

Draft Nutrient Criteria Development Plan for the State of Delaware.

USEPA has developed a series of Clean Water Act section 304 (a) Ambient Water Quality Criteria Recommendations for nutrients in several water body types and is working to complete the remaining documents. The documents are meant to guide states in setting their water quality criteria. To date, Delaware has adopted numeric nutrient criteria for its Inland Bays, and uses narrative criteria for the remaining surface waters. This plan lays out Delaware's path forward to develop and promulgate numeric criteria, where appropriate, for the remaining waters of the State.

Nutrient Criteria Status

As part of its national effort, EPA divided the nation into fourteen ecoregions based on geology, land use, ecosystem type, and nutrient conditions. Delaware falls into Ecoregion 14, which covers the Eastern Coastal Plain from Maine to Georgia. EPA published two sets of recommendations for nutrient criteria in Ecoregion 14; Rivers and Streams (2000) and Lakes and Reservoirs (2001). The recommendations were based on statistical analyses of nutrient data collected in each nutrient ecoregion. Percentile values were used to estimate levels that might be expected in waters that had not been impacted by man's presence. The statistical basis was corroborated by studies done in a number of states. Those recommendations are in the table below.

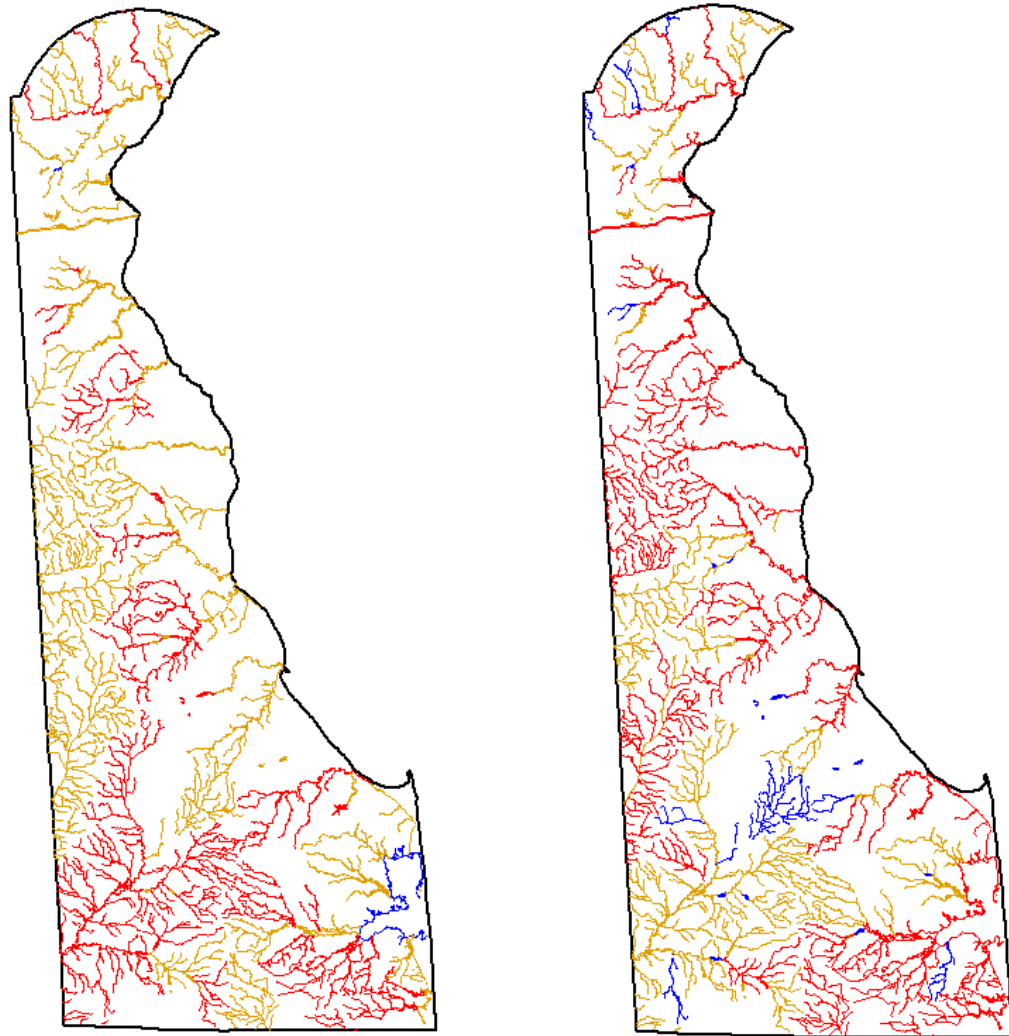
Waterbody Type	Total Phosphorus (ug/l)	Total Nitrogen (mg/l)	Chlorophyll-a (ug/l)	Secchi (m) or Turbidity (FTU/NTU)
Lakes and Reservoirs	8.00	0.32	2.90	4.50 (secchi)
Rivers and Streams	31.25	0.71	3.75	3.04 (turbidity)

Delaware promulgated Water Quality Standards in August 1999 that included narrative and numeric criteria for waters of the State. The numeric criteria for tidal portions of Delaware's Inland Bays (Indian River, Rehoboth Bay, and Little Assawoman Bay) are average levels of 0.14 mg/l-N for dissolved inorganic nitrogen and 0.01 mg/l -P for dissolved inorganic phosphorous. These criteria are applicable during the growth season (March 1 through October 31) and were established to promote the re-establishment of submerged aquatic vegetation (SAV) and protect existing SAV resources.

With regard to narrative criteria, State Standards recognize that nutrient over enrichment is a significant problem in surface waters of the State and declares that minimizing nutrient input to surface waters from point and nonpoint sources is a State policy. To implement this policy, Delaware has been using target values of 3.0 mg/l total nitrogen and 0.1-0.2 mg/l total phosphorous to categorize the State's surface waters (see Figure 1) and to establish Total Maximum Daily Loads(TMDLs) for nutrient impaired waters. These target values were established based on literature values, professional judgment, as well as a comprehensive evaluation of the State-wide water quality data to identify over enriched systems.. Delaware's 1998 303(d) List identifies waters in 37 of 45 watersheds with nutrient or dissolved oxygen impairments (See Figure 2). Furthermore, Delaware has established several TMDLs for nitrogen and phosphorous to achieve the above criteria and targets (Inland Bays, Nanticoke River, and Murderkill River).

Figure 1

Nutrient Levels in Waters of the State



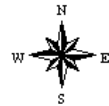
Average Total Nitrogen Levels

- Low (< 1 mg/l)
- Moderate (1 - 3 mg/l)
- High (>3 mg/l)

Average Total Phosphorus Levels

- Low (<.05 mg/l)
- Moderate (0.05 - 0.1 mg/l)
- High (>.10 mg/l)

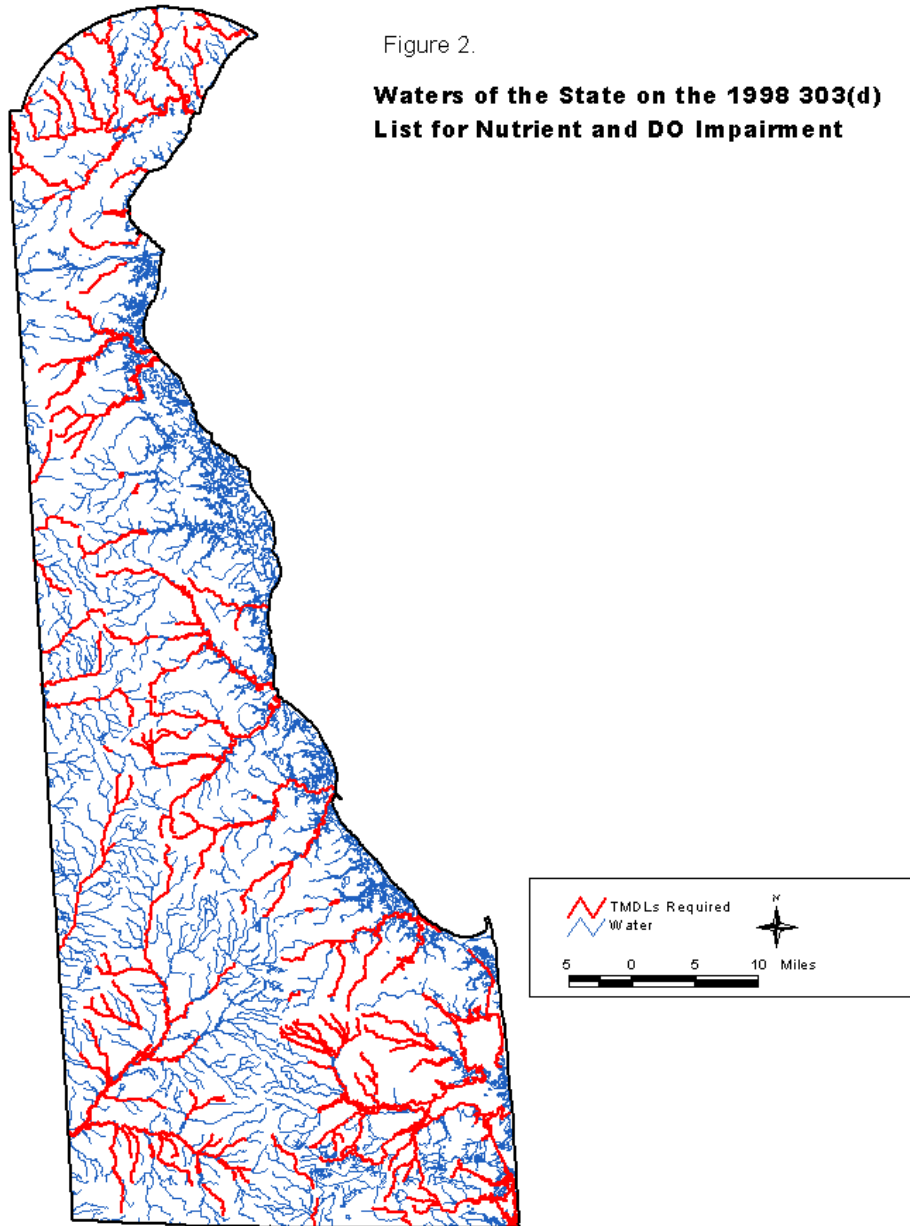
20 0 20 40 Miles



Only segments with data in the period of September 1996 through August 2001 are shown in these maps.

Figure 2.

**Waters of the State on the 1998 303(d)
List for Nutrient and DO Impairment**



A hearing was held in September 1999 for the next round of Standards to be developed as part of a triennial review mandated by the Clean Water Act. The Department of Natural Resources and Environmental Control (the Department) expects to hold hearings on proposed new standards in early spring 2003 and promulgate revisions by the end of the calendar year. The Department expects to propose revised dissolved oxygen, chlorophyll-a, and clarity criteria for waters in the Chesapeake Bay drainage basin to implement guidance recommendations made by the EPA through the Chesapeake Bay Program. The Draft Chesapeake guidance documents do not address nutrients specifically, but use dissolved oxygen and chlorophyll-a as surrogate indicators of nutrient over-enrichment. Dissolved oxygen criteria are not expected to be updated during this cycle in Delaware's other basins, but will be addressed along with nutrient criteria in the following cycle for all Delaware waters. .

Current and Planned Studies to Support Establishment of State-wide Nutrient Criteria by the end of 2004

The Department has been working with EPA and other EPA Region III states to do much of the background work needed to develop numeric nutrient criteria that are specific to Delaware waters and will consider the results while developing any new criteria. One of the projects under development is a database of Region 3 nutrient test results for rivers and streams. The draft Region 3 database contains data from 247 stations in Delaware out of 386 stations in the Eastern Coastal Plain. The database contains records for about 3900 Delaware results out of approximately 6000 for the Plain.

With financial support from the EPA, Delaware has completed two studies to assess nutrient cause-response relationships. Additionally, there is a plan to conduct data analyses and field surveys during 2002-2003 to support establishment of nutrient criteria.

A study by Dr. John Davis, Widener University, applied two general methods to establish nutrient criteria for streams and ponds within the State. The first is a statistical analysis of water quality data; and the second involves the development and application of empirical relationships to define water quality-based nutrient criteria. Dr. Kent Price, University of Delaware, also applied statistical approaches as well as water quality-based approaches to determine appropriate nutrient criteria for Delaware's estuaries and tidal rivers.

A study is being designed by Dr. Davis, to conduct additional data analyses and field surveys of several coastal plain streams during the summer of 2003. The results of these three studies will be used as a basis to establish nutrient criteria for Delaware's surface waters.

Plan and Considerations

The Department expects that the establishment of numeric nutrient criteria will be more controversial than for other criteria and thus prefers to create a "Nutrient and DO Criteria Roundtable Advisory Committee" to collaboratively proceed with criteria establishment. The Department envisions the creation of the Roundtable during the spring or summer of 2003. EPA has indicated that funding may be available for criteria establishment. If such funding is made available, the services of a neutral facilitator

would be contracted to act as an intermediary between and among the Department and stakeholders. Known stakeholders to be invited to participate include the following:

- Other agencies and governmental interests, e.g., Delaware Nutrient Management Commission, County Governments, Municipalities, owners of wastewater treatment facilities, USEPA, US FWS
- Academics
- Environmental Advocates
- Farmers
- Other Nutrient users, e.g., golf courses, commercial lawn care companies, etc.
- Tributary Action Team representatives
- Members of the general public

The goal of the Roundtable would be to collaborate with the Department during the development of nutrient criteria. The Department would seek input on the criteria and the monitoring and analysis protocols used to establish attainment of the selected criteria. Direct criteria to be considered at the outset include Total N, NO₃, Total P and dissolved P. Indirect indicators that may be considered include dissolved oxygen, chlorophyll-a, diurnal variation in pH, clarity, and potentially the development of bio-response indicators.

Conceptually, Delaware can be divided into four watersheds according to the table below.

Watershed	General Location and Description
Piedmont	Northern Delaware, underlain by rock, drains to Delaware River/Bay
Delaware Bay	Central/Eastern Delaware land that drains to Delaware Bay. Largely underlain by sandy soils.
Chesapeake Bay	Central/ Western Delaware land that drains to Chesapeake Bay. Largely underlain by sandy soils.
Inland Bays/Atlantic Ocean	Southeastern Delaware land underlain by sandy soils that drain to the Inland Bays (Delaware and Maryland).

While it is likely that all four drainages will have similar nutrient criteria, it is possible that individual watersheds may merit significantly different nutrient or DO criteria based on natural conditions and downstream impacts. Delaware anticipates concerns from the Roundtable regarding estuarine nutrient and DO levels.

For any nutrient criteria developed under this plan, the Department intends to use a ‘weight of the evidence’ approach to develop appropriate criteria. Consideration would be given to results of the statistical method EPA recommends, cause-effect data, literature values, and potentially, models that have been developed or are already in place. It appears that Delaware has sufficient data for traditional nutrient criteria development for its surface waters as discussed above. Additionally, the Department continues to collect a significant amount of water quality data including those collected by continuous monitoring stations throughout the State.

Anticipated Timeline and Milestones

Event	Timeline
Formation of Roundtable	Spring to Summer 2003
Provide Available Information to Roundtable/ Request their input and Data	Summer to Fall 2003
Work with Roundtable	Fall 2003-Summer 2004
Determine Draft Standards	Summer to Fall 2004
Public Hearings	Fall to Winter 2004
Promulgate Standards	Winter 2004