

Narragansett Bay Commission CSO Abatement: Water Quality Improvements Following Completion of Phase II



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Narragansett Bay Commission

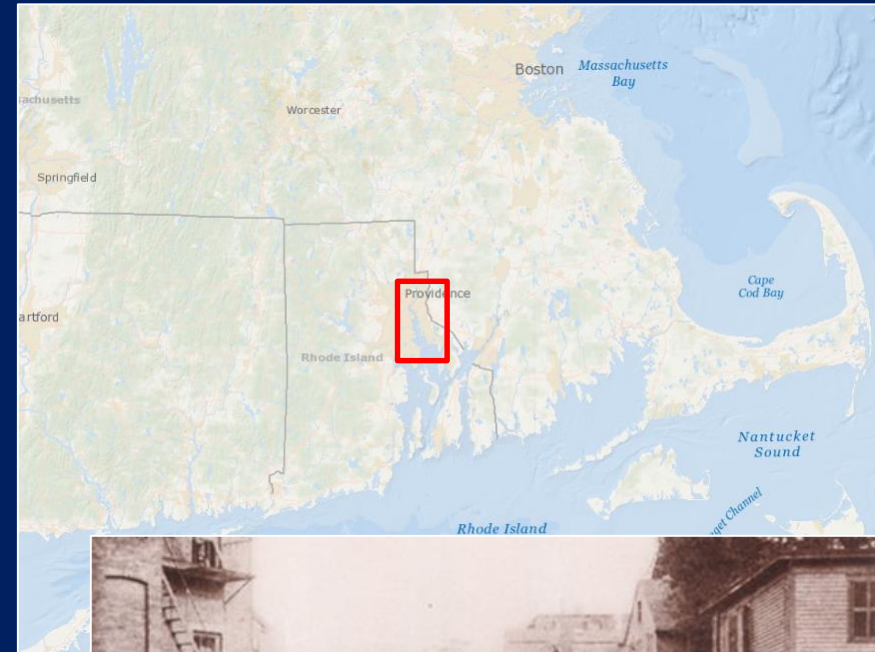


January 2023

NEWEA Annual Conference

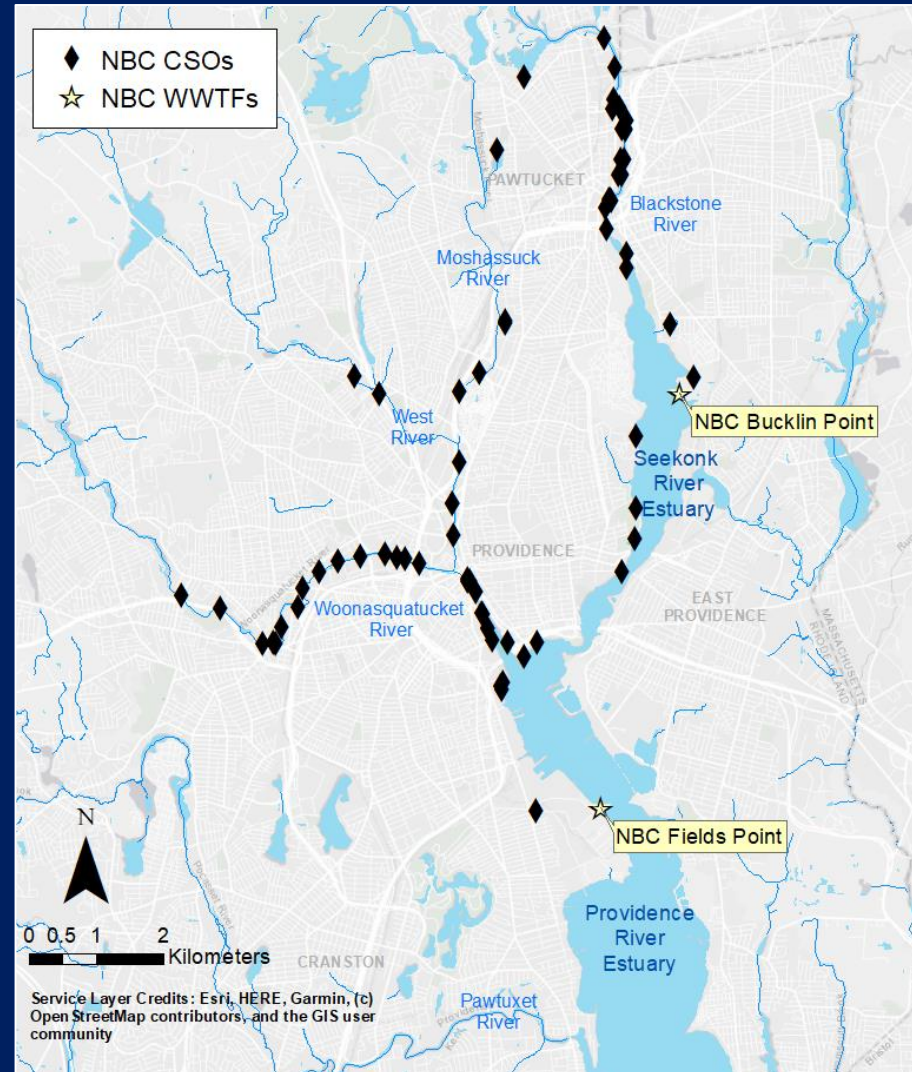
Narragansett Bay Commission

- Own and operate two largest WWTFs in Rhode Island, USA
- Serving Providence and surrounding towns
- Sewage collection system dates back to 1870s
- 60+ Combined Sewer Outfalls (CSOs)

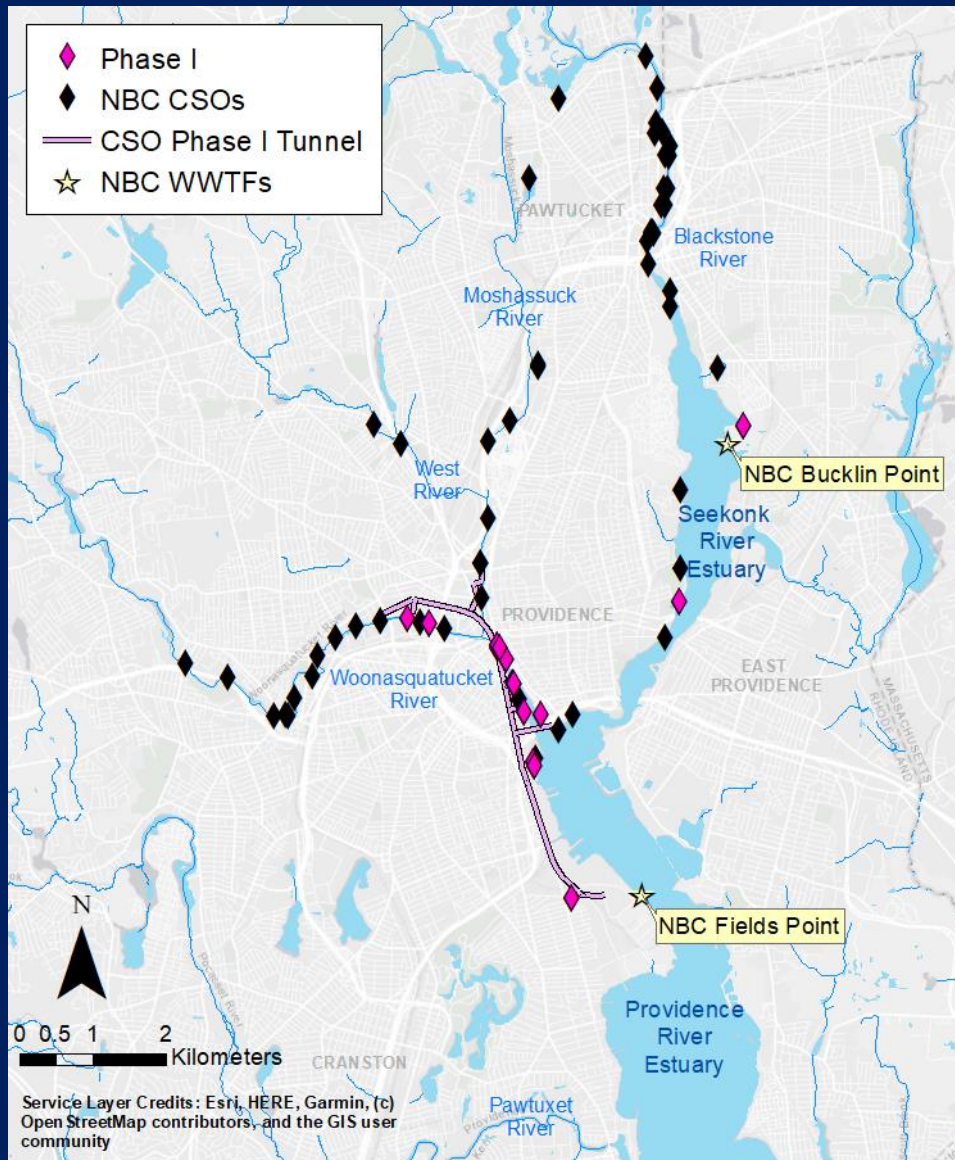


NBC CSO Abatement Project

- Total cost approaching \$2 billion
- Goal: reduce CSO discharges
 - Receiving waters are impaired (excess bacteria)
 - Shellfishing is prohibited
 - Primary contact (swimming) not approved
- Three Phases



CSO Abatement Phase I



- Completed Oct. 2008
- Addressed CSOs along the Woonasquatucket River, Providence and Seekonk River Estuaries
- “Addressed” – sealed or modifications made to reduce discharge frequency

CSO Abatement Phase I

- Providence (Phase I) Tunnel
 - 26-ft diameter deep rock tunnel, 3-mile long, 300 ft. below ground
 - 65-million-gallon capacity
 - Stores flows for eventual treatment at Field's Point WWTF



Phase I

Water Quality Improvement

[http://snapshot.narrabay.com/
LearnMore/WaterQualityReports](http://snapshot.narrabay.com/LearnMore/WaterQualityReports)

- Providence Tunnel captures an estimated 50% of CSO flows
 - “first flush”
- Shellfishing regulations relaxed in 2011
 - Increased rainfall threshold to trigger closures
 - 50-65 additional days open for shellfishing per year

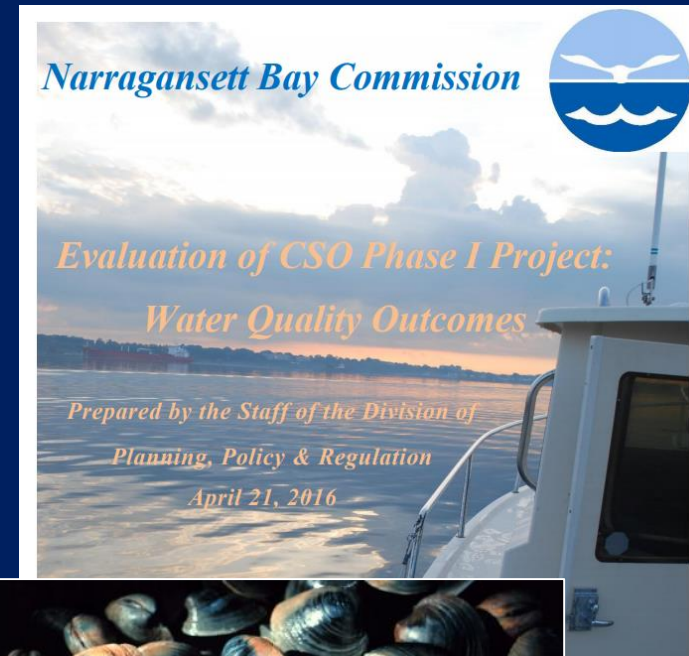
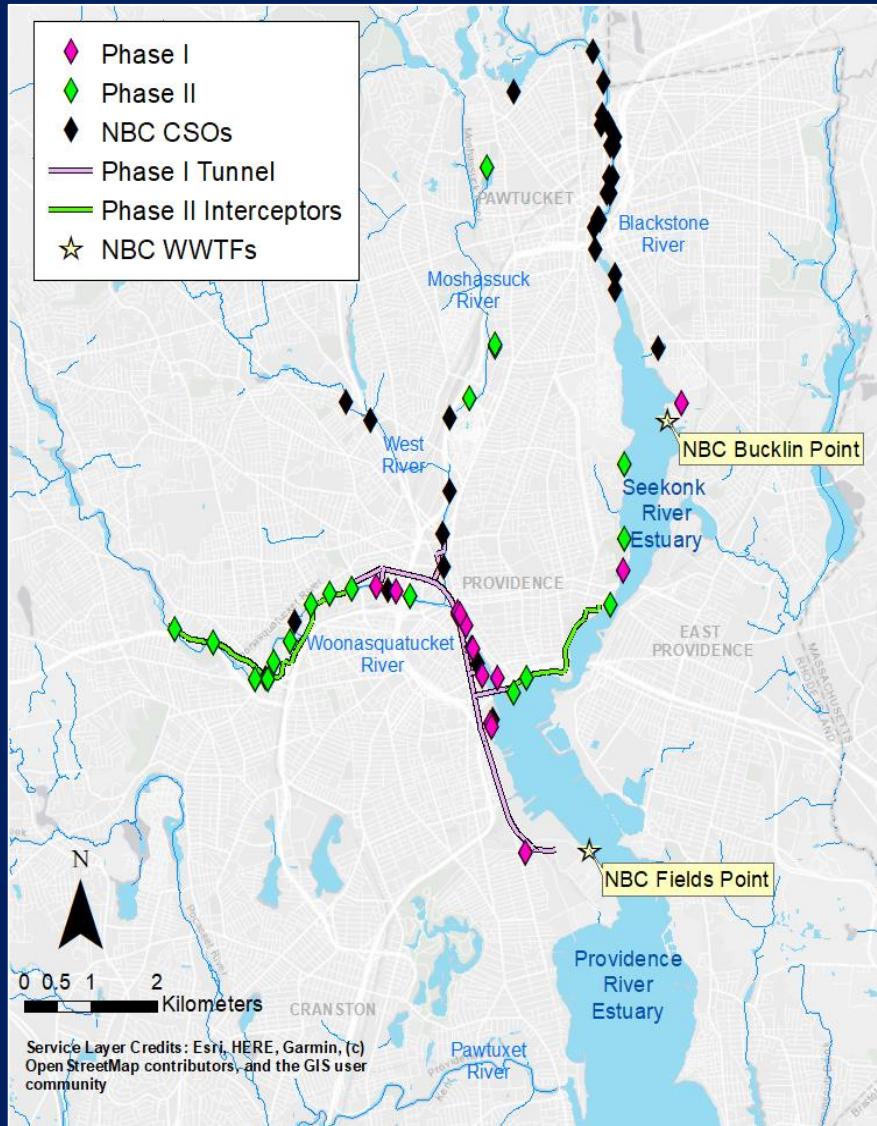


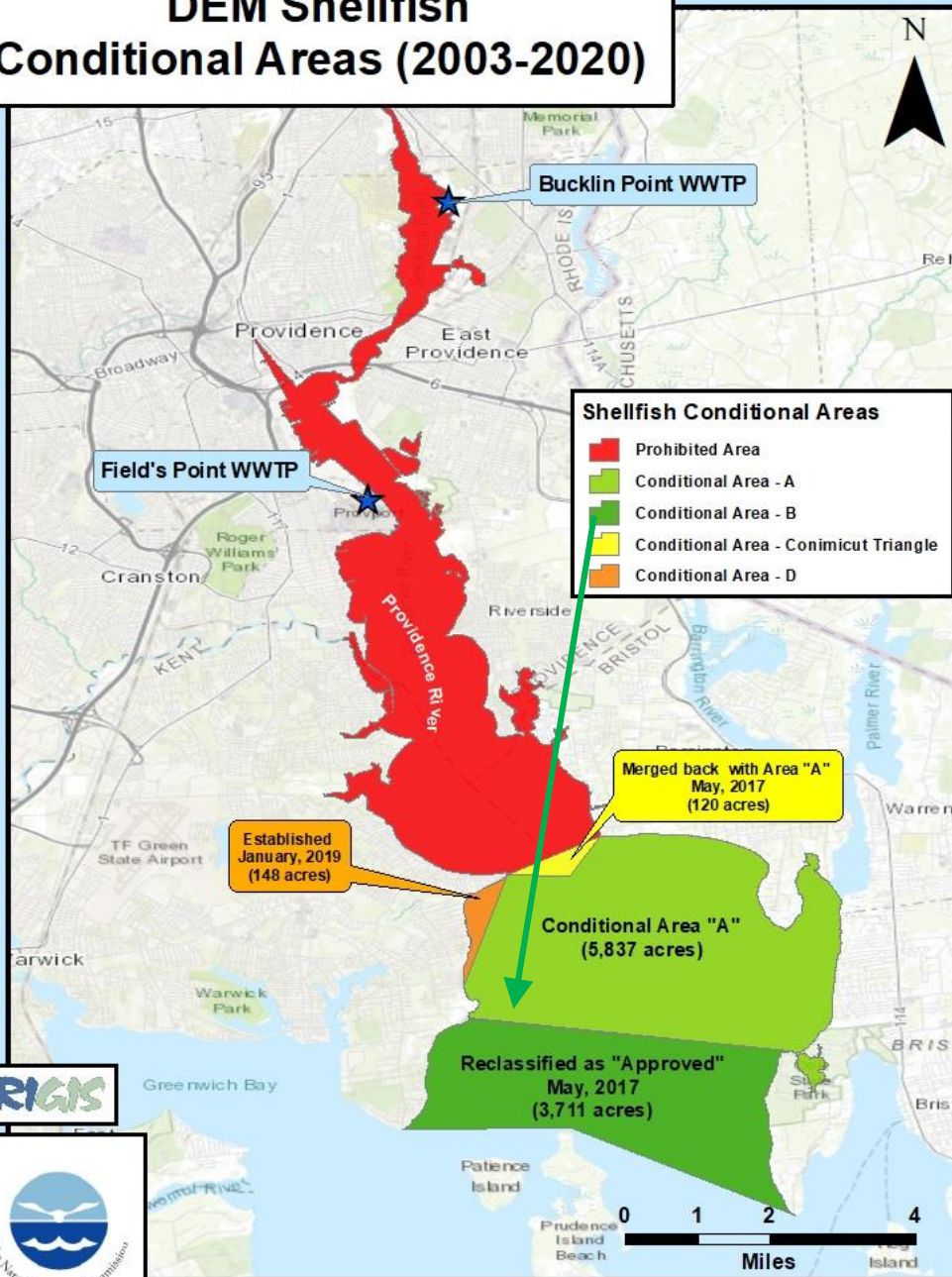
Image: newenglandhistoricalsociety.com

CSO Abatement Phase II



- Completed June 2015
- New interceptors and tie-ins to Providence Tunnel
- Sewer separation
- Screening and storage facility and constructed wetland

DEM Shellfish Conditional Areas (2003-2020)



RIGIS

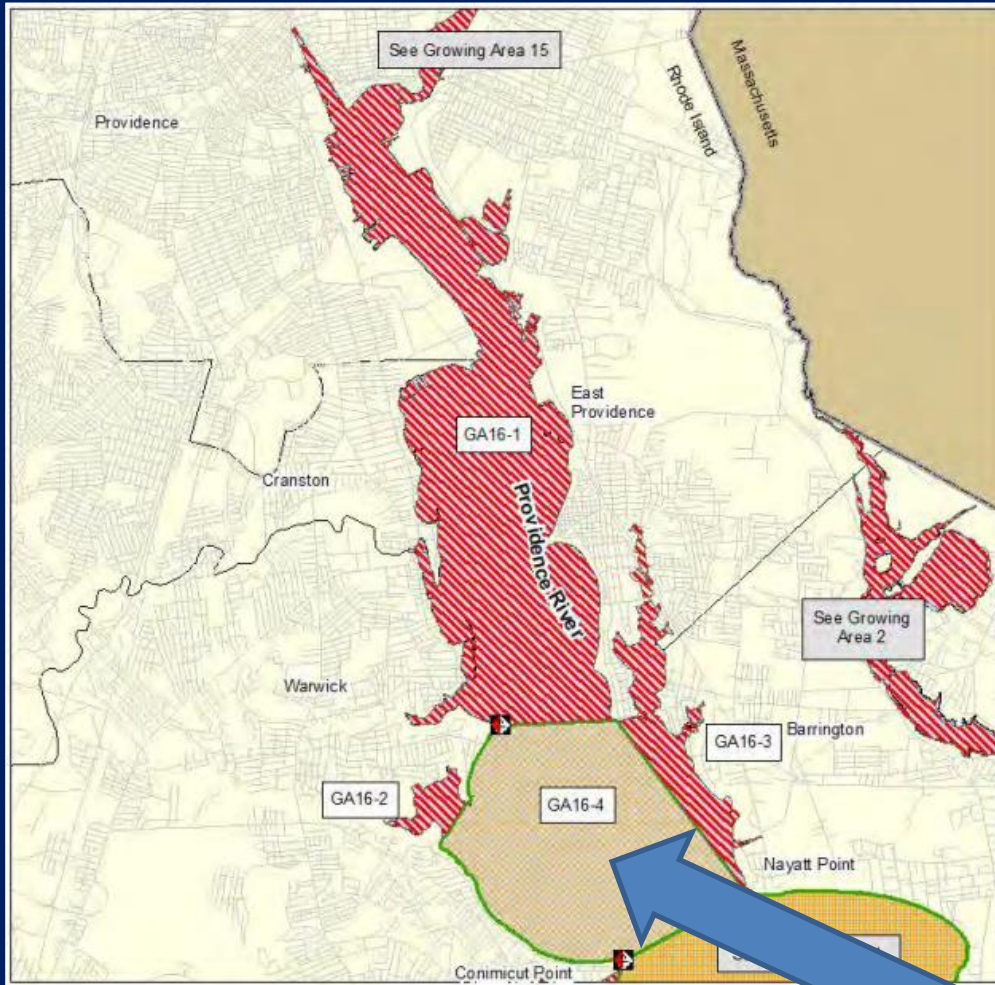


Phase II Water Quality Improvements

- 3,711 acres of conditional shellfish areas reclassified to “APPROVED” in 2017
- Further relaxation of rainfall limits in remaining conditional areas
 - Gain of ~38 additional days open to shellfishing per year!

Phase II Water Quality Improvements

Source: RIDEM

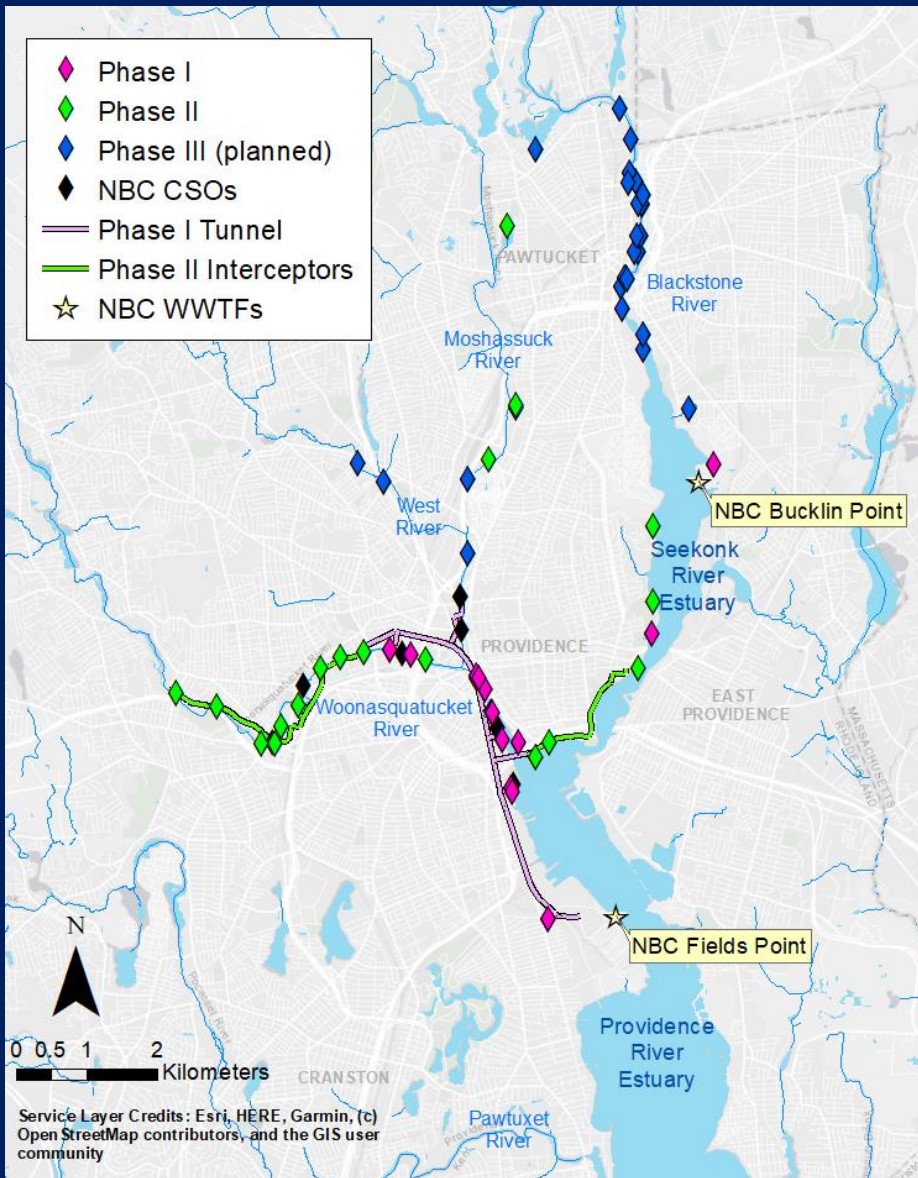


May 26, 2021 -

1,900 acres of the
Providence River opened
conditionally for
shellfishing!

First time these waters
have been open in 75+
years!

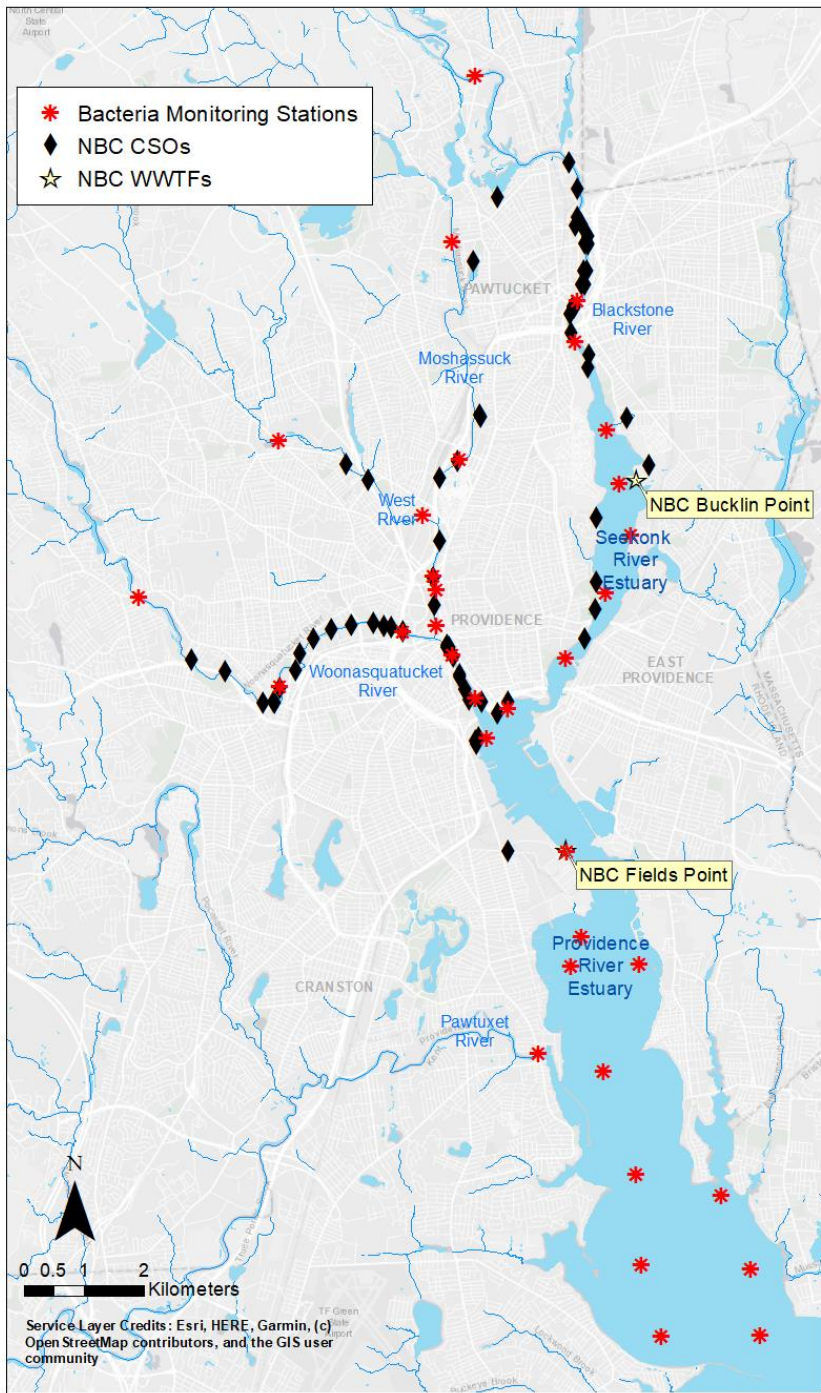
CSO Abatement Phase III



- Focus on Bucklin Point WWTF District
- Pawtucket Tunnel
 - Broke-ground 2021
 - CSOs along Blackstone River
- Green infrastructure projects
- TALK – Blanchard et al., later this session
- TALK – Mignone and Kelly, Session 16

NBC's Bacteria Monitoring Program

- Fecal coliform, enterococci
- Freshwater rivers – sampled 1-2x per week
 - Up- and downstream of CSO
- Seekonk and Providence Rivers (Bay) – sampled 2x per month
 - All downstream of CSO influence



Data Analysis

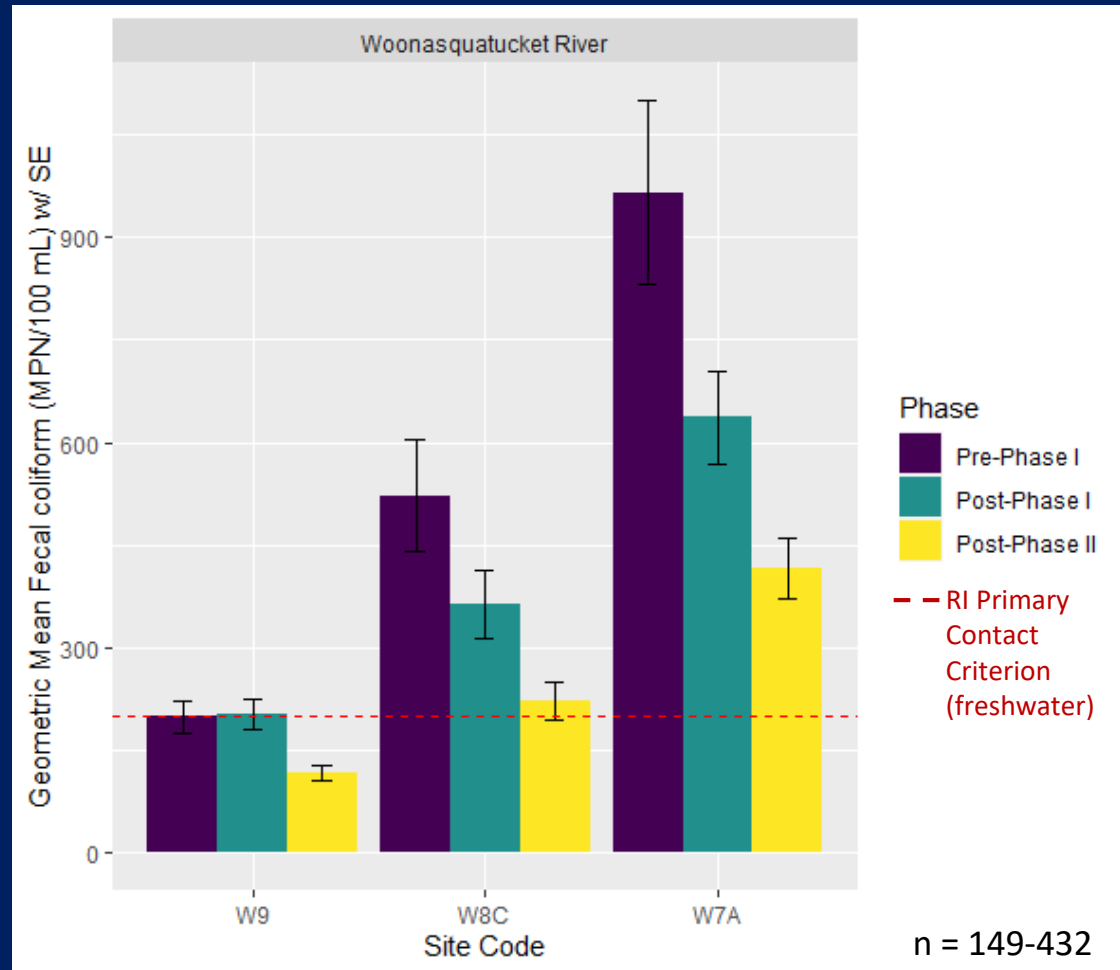
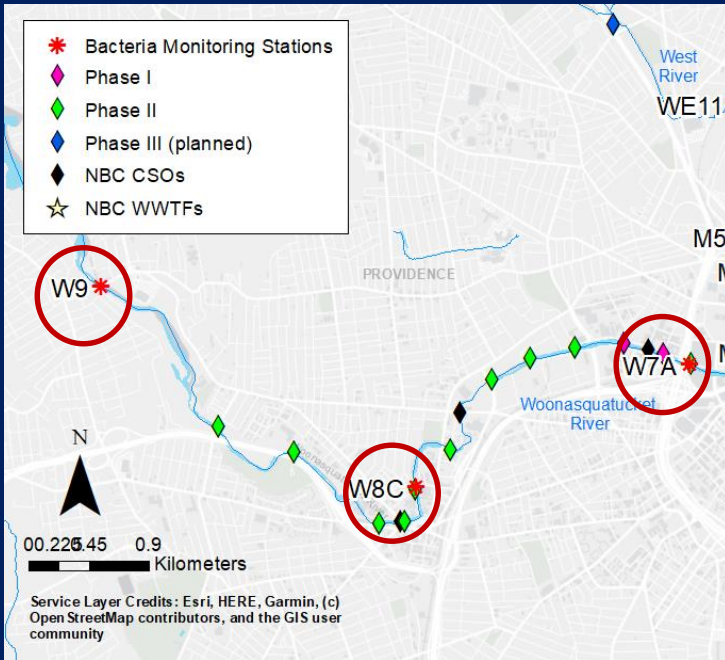


- Geometric mean **fecal coliform** counts with standard error
- **Phase:**
 - Pre-Phase I: March 2004 – October 2008
 - Post-Phase I: November 2008 – June 1, 2015
 - Post-Phase II: June 2, 2015 – December 2020
- **Weather:**
 - Wet: Sample day + 3 prior rain total ≥ 0.1 inches (TF Green NWS Station)
- Comparison to **state primary contact criteria***

*For point of comparison only, actual compliance measured through different analysis methods

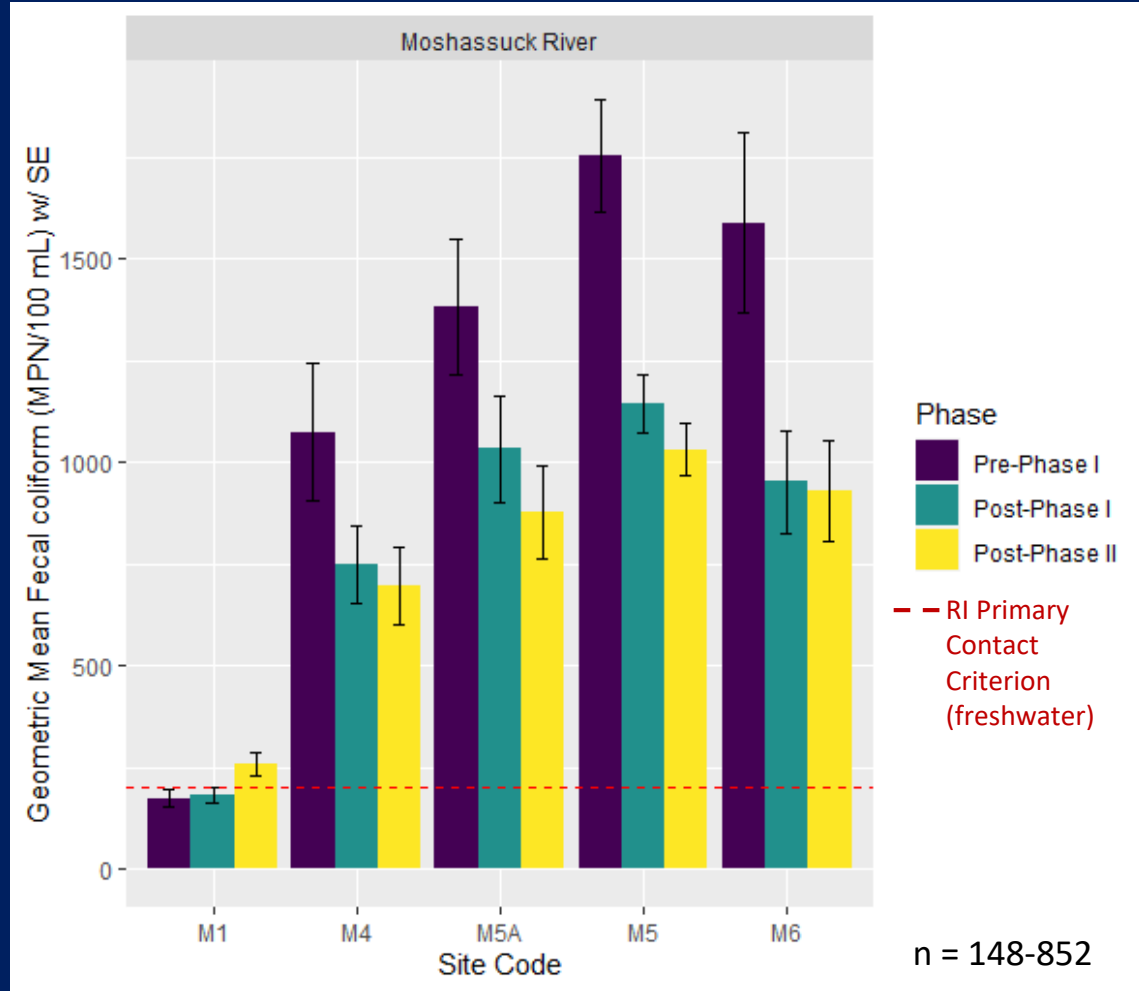
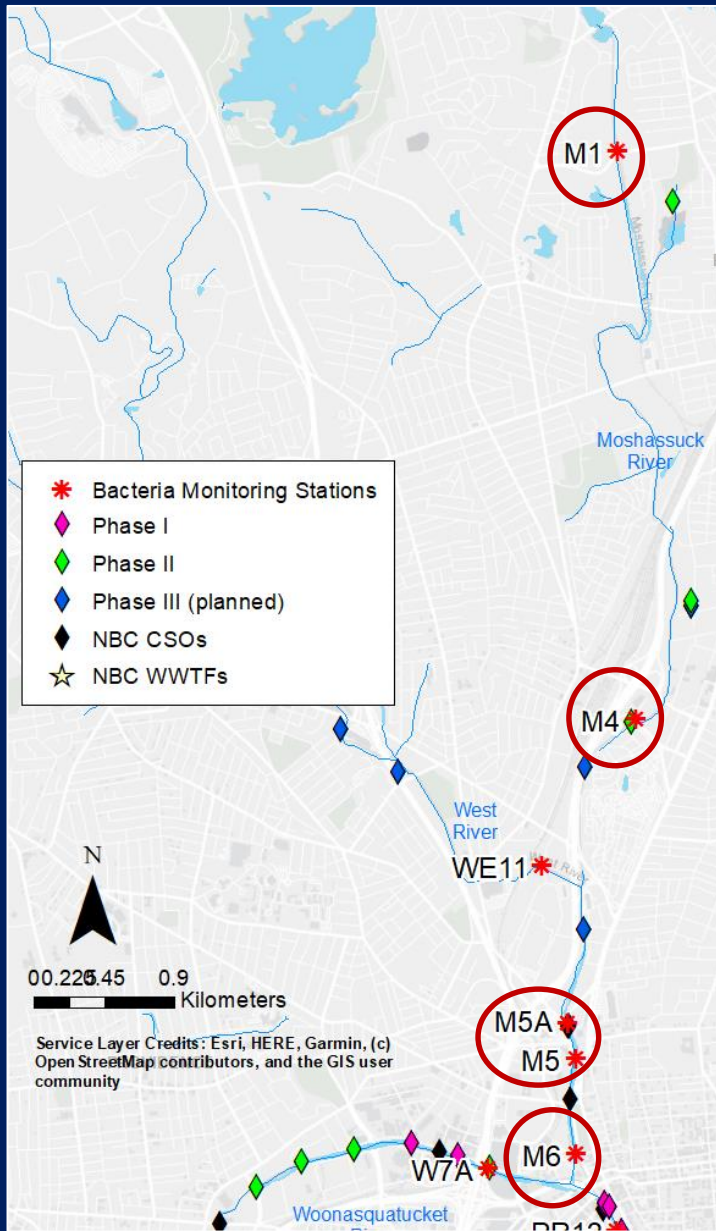
Woonasquatucket River

No further abatement planned,
some sites still exhibit elevated bacteria counts;
Stormwater? Illicit connections?



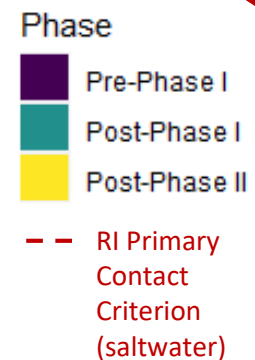
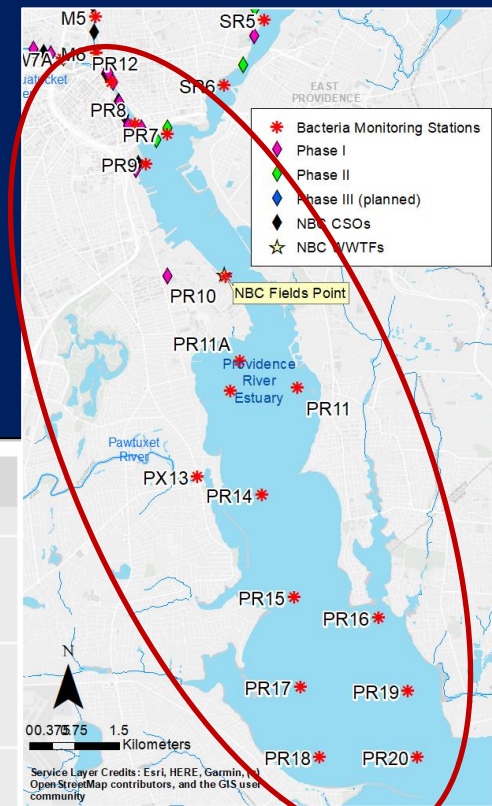
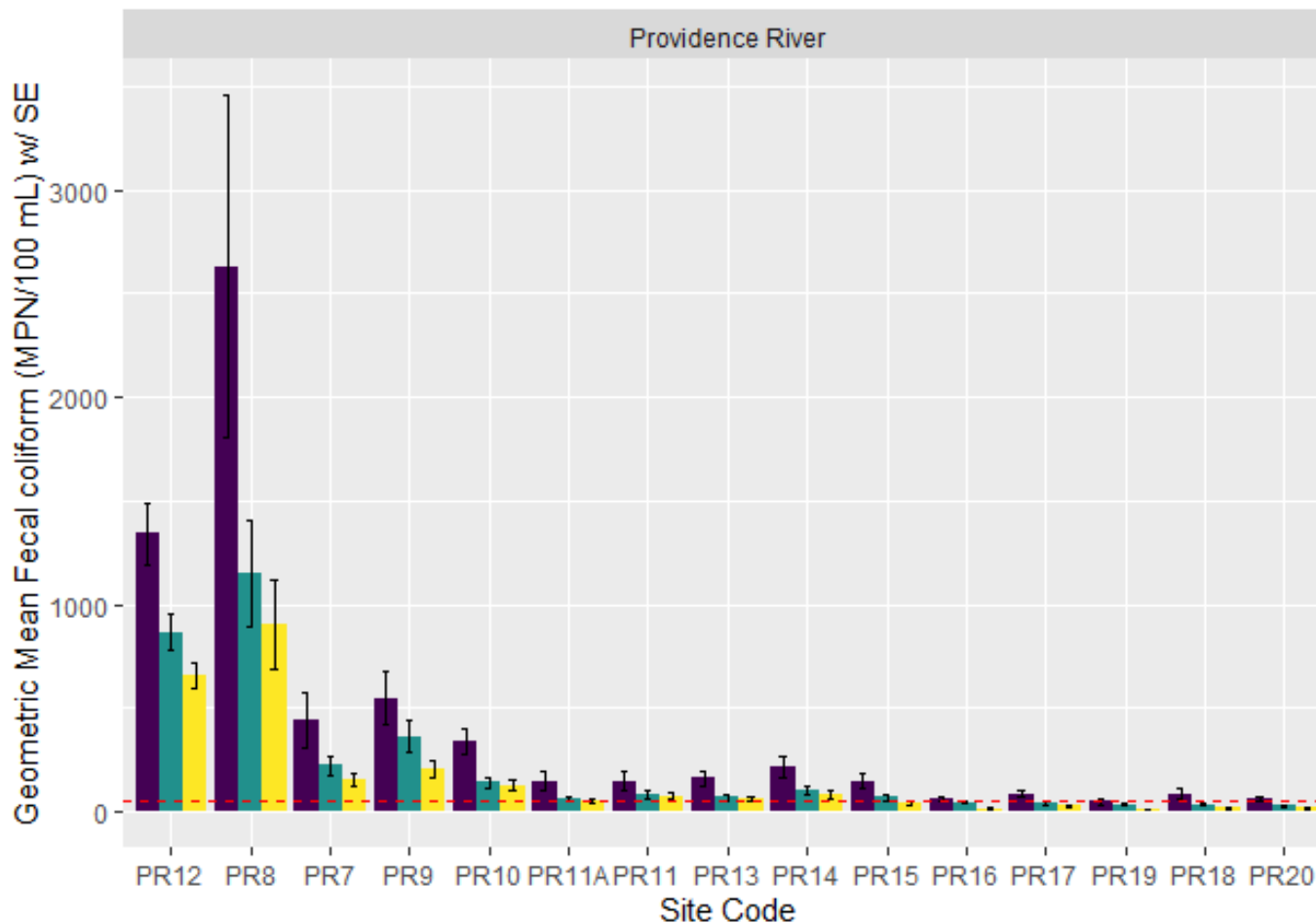
Moshassuck River

Further abatement planned for Phase III



Providence River Estuary

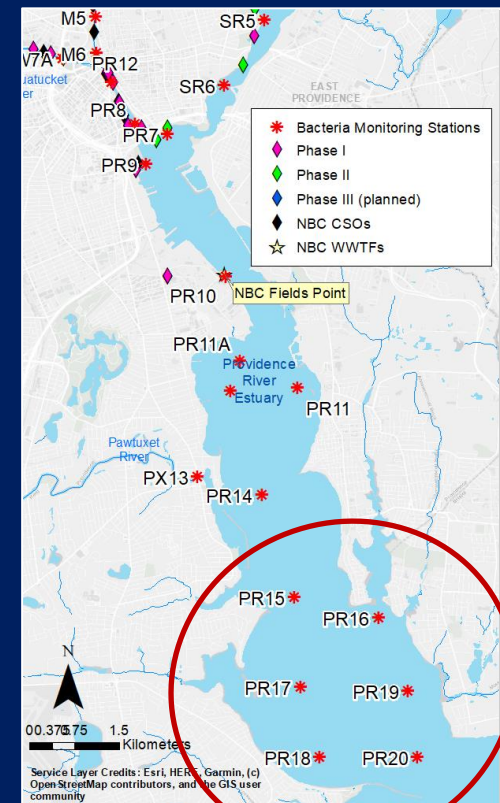
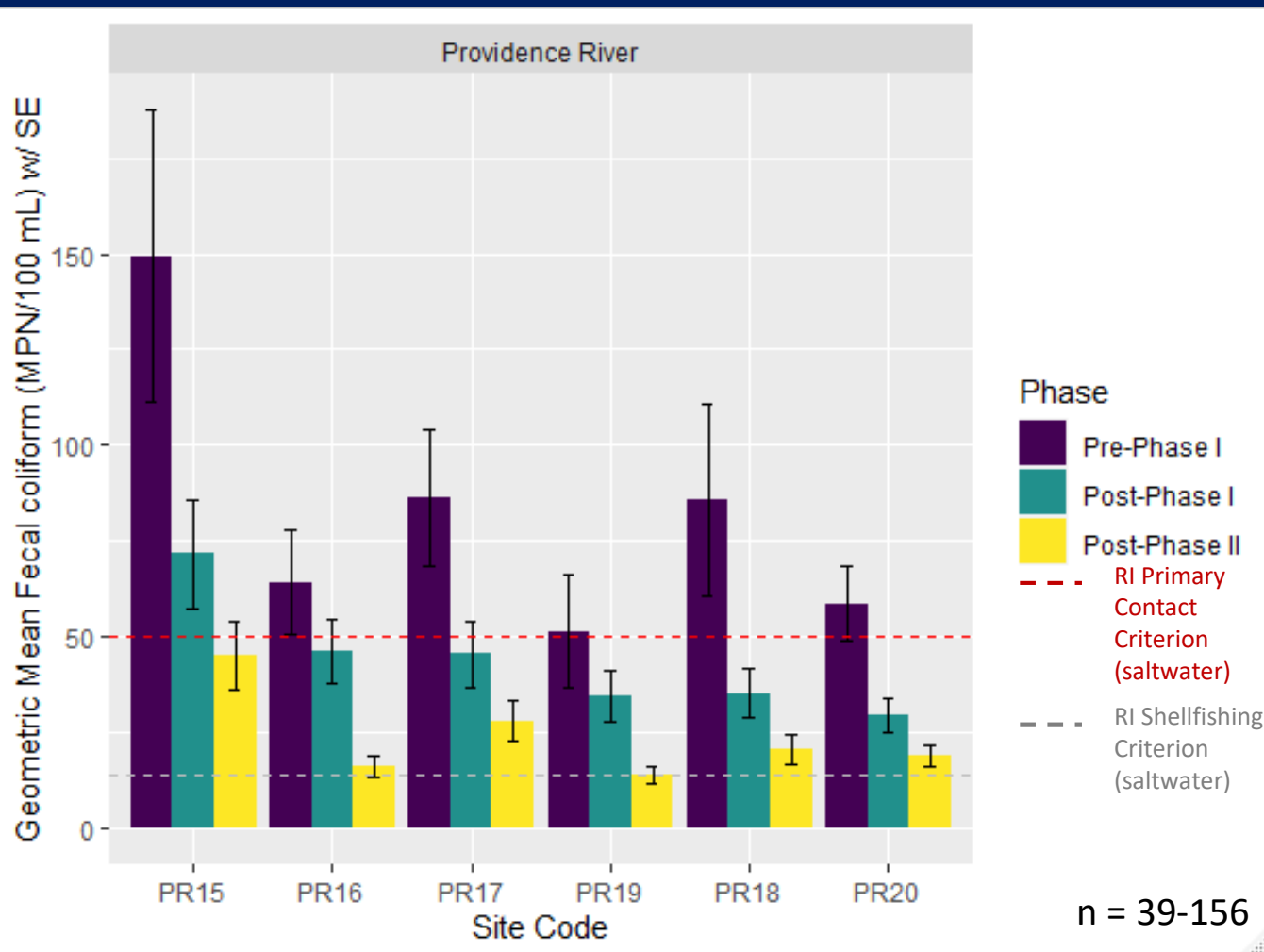
Most dramatic change after Phase I;
bacteria still elevated at northernmost sites
(located in city center)



n = 32-411

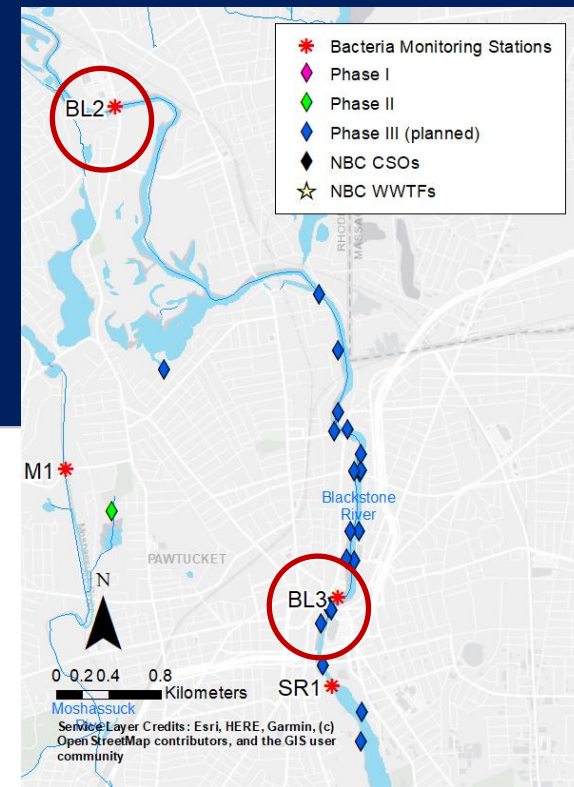
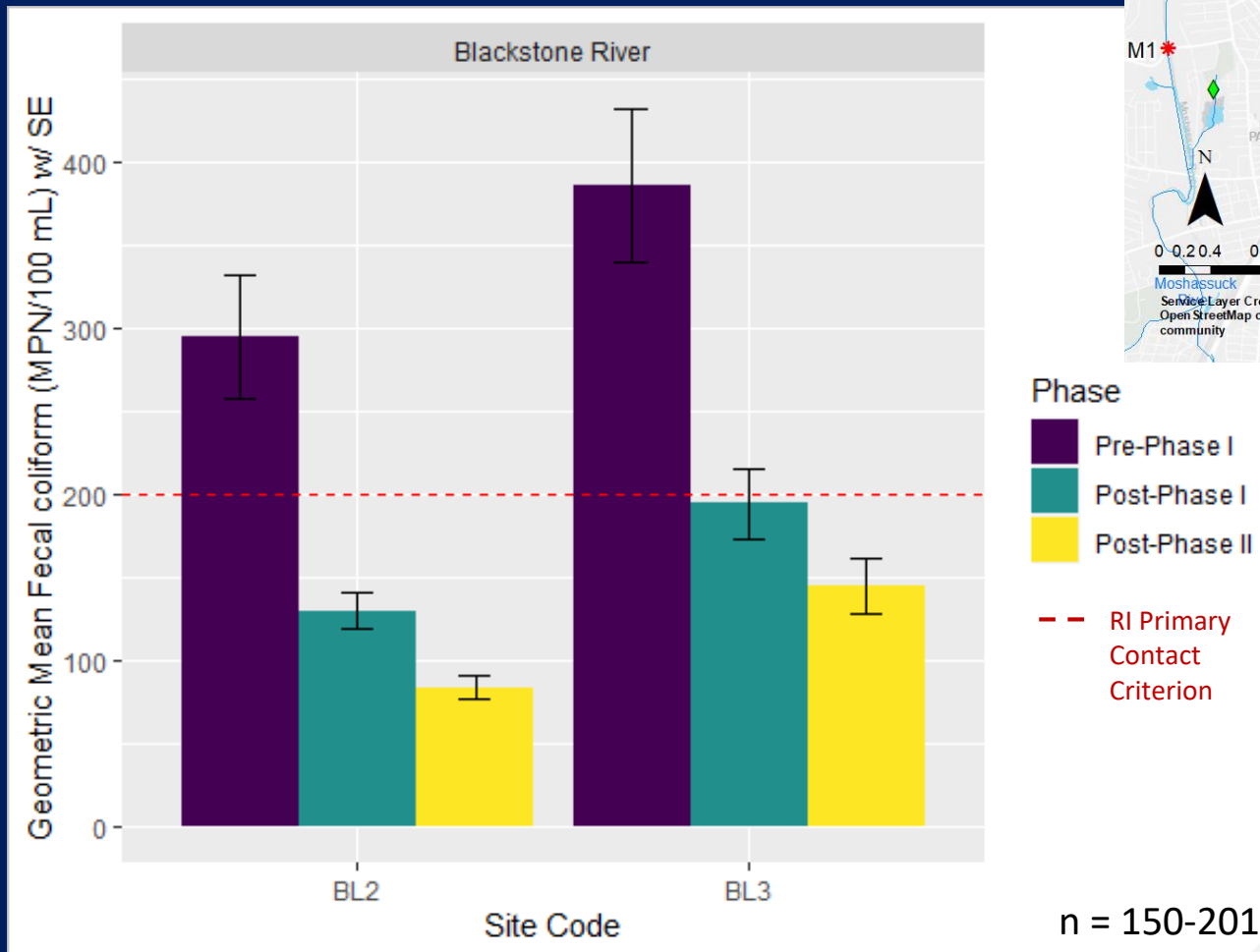
Providence River Estuary (lower)

Bacteria counts following Phases I and II frequently below state water quality criteria for primary contact



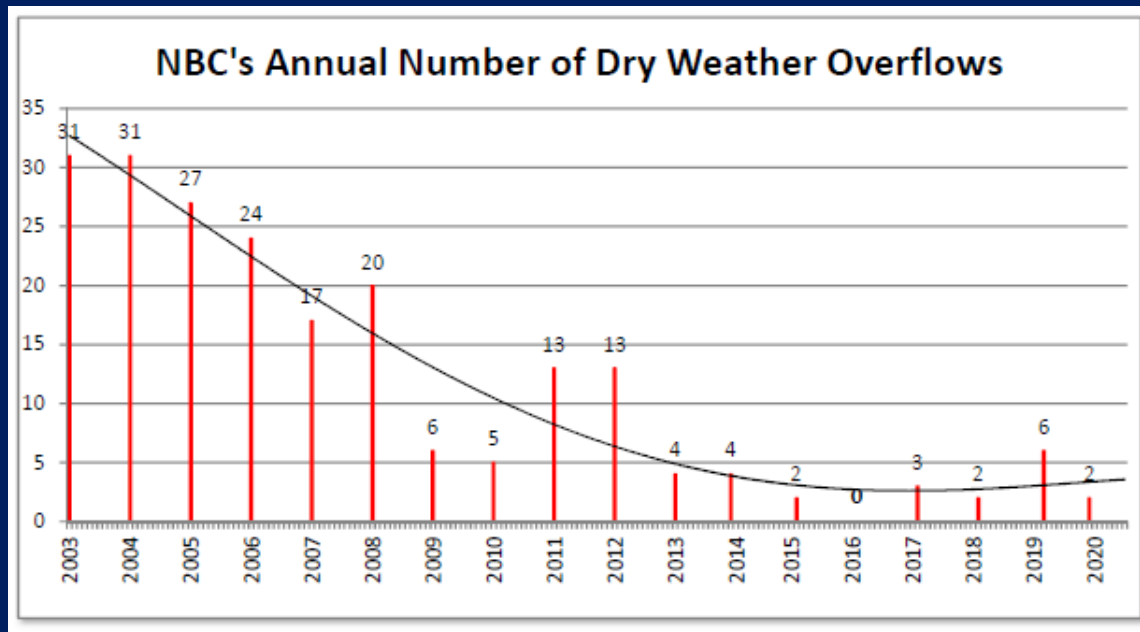
Blackstone River

Fecal coliform counts dropped at sites not impacted by CSOs or CSO Abatement



Mitigating Stormwater and Reduced DWOs

- Dry Weather Overflows dramatically reduced concurrent with CSO abatement
- NBC (and others) stormwater mitigation plans concurrent with CSO abatement



Closing Thoughts

- Water quality improvements after Phases I and II have led to tangible improvements to shellfishing regulation in upper Narragansett Bay
- Concurrent efforts to improve water quality complicate isolation of the CSO story
- Comprehensive Phase II report in preparation



Narragansett
Bay Commission
WET WEATHER SEWAGE DISCHARGE
OUTFALL # 023



Thank you!

- Many staff & depts at the NBC, notably:
 - Environmental Monitoring Dept.
 - NBC Laboratory
 - Technical Analysis & Compliance Dept.
 - Engineering Dept.
 - Interceptor Maintenance Dept.
- Questions:
emoore@narrabay.com
- Data:
<http://snapshot.narrabay.com/app/>