

REVIEW & RECAP

NC Scientific Advisory Council Meeting

October 14, 2015

August 18th SAC Meeting

- HRL Watershed Model
- HRL Nutrient Response Model
- HRL Classifications, Designated Uses & Impairments
- Discussion/Brainstorm

Developing a Water Quality Goal

Questions/Thoughts:

- How do we get to a goal?
- Is the existing condition of HRL actually a problem?
- Show us the impairment - We have no data to illustrate the impairment!
- Is there an actual impairment to aquatic life?
 - *Chlorophyll-a indicates "yes"*
- Need to list all uses for a WQ goal
- Need to understand what is appropriate for the system

High Rock Lake Water Quality Goal

To provide for the protection of designated uses in the HRL reservoir by defining and proposing the appropriate level of algal related indicators for each of the following uses:

- Aquatic Life
- Fishing
- Fish Consumption
- Wildlife
- Secondary Recreation (e.g. wading, boating)
- Agricultural uses (e.g. irrigation)
- Water Supply
- Lower lake: Primary Recreation – full human body contact (e.g. swimming, water skiing)

Indicators & Criteria

- Discussion/Brainstorm:
 - Use monitoring to provide more info on the current conditions
 - Establish a baseline for current conditions so it doesn't get worse
 - What info do we have for HRL that can link:
 - Toxins
 - Excessive biomass
 - Impacts on indigenous populations

Potential Indicators

- Aquatic Life:
 - pH, DO, Algal toxins, Biovolume (better than unit density for Aq Life)
- Fishing:
 - Quality of fishery
- Recreational:
 - Algal toxins, Cyanobacteria density, Reported incidents of adverse impacts
- Water Supply:
 - Algal toxins, Taste & odor





Albemarle Sound: Nutrient Criteria Development Progress

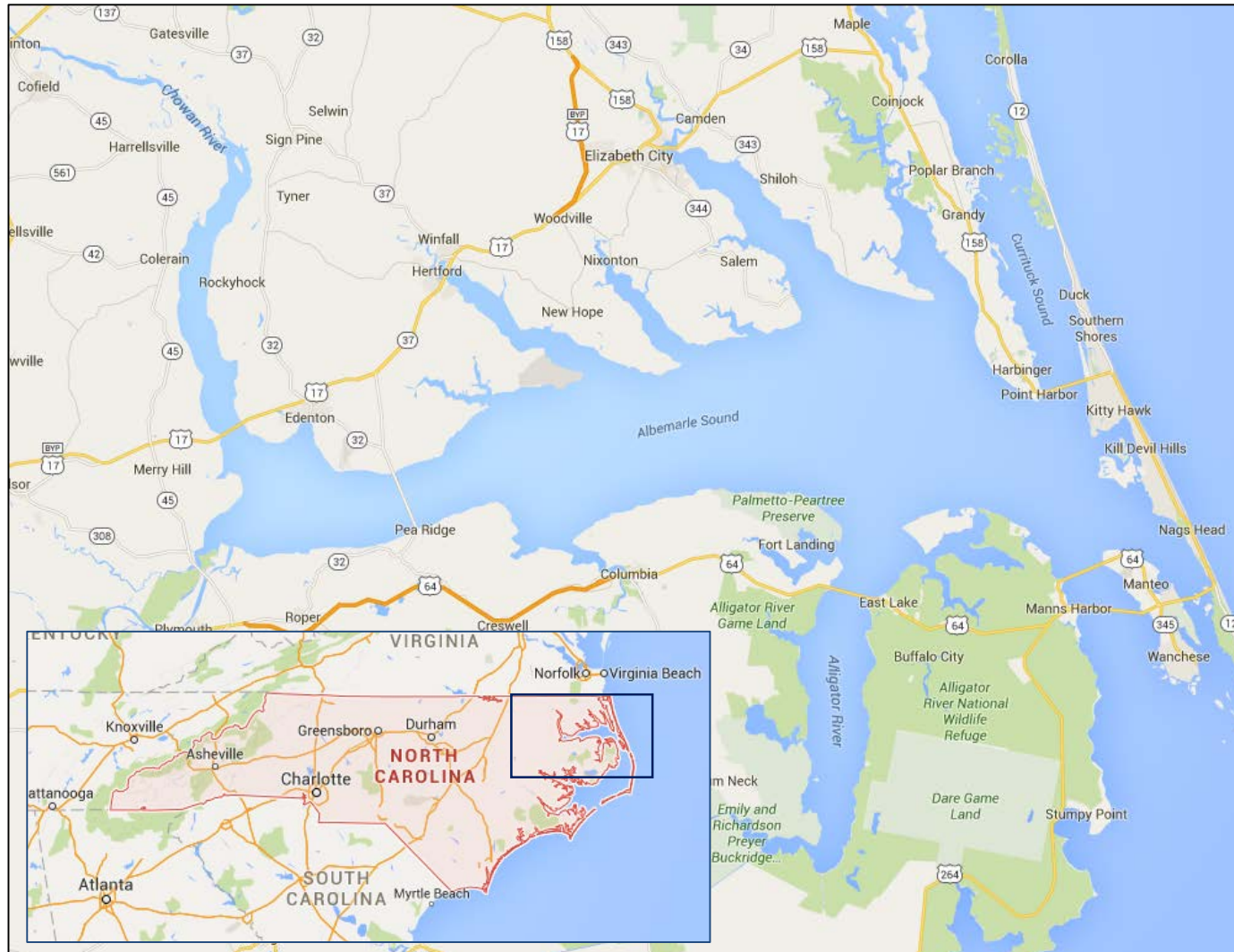


Jim Hawhee
N.C. Division of Water Resources
14 October 2015

Department of Environmental Quality



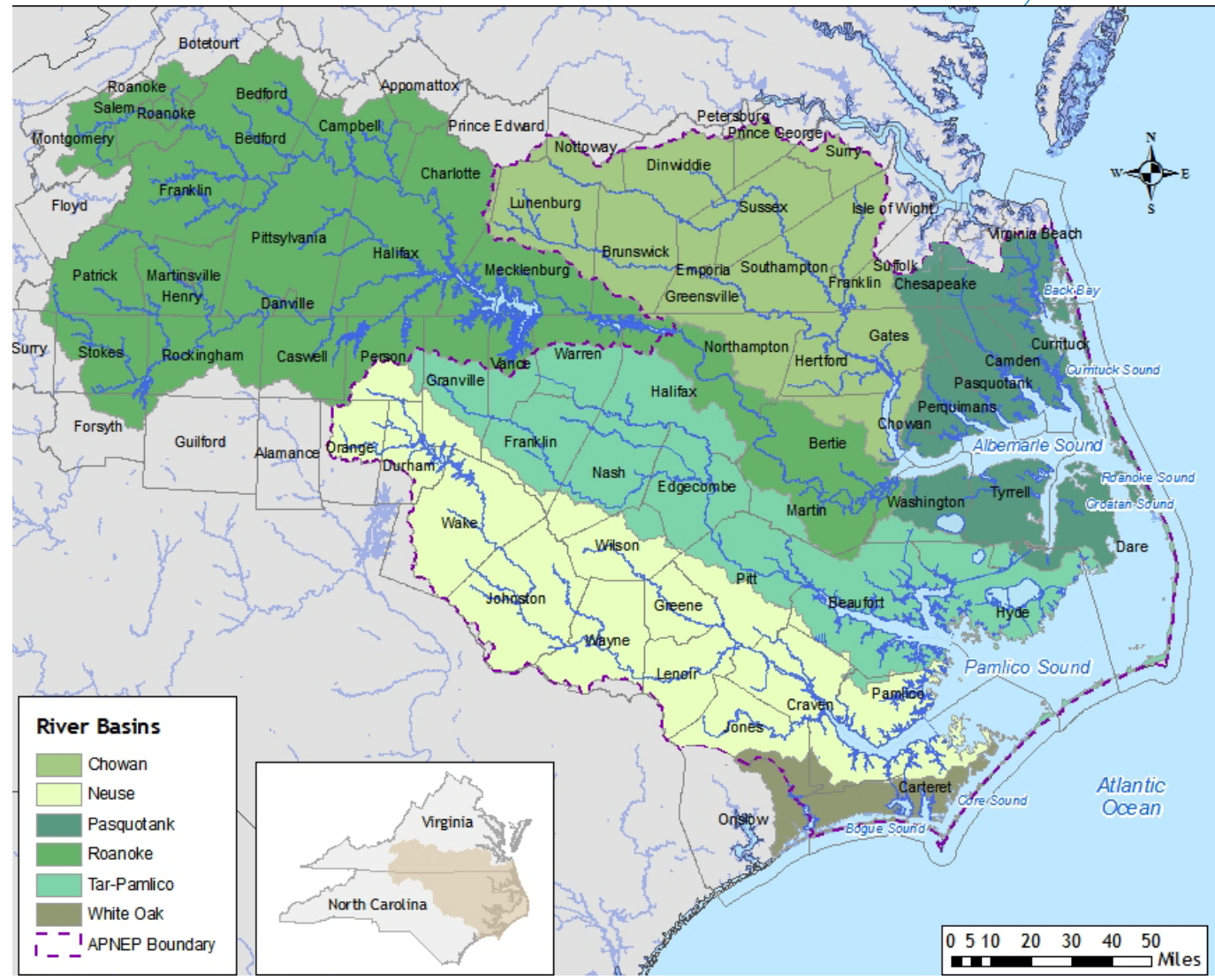
Albemarle Sound



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Albemarle-Pamlico Estuarine System



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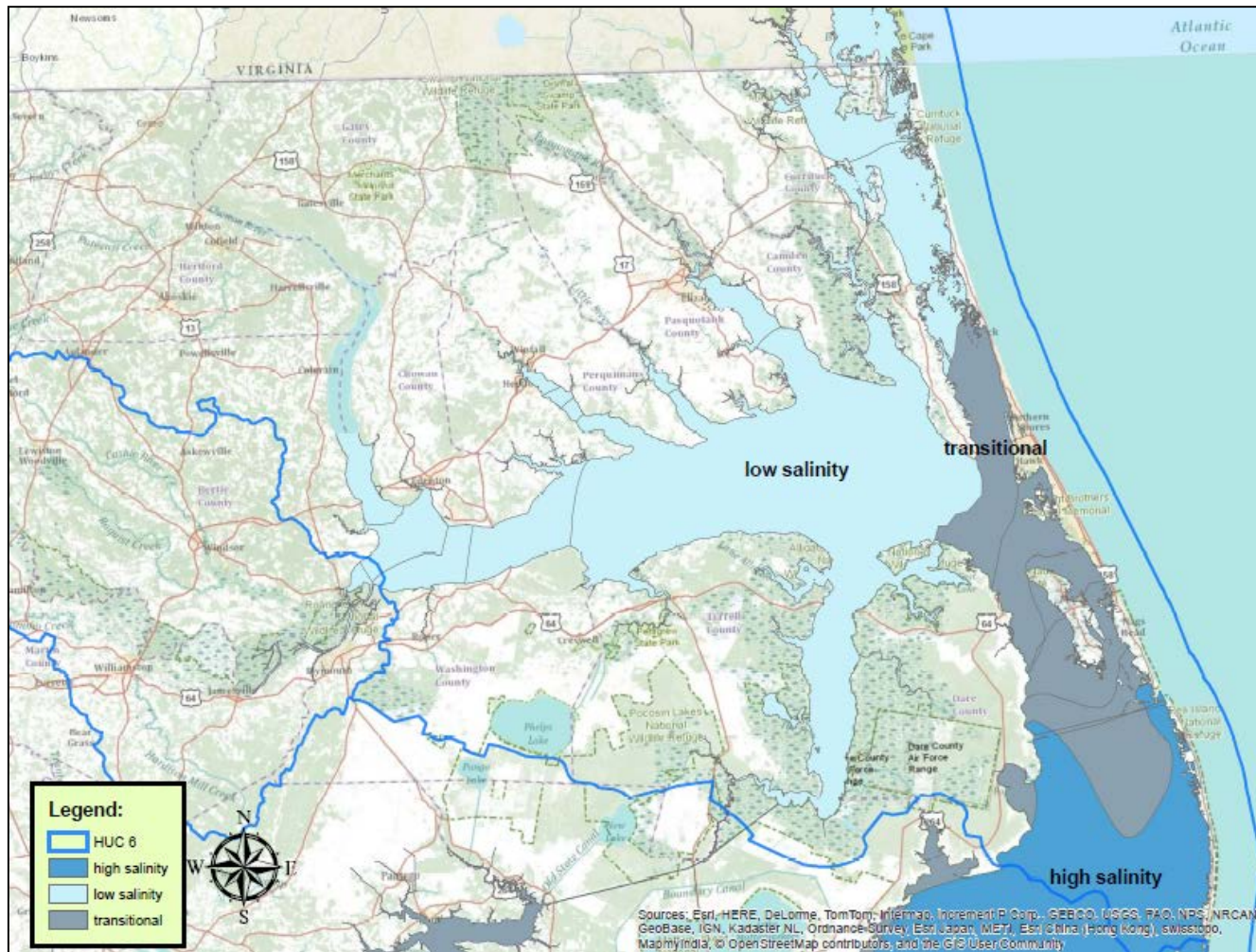
Albemarle Sound- Designated Uses



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Albemarle Sound-Salinity



Why Nutrients Matter in Albemarle Sound

- Algae/phytoplankton blooms
 - toxins
 - hypoxia
 - fish kills
 - real estate
 - tourism
- Impacts to submerged aquatic vegetation
 - increased turbidity
 - SAV habitat limitation
 - loss of fisheries production



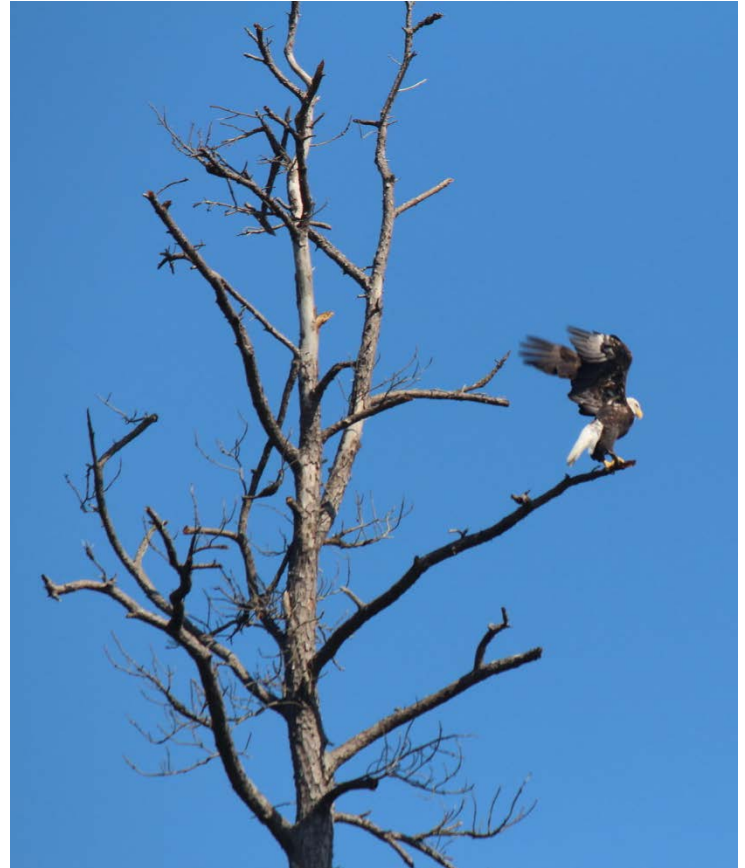
N.C. Nutrient Criteria Timeline



- 2004: NC's first Nutrient Criteria Management Plan (NCDP)
- 2011: NCDP update proposed to EPA, no concurrence.
- 2013: New draft NCDP proposed and public comment sought
- June 2014: Mutual agreement reached on NCDP update.
- Full history overview and other resources available on DWR's website:
<http://portal.ncdenr.org/web/wq/nutrientcriteria>

Albemarle Sound NCDP Workgroup/ APNEP Nutrients Workgroup

- APNEP commented on 2013 drafts of the NCDP, offering support for development of estuarine standards.
- Recognizing local expertise and supporting work underway, Albemarle Sound was chosen as an estuarine pilot site for development of criteria.
- APNEP worked closely with DWR and EPA during the negotiation process regarding timelines for Albemarle Sound nutrient criteria development.
- Nutrient criteria development aligns with APNEP's management plan and workgroup development process.



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Albemarle Sound NCDP Workgroup/ APNEP Nutrients Workgroup

Represented agencies and organizations (partial list)

- North Carolina League of Municipalities (NCLM)
- US Environmental Protection Agency (EPA)
- N.C. Division of Water Resources (NCDWR)
- U.S. Geological Survey (USGS)
- N.C. Farm Bureau (NCFB)
- UNC Institute of Marine Sciences (UNC IMS)
- East Carolina University (ECU)
- N.C. State University (NCSU)
- N.C. Sea Grant
- Albemarle-Pamlico National Estuary Partnership (APNEP)
- National Aeronautics and Space Administration (NASA)
- Waterkeepers Carolina
- Consultants

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APNEP Nutrient Workgroup Website

Committees

- Policy Board
- Science & Technical Advisory Committee
- Implementation Committee
 - Contaminants Workgroup
 - Education & Engagement Workgroup
 - Flows Workgroup
 - Freshwater Habitats & Fish Passage Workgroup
 - Monitoring Networks Workgroup
 - **Nutrients Workgroup**
 - Oyster Workgroup
 - Submerged Aquatic Vegetation Workgroup
- Past Committees

Nutrients Workgroup

[Overview](#) [Meetings](#)

[Sign up for the Nutrient Workgroup's listserv](#)

[View supporting files through Google Drive](#)

Overview

APNEP is facilitating a working group to study and recommend appropriate nutrient standards for North Carolina's estuaries. This work will advance according to North Carolina's [Nutrient Criteria Development Plan](#) using the Albemarle Sound as a pilot study area.

APNEP staff support: [Jim Hawhee](#) (primary), [Dean Carpenter](#)

Meetings

Meeting	Agenda	Notes	Meeting Materials
2015			
*Note: Nutrient-related work prior to April 2015 occurred as part of APNEP's Contaminants Workgroup. Contaminants Workgroup notes are included below for reference and continuity.			
April 23, 2015 WebEx Webinar Connection information on agenda			link
2014			
October 21, 2014 USGS Water Sciences Center 3916 Sunset Ridge Rd., Raleigh, NC			link
August 5, 2014 Kinston-Lenoir Public Library 510 Queen Street, Kinston, NC			link

<http://apnep.org/web/apnep/nutrients>

NCDP Timeline: Albemarle Sound Phase I

Table 3. Task list for the Albemarle Sound.			Anticipated Completion Date.
Task No.	Task		
1	DWR initiates discussions with APNEP's Science & Technical Advisory Committee (STAC) and Policy Board regarding the Nutrient Criteria Development Plan.		July 2014
2	APNEP convenes an Albemarle Sound workgroup of water quality specialists, interdisciplinary scientists, and local stakeholders to advance Albemarle Sound portions of the NCDP in support of its Comprehensive Conservation and Management Plan. Work on Task 5 begins.		September 2014
3	APNEP, DWR and EPA representatives discuss the necessity and availability of additional federal resources for initial project tasks, including technical support for the Albemarle Sound workgroup, facilitation support for the SAC, and support for SAC members. (Note: external funding is crucial for progress on further NCDP development).		September 2014
4	Albemarle Sound workgroup recommends focus area of study for the Albemarle Sound criteria development.		November 2014
5	Albemarle Sound workgroup meets quarterly (or more often as necessary) to develop its Preliminary Phase I report.		
	Meeting No. 1	February 2015	
	Meeting No. 2	May 2015	August 2015
	Meeting No. 3	August 2015	
6	Preliminary Phase I report completion. Report will include: <ul style="list-style-type: none"> A bibliography and a summary of relevant findings that will inform the development of estuarine nutrient criteria in North Carolina's estuarine waters. An analysis and summary of available water quality data for causal (N and P) and response variables (Table 1) in Albemarle Sound. The report will discuss the quality of the data available for Albemarle Sound and identify any spatial and temporal patterns. If necessary, identification of research or monitoring needs for establishing scientifically defensible NNC. Appropriate numeric thresholds will be reported for all variables that have scientifically defensible information supporting them, and recommendations regarding their use as NNC will be provided to DWR. 		November 2015



Potential Criteria

Table 1. Response and causal variables for consideration. (Others may be considered.)

Response variables	Causal variables
Chlorophyll- <i>a</i>	Nitrogen
Phytoplankton	Phosphorus
Periphyton	
Macrophytes	
Diurnal dissolved oxygen (DO) range	
Minimum DO	
Diurnal pH range	

NCDP Timeline: Albemarle Sound Phase II

Task No.	Task	Anticipated Completion Date.
7	With consultation from the Albemarle Sound workgroup, U.S. Geological Survey completes the Albemarle Sound pilot study of the National Monitoring Network for U.S. Coastal Waters and their Tributaries. Workgroup recommendations and report will be revised, if necessary.	December 2015
8	Present preliminary workgroup phase I report to the SAC and APNEP's STAC for review and comment.	December 2015
9	Provide a formal status update to the EPA.	December 2015
10	The Albemarle Sound workgroup adopts its final phase I report.	March 2016
11	Based on final report recommendations and subject to available resources, perform additional monitoring, research and/or modeling to inform criteria development. The timeline for this step may be revised or accelerated depending on research, monitoring and/or modeling timelines proposed in the phase I report.	September 2018
12	The Albemarle Sound workgroup incorporates new monitoring, research and modeling information into a final phase II report. Appropriate numeric thresholds will be reported for all variables that have scientifically defensible information supporting them and recommendations regarding their use as NNC will be provided to DWR. <i>Upon completion of the phase II report, the Albemarle Sound workgroup will have evaluated all causal and response variables in Table 1 for use as nutrient criteria.</i>	April 2019
13	DWR proposes recommended criteria for adoption and proposed approaches in developing nutrient criteria for estuaries statewide.	May 2019
14	Adoption of nutrient criteria for the Albemarle Sound per NC Administrative Procedure Act.	December 2020



NCDP Timeline: Estuaries

Table 5. Tasks for estuaries criteria prioritization.

Task No.	Task	Anticipated Completion Date.
1	Data review and summary for estuaries. Collect, compile and review water quality data for causal (N and P) and response variables (Table 1). An initial review will focus on data quality, determining any spatial and temporal patterns and if there are any data gaps.	June 2018
2	Based upon the water quality data review estuaries will be summarized by watershed characteristics with SAC input.	December 2018
3	Present findings to the SAC.	January 2019
4	Prioritize specific estuaries for nutrient criteria and confirm approaches proposed in the Albemarle Sound nutrient criteria development process with SAC involvement.	December 2019
5	Review progress to date and make revisions to the NCDP if necessary.	January 2020
6	Develop nutrient criteria with SAC involvement using the confirmed approaches:	
	a. Begin consultation with the SAC	January 2020
	b. Present tentative NNC to SAC	March 2021
	c. Present refined NNC to SAC	July 2021
	d. Present proposed NNC to WQ Committee	September 2021
e. Present proposed NNC to EMC	November 2021	
7	Adopt nutrient criteria per NC Administrative Procedure Act	June 2023



Albemarle Sound Nutrient Criteria Development

Phase I Considerations

- Review and synthesize information.
 - Identify ecological pathways influenced by nutrients.
 - Identify criteria thresholds or ranges
 - Identify reference conditions to the extent possible.
 - Incorporate spatial (local) considerations

Albemarle Sound Nutrient Criteria Development

Phase I Considerations (continued)

- Determine range of scientifically defensible criteria
 - All criteria for which information is available?
 - Suite of complimentary criteria.
 - Linkage to water body uses and designations
 - Causal indicators, response indicators, or both?

Albemarle Sound Nutrient Criteria Development

Phase I Considerations (continued)

- Incorporating policy:
 - Monitoring feasibility
 - Assessment methodology (for chl. a, greater than 10% exceedance, 90% or greater confidence, $n \geq 9$.)
 - Permitting
 - Enforceability
 - Recent water quality conditions and state
 - Qualitative understanding of financial implications of criteria (regulatory changes subject to a fiscal note).
 - Impacts on stakeholder groups
 - Other states' experiences (Chesapeake Bay, Florida, and others...)

Generally recognized nutrient criteria development approaches

- Reference condition
 - Study of historical data and/or relatively unimpaired water bodies can provide a baseline by which criteria can be adopted in a broader class of waters
- Stressor-response
 - Regression analyses or scientific studies that relate nutrient inputs to desired environmental outcomes or thresholds.
- Water quality simulation models
 - Simulates the relationship between physical, chemical, and biological processes to study water quality scenarios.

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Phase I

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Albemarle Sound- Status

NASA DEVELOP Project

- Status: Complete
- Results inconclusive
- Summary: Project participants analyzed satellite color imagery to evaluate its accuracy for detecting chlorophyll a. Results showed poor correlation with previously collected water quality data.
- Full report on Google Drive

NASA DEVELOP National Program
NASA Langley Research Center
Spring 2015

North Carolina Water Resources
Utilizing NASA Earth Observations to Monitor Harmful Algal Blooms in the
Albemarle Sound of North Carolina

DEVELOP
Technical Report
Final Draft – April 2, 2015

Chad Smith (Project Lead)
Jelly Riedel
Keith Benjamin
Daniel Wozniak
Matthew Carter

Dr. Michelle Moorman & Sharon Fitzgerald, Biologist, U.S. Geological Survey
North Carolina Water Science Center

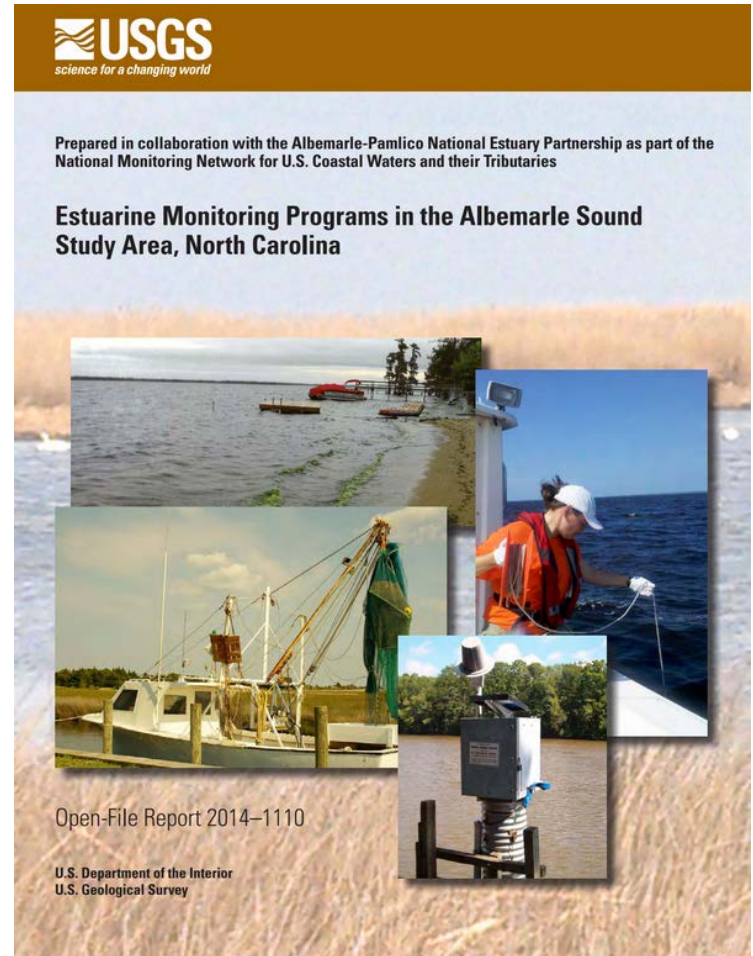
Dr. Bill Crowell, Dean Carpenter, & Jim Hawhee, Albemarle-Pamlico
National Estuary Partnership

Dr. Kenton Ross, NASA DEVELOP National Program (Science Advisor)

Albemarle Sound- Status

USGS Albemarle Sound Initiatives

- Status: Nearly complete
- An inventory of monitoring programs and available data in the Albemarle Sound watershed has been completed.
- Duke MEM project supervised by lead USGS PI offers trend analysis of variables including chl a, DO, turbidity, nitrogen and phosphorus.
- Both reports available on Google Drive
- USGS report analyzing results of field efforts ready soon.



Albemarle Sound- Status

Literature Review

- Status: Complete
- NSTEPS proposal for literature review funded and conducted by Tetra Tech.
- Summary: ~4,000 estuarine literature citations organized and associated with keywords for further exploration. Abstracts provided for most sources. Tags include geographical sorting, environmental endpoints, and methods.
- EndNote database and a series of text files associated with each keyword are available via Google Drive.



Albemarle Sound- Status

DWR Data Review and Analysis

- Status: Underway
- NSTEMPS proposal for data analysis funded, review underway by Tetra Tech
- Summary: Advanced statistical and spatial analyses of historical DWR monitoring data in and near Albemarle Sound to inform criteria development
- Report due Dec. 2015



Albemarle Sound- Status

Nutrient Criteria Law and Policy Review

- Status: Nearly complete
- Summary: An evaluation of case law regarding numeric nutrient criteria development nationally and high-level policy case studies of other jurisdictions that have revisited nutrient criteria.
- Analysis conducted by a legal fellow associated with N.C. Sea Grant and the N.C. Coastal Resources Law, Planning and Policy Center.



Albemarle Sound- What's Next

- November phone call to reacquaint workgroup, discuss progress to date, and plan through the conclusion of phase I
- Monthly meetings through next spring under consideration to discuss project results and their implications for Albemarle Sound criteria development.
- Phase I report targeted for summer 2016, including preliminary recommendations and/or areas for further study.
- Role of the SAC/CIC?



Questions?



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