recipients range from state governments to local NGOs and tribal governments, and each is bringing a unique approach to engaging partners in their regions. Panelists will first present about their innovative and transformational projects, focusing on their approach to partnership-building and how tools and data have been leveraged for adaptation in their communities. These short presentations will then be followed by an interactive conversation where panelists will discuss plans for future incorporation of tools and data in projects; innovative approaches in community engagement; and needs and opportunities for further tool development.

This session will provide the opportunity for participants to learn from regional resilience partnerships at various scales and the development of new partnerships across project teams and participants.

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Discussion: Pathways to Access—Conversations with Users on Building Useful and Usable Coastal Management Tools*

Panelists:

- Lian Plass, American Planning Association
- Nicole Cropper, NOAA's Office for Coastal Management
- TBA

This session allows attendees to learn more about current initiatives, engage in discussion, and provide input regarding ways in which NOAA's Digital Coast platform can better serve stakeholders and improve equitable access to coastal management resources.

This session will provide a forum for users of NOAA's Digital Coast online platform and resources to review and discuss equitable access to coastal management resources. It builds upon preliminary work conducted in collaboration with NOAA's Digital Coast Partnership organizations through the Digital Equity Workgroup. This session will first present the basis for the workgroup as well as NOAA's vision for equitable access to digital resources as outlined in its 2024 Equitable Climate Services Action Plan as well as preliminary findings from a survey to partner organizations issued from September to October 2024. After this, the session will then will engage participants in small group discussions to explore how Digital Coast products are currently serving their intended audiences across various stakeholder groups. Attendees will also examine potential solutions for improving usability and accessibility of Digital Coast products, including the role of emerging technologies, such as AI-driven tools, in enhancing resource delivery.

Insights and recommendations generated from this session will inform the next phase of the Digital Equity Workgroup's efforts, ideally supporting the Office of Coastal Management's implementation of the Equitable Climate Services Action Plan by highlighting challenges, opportunities, and pain points. This discussion session is open to all attendees including members of Digital Coast Partner organizations, representatives of tribal nations, local staff and elected officials, local interest groups, federal agency staff, and other users involved in coastal management.

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Coastal Erosion and Shoreline Change – Part 1

Where's the Beach?

Nathan de Ropp, AECOM; Amara Regehr, CDM Smith

Coastal erosion is a complex physical process which involves the movement of sediments in both cross-shore and alongshore directions. Communicating this movement of sediment has traditionally involved leveraging historically-known positions of the shoreline or bluff edge and developing a rate of land loss or gain. However, with the advent of significant coastal erosion exacerbation due to sea level rise, coastal practitioners must weigh the limitations of traditional shoreline change methodologies and consider new analysis techniques. Groups including the federal government, state agencies, and academics have weighed in with different approaches for modeling and mapping coastal erosion in this modern context. This presentation explores a selection of key case studies from each of these groups to explore similarities and differences in their methodologies, intended purposes, use cases, visualization methods, and dataset accessibility. Additional discussion will focus on making these datasets actionable for local stakeholders to plan and regulate erosion-threatened coastlines.

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Coastal Erosion and Shoreline Change – Part 1

The JALBTCX Toolbox Framework: User's Guides and Use Cases

Scott Spurgeon, Ashley Elkins, and Aleks Ostojic, Engineer Research and Development Center, U.S. Army Corps of Engineers

The JALBTCX toolbox framework was designed in ESRI's ArcGIS software using Python to allow coastal practitioners to quantify coastal metrics on national, regional, and local scales. The toolbox framework consists of four major toolboxes in the GIS space: the Profile Feature Extraction toolbox, the Quick Response toolbox, the Transect Editor toolbox, and the Multiple Datasets toolbox. User's guides for the Profile Feature Extraction and Quick Response Toolboxes have been released, with accompanying training materials for new users.

The Quick Response Toolbox is focused on developing analysis bins, elevation difference grids and volume change parameters including volume change above water, and shoreline change. The Profile Feature Extraction Toolbox extracts geomorphology features (dunes, sand bars, bluffs, etc.) from topo-bathymetric datasets along transects. The JALBTCX Toolbox user's guides and training overview presented here will provide background information, a step-by-step walkthrough of the workflows, and example use cases for both the Feature Extraction and Quick Response toolboxes from initialization to final data products.

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Coastal Erosion and Shoreline Change – Part 1

Geospatial Tools for Characterizing Storm-Driven Geomorphic Change on Sandy Estuarine Beaches

Aleksandra Ostojic, Justin Shawler, Charlene Sylvester, Scott Spurgeon, and Ashley Elkins, Engineer Research and Development Center, U.S. Army Corps of Engineers; Elizabeth Godsey, Mobile District, U.S. Army Corps of Engineers

The Mississippi estuarine beaches serve as a natural front line of defense against periodic storms and hurricanes and provide valuable habitat for shorebirds. Storm impacts are further exacerbated by background rates of relative sea level rise, natural longshore transport, and anthropogenic effects. As part of an ongoing effort with the Mississippi Coastal Improvements Program (MsCIP) and the USACE Mobile District to improve coastal resilience through monitoring and engineering, this project analyzed the long-term changes to the MS beach and dune system. While the comprehensive study used 25 years of lidar data (10 datasets), this presentation looks specifically at storm impacts to the Harrison County estuarine beaches and dunes associated with Hurricane Zeta in 2020. Beach profiles were extracted using the Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX) Dune Feature Extraction (DFE) toolbox and resilience to storm damage was computed using the Coastal Engineering Resilience Index (CERI). Storm driven trends in beach change focused on dune toe retreat, with preliminary results indicating a correlation between increased dune toe retreat and pre-storm morphological characteristics including lower pre-storm dune toes, narrower beaches, lower CERI values, and steeper beach slopes. Results of this study indicate that antecedent beach and dune morphology dictates estuarine beach storm impacts in similar ways to open ocean beaches. In addition, this study demonstrates the utility of the JALBTCX DFE toolbox for rapid characterization and tracking of geomorphic features through time to improve system understanding and management.

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Coastal Erosion and Shoreline Change – Part 1

Geomorphic Characterization of the Lakeshores of Lake Michigan, Lake Ontario, and Lake Superior from Regional Topobathy Lidar Datasets

Charlene Sylvester, Engineer Research and Development Center, U.S. Army Corps of Engineers

Ongoing science initiatives in the Great Lakes require high-resolution, high-accuracy datasets from which to map and characterize the physical and environmental properties of each lake. Building resilience to threats such as coastal erosion and environmental degradation caused by increasing lake levels is accomplished through well-informed mitigation measures undertaken by the US Army Corps of Engineers (USACE) and its partners. This presentation will share the regional-scale datasets, tools, products, and lessons-learned from USACE Engineer Research and Development Center efforts to develop a regional dataset of nearshore geomorphology features (e.g. bluff top and toe, dune crest, toe, and back trough, shorelines, and sand bar crests and troughs) and important metrics for coastal characterization (e.g. beach width, dune width, protective elevation, and beach slope). This dataset is being used to support updates to regional sediment budgets in the Great Lakes and provides critical inputs for a novel Lakeshore Geomorphic Vulnerability Index (LGVI) and Coastal Engineering Resilience Index (CERI). These derivative indices can be used in multi-criteria decision support tools for identifying areas of vulnerability, informing the selection of restoration measures, and supporting the prioritization of projects aimed at improving resilience.

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Wetland Habitat Mapping

Restoring the San Francisco Baylands: A Framework for Mapping Habitat Progress and Resilience

Alex Braud, San Francisco Estuary Institute

In order to support the San Francisco Estuary Wetland Regional Monitoring Program (WRMP), the San Francisco Estuary Institute (SFEI) employed automated estuarine habitat mapping approaches using Object-Based Image Analysis, aerial imagery, and various LiDAR-derived digital elevation model derivatives. The Baylands Habitat Map 2020 updated the existing map of tidal marsh, tidal flats and diked baylands to reflect the many changes in baylands distribution and abundance that have occurred over the last two decades. It also depicts land use and infrastructure information relevant to baylands restoration and management opportunities and constraints. The utilization of advancements in automated Object-Based Image Analysis enables cost-effective regular updates, enabling managers to quantify changes in wetland quantity and quality due to the impacts of climate change, shoreline management, and restoration efforts. Co-created with the WRMP Geospatial Workgroup, the Baylands Habitat Map is a fundamental component of the WRMP, serving as a common reference map to help coordinate baylands protection and restoration for all interests. It will be used commonly by public agencies to visualize and track baylands projects in EcoAtlas. By combining the Baylands Habitat Map of existing tidal marsh with planned restoration projects, the region is able to better track its progress towards meeting its restoration goals. Furthermore this foundational map will continue to feed into co-developed metrics to assess bayland resilience and change in support of WRMP goals. This new Baylands Habitat Map is necessary for the regional community of planners, regulators, managers, and scientists to track and assess the progress of restoration and protection efforts, relative to each other and over time, in the context of ongoing climate change.

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Wetland Habitat Mapping

High-Resolution Salt Marsh Habitat Mapping for New England National Estuarine Research Reserves Using Machine Learning

Chris Robinson and Diana Lopez Hernandez, NV5 Geospatial

Historically, New England salt marshes have been dominated by high marsh meadows characterized by species such as Spartina patens and Distichlis spicata. In recent decades, annual field surveys have shown an increase in the distribution of Spartina alterniflora in Rhode Island marshes, indicating a shift in the ecosystem due to the impacts of sea level rise. This compositional shift highlighted the need to update distribution maps to quantify the changes occurring in these vulnerable ecosystems. The NOAA Office for Coastal Management, in partnership with the Narragansett Bay and Waquoit Bay National Estuarine Research Reserves, contracted NV5 Geospatial (NV5G) to map critical salt marsh habitat types as well as invasive species such as Phragmites australis. Utilizing high-resolution multispectral aerial imagery and detailed field observations, NV5G built machine learning models to efficiently update the state's salt marsh habitat maps. These detailed maps support local experts in prioritizing areas for restoration along with assisting in monitoring existing management efforts.

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Wetland Habitat Mapping

Geospatial and Convening Support for Supporting the Development of System Resilience Indicators for Wild Rice in Lake Superior, Lake Michigan, and Lake Huron Great Lakes Restoration Initiative Project

Renee Walmsley, Tetra Tech; John Merrill, Galileo Group

The Tetra Tech/Galileo team was contracted to collect and deliver hyperspectral imagery, wetland vegetation classification feature datasets, field collected spectra files and ground truth data for sites within the Lake Superior and Michigan-Huron basins. Tetra Tech is also tasked with engagement with tribal partners and stakeholders through coordination of workshops. The goal of the project is to provide technical assistance and support for the protection of manoomin (wild rice) that is culturally significant to tribes in the Great Lakes basin. Many of the acquired spectral signatures (species) are highly vulnerable to the impacts of climate change, land development, invasive species, and other threats, which have led to a decline in manoomin populations. To help support manoomin management and restoration efforts in the region, the National Oceanic and Atmospheric Administration (NOAA) Office for Coastal Management, will use airborne hyperspectral remote sensing and field data collection and analysis to map and monitor existing manoomin stands. Our presentation will discuss project approach, methods and results as well as various applications of the remote sensing data, including assessing manoomin and other aquatic vegetation. Lessons learned from data collection and fieldwork as well as engagement from the workshop will also be discussed. The Tetra Tech/Galileo team will also provide some insight into how these specific areas of interest are changing over time.

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Short and Sweet: Using Imagery in Coastal Management

The Next Generation of Landsat

David Brostuen, National Geospatial Directorate, U.S. Geological Survey

The next generation of the Landsat satellite, coined “Landsat Next” will transform Earth observation with its innovative triplet constellation of satellites, which will provide enhanced spatial, spectral and temporal resolution for monitoring the planet's dynamic environments. Being free and open will ensure critical information will remain available for public use, fostering collaboration, innovation, and informed decision-making. Attend this presentation to understand the design features for Landsat Next and how it will drive critical advancements in environmental monitoring, resource management, and climate resilience efforts worldwide.

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Short and Sweet: Using Imagery in Coastal Management

Benchmarking Novel AI Models for Shoreline Detection

Tishya Chhabra and Walter Zesk, Massachusetts Institute of Technology; Manisha Bajpai, Independent Researcher; Skylar Tibbits, Massachusetts Institute of Technology

Islands are among the most vulnerable regions to the immediate impacts of climate change. In the Maldives, over 90% of islands report annual flooding, with 97% experiencing significant shoreline erosion. This highlights an urgent need for robust tools to monitor and plan for coastline changes. Satellite remote sensing, coupled with recent advances in artificial intelligence (AI), offers promising avenues for coastline detection and tracking. Specifically, AI-driven image segmentation algorithms can effectively delineate shoreline boundaries by partitioning satellite imagery into land and water segments. We propose a study that evaluates the performance of three state-of-the-art image segmentation models: the Segment Anything Model (SAM) by Meta, Prithvi by NASA and IBM and YOLOv10 by Tsinghua University. SAM is a foundation model trained on a vast dataset of general images, while Prithvi is pre-trained specifically on satellite imagery. In contrast, YOLOv10 represents a more traditional convolutional neural network approach. By running these models on imagery from the Maldives, we can compare their accuracy and precision in detecting shoreline boundaries specifically on small, sandy islands. The goal of this study is to inform future technical developments in shoreline monitoring and provide a foundation for further advancements in AI-driven coastline change detection.

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Short and Sweet: Using Imagery in Coastal Management

Species Identification in Coastal Marshes of Chesapeake Bay Using Commercial Satellite Imagery

Nicole Bartlett, NOAA's National Marine Fisheries Service; Megan Coffer and Rebecca Trinh, Global Science and Technology in support of NOAA's Center for Satellite Applications and Research

Coastal marshes provide a variety of ecosystem benefits, including shoreline protection and stabilization, long-term carbon sequestration, and filtration of excess nutrients and pollutants. Understanding the extent and species composition of coastal marshes are important for management to evaluate potential threats to coastal infrastructure and track changes in coastal habitats. Many data products delineate coastal marsh extent, but no routine assessments exist for species identification, which can be used to more accurately characterize carbon exchange and to monitor invasives such as *Phragmites australis*. This project leverages commercial, high spatial resolution satellite imagery from Planet's PlanetScope satellite constellation to map species composition across coastal regions of Virginia's Middle Peninsula. PlanetScope imagery has been collected daily at 3 m spatial resolution across 8 spectral bands since 2021. A machine learning image classifier was trained on aerial photointerpretations collected over a small subsection of the Middle Peninsula by the Virginia Institute of Marine Science in May 2021 to classify satellite pixels as one of four coastal marsh species that dominate the region: *Spartina alterniflora*, *Juncus roemerianus*, *Spartina patens*, and *Phragmites australis*. Agreement between reference data and satellite classifications was strong, yielding balanced agreements above 0.8 across all species. This model was then used to classify all remaining coastal areas of the Middle Peninsula since 2021, which can be used to assess year-over-year variability and establish frameworks for trend analyses as more years of satellite imagery become available. Using previously published relationships, this product can also be used to estimate biomass and carbon storage across species, which can then be improved upon following the collection of coincident field measurements. This work uses emerging satellite and machine learning technologies to advance our current large-scale coastal mapping capabilities, providing a species-level assessment that can be used by scientists and managers alike to better understand and protect coastal ecosystems.

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Short and Sweet: Using Imagery in Coastal Management

Analysis of Recreational Beach Use and Ecosystem Health at Narragansett Town Beach

Christopher Small, EA Engineering, Science, and Technology, Inc., PBC; Wendy Laurent, Taylor Engineering, Inc.

The overall objective of this study was to assist in a beach carrying capacity study of Narragansett Town Beach (NTB), located in Rhode Island. NTB is a popular destination for both local and visiting beach goers and is vulnerable to coastal storm impacts. EA Engineering, Science, and Technology, Inc., PBC (EA) carried out a portion of this work as a subcontractor to Taylor Engineering, Inc., who was contracted by the Town of Narragansett. EA was scoped to perform the field work components of this project, which involved the use of unmanned aerial systems (UAS) to analyze spatial and temporal recreational beach use and to investigate the ecosystem health of the dune system at NTB.

To characterize recreational beach use, the field efforts consisted of four visits across two busy August 2023 weekends, with UAS flights occurring at set intervals to capture the variation in beach use throughout the day. The photographs collected during each flight were stitched together to create 2D orthomosaics that were used to estimate the number of beach users and their spatial distribution along the beach. Additionally, the field team captured low altitude photographs over the dune system at NTB to generate 2D orthomosiacs that were used to investigate the existing ecological health of the dunes and to make recommendations on strategic vegetation planting that could improve the ecological health and resilience of the dunes. These dune system orthomoasiacs were paired with a ground-based dune assessment that identified the physical and biological characteristics, such as composition, dominant plant species, and overall vegetative cover of the dunes. The results of these field components fed into the overall multi-parameter carrying capacity study, which provided recommendations for beach operations and management that were aimed at enhancing the experience of beach visitors by creating a safer and more resilient beach.

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Coastal Adaptation Planning

Implementing Coastal Resiliency Plans

J.D. Hines, VHB; Sandy Cross, Town of Duck

A well established as a leader in the field of coastal resiliency, the Town of Duck, North Carolina, is a thriving coastal community home to over 700 year-round residents, a figure which increases by approximately 25,000 visitors daily during the summer tourist season. Recognizing the importance of planning in identifying and prioritizing public investments in its resiliency efforts, the Town successfully completed multiple studies and plans related to coastal resiliency including a public infrastructure vulnerability assessment, resilience strategy planning/prioritization, hazard mitigation plan, and elements of its comprehensive plan.

N.C. Highway 12 is vital as the only north-south route through the Town of Duck and Currituck Outer Banks to the north. This major thoroughfare faces frequent flooding and shoreline erosion from heavy rains and storm surge, causing disruptions to daily life, emergency services and emergency evacuations. In response to these challenges, the Town recently completed construction of a comprehensive coastal resiliency project that implemented several key resiliency recommendations identified in its adopted plans. Funded largely through public and private grant sources, this coastal resiliency project included marsh restoration, shoreline stabilization, roadway elevation, sidewalk/bike-lane installation, and stormwater management improvements that work together to maximize resiliency and sustainability along this stretch of N.C. Highway 12.

In this session, attendees will learn about the Town of Duck's strategies to make the community more resilient and adaptable to changing environmental forces. Attendees will gain better understanding of the Town's resiliency planning efforts and will learn about how the Town funded and implemented several of its primary goals in a single, multi-faceted coastal resiliency project featuring marsh restoration, shoreline stabilization, roadway elevation, sidewalk/bike-lane installation, and stormwater management improvements. In addition to hearing about grant opportunities for funding, attendees will gain insight into how this holistic approach is poised to be a blueprint for coastal communities seeking sustainable solutions for a more secure future.

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Coastal Adaptation Planning

Water Rises, Water Falls: Scenario Planning for Changing Lake Levels and Climate Change*

Jenna Moran and Eleanor Rappolee, Association of State Floodplain Managers

The Great Lakes shorelines are dynamic and constantly moving, with lake levels rising and falling 10-15 feet decadally. While it is unclear how climate change will affect the Great Lakes overall, it will likely increase not only the frequency and extremity of storms but also lake level fluctuations, both of which may lead to more aggressive erosion along the shorelines. These compounding phenomena - along with the challenge of already armored shorelines – present a unique challenge to coastal Great Lakes communities, creating a wide range of possible scenarios and hazards that communities must consider as a part of their current and future coastal management plans. There is little technical assistance and guidance available on best practices for managing Great Lakes coastlines during high and low water periods. In support of this need, ASFPM, APA, CSO, and the Great Lakes Sea Grant Network via Wisconsin Sea Grant are working to help three Great Lakes coastal communities (St. Clair Shores, MI; New Baltimore, MI; and Duluth, MN) better manage their dynamic coastlines and prepare for flood hazards through the improvement of local master plans, regulations, and infrastructure policies. To fully capture the potential for risks to each community from coastal hazards, we use a scenario planning method that employs three distinct climate futures and three best management practice options, yielding nine separate scenarios for comparison. This presentation will walk you through our scenario planning process, scenario results for the three coastal communities, and lessons learned to date. The overall goal of the technical assistance is for teams to identify areas where natural resource restoration efforts can have the greatest impact for social, economic, and environmental resilience to coastal flooding, and to develop plans based on those results.

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Coastal Adaptation Planning

Coastal Community Resilience Immersive Training Program: Reflections on Process, Outcomes, and Next Steps

Rebecca Ward, Coastal Resilience and Sustainability Initiative, North Carolina State University; Georgina Sanchez, Center for Geospatial Analytics, North Carolina State University; Erin Seekamp, Coastal Resilience and Sustainability Initiative, North Carolina State University; Amanda Mueller, KIETS Climate Leaders Program, North Carolina State University

This presentation will reflect on the inaugural year of the Coastal Community Resilience Immersive Training (C-CRIT) Program. This annual 10-week program trains six AmeriCorps members to conduct asset mapping and vulnerability assessments for coastal communities who may not have the human or financial capital to do so themselves. As part of their immersive training experience, members explore topics and concepts related to hazards, vulnerability, and resilience, and become familiar with tools, data, and resources for quantitatively and qualitatively assessing the vulnerability of coastal communities to environmental hazards. Over the course of the program, members additionally gain skills in GIS mapping and geospatial analysis, community engagement and data integration, and written and oral communication. Jones County, North Carolina, which is located several miles inland from the immediate coast and boasts abundant natural and economic resources while also experiencing many of the challenges faced by coastal counties, partnered with the C-CRIT Program during its initial year. The outputs generated during this pilot year hold promise for informing future resilience efforts and partnerships across North Carolina. C-CRIT is a partnership between NC State University's Coastal Resilience and Sustainability Initiative and Kenan Institute for Engineering, Technology, & Science, Conservation Corps North Carolina, the North Carolina Office of Recovery and Resiliency, and the North Carolina Division of Coastal Management.

Our presentation will examine the program's development and process, addressing challenges and opportunities related to time, commitments, financial considerations, and outputs. We will also discuss approaches for making and maintaining connections with partner communities and strategies for framing projects when approaching communities. We will explore the potential transferability of this program and lessons learned from it to other communities and contexts, emphasizing the importance of clearly defined objectives, timelines, actionable outcomes, and community benefits.

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Discussion: Infrastructure Adaptation*

Panelists:

- Lindsay Brugger, Urban Land Institute
- Chris DeWitt, VHB
- Nancy Gassman, City of Fort Lauderdale

As communities increasingly experience the impacts of a warming climate, the infrastructure they rely on to keep their cities moving must adapt. Many cities are recognizing the risking risk of higher tides and stronger storm surge and planning their infrastructure accordingly; with the help of Digital Coast tools.

This one-hour panel will uplift tools and resources for infrastructure adaptation planning through city case studies that will explore the nuances of roadway elevation. Collaborative approaches across public and private sector actors will be explored and opportunities for unique partnerships will be examined.

Attendees will take away a better understanding of key considerations when elevating roadways, such as harmonization, timing, and interdependencies; examples of road elevation criteria that can inform city policy, and a roadmap for considering new climate and flood realities in the comprehensive and capital improvements planning process. Resources from the Digital Coast, the American Planning Association (APA) and the Urban Land Institute (ULI) will be referenced and made available to participants in the session.

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Natural Disaster Risk Assessments

FEMA's Coastal Future of Flood Risk Data (FFRD)—Innovative Dataset Conceptualization and Visualization

Eric Kencel, AECOM

The Federal Emergency Management Agency (FEMA) has embarked on an initiative called the Future of Flood Risk Data (FFRD), grounded in four key objectives: to shift from a binary hazard and risk analysis to a probabilistic one, to modernize FEMA's management and delivery of flood data, to empower stakeholders and increase access to hazard and risk data to ultimately drive risk-informed mitigation, planning, and insurance actions. Multiple efforts have been undertaken over the past few years to develop and test the technical methodology for coastal and inland engineering analysis that will be implemented as part of the FFRD initiative. Leveraging probabilistic storm surge and wave data developed for coastal areas by FEMA and the US Army Corps of Engineers, FEMA has begun exploring the development of flood hazard and risk datasets and prototypes. These datasets and prototypes illustrate the power and flexibility of these probabilistic datasets and are being used to support engagement with stakeholders on how access to flood hazard data can facilitate informed decision-making for stakeholders in communities impacted by current and future flooding.

This presentation will provide an overview of the recent progress FEMA has made on conceptualizing and visualizing FFRD datasets, while highlighting the innovative prototype web-based data viewer with the intention of exploring how data could be visualized and engage stakeholders with ideas of how to use FFRD datasets. Attendees will be guided through the illustration of several prototypes of probabilistic flood hazard and risk datasets that can be leveraged to understand, for example, the change of floodplain extent due to different Annual-Exceedance-Probability (AEP) events, or the impact of sea level rise on storm surge levels across the range of AEPs throughout the floodplain. Interactive visuals of how the FFRD data can be further analyzed and investigated to support decision-making, at both the property and community (or larger) level, will be shown through the display of a prototype web-based viewer, with a focus on coastal areas of Louisiana and Texas.

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Natural Disaster Risk Assessments

New Assessment of Annualized Tsunami Losses for the United States

Anne Sheehan and Casey Zuzak, Federal Emergency Management Agency; Doug Bausch and Cadie Yaeger, Niyam IT ARC

Tsunamis pose a significant threat to coastal communities across the United States and its territories. These events can cause severe destruction, injuries, and loss of life due to powerful currents and flooding.

The FEMA National Risk Index (NRI) update is based on the best available hazard data from each of the high-risk tsunami states and territories. California has completed a Probabilistic Tsunami Hazard Assessment (PTHA) where other states and territories have focused on deterministic scenarios for the purpose of evacuation modeling. By estimating recurrence intervals for the deterministic scenarios, we can estimate potential annualized losses for both buildings and casualties. It was determined that the best approach to updating the NRI for tsunami hazards would incorporate state-level hazard data, an enhanced version of the National Structure Inventory (NSI) that includes corrections to number of stories based on open-source data, and updated earthquake building types and seismic design levels used for assignment of fragility functions for Hazus analysis. This update is critical to establishing a national baseline of relative tsunami risk, standardizing and integrating state-level hazard data with national exposure data, and ensuring equitable data representation across communities. Technical documentation will include the data, software, and methodology used to update the NRI regarding tsunami hazards, as well as any limitations encountered.

This study meets the goals of the NRI and provides significant enhancements over current data. However, several key gaps were identified over the course of this study. These include the need for additional hazard data to fill existing gaps, specifically probabilistic hazard data, and the incorporation of casualty potential for regional and distant events. Future research will include impacts to marine and harbor facilities, non-permanent populations, and tsunami risk analysis for the East and Gulf Coasts.

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Natural Disaster Risk Assessments

Using a Tsunami Transfer Function and Hazus 6.1 to Calculate Average Annualized Building Losses for Pacific States

Christopher Siverd, Moffatt & Nichol; Patrick Lynett, University of Southern California; Doug Bausch and Cadie Yeager, Niyam IT; Paul Carroll and Babak Tehranrid, Stantec; Betsy Hicks and Lauren Schmied, Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA) is exploring a method to estimate probabilistic tsunami hazards for Pacific states using data-driven modeling techniques. High-resolution physics-based modeling has been developed for some geographies but is not comprehensive or consistent across the Pacific states. This has been recognized as a challenge for FEMA programs that need consistency in data representation to develop nationwide datasets and products. Therefore, a data-driven method, referred to as a tsunami transfer function (TTF), is under development to infer tsunami depths, velocities and momentum flux for a consistent set of frequencies across California, Oregon, Washington, parts of Alaska and Hawaii. All existing physics-based tsunami modeling have been included in the TTF to provide one or more of: training data for the transfer function, validation of performance, and direct transfer function output. FEMA is also exploring use of the TTF output with the Hazus 6.1 tsunami module to estimate building losses at each frequency and compute structure-specific average annualized losses (AALs). Testing has occurred in three different pilot locations in the Pacific: Oahu, HI, Newport, OR and Westport, WA.

This presentation will discuss the compilation of data used to build and test the TTF, high-level development of the TTF, and how TTF outputs are being used as inputs for Hazus 6.1 to calculate annualized losses. The presentation will also share initial results and lessons learned at the three test locations.

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Coastal Erosion and Shoreline Change – Part 2

Hard Stabilization Structures Along Lake Erie's Coast: High-Resolution Analysis of the True Extent of Shoreline Armoring in Ohio's Coastal Counties

Emma Bouie, Office of Coastal Management, Ohio Department of Natural Resources

Shoreline hardening is a common response to erosion and flooding along the Great Lakes. However, these structures disrupt natural coastal dynamics, affecting ecosystem services and coastal resilience. To better understand the extent of shoreline modification along Ohio's Lake Erie coast, we used the Ohio Department of Natural Resources (ODNR) coastal geodatabase to calculate the percentage of hardened shoreline at the county level. Our goal was to create a high-resolution assessment that captures the percentage of current shoreline armoring more accurately than existing datasets.

We extracted hardened shoreline segments from the ODNR Shore Structure Polyline Inventory and overlaid these polylines with county boundaries. We then calculated the percentage of hardened shorelines relative to the total shoreline length within each county. Preliminary comparisons between the ODNR dataset and the NOAA Great Lakes hardened shoreline database reveal notable differences: The ODNR data, at a 1:1,000 scale, provides finer detail compared to NOAA's 1:5,000 scale, allowing for a more precise identification of smaller structures. Our analysis shows that previous reports of Ohio's shoreline being 80-90% hardened may underestimate the extent of armoring due to the limitations of coarser datasets.

The importance of this work extends to coastal management and policy. Understanding the true extent of shoreline hardening helps develop adaptive strategies that balance human needs with environmental sustainability. Our findings support targeted actions to reduce the negative impacts of shoreline hardening and enhance the resilience of Ohio's coastal ecosystems.

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Coastal Erosion and Shoreline Change – Part 2

Tools for a Sustainable Coastal Ecosystem Restoration

Syed Khalil, CPRA

Louisiana's Comprehensive Master Plan (CMP) is designed to mitigate chronic land loss and to protect fragile ecosystem and more than two million people. Sediment is critical to the sustainability of coastal Louisiana, and, proper management of limited sediment resources is vital. Louisiana Sediment Management Plan (LASMP) is being implemented to meet the sediment needs. This holistic plan follows the principles of Regional Sediment Management (RSM). It facilitates the inventory of sediment resources to manage sediment on a regional scale. The relevant geoscientific datasets provide tools for project planners and managers to efficiently manage fluvial, inshore and offshore sediment resources. Therefore, LASMP is crucial to the success of any regional strategy employing large-scale sedimentological restoration, wherein sediment management is the key. Four primary components of this Plan that direct towards a more formal system-based approach include: (1) regional approach to sediment management; (2) borrow area considerations; 3) implementation of appropriate policy and regulations; and 4) communication and coordination with Federal, State, and other stakeholders.

This presentation will highlight the various sediment management tools developed to implement LASMP to mitigate the severe landloss, and will emphasize the need of a regional approach for managing sediment. The focus of this presentation will be on the spatial application of these tools, which includes products such as the Delta Sand Search Model (DSSM); the Louisiana Sediment Resource Database (LASARD) for archiving/populating related geoscientific data; Coastal Sediment Distribution (CSD) Maps identifying known sediment resources. The Louisiana Sediment Availability and Allocation Program (LASAAP) links the sediment-needs for the State's restoration projects to the potential sediment sources. Building on these tools and with the help of regional monitoring data, a Predictive Geologic Model (PGM) was developed to depict the relationship between surface and subsurface geology with the aim to predict the depo-centers of restoration quality sediments.

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Coastal Erosion and Shoreline Change – Part 2

Integrating Behavioral Science with Spatial Modeling to Target Nitrogen Fertilizer Reduction Programs

David Dickson, Center for Land Use Education and Research, University of Connecticut

Nutrient impacts from residential lawns are a persistent and increasing concern as urban populations increase and limited progress has been made to change household behaviors. This is particularly true in the Long Island Sound (LIS) watershed where the attainment of nutrient-reduction goals is reliant on addressing household behaviors such as lawn fertilizer use. While the impacts of excessive fertilization are well known, minimal attention has been paid to understanding behaviors by residential households, how to effectively implement behavior-change campaigns, and implications for attaining nutrient-reduction goals.

This presentation will highlight a novel, integrated economic-hydrologic model that predicts high lawn fertilizer impact areas based on household characteristics combined with spatially-explicit nitrogen load and transport estimates to coastal waters. The model then predicts subsequent impacts of prospective behavior-change campaigns on fertilizer use and associated nitrogen delivery. The intent is to effectively target scarce resources for nitrogen reduction programs in those areas where (1) behavioral research indicates a high likelihood of lawn fertilization and (2) nitrogen from residential lawn fertilizer is having the largest impact on impairments.

The approach integrates multiple models including: (1) econometric modeling using household survey data to predict parcel-level residential lawn fertilizer applications, (2) landscape predictions for residential lawn fertilizer use in coastal Connecticut and New York (~884,000 single-family households), (3) a spatially explicit nutrient transport model (N-Sink) to predict nitrogen loads to LIS, and (4) contingent behavior modeling to examine willingness to reduce fertilizer use in response to prospective policy interventions. The project also assesses whether nitrogen loads from high fertilizer use and transport areas have disproportionate impacts on environmental justice communities.

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Data, Models, and Tools for Sea Level Rise, Coastal Flooding, and Erosion Vulnerability – Part 1

Regional Innovations in Resilience: Leveraging GIS for Effective Flood Management in the Tampa Bay Region

Samuel Amoako-Atta and Sean Lahav, Halff

The Tampa Bay Regional Inundation Coordination (TBRIC) project, initiated by the Tampa Bay Regional Planning Council with funding from the Florida Department of Environmental Protection's Resilient Florida Program, aims to enhance flood vulnerability assessments across the Tampa Bay region. This initiative responds to the pressing need for coordinated flood management strategies, particularly in the face of rising sea levels and increased storm intensity. The primary objectives of TBRIC include the development of comprehensive GIS datasets to assist local governments in conducting vulnerability assessments, in alignment with Section 380.093 of Florida Statute. Through the creation of a geoprocessing mapping tool, TBRIC empowers local entities to visualize and analyze flood hazard vulnerabilities in real-time, adapting to new data and guidance as it becomes available. This innovative approach not only improves the accuracy of vulnerability assessments but also promotes best practices and methodologies that foster consistency among local governments. The TBRIC story map serves as a pivotal resource, providing detailed guidance on the application of GIS datasets and geoprocessing tools for effective flood risk evaluation. By highlighting successful strategies and methodologies, the project encourages collaboration among municipalities, enhancing their capacity to mitigate flood risks and improve community resilience. Ultimately, TBRIC represents a significant step toward a unified response to climate-induced challenges in the Tampa Bay region, fostering a proactive approach to flood management that is both data-driven and community-oriented. As local governments implement these tools, the region can better prepare for and adapt to the increasing threats posed by flooding, ensuring a safer and more resilient future for its residents. The TBRPC and Halff were recognized with a 2024 ESRI Special Achievement Award in GIS for Tampa Bay Regional Inundation Coordination (TBRIC) Project.

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Data, Models, and Tools for Sea Level Rise, Coastal Flooding, and Erosion Vulnerability – Part 1

Assessing Flood Vulnerability for Road Network Asset Management in Coastal Georgia

Alexander Boland and Matthew Bilskie, University of Georgia

The Georgia coast is home to many low-lying communities that have experienced both tide and storm surge flooding. Due to historic trends of rising sea levels and ocean warming brought about by climate change, these threats are likely to increase in frequency and magnitude. In assessing these flood hazards on these communities' road networks, the Georgia Department of Transportation (GDOT) can make prudent decisions regarding transportation network disruption and future asset management to lessen transportation impacts and improve resilience for these communities. To develop a rigorous flood risk dataset for the region, high-resolution Light Detection and Ranging (LiDAR) data as well as hydrodynamic models were employed to determine sea level rise (SLR)-induced tidal flooding. For storm surge, annual exceedance probabilities (AEP) were used to create water surface elevations using data from the United States Army Corps of Engineers' (USACE) South Atlantic Coastal Study (SACS). Expanding on vulnerability, studies have shown that communities threatened by climate change often lack the resources and political influence to adequately prepare for and respond to these threats. To quantify existing disparities, a Social Vulnerability Index (SVI) produced by the Centers for Disease Control and Prevention (CDC) was used to help emphasize particular regions of concern. This presentation will explore the models and methods used and their importance in a future climate-uncertain world. Moreover, it will acknowledge the need for both resiliency and equity and will discuss opportunities for displaying and communicating resilience and risk. GDOT will use the output from the work done in this presentation as an indicator for vulnerable transportation segments that are likely to require increased maintenance and/or repair.

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Data, Models, and Tools for Sea Level Rise, Coastal Flooding, and Erosion Vulnerability – Part 1

The North Carolina Department of Transportation's Coastal Resilience Initiatives and Innovations—Focus on Sea Level Rise Impacts on Wave and Scour Impacts to Bridges

Kurt Golembesky, North Carolina Department of Transportation; Chase Davis and Zhangping Wei, University of North Carolina Wilmington

The North Carolina Department of Transportation (NCDOT) recognizes the critical role transportation plays in fostering economic growth, societal well-being, and environmental sustainability in the coastal environment. In the face of increasing challenges posed by climate change NCDOT is committed to ensuring the resilience of its transportation infrastructure and preparing for potential future sea level conditions.

This presentation will provide an overview of a variety of coastal resilience projects and studies currently taking place at NCDOT with a focus on research being conducted by University of North Carolina at Wilmington (UNCW). UNCW's study aims to evaluate the vulnerability of coastal bridges to future coastal wave and scour hazards and propose strategies to enhance their resilience. An ArcGIS Experience Builder based dashboard will be generated to visualize the results and its framework displayed.

This project promises both immediate and long-term benefits for NCDOT. In the short term, the vulnerability guide will provide an updated assessment crucial for planning maintenance and upgrades. In the long term, insights from the resilience feasibility study will aid in informed decision-making for infrastructure development in response to climate change impacts, ensuring the sustainability and safety of North Carolina's coastal transportation network.

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Data, Models, and Tools for Sea Level Rise, Coastal Flooding, and Erosion Vulnerability – Part 1

A Tool to Estimate and Communicate Coastal Probabilistic Flood Damages and Losses

Jeff Gangai and Joel Plummer, Dewberry; Lauren Schmied and Betsy Hicks, Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA) has embarked on an initative called the Future of Flood Risk Data (FFRD). This initiative is grounded in four key objectives: to shift from a binary hazard and risk analysis to a probabilistic one, to modernize FEMA's management and delivery of flood data, to empower stakeholders, and increasing access to hazard and risk data to ultimately drive risk-informed mitigation, planning, and insurance actions. FEMA is leveraging probabilistic storm surge and wave data for coastal areas developed by the US Army Corps of Engineers (USACE) as well as integrating a suite of damage functions to compute losses. The damage functions were developed based on literature and libraries that specifically address the challenges of evaluating losses in a probabilistic framework with more than one hazard contribution, rather than relying on binary choices or evaluating coastal hazards separately. The resulting losses computed at a structure level can be aggregated at multiple scales to quantify community, regional, or county level trends and identify areas at high risk.

This presentation will discuss methodologies and present a tool that supports these structure level loss calculations for coastal flood hazards in a way that incorporates the probabilistic hazards in a coastal environment. The tool incorporates the USACE comprehensive probabilistic hazard data including both storm surge and wave action and carries estimations of uncertainty through the process. The presentation will provide an overview of the approach and demonstrate how results can improve coastal risk assessments and through the use of geospatial data and web viewers, provide valuable information to support decision making including an estimation of uncertainties. The information can be used to support targeted flood mitigation projects and show the value of reducing coastal flood losses.

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Geospatial Tools in Coastal Management

Monitoring Coral Reef Ecosystems with ArcGIS Field Maps and Dashboards

Ken Buja and Kim Edwards, NOAA's National Centers for Coastal Ocean Science

Coral reefs are valuable ecosystems that are in decline from a myriad of man-made and natural threats. NOAA's National Coral Reef Monitoring Program has been monitoring these ecosystems in the US Caribbean, Florida, and the Gulf of Mexico for over a decade, using dive team to document fish and coral populations, coral health, and the spread of invasive species. NCRMP uses a custom ArcGIS Pro add-in to select stratified random dive sites, Web AppBuilder to assign the sites to divers, Field Maps to record the divers' observations, and Dashboard to track the progress of data collection.

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Geospatial Tools in Coastal Management

The Urban Sea: A StoryMap About the Long Island Sound Watershed and Its People

Cary Chadwick and Emily Wilson, Center for Land Use Education and Research, University of Connecticut

The Center for Land Use Education and Research (CLEAR) at the University of Connecticut has a long history of communicating big ideas through meaningful data analysis and interactive maps, made available to a wide range of users through websites, mapping applications, and award-winning ArcGIS StoryMaps. A StoryMap is a web-based application that combines digital media and narrative text with interactive maps, statistics, tables, charts, and infographics to tell a story about a particular topic or geographic area. They can effectively convey complex data through maps and visuals, making information easier to understand while providing interactive elements to keep audiences engaged.

With funding from the EPA's Long Island Sound Study (LISS) and the New England Interstate Water Pollution Control Commission (NEIWPCC), CLEAR has developed an interactive StoryMap to showcase the physical, built, and human landscape that makes up the land area draining to the Long Island Sound. The Long Island Sound watershed is over 16,000 square miles in size, spanning six states (and Canada!) and 27 counties. Often referred to as the "Urban Sea", the Long Island Sound collects water shed from a landscape that includes a population of close to 9 million people living across urban, suburban, and rural cities and towns. This presentation will showcase the newly published StoryMap, telling the story of its creation and the places and people featured within it.

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Geospatial Tools in Coastal Management

Integrating Google Earth Engine with ArcPro for No-Code Geospatial Analysis

Zhifei Dong, Tellus Consulting LLC; Matt Hutchinson and George Azzari, Woolpert;
Kel Markert, Google

Google Earth Engine (GEE) is a powerful cloud-based platform designed by Google to facilitate the analysis and visualization of large-scale environmental datasets. With access to an extensive repository of satellite imagery, geospatial data, and computational power, GEE offers a scalable solution for tackling the challenges faced by coastal regions. Its applications span hazard mitigation, climate adaptation, and the sustainable management of coastal and marine resources, providing essential insights that can help protect vulnerable coastal environments for future generations.

Despite its potential, GEE presents a significant barrier for users without programming experience. The platform's reliance on coding and geospatial analysis skills makes it difficult for non-programmers to fully leverage its capabilities. Common challenges include a programming-centric interface, complex syntax, a steep learning curve, and limited pre-built tools for specific tasks. In contrast, platforms like ArcPro offer a more user-friendly experience with a graphical interface, no-coding workflows, and immediate visual feedback, making them popular among GIS professionals.

This presentation introduces an ArcGIS Python toolbox that connects the Google Earth Engine API with ArcPro. This integration allows users to explore, analyze, and visualize GEE datasets within ArcPro, providing a seamless, no-code experience that combines the strengths of both platforms.

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Geospatial Tools in Coastal Management

The Great Marine Minerals Migration: Reforging the Back and Front Ends of an Established GIS in the Cloud and ArcGIS Online (AGOL), Respectively

Emily Sandrowicz and Michael Forlenza, NV5 Geospatial; Lora Turner, Marine Minerals Program, Bureau of Ocean Energy Management

In 2014, NV5 was contracted by the Bureau of Ocean Energy Management's (BOEM) Marine Minerals Program (MMP) to develop a Geospatial Information System (GIS) consisting of an enterprise geodatabase and a custom-coded web application called the Marine Minerals Information System (MMIS). The tool provides an avenue for public consumption of MMP data and helps guide MMP decision-making in support of BOEM's marine minerals leasing and environmental reviews. The MMIS is a collection of over 30 years of geophysical (e.g., shallow seismic, bathymetry, and sidescan sonar) and geotechnical (e.g., vibracore and sediment grab locations and associated laboratory analyses) derived data and information products. These datasets are critical to supporting Outer Continental Shelf (OCS) beach nourishment and coastal storm risk management projects and helping to mitigate OCS space-use conflicts.

Recently, as part of a wider BOEM effort to move away from on-premise hosting and custom applications, NV5 was tasked with migrating the MMIS enterprise database to the cloud environment and reforging the web application via COTS software. The planning and migration took place over two years and involved new implementations of AWS, Esri ArcGIS Enterprise, Branch Versioning, and Esri's AGOL Experience Builder. In this presentation, we will present a summary and comparison of the old and new systems, and share lessons learned along the way.

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Marine Spatial Planning

Insights from Regional Spatial Data Development Workshops for Marine Spatial Planning
Jessica Carlton, Joshua Chastain, Jennifer Au, and Bryce O'Brien, CSS Inc. at NOAA's National Centers for Coastal Ocean Science; James A. Morris, Jr., NOAA's National Centers for Coastal Ocean Science

Over the past two years, the National Oceanic and Atmospheric Administration (NOAA) National Centers for Coastal Ocean Science (NCCOS) has convened a series of marine spatial planning data development workshops aimed at identifying the best available data to support marine spatial planning activities, such as offshore renewable energy and other blue economy industries. These workshops have been hosted for multiple US territories and regions including the U.S. Caribbean, the Central Atlantic, the Southeast U.S., Guam, Alaska, and the Gulf of Mexico. Each workshop has had a unique set of goals and objectives based on the region's existing marine planning community, data availability, and upcoming planning needs. This presentation will explore the similarities and differences in approaches and outcomes across the data development workshops. While common themes exist among the workshops such as data availability and community engagement, unique regional opportunities and challenges highlight the importance of tailoring planning strategies to local contexts. By sharing insights and lessons learned, this presentation will provide a comprehensive overview of the progress made in marine spatial planning across multiple regions of the U.S. and will highlight next steps in data development and regional collaboration to support informed decision-making for sustainable ocean use.

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Marine Spatial Planning

Proactive Planning: Using Spatial Modeling to Inform Future Offshore Wind Energy Transmission Planning in Stellwagen Banks National Marine Sanctuary

Alyssa Randall, Brian Free, and Jennifer Au, CSS Inc. at NOAA's National Centers for Coastal Ocean Science; Alice Stratton, Mike Bailey, Michael Thompson, Pete Decola, and Samantha Tolken, Stellwagen Banks National Marine Sanctuary; Todd Callaghan, Brooke Hodge, and Hollie Emery, Massachusetts Office of Coastal Zone Management; James A. Morris, Jr., NOAA's National Centers for Coastal Ocean Science

In March 2024, the Bureau of Ocean Energy Management (BOEM) released the final Wind Energy Area (WEA) for the Gulf of Maine. Stellwagen Banks National Marine Sanctuary is located between BOEM's Gulf of Maine Wind Energy Areas and the most likely shoreside points of interconnection. While the Outer Continental Shelf Lands Act (OCSLA) gives BOEM authority to manage offshore energy, it does prohibit leasing in certain areas such as national marine sanctuaries. However, the National Marine Sanctuaries Act (NMSA) provides several authorities to NOAA that could be used to allow activities related to renewable energy in sanctuaries. The Office of National Marine Sanctuaries (ONMS) recognizes that climate change is a significant threat to sanctuary resources and that renewable energy mitigates that threat. ONMS also supports the responsible development of offshore wind and recognizes the challenges in implementing a shared transmission cable system but strongly supports its development in order to minimize impacts to sanctuary resources. ONMS and the Massachusetts Office of Coastal Zone Management (MA CZM) are working with NOAA's National Centers for Coastal Ocean Science (NCCOS) to proactively map sanctuary resources in order to minimize impacts. NCCOS is using a least cost path analysis to inform transmission routes through Stellwagen Banks NMS that considers impacts to natural resources and industry, navigation, and transportation concerns. The model seeks to find 1,000-m wide corridors starting at BOEM lease sites and ending at potential interconnection points in Boston, Massachusetts and Plymouth, New Hampshire. The results will help inform cable routes through the sanctuary and into state waters that minimize impacts to sensitive habitats and existing ocean infrastructure.

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Marine Spatial Planning

Challenges and Opportunities of Colocation of Offshore Aquaculture and Offshore Wind Farms in the United States

Jessica Couture, CSS Inc. at NOAA's National Centers for Coastal Ocean Science; Christopher Schillaci and James A. Morris, Jr., NOAA's National Centers for Coastal Ocean Science

The US, along with coastal countries around the world, is interested in increasing development of healthy and sustainable energy and food industries in ocean spaces. Although they can appear vast and unexploited, EEZs are often heavily impacted with fishing, shipping and other activities, creating conflicts to additional uses or privatization. Development of these industries in ocean spaces has proven difficult despite governmental motivations due to public opposition, conflicts with existing ocean uses, and limitations for space.

Meanwhile, research and development into the co-location of aquaculture and offshore energy production is moving forward in some of the top ocean using countries such as Germany, the Netherlands, China, and South Korea in order to increase efficiencies in ocean space use and improve public opinions about expanding the blue economy.

I will present the preliminary findings of our investigation into the challenges and opportunities for the co-location of offshore wind and aquaculture in the US. Starting with a multidisciplinary review of the state of knowledge on the co-location of offshore wind and aquaculture, we distill these lessons down and apply them to the US context to assess the potential for co-location across unique regions of the US EEZ, and will present regional assessments of the opportunities and challenges to co-location in different parts of the country. I will then open a group discussion about the spatial and planning considerations of co-location in the US, and request input on potential threats, perceptions and other concerns.

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Marine Spatial Planning

Marine Cadastre: The Foundational Data Platform for Marine Spatial Planning

Daniel Martin and Jesse Brass, CSS Inc. at NOAA's Office for Coastal Management; David Stein, NOAA's Office for Coastal Management; John Wieber, Bureau of Ocean Energy Management; Supriya Khadke and Megan Treml, Lynker at NOAA's Office for Coastal Management

With more than 150 data items in its catalog, Marine Cadastre is the premier source for authoritative and trusted ocean geospatial data. The initiative was established in 2007 by the National Oceanic and Atmospheric Administration (NOAA) and Bureau of Ocean Energy Management (BOEM) in response to the growing need for spatial data and tools to support offshore renewable energy. Fast forward to today, Marine Cadastre continues to work closely with national, regional, and industry partners to develop and provide direct access to the best-available data and tools to meet the needs of the ocean planning community. This presentation will provide an overview of Marine Cadastre, highlight new data products and tools, and describe how the data are being shared and applied across the regional ocean planning network.

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Discussion: Resilience Partnerships Matter and It Matters How We Measure Resilience

Panelists:

- Rebecca Beavers, U.S. Department of Transportation
- Kevin Zhang, U.S. Department of Transportation
- Christine Addison Buckel, NOAA's National Centers for Coastal Ocean Science
- Heidi Stiller, NOAA's Office for Coastal Management
- Chief Devon Parfait, Environmental Defense Fund and Grand Calliou/Dulac Band of Biloxi-Chitmacha-Choctaw

Through a unique, multi-year partnership, the Department of Transportation (DOT) and National Oceanic and Atmospheric Administration (NOAA) have focused on elements critical to climate change and natural hazards adaptation. Additional federal, university, and tribal partnerships demonstrate how adaptive frameworks for resilience can emphasize a community-driven, capacity-sharing approach based on mutual support and trust for a sustainable future. A next step common to these activities is monitoring and assessing resilient elements of climate adaptation and natural hazard projects.

With Inflation Reduction Act and Bipartisan Infrastructure Law funding, numerous new grant programs were established. The PROTECT Program is a flagship resilience program for the DOT that must establish and incorporate resilience metrics. The NOAA/DOT Partnership is developing methods that can be used for measuring resilience for projects across the DOT, including the Tribal Transportation Program and Rural programs.

This session will discuss the utility of qualitative and quantitative measurements for evaluating project performance, and how measurements can feed into improving future decision making to create a positive cycle of beneficial community resilience. We hope to hear input on what measurements are important to your region and where it has been difficult to break the maladaptation decision making process that is formed when decisions are made to avoid immediate risk in a way that increases long term risk. Please come to the session thinking about what your community values: Is another year in your family home or access to certain critical points in your community important measures of resilience? Is reliable access by land, sea, or air to your recreation site or hunting and fishing grounds another important measure? Or perhaps sustained protection from coastal erosion of a sacred site, road, or marina? Measures from this session will be used to inform several federal programs focused on community resilience.

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Discussion: Turning the Tide—Collaborative Efforts to Strengthen Alaska's Coastal Resilience*

Panelists:

- Leslie Jones, State of Alaska Geospatial Office
- TBA, Alaska Native Tribal Health Consortium
- Alex Nereson, U.S. Geological Survey's Pacific Coastal and Marine Science Center
- Maya Hayden, U.S. Geological Survey's Pacific Coastal and Marine Science Center
- Nathan Wardwell, JOA Surveys

Understanding coastal hazards and climate risks to communities requires high-fidelity decision-ready data. For years, Alaska communities have been impacted by data gaps, proliferating inequities in data services and tools with direct impacts to community resilience. Gaps in coastal water levels, geodetic frameworks, and foundational data, such as elevation and imagery along Alaska's coast, have limited the ability to provide accurate storm surge forecasts for coastal hazard events; basic products, such as accurate tide predictions, for safe and timely maritime services; accurate documentation of high water events to inform long-term planning and forward-looking climate scenarios. Since the 2019 presidential *Memorandum on Ocean Mapping of the United States Exclusive Economic Zone and the Shoreline and Nearshore of Alaska*, the National Oceanic and Atmospheric Administration, the State of Alaska, and the Alaska Ocean Observing System developed the Alaska Coastal Mapping Implementation Plan with specific milestones for collecting these foundational data along Alaska's coast to improve products and services for increased efficient mapping. As a result of this plan and regional coordination, significant advancements have been made in filling data gaps, opening the door for improved information services that will directly support Alaska communities. We will highlight efforts to complete statewide VDatum, coordinated funding for imagery and lidar, a real-time global navigation satellite systems (GNSS) network, and various projects across the state that are vital to ensuring critical data for decision-making.

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Discussion: Enhancing Coastal Management Applications with InSAR Vertical Land Motion Data

Panelists:

- Bryan Deslauriers, Dewberry
- Mike Aslaksen, NOAA's National Geodetic Survey
- Jamie Carter, NOAA's Office for Coastal Management
- Sara Del Conte, TRE ALTAMIRA
- Simone Fiaschi, TRE ALTAMIRA

The National Geodetic Survey (NGS), a key division of NOAA, is dedicated to surveying and safeguarding our nation's coastline to improve coastal infrastructure resilience and community safety. While NOAA provides an array of tools and data sets to monitor sea level rise and nearshore environments, NGS is expanding its approach by integrating satellite-based Interferometric Synthetic Aperture Radar (InSAR) data. This technology offers coastal managers a deeper understanding of vertical land motion and ground deformation trends, providing critical insights for long-term coastal planning and climate adaptation strategies.

In this session, a case study titled "NOAA East Coast InSAR Analysis 2023" will be presented. This study involved NOAA's collaboration with Dewberry and TRE Altamira to conduct a large-scale analysis of around 3,500 Sentinel-1 InSAR images acquired along 17 different tracks and covering more than 500,000 km2 of the U.S. East Coast, from Texas to Maine. The study spans seven years (2017–2023) and delivers 150 million measurement points at full resolution that were calibrated with NOAA's Continuously Operating Reference Stations (CORS) GNSS network. The high quality of the obtained vertical land motion data is confirmed by the average submillimeter difference between InSAR and GNSS displacement rates.

Beyond the NOAA East Coast project, the panel will compare findings with other recent InSAR analyses, showcasing a range of applications where vertical land motion data has been integrated into coastal management practices. These comparisons will highlight how this technology can enhance disaster preparedness, inform mitigation efforts, and refine sea level rise projections.

Attendees will be invited to engage in interactive discussions and consider how they can incorporate InSAR data with other NOAA resources to better understand the evolving risks to coastal regions.
We are willing to do an oral presentation if space does not allow for a whole session.

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Mapping and Monitoring Shorelines

Examples of Restoration Stewards Utilizing Survey Techniques and Indigenous Knowledge to Drive Conservation in Hawaii

Andrew McGowan, Lynker at NOAA's Office for Coastal Management; Gus Robertson, Heʻeia National Estuarine Research Reserve

As a part of the standards of the National Estuarine Research Reserve System(NERRs), routine leveling of swamp stations is required to ensure high accuracy and stability of swamp sites. In the case of the He'eia Nerr and our NOAA counter-parts, we elected to use this opportunity to offer this highly accurate technology and expertise to assist our site partners, Kākoʻo ʻŌiwii, and Paepae o Heeia to help establish elevation baselines. Additionally, this process was carried out under the complete direction and needs of our community partners. Whereby, the capabilities of the technology was presented, and the community partners had final say on which elevation points were taken, and which technologies can best suit their needs (ie. RTK, and LiDAR).

This Collaboration is one of many that are commonplace in the He'eia NERR, but is a good example of

1. Giving autonomy of the direction of research and monitoring to Indigenous site partners, community, and people of place.
2. Providing highly sophisticated technologies to indigenous communities to set elevation baseline and quantify invasive species proliferation.
3. Help to provide quantifiable data for indigenous science and restoration efforts.
4. Provides a basic etiquette and protocol for researchers working in indigenous spaces.

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Mapping and Monitoring Shorelines

Determining Shoreline Migration Rates with a Change-Point Detection Model

David Forrest, William & Mary's Batten School of Coastal & Marine Science and the Virginia Institute of Marine Science

Large-spatial-scale shoreline change data typically has limited observations over long time scales. The Shoreline Studies Program at VIMS has a rich collection of coastlines spanning from 1937 to 2021 along the Virginia portion of Chesapeake Bay. End point and least squares regression rates have been used in the past to describe change, but these do not always capture significant modifications along the shore nor the recent acceleration in the rates due to sea-level rise. Endpoint estimates are controlled wholly by their end dates, ignoring intervening rate changes. Least squares models are more inclusive of intervening data but do not represent structural changes or slope changes over time. The tool under development uses interrupted time-series analyses to model shore change through time by determining change points between early and later rates of change; it then estimates the timing and extent of the change points. This piecewise regression technique is a machine learning method for fitting separate models to partial, covering sets of observations and to determine the relationship of those models. In contrast with endpoint and least squares estimates, piecewise linear models can represent some level of curvature or change and provide estimates of the magnitudes of the changes. Additionally, extrapolations from piecewise linear models are weighted more towards their time-local observations, and their effects can be less dramatic than extrapolations made by higher-order polynomial models. We developed this analysis in Python and applied it to a series of digitized shoreline data for York River and Mobjack Bay in Chesapeake Bay. A detailed understanding of how and why these rates are changing in varying environments (marsh, upland, residential, agricultural, protected, etc.) is critical to protecting habits and increasing overall coastal resiliency.

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Mapping and Monitoring Shorelines

Advancing Shoreline Interpretation and Intertidal Zone Monitoring with Capella Synthetic Aperture Radar (SAR) Imagery Using Cutting-Edge Geospatial Tools

Kyle Goodrich and Bindi Dave, TCarta

In a time where record-breaking storms, sea level rise, and coastal development are changing our coastlines faster than ever before, the need for robust and consistent monitoring techniques is paramount. Synthetic Aperture Radar (SAR) backscatter imagery, with its high spatial and temporal resolution, has proven itself invaluable for observing these dynamic areas despite weather conditions or time of day.

Leveraging these attributes of SAR for shoreline interpretation significantly expands the surveying window of opportunity, overcoming constraints such as weather, daylight, and accessibility which typically prove to be insurmountable for aerial or satellite acquisition. By integrating SAR image tasking with tide stations, imagery can be aligned with local tidal datums, producing accurate shoreline estimations at a fraction of the cost or time of conventional methods. In addition to its effectiveness determining shoreline, SAR image raster comparisons can provide new insights into intertidal zone characteristics, holding significant opportunities for understanding this delicate ecological area of interest and importance.

This presentation will introduce Capella Space SAR backscatter imagery and its applicability as a tool for coastal geospatial inquiries using TCarta's own in-house Esri toolbox. Designed to extract shoreline from SAR backscatter with minimal manual interpretation, the key processing steps will be reviewed including: radiometric corrections, speckle filtering, data scaling, raster classification, vector polyline extraction, and smoothing. The intertidal zone calculations will also be demonstrated in several key environments to highlight the applicability of this technology in the pursuit of coastal resilience.

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Mapping and Monitoring Shorelines

Looking Below the Surface: An Update on Benthic Habitat Mapping in the Great Lakes
Lara O'Brien Lynker at NOAA's Office for Coastal Management; Brandon Krumwiede, NOAA's Office for Coastal Management

Over the last few years, the National Oceanic and Atmospheric Administration (NOAA), together with multiple federal, state, and academic partners, has been working to collect new high-resolution bathymetry, multibeam backscatter, lidar reflectance, underwater video, and sediment sampling to support the classification and mapping of coastal and nearshore benthic habitats within the Great Lakes. Bathymetric lidar and multibeam sonar are used to collect foundational data, and combined with underwater video and ancillary data to derive new and updated classifications of the substrate, biotic, and geoform components using the Coastal and Marine Ecological Classification Standard, or CMECS. This presentation will focus on providing an overview of the work completed to date, where we anticipate moving forward in the future, and the potential applications of this new data and information. This effort has been funded and supported through the Great Lakes Restoration Initiative.

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The Use of Visualizations and Virtual Reality in Risk Communication and Conservation

Developing More Effective Visualizations for Communicating Storm Risk

DJ Bromley and Peter Stempel, Pennsylvania State University; Annette Grilli, Isaac Ginnis, Chris Damon, and Roland Duhaime, University of Rhode Island

Ten percent of the world's coastlines are sandy beaches that are inherently dynamic landscapes. Coastal communities in these contexts face increasing risks from storms such as hurricanes and nor'easters that continually alter these landscapes and ecosystems and damage human development through shoreline change. This exploratory research engaged experts and planners in assessing new, animated semi-realistic 3D depictions of shoreline change based on the X-Beach model to better understand how these visualizations might be further developed and applied.

The subject visualizations were developed based on the observation that most visualizations of coastal storms and sea level rise used in planning and public engagement depict flooding. Real storm events, however, change the form of the landscape and may damage homes and infrastructure through erosion. Not depicting these changes can mislead stakeholders as to the impacts of future storms and sea level changes. The subject visualizations thus combine validated outputs of the X-Beach model with realistic 3D contexts, light and shadow, and semi-realistic depictions of structures to aid with orienting audiences to the effects of forecast storms on coastal morphology and adjacent infrastructure. These visualizations have been preliminarily applied in coastal management in Charlestown, Rhode Island, supporting management decision-making and planning.

Semi-structured interviews of experts were analyzed using grounded theory and suggest that these visualizations may spur non-expert consideration of broad landscape processes that may otherwise be difficult to understand. Experts also indicate that these visualizations have many of the advantages of other realistic 3D visualizations, such as rapidly orienting diverse audiences to the physical context.

Experts were also concerned, however, that timescales be clearly expressed. Taken together, these and other findings support the further development of semi-realistic visualizations depicting landscape dynamicity to help users assess storm impacts beyond floods and visualizations and better assist coastal managers and decision-makers.

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The Use of Visualizations and Virtual Reality in Risk Communication and Conservation

Collaborating for Resilience: Flood Visualizations and Community Conversations in Wilmington

Dan Rizza and Allison Kopicki, Climate Central; Craig Harris, City of Wilmington, North Carolina; Lynn Leonard and Phil Bresnahan, University of North Carolina Wilmington

The growing threats of sea level rise and coastal flooding present significant challenges for decision-makers and community leaders in Wilmington, North Carolina, and along the U.S. coastline. Effective communication of these risks is crucial for advancing resilience efforts. Through the Edge of America Tour, Climate Central has engaged local communities by listening to and interviewing residents, local scientists, and resilience professionals. These interactions provide insights into how communities are experiencing the impacts of climate change, what they are already doing to address these risks, and their solutions, best practices, and hopes for adaptation and resilience.

A key component of the Edge of America Tour is FloodVision, a technology that captures video, elevation, and spatial data with vehicle-mounted sensors and can produce photorealistic visualizations of flooding for any location the FloodRover vehicle can drive by. These visualizations serve as a powerful communication tool. FloodVision allows the Climate Central team to meet communities where they live, collect data, and reconnect with them through meetups, called Resilience Tailgates, where they engage with local leaders and residents. At these tailgates, local leaders and residents gather to share their experiences, while visualizations created from the data collected are introduced to inform public engagement and decision-making.

This presentation will cover the Edge of America Tour and the lessons learned from engaging with communities along the East and Gulf Coasts. It will also focus on the collaboration between Climate Central, the City of Wilmington, the University of North Carolina Wilmington, and North Carolina Sea Grant, highlighting the tailgate event where flood visualizations were generated and discussed. These visuals are now being evaluated to support ongoing adaptation work, inform decision-making, and enhance resilience planning efforts.

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The Use of Visualizations and Virtual Reality in Risk Communication and Conservation

Using Augmented Reality to Communicate Risks: Example Applications to View Flood Events

Al Souid and Kevin Heeney, WSP USA

Augmented Reality (AR) is increasingly being used to assess and communicate varieties of risks. One of these risks is the environmental and natural hazard ones like wildfires, earthquakes, hurricanes wind damages, and flood. The AR flood tool immerses users in flood scenarios, allowing them to visualize the impact and extent of flood events and comprehend the importance of flood preparedness.
Traditional 2D maps are limited in their ability to properly convey the depth and magnitude of flood risk. Using hand-held devices like smartphones or tablets, users of the AR flood tool at site locations can view the flooding of various storms as if highwater events were happening in-real-time. Additionally, users can experiment with hypothetical scenarios (what-ifs) for the purposes of planning, mitigation, or funding. With these scenarios, users can view the height of flooding on structures (i.e., houses, buildings, bridges, culvert opening), personal properties (i.e., cars) or networks (roads, drainage, electrical). Another added benefit of the AR flood tool is to view increased flood risk if certain zoning or building restrictions are unenforced upstream of watershed areas.

In this presentation, WSP has developed the AR flood tool using modern video gaming technology comprising of the Unity 3D Game Engine, Blender 3D modeling software and C# programming language. While on-site, users look through a tablet or smartphone to experience 3D modeled flooding scenarios as if they were happening in-real-time. The AR conveys depth and magnitude in a way that motivates users to proactively enact mitigation solutions to avoid disastrous implications. WSP has implemented AR at a several sites in the Americas and Great Britain; however, the potential exists for the AR flood tool to allow visualization of critical data like flood risk country-wide using FEMA Risk MAP data, sea-level rise estimates and coastal flooding, where city planners and business leaders may “walk the town” viewing in 3D the results of various community sea level rise models and studied flood data.

By simulating flood events, community leaders and the public citizens can understand the potential damage and the benefits of mitigation actions, such as planning and constructing building codes to designing and maintaining transportation and storm drainage networks. Such flooding information is very critical when making decision by the community and regional stakeholders to help planning and secure funding and bipartisan support.

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The Use of Visualizations and Virtual Reality in Risk Communication and Conservation

Using Virtual Reality to Teach Habitat Conservation: Expanding Access to Global Ecosystems

Ryan Walker, John Cartwright, and Dixie Cartwright, Mississippi State University

Habitat conservation often poses challenges in traditional classroom settings due to the abstract nature of ecosystems and their complexities. Even with direct instruction, students may struggle to transition their theoretical understanding into real-world applications. The Week's Bay National Estuarine Research Reserve Environmental Learning Center, has provided hands-on experiences for students through in-person field trips, offering them an opportunity to explore these complex systems. However, due to capacity constraints, only a limited number of students can participate in these face-to-face experiences.

To address this challenge, we have developed Virtual Reality (VR) field trips that replicate the immersive, place-based learning opportunities of the physical field trips, making them accessible to students anywhere in the world. This approach allows students to engage deeply with habitat conservation topics and make informed decisions using scientific principles, regardless of their geographical location. VR provides a platform for experiential learning that bridges the gap between abstract ecological concepts and concrete understanding, helping students apply what they've learned in meaningful ways.
In this presentation, we will discuss student outcomes from these VR field trips, focusing on how the immersive experience has improved students' understanding of ecological concepts and conservation practices. Additionally, we will explore the possibility of expanding these VR experiences to include multiple estuary locations, allowing students to compare conservation efforts across various regions and better understand the similarities and differences in ecosystem management. By integrating VR technology into ecological education, we aim to cultivate informed decision-making and long-term conservation efforts among future generations.

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Artificial Intelligence and Deep Learning

Geospatial Applications of AI for Object Detection in Remotely Sensed Imagery

Cassidy Barkalow, Blue Marble Geographics

Utilizing Machine Learning (ML), Deep Learning (DL), and other Artificial Intelligence (AI) driven methods to address any number of tasks has become commonplace across industries and domains. From customized feedback in the latest health and fitness apps, to customer engagement in industry leading CRMs, AI tools are helping address countless challenges. The geospatial industry is no exception to this. Image analysis techniques have relied on hand-crafted algorithms and traditional machine learning methods for some time. The growth of deep learning methods has further expanded what types of analysis are possible. Compared to traditional machine learning based image analysis, deep learning methods can leverage the seemingly endless amounts of data currently available in today's world. Deep learning benefits from requiring less user input, the potential to provide higher accuracy results, while having the ability to be fine tuned to a variety of tasks. This talk will review the new Global Mapper Insight and Learning Engine™ which features three unique deep learning methods for geospatial image analysis. Semantic segmentation based deep learning models will be reviewed in the context of high-resolution land cover classification and building extraction. The application of an object detection model for vehicle detection will then be discussed. Time permitting, future application of these techniques will be introduced and discussed.

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Artificial Intelligence and Deep Learning

Using Deep Learning to Extract Hydrographic Features from Lidar Data

Colin Flynn, Dewberry

Traditionally, hydrographic features are extracted manually through a digitization process. In areas with complex hydrography, this inefficient process can become expensive and time consuming. Various methods for automating the extraction of hydrographic features exists for satellite and aerial imagery, these methods typically take advantage of spectral indices and thresholding. However, when working with lidar data, it is common practice to utilize the derived terrain in this endeavor; unfortunately, the results from such efforts are inconsistent and unreliable. By looking at the source lidar data as a starting point and deriving various raster products, we are able to solve the complex image science problem and consistently visually identify hydrographic features. This allows for the subsequent training of a deep learning model for pixel classification. Since we are interested in hydrographic features, the model performs a binary classification, with every pixel being classified as either 'water' or 'other'. The result of the model is a classified raster from which polygons are derived. Since the model classifies each pixel, we have additional control over how model predictions are filtered. This allows us to provide many hydrographic features well below specification for our end users, resulting in greater accuracy for any subsequent modeling based on the lidar data.

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Artificial Intelligence and Deep Learning

Designing a Large Language Model to Support Dredging Activities

Ross Winans, NV5 Geospatial; Jesse Hall, Rhonda Lenoir, and Andrew Keith, U.S. Army Corps of Engineers; Gabe Sataloff, NV5 Geospatial

The US Army Corps of Engineers Dredging Quality Management (USACE DQM) Program maintains a large repository of policies, whitepapers, publications, and other technical documentation related to dredging activities. These documents contain important, private information to USACE DQM staff and industry partners for use in planning, knowledge retention and supporting dredging to keep coastal and inland waterways navigable for waterborne commerce and recreational boating. To unlock the information while preserving data privacy, USACE DQM partnered with NV5 to architect a Large Language Model (LLM) solution.

This project aimed to enhance accessibility to this critical dredging-related information for USACE staff and industry partners, crucial for maintaining navigable waterways. The LLM solution was designed with four key principles: secure architecture within the USACE Azure GovCloud, specialized model selection, advanced document processing for improved searchability, and tailored prompt engineering for USACE-specific topics.

The resulting system features a customized user-friendly chat interface that allows plain language queries and provides robust responses alongside source document links. This solution effectively balances information accessibility with data security, streamlining the planning and support of dredging operations for coastal and inland waterways.

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Data, Models, and Tools for Sea Level Rise, Coastal Flooding, and Erosion Vulnerability – Part 2

I-ADAPT: A Tool to Mitigate Flooding, One Property at a Time in Delaware*

Jordana Cutajar, Delaware Department of Natural Resources and Environmental Control

In addition to increasing frequency and intensity of precipitation events, climate change is also causing sea level rise, creating an urgency for implementing flood adaptation measures in coastal and floodplain-bound communities. Delaware's low elevation and expansive tidal connectivity makes it very vulnerable to flooding, leaving many residents wondering how to prepare their families and homes for future flood events.

To help foster best practices for flood adaptation amongst Delawareans, the Delaware Department of Natural Resources and Control (DNREC) released a new tool know as I-ADAPT. Created by previous NOAA Coastal Management Fellow, Nicole Marks, the Individual Adaptation Decision And Planning Tool (I-ADAPT), is a decision-making tool to help residents adapt to the higher frequency of flooding events and can be used by homeowners, renters, business property owners, and renters.

I-ADAPT is a web-based tool that takes both physical property characteristics and personal preferences into account to recommend flooding adaptation strategies. The user enters their structure's location and answers questions about their property and personal preferences, which the tool uses to compute personalized adaptation strategy recommendations that can be implemented on the property right now as well as strategies the user can implement to reduce their property's flood risk through 2050.

This presentation will overview the research and engagement that went into creating I-ADAPT, highlighting how the tool functions, and its associated adaptation strategies. The talk will conclude with reflections on outreach opportunities, efforts to translate the tool and improve accessibility, and future updates.

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Data, Models, and Tools for Sea Level Rise, Coastal Flooding, and Erosion Vulnerability – Part 2

Coastal Hazard Modeling and Risk Assessment for Adaptation Planning

Cheryl Hapke, Johanna Tatum, Eduardo Lopez, and Mike Wernau, Fugro

Be part of the conversation that shapes the future of coastal resilience. The southwest Texas coastline, and specifically the cities of South Padre Island (SPI) and Port Isabel, are crucial areas for beach recreation and ecosystem tourism and are highly vulnerable to storm impacts and sea level rise. These threats are expected to intensify with climate change, posing significant risks to the region's economic and environmental resources. Our analysis, featuring high-resolution topobathymetric lidar and 3D visualizations, offers invaluable insights for decision-makers and planners. Learn how we forecast future impacts and identify critical areas at risk.

To understand current and future potential risks, a comprehensive vulnerability and risk assessment was undertaken wherein numerous datasets were compiled to characterize the impacts of storm surge combined with sea level rise (SLR) scenarios. Coastal hazard modeling for both SPI and Port Isabel was conducted, and future sea level scenarios were combined with storms to forecast future impacts.
To perform the hydrodynamic modeling, key data layers were compiled, including recently collected high-resolution topobathymetric lidar. An Extreme Value Analysis (EVA) of wind speeds and historic storm directionality was undertaken to identify a 100-year storm with the characteristics of a Category 1 hurricane. Flood surge values were then obtained from NOAA's numerical SLOSH model.

Risk to assets was then conducted by combining inundation levels from the 100-year storm with future sea level rise over a digital elevation model. We evaluated impacts for 100-year storms with no SLR, 2040 (1.15 ft), and 2080 (3.81 ft) and analyzed which assets were impacted when, identified areas that would be flooded in the different scenarios, and generated 3D renderings of the findings in a Story Map and online dashboard that are easy to understand tools and visualizations for decision makers and planners.

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Data, Models, and Tools for Sea Level Rise, Coastal Flooding, and Erosion Vulnerability – Part 2

Updating a Parcel-Scale Quantitative Sea Level Rise Vulnerability Assessment for Puget Sound, Washington State

Ian Miller, Washington Sea Grant; Avery Maverick and Jim Johannessen, Natural Systems Design + Coastal Geologic Services; Bret Folger, Lynker at NOAA's Office for Coastal Management; Jane Lauckner and Gabrielle Roth, Sound Data Science; Oliva Vito, Natural Systems Design + Coastal Geologic Services; Sydney Fishman, Washington Sea Grant

The availability of regional and local sea level rise (SLR) projections facilitates the integration of SLR-related hazard exposure into community planning processes. Data on exposure to hazards exacerbated by sea level rise, though, paints an incomplete picture of the risks faced by communities. Vulnerability assessments combine exposure information with details about community assets to provide better insights about areas that are most at risk due to SLR-driven hazards. A careful and comprehensive assessment of SLR-driven vulnerability, therefore, can lead to more nuanced planning and decision-making and support more equitable distributions of resources and investment intended to reduce vulnerability. Vulnerability assessments, though, often rely on convening stakeholder working groups, and are therefore expensive, time-consuming, and limited spatially to the zone of stakeholder expertise. An alternative approach leverages the emergence of publicly available spatial data and analysis techniques to quantify SLR vulnerability at scales relevant to community planning and decision-making. Here we report on efforts to update a quantitative SLR vulnerability assessment for Puget Sound in Washington State that is intended to inform land-use, ecological restoration, and hazard planning. The assessment will re-calculate a SLR vulnerability index for every coastal parcel in Puget Sound, Washington, based on the configuration of infrastructure and coastal habitats within the study area. In particular we will focus this presentation on innovations to methods for assessing exposure to hazards exacerbated by sea level rise that 1) make use of NOAA's SLR inundation layers while still accounting for significant variability in relative SLR in Washington State, 2) integrate groundwater modeling recently released by the USGS and 3) better represent actual exposure in areas controlled by levees, dikes and tide gates that are not accurately modeled in inundation layers.

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Data, Models, and Tools for Sea Level Rise, Coastal Flooding, and Erosion Vulnerability – Part 2

Leveraging Federal Datasets to Assess Inundation Vulnerability of US-1 in the Florida Keys
Sarah Woolard, Brian Batten, Jeff Gangai, and Joel Plummer, Dewberry

The Overseas Highway is the sole connection between the mainland and the Florida Keys. Extending over one hundred miles from Florida City to Key West, this critical road and bridge network is the primary access point for over 30 inhabited keys, over 80 thousand residents, and millions of seasonal tourists. With rising sea levels, the highway faces increased flood threats that threaten the road and bridge infrastructure. In response to these challenges, the Florida Department of Transportation (FDOT) commissioned a study to assess long-term flooding risks to inform adaptation planning priorities.
As part of a more extensive study, we evaluated flood conditions for current (2024) and mid- and end-of-century sea level rise scenarios (2050 and 2100). Leveraging NOAA and USACE data, we developed coastal flood hazard data for six scenarios along the 117-mile stretch of US-1. Our approach encompassed a wide range of flood conditions, including daily tidal inundation, chronic flooding, storm surge impacts, and related wave conditions. These hazards were related to FDOT highway assets, with varying approaches for roadways, bridges, and facilities.

Our presentation will provide a case-study overview of how publicly available federal datasets were leveraged via a data-driven approach to evaluate transportation infrastructure. We will discuss how non-linearity in future water level conditions was incorporated. Other topics will include our approach to relate the flood data to assets using a graduated classification system and composite scoring approach to help identify priority assets for follow-up detailed study for adaptation strategies.

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Short and Sweet: Infrastructure Vulnerability

Creating GIS Datasets of Transportation Infrastructure Vulnerability for Hazard Mitigation Planning in Low-Capacity Communities

Kevin Autry, Clemson University

Flooding is a major natural hazard affecting all counties in South Carolina, with the state frequently experiencing federally declared flooding events due to hurricanes, tropical storms, and severe weather. Significant flood-related disasters include the 2015 floods, along with the floods caused by Hurricanes Matthew in 2016 and Florence in 2018. These events alone resulted in over $6 billion in economic losses, damaging homes, infrastructure, and agriculture, with ongoing recovery efforts in some areas. Since 1954, South Carolina has faced more than 25 federally declared disasters where flooding played a key role, often linked to hurricanes and storms.

Historically, flood mitigation efforts have relied on FEMA Flood Insurance Rate Maps (FIRM), which function more as regulatory tools rather than comprehensive flood modeling resources. While larger cities such as Charleston, Columbia, and Greenville have more resources to prepare for severe storms, rural and remote communities often face limitations with local and state resources, making it harder to develop effective flood mitigation strategies.

To address these challenges, Clemson University's South Carolina Institute for Sustainability and Resilience (SCISR), in partnership with the South Carolina Office of Resilience (SCOR), is creating detailed Geographic Information System (GIS) datasets. These datasets, built using multiple flood models and technologies like LIDAR and digital elevation models (DEMs), assess flood risks for roadways and bridges throughout the state. The data informs disaster preparedness and infrastructure resilience efforts by helping planners and responders identify vulnerable infrastructure and prioritize areas for flood resilience improvements.

In addition, static map books have been developed for communities lacking GIS capabilities, ensuring access to crucial flood risk management tools. These resources are vital for ongoing and future efforts to enhance infrastructure resilience across South Carolina.

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Short and Sweet: Infrastructure Vulnerability

An Interactive Tool to Communicate the National Flood Insurance Program's (NFIP) New Pricing Approach to Property Owners in Hampton Roads

Emma Corbitt and Ben McFarlane, Hampton Roads Planning District Commission

Hampton Roads is a coastal area in Southeastern Virginia that is highly susceptible to flooding due to its low-lying geography and proximity to coastal, fluvial, and pluvial flooding sources. Accelerated regional rates of sea level rise and more frequent intense storms have resulted in increased risk for property owners. As a result, flood insurance is an increasingly critical way for stakeholders to mitigate their risk. At the same time, the National Flood Insurance Program (NFIP) has transitioned to a new rating method, Risk Rating 2.0, that has significantly impacted how flood insurance policies are priced for many policy holders. The Hampton Roads Planning District Commission (HRPDC) is the regional planning organization for 17 localities and performs regional flood insurance outreach and education through GetFloodFluent.org. HRPDC staff has been working to update and improve the flood insurance calculator provided on GetFloodFluent.org. With this tool, property owners can enter property information and estimate the cost of flood insurance. Following the implementation of Risk Rating 2.0, the tool is being updated and improved to reflect the new pricing approach. The update to the tool will include detailed information about the geographic rating factors used by the NFIP rating engine to assess a property's risk based upon its location. These rating factors are determined using geospatial information such as distance to flooding source, elevation, and other characteristics. Providing information about these rating factors in an interactive tool will be a valuable educational resource for stakeholders in the region.

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Short and Sweet: Infrastructure Vulnerability

Use of Geospatial Applications in Enhancing Resilience of the Coastal Forestry Sector

Kate Grala, Robert Grala, Andrew Nagel, and John Cartwright, Mississippi State University

Coastal hazards such as sea level rise, hurricanes, storm surge, and high-tide flooding pose escalating threats to the forest sector in the U.S. southern coastal states. These hazards frequently disrupt forestry operations, threaten the functionality of forestry infrastructure, and decrease timber availability for processing. These hazards can also hinder the development of effective resilience-building and disaster mitigation strategies. Despite the growing risks, there is a limited understanding of how these hazards affect coastal wood-processing mills and their supply chains.

This study addresses the urgent need to enhance coastal resilience by examining the impacts of SLR and related hazards on coastal forestry infrastructure. Geographic Information Systems workflows were developed to assess the vulnerability of wood-processing mills and their timber procurement zones, evaluate transportation networks, and analyze the effects of SLR on timber availability within 25-, 50-, and 75-mile procurement zones across Alabama, Florida, Georgia, Louisiana, Mississippi, and Texas. These tools incorporate various SLR scenarios, trucking routes, bridge locations, untraversable road segments, and inaccessible forest areas to determine how transportation networks may be disrupted by rising seas and other coastal hazards, directly affecting timber procurement and salvage operations.
By presenting these findings through interactive online applications, such as story maps and dashboards, this study aims to equip decision-makers with actionable tools to develop strategies for increasing the resilience of the coastal forest sector. This includes optimizing timber transport routes to minimize costs and disruptions, as well as identifying resilient sites for new mill locations and processing facilities. The developed geospatial workflows can be adapted for other sectors and coastal infrastructure operations, offering vulnerable coastal communities critical tools to enhance their resilience to SLR and other emerging hazards.

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Short and Sweet: Infrastructure Vulnerability

Streamlining a Flood Impact Assessment Using GIS, PostgreSQL, and Open-Source Tools

Jesse Nelson, Dewberry

The City of Newport News, located in the coastal Hampton Roads region of Virginia, experiences flooding impacts from heavy rainfall, storm surge, and tidal flooding. These flooding challenges will continue to worsen with ongoing climate change impacts of sea level rise and more frequent and intense rainfall. The City is working to address these challenges through a master planning effort to develop three individual but interdependent plans: a Stormwater Master Plan, Floodplain Management Plan, and Climate Change and Resilience Master Plan. The City is coordinating with a consultant team led by GKY to develop these master plans with funding through the Virginia Community Flood Preparedness Fund. As part of the Climate Change and Resilience Master Plan effort led by Dewberry, the City is working to characterize current and future flood conditions and their impacts on the community and its built and natural infrastructure. This presentation will focus on the process of conducting a coastal flooding vulnerability assessment by utilizing GIS-based analyses, a PostgeSQL database, and FEMA's Hazus FAST. The flood exposure of buildings, roads, critical assets, and natural infrastructure was calculated based on current and future projected flood conditions accounting for sea level rise and storm surge. An Esri geodatabase was combined with a PostgreSQL database to reduce processing time and streamline collaborative workflows when conducting the exposure and sensitivity analysis. Property assessment information was attributed to thousands of buildings in the PostgreSQL environment to prepare for an economic loss analysis using FEMA's open-source Hazus FAST tool. The AAL per building was calculated for each flood scenario in the City and aggregated to identify areas most at risk to future coastal flooding. The process of this multi-tool vulnerability assessment will be shared, along with lessons learned, to support other communities interested in developing or updating their plans and vulnerability assessments.

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Short and Sweet: Infrastructure Vulnerability

Mapping Nuisance Flooding Days – Simple but Effective Information

Keil Schmid, Geoscience Consultants, LLC

The term “nuisance flooding” has been used to describe tidal flooding during conditions that extend to minor flooding levels. These sub-moderate events are familiar to most coastal residents as notable but not overly dangerous conditions; many can identify with the impacts/look of nuisance flooding. Recent work has highlighted the tipping point to nuisance flooding at around 30 days/year, however, this is a location/societal specific value. When nuisance flooding coincides with moderate rain events the geographic extents and societal interruptions expand and can cause moderate to major issues locally. Development of the shallow coastal flooding threshold, changes in yearly frequency based on sea level rise (SLR), and mapping of the area by NOAA has been helpful to establish a common understanding of flooding frequencies and where they occur. The shallow coastal flooding zone is, however, static at present; it does not expand with SLR.

During a recent project in Beaufort County, SC Geoscience Consultants developed a high-resolution mapping product that builds on the nuisance/shallow flooding products from NOAA. It is a map of the calculated number of days per year a location will be inundated now (ca. 2025) and in the future based on SLR curves. This provides stakeholders with the ability to gauge future conditions of their specific area of interest by examining present (2025) locations that have a similar number of predicted future inundation events. This nuisance flooding product is based on 20+ years of daily high-water levels from a nearby tide station (Ft Pulaski) that were corrected for SLR. Once the frequencies are developed, they can be applied to any level of SLR. The simple metric is easier to assimilate than calculating the difference in water levels from specific flooding events (e.g., 1-yr storm) at present and in the future.

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U.S. Geological Survey: Tools for a Changing World

Michael Slattery and Dawn Kotowicz, U.S. Geological Survey

The USGS is invested in creating actionable science for federal, state, county, and city managers. Management tools are designed to assist emergency managers in their preparation, response, and recovery from coastal hazard impacts. These products use results of state-of-the-art research about coastal hazards to assist decision makers in managing their community's risks from waves, tides, shoreline change, storm surge, coastal flooding, and sea level changes. This talk will describe a selection of USGS tools to engage potential users along with an overview of a previous workshop conducted as part of this effort in Puerto Rico in 2023. The Hazard Exposure Reporting and Analytics (HERA) tool allows emergency managers to identify highly vulnerable portions of their community by putting into numbers: people, infrastructure (roads, water, and waste management), and critical facilities (e.g., schools, police stations, hospitals) that maybe impacted or lost. The Coupled Ocean-Atmosphere-Wave-Sediment Transport (COAWST) daily forecast model includes maximum ocean water levels, wave heights, sea surface temperatures, and suspended sediment load that could influence coastal hazard exposure. It is displayed in a series of interactive, color-scaled maps. The Total Water Level and Coastal Change Forecast Viewer (TWL&CC) allows users to determine beach/dune hazards expected over the next six days from ocean influences (including wind, waves, storm surge, tides, and wave set-up/run-up). TWL&CC can inform managers of erosional potential at beaches. Lastly, the Coastal Science Navigator lets users input parameters about their needs and suggests the most applicable tools from a selected suite of USGS tools.

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The Economy and Flood Vulnerability for Essex County, Massachusetts

Charlotte Tierney and Nataly Medina, Lynker at NOAA's Office for Coastal Management; Kate Quigley, NOAA's Office for Coastal Management

Located on the northern shore of Massachusetts, Essex County is home to more than 800,000 people and at risk of many coastal hazards. This analysis of Essex County's coastal and marine economies uses data from ESRI's Business Analyst 2023, NOAA's sea level rise viewer, and the 1% coastal flood annual exceedance probability from the Massachusetts Coastal Flood Risk Model (MC-FRM) to evaluate business establishments and employee vulnerability to coastal inundation from sea level rise and storm surge. Publicly available parcel data is then combined with multiple scenarios from the MC-FRM to evaluate the county's residential vulnerability to inundation from these hazards.

Maps highlight towns at high risk of the adverse effects of one to five feet of sea level rise. Both marine and nonmarine business establishments are affected beginning at one foot of sea level rise. At five feet of sea level rise, Lynn, Massachusetts faces the greatest risk with 153 businesses potentially affected, followed by Salem with 144 and Gloucester with 110 potentially affected businesses. While Lynn and Salem surpass Gloucester in overall coastal economy impact, Gloucester leads in marine economy vulnerability. These three towns represent 60 percent of the businesses being inundated with five feet of sea level rise for the coastal economy. In addition to businesses, residential parcels are also at significant risk from sea level rise. At one foot of sea level rise, 2,895 single-family parcels are affected; that number increases to 6,063 single-family parcels affected at five feet of sea level rise.

This analysis highlights the compounding flood risks faced by coastal communities. This information will be useful to municipal planners and will allow evidence-based decision-making for future coastal development, mitigation, and actions to protect lives and property.

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Coordinating Diverse Stakeholder Groups to Improve Coastal Hazard Forecasting and Prevention

Mary Ford, Mid-Atlantic Regional Association Coastal Ocean Observing System; Kathleen Fallon, New York Sea Grant

Rip currents are a significant beach hazard resulting in over 100 annual fatalities nationally in the U.S. However, according to the US Lifesaving Association, the chance of drowning at a guarded beach is 1 in 18 million and rips account for 80% of lifeguard rescues. Recognizing this, it is integral to encourage communications not only with researchers but on-the-ground stakeholders in order to collect data and support change. Rip currents are just one of the many surf hazards that beachgoers may encounter and through education most incidents can be prevented. Through coordinated efforts and information sharing, models and forecasts can be improved upon and safety messages can be stronger and reach further. In order to foster collaboration among the various entities working within this field, New York Sea Grant and MARACOOS are jointly leading the Surf Hazards Awareness and Research Coordination (SHARC). The intention of this networking group is to work towards improving the forecasting, understanding, and prevention of surf hazards which will allow for increased beach safety and better informed science and decision-making. Since its inception, SHARC has been leading meetings, circulating information about upcoming events and opportunities, and working to coordinate data collection among lifeguards and researchers. This data, along with MARACOOS OceansMap and other tools, has the potential to improve coastal hazard mapping and surf hazard analysis. As new collaborations continue to arise, the network is able to grow and evolve in order to serve the needs of its stakeholders. SHARC has been piloted along New York's Atlantic shoreline with the intention of learning from and building upon the experiences to expand the network throughout the Mid-Atlantic Region, and potentially beyond.

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Addressing Barriers to Coastal Resilience: Stakeholder Engagement on Nature-Based Solutions

Shu-Mei Huang, South Carolina Sea Grant Consortium; Lee Bundrick, Kiawah Conservancy; Landon Knapp, South Carolina Sea Grant Consortium; Norman Levine, College of Charleston

With the increasing frequency and severity of coastal hazards across the country, the need for innovative resilience infrastructure continues to grow along the coast. Nature-based solutions are becoming a preferred option due to their ability to increase the resilience of both human and wildlife communities. Finding common ground and building consensus among key stakeholders provides the means necessary to pave the way for a combined resilience effort and identify solutions which bolster our natural infrastructure. In 2020, a project team led by the Kiawah Conservancy embarked on an effort to engage Kiawah Island, S.C. stakeholders to catalyze interest on nature-based solutions. Through the use of semi-structured interviews, continued stakeholder interactions, and educational opportunities, the Conservancy gained insight on each stakeholder's vision of resilience related outcomes as well as guidance towards identifying and garnering support for nature-based solutions to address vulnerabilities. This culminated in a comprehensive guidance document outlining suitable living shoreline and green-infrastructure practices which will serve to bolster natural infrastructure on the island. Of equal importance to these efforts was gaining a better understanding of the historical and present conditions of the natural systems on the island through concurrent research and monitoring efforts. Funded by the Town of Kiawah Island and in collaboration with the College of Charleston and S.C. Sea Grant Consortium, the Conservancy coordinated groundwater table and marsh vulnerability studies to identify and prioritize vulnerable areas. These research and monitoring efforts are providing guidance for future land management practices and site selection for implementation of nature-based solutions to enhance resilience outcomes. This combined, multi-organizational planning effort provided a pathway towards a long-term, sustainable future for the barrier island community. The presentation will provide insight on our collaborative work with stakeholders, future directions and lessons learned, and updates of nature-based solution project implementations.

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Enhancing Coastal Resiliency: Integrating Geospatial Data and Stakeholder Insights in the Texas Coastal Resiliency Master Plan

Nathalie Jung and Nicholas Wellbrock, AECOM

The 2023 Texas Coastal Resiliency Master Plan (CRMP) aims to protect and promote a resilient Texas coast, which supports nearly 6.92 million residents and over 1.55 million jobs statewide. With $1.87 billion allocated for projects, the Plan addresses coastal vulnerabilities using a "multiple lines of defense" strategy that blends natural and built infrastructure. The Plan's objectives include identifying and funding projects, adapting to changing conditions, and highlighting the coast's importance to various audiences. The planning process is informed by stakeholders and driven by data, utilizing updated coastal models and economic benefit analyses. The upcoming iteration of the CRMP will leverage new data collected via ArcGIS Survey, integrating it with existing database to enhance the Plan's effectiveness. This data transfer will streamline the intake and input processes, creating a more efficient system. Stakeholder engagement, through surveys and database integration, will play a crucial role in this process. The experiences and feedback gathered will not only benefit the CRMP but also contribute to broader coastal resiliency efforts across Texas. By improving data management and stakeholder collaboration, the CRMP aims to create a robust framework for protecting and enhancing the Texas coast, ensuring its sustainability for future generations.

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Design Science-Based Tools for Coastal Resilience

Dave Michelson, National Environmental Modeling and Analysis Center, University of North Carolina Asheville

Over the past ten years, UNC Asheville's National Environmental Modeling and Analysis Center (NEMAC) has conducted hundreds of interviews and usability studies with people as they use science-based websites and web GIS tools, including tools for building coastal resilience. As a result, we developed a well-founded understanding of the behaviors, needs, and goals of the users who visit these websites. During this session, you will learn how we used quantitative and qualitative methods, including surveys, interviews, and user studies, to gather data from diverse users to inform the design of GIS products. Attendees will leave the session with research-supported tips and hints that you can use to improve your site.

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Won't You Be a Good Neighbor? Advancing Floodplain Management Resources for Coastal Communities*

Allie Pouliot, Association of State Floodplain Managers

As Mr. Rogers said, 'We live in a world in which we need to share responsibility. It's easy to say "It's not my… community, … not my problem.' Then there are those who see the need and respond. I consider those people my heroes." One way to respond to the increasing pressures of climate change and sea level rise on coastal communities is to implement No Adverse Impact (NAI) floodplain stewardship, a set of higher standards based on a "good neighbor" ideology. Utilizing the NAI concept, actions taken to mitigate flooding do not cause harm to the larger community. Since its inception, numerous resources have been created by ASFPM and other Digital Coast partners, including a core practitioner Toolkit (2003), Coastal Handbook (2007), How-to-Guide series (2014-2019), and the new Legal Guide (2023). The Digital Coast platform also provides a broad array of data and tools for practitioners to implement NAI practices.

ASFPM and CSO are working together, with help from NOAA, to update and expand the Coastal No Adverse Impact handbook, focused on floodplain management along the Great Lakes and oceanic coasts of the United States. New trainings will be created based around the updated coastal NAI resources. In order to inform the trainings, ASFPM analyzed the existing resources on the Digital Coast platform. The presentation will highlight how the Digital Coast platform is useful for practitioners, and how Digital Coast Partners are identifying and filling gaps to advance the principle of NAI. Participants will also have the chance to provide input on the next generation of NAI resources as they are being created. Coastal communities that utilize the NAI principle for floodplain stewardship will be safer in the face of the changing climate and sea level, while also being a good neighbor.

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We Tried to Do Ten Things with AI. Some of Them Worked.

Wes Shaw and Chris Rae, MyCoast

For the past thirteen years, we at MyCoast have been working to empower citizen scientists through technology. We started with people (literally) phoning in reports on storm damage and moved on to web tools, then dedicated mobile apps.

About 18 months ago, we jumped into AI because everyone said it was smarter than we were.
Here's the thing: we know about as much about AI as you do. We've tried to make it write code, analyze our 36k coastal reports, update our logo, and fill in boring paperwork. We've fumbled our way through ChatGPT, Claude, Midjourney, and others - sometimes it made our lives easier. Sometimes we wasted precious work time unsuccessfully trying to convince it that it could, in fact, do something that it had done a week previously. Another time we accidentally spent $1500 on whatever "compute" is.

In this talk, we'll share our top ten AI experiences. Some of them will give you a glimpse into an amazing future, and some of them will make you wonder how anyone approved these clowns presenting on this important topic.

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Implementation of a Jurisdictional Socioeconomic Field Data Collection Program to Inform NOAA's Coral Reef Conservation Efforts

Alexander Swain, Eastern Research Group; Mary Allen, Lynker at NOAA's Office for Coastal Management; Chloe Fleming, CSS Inc. at NOAA's National Centers for Coastal Ocean Science; Sarah Gonyo, NOAA; Charles Goodhue and Hannah Stroud, Eastern Research Group

Coral reefs are among the most diverse and valuable ecosystems in the world, supporting more aquatic life than any other marine environment and providing critical resources and services for approximately 500 million people. In response to increasing threats, NOAA established the Coral Reef Conservation Program's (CRCP) National Coral Reef Monitoring Program (NCRMP), a coordinated monitoring effort that collects comprehensive biological, climate, and socioeconomic data. As part of NCRMP's Socioeconomic Component, the CRCP gathers spatial and non-spatial survey data from residents, focusing on population demographics, coral reef usage, and public knowledge and attitudes toward reefs and associated management practices. Data collection occurs in seven jurisdictions and requires coordination among a multidisciplinary team, often requiring travel to remote areas for in-person interviews.

To address logistical challenges and enhance efficiency, NOAA's team has modernized its data collection processes by implementing a suite of ESRI data capture and management tools with open-source solutions for progress reporting and data post-processing. The team integrated Survey123 and Field Maps to leverage existing spatial data, improve field coordination and readiness, and collect resident responses and associated spatial information to inform NCRMP's socioeconomic indicators. Automated collection of spatial data associated with resident responses was critical to the success of the survey, as location data informed statistical analyses and return visits were required for households that did not complete the survey during the field team's initial visit. The NOAA team also developed a series of open-source tools (e.g., using the R-ArcGIS Bridge) to automate data collection progress updates for project managers and post-process data for statistical analysis. These advancements have improved data collection efficiency and quality for NCRMP's data collection program, furthering CRCP's mission to use monitoring information to guide coral reef research, enhance communication strategies, and strengthen reef management programs.

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