Albemarle-Pamlico Ecosystem Symposium

Eyes on the Horizon

November 1, 2017

McKimmon Center, NC State University

Raleigh, North Carolina

#APES17

WELCOME

This month, the Albemarle-Pamlico National Estuary Partnership celebrates thirty years of collaborating to protect the natural resources of the Albemarle-Pamlico region. Our 2017 *Albemarle-Pamlico Ecosystem Symposium: Eyes on the Horizon* is both a commemoration of decades of hard work by our numerous partners as well as a look forward to the emerging issues affecting human communities, natural systems, and water resources within the region's estuaries and watersheds. Topics today will cover some of the scientific, management, and policy initiatives from partners implementing our Comprehensive Conservation and Management Plan.

Since our founding in 1987, APNEP has funded or supported over 100 applied research initiatives designed to improve our working knowledge of the Albemarle-Pamlico system. Since 2002, APNEP has supported over ninety education and outreach projects. As an independent, science-based organization, the Partnership has brought together diverse stakeholder groups to identify how we can act collaboratively to create a healthy Albemarle-Pamlico region.

With over 3,000 square miles of open water, the Albemarle-Pamlico estuary is the second largest estuarine complex in the lower 48 states. Our goal today is to bring together the stakeholders who work to protect this estuarine system's natural resources, from its upstream rivers to barrier islands where the sounds meet the sea. Looking forward, APNEP seeks to connect with new and old partners as the challenges faced by the region, such as sea level rise and population growth, grow in scale and complexity. The ideas generated during the 2017 Albemarle-Pamlico Ecosystem Symposium will help inform the focus of APNEPs future work and provide new directions for its partnerships.

We would like to thank our symposium speakers for sharing their expertise today, as well as thanking attendees for contributing to our discussion of these important issues. We hope you will join us in keeping our "Eyes on the Horizon" as we continue to work together to implement actions in the APNEP Comprehensive Conservation and Management Plan to protect and restore our region!

Dr. William Crowell, Jr.
Director
Albemarle-Pamlico National Estuary Partnership

Dr. Kirk Havens
Chair, APNEP Policy Board
Asst. Director, Center for Coastal Resources Management
Director, Coastal Watersheds Program
Virginia Institute of Marine Science

Symposium Overview

8:00 - 9:00 — **Registration, Coffee, & Poster Set-up** Room 1A - 1B

9:00 - 9:30 — **Welcome & Opening Plenary** Room 1A - 1B

Dr. Bill Crowell *Director, Albemarle-Pamlico National Estuary Partnership*

Dr. Kirk Havens *Policy Board Chair, Albemarle-Pamlico National Estuary Parrtnership*

Concurrent Sessions I

9:35 - 10:35

The Value of the Albemarle-Pamlico Region Room 3	Fish Habitats Room 4	
9:35 **Economic Valuation of the Albemarle-Pamlico Watershed's Natural Resources,** *Dr. George Van Houtven*	9:35 **Quality, Quantity, and Availability: Important Factors for Anadromous Fish Habitat Within Internal Waters of the Albemarle-Pamlico Region,** *Jerry McCargo*	
9:50 **Ecosystem Services Guidance, Models, and Prioritization,** *Dr. Lydia Olander*	9:50 **Influence of Riparian Zone Land Cover on Blueback Herring Catch Within the Albemarle Sound Watershed,** *Steven Lombardo*	**Posters/Exhibits** Room 1A - 1B
10:05 **Communicating Economic Data - How to Tell the Story of a Number,** *Dr. Jane Harrison*	10:05 **Sharks in the Sound: Coastal Shark Habitat and Ecology Within the Pamlico Sound Estuarine System,** *Dr. Charles Bangley*	
10:20 **Regional Branding: Balancing Nature & Commerce,** *Cathy Davison*	10:20 **North Carolina Coastal Habitat Protection Plan Update,** *Jimmy Johnson*	

10:40 - 11:00 — **Break** *Posters/Exhibits* Room 1A - 1B

Concurrent Sessions II

11:00 - 12:00

Education & Stewardship Room 3	Submerged Aquatic Vegetation (SAV) Room 4	Ecological Flows Room 1A - 1B
11:00 **ExPLORE NC: Take Learning Outside Through Place-BasedWatershed Education,** *Sarah Yelton*	11:00 **SAV Management in North Carolina: Striving to Make a Hidden Habitat More Visible,** *Anne Deaton & Dr. Kenneth Riley*	11:00 **A Framework for Coastal Ecological Flows,** *Dr. Robert Christian*
11:15 **Shad in the Classroom: A Memorable Experience,** *Danielle Pender*	11:15 **Oyster Culture and Seagrass Habitat: An Experimental Impact Approach in Pamlico Sound,** *Dr. Jim Morley*	11:15 **Water Resources Data for Evaluating Coastal Plain Ecological Flows in the Albermarle-Pamlico Basin,** *Dr. Mike O'Driscoll*
11:30 **North Carolina Recreational Water Quality Program Overview,** *Erin Bryan-Millush*	11:30 **SAV Mapping and Change Detection Activities in North Carolina,** *Dr. Don Fields & Marygrace Rowe*	11:30 **Integrated Modeling and Analysis for In-stream Beneficial Uses in Virginia,** *Robert Burgholzer*
11:45 **Adult Training & Stewardship at the North Carolina Coastal Reserve,** *Rebecca Ellin*	11:45 **The Underappreciated but Important Role of Seagrasses in Preserving the Intergrity of Barrier Islands and the Albemarle-Pamlico Estuarine System,** *Dr. Jud Kenworthy*	11:45 **Novel Methods for Understanding Surface Water Dynamics in North Carolina and Around the World,** *Dr. Tamlin Pavelsky*

Lunch Room 2C

12:00 - 1:20 — **Memorandum of Understanding Signing Ceremony**

Dr. Bill Crowell *Director, Albemarle-Pamlico National Estuary Partnership*

Dr. Kirk Havens *Policy Board Chair, Albemarle-Pamlico National Estuary Partnership*

Russell Baxter *Deputy Secretary, Virginia Office of the Governor*

D. Reid Wilson *Chief Deputy Secretary, North Carolina Department of Natural and Cultural Resources*

Michael S. Regan *Secretary, North Carolina Department of Environmental Quality*

Concurrent Sessions III

1:25 - 2:25

Watershed Planning & Partnerships Room 3	Innovative Conservation Strategies Room 4	Addressing Local Water Quality Issues Room 1A - 1B
1:25 **North Carolina Watershed Stewardship Network: Bringing Partners Together to Share Successes & Build Capacity,** *Christy Perrin*	1:25 **The North Carolina Wildlife Resources Commission's Green Growth Toolbox and Program Outcomes,** *Kacy Cook*	1:25 **Low Impact Development,** *Hunter Freeman*
1:40 **Bringing Partners & Science Together for Watershed Restoration at Lake Mattamuskeet,** *Dr. Michelle Moorman*	1:40 **North Carolina Oyster Blueprint - A Vision for 2020,** *Erin Fleckenstein*	1:40 **North Carolina Community College Campus Stormwater Project,** *Matt Butler*
1:55 **Engaging the Community and Local Partners to Improve Water Quality in a Nutrient-Sensitive Watershed,** *Dr. Charlie Humphrey*	1:55 **North Carolina Sentinel Landscapes Partnership,** *Dr. Mary Lou Addor*	1:55 **North Carolina Stormwater Design Manual,** *Annette Lucas*
2:10 **Basinwide Water Resource Planning in the Chowan & Pasquotank Rivers,** *Jamie McNees*	2:10 **Developing a Watershed-based Ecological Health Conservation Plan for the Chowan Basin,** *Todd Janeski*	2:10 **Stormwater Reduction Strategies for Coastal Communities,** *Lauren Kolodij*

Panel Discussion Room 1A - 1B

2:30 - 3:30

Eyes on the Horizon: Utilizing Partnerships to Address Regional & Community Issues

Incorporating Environmental Policy into Local Planning, *Holly White*
University-Community Partnerships for Community Resilience, *Dr. Michelle Covi*
Linking Communities to the Estuary, *Jackie Woolard*
Ecotourism & Economic Development on the Roanoke, *Carol Shields*
Community Action: Protecting Water Quality & Waterways, *Anne Marie Knighton*
Engaging Underserved Communities, *Mikki Sager*
Community Infrastructure Needs, *Mayor Brian Roth*

3:30 - 3:45 **Break - Posters/Exhibits** Room 1A - 1B

Concurrent Sessions IV

3:45 - 4:45

Emerging Collaborations Room 3	Re-emerging Issues Room 4	Emerging Tools & Technologies Room 1A - 1B
3:45 **Salinization, Adaptive Capacity Building for Land Use & Tourism Development (SALT),** *Matthew Jurjonas*	3:45 **Nutrient Management in the Neuse and Tar-Pamlico Watersheds,** *Rich Gannon*	3:45 **Bring a Regional Perspective to Your Local Work with the South Atlantic Conservation Blueprint,** *Hilary Morris*
4:00 **New Initiatives in the North-Northeast North Carolina Coast for Establishing an "Observatory" for Albemarle, Currituck, and Pamlico Sounds,** *Dr. Robert George*	4:00 **Assessing Potential Threats and Provide a Framework for Better Management of Emerging Environmental Contaminants in Coastal North Carolina,** *Dr. Sid Mitra*	4:00 **A New Look to North Carolina DEQ GIS,** *Melanie Williams*
4:15 **North Carolina Sentinel Site Cooperative: Creating a Network of Partners,** *Sarah Spiegler*	4:15 **Introduction to the North Carolina Aquatic Nuisance Species Management Plan,** *Rob Emens*	4:15 **The Living Shoelines Application: A Tool for Planning and Siting Living Shorelines,** *Lora Eddy*
4:30 **North Carolina Aquatic Data Hub: Connecting Aquatic Monitoring in the State,** *Alex McMahon*	4:30 **Nutrient Criteria Development for Albemarle Sound: Progress and Prognostications,** *Jim Hawhee*	4:30 **Resilience Efforts in Eastern North Carolina: The RENA Project,** *Monica Gregory*

Closing Plenary Room 1A - 1B

4:50 - 5:15

Dr. Bill Crowell *Director, Albemarle-Pamlico National Estuary Partnership*
Dr. Kirk Havens *Policy Board Chair, Albemarle-Pamlico National Estuary Parrtnership*

Track 1 - Human Communities
Track 2 - Natural Systems
Track 3 - Water Quality & Quantity
Track 4 - Eyes on the Horizon

AGENDA

8:00-9:00 **Registration, Coffee, & Poster Set-up**
Room 1A-1B

9:00-9:30 **Welcome and Opening Plenary**
Room 1A-1B Dr. Bill Crowell *Director, Albemarle-Pamlico National Estuary Partnership*
Dr. Kirk Havens *Policy Board Chair, Albemarle-Pamlico National Estuary Partnership*

CONCURRENT SESSIONS I

THE VALUE OF THE ALBEMARLE-PAMLICO REGION

9:35 **Economic Valuation of the Albemarle-Pamlico Watershed's Natural Resources**
Room 3 Dr. George Van Houtven, *RTI International*

The Albemarle-Pamlico (A-P) watershed contains a rich and diverse stock of natural resources that are essential for the well-being of the region's residents and economy, and that also provide benefits that are valued outside of the watershed. The purpose of this study is to conduct an economic valuation analysis of these resources, focusing on two main questions: (1) what are the main ways in which the human populations in and around the watershed depend on and benefit from the watershed's land and water resources and related ecosystems and (2) how can the benefits they derive each year from their connections to these natural assets and systems be measured and expressed in dollar terms? Using evidence from existing data and studies, the analysis estimates annual values for natural resource inputs to commercial agricultural and timber production, for water-based recreation in the watershed, for aesthetic and natural amenities provided to nearshore residents, for habitat provided to nongame wildlife species, for climate regulation through natural storage and sequestration of carbon, and for the air pollution removal benefits provided by tree cover in the watershed. In addition, it examines the economic contribution of natural resources in the watershed through employment and wages.

9:50 **Ecosystem Services Guidance, Models, and Prioritization**
Room 3 Dr. Lydia Olander, *Nicholas Institute and National Ecosystem Services Partnership, Duke University*

In 2009 I was asked to take lead on a nascent idea - the creation of a National Ecosystem Services Partnership that would help advance collaboration, coordination, and credibility for ecosystem services in the United States. Since that time I have worked closely with federal agencies and others in the United States on turning the methods and knowledge of the academic community into guidance and resources to support federal implementation. This has led to more recent work on how to implement ecosystem services' conceptual and predictive models, and how to use landscape data to map, account for, and prioritize ecosystem services spatially to support inclusion of ecosystem services in decision making. I will present a broad overview of these different efforts, some of which I hope will be relevant and of value to the work of the Albemarle-Pamlico National Estuary Partnership.

10:05 **Communicating Economic Data – How to Tell the Story of a Number**
Room 3 Dr. Jane Harrison, *NC Sea Grant*

Even when you have the numbers, it can be challenging to effectively communicate the relationship between economic data and environmental management. Several examples of how economic data is communicated by environmental organizations will be presented, with the intent to understand how the information was developed and its effectiveness in reaching a given target audience. Examples will be pulled from federal agencies like NOAA, state organizations like North Carolina Sea Grant, and collaborative groups like the North Carolina mariculture legislative group, which is comprised of researchers, industry, government, and nonprofit organizations.

10:20 *Room 3*

Regional Branding: Balancing Nature & Commerce

Cathy Davison, *Albemarle Commission*

A showcase of a 13-county initiative in Northeastern North Carolina where local and regional leaders came together along with their federal and state stakeholders to identify their natural assets and develop a plan that could sustain and promote long-term economic resilience. The 13 counties include: Camden, Chowan, Currituck, Dare, Gates, Hyde, Pasquotank, Perquimans, Tyrrell, Washington along with Bertie, Halifax and Northampton. One of the primary goals of the initiative is to promote the strengths that distinguish the Northeastern North Carolina Region from other regions, such as its great climate, picturesque scenery, connected waterways, historic heritage, and rich ecosystems.

FISH HABITATS

9:35 *Room 4*

Quality, Quantity, and Availability: Important Factors for Anadromous Fish Habitat Within Internal Waters of the Albemarle-Pamlico Region

Jeremy McCargo, *NC Wildlife Resources Commission*

Anadromous fish species including Striped Bass, American Shad, Hickory Shad, Alewife, and Blueback Herring historically supported thriving commercial and recreational fisheries in North Carolina, and they provided important ecological functions within the Albemarle-Pamlico estuarine system. Many populations of these migratory species are currently at or near historically low levels, owing their declines to a combination of overfishing, habitat fragmentation, and poor water quality. The NC Division of Marine Fisheries and the NC Wildlife Resources Commission designate anadromous fish spawning areas to provide protection for important spawning habitat within internal waters of the state. In addition, state and federal resource agencies, as well as non-governmental organizations are working to improve the quantity and availability of spawning habitat by alleviating migration barriers and providing access to historical spawning areas. Habitat protection and restoration are critical for improving anadromous fish populations to levels that can again support viable fisheries and functioning ecosystem processes.

9:50 *Room 4*

Influence of Riparian Zone Land Cover on Blueback Herring Catch Within the Albemarle Sound Watershed

Steven Lombardo, *NC State University – Center for Marine Sciences and Technology*

Blueback herring (*Alosa aestivalis*) are economically, ecologically, and culturally important fishes that are at low levels of abundance. Low population sizes are thought to be due to a combination of overfishing and habitat loss. The potential for disturbances within riparian zones to impede or eliminate access to spawning habitat has been discussed extensively in the literature. However, tests of habitat impediment hypotheses using long-term datasets are rare. Using a principal components analysis (PCA) and generalized additive model (GAM), we analyzed spawning habitat survey data collected by the NC Division of Marine Fisheries to explore how riparian zone land cover has influenced spawning habitat use from 2007 to 2016. Overall, the Albemarle Sound watershed's riparian zones are dominated by wetland habitats that are typically suitable for spawning activity. Blueback herring catch was variably influenced by land cover and consistently influenced by water quality metrics such as surface temperature, DO, pH. In five of 13 drainages, agriculture and silviculture were negatively related to blueback herring catch, with eight showing no relation. Urbanization negatively related to catches in two drainages, eight showed no relationship, and three showed a positive relation to development.

10:05 *Room 4*

Sharks in the Sound: Coastal Shark Habitat and Ecology within the Pamlico Sound Estuarine System

Dr. Charles Bangley, *Smithsonian Environmental Research Center*

Sharks are often thought of as inhabitants of the open ocean, but many species make use of and depend on estuaries as foraging and nursery habitats. Pamlico Sound, the largest lagoonal estuary in the continental United States, is a unique system offering a variety of potential habitat conditions for coastal sharks. Many of these species are non-target catches in fishery-independent surveys conducted within by the North Carolina Division of Marine Fisheries (NCDMF). By using boosted regression tree modeling of shark catch data from NCDMF gillnet and longline surveys, we identified areas of increased capture probability within Pamlico Sound associated with particular environmental ranges and habitat types for six principal shark species: Atlantic Sharpnose Sharks, Blacktip Sharks, Bull Sharks, Sandbar Sharks, Smooth Dogfish, and Spiny Dogfish. High capture likelihood for most species was associated with proximity to inlets, and temperature influenced seasonal changes in the shark assemblage. Areas within Pamlico Sound may function as primary nursery habitats for Atlantic Sharpnose Sharks, Bull Sharks, and Smooth Dogfish. Coastal sharks likely occupy the highest levels of the Pamlico Sound food web and may influence the population dynamics and habitat use patterns of other species.

10:20 **North Carolina Coastal Habitat Protection Plan Update**
Room 4 Jimmy Johnson, *Albemarle-Pamlico National Estuary Partnership*

The most recent version of NC's Coastal Habitat Protection Plan (CHPP) was updated and adopted by the Environmental Management Commission, the Coastal Resources Commission and the Marine Fisheries Commission in late 2015 and went into effect in 2016. It identified four priority areas that are to be the focus of implementation over the next five years. The priority areas are: Restoring oyster reef habitat; Encouraging use of living shorelines; Reducing sedimentation impacts in estuarine creeks; and Developing metrics on habitat trends and management effectiveness. The CHPP focuses on six basic fish habitats: water column, shell bottom, submerged aquatic vegetation, wetlands, soft bottom, and hard bottom. The CHPP also identifies four primary goals which help to focus available resources on habitat protection. The four goals are: Improve effectiveness of existing rules and programs protecting coastal fish habitats; Identify, designate and protect strategic habitat areas; Enhance habitat and protect it from physical impacts; and Enhance and protect water quality. These goals are each broken down into recommendations with each recommendation having a series of action items associated with it. These action items are the key component to the two year CHPP Implementation Plans.

10:40-11:00 **Break – Exhibits & Posters**
Room 1A-1B

CONCURRENT SESSIONS II

EDUCATION & STEWARDSHIP

11:00 **ExPLORE NC: Take Learning Outside Through Place-Based Watershed Education**
Room 3 Sarah Yelton, *University of North Carolina at Chapel Hill – Institute for the Environment*

Protecting waterways, ecosystems and habitats for future generations is key to preserving our quality of life and requires that people feel a personal connection to the natural environment. Studies have shown that young people are more likely to take action to improve environmental quality when they participate in place-based conservation education. Further, spending time in the outdoors with a trusted adult, such as a teacher, is a major influence on environmental stewardship behavior in later years. However, a 2016 statewide survey of elementary teachers in North Carolina revealed that in one primarily rural and under-resourced watershed of the state, almost 70% of respondents rarely or never take their students outside. Teacher respondents identified a number of barriers to using outdoor learning environments in their standards-based curriculum, including a lack of confidence in using the outdoors to teach and the perception that curriculum requirements limit opportunities to take students outdoors. To address these barriers and better prepare teachers to incorporate outdoor experiences into their instruction, the University of North Carolina-Chapel Hill's Environmental Resource Program, with funding provided by the Albemarle-Pamlico National Estuary Partnership and the Eddie and Jo Allison Smith Family Foundation, developed a place-based, intensive professional development program for fourth and fifth grade teachers. ExPLORE NC (Experiencing Place-based Learning Outdoors in Rivers and Ecosystems of North Carolina) is a year-long fellowship program that incorporates outdoor science immersion experiences in the local watershed, along with tailored lessons that integrate content areas and align with required curriculum objectives, to boost teacher confidence in using the outdoors and local natural resources for instruction. Evaluation data from a recently completed pilot program reveal that the program is successful in increasing participating teachers': (a) knowledge of local ecosystems and watershed science; (b) confidence in using the outdoors to teach required curriculum objectives; and (c) awareness of resources available through regional environmental education partners.

11:15 **Shad in the Classroom: A Memorable Experience**
Room 3 Danielle Pender, *NC Museum of Natural Sciences*

Through the Shad in the Classroom program, 5th grade – high school students get a hands-on and real-life connection with learning about their environment while addressing the importance of American Shad restoration, the species cultural and biological importance, its ecological connections to other species and habitats, and the significance of genetic integrity. We present a brief history of the program, curricular and educational aspects, and what characteristics make the program successful. The program is a successful cooperative endeavor between the NC Museum of Natural Sciences and its cooperators, Albemarle-Pamlico National Estuary Partnership, the NC Wildlife Resources Commission, the U.S. Fish and Wildlife Service, and NC State University.

11:30 **North Carolina Recreational Water Quality Program Overview**
Room 3 Erin Bryan-Millush, *NC Division of Marine Fisheries*

North Carolina's Recreational Water Quality Program monitors 204 sites along ocean beaches, sounds, and coastal rivers. The program was established in 1997 following negative publicity from Pfiesteria and overflowing hog logons into coastal waters. The federal Beaches Environmental Assessment and Coastal Health (BEACH) Act soon followed, which mandates the monitoring of coastal recreational waters and the prompt notification to the public when water quality does not meet swimming standards. The NC Recreational Water Quality Program is designated as the State's lead agency for the implementation of the BEACH Act. The Recreational Water Quality Program has developed a comprehensive monitoring and notification program. The objective of the program is to increase public awareness and to provide water quality information to help the public make informed decisions concerning their recreational use of North Carolina's coastal waters.

11:45 **Adult Training & Stewardship at the North Carolina Coastal Reserve**
Room 3 Rebecca Ellin, *NC Coastal Reserve*

The NC Coastal Reserve & National Estuarine Research Reserve (Reserve), part of the NC Division of Coastal Management, protects and manages over 42,000 acres of representative coastal and estuarine habitat at ten sites for research and education purposes. The Reserve engages adult audiences to increase the understanding of coastal and estuarine ecosystems, their importance, and the effects humans have on them. Fostering stewardship of these habitats is one of the Reserve's primary goals and is accomplished by involving adults in species monitoring, site stewardship, and outdoor educational experiences. Additionally, the Reserve has a robust training program that provides coastal professionals with science-based training to inform decisions regarding coastal resources. The Coastal Training Program focuses on sustainable development, water quality protection, and coastal and estuarine ecosystem protection. This presentation will highlight activities conducted by the Reserve to improve local decision-making, create environmental stewards, and help the Reserve manage its sites located along the coast. Through partnerships with the Albemarle-Pamlico National Estuary Partnership and other organizations, the Reserve enhances education and stewardship efforts in the region.

Human Communities

SUBMERGED AQUATIC VEGETATION (SAV)

11:00 **SAV Management in North Carolina: Striving to Make a Hidden Habitat More Visible**
Room 4 Anne Deaton, *NC Division of Marine Fisheries*
Dr. Kenneth Riley, *National Marine Fisheries Service*

SAV has long been recognized by the scientific community as a critical fish habitat for a large diversity of fish and invertebrates. Management of this habitat has improved over the years as scientists and resource managers have learned more about SAV. Development of monitoring protocols, management policies, rules, and outreach materials has strengthened agency and public awareness of where SAV is, its ecological role in fish habitat, and how different land and water based activities affect it. The NC Fisheries Reform Act, U.S. Magnuson-Stevens Act, and coastal habitat and conservation plans have played a key role in improving management of SAV and increasing its visibility. The Fisheries Reform Act mandated development of the Coastal Habitat Protection Plan (CHPP) to provide a framework for protecting and restoring coastal fish habitat. The Magnuson-Stevens Act established Essential Fish Habitat designations for federally managed species. Both the CHPP and the APNEP Comprehensive Conservation and Management Plan (CCMP) provide specific recommendations and actions to map and assess SAV, protect existing habitat, and restore where needed.

11:15 **Oyster Culture and Seagrass Habitat: An Experimental Impact Approach in Pamlico Sound**
Room 4 Dr. Jim Morley, *University of North Carolina at Chapel Hill – Institute of Marine Sciences*

The growth of the oyster aquaculture industry in North Carolina has lagged behind other U.S. states, but appears to be poised for expansion. Current policy prevents new bottom leases from being established where submerged aquatic vegetation (SAV) occurs, but this policy is under scrutiny. We are conducting an experiment to quantify the tradeoffs that are associated with allowing oyster leases to overlap with SAV habitats. Using a Before-After-Control-Impact (BACI) design we established fifteen 72 m^2 plots in eastern Pamlico Sound and during 2016 we comprehensively sampled these plots for density and species composition of fish and shellfish, and also SAV cover. During 2017, ten of these plots were established as oyster culture leases using either floating bags or submerged enclosures. Sampling in 2017 revealed that species richness was greater on oyster culture plots than on control plots. For example, gag grouper and sheepshead were common on plots with submerged enclosures but were absent in control plots. While the impact phase of this experiment is not complete, these initial results suggest that establishing oyster leases within SAV habitats may not result in a net loss of ecosystem services.

Natural Systems

11:30 *Room 4*

SAV Mapping and Change Detection Activities in North Carolina

Dr. Don Field, *National Oceanic and Atmospheric Administration*
Marygrace Rowe, *Albemarle-Pamlico National Estuary Partnership*

Since 2001, APNEP has supported a collaboration among partners that aims to promote the conservation of SAV along the entire coast of North Carolina and southeastern Virginia. This partnership has been meeting regularly since 2004 and was formalized through a Memorandum of Agreement in 2006. The partnership funded and conducted the first mapping of the entire NC SAV resource with aerial imagery from 2006-2008. With the baseline established, the second complete mapping of the NC SAV resource was conducted with aerial imagery acquired from 2012-2014. This talk briefly discusses the techniques used in these mapping efforts and the use of these data to examine areas of potential change in SAV resources.

Natural Systems

11:45 *Room 4*

The Underappreciated but Important Role of Seagrasses in Preserving the Integrity of Barrier Islands and the Albemarle-Pamlico Estuarine System

Dr. Jud Kenworthy, *National Oceanic and Atmospheric Administration (ret.)*

APNEP's productive shallow water estuarine ecosystem, including well over 130,000 acres of submerged aquatic vegetation (SAV), would not exist as we know it today if not for the physical protection provided by a narrow chain of barrier islands which insulate the estuary from the enormous amount of wave and current energy in the adjacent coastal ocean. At the same time, numerous permanent and ephemeral tidal inlets allow for the regular mixing of freshwater with seawater such that the shallow back barrier shelves located just west of the islands have relatively short water residence times and environmental quality ideally suited for the growth and widespread distribution of seagrasses. And though it would seem obvious that the mere existence of seagrasses on the back barrier shelves is largely dependent on the islands, it can also be reasoned that seagrasses play a critical role in the long-term survival of the barrier island system. Trapping, accumulating and stabilizing sediments are some of the most well documented and important physical services that seagrasses provide in coastal ecosystems. Given that the back barrier shelves are the primary underlying foundation over which the islands are moving during their westward migration, seagrasses are playing a critical "ecological engineering" function securing this foundation and maintaining its vertical elevation. Under normal circumstances it seems quite reasonable to argue that the conservation of these back barrier shelf seagrass communities is contributing directly to preservation of the islands and, more importantly, the integrity of the entire APNEP ecosystem, given how much it would change if the islands disintegrated. Considering the forecast of rising sea level and recognizing the many human interventions that minimize island overwash and starve the shelves of a vital source of sediments, the role of seagrasses in preserving the barrier island system is likely to be even more important in the future.

Water Quality & Quantity

ECOLOGICAL FLOWS

11:00 *Room 1A-1B*

A Framework for Coastal Ecological Flows

Dr. Robert Christian, *East Carolina University*

The APNEP Comprehensive Conservation and Management Plan (CCMP) includes actions to "develop and refine ecological flow requirements for each major river." Briefly, ecological flows are those that are required to maintain the health of the ecosystems of rivers and associated wetlands. As human water use may alter flows, the impacts of water use on these flows and therefore ecosystems is valuable information in balancing the respective needs for water. The actions of the APNEP CCMP build on the efforts of the State's Ecological Flows Science Advisory Board that submitted its report in 2013. Much of the Board's efforts addressed piedmont and mountain streams and rivers where gaging stations can estimate flows accurately and provide the basis for flow models. However, a large fraction of North Carolina's waterways are within the low, flat lands of the coastal plain. Therefore, the Coastal Ecological Flows Working Group was formed. They developed a typology and mapped the types of coastal streams. Further, they identified four approaches to how ecological flows could be established within the coastal plain. Their framework for ecological flows within coastal waterways formed a foundation for current efforts by APNEP.

Water Quality & Quantity

11:15 *Room 1A-1B*

Water Resources Data for Evaluating Coastal Plain Ecological Flows in the Albemarle-Pamlico Basin

Dr. Mike O'Driscoll, *Duke University*

This study focused on the status of available flow and ecological flow-related data for the APNEP region. Water withdrawals may influence streamflow, particularly low flows. These flows are important components of ecological flows (the magnitude and timing of streamflow needed to maintain ecological integrity) because of their influence on contaminant dilution, saltwater intrusion, aquatic habitat, and public water supplies. We evaluated the availability of streamflow, groundwater, geomorphological, water quality, water use, regulation (dams), and point source input data in the APNEP region. These data will be utilized to help understand the magnitude and timing of streamflow needed to maintain Coastal Plain aquatic ecosystems in the APNEP basin. This talk will focus on available data, notable data gaps, and recommendations for future work that can help guide ecological flow development within the Albemarle-Pamlico basin.

11:30 *Room 1A-1B*

Integrated Modeling and Analysis for In-stream Beneficial Uses in Virginia

Robert Burgholzer, *VA Department of Environmental Quality*

Water supply permitting in Virginia has evolved over the last 20 years from simple minimum instream flow prescriptions to practices that maintain more of the natural variation in the flow regime. Due to the complex interrelationship between water quantity, quality and instream habitat comprehensive multi-disciplinary models have been developed to insure long-term sustainability of water resources and to avoid conflicts between drinking water, food and energy production, and aquatic biota. The Commonwealth of Virginia funded the expansion of the Chesapeake Bay Program Phase 5 model to cover the entire state (including rivers linking Virginia and North Carolina), and has been using this model to evaluate water supply permitting and planning since 2009. These multi-disciplinary models (water quantity, quality and timing) have been coupled with extensive biological monitoring databases allowing us to do a cumulative impacts analysis model for every surface water permit issued since 2009, and for the 30-50 year water supply projections included in the state water supply plan.

11:45 *Room 1A-1B*

Novel Methods for Understanding Surface Water Dynamics in North Carolina and Around the World

Dr. Tamlin Pavelsky, *University of North Carolina at Chapel Hill*

In North Carolina and around the world, the majority of water resources used by humans come from surface waters: rivers, lakes, and wetlands. At the same time, natural disasters associated with surface water, especially floods, are among the most destructive hazards around the globe. Despite large-scale investment in surface water infrastructure via governmental and nongovernmental organizations, there is a tremendous amount that remains unknown about its quantity and quality. For example, water levels in most of the Carolina Bays, natural lakes in Eastern North Carolina and surrounding states, remain completely unmonitored. In this talk, we will explore novel methods that can be used to understand surface water resources and hazards, including citizen science, satellite and airborne remote sensing, and the combination of the two approaches. For example, the upcoming Surface Water and Ocean Topography (SWOT) satellite mission will provide us with an unprecedented view of rivers and lakes around the world. We will use North Carolina as a case study but will explore the global implications of these innovative measurement techniques.

12:00-1:20 *Room 2C*

LUNCH

Memorandum of Understanding Signing Ceremony, with remarks by

Dr. Bill Crowell *Director, Albemarle-Pamlico National Estuary Partnership*
Dr. Kirk Havens *Policy Board Chair, Albemarle-Pamlico National Estuary Partnership*
Russell Baxter *Deputy Secretary, Virginia Office of the Governor*
D. Reid Wilson *Chief Deputy Secretary, North Carolina Department of Natural Resources*
Michael S. Regan *Secretary, North Carolina Department of Environmental Quality*

CONCURRENT SESSIONS III

WATERSHED PLANNING AND PARTNERSHIPS

1:25 *Room 3*

North Carolina Watershed Stewardship Network: Bringing Partners Together to Share Successes & Build Capacity,

Christy Perrin, *Water Resources Research Institute*

The NC Watershed Stewardship Network is a broad and rapidly growing collaborative partnership of people from across NC. Our strength comes from our members and the valuable knowledge and experiences they bring to the network. We seek to empower more effective water stewardship because water is critical to economic, environmental, and community health. We believe watershed protection and restoration efforts can benefit (and will multiply!) if watershed professionals and volunteers on the ground have meaningful opportunities to effectively communicate, collaborate or share data. The Steering Committee and work groups of NCWSN are creating these online and in-person opportunities across North Carolina, including the coastal counties. NCWSN offered watershed planning workshops in 2015-2016, and most recently have been offering a series "Sustainably funding your watershed efforts" workshops. Learn about NCWSN events and opportunities to get more people working together for greater success protecting our waters all across North Carolina. Find workshop information at ncwatershednetwork.org/sustainably-funding-your-watershed-efforts

1:40 *Room 3*

Bringing Partners & Science Together for Watershed Restoration at Lake Mattamuskeet

Dr. Michelle Moorman, *U.S. Fish & Wildlife Service*

Lake Mattamuskeet is the centerpiece of Mattamuskeet National Wildlife Refuge, established to maintain and promote habitats for migratory birds, specifically wintering waterfowl. The lake recently experienced a reduction in water clarity and macrophyte beds and increase in phytoplankton, harmful algal blooms, and cyanotoxin production. To facilitate restoration, we focused problem formulation on SAV survival and recruitment. Because of SAV's importance to management goals and ecological relevance as a foundation of the aquatic food web, this one assessment endpoint both galvanized stakeholder support and simplified risk assessment. We adopted a conceptual model of SAV stressors to provide a visual representation of potential limiting factors. We gathered and expanded upon existing datasets to document significantly increasing trends in nitrogen, phosphorus, turbidity, suspended sediments, chlorophyll a, pH, and decreasing SAV coverage between the early 1980s and 2015. Through comparison to established benchmarks, we also documented that current water quality conditions (2012-2015) are not conducive to SAV survival and recovery and, in some cases, do not meet North Carolina water quality standards for the protection of aquatic life. This information has led stakeholders to partner and support the development of a nine-element plan to restore SAV in Lake Mattamuskeet. Moving forward, SAV continues to serve as our indicator species for lake health in guiding monitoring, research, and management efforts now focused on the restoration of SAV. Although the biology and ecology of shallow lakes is complex, we observed that problem formulation, conceptual model development, and assessment and measurement endpoint selection focused solely on SAV provided the management value and scientific rigor to effectively move stakeholders from large uncertainties to cooperative restoration.

1:55 *Room 3*

Engaging the Community and Local Partners to Improve Water Quality in a Nutrient-Sensitive Watershed

Dr. Charlie Humphrey, *East Carolina University*

Researchers from East Carolina University (ECU) partnered with Durham County Public Health, the NC Department of Health and Human Services, septic contractors, and property owners to improve water quality in the Lick Creek Watershed by improving the performance of septic systems. Suspicious discharges from septic systems were identified in the watershed restoration plan for Lick Creek as a potentially significant source of nutrients and fecal bacteria. ECU was awarded grant funding from the NC DEQ 319 Program to improve septic system performance by installing replacement septic system components, pumping septic tanks, and modifying drainageways to enhance pollutant removal. Contact was made with watershed residents via mail and phone regarding the project. Walking surveys and stream sampling were conducted to identify properties where septic system improvements may be needed and to solicit project volunteers. During this project, 37 septic tanks were pumped, three malfunctioning septic systems were repaired/replaced, and a drainageway bioreactor was installed. Efforts to engage residents in the watershed, implement best management practices and quantify pollutant transport reductions continue.

2:10 **Basinwide Water Resource Planning in the Chowan & Pasquotank Rivers**
Room 3 Jamie McNees, *NC Division of Water Resources*

Basinwide water quality management plans are a non-regulatory, watershed-based approach to addressing water quality and quantity issues in North Carolina's waters. The plans evaluate point and nonpoint sources of pollution using biological and ambient water quality data as well as computer modeling and analysis. The NC Division of Water Resources prepares basinwide water resource plans for each of the 17 major river basins in the state. For implementation, the basinwide planning program relies on coordinated efforts of many state and local agencies to implement water quality improvement practices. Specific river basins to be discussed are the Chowan and Pasquotank and their relevant water quality.

INNOVATIVE CONSERVATION STRATEGIES

1:25 **The North Carolina Wildlife Resources Commission's Green Growth Toolbox and Program Outcomes**
Room 4
Kacy Cook, *NC Wildlife Resources Commission*

Centralized development patterns that conserve, buffer, and connect priority wildlife habitats are essential for biodiversity conservation. Access to biodiversity conservation data, information, and planning methods were identified as a primary need by local government and transportation planners in NC to reduce development impacts (Miller et al. 2009). In response, the NC Wildlife Resources Commission (NCWRC) created the Green Growth Toolbox (GGT). The GGT provides biodiversity conservation data, information, recommendations and maps to local government planners and communities through training workshops, online resources, and technical assistance from NCWRC and our conservation partner organizations. We are beginning to assess program effectiveness. We analyzed workshop evaluations, an online survey, interviews with planners and use anecdotal observations to gauge preliminary outcomes. An important barrier to implementation was the need to inform the public, planning board members and elected officials of the need for conservation-based development and its benefits. We have provided technical assistance to over 33 communities mostly in priority conservation areas. Local governments have adopted or drafted 50 plans, incentives, and ordinances that would enhance habitat conservation. The GGT would likely be an effective tool to protect the conservation investments of conservation efforts such as the Albemarle – Pamlico Estuary Program's Comprehensive Conservation and Management Plan.

1:40 **North Carolina Oyster Blueprint – A Vision for 2020**
Room 4 Erin Fleckenstein, *NC Coastal Federation*

Since 2003 the North Carolina Oyster Restoration and Protection Plan: a Blueprint for Action (or *Blueprint*) has helped to provide a framework guiding oyster restoration, protection, management, enhancement and mariculture efforts in the state. Implementation of the plan is led by an interdisciplinary, cross agency stakeholder team called the Oyster Steering Committee that is coordinated by the NC Coastal Federation. This presentation will provide an overview of the vision and goals guiding the most recent edition of the *Blueprint* that will be realized by 2020. It will also highlight recent accomplishments and actions that have stemmed from the implementation of the plan including efforts to build habitat for oysters by placing suitable substrate in strategic locations throughout our coastal waterbodies as oyster sanctuaries, patch reefs and cultch planted areas. These areas serve to create reserves of oysters that help populate coastal waters with oyster spat, provide reef habitat for commercially and recreationally important fisheries, and allow for sustainable harvest efforts to expand the oyster mariculture industry as a green industry along the coast. This industry has great potential in the state to create economic opportunities along the coast while simultaneously increasing people's investment in maintaining and protecting coastal water quality.

1:55 **North Carolina Sentinel Landscapes Partnership**
Room 4 Dr. Mary Lou Addor, *NC State University*

The North Carolina Sentinel Landscape Partnership (NCSLP) is an innovative partnership that demonstrates how collaboration and coordination among private landowners, conservationists, military installations, and others can provide mutual benefits to safeguard the state's two largest economic sectors – agriculture (farming and forestry) and defense -- while conserving and protecting the state's natural resources. What leads to the success of a partnership like this? In part, viable projects and ongoing communication. Strategic implementation of multiple projects has promoted ongoing military readiness and training capacity, while also sustaining the viability of working lands and conserving natural resources. An outlined military mission footprint, allows the partners to effectively leverage resources in high priority areas resulting in optimal impact and demonstrating how a multi-faceted approach can link discrete agencies and organizations to produce mutual benefits at a larger, landscape scale. The program simultaneously advances working lands, natural resource conser-

vation and military readiness, while fostering the long-term sustainability of ecosystem services (i.e. clean air, clean water, and productive soils). From a broader perspective, the partnership provides an organizational framework for confronting landscape-scale complexities such as population growth, incompatible economic development, military readiness, and natural resource management -- issues that will continue to challenge North Carolina and other states across the United States.

2:10 **Developing a Watershed-based Ecological Health Conservation Plan for the Chowan Basin**
Room 4 Todd Janeski, *VA Dept. of Conservation and Recreation/Virginia Commonwealth University*

An overview will be provided of the Virginia Healthy Waters Program, the aquatic integrity assessment of the Chowan Basin, the newly adopted *Criteria for Ecologically Healthy Watershed Conservation* and the conservation plan for the Raccoon Creek watershed. Specific focus will be on the development of the Criteria as it compares to restoration criteria to meet water quality standards and the application of that process to protection actions in a subwatershed of the Chowan Basin.

ADDRESSING LOCAL WATER QUALITY ISSUES

1:25 **Low Impact Development**
Room 1A-1B Hunter Freeman, *WithersRavenel*

Hunter Freeman will discuss how low impact development (LID) practices have been used in new development and retrofit projects to improve water quality and reduce downstream runoff volumes. Hunter has been involved with projects from Manteo to Ocean Isle over the past 10 years and has seen firsthand the community, location, and funding challenges of implementing projects. In addition to a wealth of experience in and around Raleigh, his projects line the coast from Manteo to Ocean Isle.

1:40 **North Carolina Community College Campus Stormwater Project**
Room 1A-1B Matt Butler, *Sound Rivers Inc.*

A good stormwater system can slow down water coming off paved surfaces, meaning it can reduce flooding and minimize erosion of streambanks. It can also filter some of the pollutants coming off parking lots, such as oil from leaky engines. Sound Rivers' (SR) has received funding for stormwater impact and needs assessments on several school campuses within the Neuse and Tar-Pamlico River Basins. Stormwater infrastructure can take different forms. Rain gardens, bio-retention cells, and stormwater wetlands can not only clean and slow water; they can also serve as wildlife habitats and beautify campuses. Former projects partnered SR with Edgecombe Community College and East Carolina University to build rain gardens and construct wetlands. Students at those schools can now incorporate the green infrastructure into their coursework as an outdoor classroom. During this comprehensive study, stormwater Best Management Practices (BMP's) will be recommended for each campus, as well as reports that outline areas of concern and needs, educational materials, and suggested outdoor classroom lesson plans. The result will help make local rivers fishable, swimmable, and drinkable.

1:55 **North Carolina Stormwater Design Manual**
Room 1A-1B Annette Lucas, *NC Division of Energy, Mineral, and Land Resources*

This year, the NC State Stormwater Program updated its design standards for stormwater control measures. Designers now have much more flexibility to treat stormwater in a more cost-effective manner than can enhance developments. Ms. Lucas will share some highlights of these updates and her ideas about how these changes can be put into practice.

2:10 **Stormwater Reduction Strategies for Coastal Communities**
Room 1A-1B Lauren Kolodij, *NC Coastal Federation*

Stormwater isn't soaking into the ground the way it used to. Rooftops, driveways, parking lots and other hard surfaces now drain stormwater runoff into streets, pipes and ditches that flow into our coastal waters. The natural hydrology has been altered and the volume of polluted runoff being transported to surface waters has increased, ultimately impairing waters and causing shellfish closures and swimming advisories. Reducing the *volume* of stormwater runoff is key. Rather than focusing on reducing sources of pollutants from runoff, the North Carolina Coastal Federation and partners advocate for the reducing the overall volume of stormwater in order to limit the conveyance of pollutants from the land into coastal waters. Mimicking and restoring the natural hydrology can reduce pollutant loads. The North Carolina Coastal Federation has developed the *Watershed Restoration Planning Guidebook* to assist local governments in preparing watershed restoration

plans that include strategies for reducing the volume or runoff. An overview of the guidebook demonstrates the framework for local governments and coastal communities to develop coastal watershed restoration plans and meet the Environmental Protection Agency (EPA) Nine Minimum Elements and the NC Department of Environmental Quality (DEQ) Section 319 guidelines for developing plans.

PANEL DISCUSSION

2:30-3:30 **Eyes on the Horizon: Utilizing Partnerships to Address Regional & Community Issues**

Room 1A-1B A panel discussion on the issues, challenges, and opportunities for regional collaboration.

Since regulation of development occurs at a local level, incorporating environmental policy into long range planning is an important channel for implementing the CCMP in local communities. The CCMP contains regional policy on topics including the value of the ecosystem services of the region, developing incentives for protecting riparian buffers, wetlands, and natural shorelines, supporting Low Impact Development (LID) practices, assisting communities with stormwater retrofits, wastewater infrastructure upgrades and repairs, and incorporating resilience and adaptation strategies into local planning. APNEP and partners should pursue opportunities to work with planners and local governments to assist them in incorporating sound environmental policy into local plans. Utilizing partnerships to address regional and local issues is particularly important in small communities and rural areas of the APNEP region that do not have the resources and staff dedicated to environmental and water resource protection that larger municipalities may have.

Incorporating Environmental Policy into Local Planning

Holly White, *Town of Nags Head (APNEP Policy Board Vice-Chair)*

Communities nationwide are faced with the question of how to plan for the future in a way that preserves core community values and quality of life while increasing overall their resiliency. For communities in close proximity to the water, like Nags Head, the impacts of a changing climate and sea level rise present additional complexities. Through recent long range planning efforts, the Town of Nags Head has worked with the community and other partners to explore those questions and how the town can be proactive in adapting. In addition to key partnerships the town utilized several documents, including the APNEP Comprehensive Conservation and Management Plan (CCMP), to inform discussions and serve as a basis for policy development for multiple environmental issues. The town adopted a Comprehensive Plan in July 2017 and a report on Adaptation Planning, developed in partnership with NC Sea Grant, in August 2017. Partnerships are key in developing and implementing polices. Holly White, Principal Planner with the Town of Nags Head, and APNEP Policy Board Co-Chair, will share more about these partnerships and how policies from the CCMP were utilized as the basis for development of policy in the town's Comprehensive Plan.

University-Community Partnerships for Community Resilience

Dr. Michelle Covi, *VA Sea Grant*

Coastal Virginia faces a growing threat to life safety and quality due to increasing flooding associated with sea level rise and extreme precipitation events. Many of the already existing underlying problems of underserved communities have become more acute including transportation access, social and economic immobility and public health disparities. A new focus of effort has been resilience, defined as the ability to persist and even transform, in the face of increasing threats. To build resilience, all sectors of the community need to be engaged in the process, yet there is a gap in meeting the needs of communities, especially at the resident and neighborhood level. The University-Community Partnerships to Build Coastal Community Resilience works to connect university faculty and students with community organizations working on community resilience projects in the coastal region of Virginia. A kick-off workshop in 2016 was funded through a National Sea Grant program and 5 partnership projects received seed funds. The OODU Resilience Collaborative funded a second networking event in summer 2017and faculty continue to make matches and promote partnerships. The program is synergistic with a number of other efforts to bring university resources to assist with improving community resilience.

Linking Communities to the Estuary

Jackie Woolard, *Partnership for the Sounds*

The Partnership for the Sounds embodies the call in the original APES CCMP for state/local governments, nonprofits, educational institutions, and private businesses to work together in promoting greater awareness of the Albemarle-Pamlico estuarine system and why we all must share in its protection. With the support of those entities, plus countless other individuals and contributing organizations, we have carried out a program of planning, building, and operating a network of estuarine education facilities located in small towns at the rural heart of the A-P system since 1993. Our mission was

and remains to provide education about the A-P system, stimulate sustainable local economic development based around natural/cultural tourism, and serve as an organization that can bring together groups with diverse interests to encourage support of an ecosystem we all cherish. As threats to the estuary have evolved in the past 24 years and long-held strategies for protection have been diminished, the Partnership continues to offer opportunities for all citizens to better understand why the Albemarle-Pamlico estuarine system matters, and provide connections to help them care.

Ecotourism & Economic Development on the Roanoke

Carol Shields, *Roanoke River Partners*

An overview of the collaborative, rural development that Roanoke River Partners (RRP) has engaged over the past 20 years. From its inception, this network of partners capitalized on the region's inherent natural and cultural assets as a source of new enterprise. RRP's signature achievement has been the development and promotion of an over 200-mile water trail which features 16 rustic camp sites—most river platforms. Among the first to pioneer such development, RRP is considered by many to be the "grandfather" of water-based trail development that incorporates a system of camping platforms along a multi-county stretch of waterways. This water-based trail has attracted outdoor enthusiasts from across the U. S. as well as other countries. Trail users bring with them revenues which positively impact local economies. In addition to developing a nationally-recognized water trail, RRP has more recently engaged in the preservation of the former Hamilton Colored School with plans to repurpose it as the Rosenwald River Center. Upon completion, this historic school will serve as: a river/community center; an interruptive site to feature both the region's Rosenwald history and the Roanoke River's role in the Underground Railroad; and an economic stimulus for the entire region.

Community Action: Protecting Water Quality & Waterways

Anne Marie Knighton, *Town of Edenton*

In 1997, the Mayor and Edenton Town Council made a commitment to prioritize water quality and protecting our waterways. Over the years the Mayor and Council recognized partnerships were a way for small towns to get things done - partner up! The Town has partnered with various state and local entities to improve water quality and address regional & community issues. Citizen Scientists, motivated citizens, high school students, Boy Scouts and Public Works employees are doing amazing things, collectively and in partnership to protect and improve the health and quality of our waterways. Town Manager Anne Marie Knighton will share how action plans were developed and partnerships were forged to improve and protect tributaries and waterways.

Engaging Underserved Communities

Mikki Sager, *The Conservation Fund*

Component D of APNEP's CCMP states, "Engaging partners and collaboration are the overarching principles necessary for the achievement of suitable environmental outcomes. To accomplish program goals, APNEP will work closely with its partners to ensure that activities and resources are focused on the most urgent and important problems." A fundamental principle of any strategy for meaningful community engagement is to make the conversations and following actions relevant to the people and places with which you are interested in engaging. And if you are looking to engage underserved or non-traditional community partners, the best place to start is by researching the conditions in those communities and meeting with the people to listen and better understand the challenges being faced by community members and leaders. Community and faith-based groups in the Albemarle-Pamlico region are very interested in, and supportive of engaging in developing solutions to environmental challenges, as long as they also address the social justice and economic challenges that pervade their communities. This presentation will showcase approaches, community-driven efforts and resources being leveraged to address the inter-connected economic, social and environmental challenges in the region.

Community Infrastructure Needs

Mayor Brian Roth, *Town of Plymouth*

The first goal of the 2012-2022 Comprehensive Conservation and Management Plan (CCMP) is "A region where human communities are sustained by a functioning ecosystem." Obviously, the natural ecosystem itself is directly affected by humans and human communities that interact with the natural ecosystem. Public infrastructure, particularly waste water treatment systems, potable water supply systems, and drainage/runoff are great impactors of healthy environments. Reducing public potable water loss reduces over-pumping from deep freshwater wells and reduces electricity consumption. Reducing groundwater intrusion into sanitary sewer pipes reduces electricity consumption and also reduces the likelihood of sewage overflows through manholes into storm water systems that flow into waterways of our state. Properly designed and maintained storm water systems can reduce flooding and lower contaminate levels into the natural ecosystem. Aging

infrastructure that is often in close proximity to waterways and wildlife is exceptionally expensive to maintain and often complex to properly manage. This can be particularly true for rural and lower wealth communities. However, through sustained collaboration, persistence, long range planning and proper funding, aging infrastructure is slowly being re-engineered and replaced. This drastically lowers system operating costs and greatly reduces negative impacts to the natural environment.

3:30-3:45 **Break – Exhibits & Posters**
Room 1A-1B

CONCURRENT SESSIONS IV

EMERGING COLLABORATIONS

3:45 **Salinization, Adaptive Capacity Building for Land Use & Tourism Development (SALT)**
Room 3 Matthew Jurjonas, *NC State University*

The Albemarle Pamlico Peninsula is already experiencing the effects of climate change as brackish water migrates inland during coastal storms, times of drought, and under the gradual influence of sea level rise. The extensive ditch and drainage network across the peninsula further contributes to this problem. Timber and crop production, ecosystem processes and services, and nature based tourism are all affected by this salinization. The communities on the APP also struggle to adapt to changing conditions as local economic factors challenge adaptation. With this in mind, an interdisciplinary team from NC State University set out to address how natural resources and communities will be impacted. Working with a conceptual model highlighting the feedbacks between land use, management decisions, and market responses within the APP, the SALT team has worked to document change and explore strategies for future management. Together the team has developed a hydrological model addressing salinization vulnerability, documented changes to plant and animal communities, addressed risk perceptions in the timber industry, explored decision making by larger scale landowners, and reached out to include diverse voices from the region for resilience planning. The collaboration represents a major effort within the College of Natural Resources to promote interdisciplinary research.

4:00 **New Initiatives in the North-Northeast North Carolina Coast for Establishing an "Observatory" for Albemarle, Currituck, and Pamlico Sounds**
Room 3 Dr. Robert George, *Elizabeth City State University*

Climate change along the northeast North Carolina coast in the Albemarle, Pamlico and Currituck Sounds has posed threats to the health and integrity of these estuarine ecosystems with significant changes in nutrient load in both upper and lower Neuse River, as was evidenced in a September 2016 conversations workshop at North Carolina State University. The health of the Neuse River before and after Hurricane Mathew was clearly established. Recent funding from the National Science Foundation (NSF) to initiate a new "spoke" project with SOUTH DATA HUB to pool environmental spatial-temporal data (salinity, pCO2, oxygen, nutrients, Ch-a, temperature, current, turbidity) and ecosystem structure (species composition) into Encyclopedia of Life (EoL) has given a new direction to monitor these North Carolina Sounds. There is also a plan to develop a integrated summer program with NSF funding for three years (2018 to 2020) to train high school teachers and students in twelve coastal counties with focus on Marine-STEM (**S**cience, **T**echnolgy, **E**ngineering and **M**athematics) areas such as (1) Science of ocean acidification, (2) Remote sensing by using drones and ROVs & AUVs and (3) Fisheries Models with data from an "Observatory" located in Elizabeth City on the bank of Pasquotank River.

4:15 **North Carolina Sentinel Site Cooperative: Creating a Network of Partners**
Room 3 Sarah Spiegler, *NC Sentinel Site Cooperative*

The North Carolina Sentinel Site Cooperative (NCSSC) promotes a network of partners among the scientific and academic communities, resource managers, and nongovernmental organizations. Its active research and monitoring programs play a key role in understanding the coastal environment, including sea level rise, coastal inundation, marsh ecosystems, and living shorelines. Current project partners include NOAA NCCOS, UNC-IMS and the NC King Tides project, the NOAA Ecological Effects of Sea Level Rise program, the NC Aquarium at Pine Knoll Shores, and the City of Jacksonville. The NC Cooperative was established in 2012 as part of a NOAA wide effort to provide coastal communities and resource managers with information on the potential impacts of sea level rise on coastal habitats. The NC Cooperative is one of five NOAA Sentinel Site Cooperatives, which also include the Chesapeake Bay, Northern Gulf of Mexico, San Francisco Bay,

and Hawaii. The NCSSC operates with an advisory core management team of 11 people from federal and state government organizations, academic institutions, and local governments.

4:30 *Room 3*

North Carolina Aquatic Data Hub: Connecting Aquatic Monitoring in the State

Alex McMahon, *Watershed Stewardship Network*

The North Carolina Aquatic Data Hub (NCADH) is a new initiative for connecting aquatic monitoring programs in North Carolina. The program aims to make citizen data more useful to data end users, and to ultimately better understand the condition of North Carolina's waters. In order to do so, NCADH will provide new groups and existing organizations with the resources and training to access and contribute to a statewide network of data. The project has three primary deliverables: a set of standardized monitoring protocols, database/analysis tools, and the training to use them. First, NCADH is establishing a tiered system of standard monitoring parameters and protocols that allow for direct comparison of data from many sources while remaining flexible enough to accept data collected by entities with varying equipment and capabilities. Second, NCADH is creating database tools for monitoring groups to store their own data and contribute to a central repository of volunteer data collected in the state. Third, NCADH will provide a series of training workshops in 2018 to help groups adopt these tools.

RE-EMERGING ISSUES

3:45 *Room 4*

Nutrient Management in the Neuse and Tar-Pamlico Watersheds

Rich Gannon, *NC Division of Water Resources*

Approaching twenty years since enactment of a precedent-setting regulatory strategy to reverse nutrient over-enrichment in North Carolina's Neuse River estuary, success remains elusive as it does in the adjacent Pamlico estuary, which followed the same process three years later. Rich will recap strategy designs and compliance, highlight nutrient delivery changes and estuary response in the intervening years, touch on adaptive assessment needs and outline current rulemaking proposals for these two river basins.

4:00 *Room 4*

Assessing Potential Threats and Providing a Framework for Better Management of Emerging Environmental Contaminants in Coastal North Carolina

Dr. Sid Mitra, *East Carolina University*

Emerging contaminants include compounds that are detectable in the environment which result from medicines, personal hygiene products, and byproducts of chemical manufacturing processes. These chemicals are introduced into surface and groundwaters via wastewater influx, runoff, and permitted industrial discharge. Few studies have comprehensively quantified their presence and ecosystem risk to North Carolina's coastal and estuarine waters. This lack of data is not unique to North Carolina; only a handful of states and geographical areas of the US have addressed these chemicals. This presentation will highlight some of the primary concerns associated with emerging contaminants in coastal and estuarine waters and present strategies used by other states to assess their risks. Providing a framework for better understanding of the risk from emerging contaminants to coastal and estuarine waters will facilitate their better management and minimize ecosystem impacts.

4:15 *Room 4*

Introduction to the North Carolina Aquatic Nuisance Species Management Plan

Rob Emens, *NC Division of Water Resources*

North Carolina, like many states, has an Aquatic Nuisance Species (ANS) Management Plan. This presentation will review the components of the NC ANS plan, provide some background as to why it was drafted in 2016, and explain what the writer's intended outcomes were. The plan can be found on the NC Department of Environmental Quality website: https://deq.nc.gov/conservation/natural-resource-conservation

4:30 *Room 4*

Nutrient Criteria Development for Albemarle Sound: Progress and Prognostications

Jim Hawhee, *NC Divison of Water Resources*

North Carolina's Nutrient Criteria Development Plan (NCDP) was instituted in 2014 by mutual consent between the NC Department of Environmental Quality and the U.S. Environmental Protection Agency. The plan's overarching goal is to revisit North Carolina's nutrient-related water quality criteria by 2025. The NCDP identifies Albemarle Sound as the pilot waterbody for evaluating estuarine nutrient criteria, and an APNEP-facilitated workgroup conducted the first phase

of this evaluation from 2014-2016. Several targeted projects were completed in support of this effort, and the workgroup ultimately developed and evaluated a range of nutrient criteria proposals for Albemarle Sound. While no consensus criteria recommendations were formulated, the criteria evaluation process helped to identify and prioritize further applied research opportunities. This presentation touches on the implications of estuarine criteria development, summarizes efforts to date, and offers some insights regarding the path forward in Albemarle Sound.

EMERGING TOOLS & TECHNOLOGIES

3:45 **Bring a Regional Perspective to Your Local Work with the South Atlantic Conservation Blueprint**

Room 1A-1B Hilary Morris, *South Atlantic Landscape Conservation Cooperative*

The South Atlantic Landscape Conservation Cooperative (LCC) is a partnership of federal, state, nonprofit, and private organizations committed to sustaining natural and cultural resources for future generations. Our mission focuses on the Conservation Blueprint, a living spatial plan identifying priority areas for shared conservation action in the face of future change. The latest update to the Blueprint, Version 2.2, prioritizes the lands and waters of the South Atlantic region based on ecosystem indicator models and a connectivity analysis. It covers parts of six states, from southern Virginia to northern Florida, including terrestrial, freshwater, estuarine, and marine environments. So far, more than 500 people from over 150 organizations have actively participated in the development of the Blueprint. It integrates with neighboring LCCs' spatial priorities to create a Southeast-wide plan and has been used in over 30 different projects. Learn how the Blueprint can strengthen your funding proposals and bring a landscape-scale perspective to your local efforts!

4:00 **A New Look to North Carolina DEQ GIS**

Room 1A-1B Melanie Williams, *NC Division of Water Resources*

The North Carolina Department of Environmental Quality relies heavily on the support of spatial awareness using Geographic Information Systems (GIS) to accomplish a large portion of its mission, from day to day tasks to long term environmental planning. Providing high quality, up-to-date GIS data with limited staff time was challenging. Now, with the development of a simplified GIS program on cloud servers, DEQ can provide this information and mapping tools to all users in a more efficient way. Through a website interface, users can easily find GIS data to download in various formats, keep their GIS maps up-to-date through web service links, and explore other existing mapping applications. The goal of the NC DEQ Online GIS project is to enhance and expand environmental spatial awareness through an effortless GIS experience for all North Carolinians. In this session, you will learn more about what can be found on the NC DEQ Online GIS website, how it can help answer questions, and expand collaborative efforts.

4:15 **The Living Shorelines Application: A Tool for Planning and Siting Living Shorelines**

Room 1A-1B Lora Eddy, *The Nature Conservancy – NC Chapter*

Since 2007, The Nature Conservancy has led the development of Coastal Resilience, which consists of an approach, a web mapping tool, and a network of practitioners around the world to examine nature's role in reducing coastal hazards. In North Carolina, The Conservancy has expanded the Coastal Resilience tool in partnership with scientists at NOAA's Beaufort Lab to create the NEW Living Shorelines application (app) by bringing in their research on shoreline wave energy in the southern Pamlico, Core and Bogue Sounds and the New River Estuary. This tool can help coastal managers and residents identify where they can use a living shoreline as an erosion control strategy. It uses this science-based analyses of shoreline wave energy factors to determine which living shoreline approach is most suitable and identifies the areas on the map. Using living shorelines to control erosion improves water quality and ecological outcomes with the least impact to natural shoreline function.

4:30 **Resilience Efforts in Eastern North Carolina: The RENA Project**

Room 1A-1B Monica Gregory, *NC Division of Coastal Management*

Eastern North Carolinian communities are experiencing increasing damages from environmental hazards, including impacts to their ecosystem services. The RENA project is an effort between the Division of Coastal Management (DCM) and local governments to identify important assets in their communities, discuss potential vulnerabilities, and create solutions to increase resilience in the face of severe weather, flooding, and rising sea levels, among other events. DCM is working to record best management practices throughout the process and to build a final resilience guide for coastal communities in

the state. A NOAA Fellow is leading the effort. She is working through the process in five pilot communities: Edenton, Oriental, Pine Knoll Shores, Duck, and Hatteras Village. Each community has a unique character and a wide variety of issues, but they are also connected to communities around them in both economic and environmental terms. The process created through the RENA project could be an opportunity for organizations like APNEP to engage a wide range of communities, create dialogue within and between towns, and identify important resources to protect for a community and, if applicable, a region.

4:50-5:15 **Closing Plenary**

Room 1A-1B Dr. Bill Crowell *Director, Albemarle-Pamlico National Estuary Partnership*

Dr. Kirk Havens *Policy Board Chair, Albemarle-Pamlico National Estuary Partnership*

5:15 **Adjourn**

Are you working on your NC Environmental Education Certification? Attendees of today's Symposium can receive 7 Criteria III hours or 7 Continuing Education Credit hours towards their Certification; stop by the registration table after 4:50 pm to pick up your signed EE form.

Albemarle - Pamlico National Estuary Partnership

Special Thanks to Our Symposium Partners

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Notes

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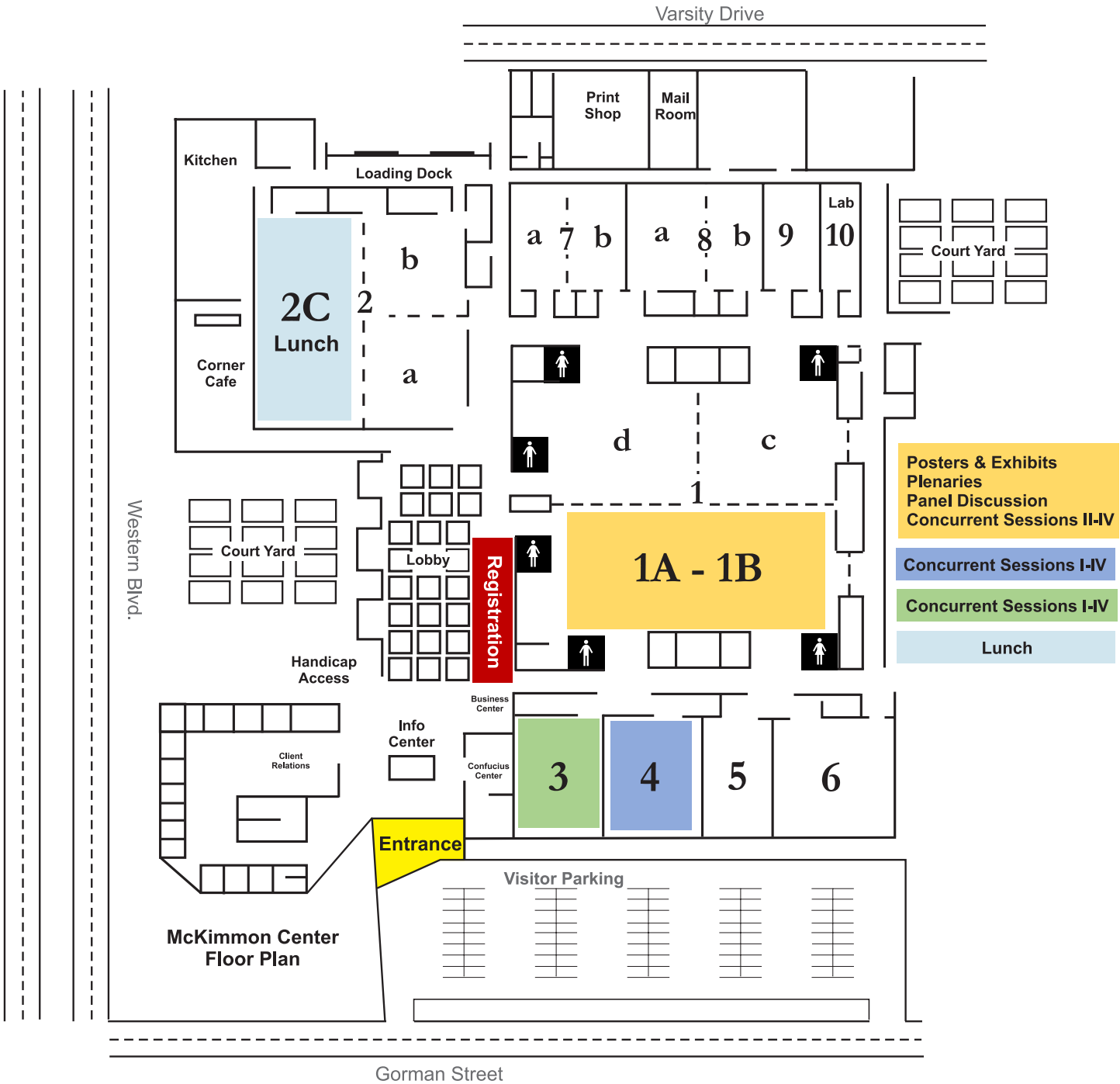

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