

River Herring Spawning and Nursery Habitat Assessment

GULF of MAINE MONITORING & RESEARCH SYMPOSIUM

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Diadromous Fish in Massachusetts



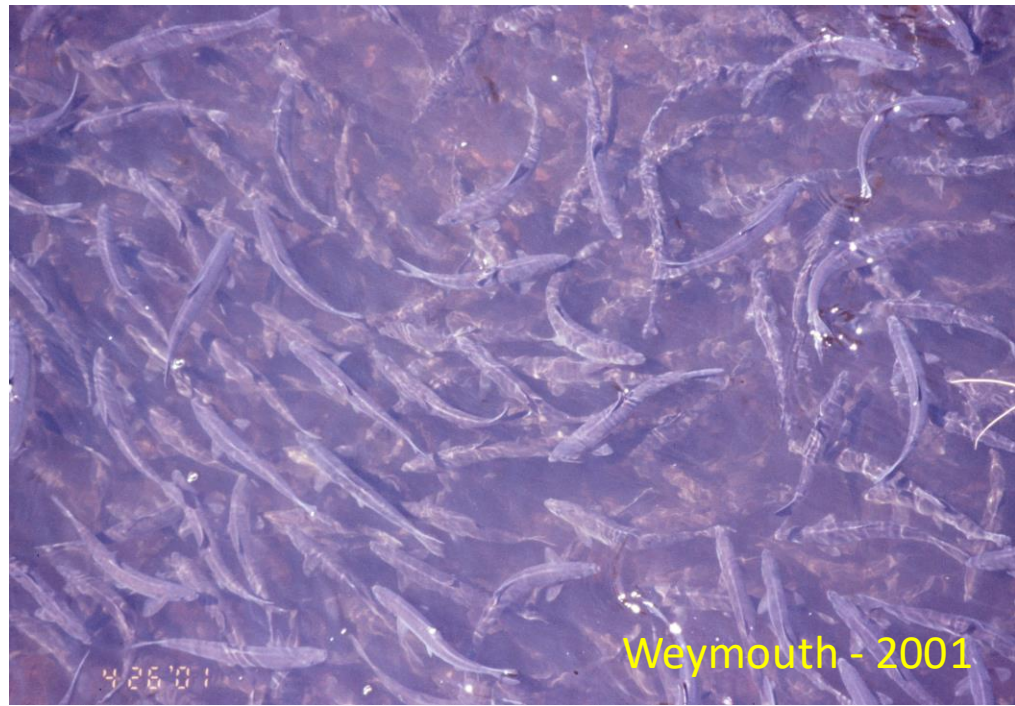
- rainbow smelt
- American eel
- alewife
- blueback herring
- American shad
- white perch
- sea lamprey
- Atlantic tomcod
- sea-run trout
- striped bass





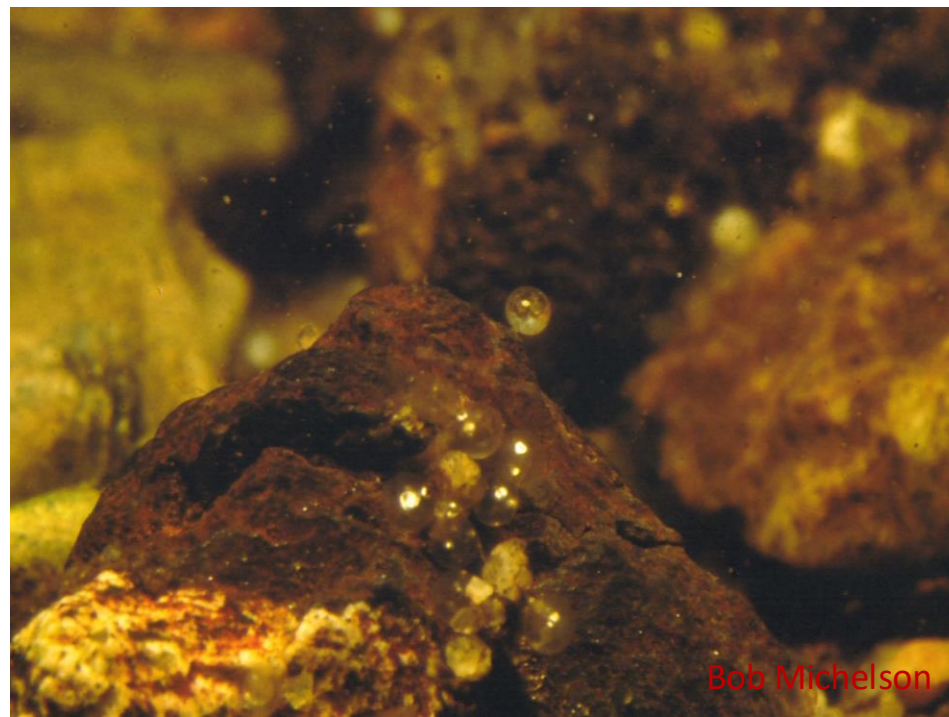
Declining Populations

- Fishing mortality
- Natural mortality
- Climate change
- Habitat alteration



Habitat Alteration

- Passage barriers
- Watershed development
- Water management
- Eutrophication

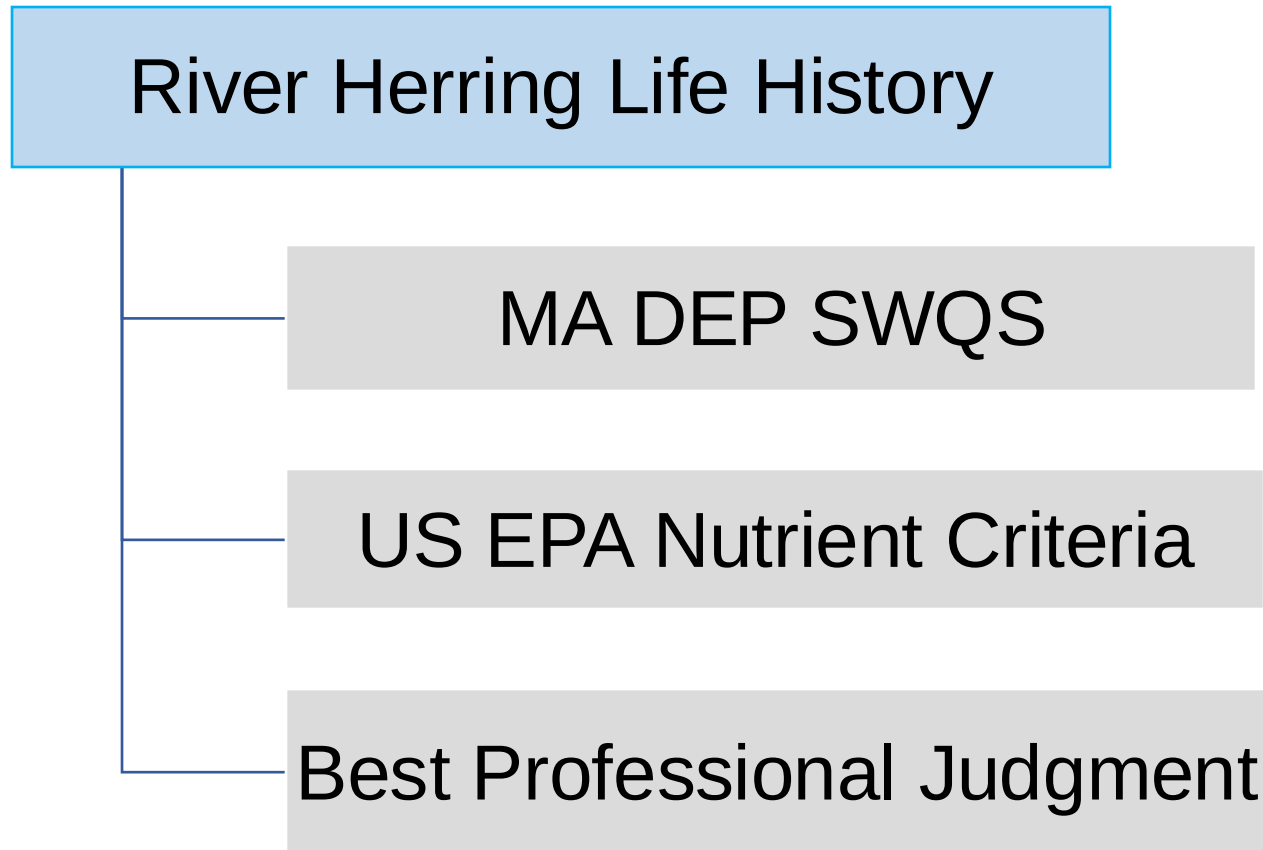


Habitat Assessment

- Low-cost process to gain information on spawning, nursery, and migratory habitat status in individual runs
- Tool to identify freshwater habitat stressors and assist restoration planning
- Standardize methods and protocols in QAPP



QAPP-based Habitat Classification



<https://www.mass.gov/service-details/marine-fisheries-technical-reports>

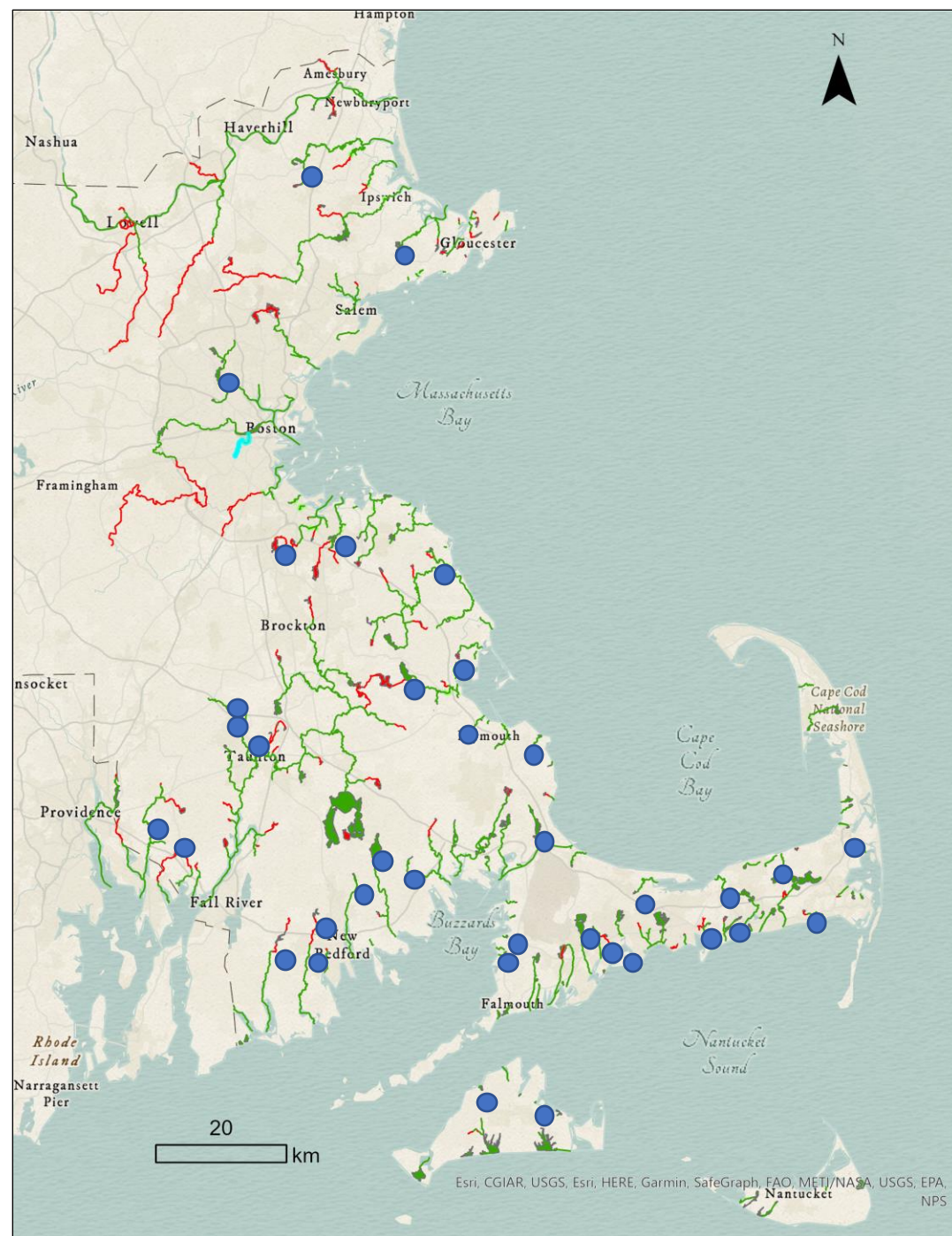
Habitat Assessment Methods

- Monthly sampling trips, May-September for 2 years
- Water chemistry sampling at spawning/nursery habitats
- Assessment of stream flow and fish passage status at migratory junctions in watershed
- Apply QAPP criteria for classifying suitability of habitats to support river herring early life history

River Herring Spawning and Nursery Habitat Assessments

- 50 ponds assessed
- Presenting data on 32 ponds
- Pooling samples by region and pond type

[MassGIS Data: Diadromous Fish |](#)
[Mass.gov](#)



River Herring Spawning and Nursery Habitat Assessments

Pond Type

Large Impoundments



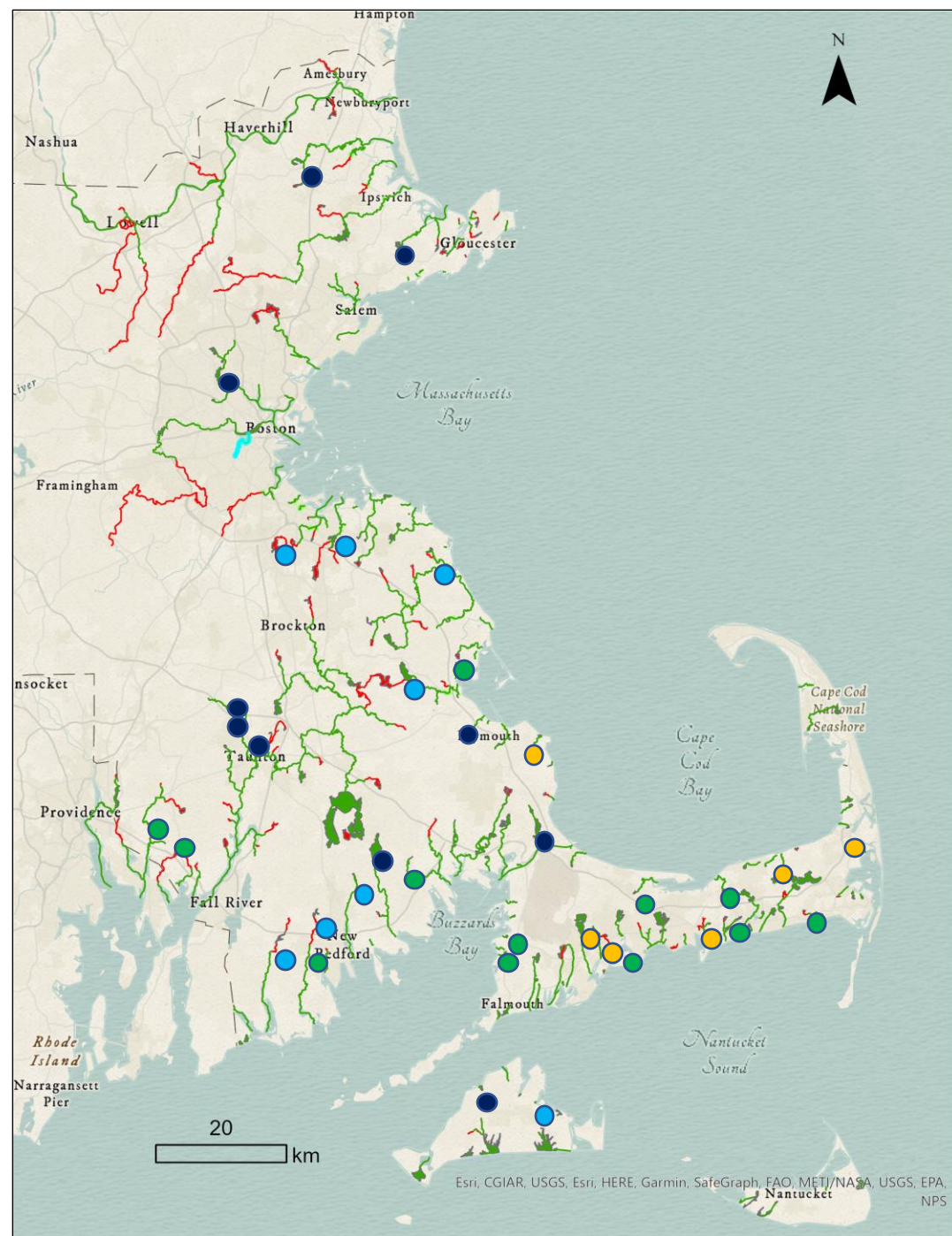
Kettle Ponds



Mill Ponds



Water Supply

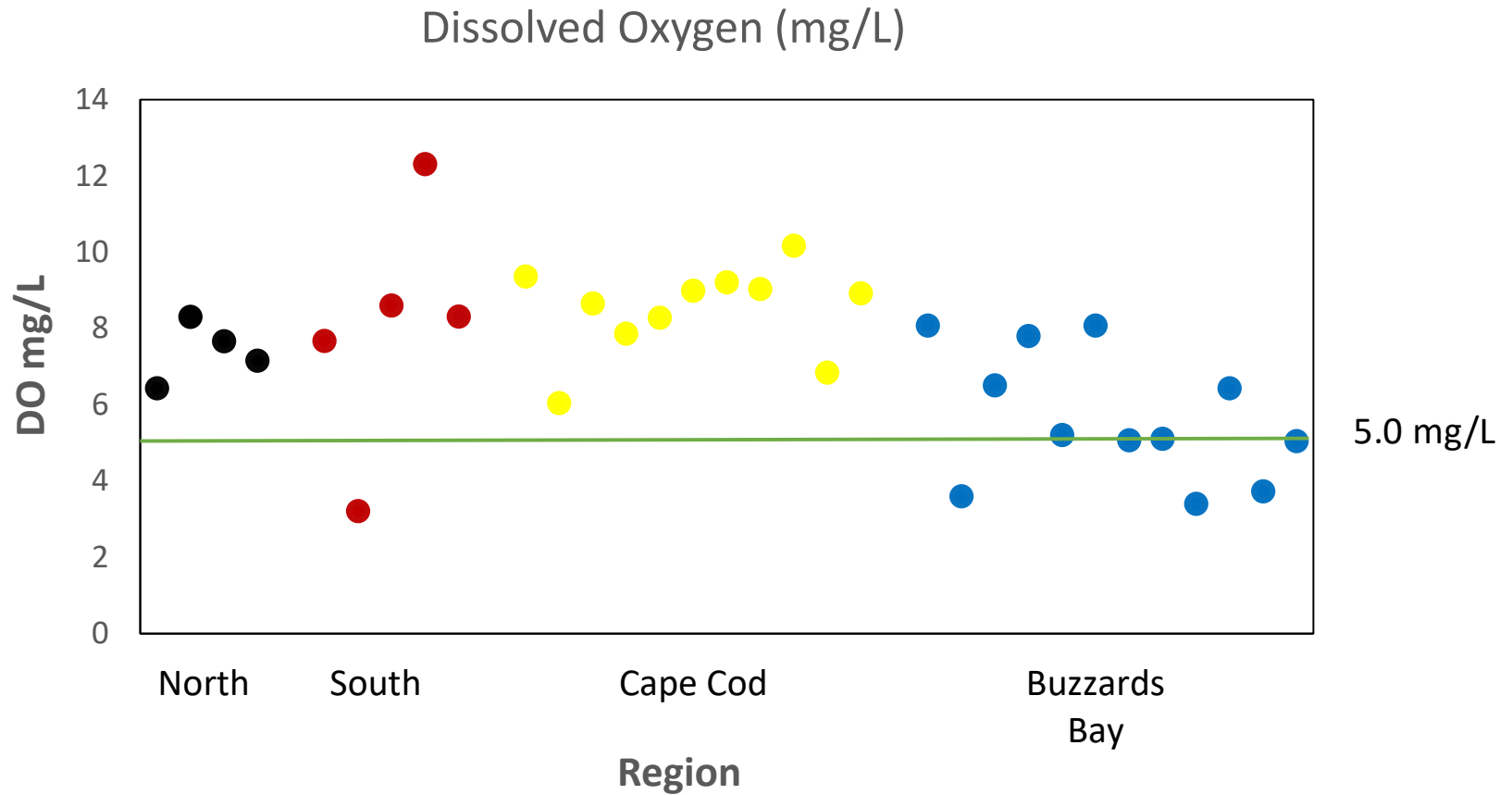


Habitat Assessment Classification Table

Table 1. Summary of river herring habitat assessment at Great Pond Reservoir, Braintree, 2008/2010.

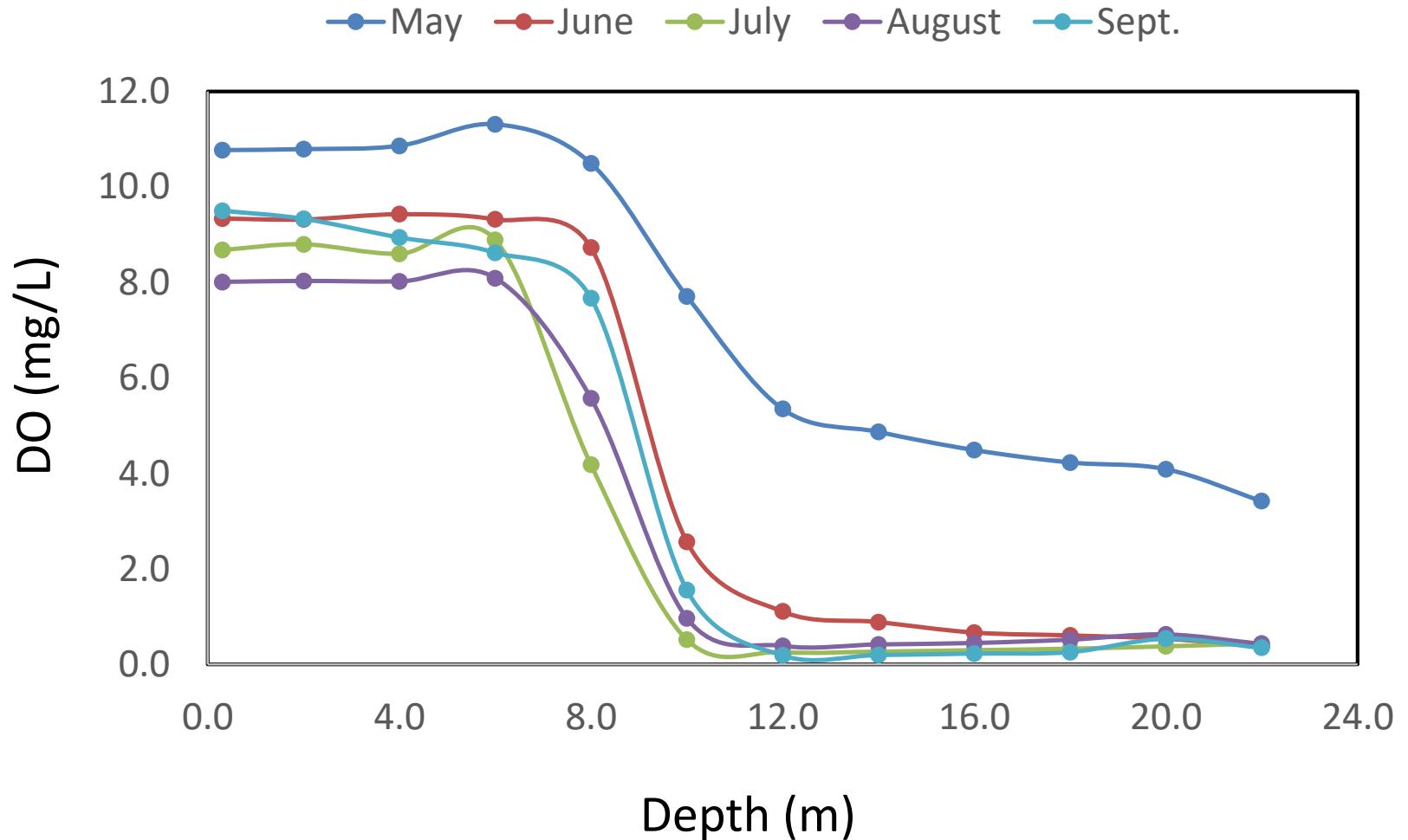
Parameter	Units	Sample (No.)	Sample (Mean)	Acceptable Criteria	Exceedance (%)	Classification
Temp. (nursery)	°C	31	20.51	<28.3	0	<i>Suitable</i>
Temp. (spawning)	°C	43	22.75	<26.0	0	<i>Suitable</i>
DO	mg/L	64	8.30	>5.0	2	<i>Suitable</i>
pH	SU	74	7.30	6.5 to <8.3	1	<i>Suitable</i>
Secchi	m	18	3.5	>2.0	0	<i>Suitable</i>
TN	mg/L	5	0.300	<0.32	40	<i>Impaired</i>
TP	ug/L	5	6.7	<8.0	20	<i>Impaired</i>
Fish Passage	NA	10		BPJ	100	<i>Impaired</i>
Stream Flow	NA	10		BPJ	100	<i>Impaired</i>

Mean Dissolved Oxygen



Mashpee Pond, Mashpee

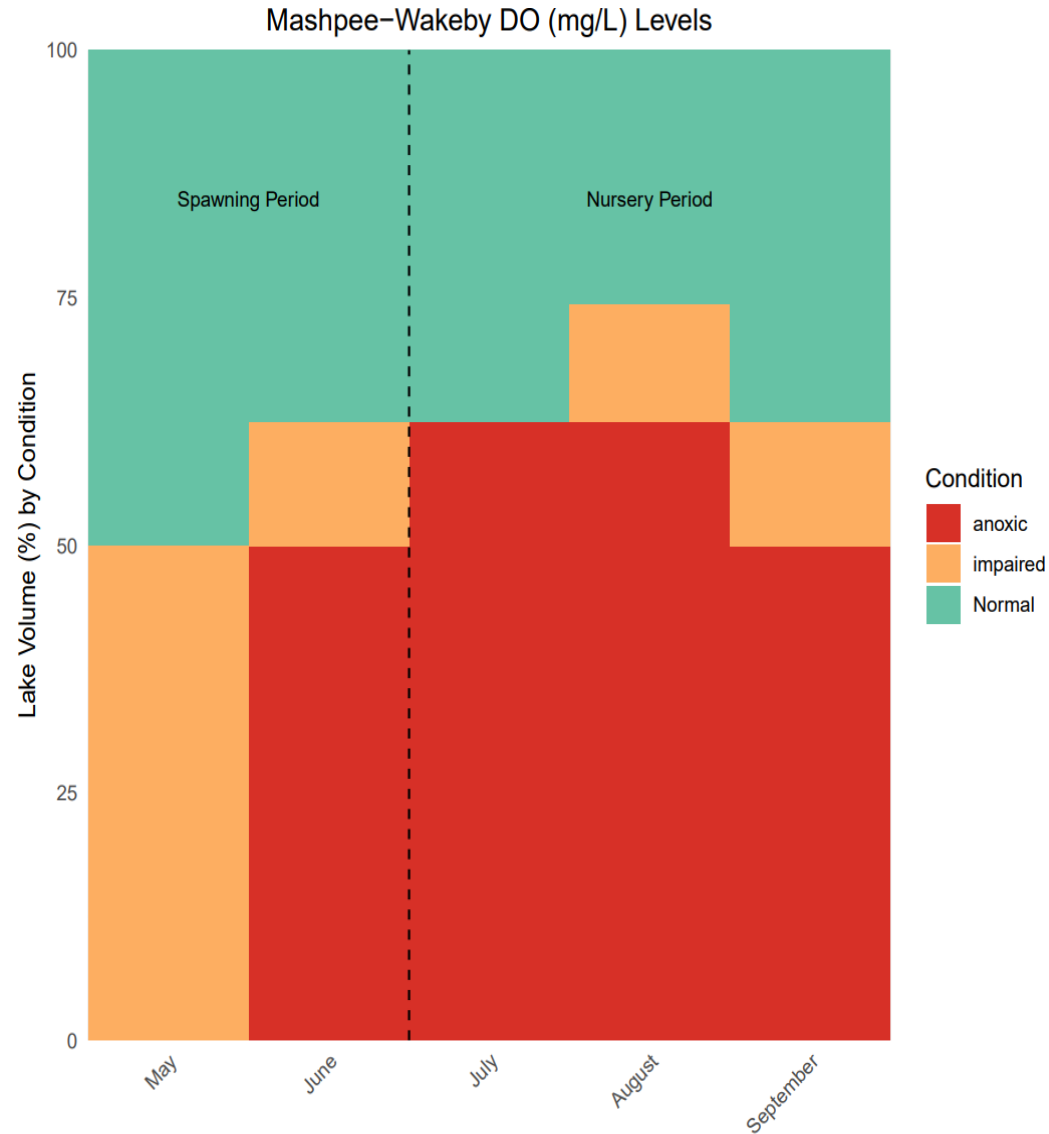
Monthly DO at Depth



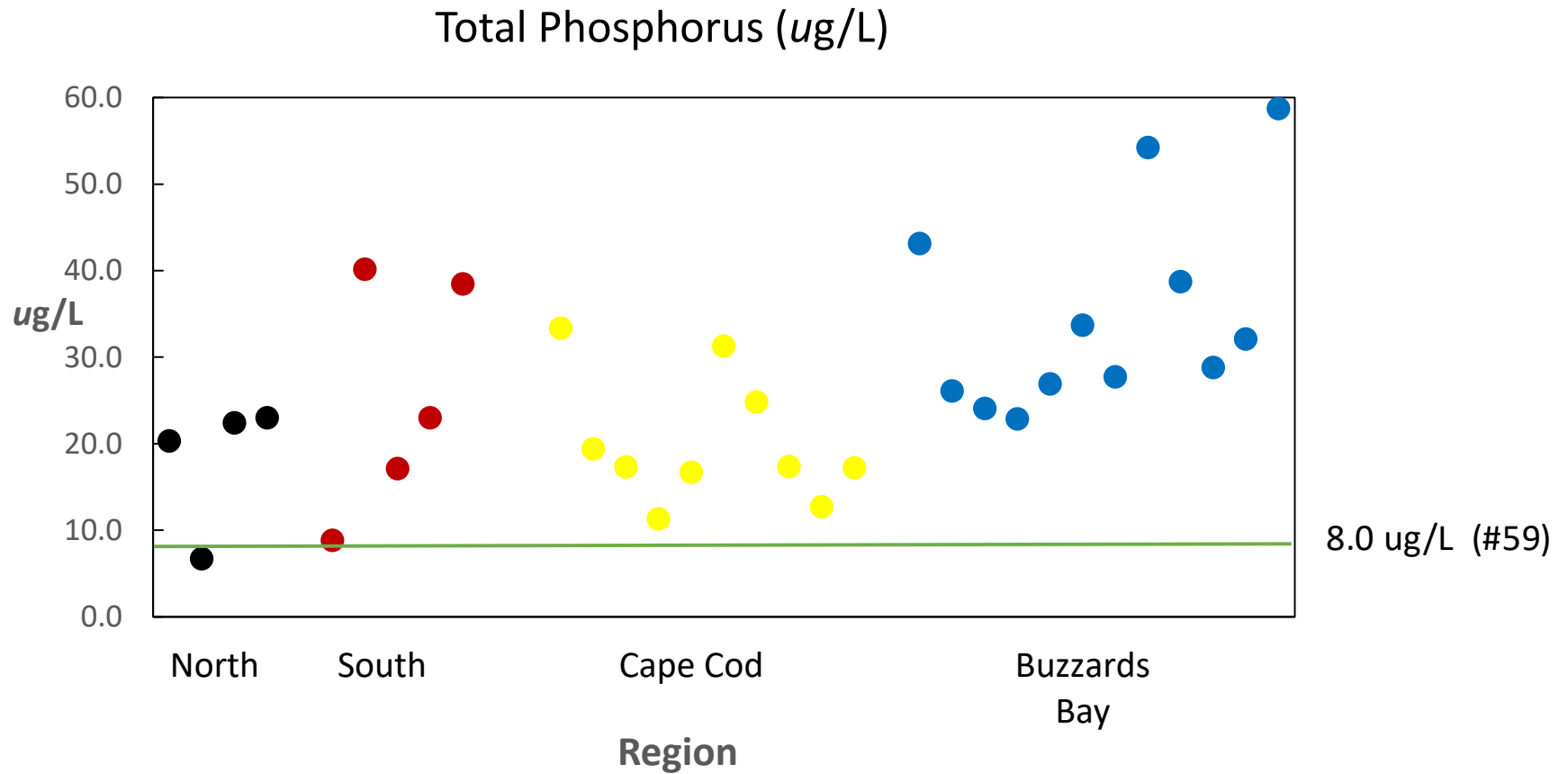
Mashpee Pond

Oxygen at Depth

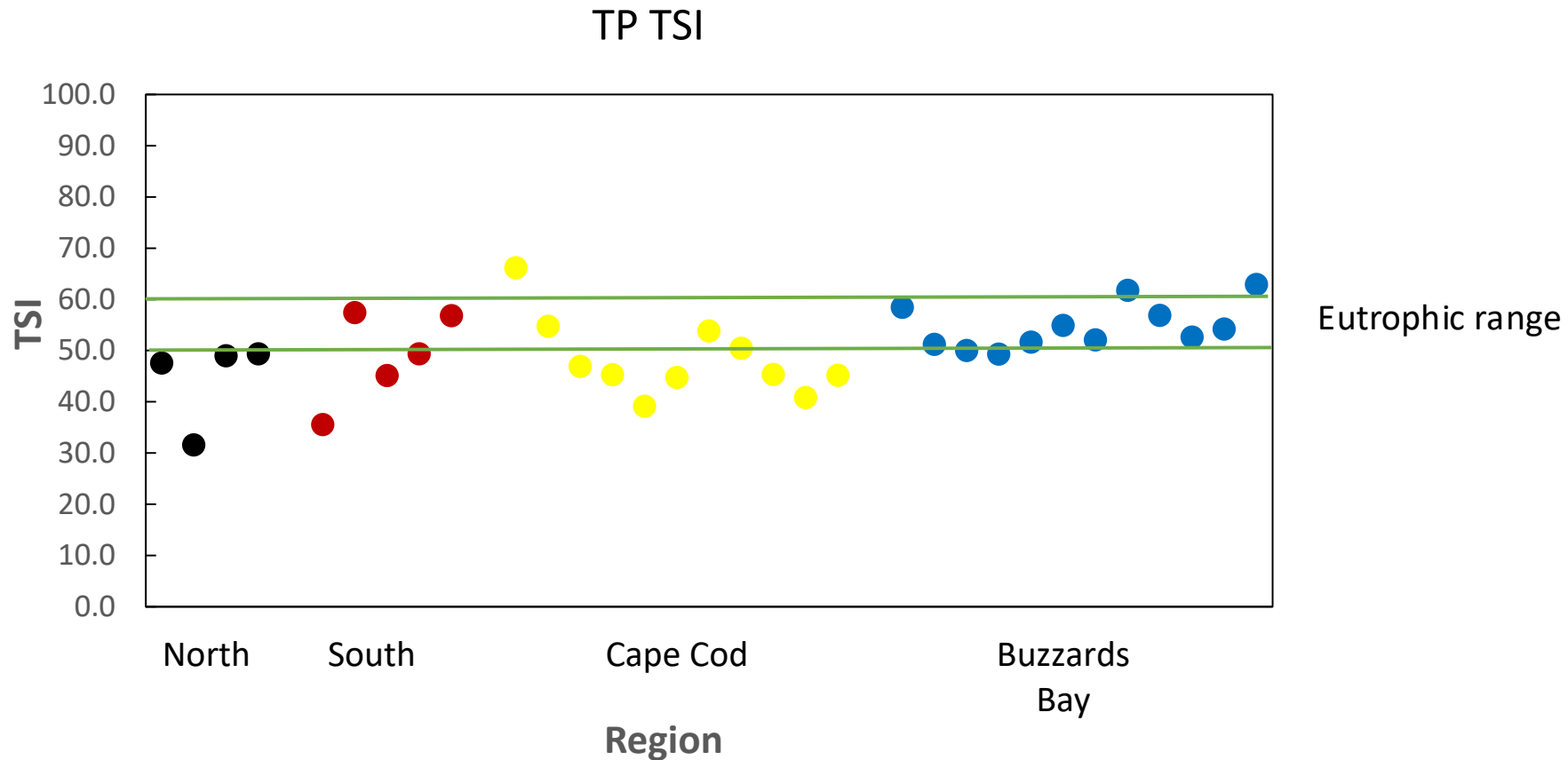
- Using GIS and bathymetric tools to estimate lake volume and extent of hypolimnion
- Mashpee Pond has about 60% of the pond volume unavailable for juvenile river herring.



Mean Total Phosphorus



Total Phosphorus Carlson Trophic State Index (TSI)



River Herring Habitat Stressors

Water Quality

- Low pH – primarily mill ponds in Buzzards Bay region
- Widespread high TN and TP
- Low Secchi Disk depth
- Low DO - expansive hypolimnion may reduce habitat

Fish Passage

- Fish passage impediments
- Stream flow limitations for juvenile emigration
- Stream obstruction from debris and vegetation overgrowth

<https://www.mass.gov/doc/dep-dmf-stream-maintenance-policy-april-2022/download>

- Increasing presence of invasive vascular plants

River Herring Stock Recruitment Relationships

Limited data on spawning stock abundance relationships to **juvenile abundance**, **future recruitment**, and **habitat conditions**

Comparing habitat assessment data to river herring spawning run count data

River Herring Counting Stations in Massachusetts

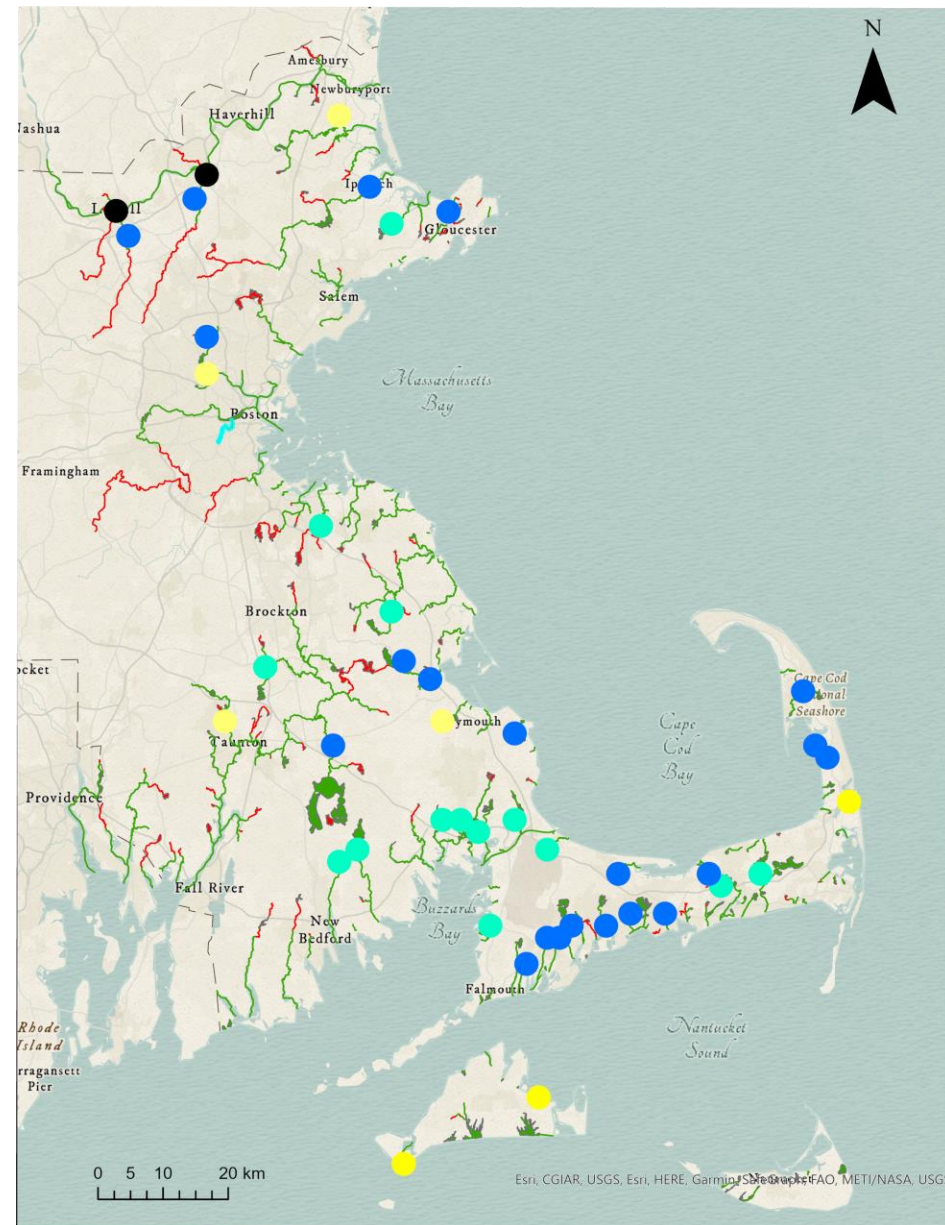
45 locations with spawning run counts in 2024

Volunteer Visual – 26 (**blue**)

Electronic – 14 (**green**)

Video – 7 (**yellow**)

Fish Lift – 3 (**black**)

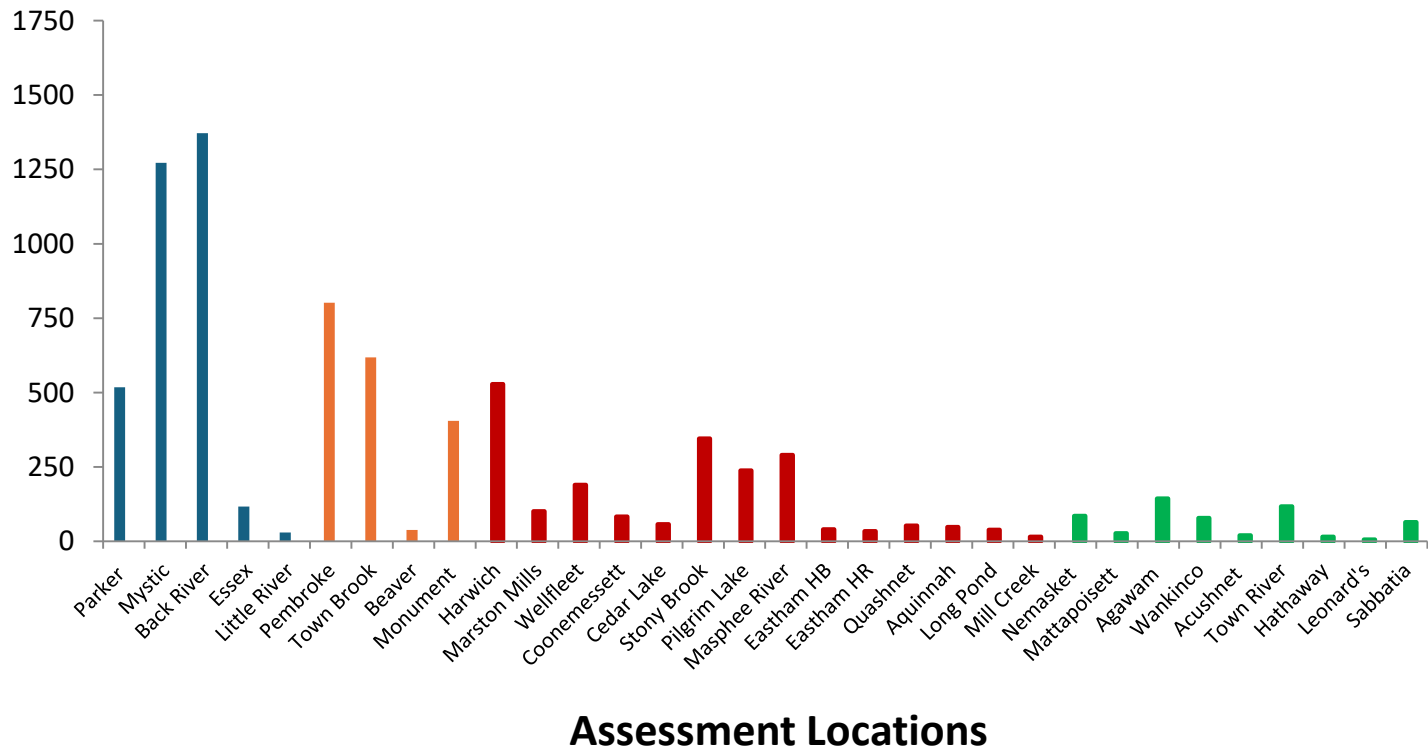


River Herring Spawning Run Counts

Region – 2001 to 2024

Fish / Acre

■ North ■ South ■ Cape ■ Buzzards

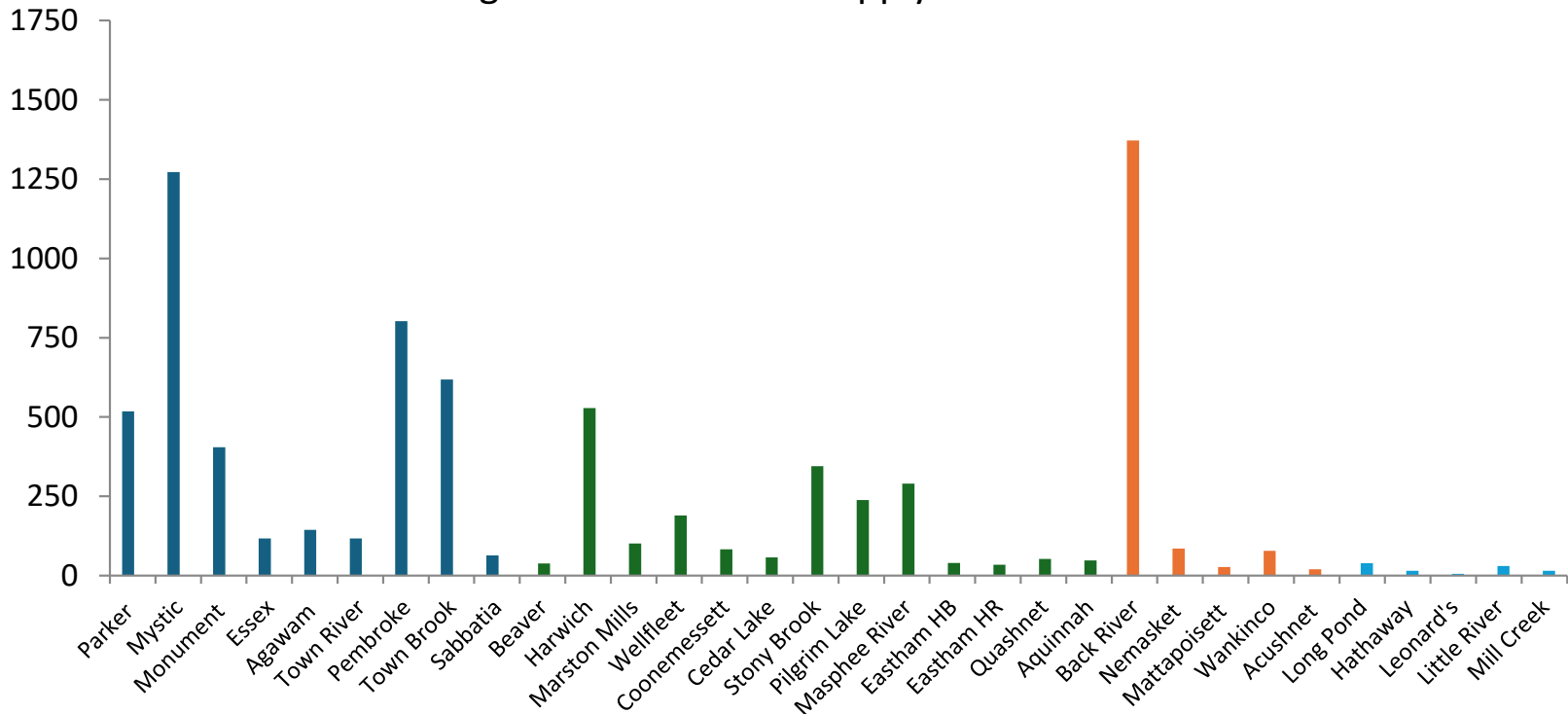


River Herring Spawning Run Counts

Pond Type – 2001 to 2024

Fish / Acre

■ Large Ponds ■ Water Supply ■ Kettle Ponds ■ Mill Ponds



Assessment Locations

Next Steps

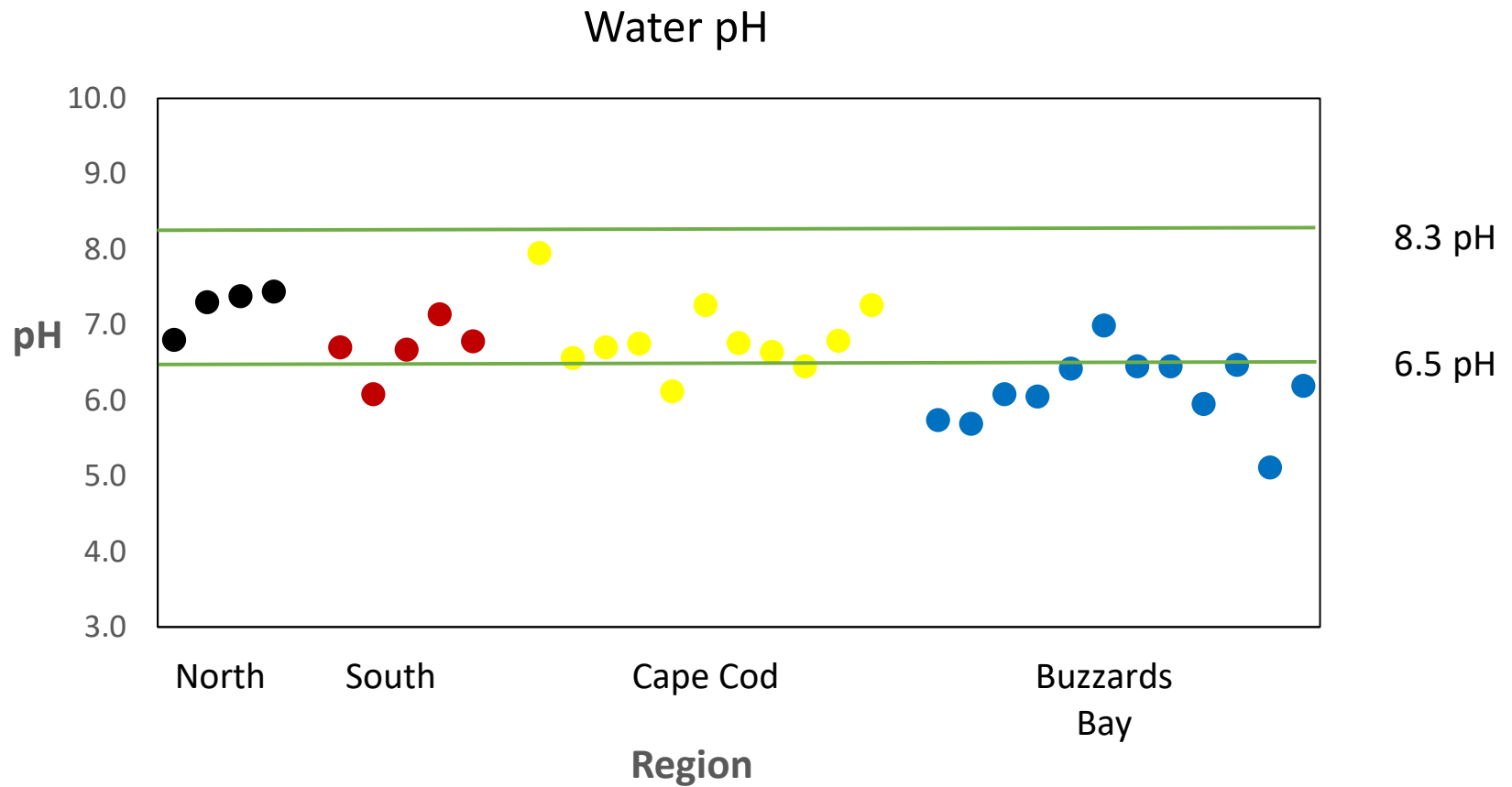
- Apply assessment results to regional restoration planning
- Habitat Productivity
- Analysis of Covariates
 - Water Quality
 - Environmental
 - Landscape
 - Pond type
 - Hypolimnion dynamics

Thank you!

Fore River, Braintree - 1989



Mean Water pH



Mean Total Nitrogen

