

Highlights: New Monitoring & Other Initiatives at MassDEP

Kimberly Groff, Ph.D.

Massachusetts Department of Environmental Protection
Bureau of Water Resources, Division of Watershed Management
Watershed Planning Program
Worcester, MA



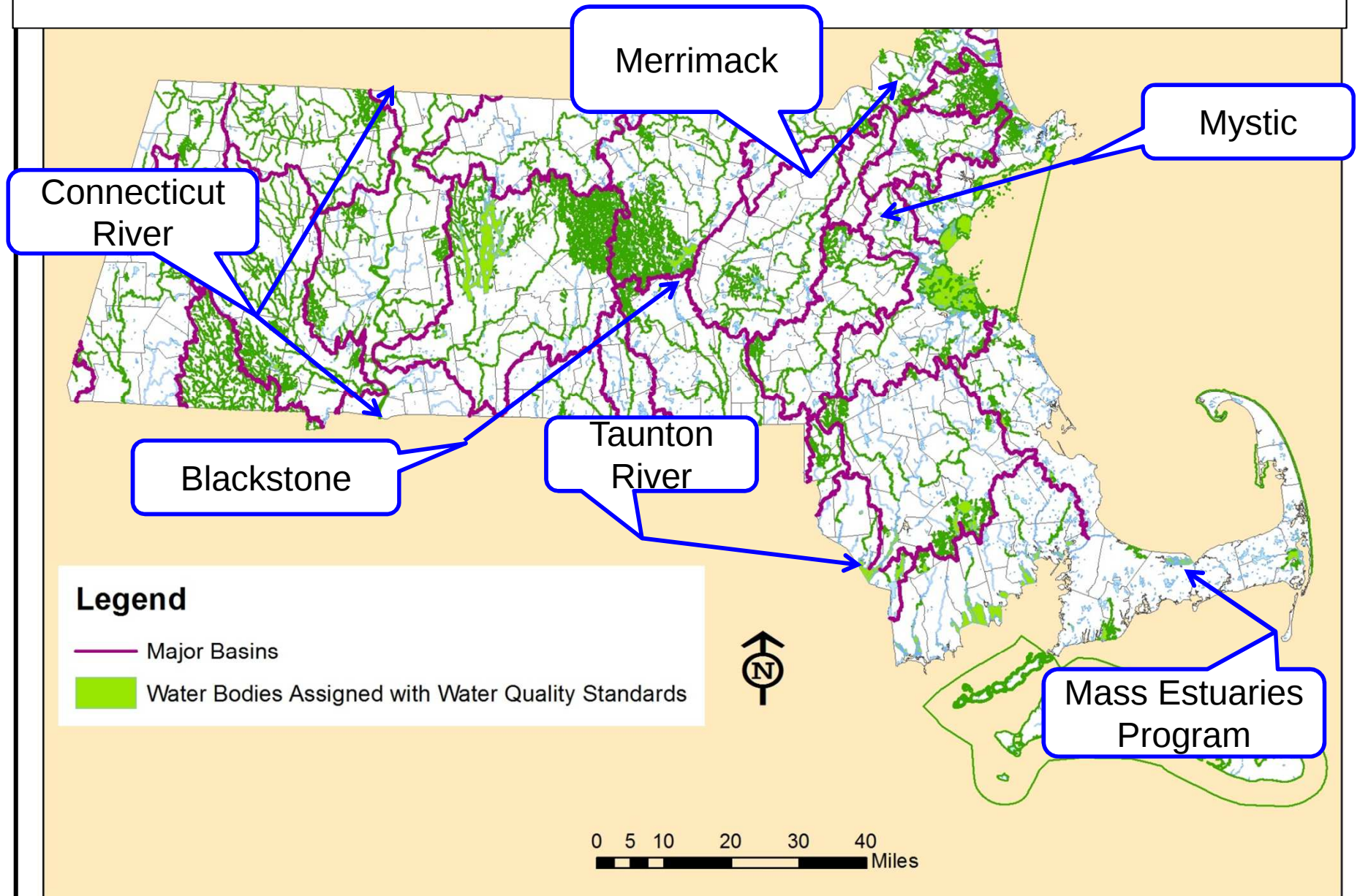
MassDEP

Commonwealth of Massachusetts
Department of Environmental Protection

CWA Monitoring Objectives

1. Assess the status or condition of Massachusetts' waters
Integrated Report
2. Develop, implement and evaluate pollution control strategies
NPDES Permits, TMDLs, Alternative Plans (NPS Watershed Plans)
3. Develop policies and standards and identify/explore emerging issues
E.g., Biological criteria, emerging contaminants
4. Measure the effectiveness of water quality management programs
Are standards met? (success stories, trends, delisting of impaired waters)

Monitoring Partnerships?



Assessment

MassDEP Probabalistic- Wadeable Streams & Lakes

Wadeable Streams (2011-2015)

Network:

5 basin groups
(35/region)
182 statewide

Water Quality Monitoring:

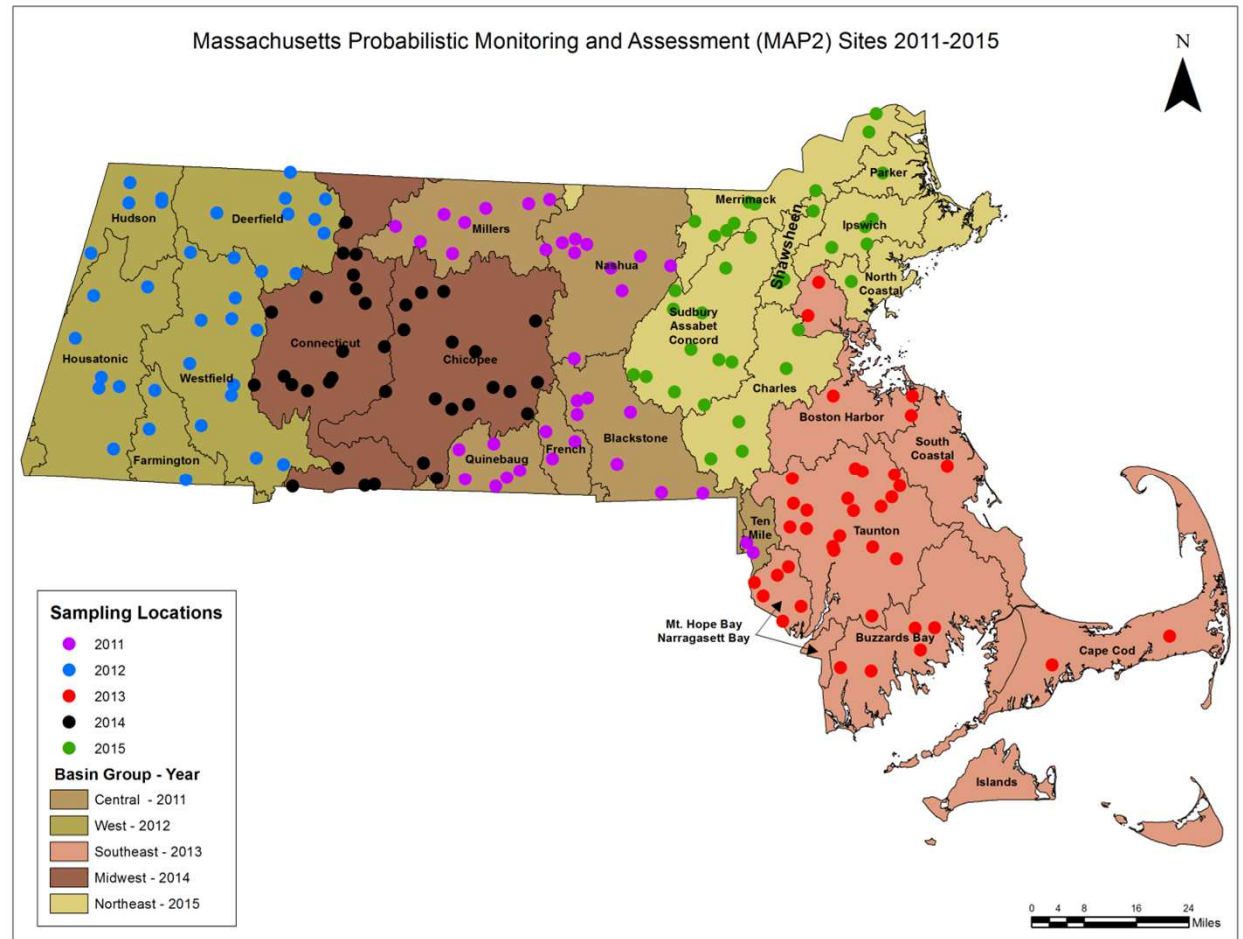
nutrients, bacteria,
chloride, color, turbidity

Dissolved metals,

Deployed multi-
probes: dissolved
oxygen and
temperature

Macroinvertebrate
community

Fish community



Primary recreation, Secondary Recreation,
Aquatic Life and Aesthetics

Lakes (2016-2018)

Network:

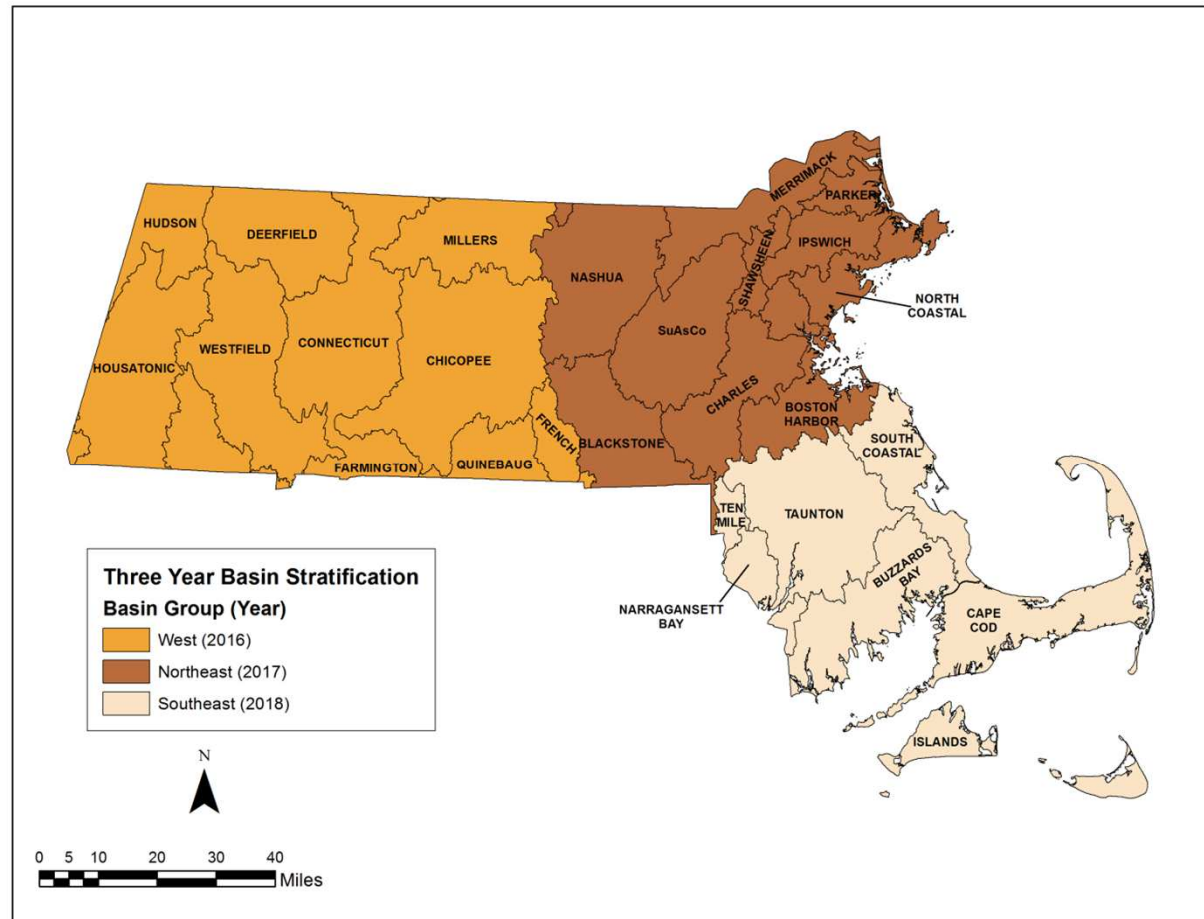
3 groups (25/region),
75 total.

Area > 2 hectares, > 2
meters depth

Water Quality:

Secchi, DO, T, pH,
specific conductivity,
nutrients, chloride,
alkalinity, hardness,
dissolved organic
carbon, color, turbidity,
chlorophyll a, E. coli

Microcystin, anatoxin,
Fish tissue (mercury,
organochlorine
pesticides, metals),
macroinvertebrate
community,
Macrophyte,
Bathymetry



Primary recreation, Secondary Recreation,
Aquatic Life and Aesthetics

MassDEP Temperature & Chloride Network

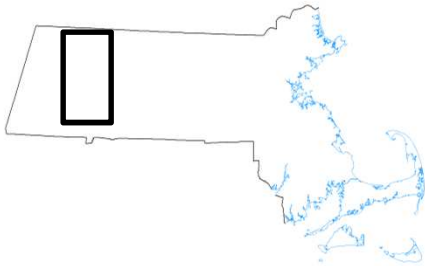
Continuous Temperature Logger Project



Temperature impacts aquatic life

Goal: to collect temperature (and/or DO) data in coldwater fishery streams, based on recommendations in water quality assessments

- Assess condition
- Identify threats
- Designation in Standards
- Partnership F&W CFR



- 38 Sites

- 35 in the Westfield River watershed
- 3 in the West Branch Farmington River (known to be impacted by elevated temperatures that threaten its CWF status)

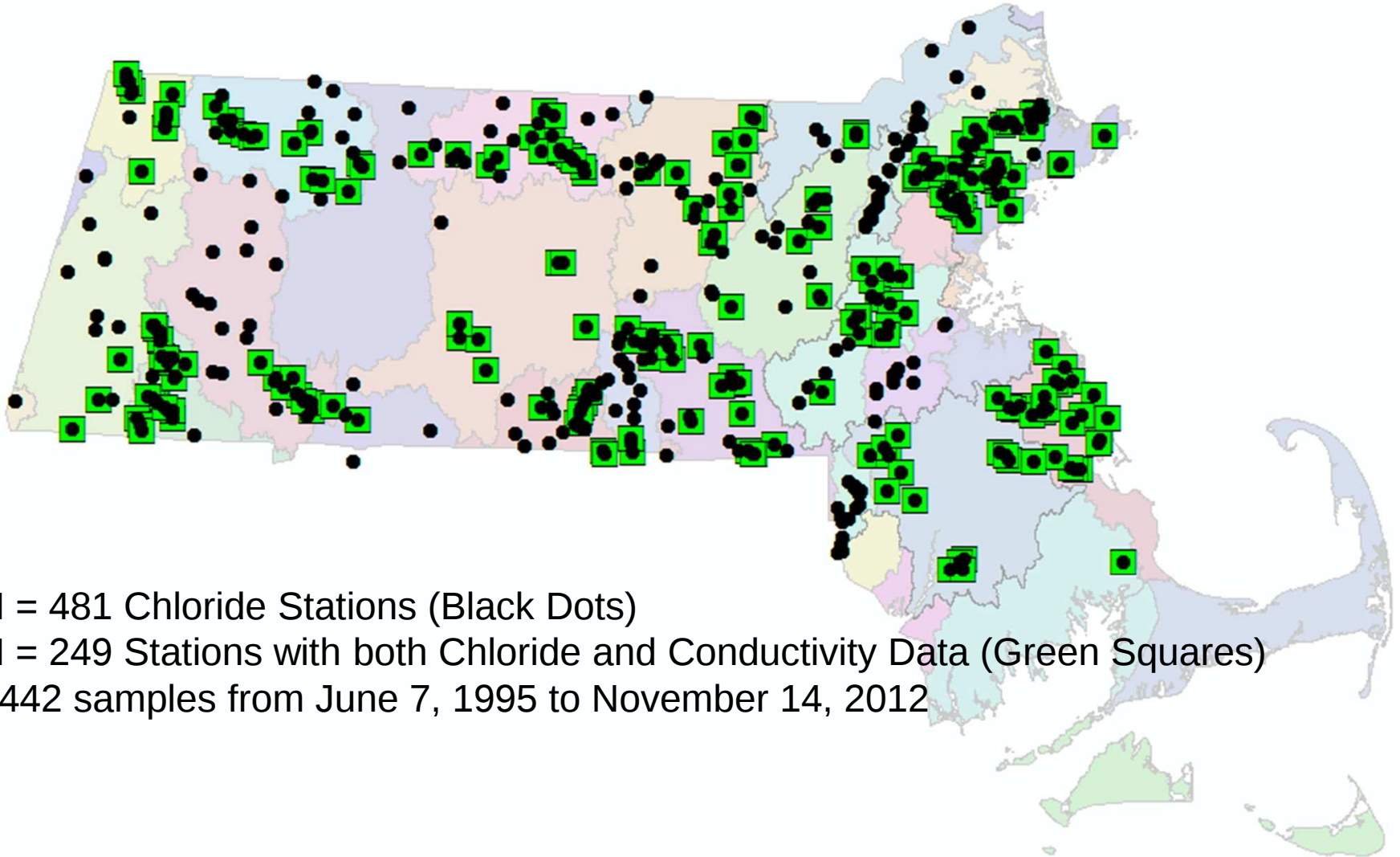
Chloride and Sodium

- Elevated Chloride/ Sodium impacts aquatic life, public health issue in PWS
- Major source is salt application: roads, commercial properties, private
- MassDEP - Some listed impairments, need better understanding
- Many sites in Massachusetts with Specific conductivity measurement
- MassDEP developed a freshwater correlation (specific conductivity vs Chloride), used as a predictive tool
- Targeted monitoring to validate the model and updated assessments

Great opportunity:

- (1) information;
- (2) protection, such as shielding areas from the impacts of road salt;
- (3) TMDLs and alternatives, which might include thinking differently about how to use and apply road salt and perhaps looking into substitute applications; and
- (4) public engagement.

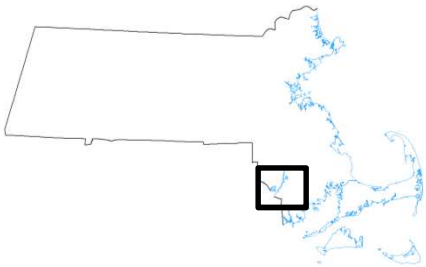
Stations with both Chloride and Conductivity



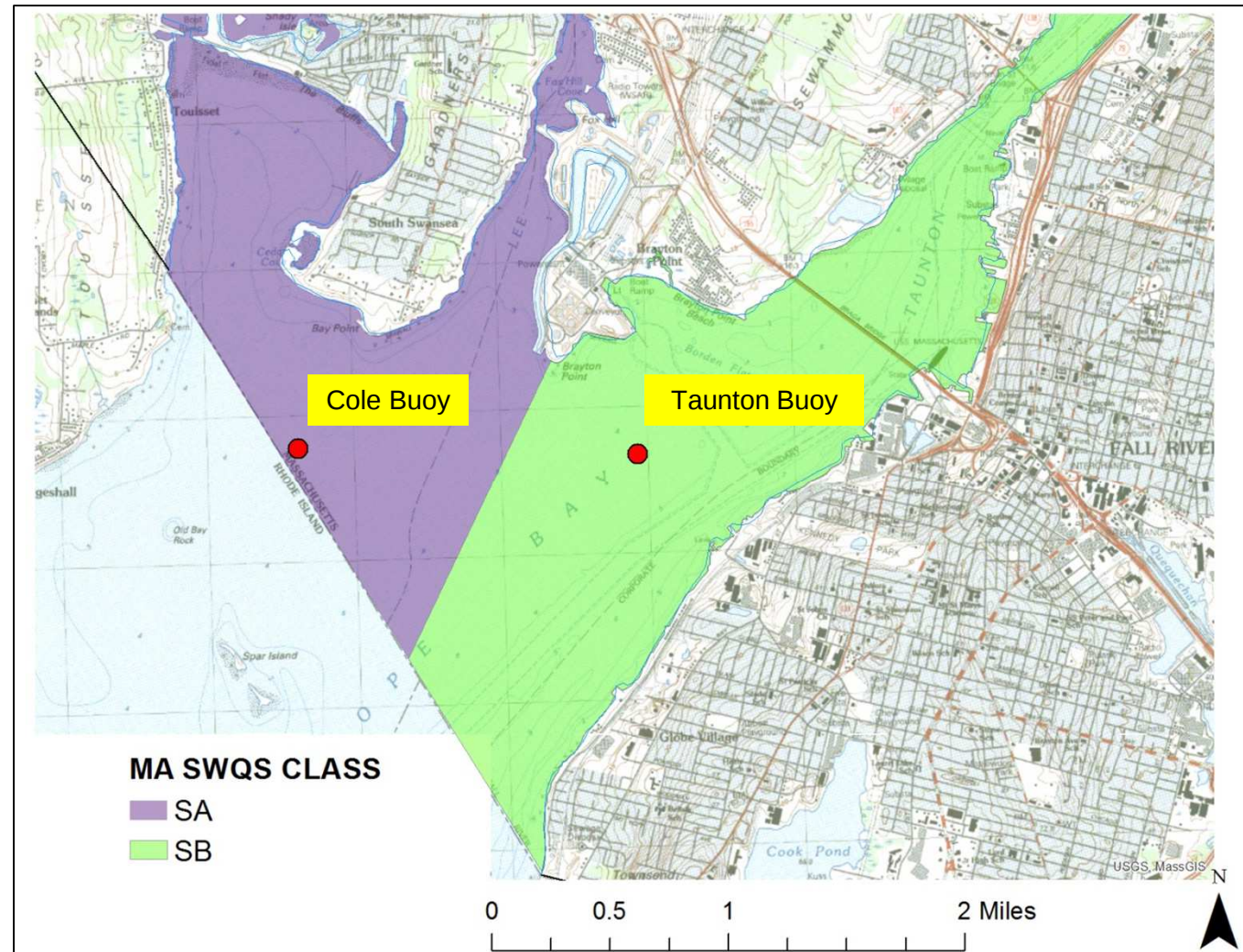
MassDEP Develop, Implement and Evaluate Pollution Control Strategies

Mount Hope Bay Water Quality Monitoring

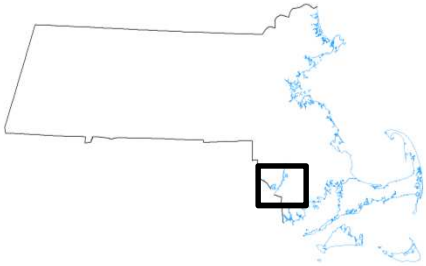
Mount Hope Bay Buoy Locations



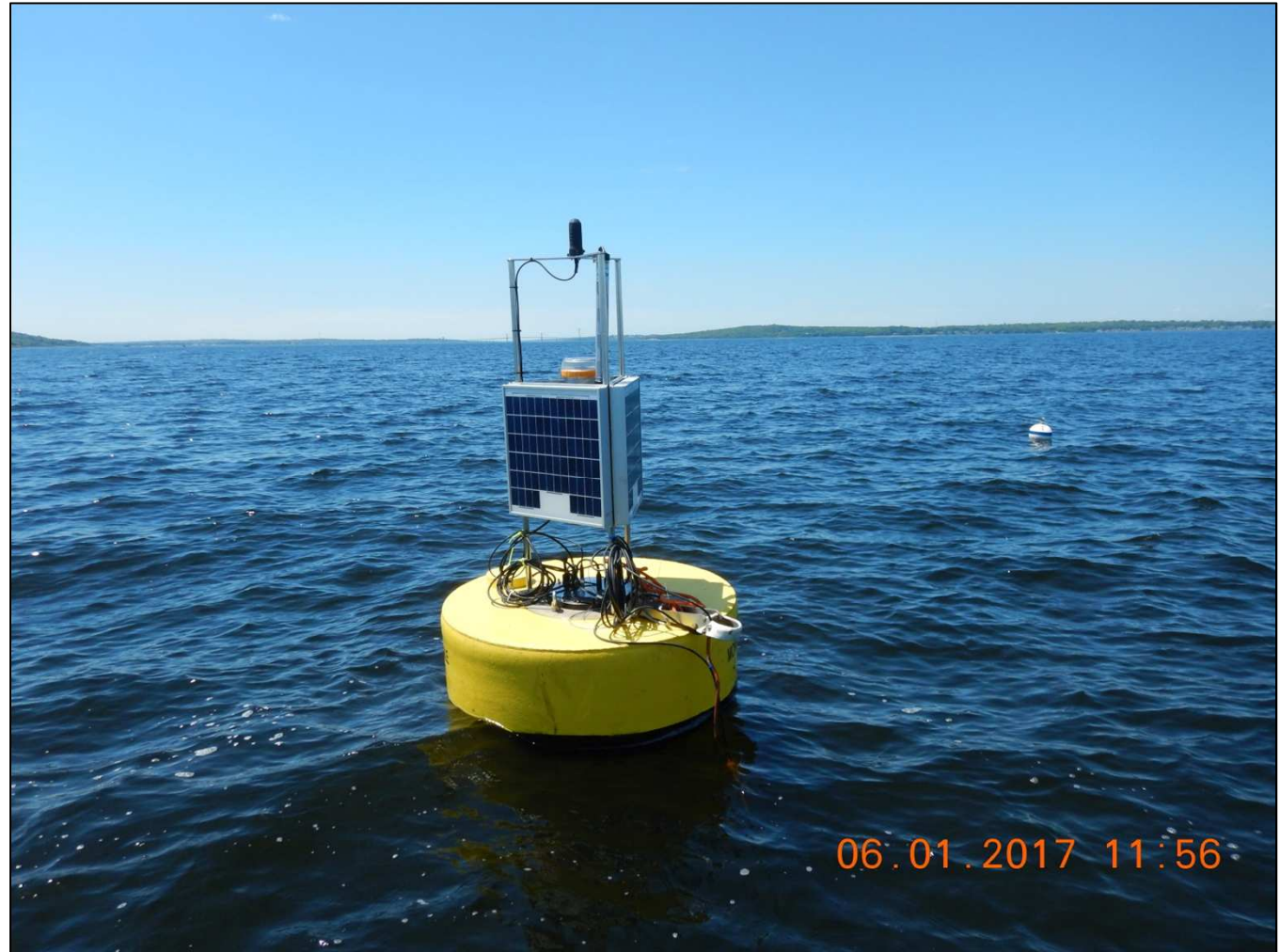
- Buoys deployed: 2016 and 2017
- Narragansett Bay Fixed-Site Monitoring Network (NBFSMN)
- Fill Data gaps



Mount Hope Bay Buoy Deployment

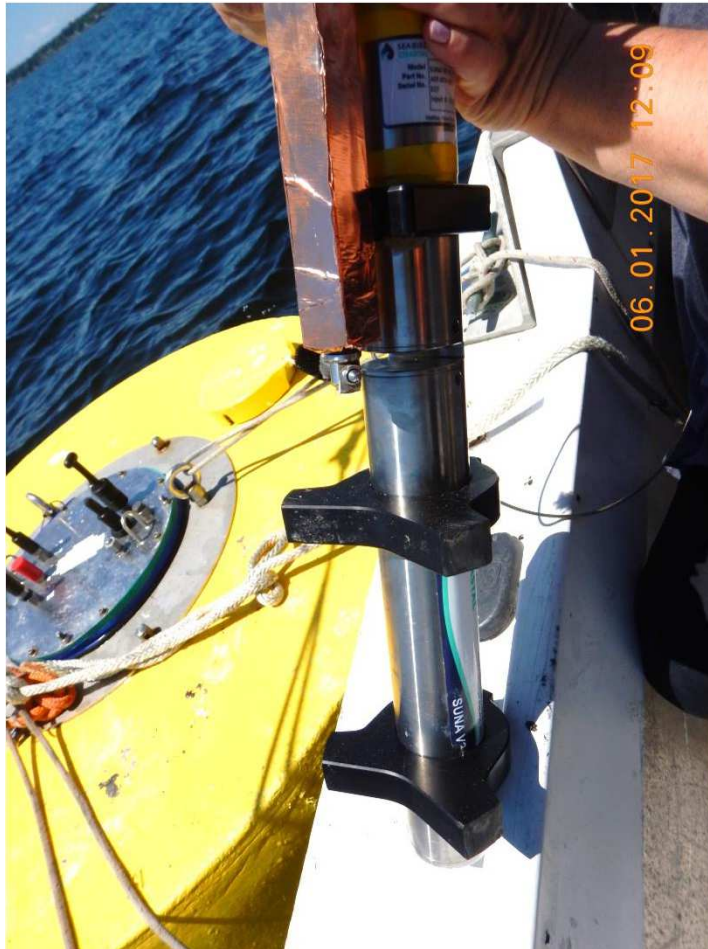


- **Measurements:**
Nitrate-nitrogen,
dissolved oxygen,
temperature, pH,
specific conductivity,
salinity, chlorophyll,
and blue-green algae



06.01.2017 11:56

Two Types of Measurement Sensors

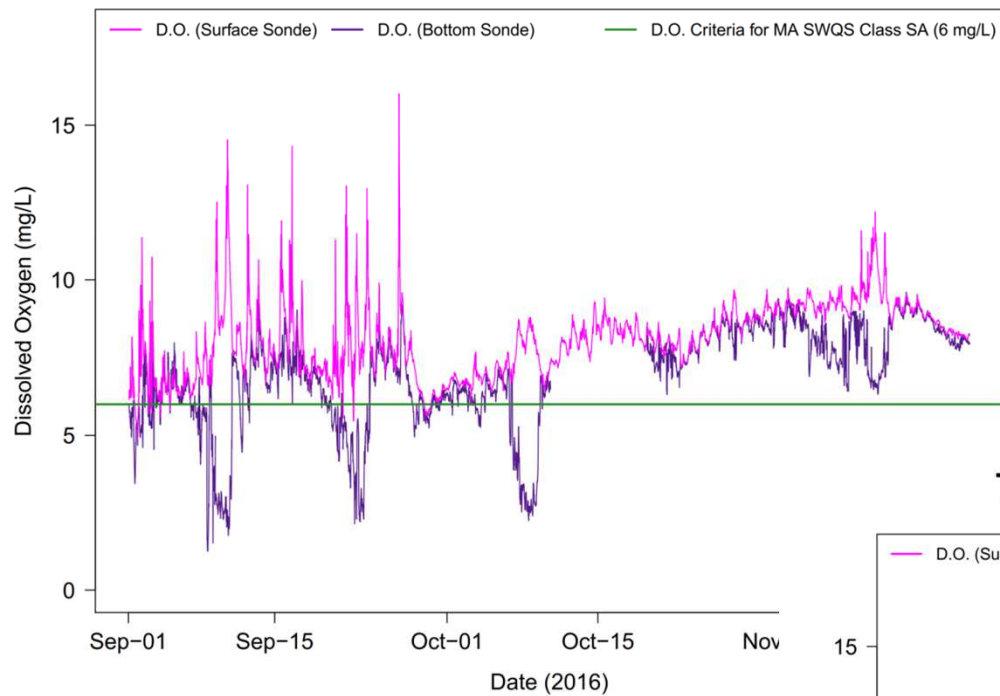


- Submersible Ultra-violet Nitrate Analyzer (SUNA)
- Measures nitrate-nitrogen concentrations only
- Hourly measurements at 1m depth



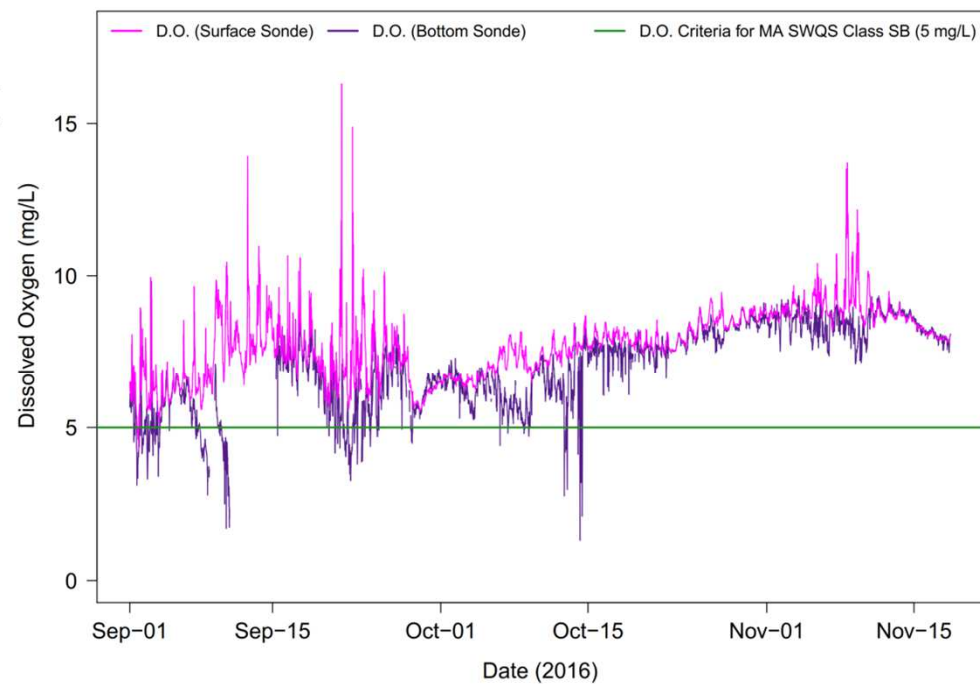
- YSI EXO2: multi-parameter sonde
- Measures all other parameters
- Every 15 minutes at two depths (1m and 5m)

Cole Buoy – Dissolved Oxygen (mg/L)

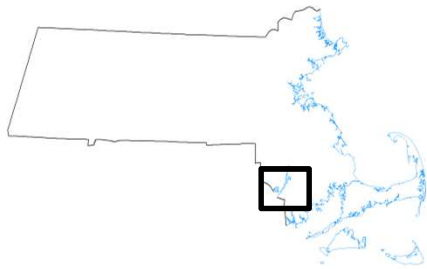


- 1) Current condition
- 2) Trends
- 3) Management decision
- 4) water quality models

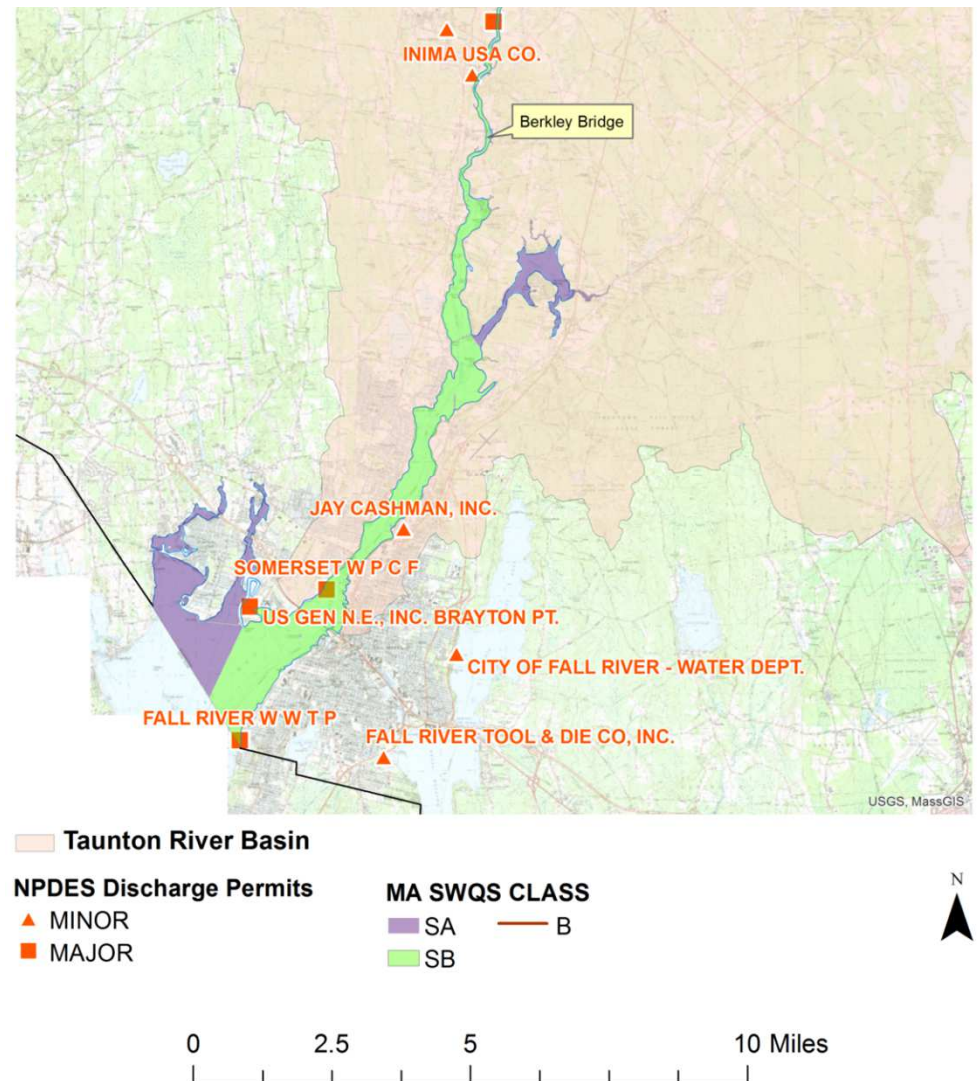
Taunton Buoy – Dissolved Oxygen (mg/L)



Mount Hope Bay and Taunton River Study Area



- Nutrient related impacts
- Need for current data and updated assessment
- Updated assessment
- Pre-Post WWTP upgrades
- Information needed to guide management decisions
- Forge monitoring partnerships

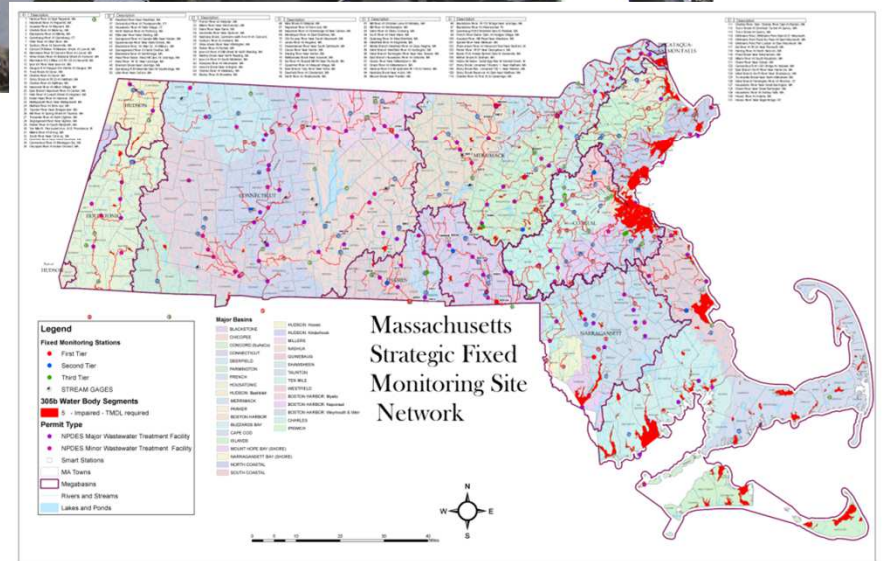


Statewide Monitoring Network

Statewide Monitoring Network

Preliminary Scoping Partnership with USGS

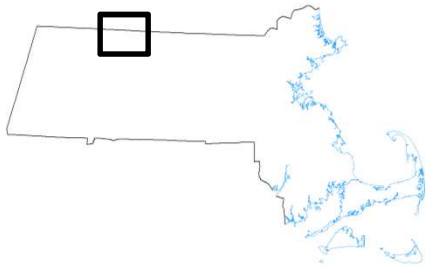
- Background
- Water quality
- Co-located with gages - Contaminant loads
- Water Quality Trends
- NPDES Permit Renewals



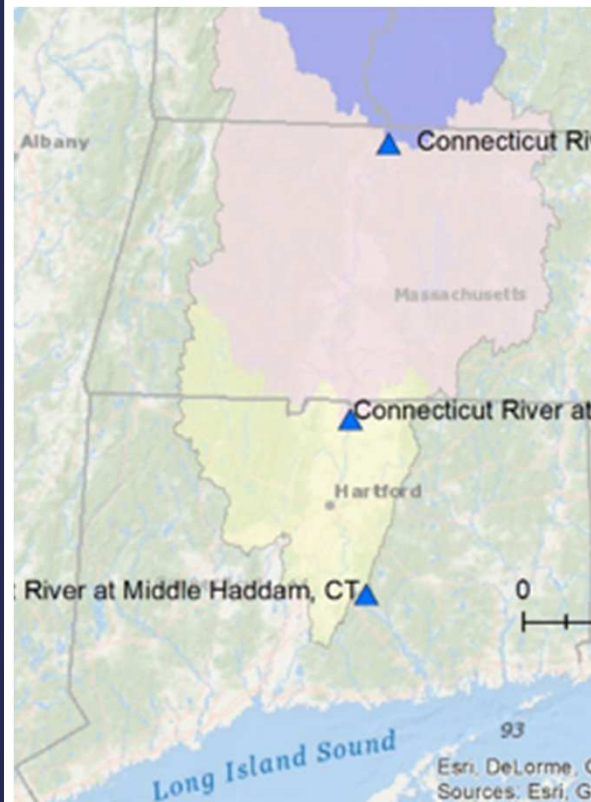
Connecticut River – Long Island Sound

Connecticut River

Flow Gage
Water Quality
Sampling
Nutrient Loading
(In and Out)



Stream flow and Water Quality of the Connecticut River near Northfield MA



Connecticut River – Long Island Sound

- Operate, a flow-monitoring station (MA/NH/VT) border at Northfield MA
- Co-located water-quality monitoring site, nutrient load estimation at Northfield MA.
- Increase the sampling frequency at the Connecticut River at Thompsonville CT. station to refine nutrient load estimates.
- Develop a 5 year monitoring strategy for load calculations at both Northfield MA. and Thompsonville CT. stations.



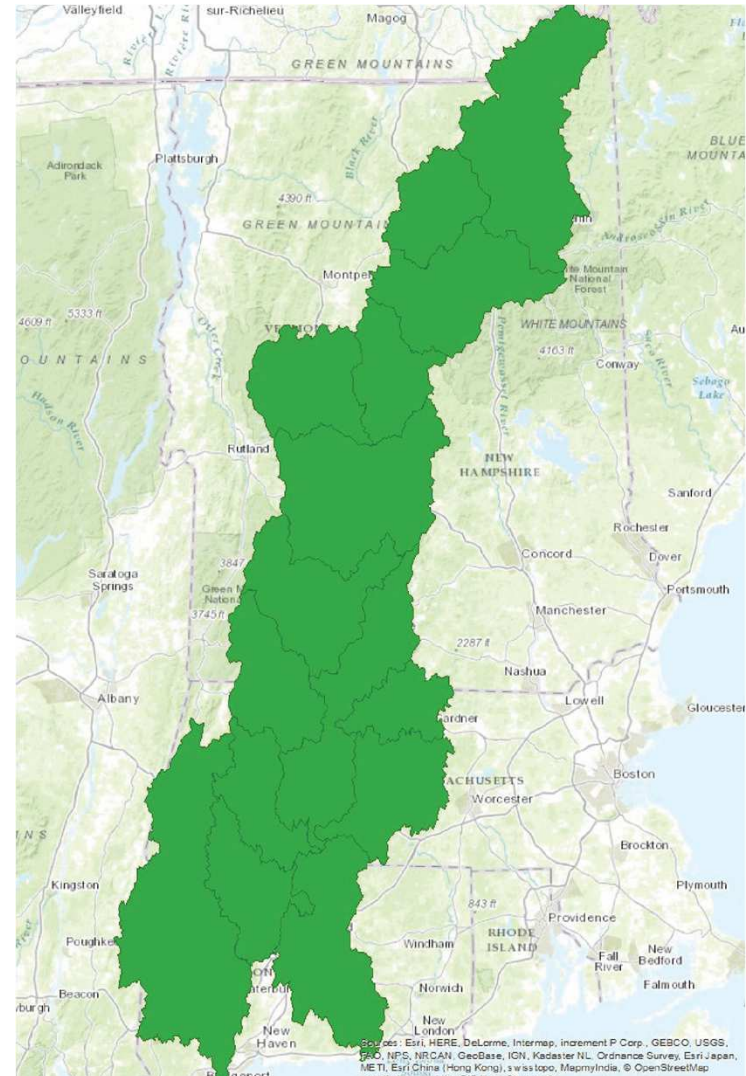
Clean water. Healthy habitat. Thriving communities.

**Connecticut River
Conservancy**



Connecticut & Housatonic River – Long Island Sound Nitrogen Strategy

- Long Island Sound Futures Fund
- Compliment – LIS Nitrogen Reduction Strategy
- Connecticut River Conservancy
- MassDEP – Match
- Other Partners
 - States (VT, NH, CT)
 - Municipalities - City of Springfield
 - USGS
- Deliverables
 - Monitoring Strategy – Nutrient
 - QAPP
 - Data management
 - Stakeholder engagement



Policy and Standards

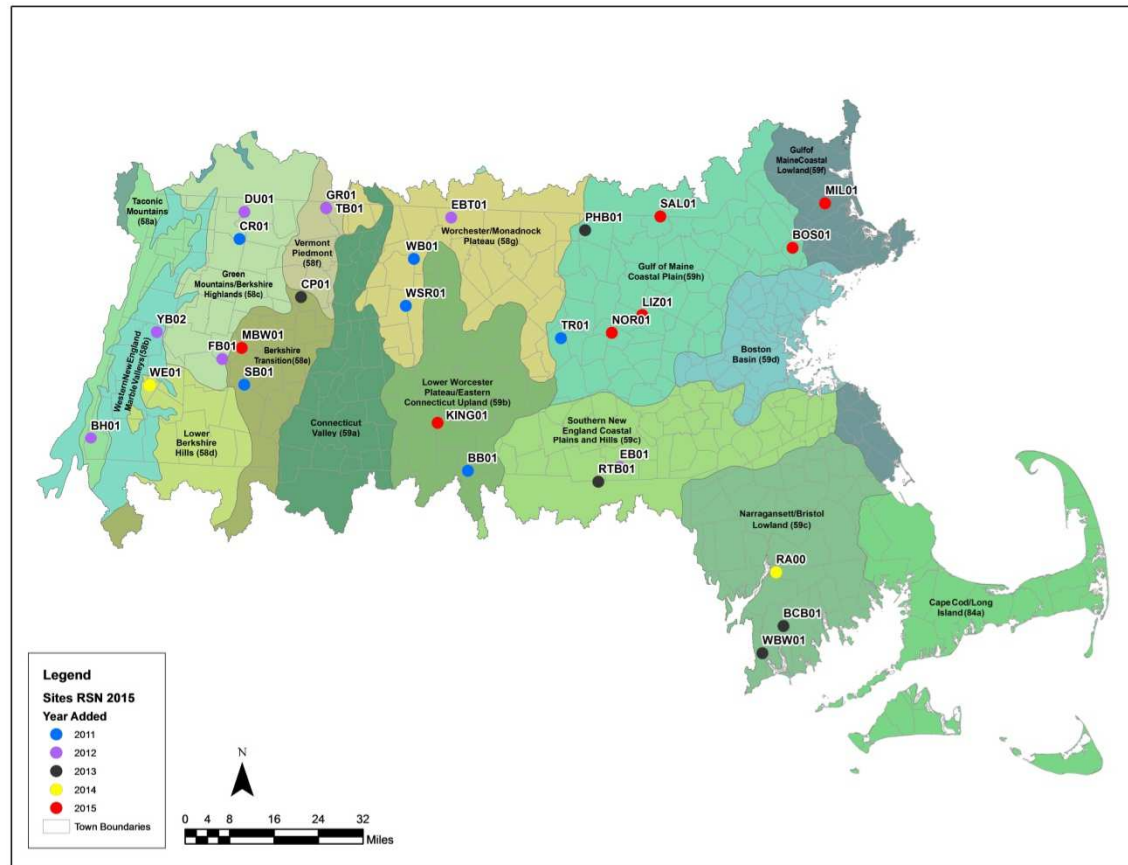
Reference Site Network

Reference Site Network

- Least disturbed streams
- Background conditions by Eco Region (natural vs. anthropogenic)
- Since 2011 38 sites sampled at least once

Policy and Standards

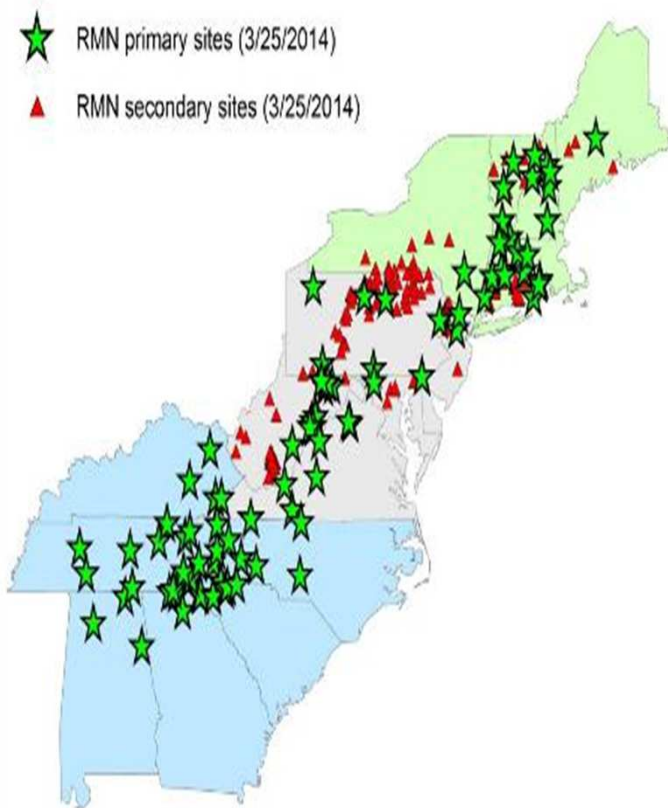
- Assessment methods
- Bio-criteria
- Probabilistic streams assessment



- Nutrients (TN,TP, Nitrate/Nitrite, Ammonia)
- Color
- Turbidity
- Chloride
- Dissolved Oxygen/Temperature Probe Deploys (May-September)
- Habitat Assessment
- Fish Community
- Macroinvertebrate Community

Climate Change

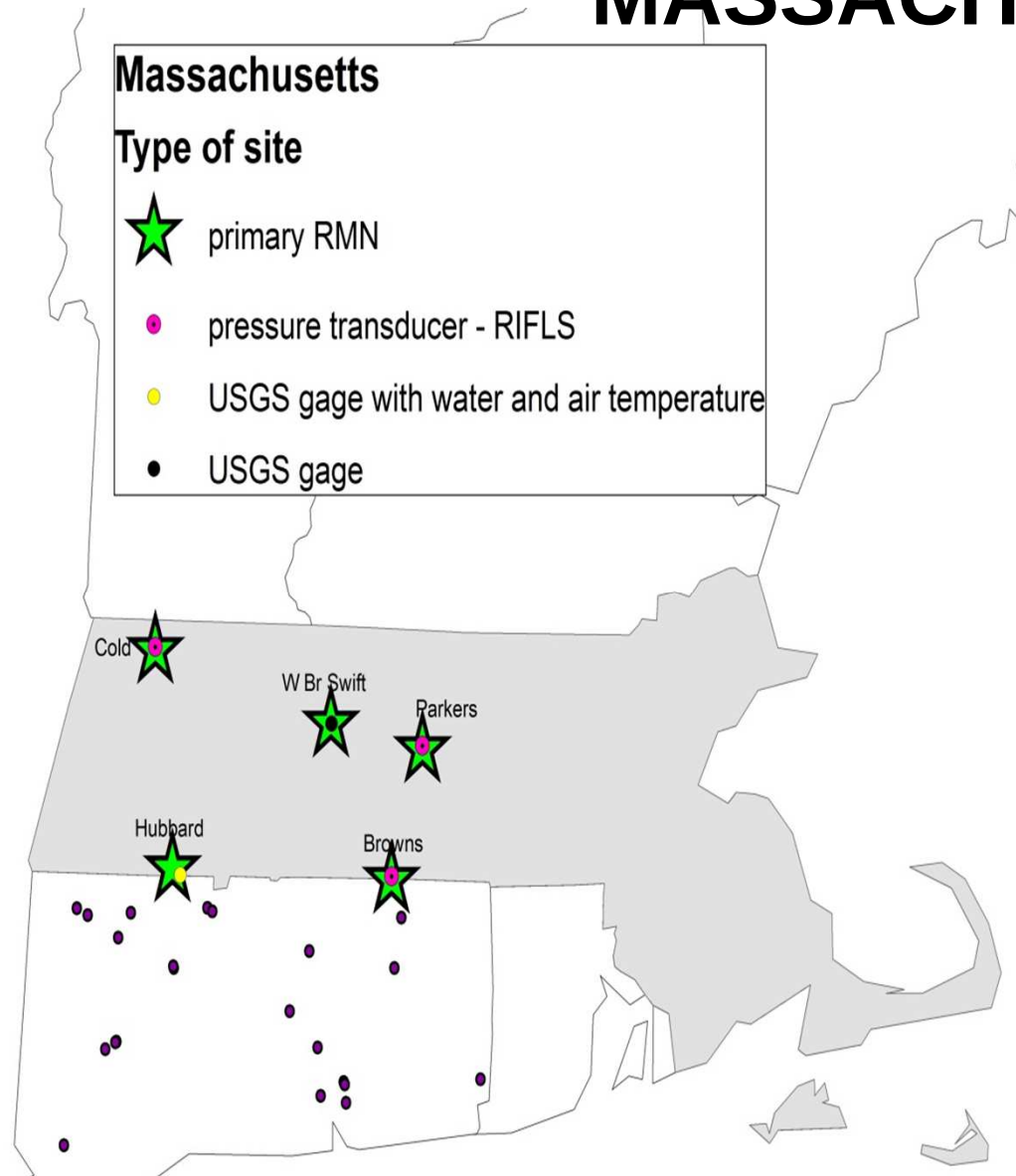
Background on Regional Monitoring Networks (RMNs)



- Working with **states, EPA Regional offices, tribes** and other biomonitoring programs in the **Northeast, Mid-Atlantic & Southeast (2012 - Northeast pilot)**
- Focusing on **riffle-dominated freshwater wadeable streams** (to start)
- Detect **climate-related changes**; **monitor reference conditions**

By coordinating these efforts at a **regional level**, **resources can be pooled** and **efficiencies increased**.

MASSACHUSETTS



Main contacts: Bob Nuzzo (MA DEP),
Laila Parker (RIFLS), Michelle Craddock
(RIFLS)

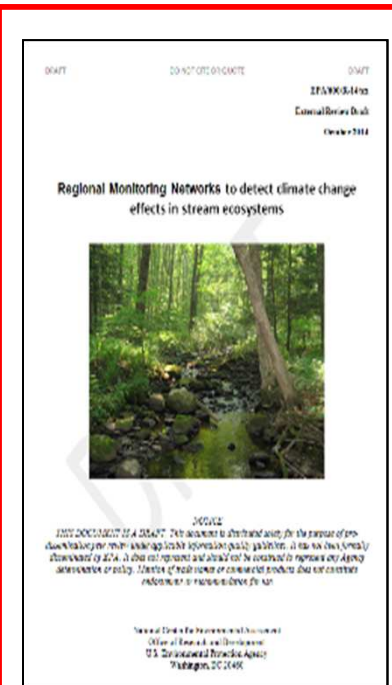
- 5 primary RMN sites
- Partnership: MA DEP and River Instream Flow Stewards (RIFLS)
- Macroinvertebrate, temperature and hydrologic data

How will these data be used?



- **temporal trends** in biological, thermal, hydrologic, habitat and water chemistry data
- **better understanding of relationships between biological, thermal, and hydrologic data**
- **response and recovery of organisms to extreme weather events**
- **predictive models related to climate change vulnerability**
- **Quantifying natural variability**

**Multiple
uses!**



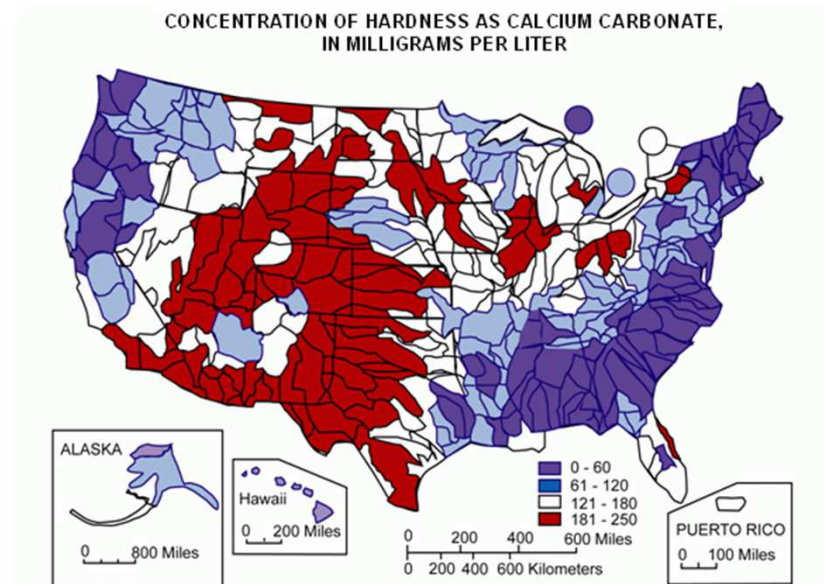
For more details,
see the Data
Usage section of
the RMN report



Aluminum

Background & Problem

- Waters in Massachusetts (MA) have low hardness.
- Humic substances can be high which may decrease aluminum toxicity.
- Natural instream aluminum concentrations in some MA waters higher than EPA recommended criteria (750 $\mu\text{g/L}$ acute; 87 $\mu\text{g/L}$ chronic).
- Aluminum discharge limits in NPDES permits difficult to meet due to natural instream aluminum concentrations.



Modified from [Briggs and others, 1977](#).

Aluminum Criteria



- Better reflects latest science on aluminum toxicity
- pH, hardness, and DOC affect the toxicity of aluminum
- Multiple linear regression (MLR) model
- Allows adjustment to account for local water chemistry

Aluminum Criteria

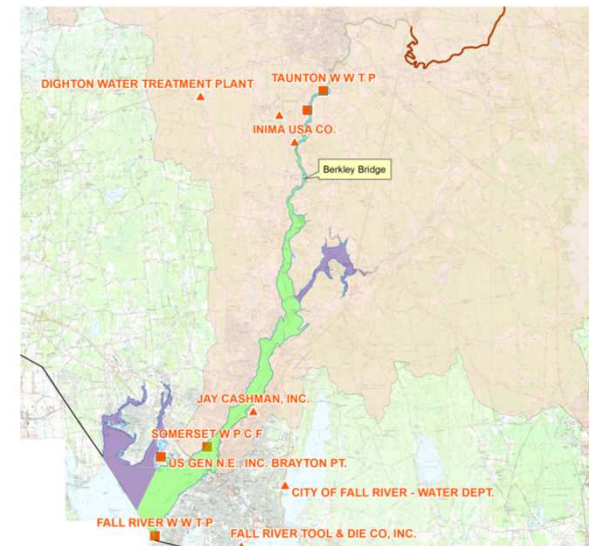


- EPA Draft Aluminum - July 2017
 - Site Recon
 - Data collection at PWS
 - Apply MLR to calculate aluminum criteria
 - Document process

Marine Dissolved Oxygen (DO)

- Phase I - 2017- Marine DO Criteria Review
- Contractor Support - Tetra Tech, Normandeau
- Working with RIDEM, Federal & State Agency Staff
- Pilot Study Area - Mount Hope Bay Taunton River
- Species Review
- EPA Guidance - Virginia Province Approach
- Phase II –Scoping - underway

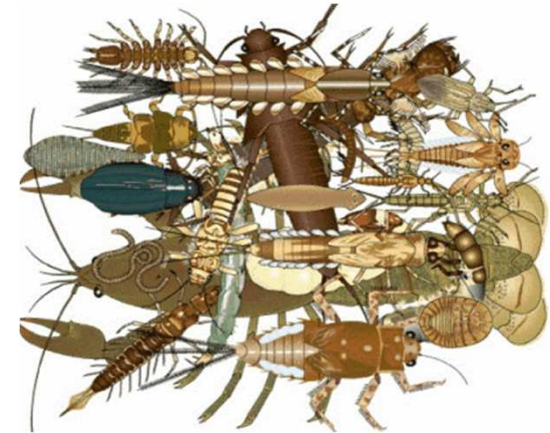
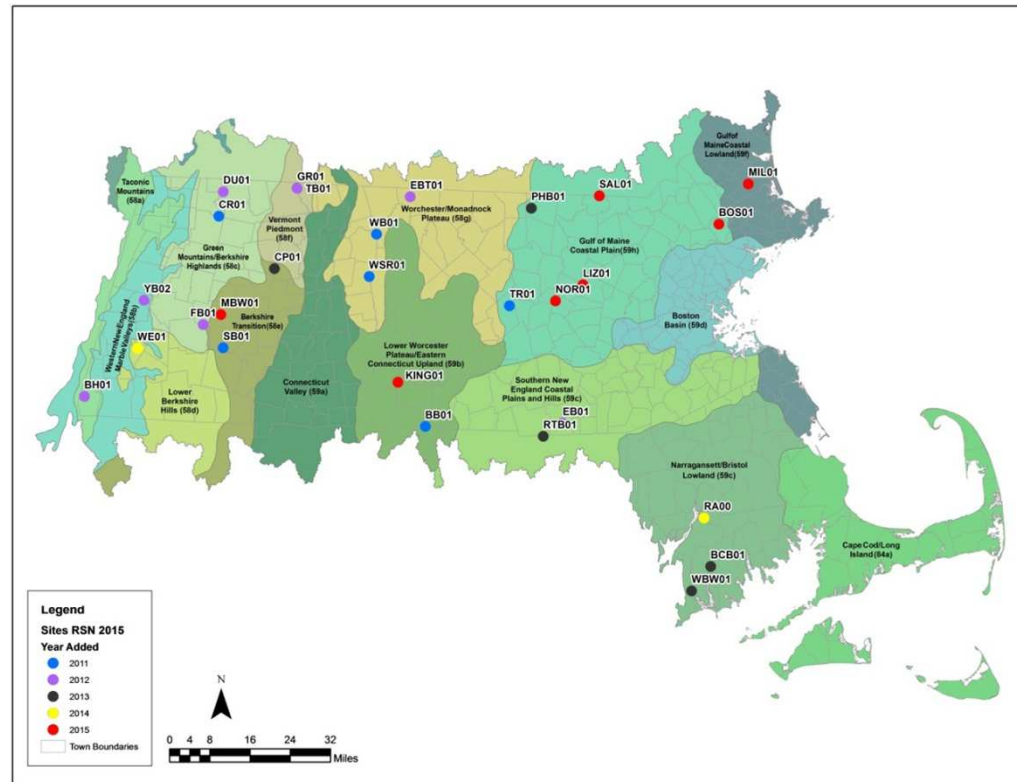
Marine DO Criteria Review



Common	Scientific	GMAV	Rank
Atlantic Sturgeon	Acipenser oxyrinchus oxyrinchus	2.33	1
American Shad	Alosa sapidissima	2.17	2
Northern Pipefish	Syngnathus fuscus	1.63	3
Striped Bass	Morone saxatilis	1.58	4
Winter Flounder	Pseudopleuronectes americanus	1.38	5
Summer Flounder	Paralichthys dentatus	1.32	6
Mysid Shrimp	Mysidae	1.27	7
Scup	Stenotomus chrysops	1.25	8
Eastern Oyster	Crassostrea virginica	1.15	9
Atlantic Menhaden	Brevoortia tyrannus	1.12	10

Freshwater – Biological Criteria

- Phase I – Planning
- Multi Metric Index (MMI)
- Tetra Tech
- Biological Communities
- Review Data Identify Gaps
- Develop Phased Work plan



Other Initiatives

Data Management

- UMass Data Collaborative – support for QAPP development and data review

TMDL

- Regional Freshwater Bacteria TMDL

Policy & Standards

- Biomonitoring Method Development in Estuarine Waters

Thanks to our partners.....



UBWPAD



THE
UNIVERSITY
OF RHODE ISLAND



Questions ?

**Kimberly Groff,
Ph.D.**

MassDEP
Bureau of Water
Resources
Worcester, MA

Kimberly.groff@state.ma.us
508-767-2876



*Rowing together to Protect and Restore the
Waters of the Commonwealth*

.J. Fleck anywhere he goes: "Row the boat."