

North Carolina Estuarine Nutrient Criteria Overview

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A brief history of nutrient criteria development in North Carolina's estuaries

- 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>



A brief history of nutrient criteria in North Carolina's estuaries- APNEP's role

- 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 CCMP and workgroup development process.

Definitions

- **Nutrient Criteria Development Plan (NCDP):** A plan mutually agreed upon by the State of North Carolina and the U.S. Environmental Protection Agency detailing the process and timelines by which nutrient criteria will be set in North Carolina.
- **Water Quality Standard-** A water quality standard defines the water quality goals for a water body, or portion thereof, by designating the use or uses to be made of the water, by setting criteria necessary to protect the uses, and by protecting water quality through antidegradation provisions.
- **Designated Use-** Designated uses of a water body should provide, wherever attainable, water quality for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water("fishable/swimmable") and consider the use and value of State waters for public water supplies, propagation of fish and wildlife, recreation, agriculture and industrial purposes, and navigation.

Definitions

- **Water Quality Criteria-** State criteria must be based on sound scientific rationale and must contain sufficient parameters or constituents to protect the designated use(s). For waters with multiple use designations, the criteria must support the most sensitive use. Criteria can be narrative (descriptive) or numeric.
- **Numeric Nutrient Criteria-** Causal and response variables expressed as numerical concentrations and/or mass quantities or loadings, OR causal and response variables expressed as narrative statements with a scientifically defensible translator mechanism to derive or calculate numerical concentrations and/or mass quantities or loadings.
- **Causal Numeric Nutrient Criteria-** Criteria detailing the quantity of nitrogen or phosphorus compounds appropriate for a water body.
- **Response Numeric Nutrient Criteria-** Criteria detailing quantitative thresholds for environmental responses typically resulting from nutrient inputs.

Potential Estuarine Nutrient 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	

Generally Recognized Approaches for Developing Nutrient Criteria

- 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.

NC Nutrient Criteria Development Plan Timeline: Albemarle Sound

- General Timeline
 - March 2016: Phase I research and data report, potential recommendations to DWR
 - September 2018: Supplemental research and monitoring completed
 - May 2019: Phase II research and data report, final recommendations to DWR
 - December 2020: Adoption of Albemarle Sound nutrient criteria.

NC Nutrient Criteria Development Plan Timeline: Albemarle Sound

Near term actions (page 10, NCDP):

- Lead: APNEP

Table 3. Task list for the Albemarle Sound.

Task No.	Task	Anticipated Completion Date.
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 Meeting No. 3 August 2015	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



NC Nutrient Criteria Development Plan Timeline: Albemarle Sound

Later actions
(page 11, NCDP):

- Lead: APNEP

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



General Considerations for Nutrient Criteria Development in Albemarle Sound

Phase I

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

General Considerations for Nutrient Criteria Development in Albemarle Sound

Phase I (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?

General Considerations for Nutrient Criteria Development in Albemarle Sound

Phase I (continued)

- Incorporating policy considerations:
 - 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

General Considerations for Nutrient Criteria Development in Albemarle Sound

Phase I (continued)

- Policy considerations (continued):
 - Qualitative understanding of financial implications of criteria
 - Regulations proposed by DWR to the EMC will be subject to a fiscal note
 - Impacts on stakeholder groups
 - Other states' experiences (Chesapeake Bay, Florida, and others...)

General Considerations for Nutrient Criteria Development in Albemarle Sound

Phase I (continued)

- After considering the preceding factors and others, workgroup provides recommendations to DWR and the EMC regarding nutrient criteria for Albemarle Sound.
- Consensus recommendations?
- Workgroup provides guidance and lessons learned regarding determination of statewide estuarine nutrient criteria.

NC Nutrient Criteria Development Plan Timeline: Estuaries-Statewide

(page 15, NCDP):

Lead: DWR

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: <ul style="list-style-type: none"> a. Begin consultation with the SAC b. Present tentative NNC to SAC c. Present refined NNC to SAC d. Present proposed NNC to WQ Committee e. Present proposed NNC to EMC 	January 2020 March 2021 July 2021 September 2021 November 2021 December 2021
7	Adopt nutrient criteria per NC Administrative Procedure Act	June 2023



Questions?

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Albemarle Sound: Designated Uses



Albemarle Sound: Salinity

