Assessing Nutrient Impacts in New Jersey Waters

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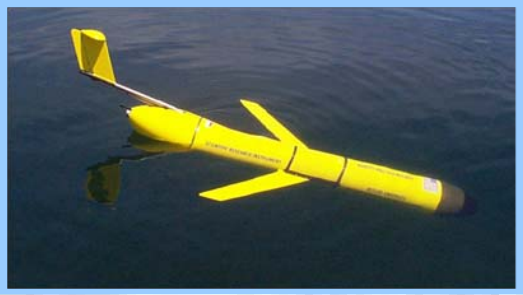
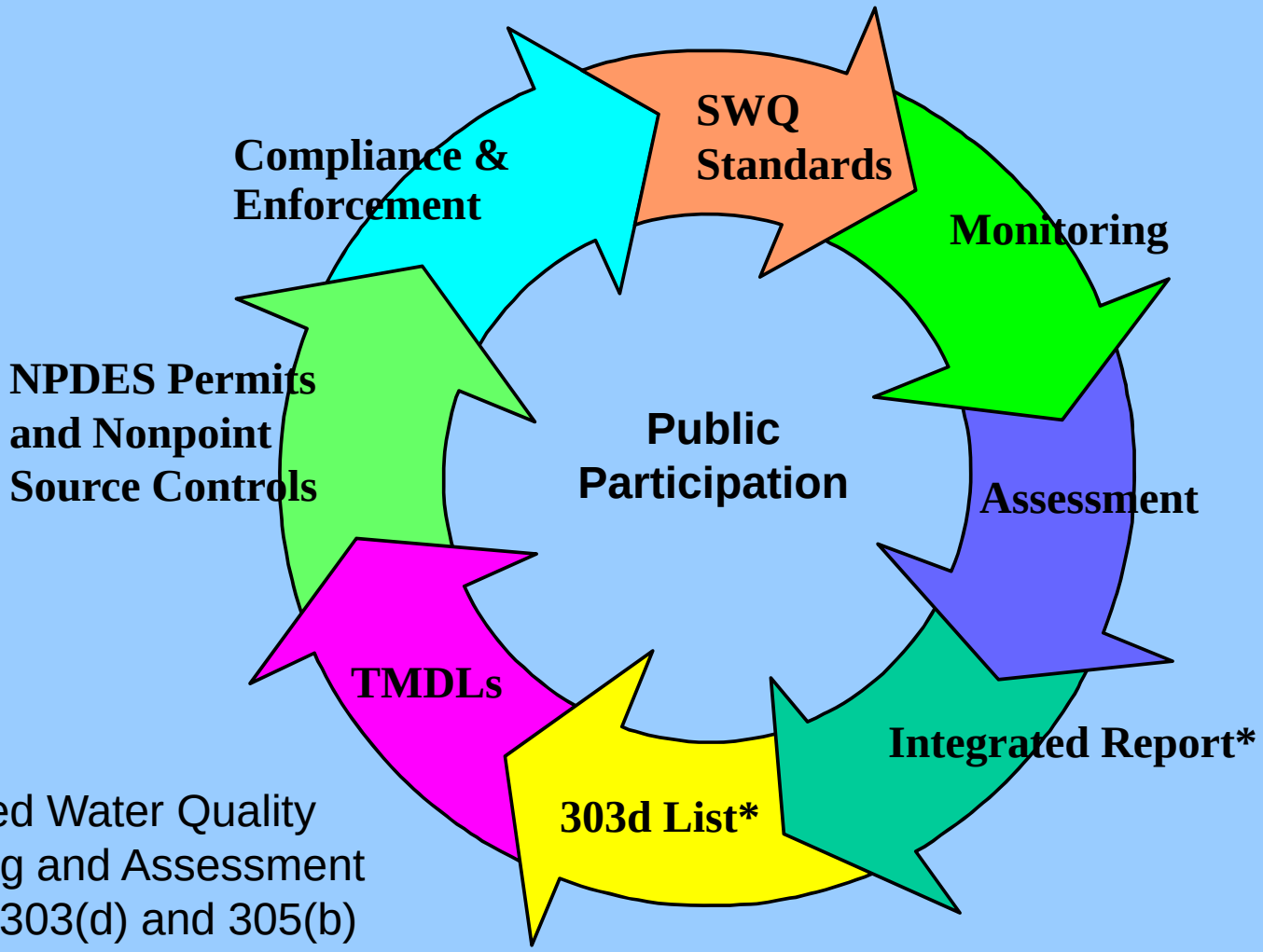


OVERVIEW

- Surface Water Quality Standards
- History of New Jersey's Freshwater Nutrient Criteria
- Implementation through NPDES Permitting
- Water Quality Assessment Methods– 303(d) and 305(b)
- Nutrient Criteria Enhancement Plan

Water Resource Management: Role of Standards, Monitoring and Assessment



*Integrated Water Quality Monitoring and Assessment Report – 303(d) and 305(b)

Water Quality Standards

- CWA Section 303(c) - States required to adopt WQS
- Standards must include:
  - designated uses,
  - water quality criteria (should include magnitude, frequency and duration)
  - antidegradation policy and other policies
- States required to review & revise WQS 1x/3yrs
- After formal consultation with USFWS, EPA can approve or disapprove State Water Quality Standards
- If EPA disapproves, Agency can establish standards for State

New Jersey Surface Water Quality Standards - N.J.A.C. 7:9B

- Classify waters based on uses, including:
  - Aquatic life
  - Drinking water
  - Recreation
  - Fish and Shellfish consumption
  - Agricultural and Industrial supplies
- Water Quality Criteria to protect uses
  - Numeric criteria
  - Narrative criteria
- Policies
  - Antidegradation
  - Mixing zone
  - Variances
  - General and Technical

History of NJ Freshwater Numeric Phosphorus Criteria

1974 - 0.05 mg/L for lakes, reservoirs and tributaries

1981 - 0.1 mg/L for freshwater rivers and streams

1985 - Adopted effluent standard of 1.0 mg/L

1996 - 1999 - SWQS Stakeholder process

2001 - Adopted provision to establish watershed-specific criteria

2002 - Imposed WQBEL based on numeric criteria for discharges to 303(d) listed waterbodies

2002 – Developed a technical manual (guidance) to evaluate narrative criteria for individual dischargers

NJ Freshwater Criteria

Narrative Criteria

Nutrients shall not be allowed in concentrations:

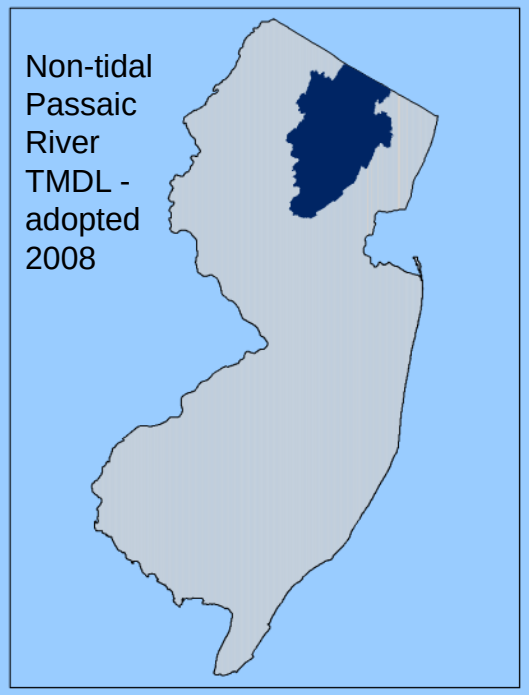
- that cause objectionable algal densities
- nuisance aquatic vegetation
- abnormal diurnal fluctuations in dissolved oxygen or pH
- changes to composition of aquatic ecosystems
- or otherwise render the waters unsuitable for designated uses

Phosphorus Numeric

- Lakes: 0.05 mg/L
- Streams: 0.1 mg/L

Nutrient Policy

Watershed-specific translation of the narrative criteria (e.g. chl *a* concentration) or site-specific numeric criteria for phosphorus can be adopted into NJ's SWQS as part of the Total Maximum Daily Load (TMDL) process



Phosphorus Technical Manual – NPDES Permit Limits

- Specified monitoring requirements and study design for NPDES facilities
- Required demonstration that waterbody was **not impacted** by nutrients to remove the WQBEL based on numeric criteria
- Established conservative thresholds to interpret narrative criteria
- Provided important information on response indicators to develop nutrient assessment method for narrative nutrient criteria in freshwater wadeable streams

Phosphorus Technical Manual – NPDES Permit Limits - Thresholds

Must meet all thresholds to demonstrate compliance with narrative criterion under summer (growing season) and low flow conditions

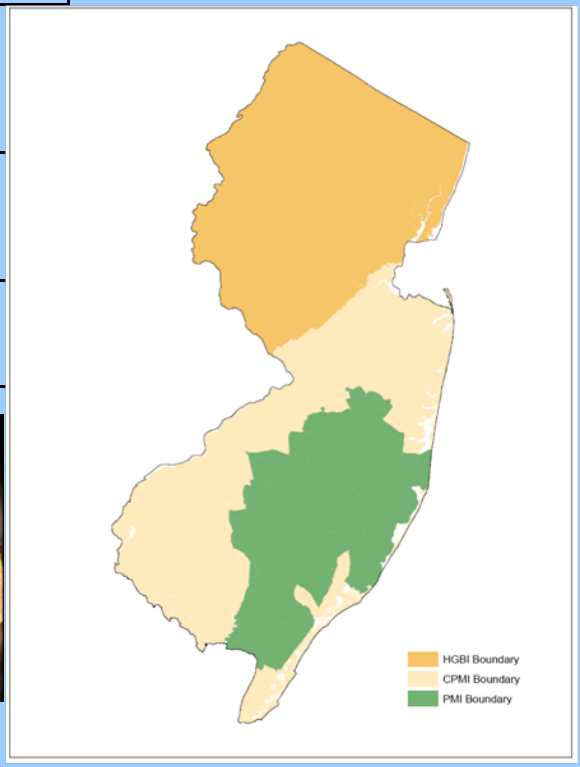
- Dissolved Oxygen criteria (continuous monitoring)
  - DO criteria 90% of the time
  - Daily average DO criteria
- Phytoplankton concentration:
  - 24 µg/L chl-*a* seasonal mean, or
  - 32 µg/L chl-*a* 2-week mean
- Periphyton density:
  - 150 mg/m² chl-*a* seasonal mean, or
  - 200 mg/m² chl-*a* single sample event

Development of 2010 Narrative Nutrient Assessment Method

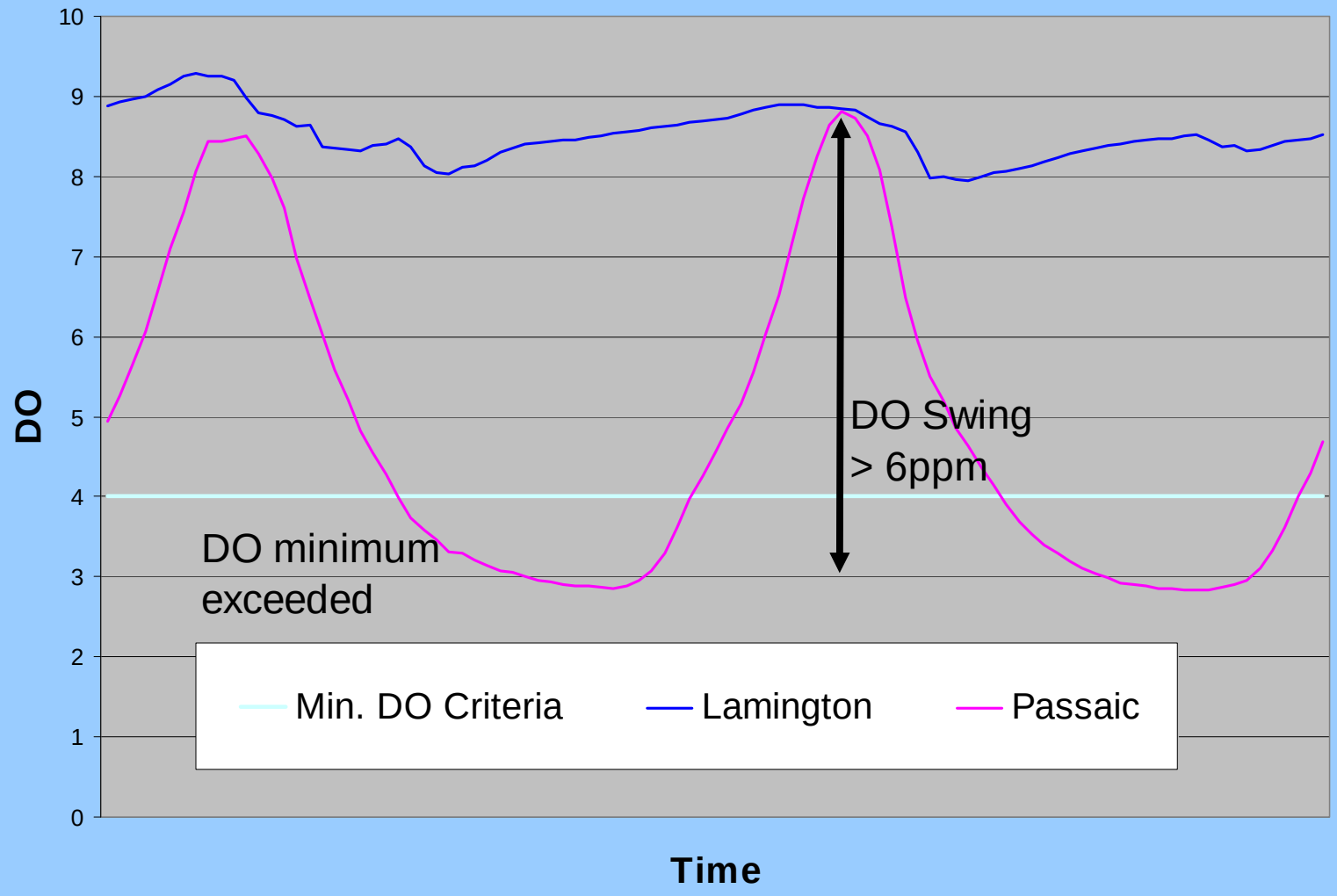
- Weight of evidence approach is needed
- Critical to incorporate biological conditions (benthics, diurnal DO)
- Statewide numeric criterion may need to be augmented with site-specific factors
- 2009 – proposed method in 2010 Water Quality Monitoring and Assessment Methods for developing 2010 Integrated Report (303(d) 305(b))

Biological Thresholds of Macroinvertebrate Metric Index

Category	High Gradient	Coastal Plains	Pinelands	Assessment
Excellent	63 - 100	22 - 30	63 - 100	Not Impaired
Good	42 - < 63	12 - 20	56 - < 63	Not Impaired
Fair	21 - < 42	10 - 6	34 - < 56	Impaired
Poor	< 21	< 6	< 34	Impaired



Diurnal DO Swing
(< 3mg/L)



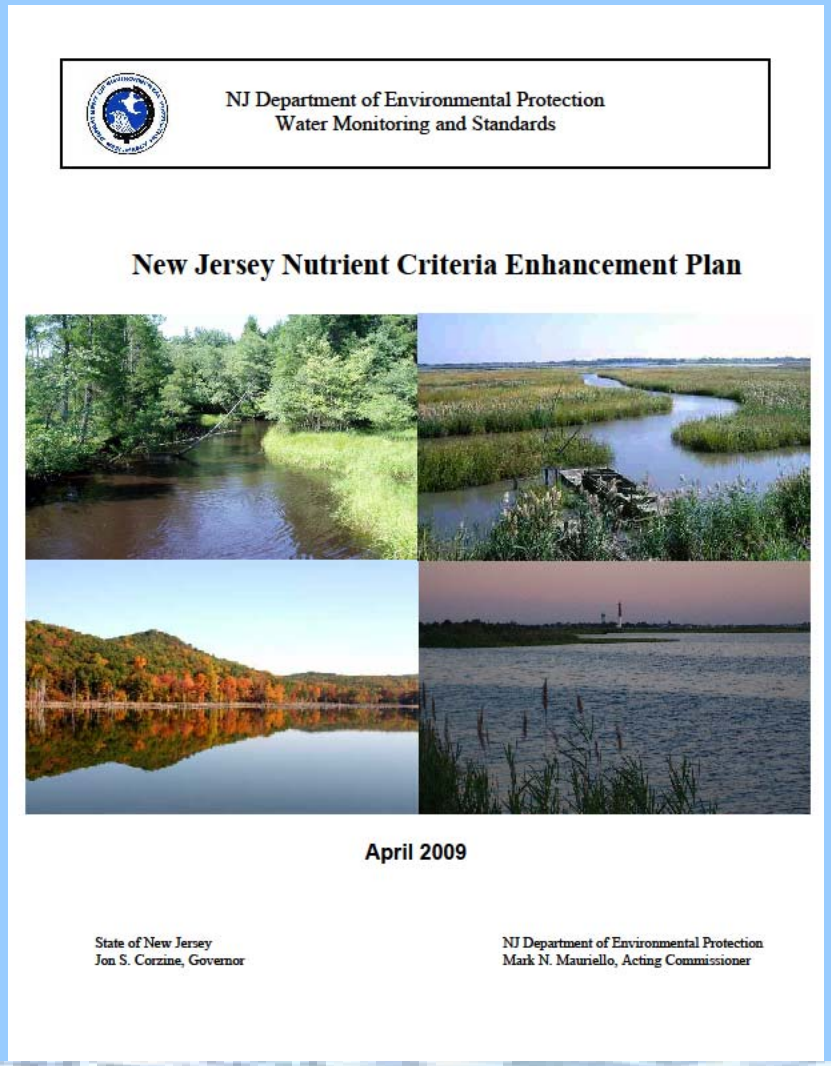
2010 Narrative Nutrient Criteria Example Assessment Results

Benthic Index Assessment	DO Criteria	Diurnal DO Swing	Narrative Nutrient Criteria
Not Impaired	Met		Met
Impaired	Exceeded	> 3 mg/L	Exceeded*
Impaired	Met	> 3 mg/L	Exceeded* if Chl *a* > 150 mg/sq meter

***Where narrative nutrient criteria exceeded – phosphorus is listed on the 303(d) list**

NJ Nutrient Criteria Enhancement Plan

- Documents State's Strategy to develop assessment methods and numeric criteria for all waterbody types
- Current criteria and assessment limited to non-tidal wadeable freshwater rivers/streams
- Under Development:
  - Coastal Waters (estuaries, ocean waters)
  - Freshwater Non-Wadeable Rivers
  - Lakes


NJ Department of Environmental Protection
Water Monitoring and Standards

New Jersey Nutrient Criteria Enhancement Plan

April 2009

State of New Jersey
Jon S. Corzine, Governor

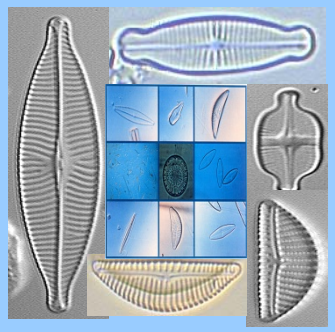
NJ Department of Environmental Protection
Mark N. Mauriello, Acting Commissioner

Nutrient Criteria Enhancement Strategy

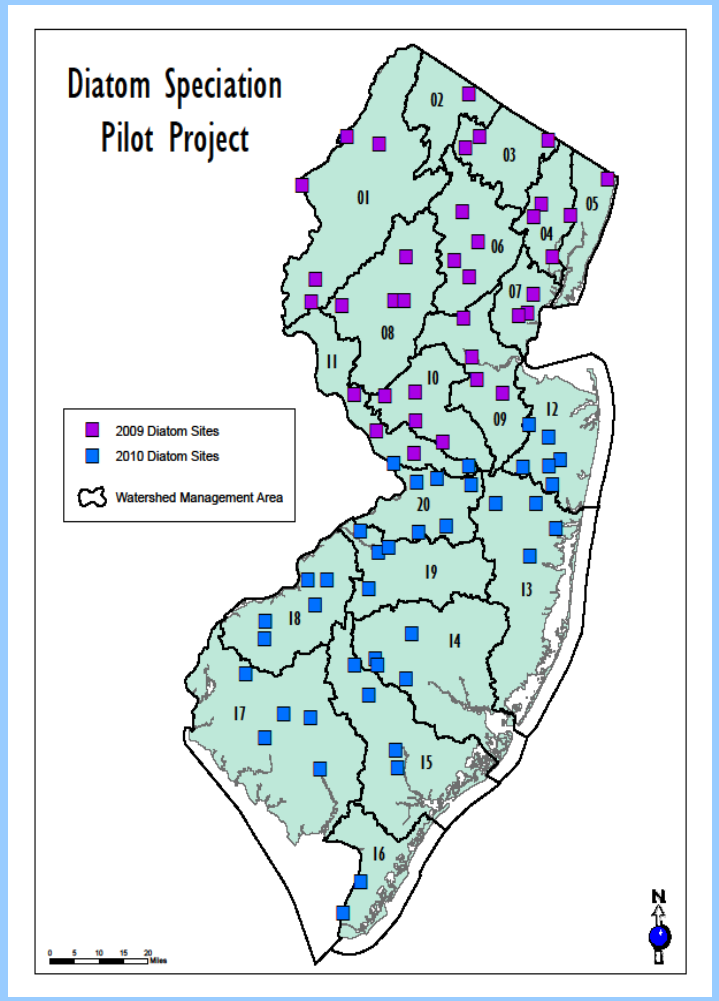
- Enhance monitoring and data collection on nutrients and response variables
- Research cause/response relationships and select appropriate indicators of aquatic life use impairment
- Develop enhanced assessment methodologies based on ecosystem response variables (e.g. DO, diatoms, SAV)
- Implement enhanced assessment methods through Integrated Report
  - Listing/Delisting
  - TMDLs
- Develop/promulgate new numeric nutrient site-specific criteria through TMDLs

Projects Under Development for Freshwaters*

- Trophic Diatom Index – complete
- Using BCG to set nutrient thresholds using diatoms based on eco-regions
- Lake Diatom Index – under development using sediment cores collected as part of our probabilistic lake survey work
- Paleolimnological Analysis of Nutrient Enrichment for Criteria Development in New Jersey Lakes



*These projects completed in conjunction with the Philadelphia Academy of Natural Science



Nutrient Criteria Development for Coastal Waters

- Benthic Index for Near Shore Ocean Waters
- Benthic Index for shallow coastal bays
- Nutrient and Ecological Histories in Barnegat Bay
- Ecological health for shallow coastal bays to incorporate several factors –benthic index, SAV, and algal blooms

Conclusions

- New Jersey is currently implementing both narrative and numeric criteria in freshwater wadeable streams
- Need to rely more on biological responses using a weight of evidence approach to evaluate nutrient impacts
- More work is needed to develop cause-response relationships before we adopt numeric criteria for all waters.

Comments/Questions

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