




Narragansett Bay Commission Update

Blackstone River Users Conference
September 18, 2012

Overview

- ▶ NBC Construction Update
 - CSO Project
 - Alternative Energy Projects
 - Biological Nutrient Removal (BNR)
 - ▶ NBC Nutrients Monitoring Program
 - Bay Results
 - River Results
 - ▶ Conclusions & Questions
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NBC Construction Project Update

- ▶ Combined Sewer Overflow (CSO) Abatement Project
- ▶ 3 Phases over 20 years – \$1.3 Billion!!!
- ▶ Phase I Complete: 2001 – 2008 (~\$359M)
- ▶ Phase II: 2011 – 2014 (~\$363M)
- ▶ Phase III – evaluation period after Phase II
 - Estimated Cost – \$603 Million
 - Design complete 2016/2017
 - Anticipated construction 2017 – 2022

CSO Tunnel Success – Phase I

- ▶ CSO Tunnel has captured 4.3 billion gallons since November 2008
- ▶ Fecal coliforms in the Upper Bay (Point St Bridge to Conimicut Point) have decreased by 34%
- ▶ Changes in shellfish closure criteria by RIDEM due to tunnel success

Phase I tunnel has prevented thousands of pounds of pollutants from entering the Upper Bay by being captured and processed at Field's Point

Pollutant	Pounds
TSS	1,564,026
BOD	1,025,245
Total Nitrogen	107,953
Aluminum	8,154
Cadmium	68
Chromium	257
Copper	373
Cyanide	177
Iron	38,985
Lead	301
Nickel	139
Silver	111
Zinc	915

NBC Alternative Energy Projects



Wind Turbines – Field’s Point

- ▶ 3 (365ft.) wind turbines
- ▶ Expected to supply approximately 35 – 40% of electricity needs for the FP WWTF (7.1 million kWh/year)

Biogas–Fired Generator– Bucklin Point (design phase)

- ▶ Biogas generated from anaerobic digestion of sewage sludge
- ▶ Expected to supply facility with approximately 40% of the 1.3 MW of electricity needs
- ▶ **2.6 MW Solar Photovoltaic Project Feasibility Assessment/Study Underway for Bucklin Point**



Biological Nutrient Removal Upgrades – Total Nitrogen (TN) – Field's Point



- ▶ Construction ongoing at Field's Point – complete by 2013/2014
- ▶ Designed to meet 5 ppm TN, reduction of ~3000 lbs TN/day
- ▶ Achieving 8.2 ppm TN for the 2012 Season, **4.2 ppm TN for Aug '12**
- ▶ Cost – \$31 million

Biological Nutrient Removal Upgrades – Total Nitrogen (TN) – Bucklin Point



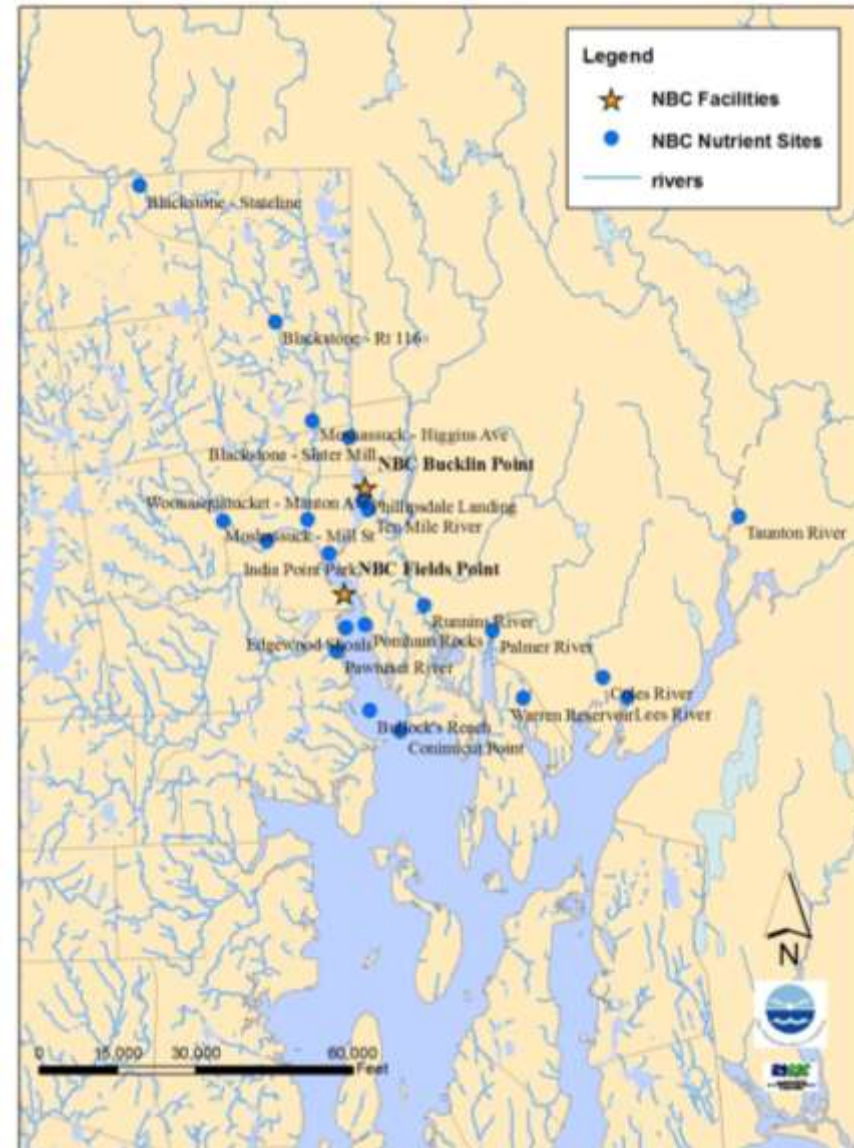
- ▶ Built to meet 8.5 ppm TN in 2005/2006
 - \$8.3 million for initial nitrogen upgrade
- ▶ Currently achieving 6.2 ppm TN for 2012
- ▶ Upgrade design to 5ppm TN ongoing
 - Estimated cost – \$13 million
 - Reduction of ~104 lbs TN/day

NBC TN Reductions since 2003

	Concentration (ppm)	Loading (lbs/day)	Percent Reduction (Loading)
Field's Point TN Loading			
2003	15.7	5,872	
Presently	8.5	2,926	50%
IFAS Upgrade	5.0	1,788	70%
If plant achieves 3 ppm	3.0	1,073	82%
Bucklin Point TN Loading			
2003	14.8	2,920	
Presently	6.2	917	69%
When achieves 5 ppm	5.0	813	72%
If plant achieves 3 ppm	3.0	488	83%
Combined NBC Facilities			
2003	FP=15.7, BP=14.8	8,792	
Presently	FP=8.5, BP=6.2	3,843	56%
FP&BP Upgrade to 5 ppm	FP=5.0, BP=5.0	2,601	70%
FP&BP Upgrade to 3 ppm	FP=3.0, BP=3.0	1,561	82%

NBC Nutrients Monitoring

- ▶ Program instituted in 2005
- ▶ Designed to evaluate nutrient loading in the urban rivers and Narragansett Bay, and
- ▶ Address and understand the magnitude of impacts that facility operations have on receiving waters
- ▶ Parameters include: NO_2/NO_3 , NO_3 , NH_4 , PO_4 , Chlorophyll, Total Dissolved Nitrogen, Silicate, Total Suspended Solids, Total Organic Carbon
- ▶ River/Bay sampled twice a month; State border rivers once a month



National Coastal Condition Report III



Table I-2. Criteria for Assessing Dissolved Inorganic Nitrogen (DIN)

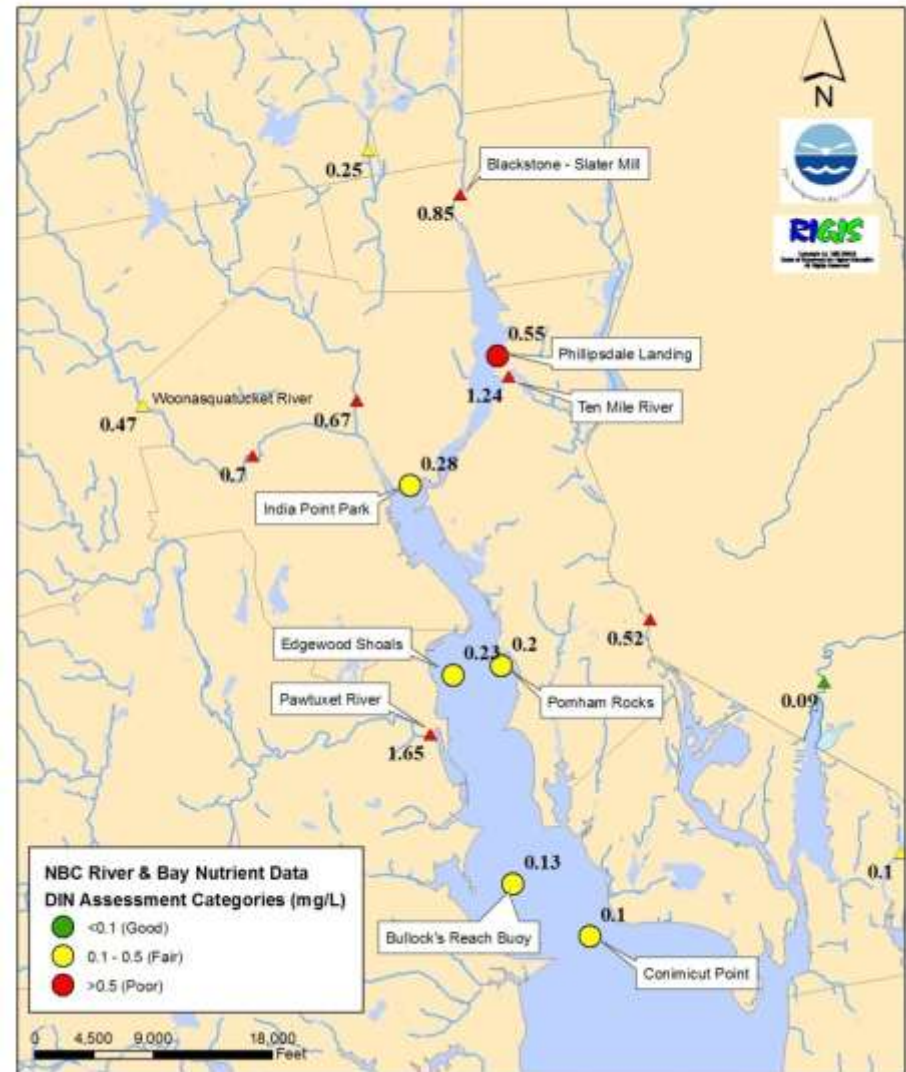
Area	Good	Fair	Poor
Northeast, Southeast, and Gulf Coast sites	< 0.1 mg/L	0.1–0.5 mg/L	> 0.5 mg/L
West Coast and Alaska sites	< 0.5 mg/L	0.5–1.0 mg/L	> 1 mg/L
Hawaii, Puerto Rico, and Florida Bay sites	< 0.05 mg/L	0.05–0.1 mg/L	> 0.1 mg/L
Regions	Less than 10% of the coastal area is in poor condition, and more than 50% of the coastal area is in good condition.	10% to 25% of the coastal area is in poor condition, or more than 50% of the coastal area is in combined poor and fair condition.	More than 25% of the coastal area is in poor condition.

Dissolved Inorganic Nitrogen

NBC Bay Nutrient Sampling Stations
 Summer 2010 DIN Concentrations (mg/L) at Surface
 May - October Rainfall Total: 19.22 inches

May – October Rainfall Total: **19.22 inches**

Station	2010	
	DIN (mg/L)	EPA NEP criteria
	DIN (mg/L) Good <0.1 Fair 0.1-0.5 Poor >0.5	
Phillipsdale Landing	0.55	Poor
India Point Park	0.28	Fair
Edgewood Yacht Club	0.23	Fair
Pomham Rocks	0.20	Fair
Bullock's Reach	0.13	Fair
Conimicut Point	0.10	Fair

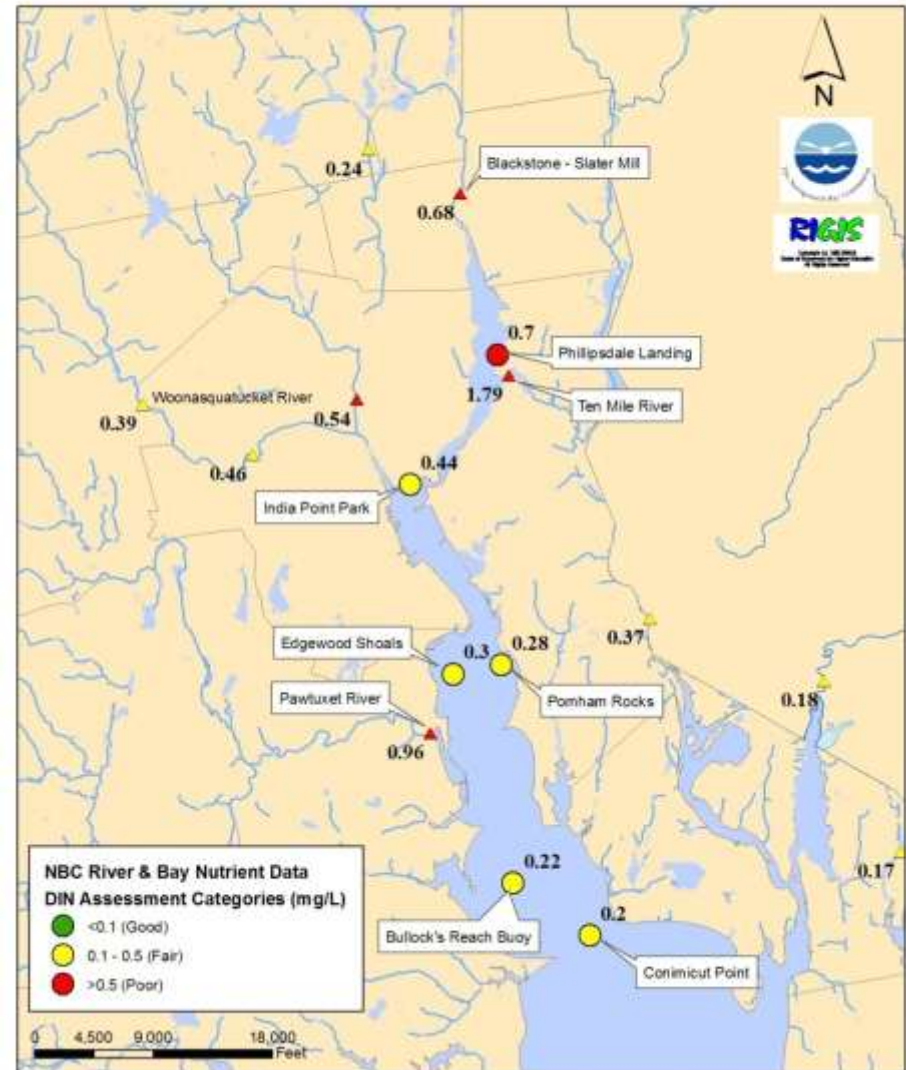


Dissolved Inorganic Nitrogen

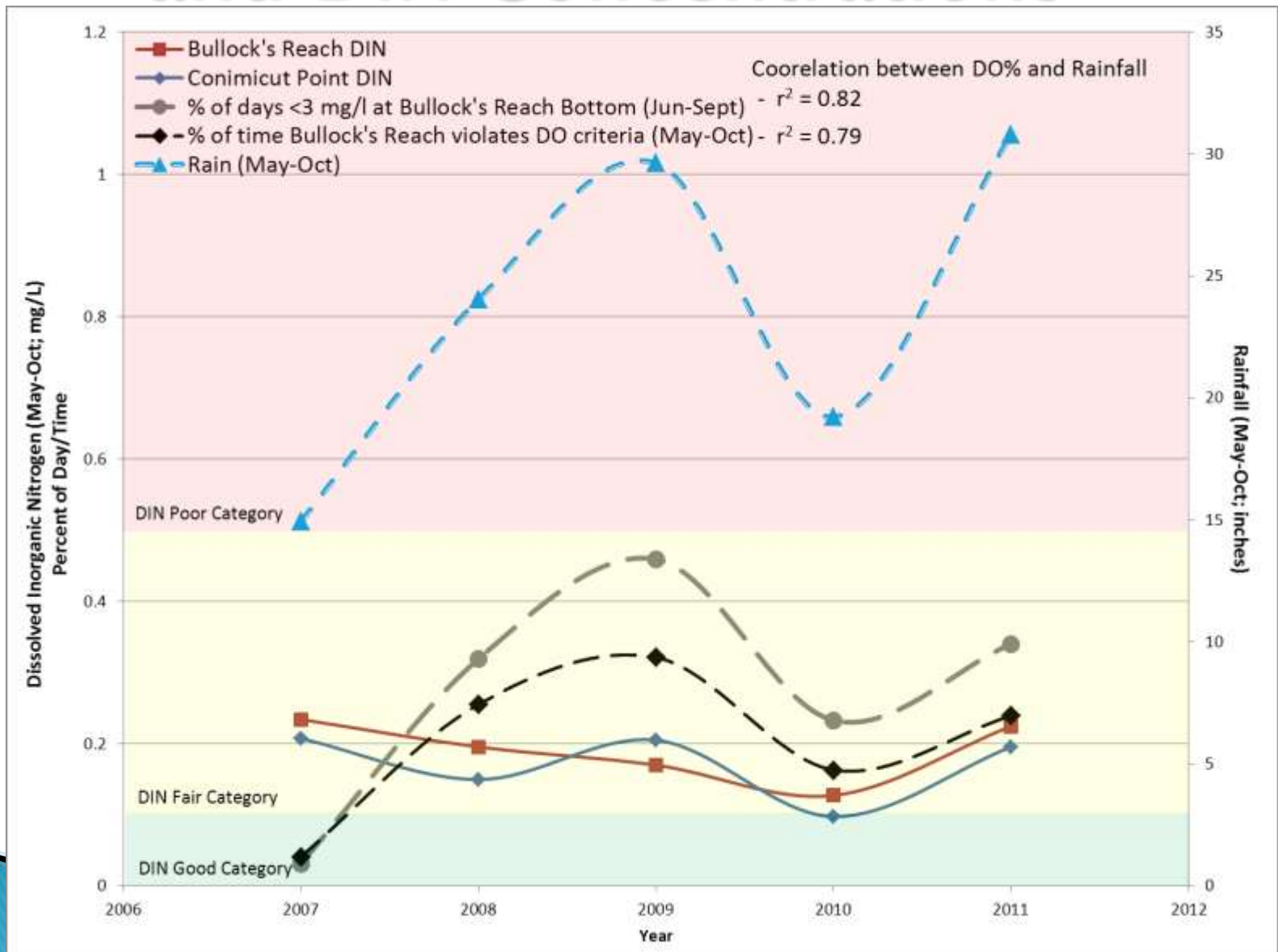
NBC Bay Nutrient Sampling Stations
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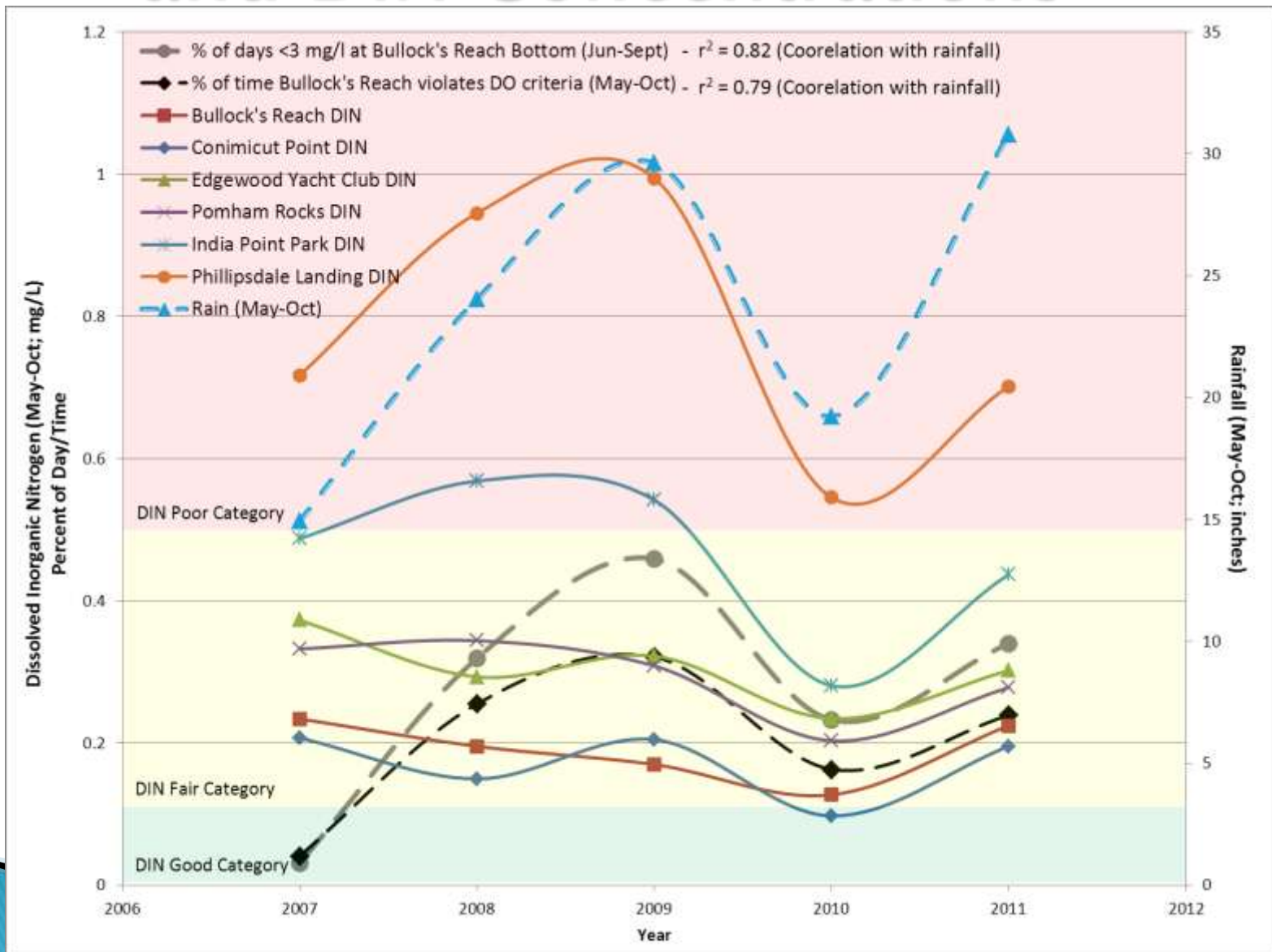
Station	2011	
	DIN (mg/L)	EPA NEP criteria
	DIN (mg/L) Good <0.1 Fair 0.1-0.5 Poor >0.5	
Phillipsdale Landing	0.70	Poor
India Point Park	0.44	Fair
Edgewood Yacht Club	0.30	Fair
Pomham Rocks	0.28	Fair
Bullock's Reach	0.22	Fair
Conimicut Point	0.20	Fair



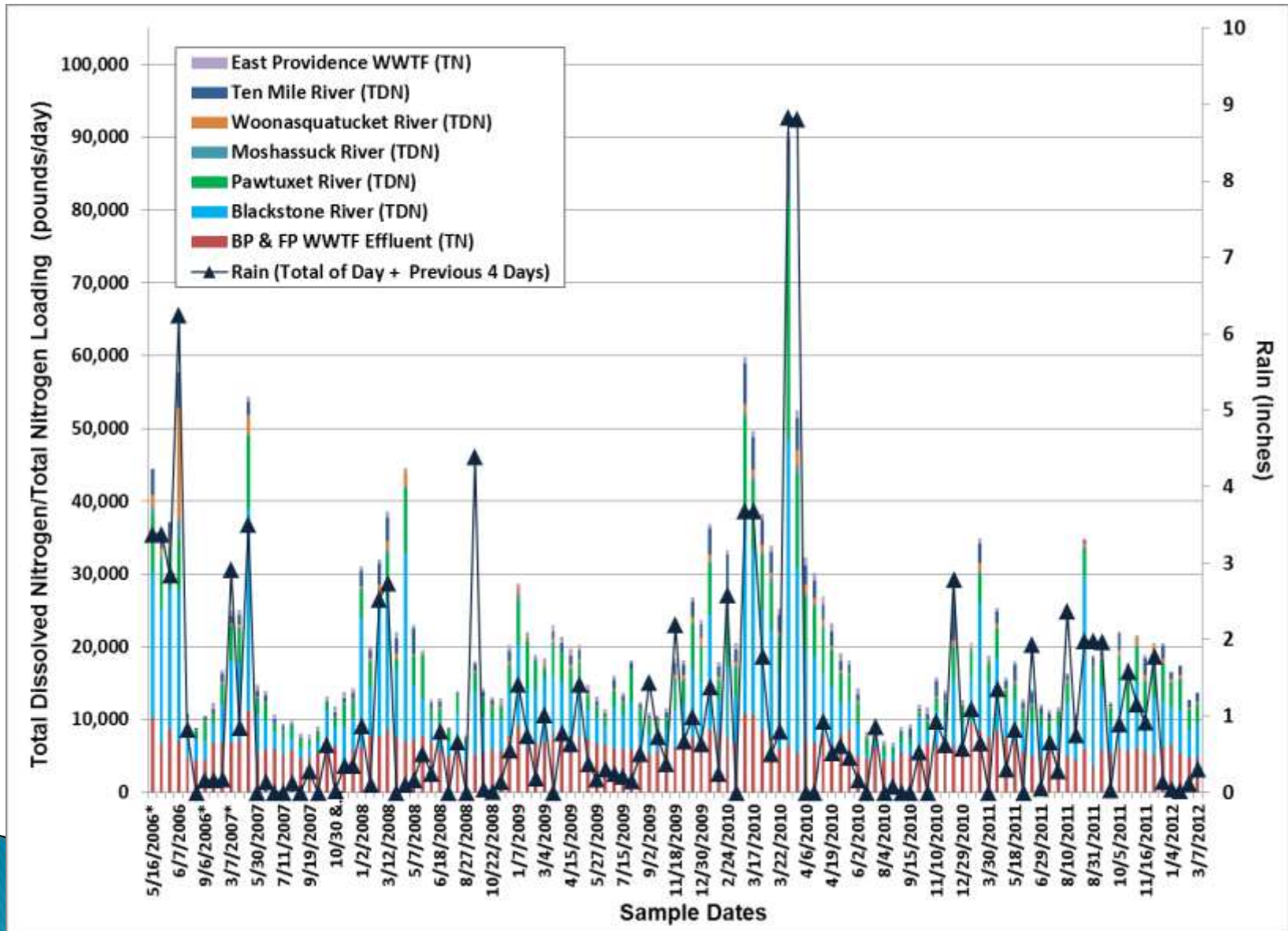
Effect of Rainfall on Hypoxia and DIN Concentrations



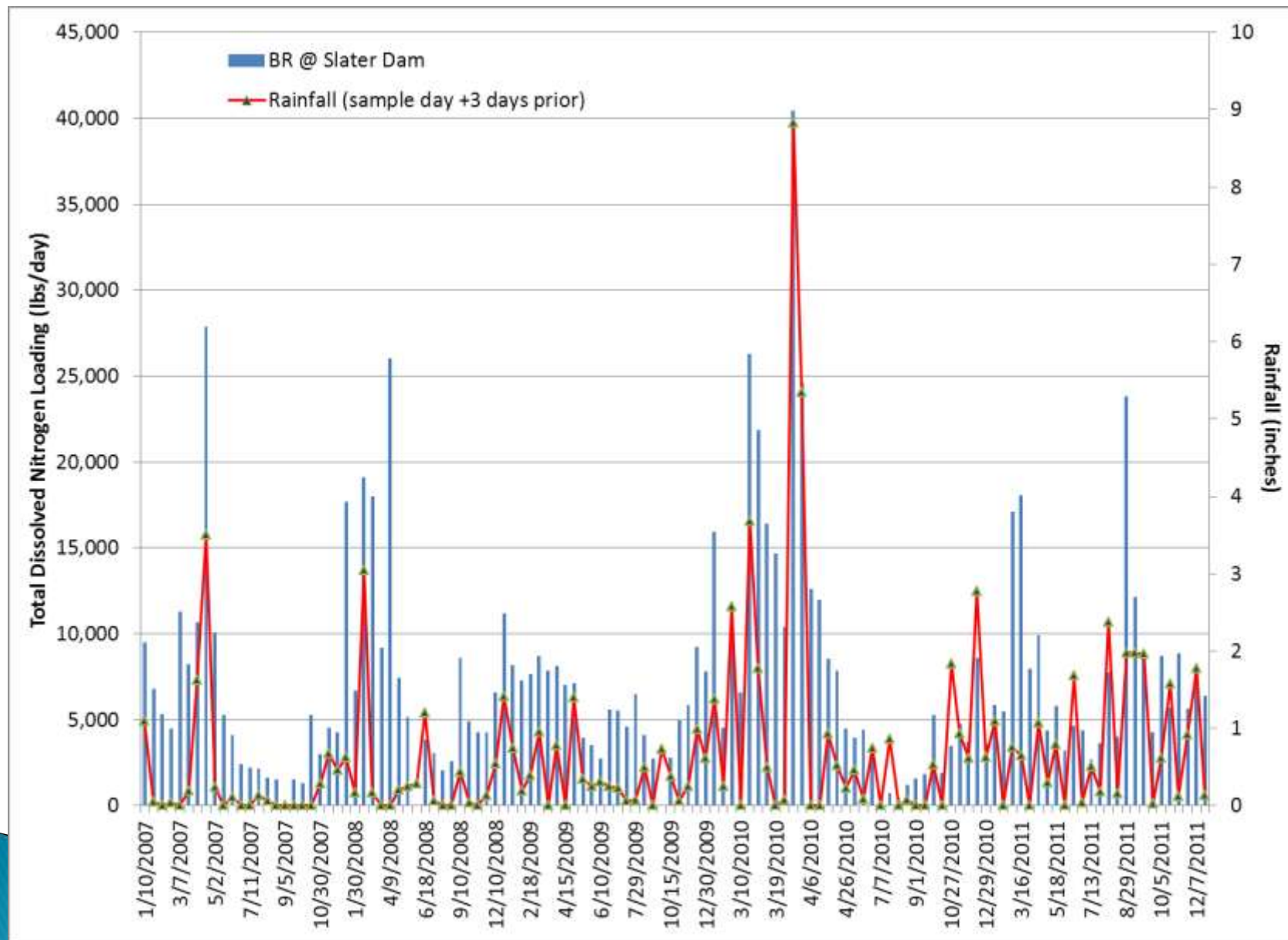
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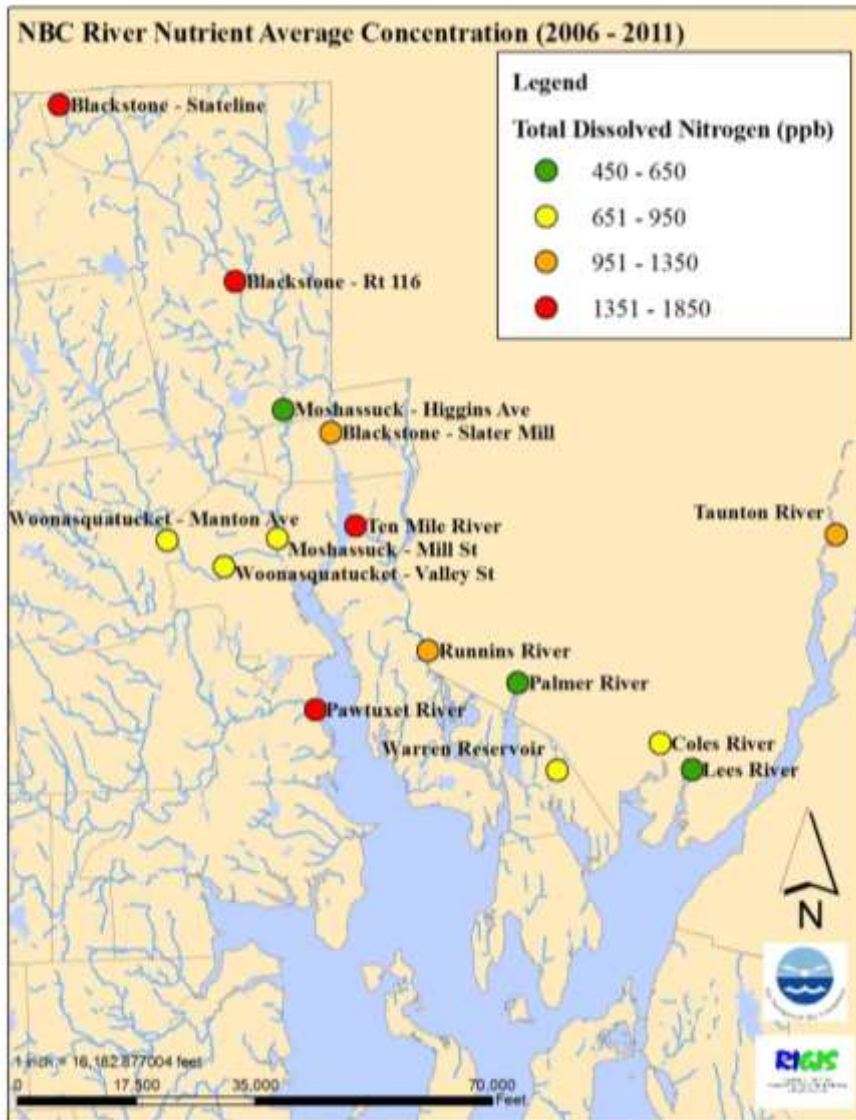
Upper Bay TDN Loading vs. Rainfall



Blackstone River TDN Loading vs. Rainfall

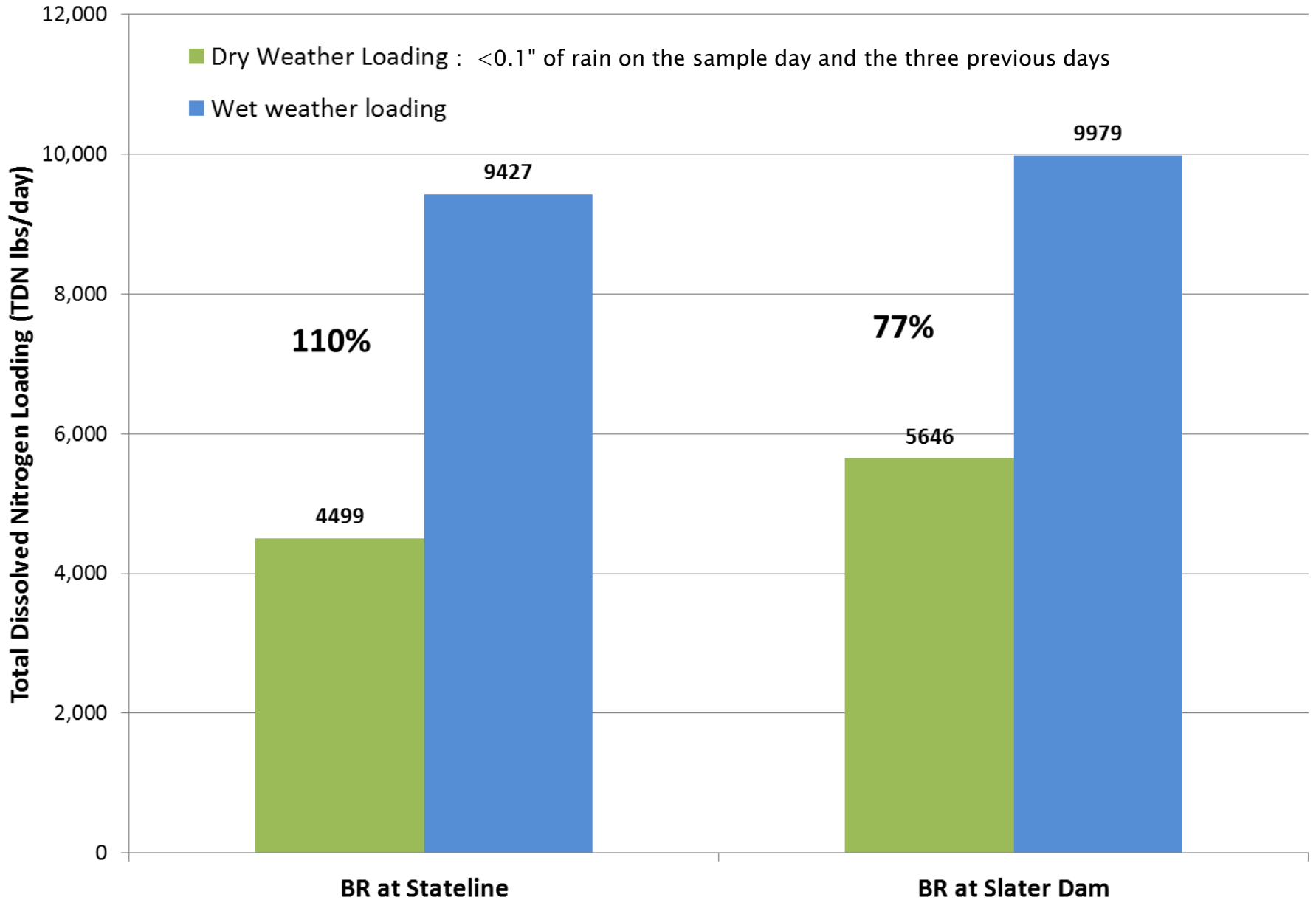


Total Dissolved Nitrogen in Rivers



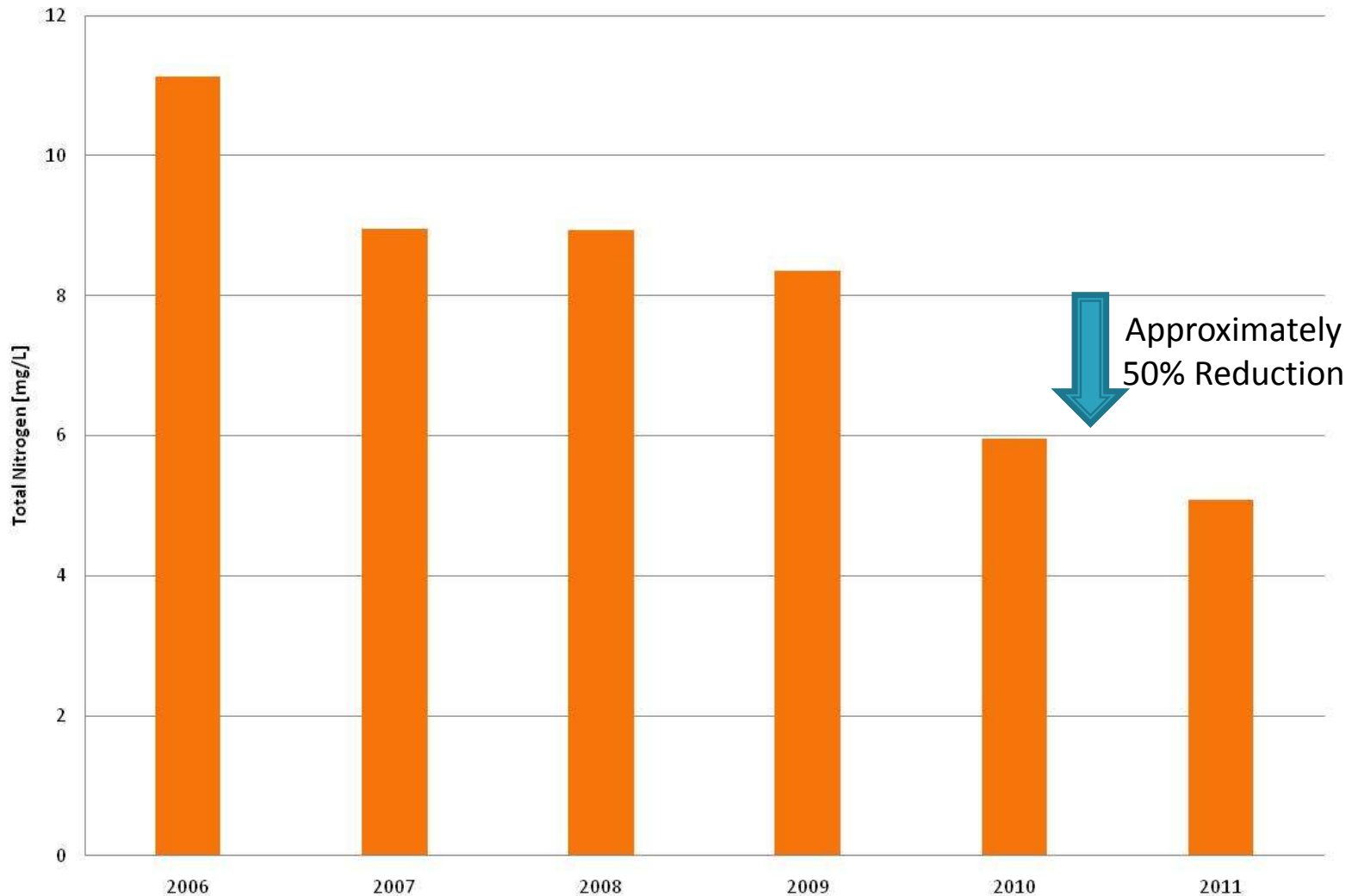
- ▶ Concentrations are in ppb ($\mu\text{g}/\text{L}$)
- ▶ Average of all data (wet & dry) from 2006 to 2011
- ▶ Range from 452 – 1824 ppb
- ▶ Highest concentrations:
 - Ten Mile River (1824 ppb)
 - Pawtuxet River (1568 ppb)
 - Blackstone River –
 - Stateline (1448 ppb)
 - Rt 116 (1446 ppb)
 - Slater Mill (1290 ppb)
- ▶ Lowest concentration – Lees (452 ppb), Palmer (519 ppb) and Moshassuck (Higgins; 596 ppb) Rivers

Dry and Wet Weather TDN Loading Blackstone River



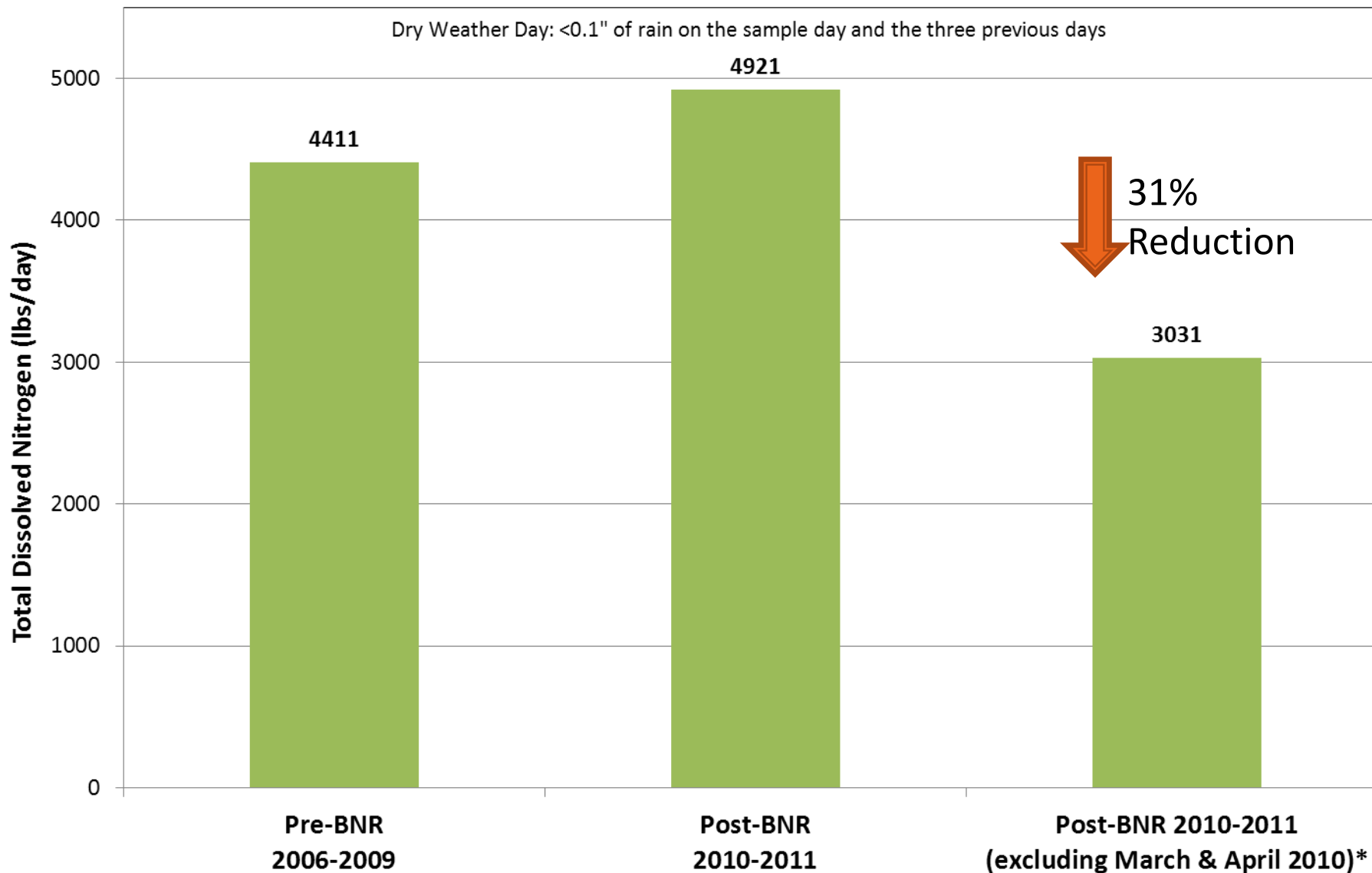
UBWPAD Effluent TN Results

Average Annual Total Nitrogen Effluent Concentration



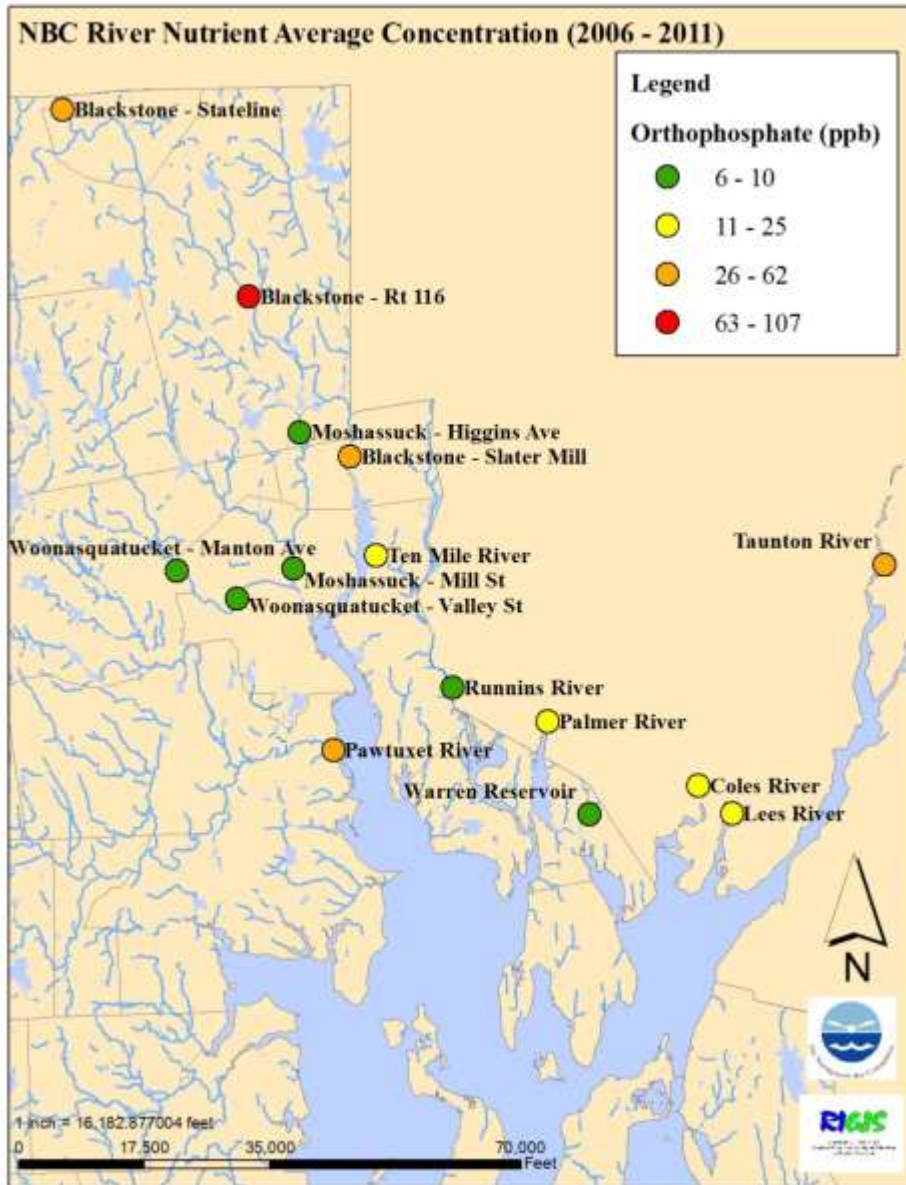
Dry Weather TDN Loading on the Blackstone River at the Stateline Pre- & Post-BNR at UBWPAD

Dry Weather Day: <0.1" of rain on the sample day and the three previous days



*River flow was almost 5X higher during this time period than an average dry weather day

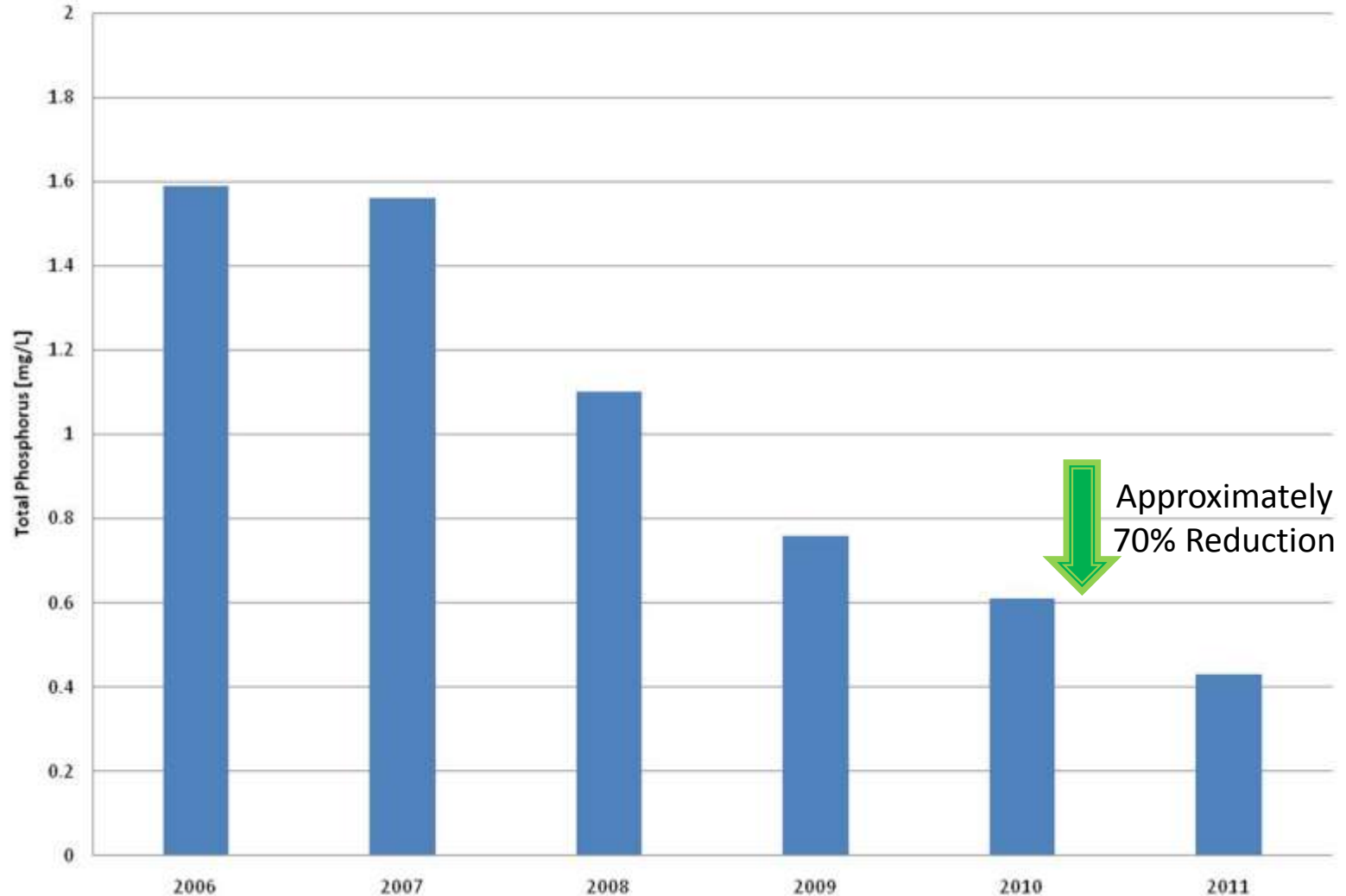
Orthophosphate (PO_4) in Rivers



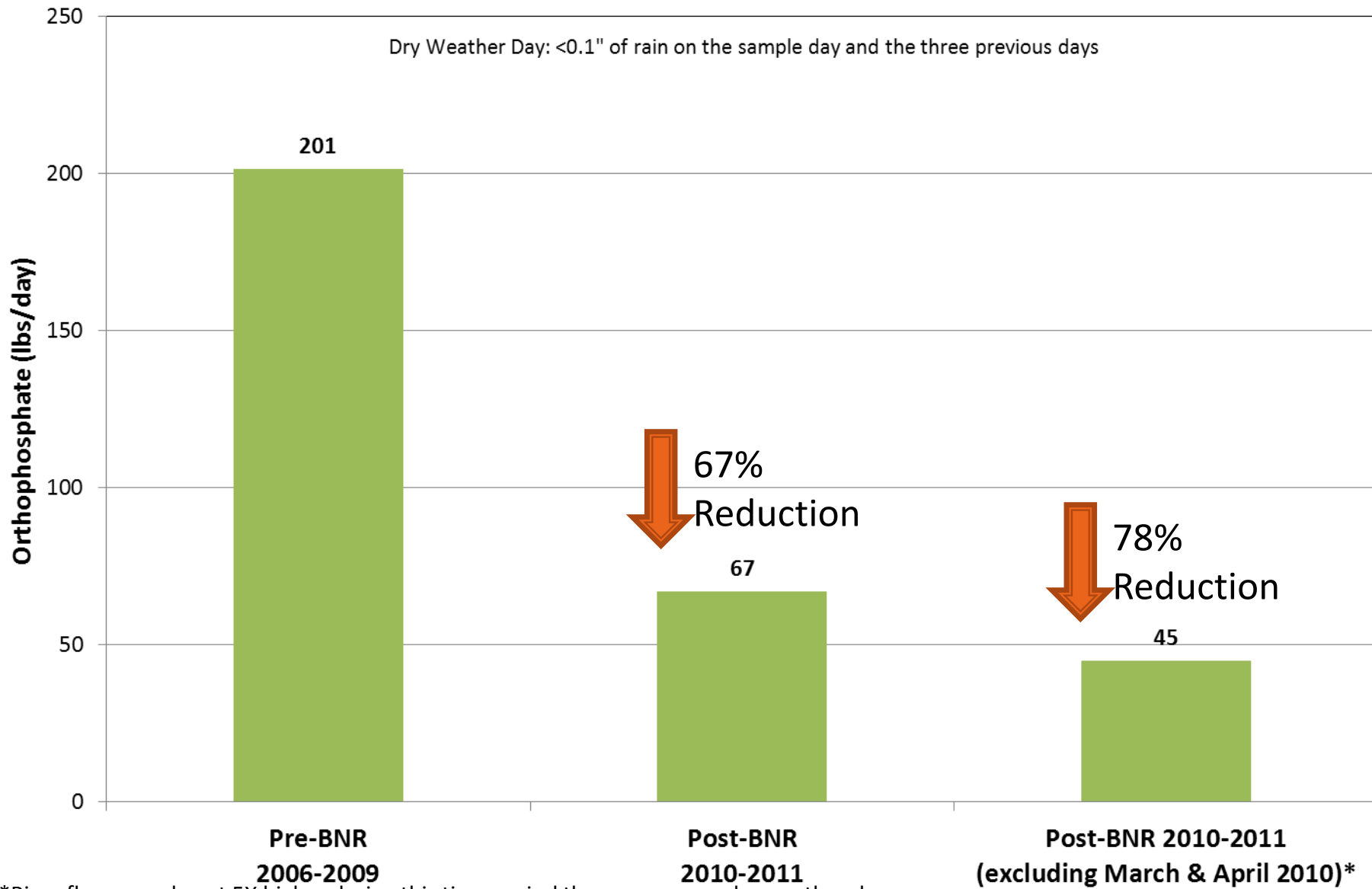
- ▶ Concentrations are in ppb ($\mu\text{g}/\text{L}$)
- ▶ Average of all data from 2006 to 2011
- ▶ Range from 6 – 107 ppb
- ▶ Highest concentrations:
 - Blackstone River –
 - Rt 116 (107 ppb)
 - Stateline (62 ppb)
 - Slater Mill (54 ppb)
 - Pawtuxet River (49 ppb)
 - Taunton River (40 ppb)
- ▶ Lowest concentration –
Woonasquatucket (Manton; 6 ppb), Moshassuck (Mill; 7 ppb)
Runnins (7 ppb) Rivers

UBWPAD Effluent TP Results

Average Annual Total Phosphorus Effluent Concentration



Dry Weather PO₄ Loading on the Blackstone River at the Stateline Pre- & Post-BNR at UBWPAD



*River flow was almost 5X higher during this time period than an average dry weather day

Conclusions

- ▶ NBC reduced nitrogen discharges by 56% since 2003
- ▶ Other POTWs have also achieved impressive nutrient reductions
- ▶ Nutrient loadings in area rivers increase significantly as rainfall increases
- ▶ Percent of time Upper Bay dissolved oxygen is impaired increases as rainfall increases
- ▶ UBWPAD has reduced nitrogen loading by ~50% and phosphorus loading by ~70%
- ▶ Blackstone River Nitrogen loadings increase 77 – 110% due to rainfall
- ▶ Dry weather Nitrogen loading in Blackstone River is down 31% and Phosphorus loading is down 78%

Questions?



- ▶ Contact info:

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