



ALBEMARLE-PAMLICO
ECOSYSTEM
SYMPOSIUM

Embarking on a New Voyage

NOVEMBER 20, 2013

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 AICP, CEE, *Director, Albemarle-Pamlico National Estuary Program*

Todd Miller, M.A., *Policy Board Chair, Albemarle-Pamlico National Estuary Partnership, Executive Director, NC Coastal Federation*

10:45-11:00 BREAK – EXHIBITS & POSTERS

Heritage Hall

CONCURRENT SESSIONS

11:00-11:30 JOCKEY'S RIDGE LIVING SHORELINE: A COMMUNITY-BASED RESTORATION AND EDUCATION PROJECT

Ballroom B

Ms. Sara Hallas, B.S., *Coastal Education Coordinator, NC Coastal Federation*

The North Carolina Coastal Federation along with Jockey's Ridge State Park, NC Division of Marine Fisheries and the Nature Conservancy have worked to restore over 750 feet of shoreline, totaling more than 1.5 acres of coastal marsh and riparian habitat, at Jockey's Ridge State Park. The shoreline is now protected by an oyster shell bag sill and was hand-planted with native marsh grasses. Thousands of volunteers worked to bag oyster shell, build the sill, and plant marsh grasses. One key component of this project's success was implementing the federation's student wetland nursery program. This program engages local middle school students in a yearlong classroom curriculum about the coast and coastal habitats. The classroom learning is complimented through hands-on field experience and restoration. Sara will talk about the living shoreline project at Jockey's Ridge, specifically highlighting the components of successful community involvement and restoration. She will also highlight how the project continues to be used as an outdoor classroom for students and teachers alike.

11:30-12:00 TIDAL CREEKS AND MIGRATING REEFS

Ballroom B

Dr. Niels Lindquist, *Professor of Marine Sciences, UNC Chapel Hill Institute of Marine Sciences*

Oyster communities populate many tidal creeks and their filtration activity improves the quality of water flowing through the creeks by reducing levels of suspended particulates and nutrients. Intertidal oyster communities are common in the higher salinity areas near the mouths of tidal creeks, but typically only sparse intertidal and subtidal communities occur in the creeks' upper regions. Although the lower salinities of upper creek areas should enhance oyster communities, less hard substrate and lower numbers of oyster larvae reaching these areas are thought to limit upper creek oyster reef development. Our project (1) demonstrated substrate and larval limitation in the upper regions of multiple tidal creeks and (2) is enhancing oyster populations in tidal creeks by deploying concrete-coated crab pots as oyster substrate in the lower portions of creeks and then subsequently migrating the oyster-coated crab pots to up-creek areas where salinity regimes are favorable for subtidal reef development. Results to date support the generality of our findings; however, we are observing a wide range of reef development trajectories among creeks after 18 months. "Migrating reefs" could help sustain North Carolina oyster populations imperiled by increasing saltwater intrusion into coastal regions caused by human coastline engineering and rising sea levels.



PROTECT/RESTORE

Embarking on a New Voyage



IDENTIFY

11:00-11:30 **INTRODUCING THE NORTH CAROLINA COASTAL ATLAS ++ EXHIBIT**
Ballroom C Dr. Tom Allen, *Associate Professor of Geography, Dept. of Geography, Environment, and Planning,*
East Carolina University

The North Carolina Coastal Atlas is an online mapping system that provides static and interactive maps and related data and information for exploration, analysis and learning about coastal issues and resources for students. Aimed at managers, scientists, teachers, and the public, the atlas combines physical, ecological and human use data to support education, management and decision-making. <http://www.nccoastalatlus.org/>

11:30-12:00 **INSIGHTS INTO HOW ATMOSPHERIC DEPOSITION AND WETLANDS**
Ballroom C **INFLUENCE NUTRIENT TRANSPORT TO ESTUARIES IN THE SOUTHEASTERN U.S.**
Dr. Ana Maria Garcia, *Research Hydrologist, U.S. Geological Survey*

Agricultural activities, including intensive animal production and urbanization, are important anthropogenic sources of nutrients transported to streams that can lead to increased algal production and eutrophication of coastal waters in the southeastern United States. Effective management of controlling nutrient delivery to streams requires a systematic understanding of nutrient sources and pathways at watershed and regional scales. The U.S. Geological Survey (USGS) has developed a modeling tool, SPARROW (SPATIally Referenced Regression On Watershed Attributes), that statistically relates landscape attributes to monitored nutrient loads. Existing SPARROW models for sources and transport of nitrogen and phosphorus for the northeastern and southeastern regions of the United States were modified to investigate specific management questions: (1) what are the sources of atmospheric deposition?, (2) what is the regional-scale impact of coastal wetlands on water quality? Refinements to the nitrogen SPARROW models have improved estimates of individual atmospheric inputs, including emissions from agricultural livestock and manures, vehicles, power plants, other industry, and background sources. The recalibrated nitrogen and phosphorus models account explicitly for the influence of wetlands on regional-scale land-to-water and in-stream transport of nutrients and therefore allow comparison of the water-quality functions of different wetland systems over large spatial scales.



ENGAGE

11:00-11:30 **BLUE CRABS AS EDUCATION TOOLS: OH MY!**
Tryon (2nd floor) Ms. Amy Sauls, CEE, *Science Teacher/ Marine Education Consultant, Jones County Senior High School*

In the US, blue crabs (*C. sapidus*) live along the Atlantic and Gulf coasts. North Carolina is rich in blue crabs throughout all of its estuaries. Blue crabs are the largest commercial seafood harvested in the state. In Texas, blue crabs are the major dietary item for the last natural migratory population of Whooping Cranes (*Grus Americana*), an endangered species. We are working in NC and TX to better understand migration and population dynamics of blue crabs. Cranes starve when crab populations are low. Understanding crab movements, the coupling of crabs and cranes could inform restoration efforts in other areas like Florida and North Carolina. Historically, Lake Mattamuskeet was the center of crane overwintering on the east coast. Our studies include place-based education components in Texas and NC. Our team includes a 6th grade teacher and science educator who identifies components of blue crab biology to meet STEM education efforts. This includes crabbing activities in Texas and NC, lessons, and short informational videos generated by high school students for use by teachers. The researchers are learning the nuances of providing useful information to educators in rural communities with plans for use by educators wherever there are blue crabs.

11:30-12:00 **COMMUNICATING AT THE EDGE: NORTH CAROLINA SEA GRANT INITIATIVES**
Tryon (2nd floor) **FOR TIDAL CREEKS COLLABORATION AND**
CLIMATE CHANGE/SEA LEVEL RISE OUTREACH
Gloria Putnam, M.S.P.H., *Coastal Resources and Communities Specialist, North Carolina Sea Grant*

North Carolina Sea Grant is collaborating with multiple partners on two initiatives to engage local, state, and regional communities on topics of importance to the APNEP Region. The first is a regional effort focused on tidal creeks. Although naturally resilient to fluctuating water and salinity levels, tidal creeks can be stressed by significant changes in local landscapes and lose many of their ecological services. To better understand and improve coordination on tidal creek research, management, restoration and education, we are coordinating regional summits and a planning group for organizations from North Carolina, South Carolina, Georgia and Florida. The second initiative involves collaboration with local, state, and federal partners to improve how community assistance is provided in coastal North Carolina for adapting to climate change. Effective materials and strategies are needed to communicate to the public, decision-makers, and other target audiences about sea level rise and climate change. Equally important, is the need for processes and tools that increase the ability of communities to discuss the topics and identify and adopt adaptation strategies. Our approaches, partners, progress, and plans related to these two initiatives will be highlighted.

11:00-11:30 ALBEMARLE SOUND DEMONSTRATION STUDY OF THE NATIONAL MONITORING NETWORK FOR U.S. COASTAL WATERS AND THEIR TRIBUTARIES
Berne (2nd floor) Dr. Michelle Moorman, *Biologist, US Geological Survey*

The U.S. Geological Survey's (USGS) North Carolina Water Science Center is implementing a demonstration project in the Albemarle Sound for the National Monitoring Network for U.S. coastal waters and their tributaries. The goal of the National Monitoring Network is to provide information about the health of our oceans and coastal ecosystems and inland influences on coastal waters for improved resource management. The network integrates biological, chemical, and physical features and links uplands to the coastal ocean. The purpose of the Albemarle Sound pilot study is to: 1) Inventory current monitoring programs in the Albemarle Sound, 2) Conduct a gap analysis to determine current monitoring needs, 3) Implement a monitoring program to address data gaps, and 4) Create a web-based map portal of monitoring activities. As part of the project, the USGS worked with stakeholders to inventory current programs and design a monitoring program. This presentation will provide more information about the project including a demonstration of the shapefile and database compiled as part of the monitoring inventory, and results from the first year of data collection.

11:30-12:00 REMOTE SENSING OF CHLOROPHYLL A IN SUPPORT OF NUTRIENT MANAGEMENT-NEUSE AND TAR-PAMLICO RIVER ESTUARIES
Berne (2nd floor)

Dr. Darryl Keith, *Research Oceanographer, USEPA/Atlantic Ecology Division/Monitoring and Assessment Branch*

The NC Environmental Management Commission (EMC) has adopted, as a water quality standard, that chlorophyll a concentration should not exceed 40 ug/L in sounds, estuaries, and other slow-moving waters (NC Administrative Code Section 15A NCAC 2B.0212) in response to eutrophic events in the lower Neuse River basin. The North Carolina Division of Water Resources (NCDWR) concluded that algal growth was being stimulated by excess nutrients from agricultural and urban expansion upstream of the estuary. In 2009, a workshop was held to discuss incorporating satellite data into the NC decision process. It was agreed that the high spatial resolution of Chl a data obtained from the Medium Resolution Imaging Spectrometer (MERIS) could be beneficial during any future development of water quality regulations based on "phytoplankton density" and to support retrospective analysis for the potential development of new nutrient regulations or revisions of current regulations. In this study, MERIS data were used to retrospectively analyze (2006 – 2009) compliance of the chl a standard in the Neuse and Tar-Pamlico River estuaries. This study is important because for the first time, remotely sensed data were used to directly address issues associated with the management of total nitrogen in the Neuse and Tar-Pamlico River estuaries.

11:00-12:00 AN OVERVIEW OF THE 2012 ECOSYSTEM ASSESSMENT OF THE ALBEMARLE PAMLICO ESTUARINE SYSTEM
Craven Boardroom

Dr. Dean Carpenter, Program Scientist, Albemarle-Pamlico National Estuary Partnership

One of four major activities in APNEP's approach to adaptive management, the ability to assess regional ecosystem condition and vulnerability, should provide critical information that enables staff and partner decision makers to help ensure that the elements of the Comprehensive Conservation Management Plan (CCMP) remain aligned with the partnership's mission. The 2012 APNEP ecosystem assessment was the first comprehensive ecological assessment in the region since the early 1990s. This presentation will provide an overview of the importance of the role of assessment in APNEP, features of the 2012 report, planned additions and improvements in the near term, and the importance of another adaptive management activity, the design and implementation of monitoring, to improvements APNEP assessments in the longer term.

12:00 PM LUNCH BUFFET
Ballroom A

12:30-1:15 SCIENCE TO SUPPORT ECOSYSTEM MANAGEMENT AND RESTORATION: SYNERGY THROUGH COOPERATION AT APNEP
Ballroom A

Dr. Michael Pichler, *Associate Professor, UNC Chapel Hill Institute of Marine Sciences*

POSTERS

1:15-2:00
Heritage Hall

DEVELOPING A COMPREHENSIVE NC SALINITY DATABASE TO IMPROVE ECOSYSTEM MANAGEMENT, HABITAT RESTORATION AND HUMAN HEALTH

Mr. Rodney Guajardo, *GIS/Database Specialists, UNC Chapel Hill Institute of Marine Sciences*

Salinity is a primary driver of estuarine species distributions, including many foundation species such as oysters, submerged aquatic vegetation, and marsh plants. Spatial and temporal variations in salinity also greatly influence the distribution of higher trophic species (e.g., crustaceans and fishes) and human pathogens. Importantly, sea-level rise over the next century will inject increasing volumes of saltwater into our State's sounds and estuaries, thereby greatly impacting estuarine species and ecosystems. Presently there is no salinity database for North Carolina with sufficiently high spatial and temporal resolution to rigorously examine salinity effects on critical estuarine habitats and human pathogens at multiple spatio-temporal scales and for detecting sea level rise effects on estuarine salinity dynamics. While past and on-going studies provide disparate salinity records for various coastal regions of North Carolina, these data have not been integrated into a single, inclusive platform that connects multiple regions over time. The objective of this CRFL-funded project is to develop a comprehensive NC salinity database that will support queries and analyses valuable for informing diverse management decisions and better guiding restoration of critical habitats. Here we provide an overview of the status of the discovery phase of this project.

TESTING SALINITY-BASED PREDICTIONS OF OYSTER SHELL CULTCH PLANTING SUCCESS

Mr. Adam Tyler, *Commercial Fisherman*

The NC Division of Marine Fisheries has for many decades, worked to enhance and rehabilitate oyster habitat throughout state waters by "planting" oyster shell and marl (or cultch) to create new oyster habitat. One over-arching goal of the cultch planting program is "...to provide additional fishing opportunities for both commercial and recreational fishermen." Given financial constraints and the need to prioritize section activities, DMF's Resource Enhancement Section has sought to measure cultch planting success mainly through annual "quick-look" surveys of oyster spat density on a limited number of sites within different water bodies. These data show great spatial and temporal variability. There is a general decrease in spat counts with increasing plant site age, and these counts often do not reflect subsequent abundance patterns of post-juvenile/adult oysters. The objectives of our Fishery Resource Grant (FRG) project are to (1) identify oyster cultch planting site that are failing to perform as expected; (2) examine boring sponges as a cause of cultch plant site failure; (3) use an evolving coast-wide salinity database, underpinned by data from the Shellfish Sanitation Program, to predict cultch plant success from area salinity characteristics; and (4) use project data to help DMF optimize oyster yields from cultch planting efforts.

RESPONSE OF MICROBIAL-DRIVEN LEAF LITTER BREAKDOWN TO INCREASED SALINITY IN NORTH CAROLINA WETLANDS

Mr. Patrick Korn, *Masters Candidate, East Carolina University*

Climate change predictions for the southeastern United States of accelerating sea level rise and increased frequency and duration of drought will make saltwater incursion more common. The effects of saltwater incursion on microbial function in former freshwater wetlands have received little attention. Saltwater incursion to former freshwater wetlands could change the function of microbial communities, leading to changes in carbon sequestration and nutrient cycling. This proposal examines two questions about the effects of saltwater on microbial processes: 1) Does increased salinity alter leaf litter breakdown rate and the composition of microbial communities on leaf litter packs? 2) How are microbial biomass and the production of microbial enzymes affected by increased salinity? To answer these questions, I will measure leaf litter decomposition rates in three wetland sites spanning a salinity gradient. To examine some potential mechanisms driving differences in decomposition rate, I will measure microbial enzyme activity on leaf litter packs. A microcosm experiment will also be conducted to study the uptake of dissolved organic carbon (DOC), as well as microbial enzyme activity, microbial respiration, and leaf decomposition in controlled salinity. Improved understanding of the consequences of saltwater incursion on microbial function will aid in forecasting the ecosystem consequences of salinization of coastal wetlands.

POSTERS (cont.)

1:15-2:00
Heritage Hall

TESTING A NOVEL RESTORATION METHOD TO ENHANCE OYSTER POPULATIONS IN TIDAL CREEKS

Mr. David “Clammerhead” Cessna, *Commercial Shellfish Harvester*

Oyster-based habitats provide important goods and ecosystem services, including fisheries production, protecting sensitive shores, acting as critical habitat for a wide range of fish and invertebrate species, water clarification and nutrient removal. Tidal creeks along NC’s smaller coastal sounds and estuaries receive and filter much of the region’s runoff. There is a critical need to restore and enhance tidal creek oyster populations to improve water quality in creeks and adjacent sounds and river estuaries. While subtidal oysters occupy upper reaches of many tidal creeks, where periodic freshening diminishes biological stressors, oyster reefs generally only form in intertidal refugia at the mouths of the creeks where salinities are elevated. In conducting a survey of boring sponges in NC oyster habitats, project oystermen harvested numerous large, often single, oysters largely buried in sandy and muddy sediments in high salinity environments. Partial burial in sediments appears to provide oysters an alternative refuge from biological stressors. In this APNEP-funded project, we are using the little recognized buried growth of oysters to enhance oyster populations in the lower portions of tidal creeks in Carteret County, NC. If successful, this restoration methodology would be readily transferable to tidal creek oyster restorations throughout coastal NC and beyond.

EFFECTS OF SALTWATER INCURSION ON THE GROWTH OF BALD CYPRESS (*TAXODIUM DISTICHUM*) FORESTED WETLANDS

Ms. Amanda Powell, *Graduate Student, East Carolina University;*

Dr. Marcelo Ardon, *Assistant Professor in Biology, East Carolina University*

Bald cypress trees are dominant trees in forested coastal wetlands. This study combined field observations and a greenhouse experiment to examine the effects of saltwater incursion on growth of young bald cypress (seedlings and young trees). We examined growth of young trees (>8 years old) that were planted across a restored wetland that has experienced seasonal drought-induced saltwater incursion. We also conducted a greenhouse experiment where we looked at seedling growth under flooded and drought conditions and different salinity treatments. Our results for the young trees indicate that increased water depth did not have a significant effect on diameter (DBH) but did have a significant negative effect on tree height. Increased chloride concentrations from saltwater incursion decreased height and DBH for young trees. In the greenhouse experiment, we found that drought, saltwater, and sulfate had a significant negative effect on height, while drought and saltwater had a significant negative effect on root collar growth. Overall, we found that salinity decreased growth of young bald cypress trees. Increases in saltwater incursion and sea level rise could lead to decreased growth of bald cypress trees which are important for coastal ecosystems and provide habitat and food for wildlife.

FERRYMON AND MODMON: KEEPING A WATCHFUL EYE ON WATER AND HABITAT QUALITY IN THE ALBEMARLE-PAMLICO SOUND SYSTEM

Dr. Hans Paerl, *Kenan Professor of Marine and Environmental Sciences,*

UNC-Chapel Hill Institute of Marine Sciences

North Carolina has existing infrastructure in place to support this vital need in the form of N.C. Dept. of Transportation ferries as “ships of opportunity” which, since 2000 have served as platforms to automatically monitor and assess water quality and ecological health of APES, through a UNC-Duke-NC DENR collaborative program called FerryMon. In addition, the UNC-NC DENR Neuse River Modeling and Monitoring Program (ModMon) provides biweekly water quality information along the estuary and continuous vertical profile data to State, University researchers, educators and the public via an interactive website. ModMon and FerryMon have been instrumental in linking human nutrient enrichment and climatic events to water quality “events” of concern, including algal blooms, low oxygen events, and fish kills. ModMon and FerryMon are highly complementary to the State’s monthly ambient water quality monitoring program in that they fill informational “gaps”, enabling State and Federal water quality managers to more meaningfully connect human and climatic perturbations to estuarine water quality responses in this large system. FerryMon and ModMon are cost-effective tools that ensure optimal water quality in support of long-term sustainable use of the APES for fisheries, recreation, tourism, and environmentally-sound development. It also supports novel scientific research into the causes and consequences of man-induced and climatically-induced perturbations on the ecological integrity and overall value of APES. There is a critical need to predict ecosystem response to water quality change in the APES in order to provide management tools and guide future management action.

Embarking on a New Voyage

CONCURRENT SESSIONS



PROTECT/RESTORE

1:30-2:00

Ballroom B

LANDSCAPE SCALE WATERSHED RESTORATION IN HYDE COUNTY: GOOD FOR FARMERS, GOOD FOR FISHERMEN

Mrs. Erin Fleckenstein, M.S., *Coastal Scientist and Northeast Regional Manager, NC Coastal Federation*

The N.C. Coastal Federation joined farmers, landowners, fishermen, government agencies and business owners to design a set of projects that replicate, as much as practical, natural hydrology on almost 42,500 acres of farmland in Hyde County adjacent to the Pamlico Sound. Ten projects were identified as priorities and together comprise a holistic watershed restoration plan. Six hundred acres have been restored to date and 3,000 more acres of restoration are underway. These restoration projects make use of agricultural runoff that would otherwise be directed to sensitive coastal waterways. The plan improves agricultural water management and water quality for oysters by: creating wetlands that filter agricultural runoff; restoring more natural water flows; and managing the wetlands to maximize wildlife, fisheries and water quality benefits. Erin will present on the federation's latest restoration efforts funded and in partnership with the landowners, Albemarle-Pamlico National Estuary Partnership, N.C. Clean Water Management Trust Fund, N.C. Division of Water Quality, N.C. State University, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service and USDA Natural Resources Conservation Service.

2:00-2:30

Ballroom B

FATE OF RESTORED OYSTER REEFS GOVERNED BY PRINCIPLES LEARNED FROM ROCKY SHORES AND SALTMARSH WETLANDS

Dr. Joel Fodrie, *Assistant Professor of Fisheries Ecology and Oceanography, UNC Chapel Hill Institute of Marine Sciences*

Thirty-two oyster shell piles were constructed across an aerial exposure gradient (shallow subtidal to mid-intertidal) to explore how oyster recruitment, growth and interspecific interactions affected the trajectory of restored oyster reefs. We recorded nearly an order-of-magnitude higher spat settlement on the deepest (subtidal) reefs. Within a year, however, abundance patterns reversed, and oyster densities were ultimately highest on the shallowest (mid-intertidal) reefs by over an order-of-magnitude. This reversal was due to: 1) greatest individual oyster growth at mid depths; and 2) significantly elevated survivorship on intertidal reefs over subtidal reefs. Likely, these patterns followed from the restriction of oyster predators (e.g., stone crabs, gastropods) and heavy biofouling to deeper reefs where aerial exposure was <5% of the tidal cycle. These results demonstrate that the siting of new reefs can be guided by paradigms learned from the rocky intertidal and saltmarshes. As with rocky shores, the lower vertical limit of adult oyster distribution in euhaline systems was controlled by predatory and competitive (i.e., smothering) interactions. As with *Spartina* saltmarsh, oyster growth was greatest at an intermediate vertical position relative to mean sea level. Our developing model proscribes a vertical "hotspot" for restoration efforts to maximize reef fitness and production. This restoration work was funded by APNEP.

2:30-3:00

Ballroom B

OYSTER REHABILITATION, RESTORATION AND MANAGEMENT IN NORTH CAROLINA

Mr. Craig Hardy, *Chief, Habitat and Enhancement Section, NC Div. of Marine Fisheries, NC DENR*

The health of the oyster population in North Carolina is affected by factors from the effects of hurricanes, water quality, predators, habitat loss, and harvest pressure. The NC Department of Environment and Natural Resources through the Division of Marine Fisheries incorporates various strategies to enhance and create oyster habitat, map and monitor oyster resources, manage the oyster harvest, and administer shellfish culture in the state. Collaboration with state and federal agencies, non-government organizations, researchers, oyster restoration practitioners, fishermen, and the public are keys to the success of projects and overall oyster resource management.

1:30-2:00
Ballroom C

USING POSITIVE INTERACTIONS BETWEEN BIVALVES AND SEAGRASS AS A COMMUNITY BASED APPROACH FOR HABITAT MANAGEMENT

Ms. Abigail Poray, M.B., *Researcher and Lab Manager, UNC Chapel Hill Institute of Marine Sciences*

This project investigated the potential use of hard clams (*Mercenaria mercenaria*) as a restoration technique for the recovery and growth of eelgrass (*Zostera marina*) habitat. Hard clams were introduced into eelgrass meadows at Oscar Shoal (Back Sound) and Lighthouse Bay (Roanoke Sound) in March of 2010 and 2013 (with paired control sites). Following clam deployment, we made seasonal measurements of sediment and seagrass nutrient content, seagrass aboveground biomass, seagrass growth, and seagrass reproductive output. We recorded evidence of sediment nutrient enrichment via decreased C:N ratios in clam-addition plots, although changes in nutrient content were not observed in seagrass tissues themselves (above or below ground). Despite dramatic seasonal cycles in eelgrass production, we also observed a significant response in aboveground biomass and individual plant growth following the addition of clams in the summers of 2010 and 2013. As measured in 2011, reproductive effort was higher in plots that received clam subsidies relative to plots that were used as controls. Collectively, these data suggest that positive bivalve-seagrass interactions may be an effective tool for strengthening the function and resiliency of North Carolina seagrass meadows.

2:00-2:30
Ballroom C

THE NORTH CAROLINA DIVISION OF COASTAL MANAGEMENT'S ESTUARINE SHORELINE MAPPING PROJECT

Matt Slagel, M.S., *Shoreline Management Specialist, NC Division of Coastal Management*

The goal of the project was to classify North Carolina's estuarine shoreline by type and delineate all shoreline armoring structures and access structures. The final product is a geospatial representation of the complete estuarine shoreline and structures for the state's 20 coastal counties. These shoreline characterizations allow the NC Division of Coastal Management to generate county-level and municipal statistics and analyze data for the purpose of understanding the nature of shoreline types and frequency of shoreline structures. Structures along the estuarine shoreline may affect ecosystem function, water quality, fisheries, wetland habitats and other natural resources. Completed shoreline data has been made available on DCM's website for other DENR agencies, local governments, academic institutions, and interested stakeholders. DCM is in the process of updating this information using 2012 aerial imagery. Updating the data will help DCM keep pace with changes along the estuarine shoreline and monitor future development trends. DCM intends for the Estuarine Shoreline Mapping Project to provide interested stakeholders with updated shoreline information and the ability to modify management policies to mitigate risk to estuarine environments and provide for resource conservation into the future.

Interactive Shoreline Mapping Site: <http://ims.ncdenr.org/Website/ncshore/viewer.htm>

Data Download Page: <http://dcm2.enr.state.nc.us/Maps/chdownload.htm>

2:30-3:00
Ballroom C

A NATURAL HERITAGE INVENTORY OF THE LOWER ROANOKE FLOODPLAIN

Dr. Stephen Hall, *Landscape Ecologist, North Carolina Natural Heritage Program*

The floodplain of Lower Roanoke River in North Carolina contains one of the largest, least fragmented blocks of riparian forest along the Atlantic Coast. This area has been a major focus of Natural Heritage Program inventories since the 1970s, which helped guide the conservation of over 170 square miles of its natural habitats. It is also, however, an area subject to strong environmental change. In 2012, the Natural Heritage Program conducted a new inventory of the floodplain to monitor changes to native species and natural communities, giving particular attention to the biologically rich alluvial forest and slope habitats as well as areas important for maintaining the landscape integrity of the floodplain. Some of the rarest species previously identified within the floodplain, such as the Cerulean Warbler and Atlantic Ispopyrum, appear to be declining. Mississippi Kites and Swainson's Warblers, on the other hand, appear to be increasing while still others, such as the Cocoa Clubtail Dragonfly, Limestone Wild Petunia, and Squatty Ambersnail, were documented within the floodplain for the first time. High priority conservation recommendations include the protection of a newly identified Significant Natural Heritage Area and the protection/restoration of areas where movement of native species has become strongly constricted.

1:30-2:00 SHAD IN THE CLASSROOM

Tryon (2nd floor) Ms. Melissa Dowland, M.S., *Coordinator of Teacher Education, NC Museum of Natural Sciences*
 Ms. Megan Chesser, M.S., *Curator of Teacher Education, NC Museum of Natural Sciences*

The Shad in the Classroom program connects teachers and students with North Carolina river basins through active participation in American Shad restoration efforts in the Neuse and Roanoke Rivers. Teachers receive materials and training, and raise American Shad from egg to releasable fry for one week in their classrooms. Students become stewards of their Shad through observation, water quality monitoring, and a field trip to release fry into the river. Teachers have the opportunity to be immersed in American Shad habitat through an overnight field experience on the Roanoke River. The Shad in the Classroom program allows teachers and students to become active participants in fisheries management and research, exposing students to careers in the natural sciences and fostering a connection with the natural environment. In the spring of 2014, a new outreach component will provide programming on American Shad to Roanoke River communities, featuring an inspiring production about the Roanoke River to be shown the Museum’s inflatable Geodome theater and supplemented by educational activities

2:00-2:30 LANDSCAPING FOR WATER QUALITY IN CURRITUCK COUNTY, NC

Tryon (2nd floor) Ms. Barbara Doll, P.E., M.S., *Water Protection and Restoration Specialist, North Carolina Sea Grant*

In 2008, Currituck County began a Goes Green Initiative to operate in a manner to conserve, sustain and enhance the environment and natural resources. The initiative has provided sustainability leadership, education and opportunities for county employees, citizens and businesses. As an initiative partner, NC Sea Grant and Cooperative Extension worked with the county to develop a sustainability mission statement, create a sustainability resolution; launch a website for businesses and citizens; conduct design charettes for county properties; and secure APNEP funds for a stormwater retrofit demonstration project. The demonstration was intended to educate target audiences about the methods and value of incorporating wetlands and native plants into the developed landscape. In 2010, wetland features were added to existing stormwater ponds at the County’s Cooperative Extension Facility to improve stormwater treatment. Perennial buffers were added to improve water quality, deter geese and improve aesthetics. Additional funding was obtained to install monitoring equipment to assess improvements in water treatment from the modifications. A small wildlife garden of native plants was also installed adjacent to the largest pond. The design process and end product helped the county to visualize and understand what adopting “green” practices can do for a site and the environment.

2:30-3:00 STUDENT DATA COLLECTION: THE BASIC OBSERVATION BUOY (BOB)

Tryon (2nd floor) Mr. David Sybert, B.S., *K-12 Education Specialist, UNC Coastal Studies Institute*

The Basic Observation Buoy (BOB) program provides students the opportunity to collect water quality data from the Albemarle, Pamlico and Currituck Sounds. UNC Coastal Studies Institute has worked alongside partners at North Carolina Sea Grant and NOAA Monitor National Marine Sanctuary to implement this project among seven schools in northeastern North Carolina. The students construct a basic buoy that supports water quality and atmospheric sensors and records data for five to seven days. The students retrieve the buoy at the end of each week to recharge batteries, recalibrate sensors, download the data from the on-board computer and upload it to the Internet. The data is shared in a large network of BOB buoys along the East Coast.

1:30-2:00 SALTWATER INCURSION ALTERS NITROGEN AND CARBON EXPORT
 FROM A RESTORED COASTAL PLAIN WETLAND

Berne (2nd floor)

Dr. Marcelo Ardon, *Assistant professor, Department of Biology, East Carolina University*

Dr. Emily Bernhardt, *Associate professor, Department of Biology, Duke University*

Sea-level rise and decreased precipitation will increase the probability of saltwater incursion into formerly freshwater wetlands. Saltwater incursion can alter the availability and chemical species of carbon (C) and nitrogen (N) in water through various mechanisms. Over five years, we examined carbon (DOC) and nitrogen (NO₃⁻, NH₄⁺, and TDN) export from the Timberlake Observatory for Wetland Restoration (TOWeR), a large (440 ha) restored wetland that drains into the Albemarle Sound. In three out of the five years we documented drought-induced saltwater incursion during fall and winter. Increased salinity decreased DOC export by half and doubled NH₄⁺ export. Decreases in DOC export were driven both by changes in the concentration of DOC in surface water and decreased water export. Salinity also changed the composition of dissolved organic matter exported from the site as evidenced by changes in fluorescence. Laboratory assays indicated that flocculation could partially explain decreases in DOC concentrations observed in the field. Increased NH₄⁺ concentrations during periods of increased salinity were due to salt-cation exchange with sediments. Understanding the response of coastal plain wetlands to saltwater incursion is necessary to forecast the potential negative impacts on water quality of the Albemarle-Pamlico sound in response to land-use and climate change.

2:00-2:30 FERRYMON AND MODMON: KEEPING A WATCHFUL EYE ON WATER AND
 HABITAT QUALITY IN THE ALBEMARLE-PAMLICO SOUND SYSTEM

Berne (2nd floor)

Dr. Hans Paerl, *Kenan Professor of Marine and Environmental Sciences,*

UNC-Chapel Hill Institute of Marine Sciences

The Albemarle-Pamlico Estuarine System (APES) is North Carolina's most important aquatic resource. It is also the Nation's second largest estuary and supports a large fraction of the Southeastern U.S. fishery, and is the mainstay of North Carolina's coastal economy (>4 billion dollars annually). Maintaining a high standard of water quality is critical for supporting the vital ecological and socio-economic roles the APES plays for North Carolina and the Nation. Despite its importance as essential fish habitat, and its tourism, recreational and residential value, the much of the APES is not monitored for water quality by State or Federal agencies, in stark contrast to its sister estuary to the north, the Chesapeake Bay. Keeping a watchful eye on and maintaining acceptable water quality of this invaluable resource has become a critical need in light of rapid residential growth, agricultural and industrial expansion in the APES watershed, AND the impacts of climatic changes facing the system; including a period (since the mid 1990's) of elevated tropical cyclones and extra-tropical storms, floods, record droughts and the continuing threat of sea-level rise impacting North Carolina's fragile coastal zone. It is essential that we develop a continuous data-base that will enable researchers, educators, water quality and fisheries managers, and decision makers to examine and evaluate the relative effects and importance of human nutrient enrichment and climatic events on APES. Fortunately, North Carolina has existing infrastructure in place to support this vital need in the form of N.C. Dept. of Transportation ferries as "ships of opportunity" which, since 2000 have served as platforms to automatically monitor and assess water quality and ecological health of APES, through a UNC-Duke-NC DENR collaborative program called FerryMon. In addition, the UNC-NC DENR Neuse River Modeling and Monitoring Program (ModMon) provides biweekly water quality information along the estuary and continuous vertical profile data to State, University researchers, educators and the public via an interactive website. ModMon and FerryMon have been instrumental in linking human nutrient enrichment and climatic events to water quality "events" of concern, including algal blooms, low oxygen events, and fish kills. ModMon and FerryMon are highly complementary to the State's monthly ambient water quality monitoring program in that they fill informational "gaps", enabling State and Federal water quality managers to more meaningfully connect human and climatic perturbations to estuarine water quality responses in this large system. FerryMon and ModMon are cost-effective tools that ensure optimal water quality in support of long-term sustainable use of the APES for fisheries, recreation, tourism, and environmentally-sound development. It also supports novel scientific research into the causes and consequences of man-induced and climatically-induced perturbations on the ecological integrity and overall value of APES. There is a critical need to predict ecosystem response to water quality change in the APES in order to provide management tools and guide future management action.

2:30-3:00 NOVEL APPROACHES TO DECISION SUPPORT AND
 STAKEHOLDER ENGAGEMENT IN ESTUARINE SYSTEMS

Berne (2nd floor)

Mr. David Jasinski, M.S., *Vice President, Chesapeake Environmental Communications*

An informed and engaged public can be a tremendous ally in the management, preservation, and restoration of natural systems. We present two examples of information rich and visually engaging tools that represent the next level in decision support and stakeholder engagement. The James River Watch (JRW) – The JRW is a map-based web page developed for the James River Association (Richmond, VA) for the purpose of informing the general public on current health and safety conditions at multiple locations in the James River watershed. Data from USGS, the National Weather Service, and NOAA are accessed every fifteen minutes to update conditions on the map. Additionally, volunteer watershed monitors, managed by the James RiverKeepers, can upload the data that they collect weekly through the summer. This information is used to inform visitors to the JRW about current swimming and fishing conditions. The James River Association has indicated that the JRW has resulted in “record-breaking” traffic to their website indicating that it has been a stakeholder engagement success. This system is becoming a model for other organizations conducting volunteer monitoring with a desire to develop a framework for public access and information. The Chesapeake Bay Ecological Atlas (Atlas) – The Atlas is a custom iBook for the iPad developed for NOAA’s National Centers for Coastal Ocean Service (NCCOS). It features interactive diagrams and maps based on the thirty-year data record in Chesapeake Bay. NCCOS research and several of their scientists are featured prominently throughout the product, creating broader awareness around the value of federal research. The Atlas has been developed as a highly visual, interactive, and data-rich learning tool for high school through college age students and as a desktop reference for environmental managers. NCCOS plans to make the Atlas available for free download from the iTunes bookstore.



ECOSYSTEM-BASED
MANAGEMENT

1:30-2:00

*Craven
Boardroom*

**APNEP’S COMPREHENSIVE CONSERVATION AND
MANAGEMENT PLAN (2012 – 2022): COLLABORATIVE ACTIONS FOR
PROTECTING AND RESTORING THE ALBEMARLE-PAMLICO ECOSYSTEM**

Ms. Lindsey Smart, M.E.M., *Project Coordinator, Albemarle-Pamlico National Estuary Partnership*

The development of the 2012-2022 Comprehensive Conservation and Management Plan (CCMP) has been a significant milestone for the Albemarle-Pamlico National Estuary Partnership. The current plan’s integration of ecosystem-based management approach provides a landmark shift from the management methods presented in the previous CCMP (1994). While the Albemarle-Pamlico estuarine system is rich in natural resources, it is not without its unique challenges. The CCMP is aimed at helping to navigate those challenges. The objectives, actions, and intended outcomes within the current plan were carefully crafted through a systems-based analysis of the regional ecosystem. Initiatives within the plan include protection and restoration efforts to improve water quality and habitats, identification of knowledge gaps in system concepts, and public engagement to foster connections to the natural environment. Many of these initiatives are achieved through key collaborative partnerships and leveraged resources. The continued success of CCMP implementation, and of APNEP as a program, is highly dependent upon the success of these partnerships. This presentation will explore the objectives, actions, and expected outcomes that constitute the CCMP and will also explore how the systems-approach provides the foundation for this plan.

2:00-2:30

*Craven
Boardroom*

**IMPLEMENTING THE 2012-2022 COMPREHENSIVE CONSERVATION AND
MANAGEMENT PLAN**

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

After more than four years of work, Albemarle-Pamlico National Estuary Partnership (APNEP) released its new Comprehensive Conservation and Management Plan (CCMP) in 2012. The 10-year strategic plan is based on the principles of Ecosystem-Based Management and incorporates collaborative approaches to implementation. The session will present APNEP’s plan for a collaborative approach to implementation of the CCMP’s actions.

2:30-3:00

*Craven
Boardroom*

ADAPTIVE MANAGEMENT IN AN ECOSYSTEM BASED MANAGEMENT PROGRAM

Dr. Carl Hershner, *Director, Center for Coastal Resources Management, VIMS*

Dr. Kirk Havens, *Director, Coastal Watersheds Program, Center for Coastal Resources Management, VIMS*

Ecosystem based management presumes an understanding of the managed system which typically does not exist. This places an emphasis on capacity to learn-while-doing. To accomplish this in a public program that needs a high degree of accountability, the program must incorporate very effective adaptive management strategies. Key to these are appropriate design of monitoring and planned utilization of monitoring information in program performance assessments. When undertaken correctly these assessments can help manage the inherent uncertainties in environmental restoration and incrementally improve the operative system model. Application of this framework to the new APNEP CCMP will be explained.

CONCURRENT SESSIONS



PROTECT/RESTORE

3:15-3:45
Ballroom B

STRATEGIC HABITAT AREAS WITHIN THE APNEP REGION

Ms. Christine Jensen, *Marine Fisheries Biologist, NC Division of Marine Fisheries*

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". These areas are determined through a scientifically-based process that considers existing habitats, human alteration factors, biological data, and input from regional experts. Strategic Habitat Areas have been identified for most of the APNEP region and nominations for the remaining portion of the APNEP region are currently under 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.

3:45-4:15
Ballroom B

STATUS OF THE NORTH CAROLINA NUTRIENT CRITERIA DEVELOPMENT PLAN

Ms. Dianne Reid, *B.S., Environmental Sciences Section Chief, NC Division of Water Resources*

North Carolina has established itself as a leader in site-specific, flexible nutrient control strategies through the implementation of a comprehensive nutrient management program for its surface waters. Existing programs include numeric nutrient response criteria, ambient monitoring programs, assessment methodologies, nutrient TMDLs, regulatory control of nonpoint sources, nitrogen and phosphorus permit limits, and an innovation supplemental classification of Nutrient Sensitive Waters (NSW) for certain waters of the state. In 2004, the division began implementing a plan for updating and expanding nutrient control criteria for the state to address some areas such as biological response parameters that were not included in the current management strategies. That plan was the NC Nutrient Criteria Implementation Plan that is now being totally revised and has been renamed the NC Nutrient Criteria Development Plan (NC NCDP). This presentation will provide a brief background on the NC NCDP, current status and the timeline for revisions to the plan.

4:15-4:45
Ballroom B

ALBEMARLE-PAMLICO PEATLAND ENHANCEMENT PROJECT: WATER MANAGEMENT IMPLEMENTATION

Mr. Chuck Peoples, *M.S., The Nature Conservancy*

The Nature Conservancy (TNC) has long worked to conserve the lands and waters of the Albemarle-Pamlico estuarine system. Recently, in concert with land conservation, TNC is focused on restoring wetland hydrology to help resource managers mitigate the impacts of climate change. The region is vulnerable to salt water intrusion and catastrophic wildfires given its geography, organic soils, and increasingly powerful storms. Human-based alterations such as drainage ditches are often present on conservation lands as remnants of past land use and exacerbate the landscape's vulnerability to climate and other impacts. Currently, over 280 miles of ditches at Alligator River National Wildlife Refuge (ARNWR) contribute to the release of acidic freshwater, low in dissolved oxygen, into contiguous waters. Ditches are also conduits for saltwater intrusion into forested swamps and pocosin, degrading organic soils. Three ditch plugs were installed and evaluated at ARNWR to demonstrate a water management approach for ditches. Measurements and observations indicate that plugs prevent saltwater intrusion, but vary in ability to prevent the release of low dissolved oxygen water towards the sound. In addition, four water control structures at Great Dismal Swamp NWR were installed to raise water level and prevent peat soil oxidation. These structures will support a larger water management effort at the refuge.



3:15-3:45
Ballroom C

SEARCHING FOR SENSITIVE JOINTVETCH - A SPECIES IN DECLINE

Mrs. Misty Buchanan, *M.S., Natural Areas Inventory Manager, NC Natural Heritage Program*

Sensitive Joint-vetch (*Aeschynomene virginica*), a federally Threatened plant, is currently known from Maryland, New Jersey, Virginia, and North Carolina. In Maryland, New Jersey, and Virginia, its habitat is tidal freshwater marshes of river systems. Sensitive Joint-vetch seems to grow best in marsh edges at an elevation near the upper limit of tidal fluctuation. In early 2013, none of the historical populations in North Carolina were thought to persist. The occurrences most recently observed in NC (last seen in 2011), were in wet roadside ditches, not high quality habitat. Most of the surveys in NC for this species have focused on previously known locations at roadside ditches, rather than high quality estuarine habitat. In 2012, NC botanists from state Heritage Programs and USFWS surveyed populations in Virginia and Maryland to learn successful survey techniques, and in 2013, these survey methods were applied in North Carolina. Despite training in habitat identification, in 2013 surveys, no new Sensitive Joint-vetch populations were found in high quality habitat along the Trent River, Pamlico River, or in Swan Quarter National Wildlife Refuge, or in any new sites within roadside ditches surveyed. Only one small population was found in North Carolina (at a location previously believed extirpated).

3:45-4:15
Ballroom C

INTEGRATING AN ESTUARINE RESEARCH AND MONITORING PROGRAM (DCERP) INTO COASTAL DECISION MAKING

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

The Defense Coastal/Estuarine Research Program (DCERP) has conducted research and monitoring on the New River Estuary and Marine Corps Base Camp Lejeune (MCBCL) since 2006. MCBCL provides an ideal platform for DCERP because it includes barrier, aquatic, estuarine, wetland, and terrestrial ecosystems. The second phase of DCERP (DCERP2) is focused three major themes: climate change, the carbon cycle, and translating science into practice. These three themes span the four ecosystem modules and 12 research projects that are part of DCERP2. Managing infrastructure and natural assets in coastal regions requires significant research and monitoring to inform decisions. DCERP and DCERP2 have generated tremendous amounts of data and have made significant effort to convey those data to coastal decision makers beyond MCBCL. Coordination with estuarine resource groups such as APNEP has and will be a priority for DCERP.

4:15-4:45
Ballroom C

INTEGRATING STAKEHOLDER ENGAGEMENT, SCENARIO ANALYSIS, AND ECOSYSTEM-SERVICE MAPPING FOR CONSERVATION PLANNING IN THE ALBEMARLE-PAMLICO BASIN

Dr. Paul Angermeier, *Research Scientist and Professor, Virginia Cooperative Fish and Wildlife Research Unit, Virginia Tech; U.S. Geological Survey*

Dr. Amy Villamagma, *Research Scientist, Dept. of Fish & Wildlife Conservation, Virginia Tech*

Assessing the capacity of landscapes to provide ecosystem services (ES), demand for services, flow of benefits, and ecological pressures reducing services, can enhance our understand of how land/water use decisions impact ES delivery and human wellbeing (HWB). We developed spatially explicit methods for assessing watershed-derived ES and mapping elements of ES delivery. To advance the utility of these methods, we engaged with conservation stakeholders from 27 groups working in the Albemarle-Pamlico basin (APB). We conducted workshops to a) discuss how an (ES) framework might be useful, b) co-develop plausible future scenarios for the APB, and c) share spatially-explicit, basin-wide maps of components of ES delivery and HWB. When used together, stakeholder engagement, scenario analysis, and ES mapping exposes trade-offs in resource-use decisions, thereby informing environmental choices. Our future scenarios included changes in human population, economics, and land use, as well as management responses to those changes. Our resulting maps of ES capacity, ecological pressures on ES, and potential impacts on HWB sparked additional discussion. Overall, our 3-year project produced an innovative process for mapping ES and HWB, better understanding of the advantages and disadvantages of scenario analysis, and new insights into how an ES framework can inform conservation planning.

3:15-3:45 **ENGAGING TEACHERS IN WATER QUALITY EDUCATION TO CONNECT THE ENVIRONMENT AND HUMAN HEALTH**

Tryon (2nd floor)

Mrs. Sarah Yelton, M.S., CEE, *Environmental Education Coordinator,*

UNC Institute for the Environment/UNC Superfund Research Program

Since 2007, the UNC Superfund Research Program, UNC Institute for the Environment and APNEP have partnered to provide North Carolina middle and high school science teachers with hands-on, investigative professional development about the diverse environmental science, health and civics issues related to water quality in NC. Learn how project coordinators work with multiple partners to design an authentic experience that allows participants to explore watersheds and aquatic ecosystems, develop skills in watershed monitoring, examine methods for addressing hazardous chemicals that threaten water quality and discover the effects of contaminated water sources on wildlife, ecosystems and human health. Strategies for including scientists and incorporating cutting-edge research on the health effects of toxic contaminants and water quality monitoring techniques into programming will also be addressed. Post-institute evaluations revealed that 100% of participants increased both their content knowledge and confidence in teaching about water quality and hazardous waste issues as a result of programming. 100% of teachers reported that they planned to incorporate activities featured during the institute into instruction and 70% reported an increased comfort level in teaching outdoors as a result of participation. Agenda, sample activities and evaluation results will be shared during the session.

3:45-4:15 **IDENTIFICATION OF HEALTHY WATERS IN THE CHOWAN BASIN**

Tryon (2nd floor)

Mr. Todd Janeski, B.S., *VA Healthy Waters Program Manager*

The Virginia's Healthy Waters Program (VHWP) takes a systems approach to identify and protect the resources with highest ecological integrity and diversity. Virginia Healthy Waters Program 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. The success of the Virginia's Healthy Waters Program is the collaboration with state, federal, regional agencies as well as local stakeholders to identify opportunities to implement the protection of critical resources. This session will explore the VHWP and the progress being made in the shared Chowan basin to identify and conserve healthy resources through a partnership with the APNEP, the State of NC and the Nature Conservancy.

4:15-4:45 **FOSTERING PUBLIC ENGAGEMENT AT THE NORTH CAROLINA COASTAL RESERVE**

Ms. Kate Brogan, M.E.M., *Communications Specialist, NC Coastal Reserve*

The North Carolina Coastal Reserve is a partnership between NOAA and the N.C. Division of Coastal Management that manages ten protected sites along the North Carolina coast, including several in the Albemarle-Pamlico region. The Reserve promotes informed management and stewardship of North Carolina's estuarine and coastal habitats through research, education, and by example. The Reserve uses a variety of outreach and communications strategies to engage stakeholders about the value of estuarine ecosystems and the interaction between human activities and coastal systems. Educational opportunities for both students and professionals, outreach activities at festivals and events, online interactions, and advisory committees comprised of local community leaders all target specific audiences with relevant information about the Reserve program and mission. Examples of the Reserve's current engagement efforts will be presented, and discuss strategies for communications planning and evaluation.

3:15-3:45*Berne (2nd floor)***RELATION OF WATERSHED SETTING AND STREAM NUTRIENT YIELDS IN CENTRAL AND EASTERN NORTH CAROLINA**Steven Harden, *Hydrologist, U.S. Geological Survey*

The U.S. Geological Survey conducted a cooperative study with the North Carolina Division of Water Quality to characterize relations between watershed settings and stream nutrient yields throughout central and eastern North Carolina. Stream yields of nitrate, total nitrogen (N), and total phosphorus (P) were compiled for 48 sites for 1997–2008. Environmental data also were compiled, including land cover, hydrologic soil groups, streamflows, wastewater treatment facilities, and confined animal feeding operations. The environmental data were used to characterize the watershed settings for the study sites. Data analyses indicated that grouping and examining stream nutrient yields based on land-use classifications developed for the study can be useful for characterizing relations between watershed settings and nutrient yields. The analysis of data with four regression tree models showed that some of the environmental variables, such as percentage of forested land and point-source flow contributions in the watersheds, were useful predictors of nitrate, total N, and total P yields in the streams. The regression tree models can serve as a tool for relating differences in select watershed attributes to differences in stream nutrient yields, which can provide beneficial information for improving nutrient management in streams throughout North Carolina.

3:45-4:15*Berne (2nd floor)***ACCURACY OF PROTOCOL TO MONITOR SUBMERGED AQUATIC VEGETATION AT SENTINEL SITES IN NORTH CAROLINA**Dr. Josseph Luczkovich, *Associate Professor, East Carolina University*

Monitoring change in North Carolina's Submerged Aquatic Vegetation (SAV) coverage is a significant undertaking that is one of the goals of APNEP. High-resolution aerial digital photography being used at 5-year intervals to monitor inter-annual variability, but turbid water conditions make it difficult to reliably detect SAV from aerial surveys alone. Here, we test the accuracy of APNEP boat-based protocol established in 2012 using transects established sentinel sites (low-salinity sites at Currituck Sound, Blount's Bay in Pamlico River, and high-salinity site at Jarrett Bay in Core Sound). We collected continuous single-beam echosounder (BioSonics DTX in Sep 2012 and Lowrance HDS5 in April 2013) data along transects at each site and used a pole-mounted low-light video camera to get bottom images at 100 random locations to estimate % accuracy. Accuracy of SONAR relative to video was 77% in Fall 2012 at Currituck and 88% at all three locations in Spring 2013. The boat-based methods can be done rapidly at a sentinel site (2 days per site) at low cost. We recommend that the sentinel sites expanded to include at least 25 such sites in low and high salinity regions surveyed at 5-year intervals along with concurrent aerial photography.

4:15-4:45*Berne (2nd floor)***ESTUARINE OBSERVING IN NORTH CAROLINA - PAST, PRESENT, AND FUTURE**Dr. Reide Corbett, *Professor, East Carolina University, UNC Coastal Studies Institute*Dr. J.P. Walsh, *Associate Professor, East Carolina University, UNC Coastal Studies Institute*

Regional observing systems generally depend on the cooperation of multiple local monitoring sites and the organizations responsible for them. The principle is that the benefits to the users from this cooperation exceed the sum of the individual activities. Although NC has made strides in establishing a robust monitoring network in the Albemarle Pamlico Estuarine System (APES), there are opportunities for improvement. Examples include a large observing platform built and equipped with funds provided by UNC-GA in 2008 (NC-EONS). Unfortunately, this platform was destroyed before the first data was collected. Previous partnerships between ECU, ECSU, and the Corps of Engineers constructed and established an observing site in the Albemarle Sound (AL-EON) that continues to collect data (albeit, with fewer instruments today). FerryMon, an innovative ferry-based water quality monitoring system first established in 2000 and coordinated by UNC-IMS, has been critical to the long-term environmental management of the APES. Based on these and other efforts, it is clear that NC has made a substantial commitment to create an estuarine observing system to establish baseline conditions, evaluate temporal change, and understand the coastal response to events. This presentation will provide a short overview of some observing efforts in the APES and discuss possible partnerships moving forward.



4:15-4:45

Craven
Boardroom

USING SOCIAL NETWORK ANALYSIS TO IDENTIFY COMMUNICATION PATTERNS AMONG ALBEMARLE-PAMLICO NATIONAL ESTUARY PARTNERSHIP PARTNERS

Ms. Kate Brogan, *M.E.M., Communications Specialist, NC Coastal Reserve*

In order to accomplish its mission of conservation and restoration with a limited budget, the Albemarle-Pamlico National Estuary Partnership (APNEP) engages in cooperative projects with a variety of partner organizations. As APNEP implements the 2012 Comprehensive Conservation and Management Plan, communicating with existing partners, identifying potential collaborators, and encouraging information sharing is crucial to efficiently accomplishing management plan objectives. In order to assess how APNEP interacts with its partners and the larger environmental community, a social network analysis was developed to map individuals and organizations that regularly communicate about environmental issues in the Southeast. Using snowball survey methodology to identify relevant individuals and organizations, regional social network maps were created using the statistics program R. The social network maps include representations of communication links between sectors, the relative importance of specific individuals within the network, and a geographic representation of the connections between environmental professionals in the region. Analysis of the network maps identified geographical and organizational gaps in APNEP's outreach efforts, as well as key individuals whose network position could be leveraged to improve information transfer among the regional network. The network map structures provided implicit recommendations for improving outreach efforts and targeting APNEP's limited resources to increase collaboration and share information efficiently with stakeholders.

3:15-3:45

Craven
Boardroom

INTEGRATING IMPLEMENTATION OF APNEP'S CCMP WITH NC'S COASTAL HABITAT PROTECTION PLAN AND OTHER PARTNERS

Mr. Jimmy Johnson, *D.S., Albemarle-Pamlico National Estuary Partnership*

The Albemarle-Pamlico National Estuary Partnership (APNEP) has multiple partners who also utilize conservation plans and conservation strategies within their own organizations. One such plan is NC's Department of Environment and Natural Resources' Coastal Habitat Protection Plan (CHPP). This presentation will look at how the CCMP integrates these plans and how the CCMP is a complimentary document to a number of partner organization's plans and strategies.

3:15-4:45

Craven
Boardroom

CONSERVATION PLANNING TOOL

Ms. Allison Schwarz Weakley, *M.S. NC Dept. of Environment and Natural Resources*

The North Carolina Conservation Planning Tool (CPT) provides a valuable means for synthesizing and sharing the priorities of the state's conservation agencies and organizations with planners in government and the private sector to inform decisions and guide conservation efforts statewide. The CPT includes assessments and maps that integrate the best available, most current data and information from multiple sources, and can assist users in identifying lands that provide multiple resource priorities at different landscape scales for Biodiversity and Wildlife Habitat, Open Space and Conservation Lands, Agricultural Lands, and Forestry Lands. This comprehensive planning tool is used by local and state governments, regional planning organizations, and non-profit organizations to inform decisions about conservation and other land use planning efforts in North Carolina. By showing a relative order of conservation significance, these data can assist with conservation funding decisions and support cost-effective investments. 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.

4:45

ADJOURN

Thanks for participating in the 2013 APNEP Ecosystem Symposium!
Safe Travels.

Notes



Notes

Embarking on a New Voyage



Notes



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