

# TOWARDS THE GOAL OF SETTING NUTRIENT CRITERIA FOR THE DELAWARE ESTUARY

**Edward D. Santoro M.S.  
Monitoring Coordinator**



**Delaware River Basin Commission**

DELAWARE • NEW JERSEY  
PENNSYLVANIA • NEW YORK  
UNITED STATES OF AMERICA

# **TOWARDS THE GOAL OF SETTING NUTRIENT CRITERIA FOR THE DELAWARE ESTUARY**

- **The USEPA nutrient criteria guidance recommends the adoption of nutrient criteria by states and the DRBC. The guidance also provides for optional criteria based upon extensive monitoring data.**
- **EPA recommends that states adopt criteria for Total N, Total P, Chlorophyll-*a* and water clarity. The USEPA criteria suggest an assignment of a level encompassed by the 25th percentile of data for ambient conditions or the 75<sup>th</sup> percentile in reference areas.**
- **The current EPA guidance allows for the setting of optional criteria based upon extensive monitoring data.**

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- **Academic, regional EPA and state scientists have strongly advised that criteria be based on a response parameter – e.g., chlorophyll, dissolved oxygen, SAV cover etc.**
- **I would like to identify our approach towards setting nutrient criteria in the tidal areas of the river and the estuary. This approach uses a large data set (> 17 years) from our long-term boat run program and river studies.**

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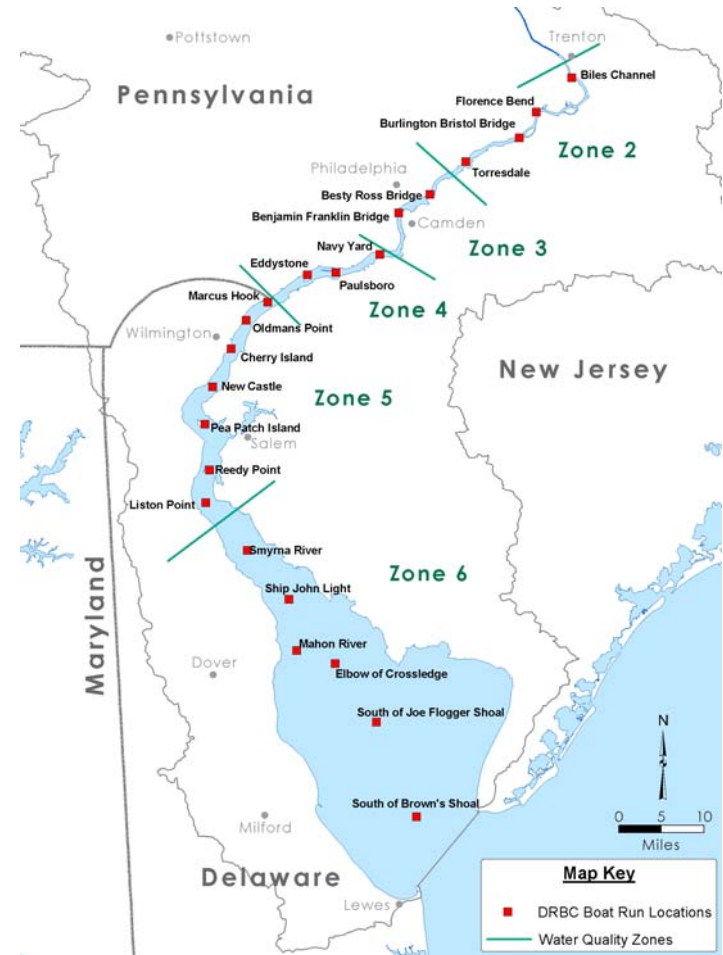
- **Most of the mainstem Delaware River is meeting “swimmable” water quality objectives.**
- **Historically the Delaware River and Bay have not experienced the typical signs of eutrophication i.e.; fish kills, algal blooms or water discoloration.**
- **Elevated nutrient levels, do not appear to produce aquatic impacts and are effectively utilized by resources downstream.**

# **DRBC Nutrient Criteria Approach-Estuary**

- The Delaware Estuary is atypical. The current nutrient loadings, although elevated, are not causing a noticeable problem with nutrient levels e.g. fish kills, massive algal blooms, or suppression of dissolved oxygen.**
- The DRBC is moving towards using the existing water quality as nutrient criteria in the Estuary.**
- We will also continue to evaluate nutrient effects in the Basin. These include studies to define nutrient impact thresholds and algal stimulation studies which started in 2003.**
- We believe the large amount of nutrient data we have been collecting over a long period will provide a basis for establishing criteria which is realistic based upon our understanding of the Delaware River Basin.**

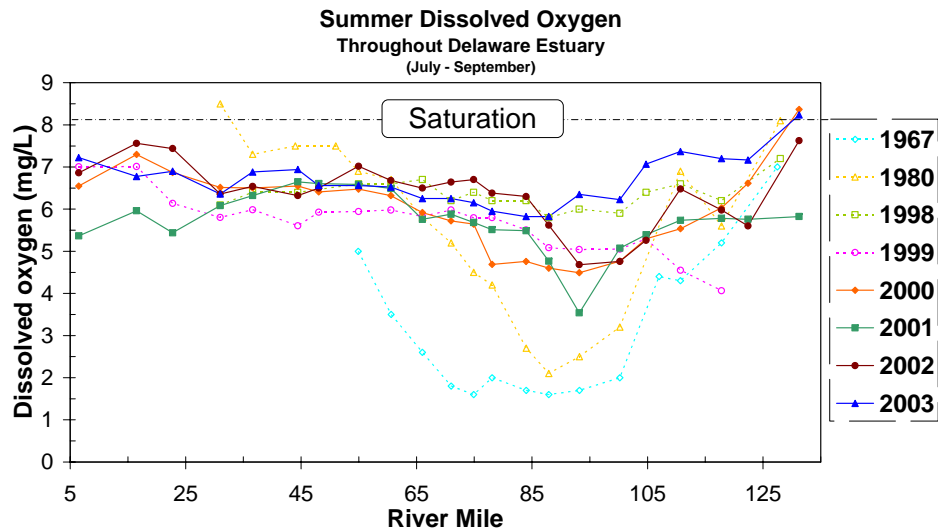
# DRBC Estuary Monitoring Sites

- **Zones 2 through 6 of the Delaware River Estuary have been designated by the DRBC between the entrance of Delaware Bay (River mile 0.0) and the head of tide at Trenton, NJ. (River Mile 133.4).**
- **Surface water samples are collected 12 times / yr from March through November.**
- **Over the period 1990 to 2006, the same methods were used by the Field/Lab personnel. Parameters include: TKN, nitrate, nitrite & ammonia nitrogen and total phosphorus.**



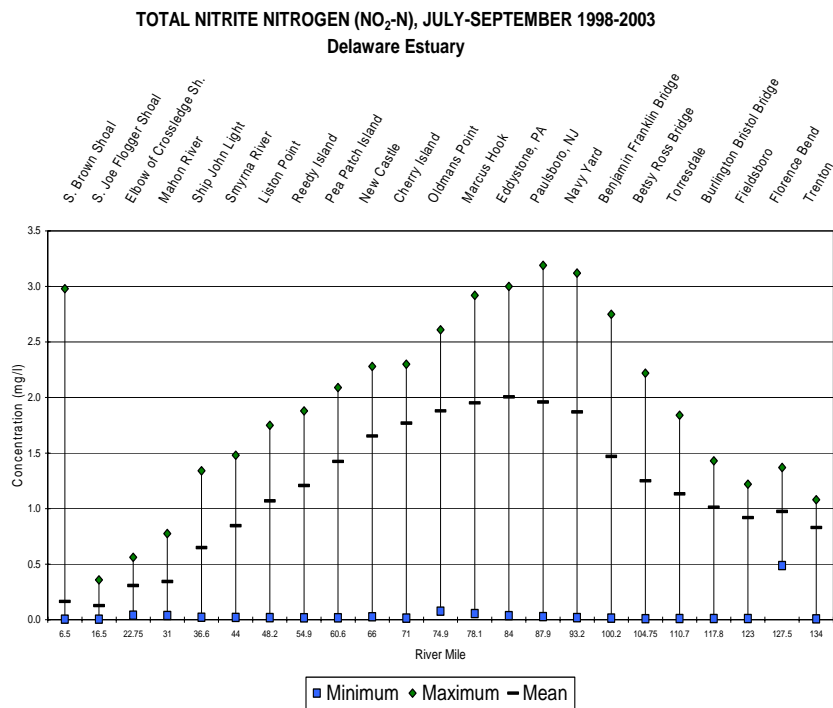
# DRBC Nutrient Criteria Approach-Estuary

Summer Period Dissolved Oxygen Sag in the Delaware Estuary (Source: DRBC Boat Run)



- A well documented dissolved oxygen sag occurred in portions of the estuary below Trenton and Philadelphia in 1960 through the 1980's (Santoro, 2000, 2004).
- Dissolved oxygen levels have recovered over the last two decades. Minimum  $O_2$  levels are well above 3.0 mg/l.
- The Delaware Estuary has historically been very turbid (i.e., light limited)

# DRBC Nutrient Criteria Approach-Estuary



Source: DRBC Boat Run Program

- **Historically the Delaware river and Bay have not experienced the typical signs of eutrophication i.e.; fish kills, algal blooms, water discoloration or other.**
- **The conditions of the waters of the Delaware Estuary continue to improve. The nutrient levels, while elevated do not appear to manifest aquatic impacts and are effectively utilized by resources downstream.**
- **It would therefore appear that the assignment of a level encompassed by the 25th percentile of ambient data would be arbitrarily restrictive and may not be achievable.**
- **The DRBC is moving towards using the 95 percentile of ambient data as a nutrient criteria limit. However we would like to structure the criteria to keep water quality at the current level and not drive those levels higher.**



# **Strategy Issues**

**As noted above we are moving towards the use of 95% levels as a threshold.**

**Do we pay special attention to the Schuylkill River ?**

**One question that needs resolution is whether the criteria will be in the form of guidance values based upon Existing Water Quality or numerical water quality standards.**

# Basin States Nutrient Development

## Delaware:

There are no numeric nutrient criteria for the streams in the Delaware River Basin, only for inland bays. They do have "targets" of 0.05 mg/l total Phosphorus and 1 mg/l total Nitrogen and TMDL "goals" of maximum 0.2 mg/l total P and 3 mg/l total N for protecting DO. Delaware plans to convene a Nutrients Criteria committee to update nutrient criteria in the near future.

## Pennsylvania:

Is in the process of developing nutrient criteria and plans to have them by 2007. PA has default values for N and P for their High Quality and Exceptional Value waters but uses specific data when possible. When a permit application is received, PADEP uses reference stream data (there are about 10 reference sites in the DRB for EV/HQ streams) such that the most appropriate reference stream is used to infer existing water quality at the proposed discharge site.

## New Jersey:

NJ has Nitrate criteria for the protection of drinking water (10 mg/l) in their FW2 waters as well as Total Phosphorus of 0.1 mg/l in their FW2 waters, unless it can be shown that total P is not a limiting nutrient and that a higher level would not cause nutrient pollution.

## New York:

NY State currently has narrative criteria. NYS has received EPA concurrence on a Nutrient Standards Plan. These include some site-specific phosphorus criteria for impounded waters. The state will be developing numerical criteria as a follow-up to the nutrient standards plan.

## Percentile Values for Nutrient Data by DRBC Zone for the Delaware Estuary.

### Total Nitrogen (N) (mg/L)

Zone	# of Samples	95%	75%	50%	25%
2	294	1.91	1.60	1.31	1.10
3	238	2.60	1.91	1.60	1.30
4	383	3.52	2.70	2.20	1.80
5	837	3.17	2.60	2.20	1.81
6	509	2.55	1.80	1.41	1.11
Total	2261				

# Total Phosphorus (mg/L)

Zone	# of Samples	95%	75%	50%	25%
2	441	0.19	0.13	0.09	0.06
3	402	0.16	0.09	0.06	0.03
4	597	0.23	0.16	0.12	0.09
5	1279	0.26	0.16	0.13	0.10
6	755	0.27	0.14	0.11	0.08

Total 3474

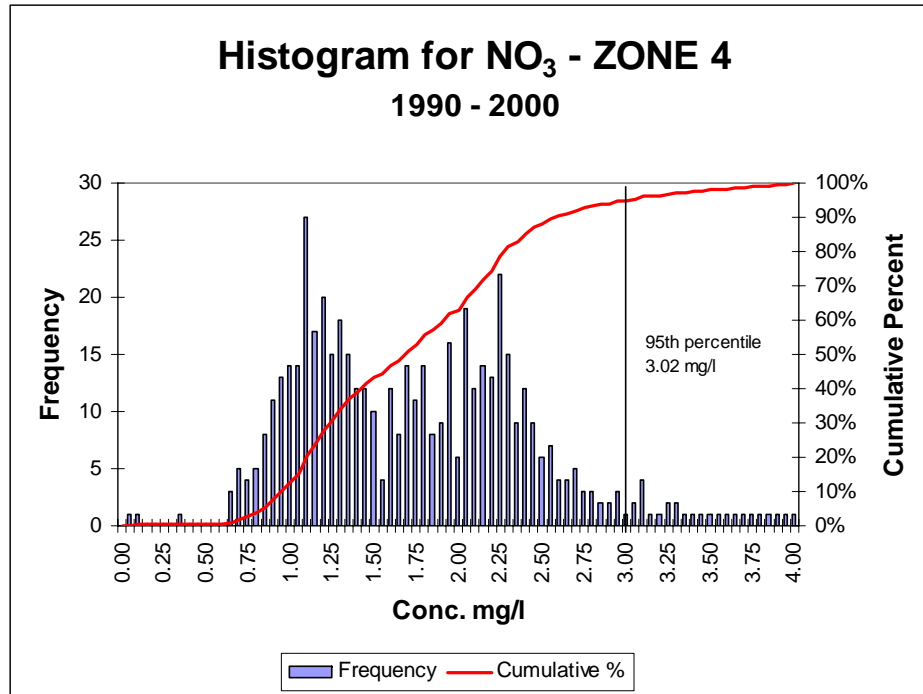
# Chlorophyll-A (mg/L)

Zone	# of Samples	95%	75%	50%	25%
2	280	27.86	10.94	4.13	1.87
3	230	25.31	12.87	4.39	1.86
4	437	31.82	14.94	7.32	2.55
5	768	19.72	9.85	4.23	1.79
6	538	40.95	14.78	6.72	2.51
Total	2253				

# Water Clarity (FTU)

ZONE	N	95%	75%	50%	25 %
Zone 2	446	12.17	5.29	3.10	1.69
Zone 3	403	11.28	5.39	3.46	2.09
Zone 4	620	19.54	9.96	5.73	3.21
Zone 5	1327	49.61	24.57	15.69	9.44
Zone 6	764	31.96	14.53	8.56	5.42
Total	3560				

# Next Steps



- **Eutrophication is a potential problem, but the regulatory effect levels are undefined.**
- **Several tributaries contribute much more than expected background levels of nutrients to the river.**
- **The use of a threshold approach to evaluate nutrient effects in the estuary is a prudent way to establish whether nutrient concentrations are changing.**
- **DRBC has initiated studies to define nutrient impact thresholds:**
  - 1. Periphyton Biomonitoring & criteria (2005-)**
  - 2. Algal stimulation studies**
- **For the Estuary the approach would be to develop criteria using physical characteristics and natural trophic conditions.**
- **If eutrophication emerges even though existing water quality 95th percentile is maintained, lower nutrient criteria will be established based on empirical thresholds between nutrient levels and biological responses within the Delaware Estuary.**

**Edward.Santoro @drbc.state.nj.us**  
**(609)883-9500 ext.268**