STATE of the SOUNDS SYMPOSIUM

Charting a New Course

November 17, 2011

New Bern Riverfront Convention Center

AGENDA

9:00-10:00 Registration & Coffee
Heritage Hall

10:00-10:45 Welcome and Opening Plenary
Ballroom A
Dr. Bill Crowell, *Director, Albemarle-Pamlico National Estuary Program*
David Knight, J.D., *Assistant Secretary for Natural Resources, NC Department of Environment & Natural Resources*

10:45-11:00 Break – Exhibits & Posters
Heritage Hall

CONCURRENT SESSIONS

IDENTIFY

11:00-11:30 Loads of Nutrients in Selected Streams of the Albemarle-Pamlico Basin: Description, Trends, and Comparisons
Ballroom C
Tim Spruill, *Hydrologist*

Nutrients are known to be an important factor in the health of both freshwater and estuarine ecosystems, particularly when too much nitrogen or phosphorus is released into these systems. Publically available streamflow and nutrient data from the North Carolina Department of Environment and Natural Resources and from the U.S. Geological Survey were analyzed for selected streams draining portions of the Albemarle-Pamlico Basin (primarily the Neuse River Watershed). These data are compared with previous world-wide and U.S. East and Gulf Coast estimates from the 1970s-1990s. Long-term (1973-2005) and recent (1997-2008) trends in total nitrogen and phosphorus are examined in the context of complexities of interpreting such data and evaluating their utility in water-quality management. The need for continued long-term monitoring is discussed.

11:30-12:00 Strategic Habitat Areas in the APNEP Region of North Carolina
Ballroom C
Christine Jensen, *Marine Fisheries Biologist, NC Division of Marine Fisheries*
Anne Deaton, *Habitat Protection Section Cheif, NC Division of Marine Fisheries*

The identification and designation of Strategic Habitat Areas (SHAs) for marine and coastal fishery species is a critical component in the implementation of North Carolina's Coastal Habitat Protection Plan. Strategic Habitat Areas are defined as "specific locations of individual fish habitat or systems of habitats that have been identified to provide exceptional habitat functions or that are particularly at risk due to imminent threats, vulnerability, or rarity." Strategic Habitat Areas have been identified for most of the APNEP region through a scientifically-based process that considered existing habitats, human alteration factors, biological data, and input from regional experts. Strategic Habitat Area nominations include areas that have already been protected by other designations, as well as areas not currently recognized in any way. Once SHAs are designated, resource managers may address gaps in existing conservation and management efforts and take steps to prevent further alteration of the system as a whole. The nomination of SHAs can provide guidance for conservation projects focused on conservation/land acquisition, enhancement, or restoration. A network of designated SHAs providing habitat connections throughout North Carolina's coastal waters will help maintain a healthy ecosystem and ensure that the complex life history needs of all fishery species are met.

11:00-11:30 *Ballroom B*

Coastal Carbon Sequestration by Shellfish Reefs

Dr. Joel Fodrie, *Assistant Professor, UNC Institute of Marine Sciences*

There is increasing appreciation for the role of natural ecosystems in sequestering anthropogenically released CO2. In particular, coastal habitats can be hot-spots of CO2 removal due to the combination of high primary production and deposition rates. While recent attention has focused on vegetated marine habitats as carbon sinks (e.g. saltmarsh, mangrove), shellfish reef environments may also contribute significantly to the sequestration of carbon. Over these biogenic reefs, phytoplankton, particulate/dissolved carbon are filtered (concentrated), re-packaged and deposited as carbon-rich shells, feces, and pseudofeces in an accreting reef matrix. New oyster-reef data within North Carolina indicate that > 25 Mg (tonne) C ha-1 yr-1 can be sequestered within this biogenic habitat. These data compare favorably with other notable estuarine 'blue carbon' sinks (mean: 1.2 Mg C ha-1 yr-1; max record: 17.3 Mg C ha-1 yr-1), although our preliminary data also suggest that oyster-reef sequestration rates are mitigated by landscape setting and water depth. Because shellfish reefs are among the most imperiled habitats on the planet (> 85% losses), there is extra incentive for gathering entirely novel data on emergent reef properties such as accretion rates (vis-à-vis sea-level rise) and carbon storage as we continue to face global climate change.

11:30-12:00 *Ballroom C*

Using Ecosystem Restoration to Build Climate Change Resilience into a Coastal Habitat Complex

Dr. Brian Boutin, *Climate Adaptation Project Director, The Nature Conservancy*

Located between the Albemarle and Pamlico Sounds, the Albemarle Peninsula is a low-lying landscape containing more than 540,000 acres of coastal conservation lands. However, extensive ditching and draining of wetlands in concert with it's extremely low elevation has left the peninsula vulnerable to the impacts of climate change, particularly sea level rise, threatening these conservation investments. Many impacts of sea level rise – increased shoreline erosion, rapid habitat transitions, saltwater intrusion, and a rising water table – have already become visible. Recognizing the urgency to build the resilience of the landscape to future change, The Nature Conservancy partnered with the U.S. Fish and Wildlife Service to ensure that, as the ecosystems of the region are altered by climate change, they are transformed into ones that remain complex and provide a suite of ecosystem services. This partnership aims to address climate stressors through implementing long-term adaptive management strategies that contribute most to the resilience of both the terrestrial and aquatic ecosystems on the peninsula, including re-establishing a natural hydrologic regime in drained wetlands, managing the transition of habitats through strategic plantings of salt – and flood-tolerant vegetation, and using oyster reefs, submerged aquatic vegetation, and marsh grasses to abate shoreline wave energy.

11:00-11:30 *Tryon (2nd floor)*

Basic Observation Buoy Workshop, Construction, and Deployment for Schools in the Albemarle Pamlico Sound Region

David Sybert, *Education Associate, UNC Coastal Studies Institute*

The UNC Coastal Studies Institute, along with partners from NC Sea Grant and NOAA's Monitor National Marine Sanctuary, have implemented an estuarine observing project that utilizes Basic Observation Buoys (BOB) constructed, deployed and maintained by six schools in northeastern North Carolina. Students from these schools learn important scientific concepts and experience real world challenges while learning about the area where they live. Curriculum created in conjunction with the project engage students in a manner that highlights STEM (Science, Technology, Engineering and Math) education and encourages career paths in related fields. The BOB units carry a suite of environmental sensors that collect meteorological and water quality data for up to a week at a time before required maintenance. The six schools are located in five different counties along the Albemarle and Pamlico Sounds, and the data collected from their buoys will be shared with the SECOORA BOB network. This is the first year of a legacy project that will increase the amount of water quality data available for one of the largest estuarine systems in the United States and allow students and teachers to identify trends in local systems while relating them to national and global trends in water quality issues.

11:30-12:00 *Tryon (2nd floor)*

Virginia Healthy Waters Initiative

Dr. Todd Janeski, *Manager, Virginia Healthy Waters Initiative, VA Commonwealth University & Virginia Department of Conservation and Recreation*

The Virginia's Healthy Waters initiative is designed to raise awareness about the need to protect high-function stream resources before they become impacted by changes in land use. Traditional water quality programs have focused on costly methods of rehabilitating degraded waters. In contrast, the Healthy Waters Initiative focuses on taking a systems approach to identify and protect the resources with highest ecological integrity and diversity. Virginia Healthy Waters Initiative data helps prioritize protection efforts and can be integrated into land-use decision making and voluntary conservation efforts. This program seeks to reduce the number of streams that will become degraded and have an overall positive, long-term impact on the interconnected health of Virginia's waters from the mountains to the ocean. Virginia's Healthy Waters Initiative works collaboratively with state, federal, regional agencies as well as local stakeholders to identify opportunities to implement the healthy waters initiative. Virginia and North Carolina are cooperating to identify Healthy Water Resources in our shared resources,

including the Chowan basin. Specifically, we are working with the Albemarle-Pamlico National Estuary Program and the Nature Conservancy to develop a pilot Healthy Waters planning effort that will identify and prioritize healthy waters for regional, state and local conservation efforts.

MONITOR

11:00-11:30 *Berne (2nd floor)*

Water Science at Work: A Sampling of USGS Activities in Eastern North Carolina

Mary Giorgino, *Water Quality Specialist, U.S. Geological Survey North Carolina Water Science Center*

Water—the estuaries, coastal rivers, wetlands, and groundwater—defines the Albemarle-Pamlico region and is an invaluable resource to its human and non-human inhabitants. As the second largest estuary in the United States, the Albemarle-Pamlico Estuary is nationally significant. However, its waters are subject to multiple pressures including landscape and climate change, competing uses, pollution, and natural but catastrophic events like hurricanes. For more than 100 years, the U.S. Geological Survey has worked in collaboration with local, State, and other Federal agencies to provide the data and science needed to promote wise management of the region's water resources. This overview of recent activities will include: documenting storm tide from Hurricane Irene; monitoring and modeling dissolved-oxygen dynamics in the Roanoke River; investigating nutrient loadings, trends, and sources; and evaluating the quality and sustainability of drinking-water supplies.

11:30-12:00 *Berne (2nd floor)*

Linking Landuse to Patterns in Coastal Stream Discharge and Loading of Nutrients and Suspended Solids

Dr. Michael Piehler, *Associate Professor, UNC Institute of Marine Sciences*

Coastal streams transport landscape-derived materials to estuarine receiving waters. Their high level of connectivity to surrounding watersheds makes them indicators of impacts resulting from changing land uses. Coastal streams in the New River Estuary, NC, USA have been monitored for three years, during which water samples were collected during base – and throughout storm-flow. Samples were analyzed for nutrient and total suspended solid (TSS) concentrations, and flow was measured continuously. This research determined that in developed watersheds, loading of some constituents (nitrate, ammonium, TSS) and stream discharge increased, as did the relative importance of storm flow delivery, when compared to reference watersheds. Determining the impacts of land use and precipitation patterns on material delivery by coastal streams is requisite for quantifying and mitigating degradation resulting from watershed development.

APNEP

11:00-11:30 *Ballroom A*

Ecosystem Assessment of the Albemarle Pamlico Estuarine System

Dr. Lindsay Dubbs, *Postdoctoral researcher, UNC Institute of Marine Sciences*

"The State of Sounds 2011: An Assessment of the Albemarle Pamlico Ecosystem" is the first assessment of the condition of the Albemarle Pamlico Estuarine System (APES) to be completed in 20 years. This presentation will provide insights on the process of completing the assessment, highlight important information about the condition of the APES revealed by the assessment, and present guidance on how to use the assessment as a resource.

12:00 PM *Ballroom A*

Lunch Buffet

12:30-1:15 *Ballroom A*

Science-based Decision-Making *or* Can we do better than "I have my scientist, do you have yours?"

Dr. Nancy White, MLA, Ph.D., *Director, UNC Coastal Studies Institute*

Exhibits & Posters

1:15-2:00
Heritage Hall

Human Population Distribution in the Albemarle-Pamlico Basin, 1990-2010

Dr. Tom Crawford, *Associate Professor of Geography, East Carolina University*

Indicator results presented here report geographical patterns of total human population amounts and change summarized at the basin and sub-basin levels for 1990-2010. Human populations alter the environment in myriad ways. Selected impacts associated with human population and their behaviors include: loss of natural land covers (e.g. wetlands and forests), natural habitat fragmentation, increased impervious surface, point and non-point source water pollution, water withdrawal, air pollution, greenhouse gas emissions, and reduced health of terrestrial and aquatic species populations. Historical evolution of settlement patterns is driven by multiple factors such as demographic processes (i.e. human fertility, mortality, and migration), geographical accessibility, land economics, natural landscape environmental opportunities and constraints, and institutional land policies governing where settlement may occur. The spatially varying nature of these factors causes an uneven distribution of human population such that it is important to report human population patterns at multiple geographical scales of increasing spatial resolution that range from the entire Albemarle-Pamlico basin to individual sub-basins.

Successes of the Coastal Habitat Protection Plan

Jessi Baker, *Habitat Alteration Permit Reviewer, NC Division of Marine Fisheries*
Kevin Hart, *Habitat Alteration Permit Reviewer, NC Division of Marine Fisheries*

The 1997 Fisheries Reform Act required the North Carolina Department of Environment and Natural Resources develop a Coastal Habitat Protection Plan (CHPP) with a goal of long-term enhancement of coastal fisheries (N.C.G.S. 143B-279.8). The CHPP was adopted in 2004 and updated in 2010. The plan describes NC's coastal fisheries habitats (water column, soft bottom, hard bottom, submerged aquatic vegetation (SAV), wetlands, and shell bottom), the latest scientific information on habitat needs, ecosystem and fisheries benefits, threats, and status. Management and research recommendations are provided for the associated state agencies, commissions and interested parties to implement. The plan has fostered interagency cooperation between the states resource commissions (Marine Fisheries Commission, Coastal Resource Commission, Environmental Management Commission, and Wildlife Resource Commission). CHPP successes include coordinated rulemaking, increased compliance monitoring, changes to the coastal stormwater rules, identification of Strategic Habitat Areas, coastwide SAV mapping, designation of anadromous fish spawning areas, and expanded oyster reef restoration. The 2010 CHPP provided updated explanations of new threats, including sea level rise, invasive species, energy development, and endocrine disrupting chemicals. CHPP and APNEP staff work closely on common habitat protection and restoration goals, in a beneficial manner for North Carolina's coast.

Seasonal Variation of Submerged Aquatic Vegetation in Currituck Sound

Dr. Maurice Crawford, *Associate Professor of Marine and Environmental Science, Elizabeth City State University*

I collected core samples over a ten month period from a bed of Submerged Aquatic Vegetation (SAV) near Bells Island in Currituck Sound, NC. Plant samples were sorted by species, divided into leaves and roots/rhizomes, weighed and then dried at 60°C for three days. Biomass (g/m2) was calculated based on the dried weights. The three species that dominated the samples were wild celery (Vallisneria americana), widgeon grass (Ruppia maritima) and redhead grass (Potamogeton perfoliatus). Total biomass in the SAV bed peaked in September and October. I found that the species that accounted for more than half of the biomass varied by month. Wild celery was the dominant species during August and September; widgeon grass during April and May while redhead grass was the dominant in July. The overall patterns of peak biomass are similar to the SAV communities studied by Moore et al (1998) in the Chesapeake although the values for mean SAV biomass were generally lower in the Currituck Sound. I plan to expand this work to other sites in the Currituck Sound to see if this pattern is consistent and to better understand the life history of oligohaline SAV in North Carolina.

Submerged Aquatic Vegetation Map for North Carolina and Southern Virginia Coastal Waters

Scott Gentry, *Project Manager, Albemarle-Pamlico National Estuary Program*

A map of submerged aquatic vegetation (SAV) for North Carolina and southern Virginia estuarine coastlines was completed in August 2011. SAV serves multiple habitat functions for fish, shellfish, and crustaceans, including providing dissolved oxygen, filtering pollutants out of the water, and providing shelter for protection and spawning. Knowing the location of SAV is important for assessing habitat condition and determining where to direct resources for conservation efforts. The map classifies SAV based on density, with waterfowl impoundments and aquaculture vegetation classified as such. Led by the Albemarle-Pamlico National Estuary Program with many state and federal partners, this effort is the first to detail the location of submerged aquatic vegetation in the region.

CONCURRENT SESSIONS

IDENTIFY

2:00-2:30
Ballroom C

The First Complete Mapping of North Carolina's Submerged Aquatic Vegetation Resources

Dr. Donald Field, *Fishery Biologist (Research), NOAA/NOS – Center for Coastal Fisheries and Habitat Research*

A cooperative effort involving federal, state, local and academic personnel has recently finished the first ever complete mapping of North Carolina's Submerged Aquatic Vegetation (SAV) resources (Including Back Bay, VA). The mapping effort was conducted using state-of-the-art digital aerial imagery supported by a concerted field verification effort that collected more than 1000 points throughtout the state. The imagery and final SAV map will serve a broad spectrum of needs for the NC coastal management community and will also provide a valuable baseline for future monitoring efforts. The GIS data for the final map product are presently available on-line at the APNEP website. The imagery, mapping, and field verification procedures are described.

2:30-3:00
Ballroom C

Short-term erosion of Wetland Shorelines in the Albemarle-Pamlico Estuarine System

Dr. D. Reide Corbett, *Professor, Dept. of Geological Sciences/Institute for Coastal Science & Policy, East Carolina University*

Dr. J.P. Walsh, *Associate Professor, Dept. of Geological Sciences/Institute for Coastal Science & Policy, East Carolina University*

Shoreline erosion has been recognized as a problem with important human and ecological ramifications (e.g., property and marsh loss) in coastal zones. Previous studies have typically focused on oceanfront shorelines; however the rate of shoreline erosion along protected mainland shorelines can exceed that of oceanfront areas. In the Albemarle-Pamlico Estuarine System (APES), prior research has focused on long-term changes in the estuarine shoreline. For example, work has shown the highest rates of shoreline erosion (from 1 m yr-1 to as high as 3 m yr-1) occur along the exposed sound areas and at the mouths of major sub-estuaries (e.g., Pamlico River mouth), and elsewhere rates are commonly 0.25 m yr-1. The goal of this research was to quantify changes in estuarine wetland shorelines over telescoping time periods (weeks to months to decades) and associated with individual storm events. Although accretion was locally measured at several of the study sites during bi-monthly surveys, generally net erosion is dominating the change throughout the system and slow stay erosion from regular wave action appears to be controlling change based on this preliminary dataset.

PROTECT/RESTORE

2:00-2:30
Ballroom B

Landscape-Scale Hydrologic and Wetlands Restoration in Coastal North Carolina: Benefitting Coastal Water Quality and Water Management Needs

Erin Fleckenstein, *Coastal Scientist, NC Coastal Federation*

In an effort to restore water quality and oyster habitat in the Pamlico Sound, the North Carolina Coastal Federation is spearheading the development of a landscape-scale hydrologic restoration plan that will redirect agricultural drainage water within a 42,000-acre Hyde County Drainage District. Hydrologic modifications within the district and water management techniques that include pumping agricultural drainage waters into coastal waterways exacerbate water quality and oyster habitat declines in Pamlico Sound. Led by NCCF, a group of landowners, farmers, fishermen, researchers, resource agencies and others have identified, planned, and begun implementing several projects that will revolutionize water management within the drainage district. By modeling historic flows, the group has developed a plan that redirects drainage water into impoundments using the land to retain, filter and treat the runoff. This restoration design lends itself to provide other unique benefits and opportunities; marrying the needs of the farmers for water management with water quality improvements and needed migrating shorebird habitat. This work represents the advancement and integration of agricultural drainage practices with environmentally sound objectives. The lessons learned and methods used have potentially wide spread application.

2:30-3:00
Ballroom B

Integrating and Enhancing Strategic Landscape Conservation in Eastern North Carolina and Southeastern Virginia

Peter Campbell, *Wildlife Biologist, U.S. Fish and Wildlife Service*

In 2009, the Department of Interior (DOI) adopted a new business model that relies on the Strategic Habitat Conservation (SHC) framework and a national network of Landscape Conservation Cooperatives (LCCs) to more effectively fulfill its mission of protecting and managing priority natural. The SHC framework is founded on the principles of Adaptive Management and includes five elements; biological planning, conservation design, conservation delivery, monitoring and research. LCCs are large geographic areas designed to encourage the development and implementation of science-based conservation actions by engaging multiple interests across a broad conservation community. The boundary of the DOI Eastern NC/Southeastern VA SHC Team comprises the northern third of the South Atlantic LCC. The Team, which has over twenty years of experience working

together and in collaboration with partners to accomplish its conservation goals, is now engaging stakeholders to develop a new plan to apply the SHC framework within the Coastal Plain and Piedmont of southern Virginia and eastern North Carolina. The plan will identify our conservation targets, threats to those targets, and the objectives and strategies that must be implemented in order to achieve target goals. Our vision is to establish a viable network of public and private lands and waters that will sustain resilient populations of priority fish, wildlife, and plants, and the habitats on which they depend. While the Team is primarily focused on protecting and managing important natural resources, to realistically achieve its vision we acknowledge that we must engage both traditional and non-traditional partners to create objectives and strategies that balance natural resource, cultural, social and economic interests. We intend to fully cross-walk and integrate strategies from our SHC Strategic Plan with that of the Albemarle-Pamlico National Estuary Program's (APNEP) new Comprehensive Conservation and Management Plan (CCMP). The Team's can provide APNEP with further information in the areas of biological planning and conservation design while APNEP can provide the Team with important data and expertise in the areas of monitoring and community engagement.

2:00-2:30 Shad in the Classroom

Tryon (2nd floor) Liz Baird, *Director of Education, NC Museum of Natural Sciences*
Melissa Dowland, *Teacher Education Specialist, NC Museum of Natural Sciences*

"Shad in the Classroom" is a collaborative project that provides students with an understanding of the science process, inspiration for careers in science, and a desire to protect our waterways, particularly in the APNEP region, through hands-on experience raising American Shad from egg to releasable fry. The objective of this project is to build an understanding of the life history of shad and an appreciation for our natural world. The project has two primary components: 1. Classroom project: Equipping classrooms to raise the shad, providing the shad eggs, assisting with the release. 2. Teacher training: one day training on the process of raising shad, overnight canoe workshop on the Roanoke to learn about the ecosystem.

2:30-3:00 Engaging APNEP Communities on Climate Change

Tryon (2nd floor) Dr. Jessica Whitehead, *Regional Climate Extension Specialist, NC Sea Grant and SC Sea Grant Consortium*

For APNEP's vision of identifying and monitoring climate risks and protecting the region by enhancing climate change resilience, it will need to obtain local support by engaging the public on the need for such work. Local level knowledge is vital to determining the factors that influence community and ecosystem resilience to climate impacts and the appropriate actions for communities to prevent damage from or take advantage of those impacts. One way of gaining such knowledge and trust is to engage communities through locally based climate extension. In the Town of Plymouth, North Carolina Sea Grant is using interviews and structured diagramming based on current flooding infrastructure vulnerabilities to facilitate a discussion of climate adaptation needs in a community where climate change alone is not sufficient motivation for adaptation planning. Vulnerability and Consequences Adaptation Planning Scenario (VCAPS) process allows local decision-makers to synthesize their concerns about climate impacts, consequences, and decisions in a structured diagram that help town decision-makers understand the potential impacts and decisions they will need to make as sea level rises. Lessons learned from the ongoing Plymouth case study will be valuable and applicable as APNEP continues to expand its work on building a climate ready estuary.

MONITOR

2:00-2:30 *Berne (2nd floor)*

FerryMon: Highlights from a Decade of Intensive Ferry-Based Monitoring of the Pamlico Sound System

Dr. Nathan Hall, *Postdoctoral Research Associate, UNC Institute of Marine Sciences*
Dr. Benjamin Peierls, *Postdoctoral Research Associate, UNC Institute of Marine Sciences*

For over a decade FerryMon has used NC-DOT ferries as platforms to monitor Pamlico Sound and a key tributary estuary, the Neuse River. Before FerryMon, very little water quality data existed for much of Pamlico Sound despite its tremendous economic, social, fisheries and recreational value and the increasing impacts of multiple natural and anthropogenic stressors. FerryMon measures key indicators of water quality (temperature, salinity, chlorophyll a, dissolved oxygen, turbidity, pH and dissolved nutrient concentrations) with the temporal and spatial resolution necessary to determine the ecological integrity and understand the complex dynamics of these systems. For example, FerryMon data are used to assess compliance of the chlorophyll a standard for the Neuse River estuary TMDL and have documented water quality impacts to Pamlico Sound from hurricanes. FerryMon provides critical ground-truthing measurements for satellite-based remote sensing enabling researchers and managers to "scale-up" to an unprecedented regional view of water quality conditions. FerryMon has been used to test newly developed instrumentation that provides class-level characterization of the phytoplankton assemblage, information critical to the early detection of harmful algal blooms. Additionally, FerryMon is currently equipped to measure dissolved CO2 to help fill the knowledge gap surrounding global C fluxes at the land-sea margin.

2:30-3:00 *Berne (2nd floor)*

Estuarine Shoreline Mapping Project: Preliminary Results

Lisa Cowart, *Environmental Specialist, NC Division of Coastal Management*

The goal of the ESMP is to create a continuous estuarine shoreline and to quantify the mileage of shoreline types and number of shoreline structures, with the intention of further understanding the effects of development along the shoreline and the effects of permitted activities on coastal residents and the environment. A detailed methodology was created and the estuarine shorelines were digitized using the most recent available aerial photography for each county. To date, 17 of the 20 CAMA counties have been digitized. Of the 17 counties digitized, five have been QA/QC'ed by DCM staff and are considered complete. There are three counties that have yet to be digitized and the digitization process is expected to be completed by December 2011. A basic statistics and summary analysis has been performed on the five completed counties. The analysis includes calculations of length of five distinct shoreline types, length of the types of modified shoreline, and the number of modified structures. In order to highlight the potential use of the data, an expanded analysis was performed for Washington County, which will be applied to the other counties as they are completed.

APNEP

2:30-3:00 *Ballroom A*

Charting the Course: An Overview of APNEP's Ecosystem-Based Approach to Regional Planning and Environmental Management

Dr. Bill Crowell, *Director, Albemarle-Pamlico National Estuary Program*
Dr. Dean Carpenter, *Program Scientist, Albemarle-Pamlico National Estuary Program*

Recognizing the need to incorporate advanced scientific principles into its environmental management efforts, APNEP adopted an ecosystem-based management (EBM) approach in late 2009. As a first step to realizing this approach, APNEP has incorporated EBM principles into its Comprehensive Conservation and Management Plan. This presentation will provide an overview of ecosystem-based management, discuss the ecosystem-based planning process behind APNEP's new plan, and propose near-term action steps to facilitate the transition to ecosystem-based management in the region.

3:00-3:15 *Heritage Hall*

Break – Refreshments, Exhibits & Posters

CONCURRENT SESSIONS

IDENTIFY

3:15-3:45
Ballroom C

The State of Central Coast North Carolina Marshes

Dr. Christine Voss, *Postdoctoral Research Associate, UNC-CH Institute of Marine Sciences*

The in situ persistence of coastal marsh habitat as sea level rises depends on the ecophysiologically based responses of the dominant macrophytes to inundation. Establishing plugs of dominant marsh macrophytes in experimental planters placed at six elevations in two contrasting North Carolina marshes served to expose plants to a range of differing inundation periods, thereby creating conditions that anticipate responses to varying sea level. Both Spartina alterniflora and Juncus roemerianus exhibited significant trends of decreasing growth with increasing inundation and their growth response patterns to inundation period were strikingly similar. J. roemerianus response differed little between inundation regime whether exposed to regular semi-diurnal tides or via irregular, meteorologically driven flooding. Currently, central coast North Carolina marsh elevations already induce sub-optimally long inundation, producing less vigorous growth of live plants and failing to achieve maximal levels of production of above – and below-ground biomass to contribute indirectly (above) and directly (below) to elevating the marsh surface and thereby providing resilience to sea-level rise. Since in situ persistence of coastal marshes is unlikely in this region, transgression landward remains a mechanism that could allow these marshes to continue to provide their valuable ecosystem services indefinitely into the future.

3:45-4:15
Ballroom C

Identifying and Prioritizing Important Natural Resources in North Carolina: The Conservation Planning Tool

Allison Schwarz Weakley, *Conservation Planner, NC Natural Heritage Program*

The N.C. Department of Environment and Natural Resources has developed a Conservation Planning Tool to identify, evaluate, and prioritize an interconnected network of important natural resources required to maintain healthy and sustainable ecosystems statewide. Through the One NC Naturally initiative, this tool is used to inform planning and funding decisions, and to coordinate and guide conservation efforts. The tool consists of a series of assessments conducted using the best available, most current data and information on biodiversity and wildlife habitat, forestry and farmland, water resources, and open space and conservation lands in the state. These assessments are used by state and local governments, regional councils of governments, conservation organizations, and the state's trust funds to inform planning and decision-making for land use, conservation, watershed, parks and recreation, and transportation projects; to identify preservation and restoration sites for mitigation; and to support grant applications for land acquisition. The assessments are also used to promote a greater understanding of the importance and location of natural resources in the state, and to develop strategies to manage and protect these important resources at the local, regional, and state levels.

PROTECT/RESTORE

3:15-3:45
Ballroom B

Ecosystem Services: History and Significance with an Application to Oyster Restoration

Dr. Andy Keeler, *Professor, East Carolina University / Program Head, UNC Coastal Studies Institute*

The concept of ecosystem services has been widely adopted as an appropriate paradigm for modeling and measuring the interaction between the natural and economic systems. This presentation discusses the history and importance of ecosystem services from the standpoint of environmental economics. It identifies the strengths and weaknesses of ecosystem services as an organizing principle for multidisciplinary research, and discusses the ways that ecosystem services can affect environmental policy decisions. Illustrative examples are drawn from oyster restoration in estuarine environments.

3:45-4:15
Ballroom B

Capacities and Flows of Aquatic Ecosystem Services in the Albemarle-Pamlico Basin

Dr. Paul Angermeier, *Research Scientist and Professor, USGS Cooperative Fish & Wildlife Research Unit, Virginia Tech*

Dr. Amy Villamagna, *Lecturer, Sustainable Development & Conservation Biology Program, University of Maryland*

Ecosystem services (ES) provide a crucial management nexus among ecological function, socioeconomic value, and biological conservation. However, ES are not commonly incorporated into resource-planning decisions in private or public sectors. ES assessments often focus on the flow of societal benefits but ignore spatio-temporal variation in the biophysical capacity of ecosystems to provide services. We have developed a new framework to quantify and map ES, which we are applying to the Albemarle-Pamlico basin (APB) of NC and VA. Our framework distinguishes among the capacity of an ecosystem to provide services, the flow of benefits to humans, and the ecological and social demands on ES. Collectively, these features enable us to more clearly assess landscape-level sustainability. We will present current findings on spatial variation in the capacity and flow of selected aquatic ES; our maps illustrate that ES capacity and flow vary greatly and independently across landscapes. We will also examine the extent to which lands managed by federal, state, county, and municipal entities within the NC portion of the APB can protect regulating and cultural services.

ENGAGE

3:15-3:45 **Strategies for Managing North Carolina's Estuarine Shoreline**

Tryon (2nd floor) Lisa Schiavinato, *Law, Policy and Community Development Specialist, North Carolina Sea Grant*
Joseph Kalo, J.D., *Graham Kenan Professor of Law, University of North Carolina School of Law*

The NC Coastal Resources Law, Planning and Policy Center and its partners are currently conducting a study on emerging issues that will impact the state's estuarine shoreline. The objectives of this study are to: (1) identify the emerging natural resource issues that will impact North Carolina's estuarine shoreline for the next 15-20 years; (2) provide technical information on the factors associated with them; and (3) recommend management strategies on how to address these issues. Research on these emerging issues and the development of recommendations on how to address them would benefit not only state agencies and local governments, but also those that live in coastal communities. A statewide advisory committee has been convened to provide technical support to assist the Center and develop recommendations for a final report. This session will present the work accomplished to date on the study.

3:45-4:15 **Promoting Awareness and Stewardship of APNEP's Estuarine Shorelines and Habitats**

Tryon (2nd floor) Whitney Jenkins, *Coastal Training Program Coordinator, NC Coastal Reserve/National Estuarine Research Reserve*

The Albemarle Pamlico National Estuary Program (APNEP) region has an estimated 8,100 miles of estuarine shoreline. These shorelines along the Albemarle and Pamlico Sounds have been identified as one of the top three most threatened areas from sea level rise in the United States. To combat declining environmental quality along our estuarine shorelines, the N.C. Coastal Reserve/National Estuarine Research Reserve (Reserve), which is part of the N.C. Division of Coastal Management, received funding from APNEP to conduct an education campaign on estuarine shorelines in the Summer of 2011. This campaign was complementary across multiple target audiences that the Reserve is experienced in working with: K-12 teachers and students, coastal decision-makers, and the public (including estuarine-front property owners). The goal of this campaign was to teach the value and function of estuarine habitats, how these habitats may be affected by sea level rise, and alternative methods (other than bulkheads) of estuarine shoreline stabilization. The presentation will detail all aspects of the campaign: curricula for 3rd-5th graders, teacher workshop, coastal decision-maker workshop, public field experiences, and social media campaign on Twitter and Facebook.

MONITOR

3:15-3:45 **An Online Environmental Dashboard for Albemarle-Pamlico Sound**

Berne (2nd floor) David Jasinski, *Vice President, Chesapeake Environmental Communications*
Dr. Kirk Havens, *Director, Coastal Watersheds Program, Virginia Institute of Marine Science*

Natural resource protection agencies need information on ecosystem health in a format that is timely, actionable and easily accessible by a wide audience. To address this need, we have developed a prototype interactive online "dashboard" for displaying graphs and maps of indicators of ecosystem health for the Albemarle-Pamlico estuarine complex. The dashboard was developed using open source solutions such as MySQL database, Google Maps API and Google Charts API and is viewable on all popular web browsers. Because the dashboard is database driven, updating content is as simple as updating tables in the database. Users can view indices of water quality, nutrient loads, habitat and fisheries status and trends at geographic scales ranging from Sound-wide to station specific. Information on basin specific land use and 303(d) impairments is also viewable. The target audience of the dashboard ranges from an interested public to environmental managers. The current version of the dashboard is a prototype and meant to showcase what will be possible in a final version. Funding from the Virginia Department of Conservation and Recreation and the Albemarle-Pamlico National Estuary Program supported this work.

3:45-4:15 **Development of Protocols to Monitor Changes in Submerged Aquatic Vegetation in North Carolina's Estuaries**

Berne (2nd floor) Dr. Joseph Luczkovich, *Associate Professor, East Carolina University*

The first-ever aerial survey of North Carolina revealed the third largest extent of Submerged Aquatic Vegetation (SAV) in U.S. coastal waters. But is SAV coverage stable, declining, or increasing? Both intra-annual variability and turbid water conditions make it difficult to reliably detect SAV with aerial remote sensing tools alone. Here, we present data evaluating two boat-based detection methods using a single-beam echosounder and low-light video camera to classify SAV percent cover at four sites (2 low-salinity and 2 high-salinity). Both video and echosounder methods will require high sampling effort (statistical power) to detect a 10% change in the SAV percent cover. Echosounder surveys were quicker to collect and analyze than video surveys, so these were repeated monthly at the test sites. SAV changed more than 10% within a single year at all sites; thus, time of year for inter-annual aerial and boat-based surveys is critical. Peak period of SAV cover was May and June for high salinity sites and August and September for low salinity sites. Detecting SAV changes of more than 10% cover will be possible, if sentinel sites are surveyed at peak periods. Cost estimates for various power levels and SAV change with each method will be presented.

3:15-3:45 *Ballroom A*

Charting the Course: The 2012-2022 Draft CCMP

Scott Gentry, P.E., *Project Manager, Albemarle-Pamlico National Estuary Program*
Dr. Bill Crowell, *Director, Albemarle-Pamlico National Estuary Program*

Elements of the new draft APNEP Comprehensive Conservation and Management Plan (CCMP) will be presented and discussed. The CCMP is based on the incorporation of ecosystem-based management principles and a simple ecosystem model. The proposed plan has goal and ecosystem outcomes and is presented in 5 components: Indentify, Restore, Protect, Engage, and Monitor.

3:45-4:15 *Ballroom A*

Implementation of Ecosystem Based Management in APNEP: Assessing Progress and Accomplishments

Dr. Carl Hershner, *Director, Center for Coastal Resources Management, Virginia Institute of Marine Science*

Ecosystem Based Management is not easy, but it is supposed to improve the effectiveness of large scale environmental management programs like APNEP. This talk will review the progress made in applying EBM principals to the new APNEP Comprehensive Conservation and Management Plan. Theoretical advantages will be assessed against observable accomplishments as an early assessment of the value of the program's year-long implementation effort. Remaining challenges and key steps in sustaining the approach will be identified.

4:15-4:30 *Heritage Hall*

Break – Exhibits & Posters

4:30-5:00 *Ballroom A*

Monitoring To Enable Effective Adaptive Management

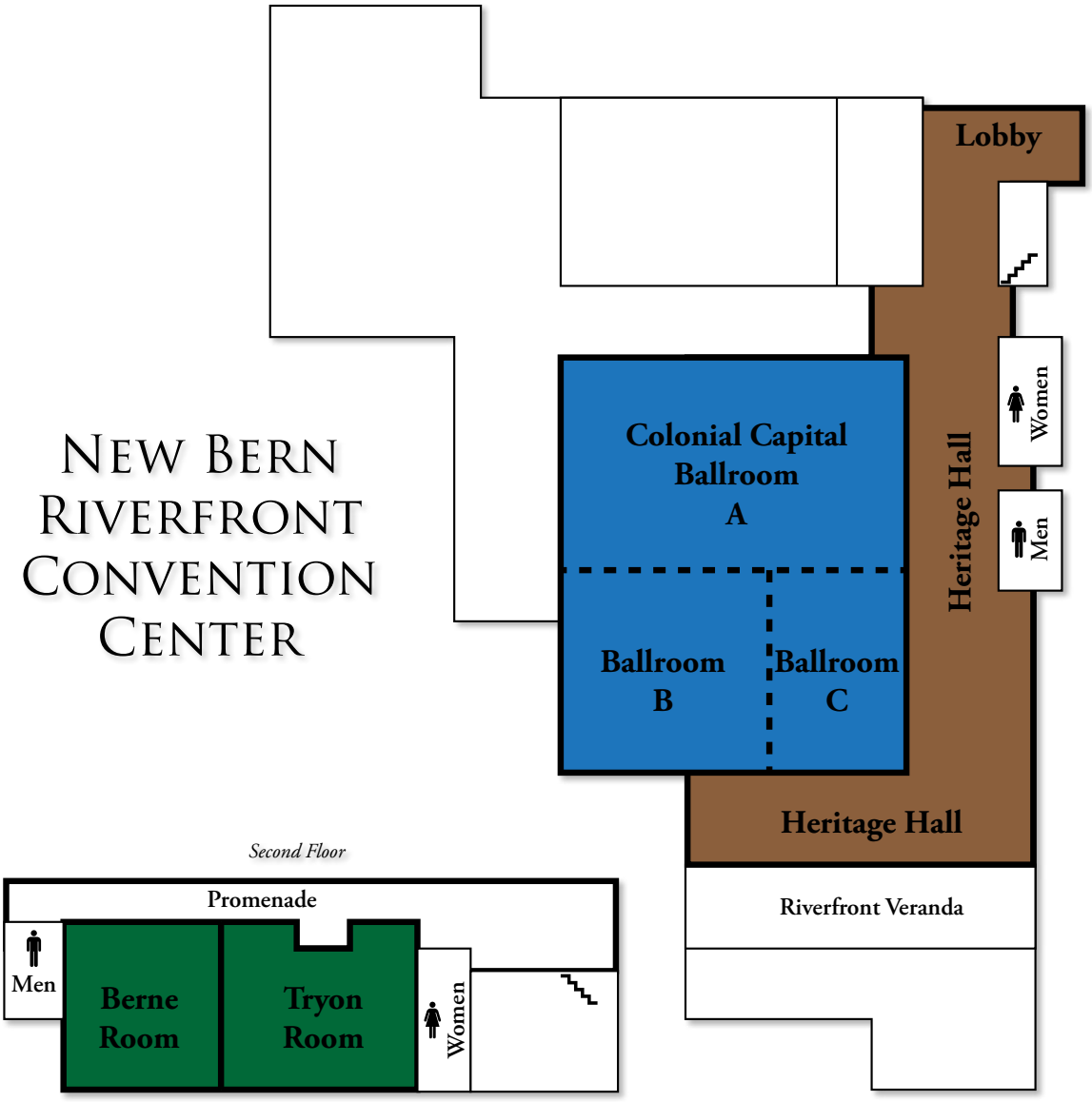
Dr. Kirk Havens, *Science & Technical Advisory Albemarle-Pamlico National Estuary Program*
Director, Coastal Watershed Program, Virginia Institute of Marine Science

Closing Comments

Tony Reevy, *Chair, Policy Board, Albemarle-Pamlico National Estuary Program,*
Senior Associate Director,UNC Institute for the Environment

5:00

Adjourn



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Albemarle-Pamlico National Estuary Program
North Carolina Sea Grant
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This program printed using federal funds provided by the EPA.