

DELAWARE ESTUARY
SCIENCE AND ENVIRONMENTAL SUMMIT 2015
“BALANCING PROGRESS AND PROTECTION”
SESSION 3: WATER QUALITY I
JANUARY 26, 2015

Development and Implementation of Site-Specific
Nutrient Control Solutions in New Jersey

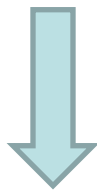


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Agenda

- Why are Nutrients Important?
- Recent History of Nutrient Regulation in NJ
- Phosphorus Impact Evaluations



- Basin-Wide Nutrient Studies and TMDLs
- Why This Matters

Why are Nutrients Important?

- Phosphorus and nitrogen are macronutrients – required for plants and algae to grow
- Nutrients are regulated because they can contribute to eutrophication (“render unsuitable”)
 - Objectionable algal densities
 - Nuisance aquatic vegetation
 - Diurnal fluctuations in dissolved oxygen or pH indicative of excessive photosynthetic activity
 - Detrimental changes to the composition of aquatic ecosystems
 - Exception: natural conditions

Recent History of Phosphorus Regulation in NJ

Pre-2002

- Numerical stream and lake criteria on the books
- Effluent criteria of 1.0 mg/L for discharges to lakes
- Water Quality Assessment based solely on 0.1 mg/L

Phosphorus Strategy

- 0.1 mg/L TP criterion assumed to apply
- Stringent effluent TP limits on WWTPs
- Phosphorus Impact Studies allowed

Basin-wide Nutrient TMDLs

- **Cooperative** effort between NJDEP and NJPDES permittees to extend near-field phosphorus studies to entire basins

Phosphorus Impact Studies

- Purpose of Studies

- Determine whether excessive phosphorus is “rendering the waters unsuitable”

- Indicators of Use Impairment

- Dissolved oxygen

- must not violate criteria due to diurnal swings

- Phytoplankton concentration

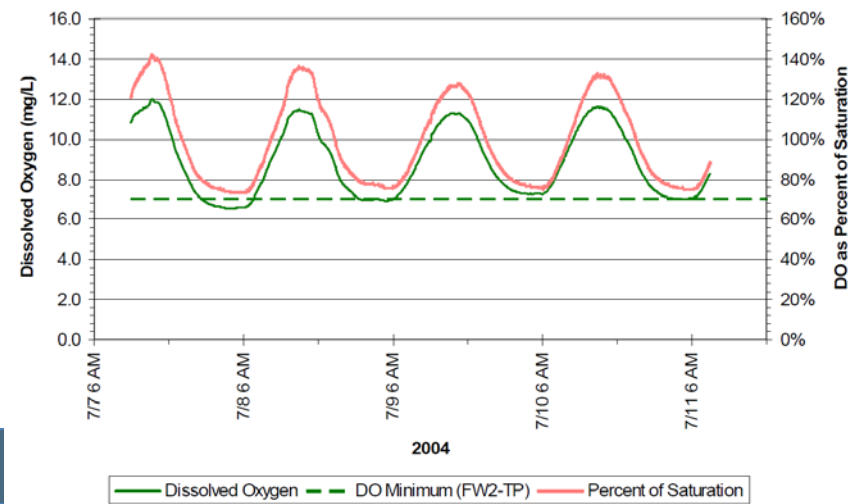
- 24 µg/l chl-a seasonal mean

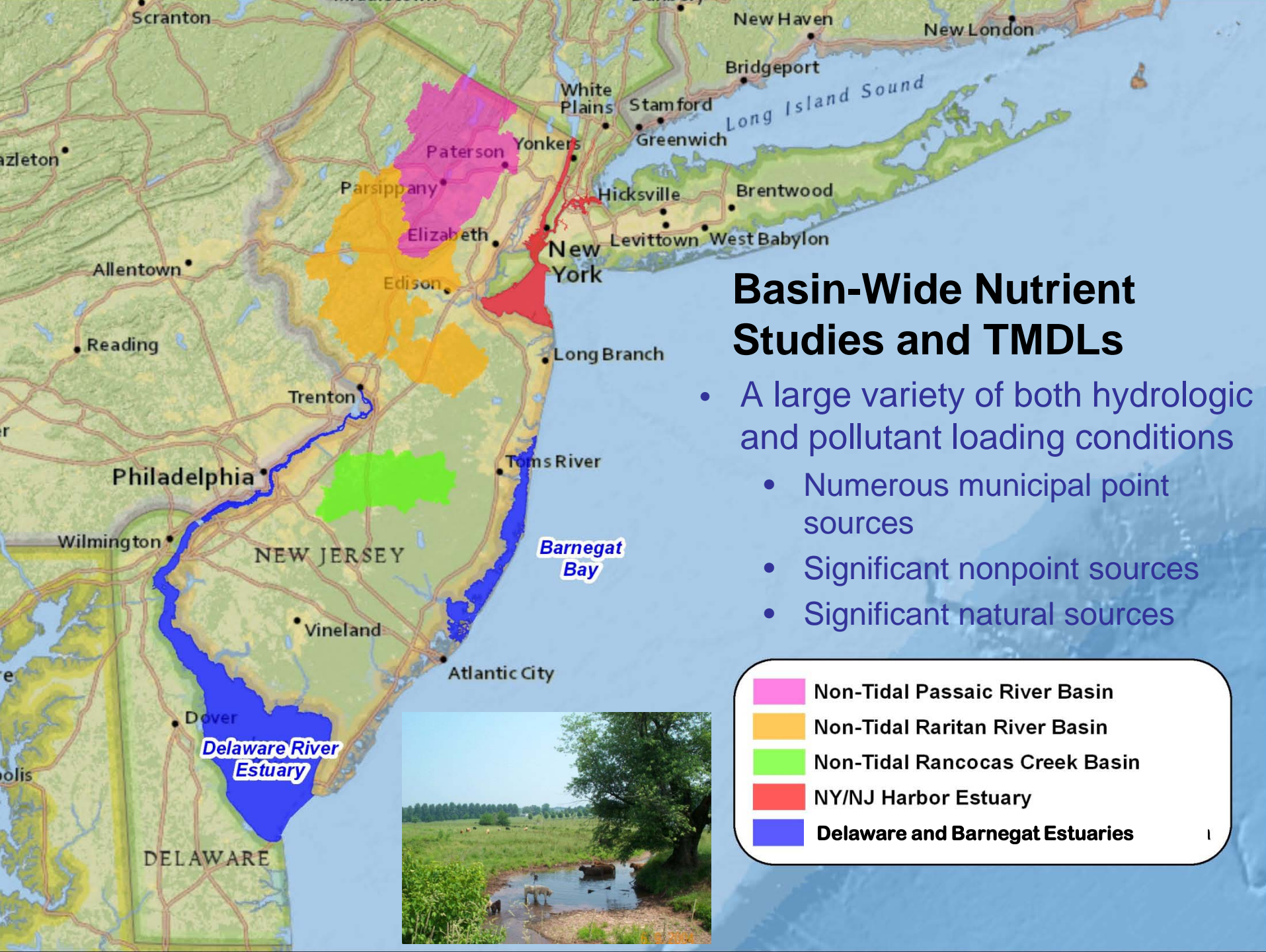
- Periphyton density

- 150 mg/m² chl-a seasonal mean

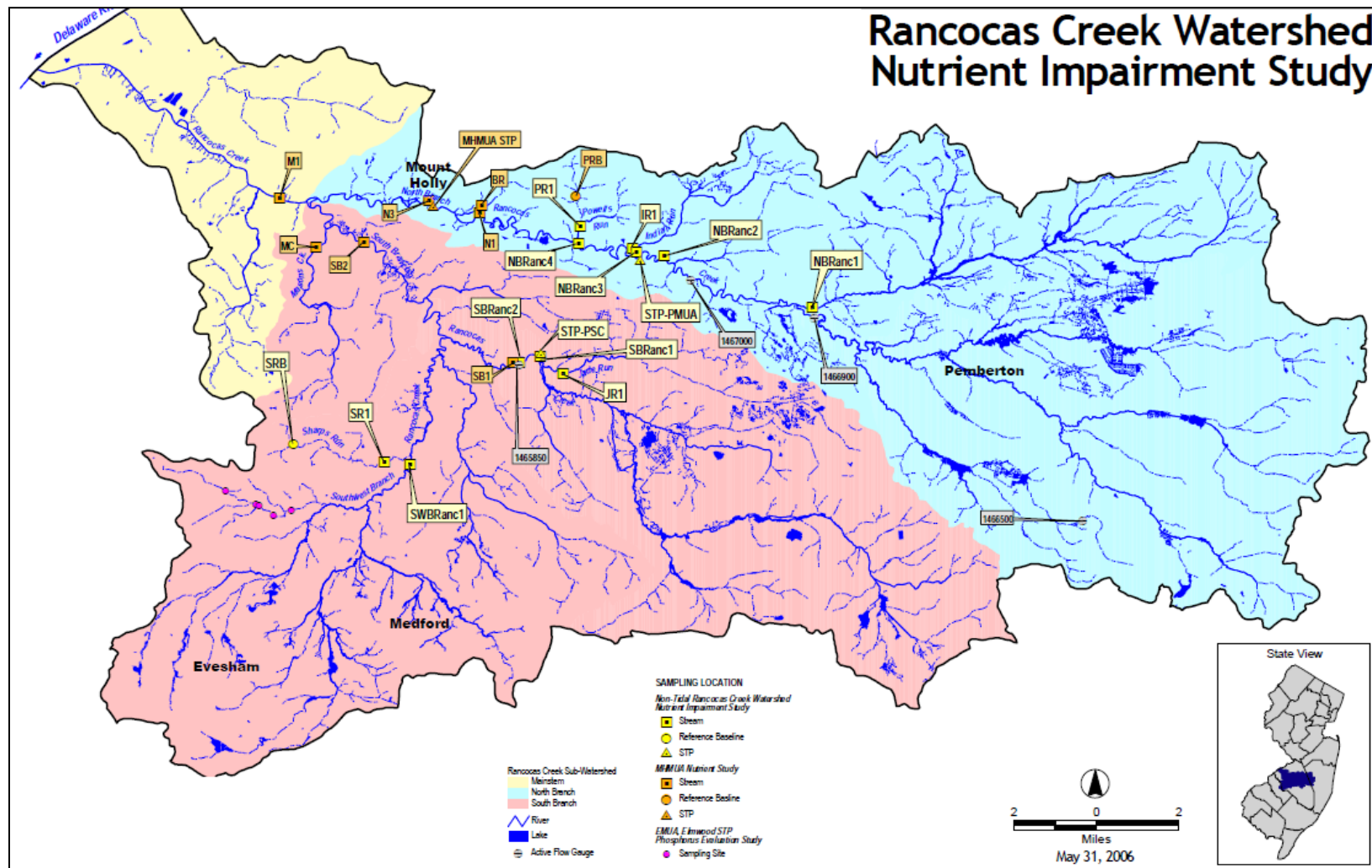
Results of Phosphorus Impact Studies

- Plenty of available nutrients downstream of treatment plants
 - Algal kinetic demand is saturated ≥ 0.05 mg/L P
- Results highly site-specific
 - Many examples where phosphorus is not causing impairment and TP criterion therefore does not apply
 - Other examples where phosphorus is causing impairment and TP criterion therefore does apply





KEY: Comprehensive Monitoring and Assessment



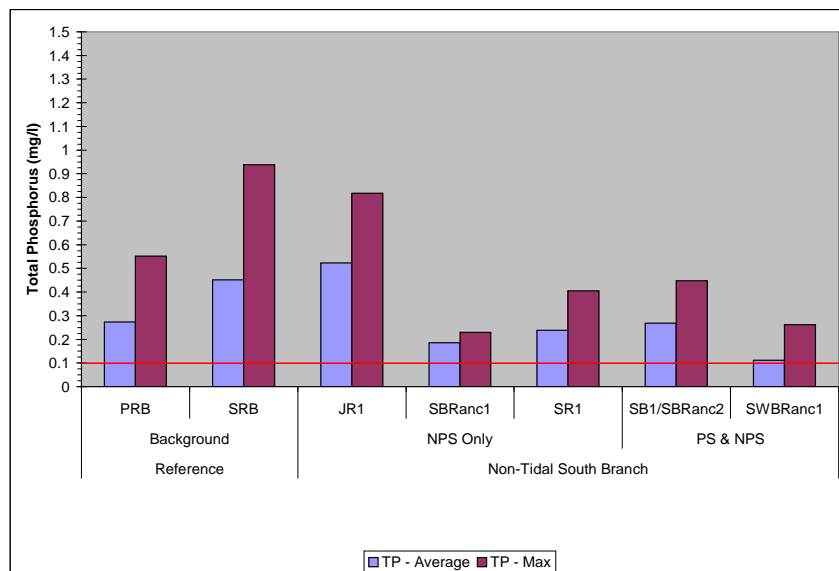
Extensive Water Quality Monitoring

- 17 Nutrient Chemistry stations
 - 20 summer sampling events
 - WWTPs sampled at the same time
- 11 Impairment Evaluation stations
 - 20 phytoplankton measurements
 - 4 periphyton measurements
 - 3 diurnal DO, pH, temperature events (~5 days each)
- 2 Reference Baseline stations
 - Nutrient chemistry, phytoplankton, and periphyton

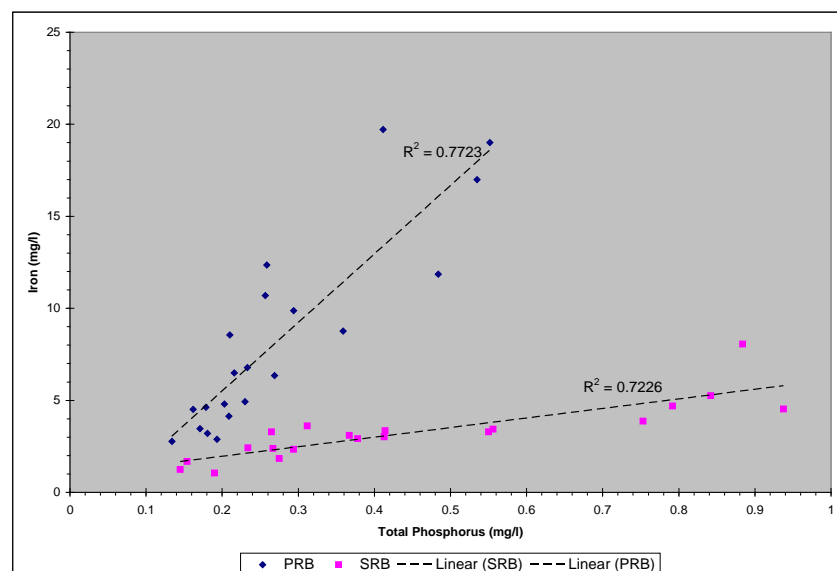


Comprehensive Water Quality Assessment

Significant Background Sources



Significant Interactions with Iron



Rancocas Creek Study Conclusions

- Phosphorus is not causing, nor could it potentially cause, instream impairment
 - Phosphorus in the study area is not limiting productivity
 - Natural levels of phosphorus are above the levels where phosphorus could be expected to limit productivity, and are sufficient to drive the productivity observed throughout the watershed
- Productivity is minimal throughout the watershed, and is not sensitive to changes in phosphorus concentration
 - Very high iron concentrations prevalent throughout the watershed render phosphorus unavailable for uptake
 - Black color of streams throughout the watershed also greatly limit light penetration and therefore productivity

TMDL Not Needed
New Phosphorus Limits not
Imposed on WWTPs

Keys to a Successful Nutrient Study and TMDL

- The Right Monitoring and Assessment
 - Importance of thorough characterization and assessment
 - Understand natural conditions
 - Identify appropriate regulatory path to solve problem
- The Right Critical Locations and End Points
 - “Where” matters
 - End point = how to define success
- The Right Technical Tools
 - Hydrologic Model
 - Pollutant Loading Model
 - Hydraulic Model
 - Water Quality Model

Effective partnerships based on
TRUST and **CREDIBILITY**
are critical

Why This Matters

- Nutrient impacts are highly site-specific
 - Any nutrient control solutions must be site-specific, designed to solve particular water quality problems
 - There is no “right” target number, either in treated effluent or in receiving water
- Work cooperatively with regulators to identify and solve real nutrient impairments
 - Simplistic, broad-brush “solutions” often not appropriate
- Equally applicable to estuaries
 - Nutrient impact diagnostic studies of Barnegat Bay
 - NBOD controls may be next step in Delaware Estuary

Questions?



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