



Water Quality Monitoring in the PIE Rivers Region

Intro: Kaitlyn Shaw, PIE Rivers Steering Committee

Panel: Drew Robinson, Yvonne Buswell,
Sue McLaughlin, Ryan Joyce, Gina Snyder

Why Routinely Monitor?

- To protect public health & achieve designated uses:
 - Swimming, boating, fish consumption, shellfish harvesting, aquatic life use.
- To ascertain long term improvements/ declines in water quality health.
- To promote management/ restoration by providing project specific evidence.



Metric Groups

Aquatic Life & Fisheries

Water Quantity & Quality

Habitat & Land Use

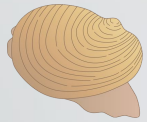
Management & Institutional Capacity

Restoration Index

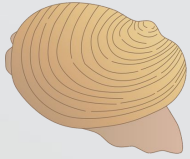
The Restoration Index tracks conditions and progress in seven functional categories, each with 2-4 specific metrics. The draft framework was developed in 2013 and can be downloaded [here](#). As more information and metric results for each category become available, they will be linked from the list below. Dates in parentheses indicate most recent data available on each metric.

- **Fish and aquatic animals**
 - [River Herring Counts](#) (2014) – Tracks changes in river herring spawning abundance on an annual basis
 - [Freshwater Fish Community Structure](#) (1999)
 - [Aquatic Macroinvertebrate Community Structure](#) (Check back soon)
- **Commercial and consumptive fisheries**
 - [Shellfish Closures](#) (Check back soon)
- **Water quality**
 - [Aquatic Life Use Standards](#) (Check back soon)
 - [Fecal Coliform](#) (Check back soon)
 - [Dissolved Oxygen](#) (Check back soon)
 - [Nutrient Loading](#) (Check back soon)
- **Water quantity**
 - [Summer Streamflow](#) (Check back soon)
 - [Municipal Water Use](#) (Check back soon)
- **Land use**
 - [Impervious Cover](#) (2011)
 - [Protected Lands](#) (Check back soon)
- **Critical habitat**
 - [River Connectivity](#) (Check back soon)
 - [Wetland Restoration](#) (Check back soon)
- **Management practices and partnership reach**
 - [Water Wise Practices](#) (Check back soon)
 - [PIE-Rivers Priority Actions](#) (Check back soon)
 - [PIE-Rivers Programs](#) (Check back soon)

PIE River's Water Quality Metrics



Group	Metric	Sub-metric	Availability	Frequency	Response Variable
Commercial and consumptive fisheries	Shellfish permanently closed areas		PIE	Annual	2.1. Closed area (acres)
	Shellfish temporarily closed areas (rainfall)		PIE	Annual	2.2. Closed area (acres)
			PIE	Annual	2.3. Days Closed (count)
Water quality	Aquatic Life Use		PIE	Sporadic ~10-15 years	3.1. Percent of assessed river habitat meeting standards
			PIE	Sporadic ~10-15 years	3.1. Percent of assessed lake/pond habitat meeting standards
	Fecal Coliform		PIE	Monthly	3.2. Number FC organisms per 100 ml
			PIE	Annual	3.2. Median Number FC organisms per 100 ml
	Dissolved oxygen concentration		PI	Variable	3.3. Annual Mean DO (mg/L)
			PI	Variable	3.3. Quarterly Mean DO (mg/L)
Dissolved nitrogen concentration		PI	Continuous	3.4. Concentration of biologically available N compounds	



Division of Marine Fisheries

Shellfish Classification



- **Growing area classifications** are assigned based on the results of **sanitary surveys**, which evaluate pollution sources, physical characteristics and indicator bacteria presence **every 12 years**.
 - The classification determines whether or not shellfish in the area can be harvested for human consumption. There are five classifications ranging from approved to prohibited.
- The **area status** can either be **'opened'** or **'closed'** for all classifications other than prohibited.
 - **Closed status** can occur due to weather events, biotoxin presence (HAB), conditional values (such as rainfall amount), WWTF failures and boat activity.
 - Mussel tissue **monitoring** for **biotoxins** takes place from May-Oct at Conomo Point in Essex and Pavilion Beach in Ipswich.
 - Phytoplankton monitoring takes place weekly year round to provide early detection of potentially harmful algae.
- These closures are problematic from an economic and social standpoint and are also indicative of **watershed scale issues including pollution and stormwater runoff**.



MA Department of Environmental Protection Water Quality Monitoring



- Surface water quality with respect to **designated uses** (e.g., swimming, boating, fish consumption, shellfish harvesting, aquatic life use) as required by the Clean Water Act.
- **Nutrients (e.g., nitrogen, phosphorus), color, turbidity, bacteria, dissolved metals** and other parameters.
- Data from 1994 to 2014, not currently monitored.
- Re-evaluate areas as **management** progresses TMDL and other health-related goals (WQ criteria, effectiveness of pollution control measures etc).
- New grant announced to aid watershed groups with bacterial sampling.



MA Department of Public Health & Town Bathing Beach Testing

- The 2000 Massachusetts Beaches Act.
- Beginning in 2001, the act required
 - 1) adopting the EPA-recommended **water quality standards for all marine and freshwater public beach waters**
 - 2) monitoring weekly for **bacteria**
 - 3) **informing the public about unsafe waters** by posting notices at beaches when the water is polluted
- Collaborative effort between local boards of health, private owners & the Massachusetts Department of Public Health. **Publically available data on bacteria levels.**

Marine



Ma DPH Marine Beach Sample Sites



Town Freshwater Beach Sample Sites

Freshwater

Long-term Watershed Monitoring



- **Ipswich River Watershed:** Dissolved oxygen, temperature, conductivity, depth, velocity, invasive aquatic plants, color, clarity, odor.



- **Parker River Clean Water Association:** Dissolved oxygen, temperature, pH, phosphate, nitrate, E. coli, invasive aquatic plants.



- **Chebacco Lake & Watershed Association:** Dissolved oxygen, temperature, conductivity, depth, velocity, invasive aquatic plants, color, clarity, odor.



- To ascertain trends in water quality health.
- Promote management/restoration
- Encourage stewardship of resources

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Plum Island Ecosystems Long Term Ecological Research

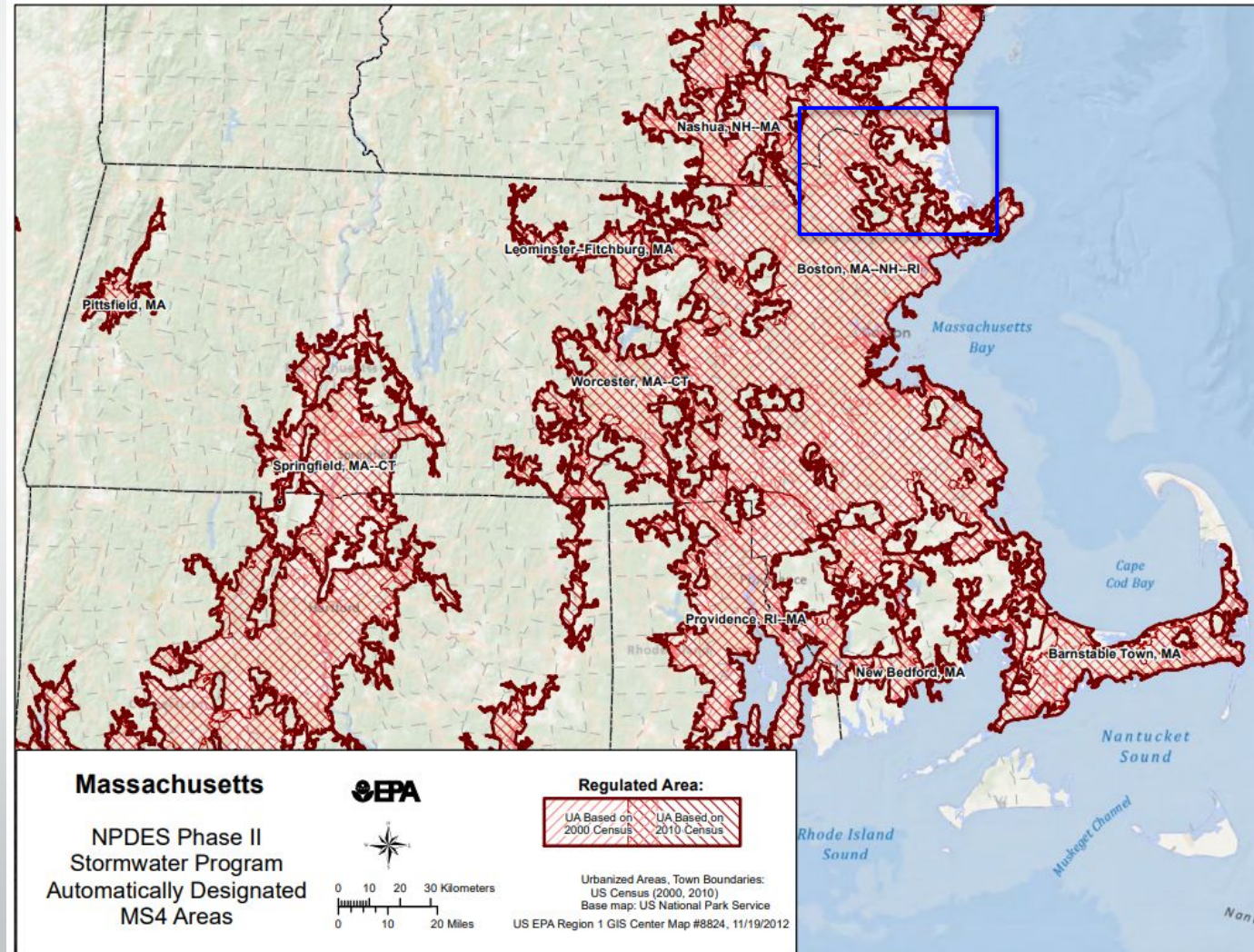


- Measurements surrounding major **drivers**, material **stocks/ fluxes**, and key biotic and abiotic **responses**.
 - **Nutrient** concentrations and **dynamics** from the watershed, estuary, and marshes.
 - Water column **primary production** and **benthic chlorophyll *a***.
 - Grab samples of **inorganic nutrients** at dams discharging to the estuary.
- Designed to **detect long term changes**.

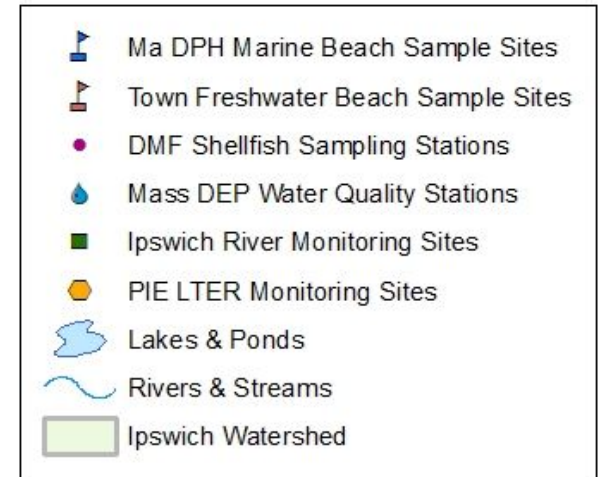
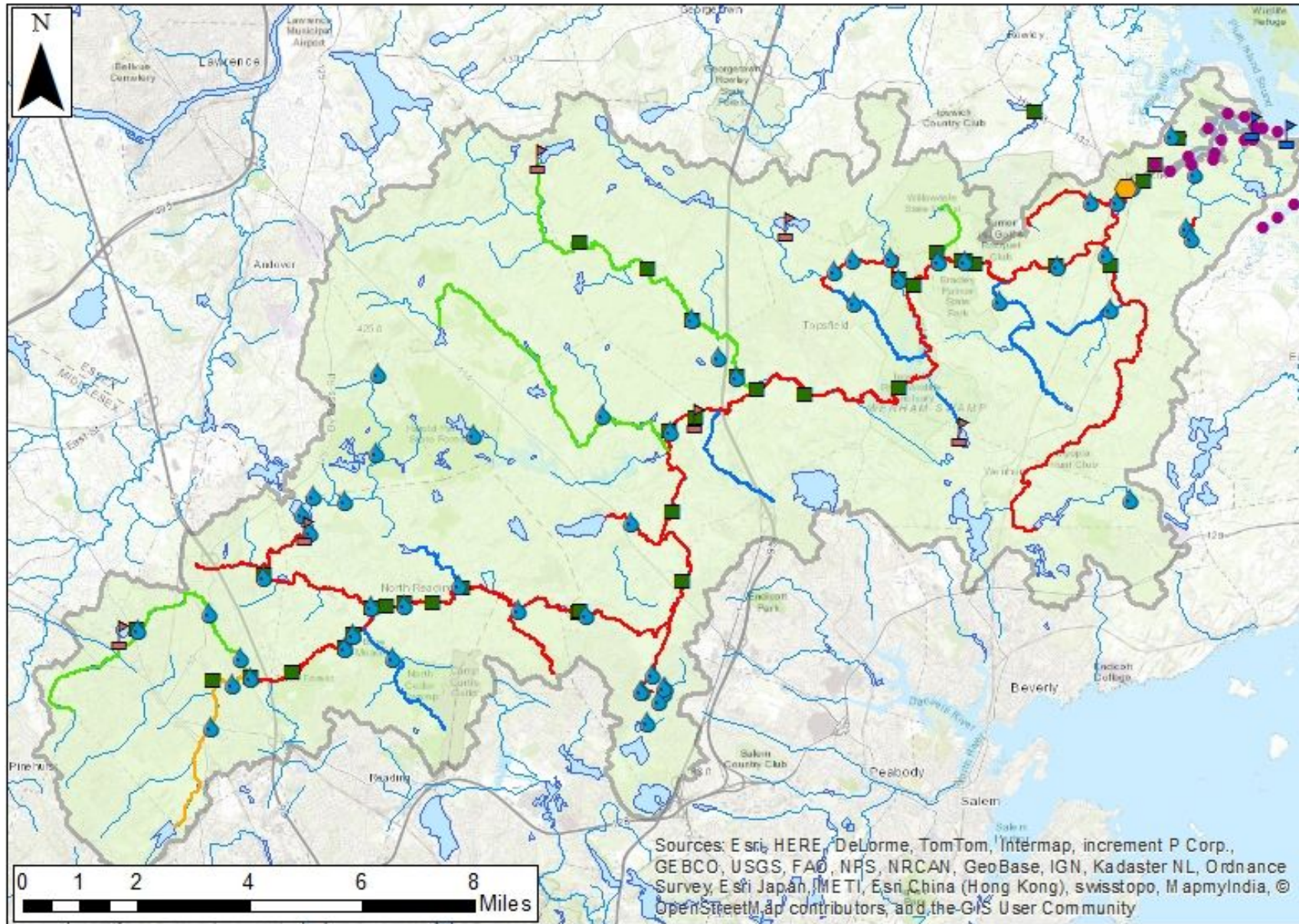


Municipal Seperate Storm Sewer System (MS4) Sampling

- New program!
- Permittee compliance with NPDES permits
- Fecal coliform and other parameter testing for stormdrains during dry weather
- New metric possibility:
of failed stormdrains fixed



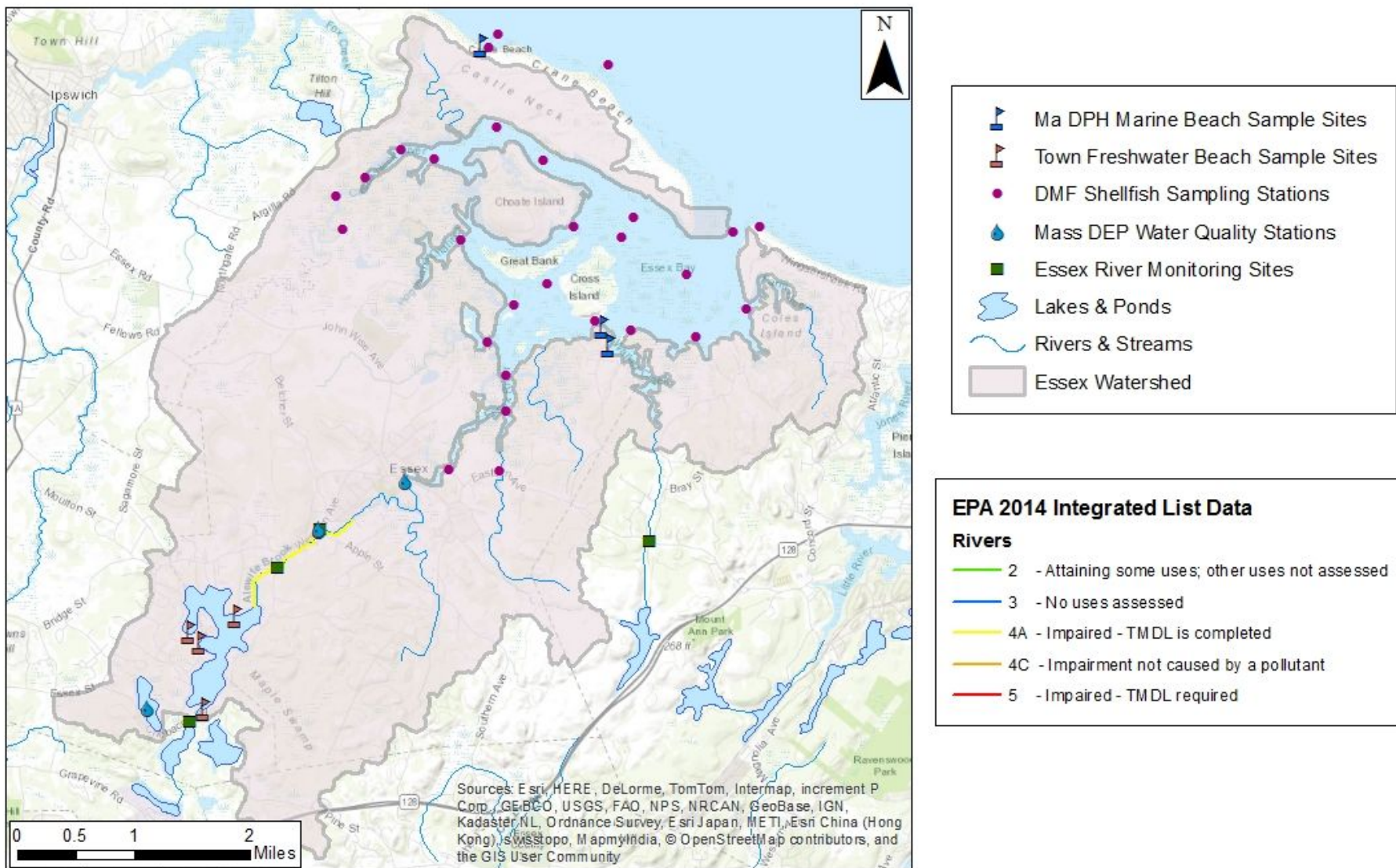
Ipswich River Watershed



Data Sources: Mass GIS, Environmental Protection Agency, Massachusetts Department of Public Health, Massachusetts Department of Marine Fisheries, and PIE Long Term Ecological Research



Essex River Watershed



Data Sources: Mass GIS, Environmental Protection Agency, Massachusetts Department of Public Health, Massachusetts Department of Marine Fisheries and PIE Long Term Ecological Research

By: Kristen Theibault 2018

Panelists

- Watershed Organizations:
 - Yvonne Buswell: Parker River Clean Water Association
 - Sue McLaughlin: Chebacco Lake Watershed Association
 - Gina Snyder: Ipswich River Watershed Association
- Division of Marine Fisheries (DMF):
 - Ryan Joyce
- Plum Island Ecosystems Long Term Ecological Research (PIE- LTER):
 - Drew Robison

Panelist Questions

Watershed
Groups

1. What are the hurdles to maintaining a long term monitoring program and how could PIE Rivers help with those?
2. What have you learned from your participation in long term WQ monitoring?
3. How can PIE Rivers improve coordination between partners, and help make your data available to the Partnership?

Managers/
Researchers

1. What do you use your data for?
2. How does or could your program inform management of the regions water resources?
3. How can volunteer monitoring groups help your program and how can we help make your data available to the Partnership?



Discussion

What other long term data sources/ metrics are we missing?

What other parameters should be monitored long term to effectively track progress?