

Coastal Water Quality Monitoring being done by the U.S. Geological Survey

Jon Morrison

USGS Long Island Sound Coordinator

6/12/2024



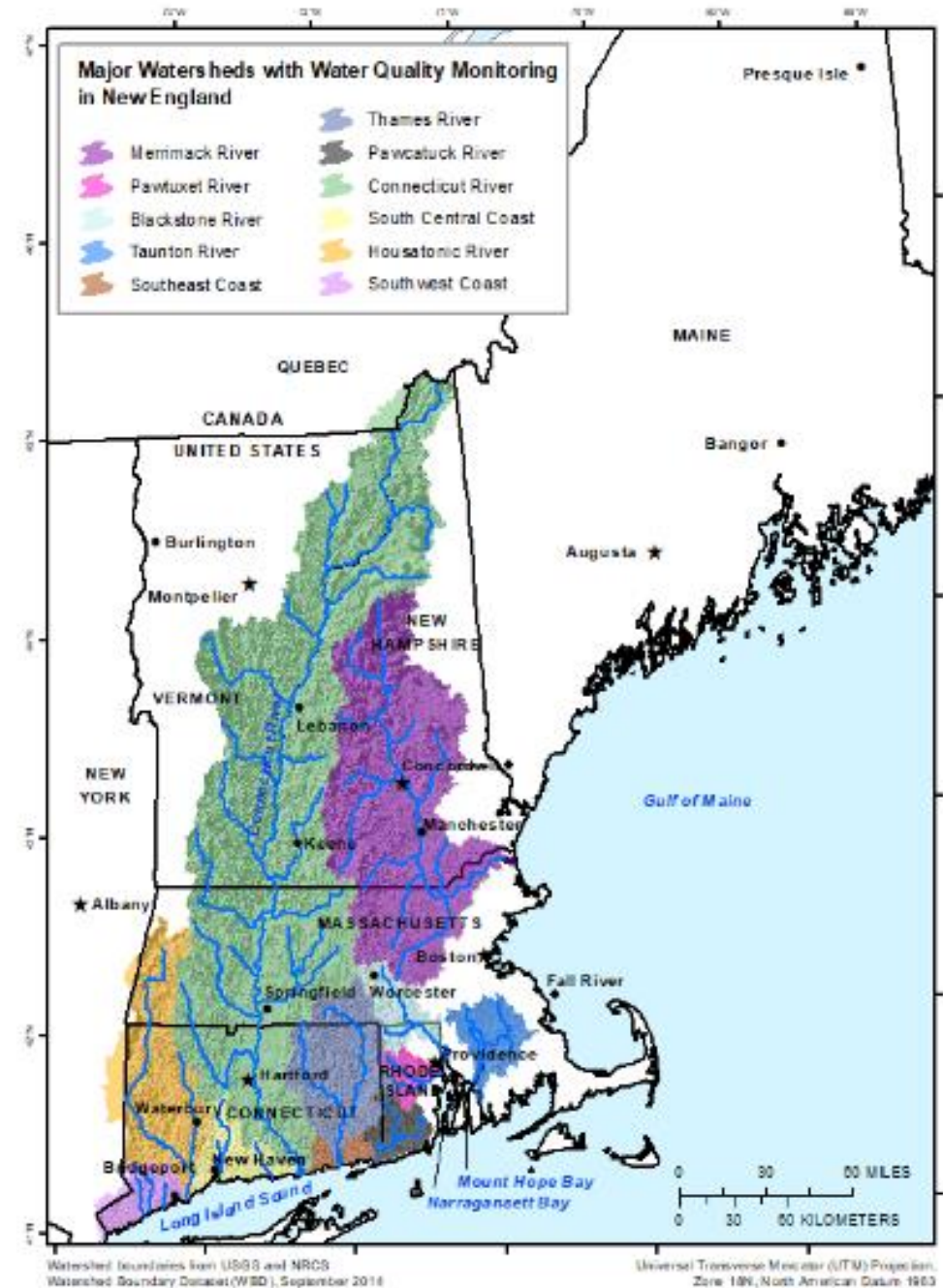
USGS Coastal Monitoring Overview

- Watershed scale nutrient monitoring and loading calculations
- Major tributary monitoring;
Connecting head of tide to estuary mouths
Thames River
Connecticut River
Housatonic River
- Linking coastal watersheds and embayment monitoring
Pawcatuck River
Mystic River
Norwalk River
Saugatuck River
Southport Harbor
Farm River

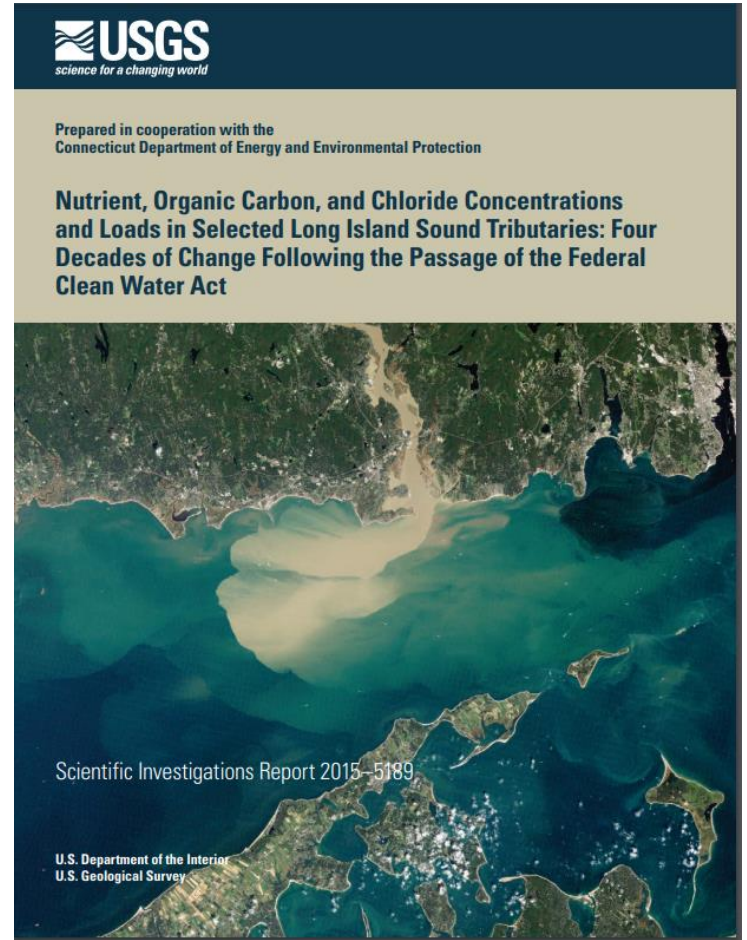
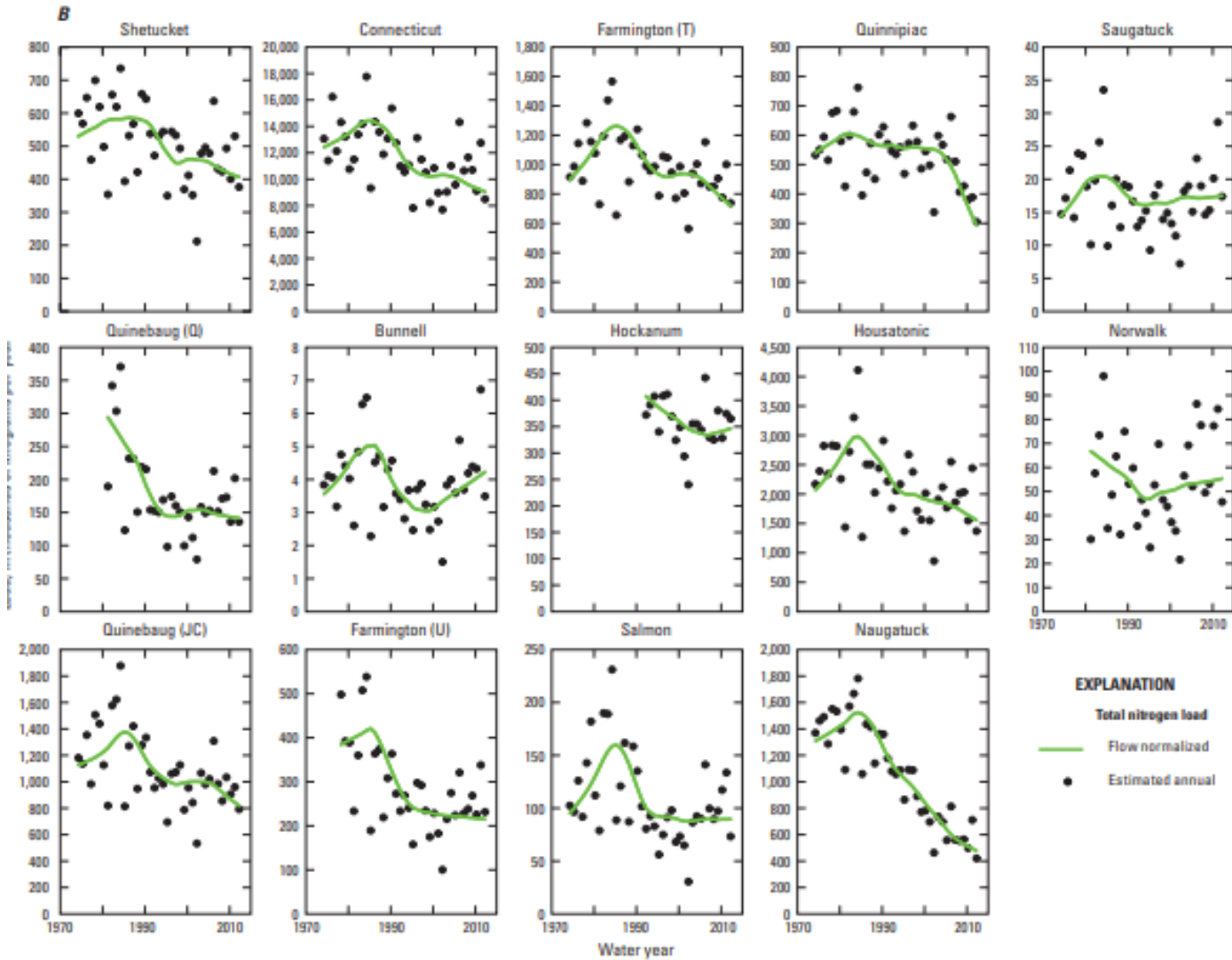


Development of a USGS Coastal Loading Network

- Major Watershed Nutrient Loads
- Point-Source Contributions
- Non-Point Source Contributions
- Groundwater Discharges
- Assessing Unmonitored Gaps



Long-Term Trends in Concentrations and Loads



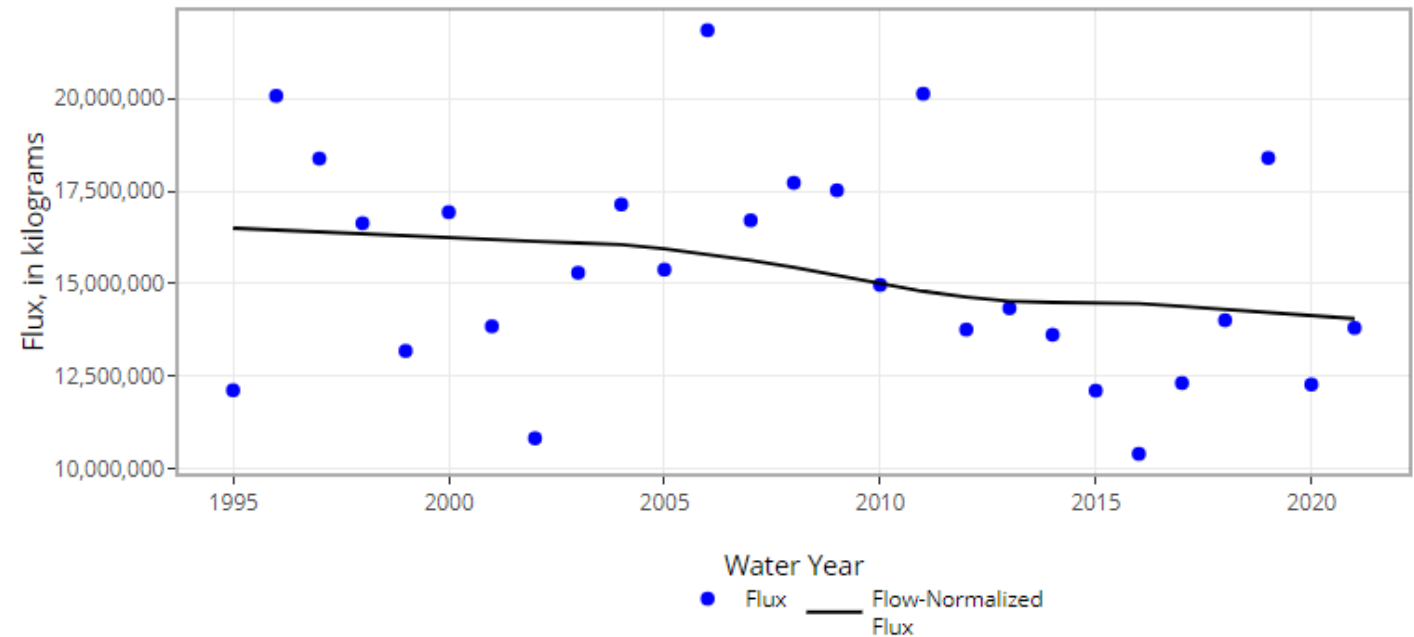
Mullaney, J.R., 2016, Nutrient, organic carbon, and chloride concentrations and loads in selected Long Island Sound tributaries—Four decades of change following the passage of the Federal Clean Water Act: U.S. Geological Survey Scientific Investigations Report 2015-5189, 47 p., <http://dx.doi.org/10.3133/sir20155189>.

USGS Long Island Sound Nitrogen Loading Dashboard

<https://rconnect.usgs.gov/LIS-dashboard/>

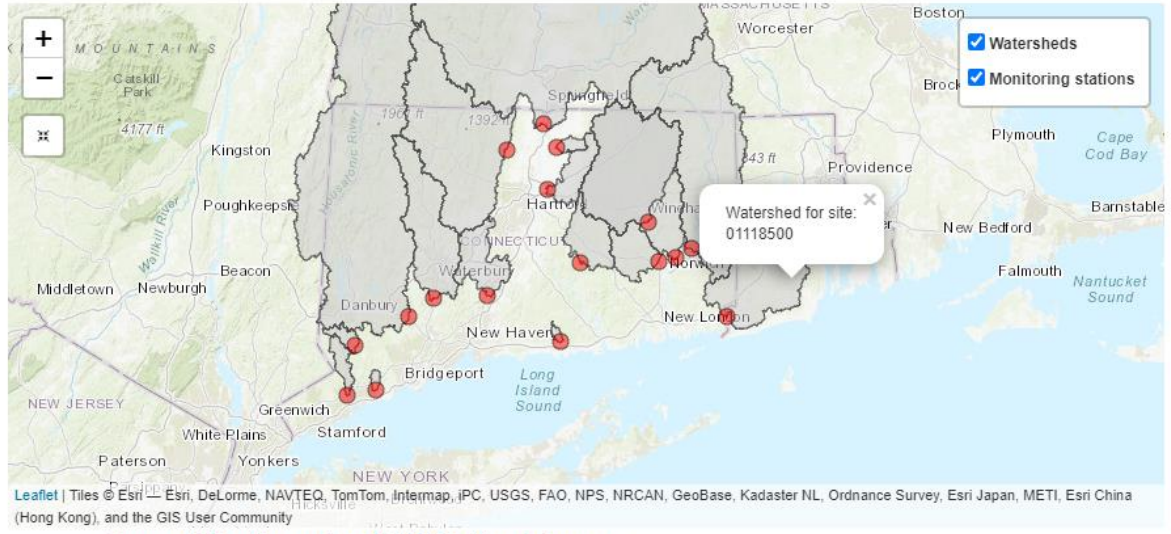
Nitrogen Loading from Selected Long Island Sound Tributaries from 1995 to 2021

Plot of combined flux for stations with data for water years 1995 - 2021



Select Monitoring Location

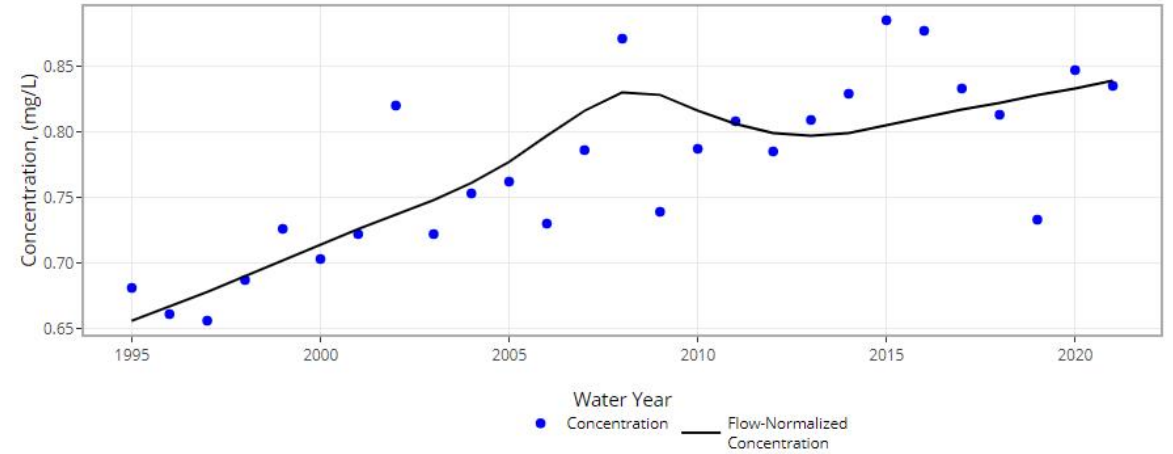
PAWCATUCK RIVER AT WESTERLY, RI



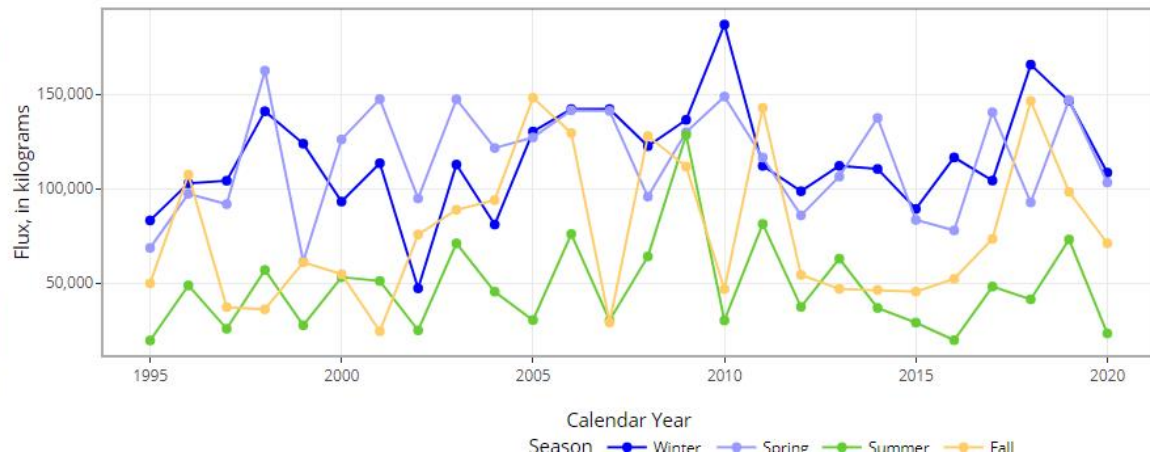
Select Water-Quality Constituent

Total nitrogen

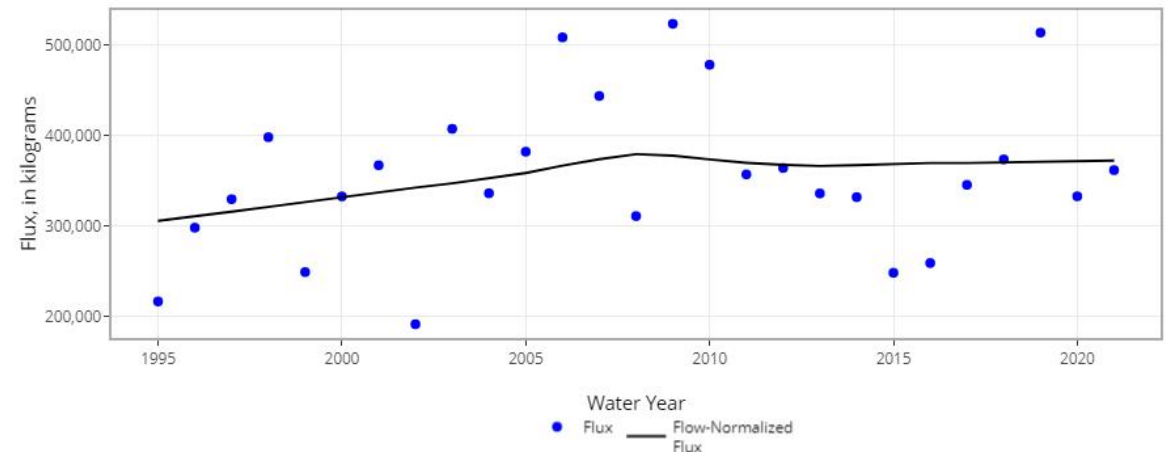
Concentration for station 01118500: Total nitrogen



Seasonal flux for station 01118500: Total nitrogen

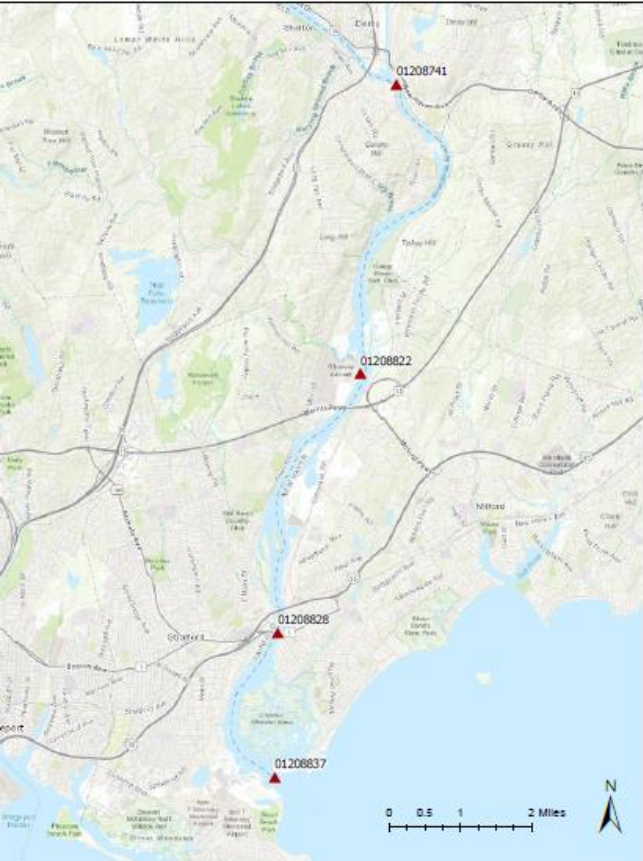


Flux for station 01118500: Total nitrogen



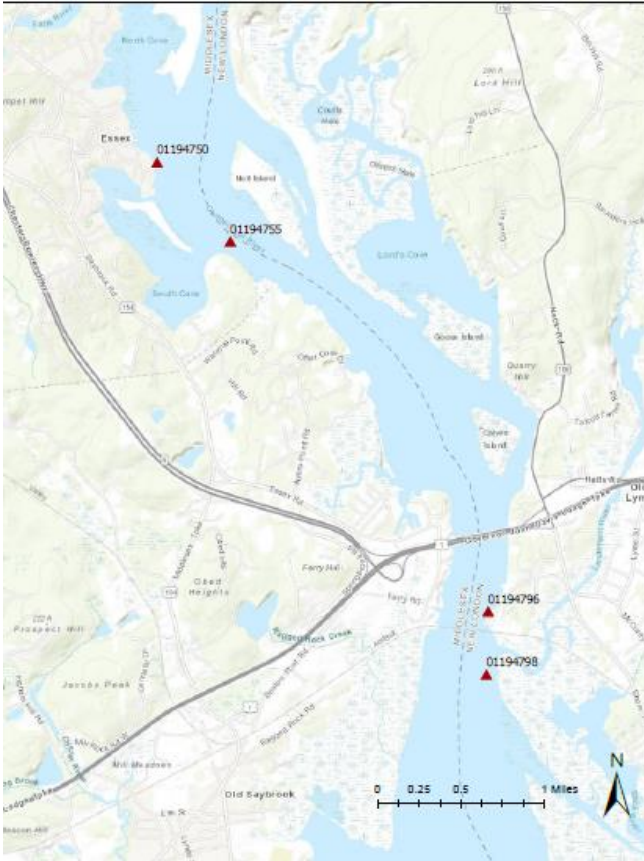
Major Tributaries to Long Island Sound 2020-2024

Lower Housatonic River



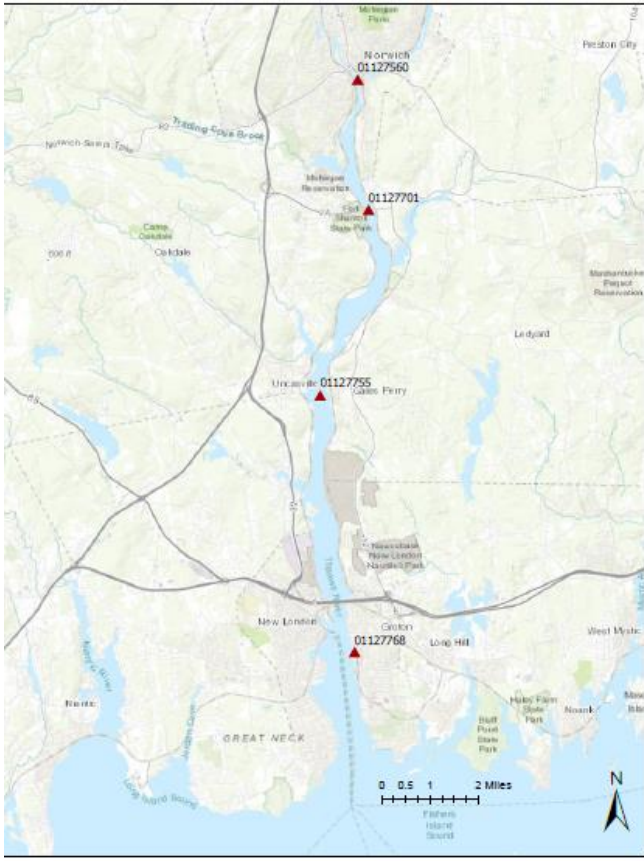
Drainage Area = 1,950 mi²

Lower Connecticut River



Drainage Area = 11,200 mi²

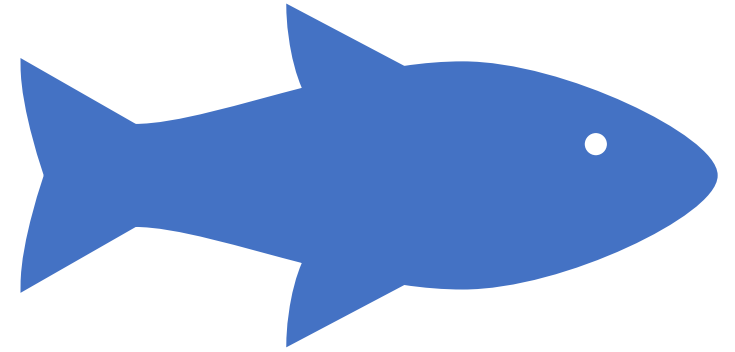
Thames River



Drainage Area = 1,470 mi²

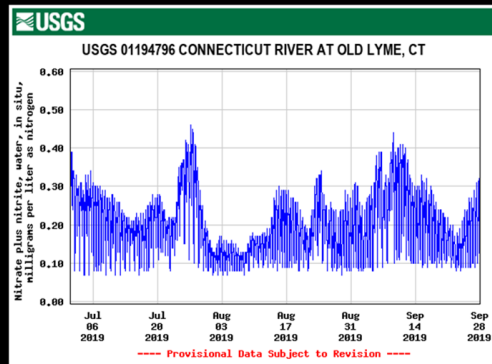
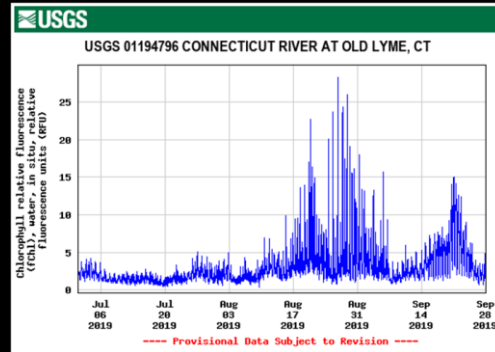
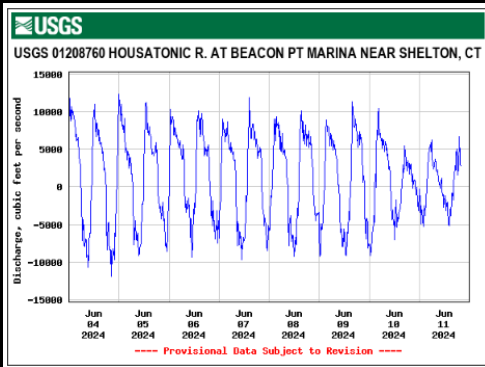
Major Tributary Estuaries

- Complex hydrology,
Large watersheds,
Hydropower regulation
- Complex salinity structure
stratified to well mixed
estuaries
- Complex nutrient loading
Numerous point sources and
large non-point source
contributions
- Variable residence times
with seasonal hypoxia

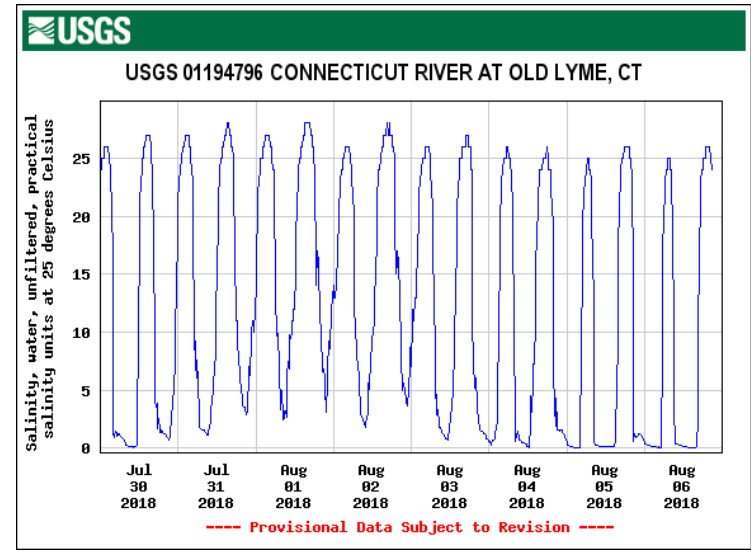
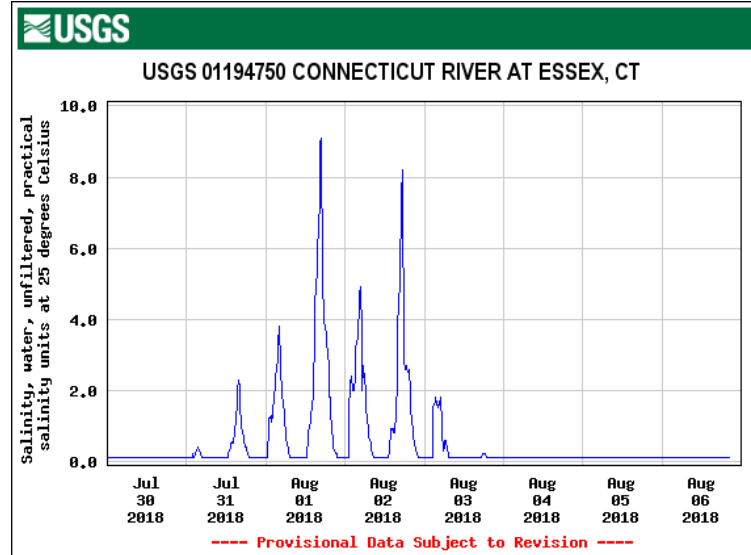
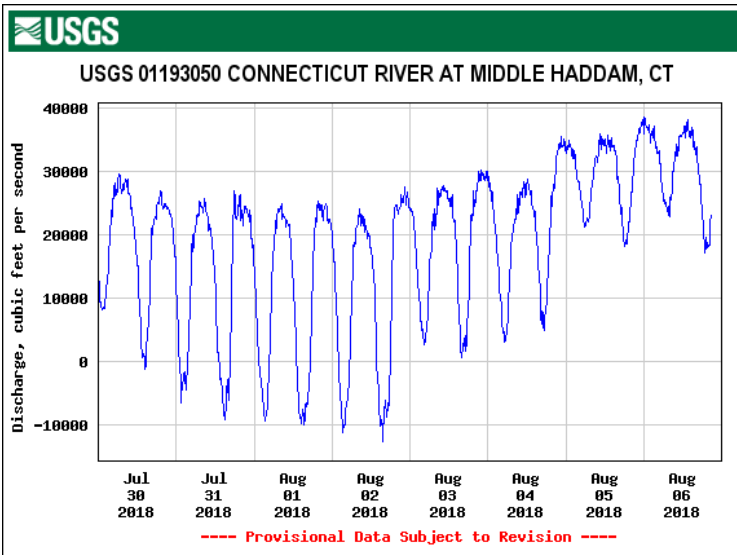
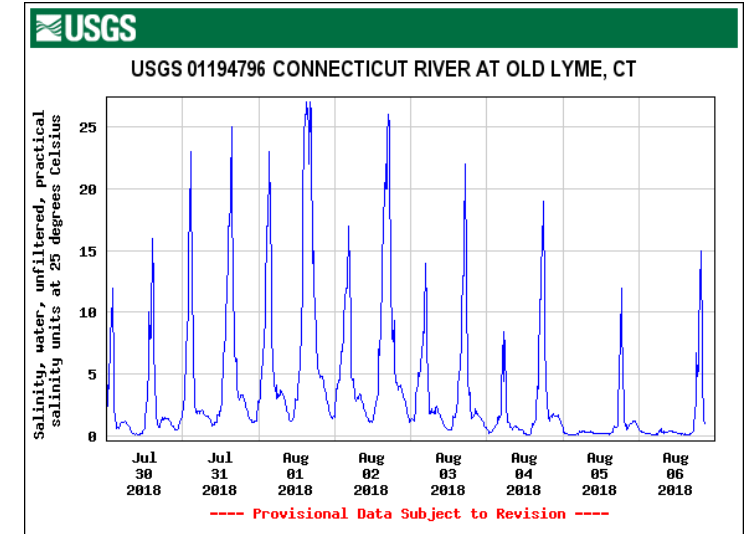
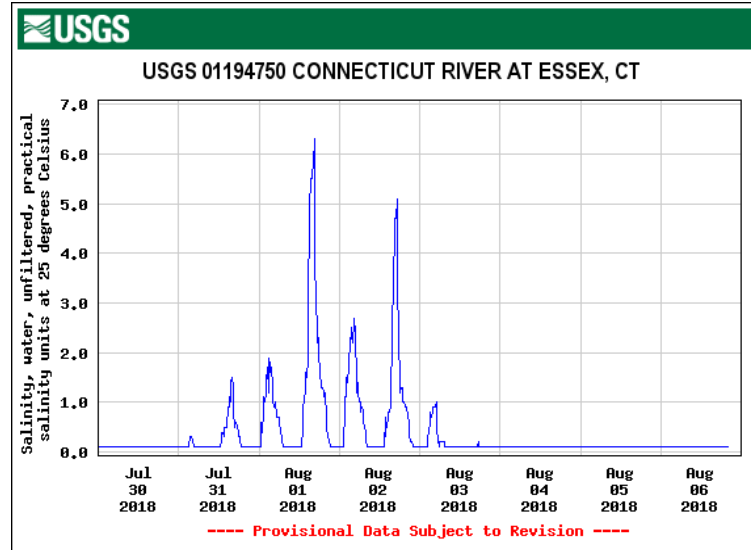
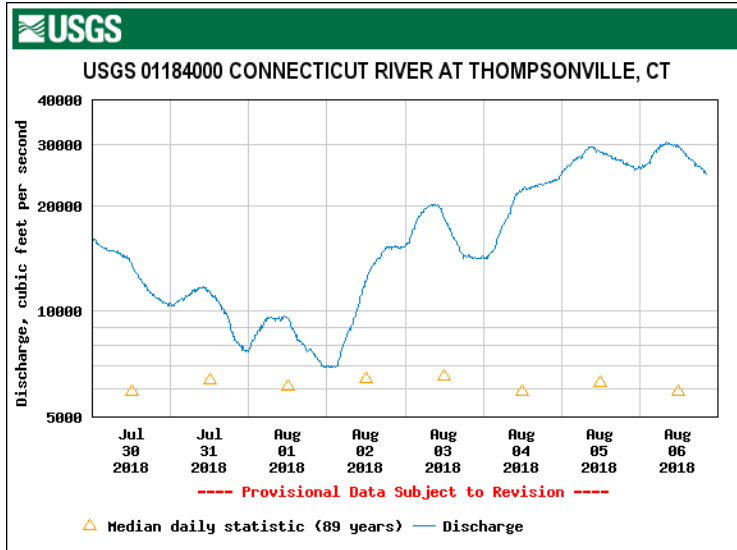


Major Tributary Monitoring Elements

- Tidal streamflow gages for calculating nutrient fluxes
- Continuous water quality sampling near top and bottom
- Discrete water quality sampling

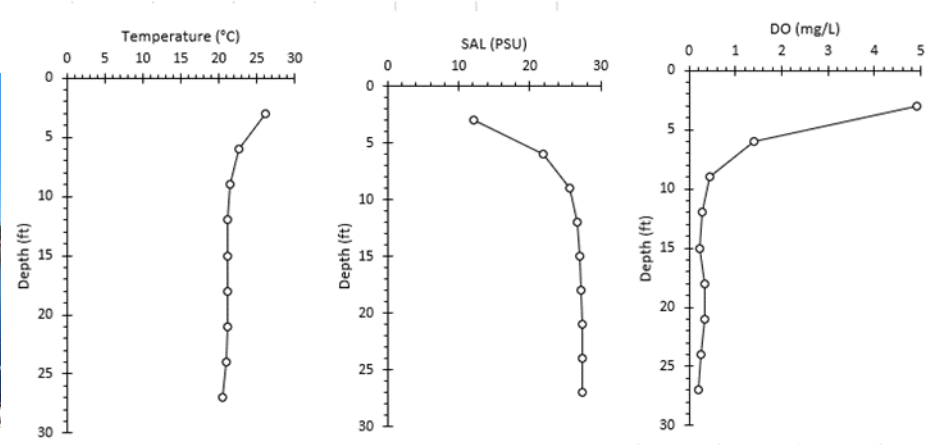


Connecticut River Streamflow and Salinity

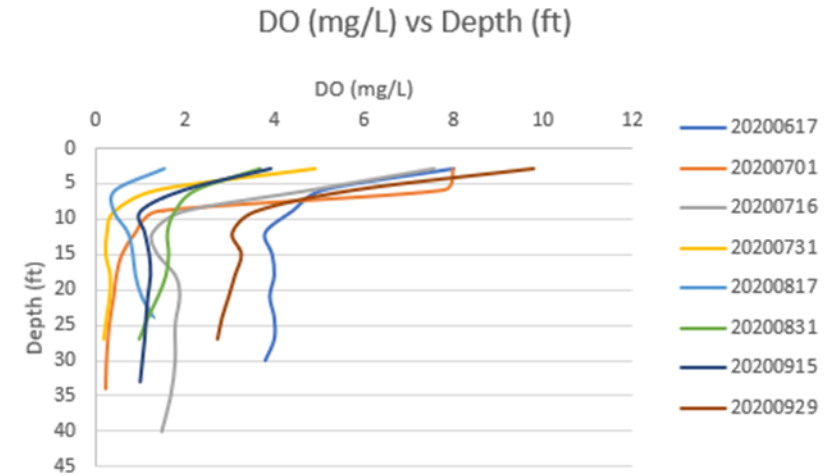


Hypoxia in Major Tributaries

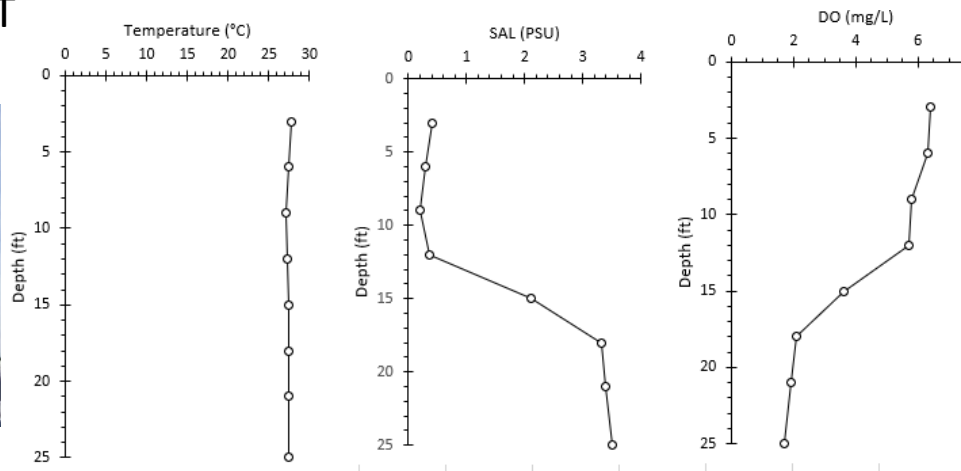
Thames River at Norwich, CT



7/31/2020



Housatonic River at East Derby, CT

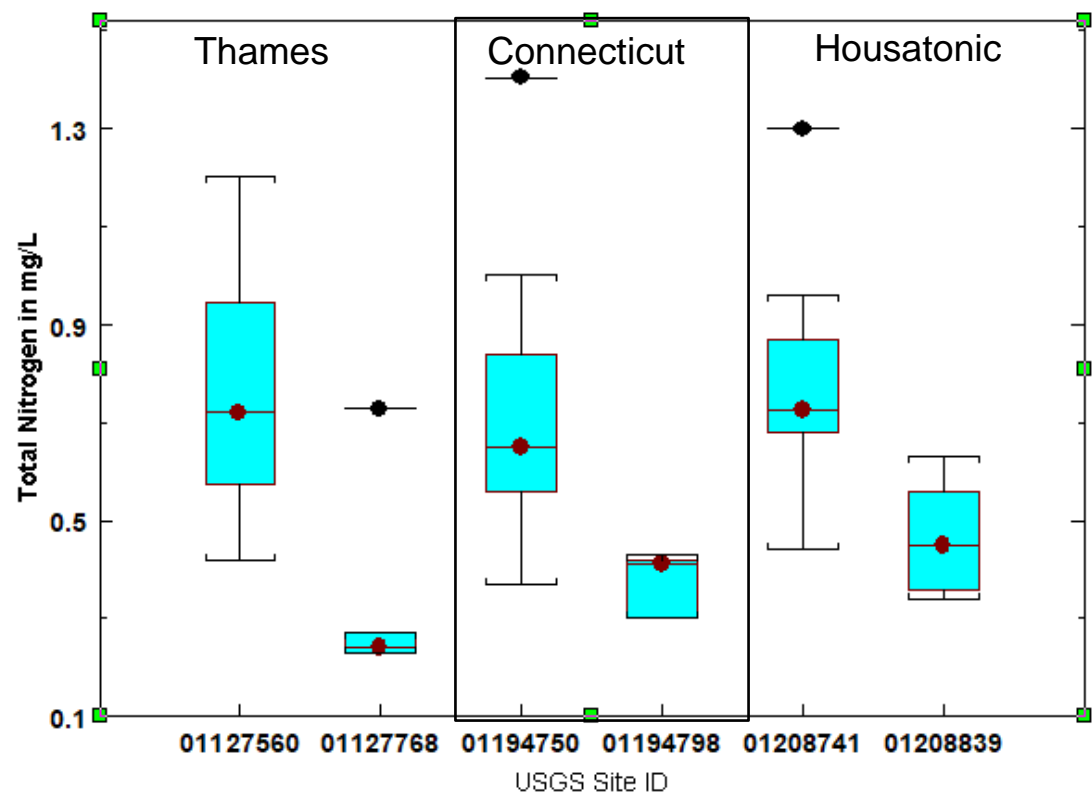


7/29/2020

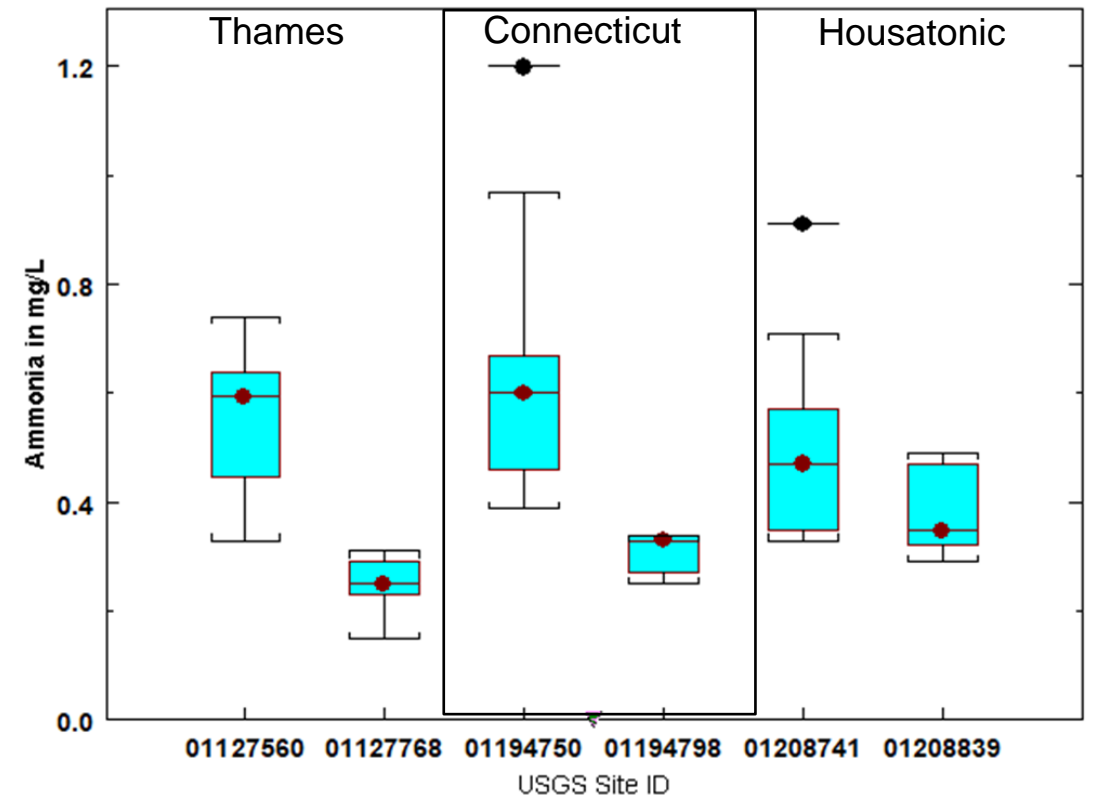


Concentrations of Total Nitrogen and Ammonia from Upstream to the Mouth

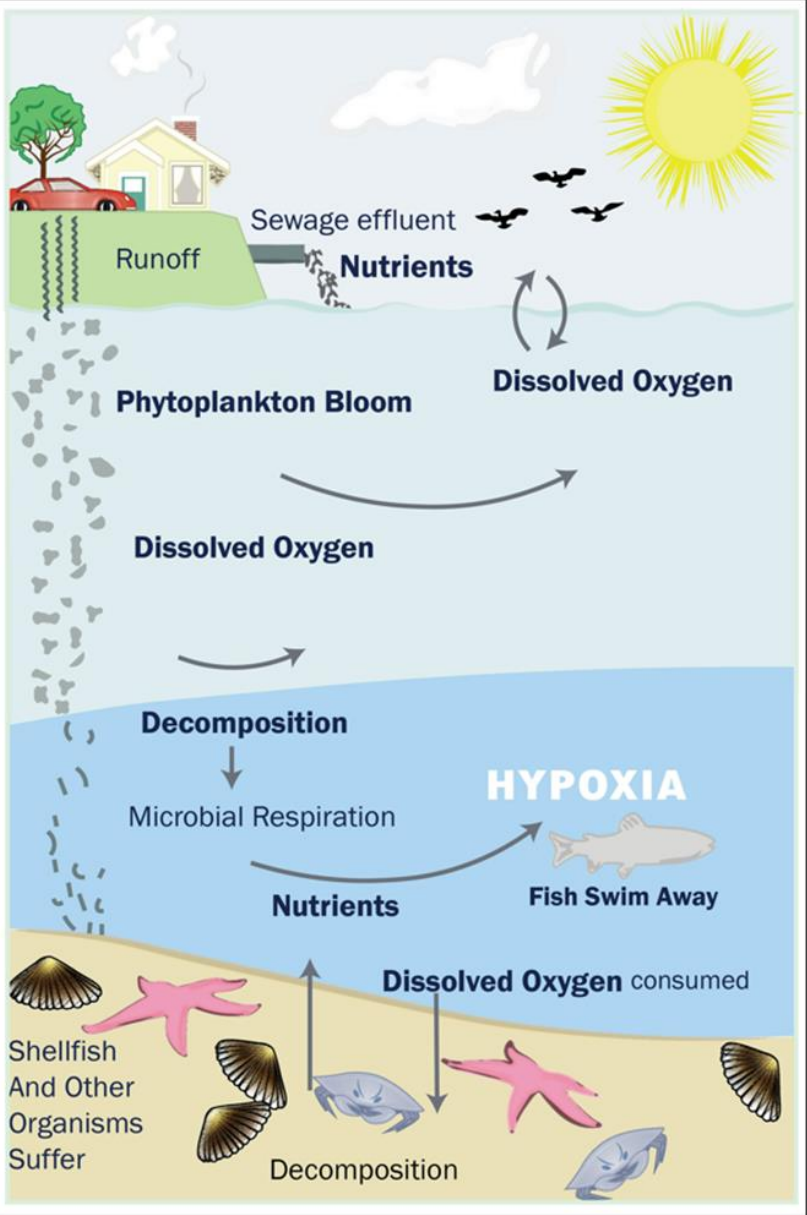
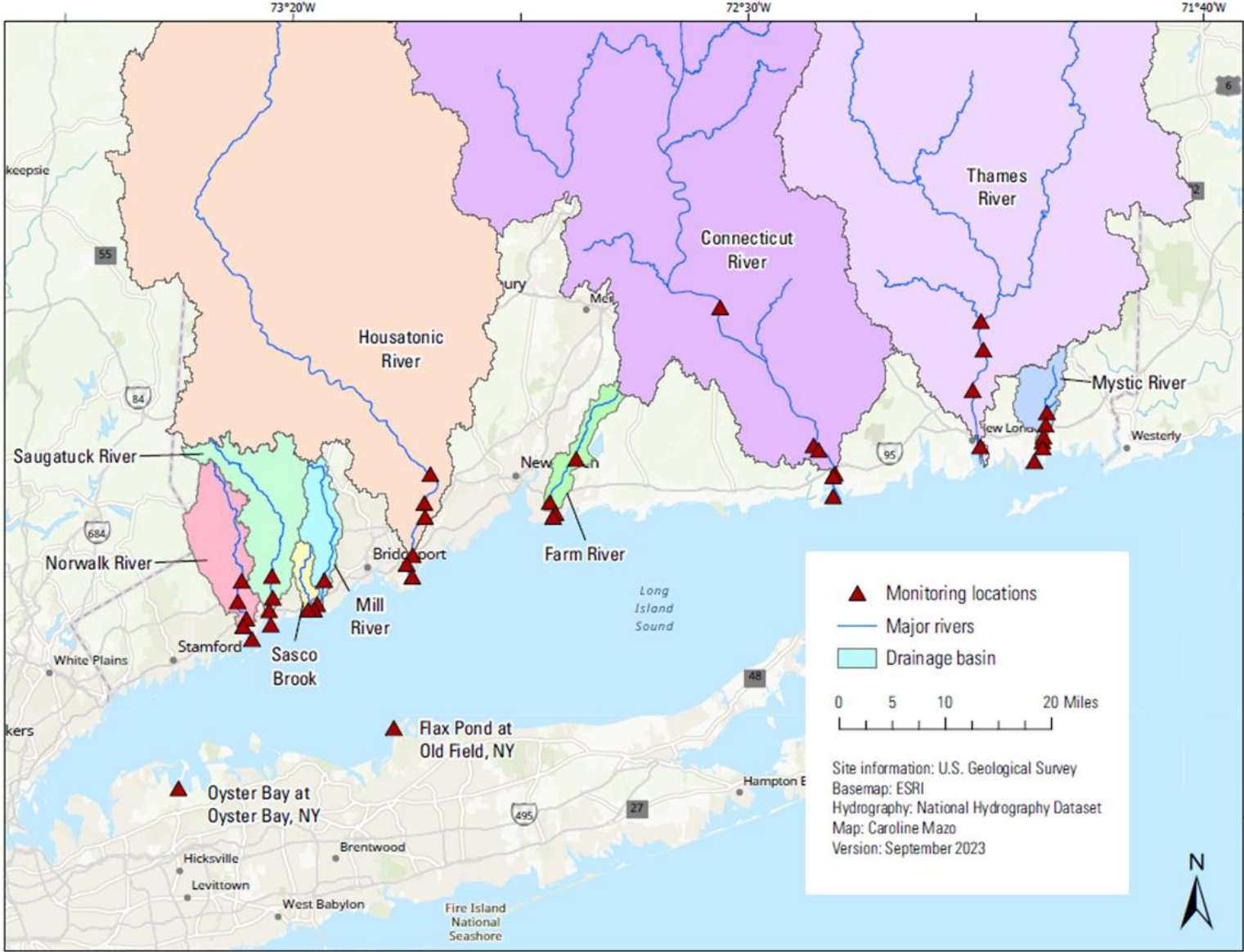
Total Nitrogen Summer 2020

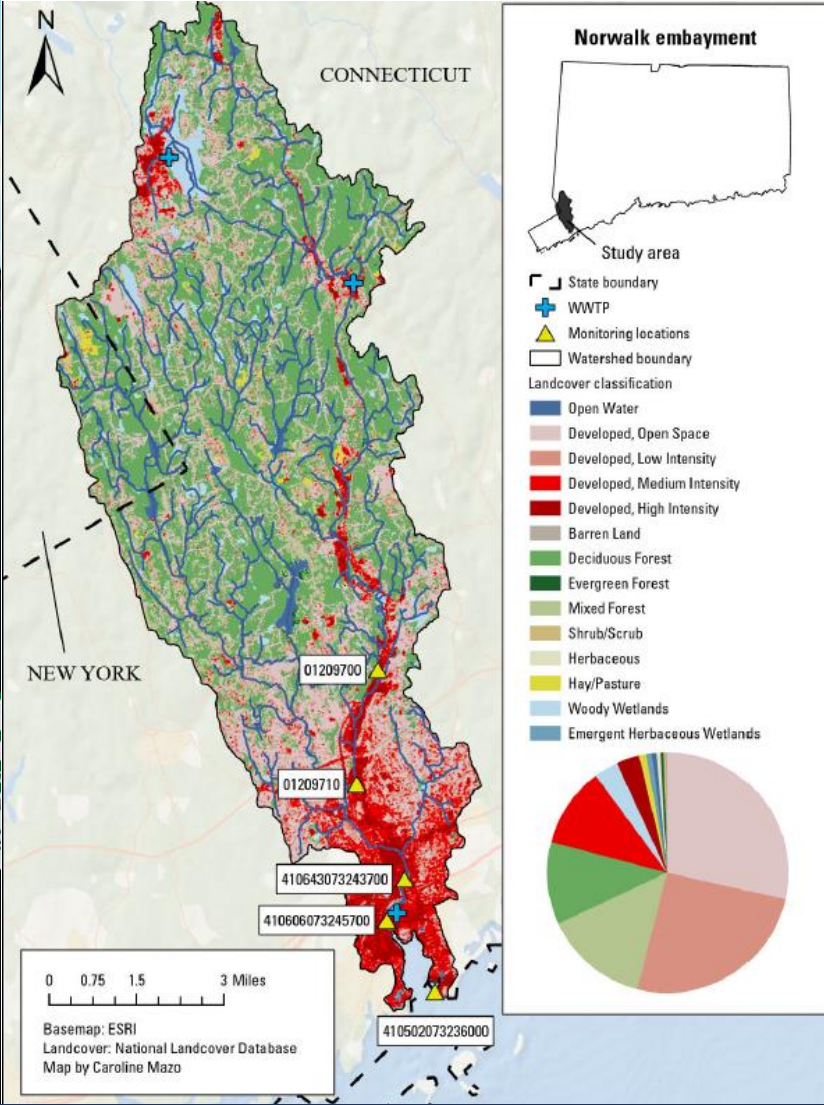


Ammonia Summer 2020

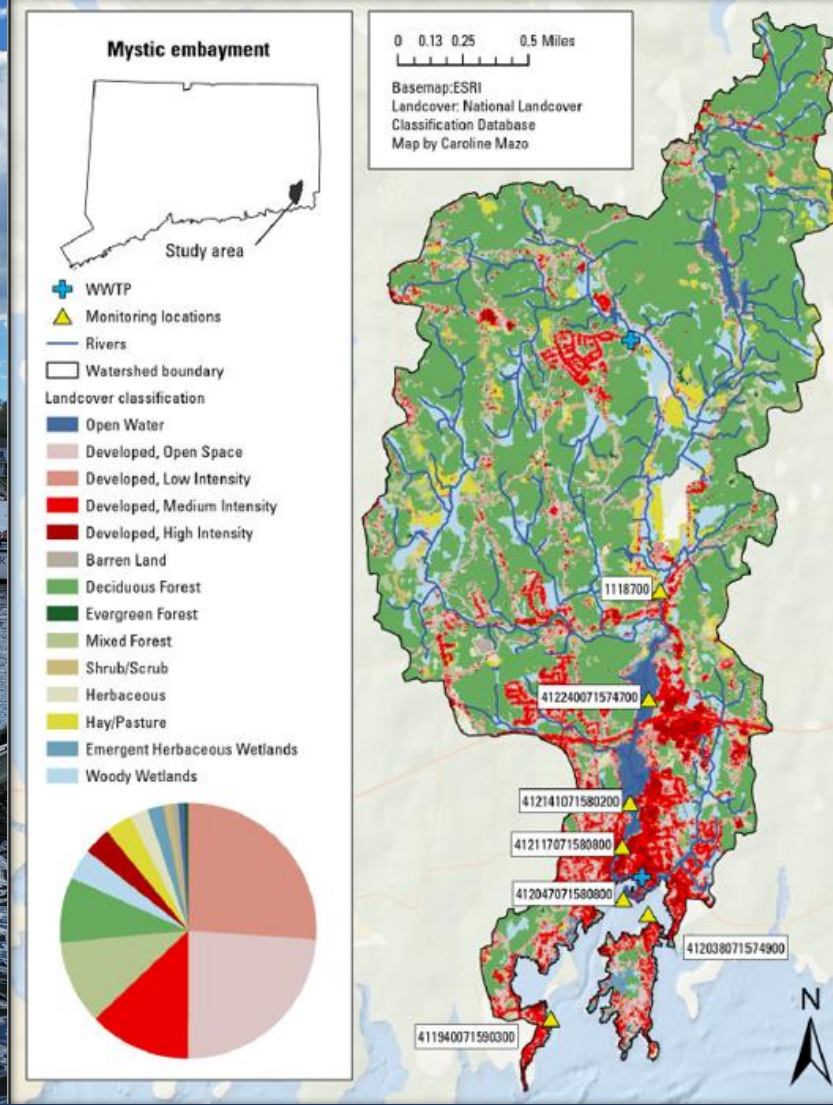


Long Island Sound Embayments and Estuaries





Norwalk Embayment
May 2021-April 2023



Mystic Embayment
May 2021 – April 2023

USGS Embayment Monitoring Objectives

1

Obtain representative water-quality data under a range of seasonal conditions to characterize the water quality spatially and vertically in each embayment.

2

Monitor selected water-quality parameters with high temporal resolution to provide time-series data needed for water quality model calibration and evaluation.

3

Monitor selected physical water-quality parameters at multiple locations in each embayment that will provide understanding of variability at spatial scales.





Discrete Water-Quality Data Collection

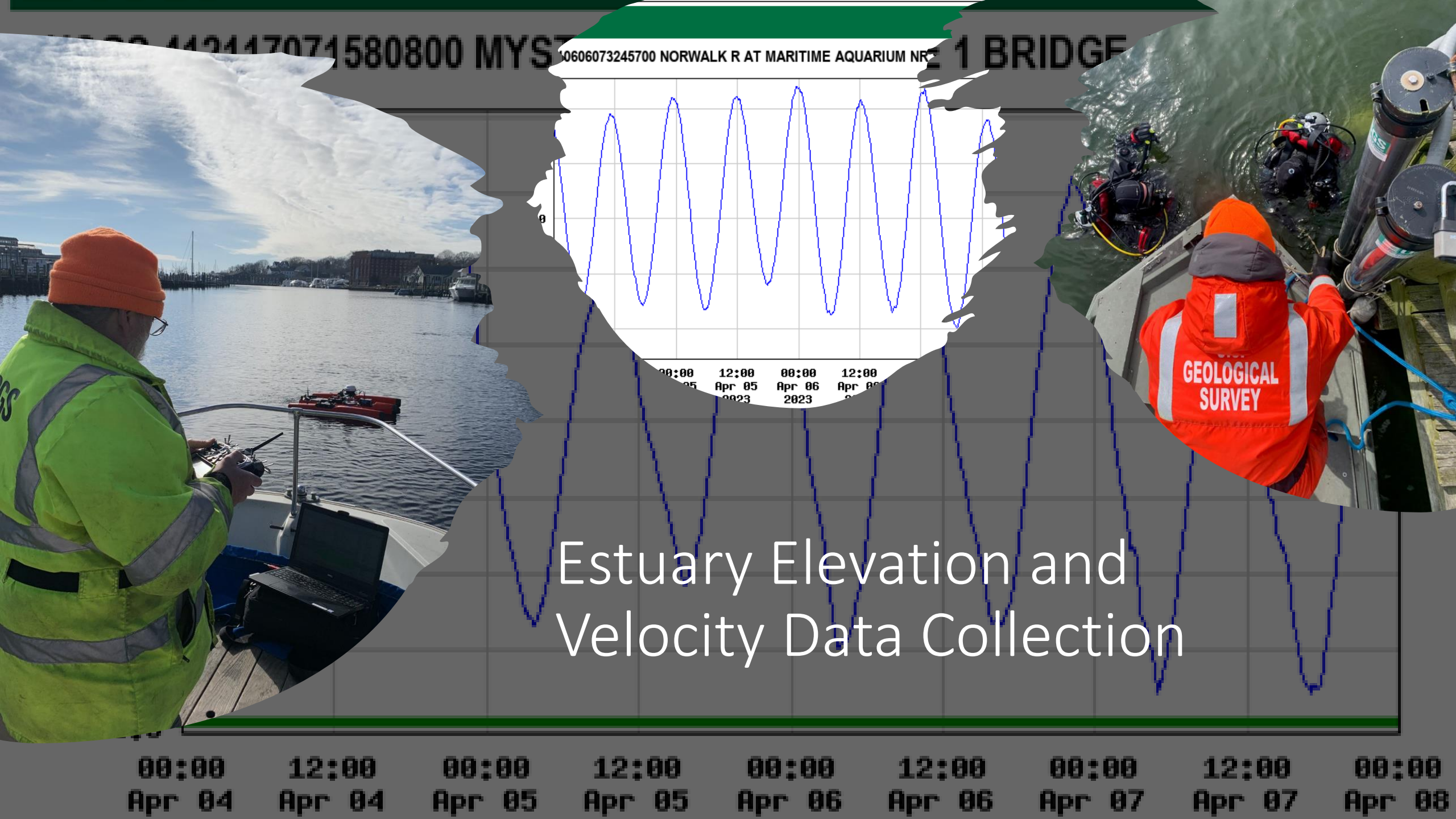
Measurement	Parameter	USGS Parameter	Units
Analytical Data from Discrete Data	Ammonia in seawater (dissolved)	00608	mg/L
	Ammonia + Organic N (TKN)	00625	mg/L
	Nitrate + Nitrite as N (dissolved)	00631	mg/L
	Orthophosphate	00671	mg/L
	Total Phosphorus in brines (Whole)	00665	mg/L
	Orthophosphate	00671	mg/L
	Alkalinity	39086	mg/L
	Silica in seawater (Dissolved)	00955	mg/L
	Dissolved Organic Carbon (DOC)	00681	mg/L
	Total Suspended Solids (TSS)	00530	mg/L
	Carbonaceous Biological Oxygen Demand (CBOD)	80082	mg/L
	Chlorophyll a phytoplankton	70953	µg/L
	Pheophytin A, Phytoplankton	62360	µg/L
	Calculated Values	Total Nitrogen as N (TKN + (Nitrite + Nitrate))	00600
Organic Nitrogen		00605	mg/L



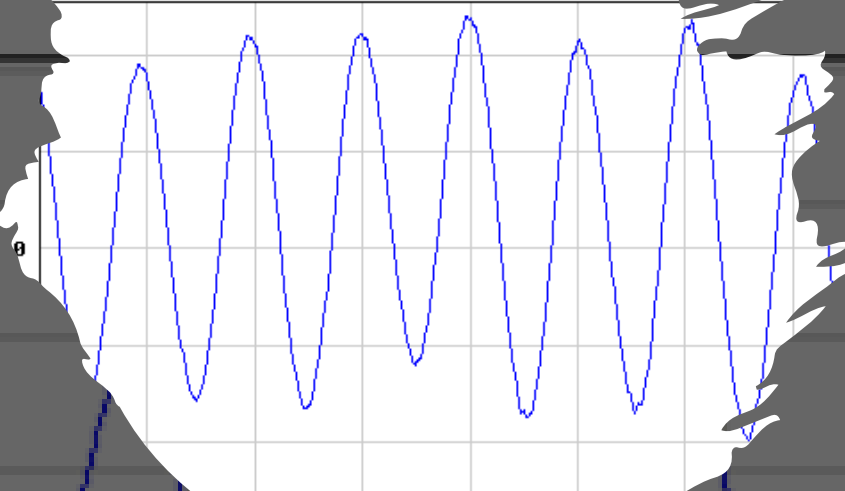
Continuous Water-Quality Data Collection



Measurement	Parameter	USGS Parameter	Units
Continuous QW measurements	Water Temperature	00100	Deg C
	Specific Conductance	00095	μS/cm
	Salinity (Computed)	90860	psu
	Dissolved Oxygen	00300	mg/L
	Dissolved Oxygen (Computed)	00301	% saturation
	Turbidity	63680	FNU
	Chlorophyll	00925	RFU
	Photosynthetic Active Radiation (PAR)	99997	μmoles/m ² /s
	Barometric Pressure	00025	mmHg



0606073245700 NORWALK R AT MARITIME AQUARIUM NR 1 BRIDGE

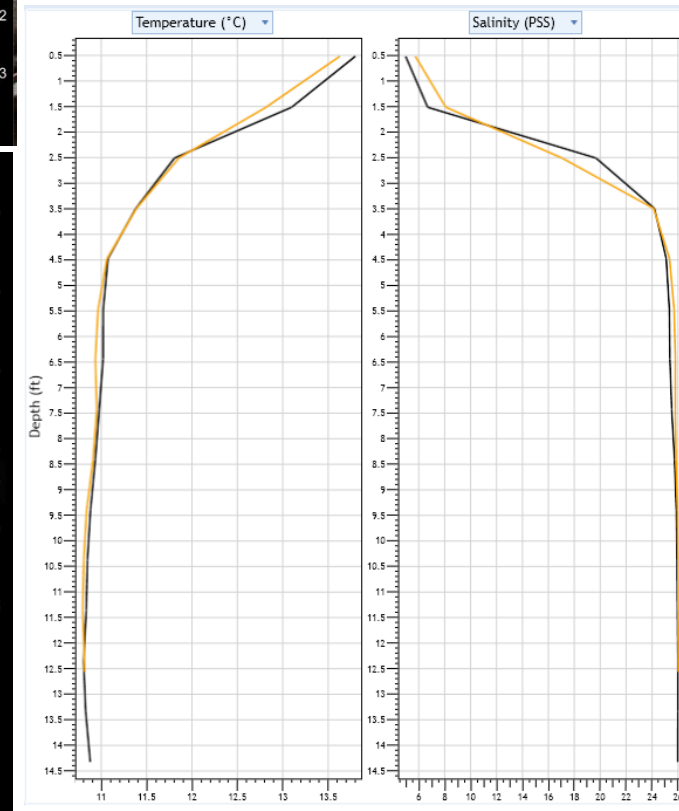
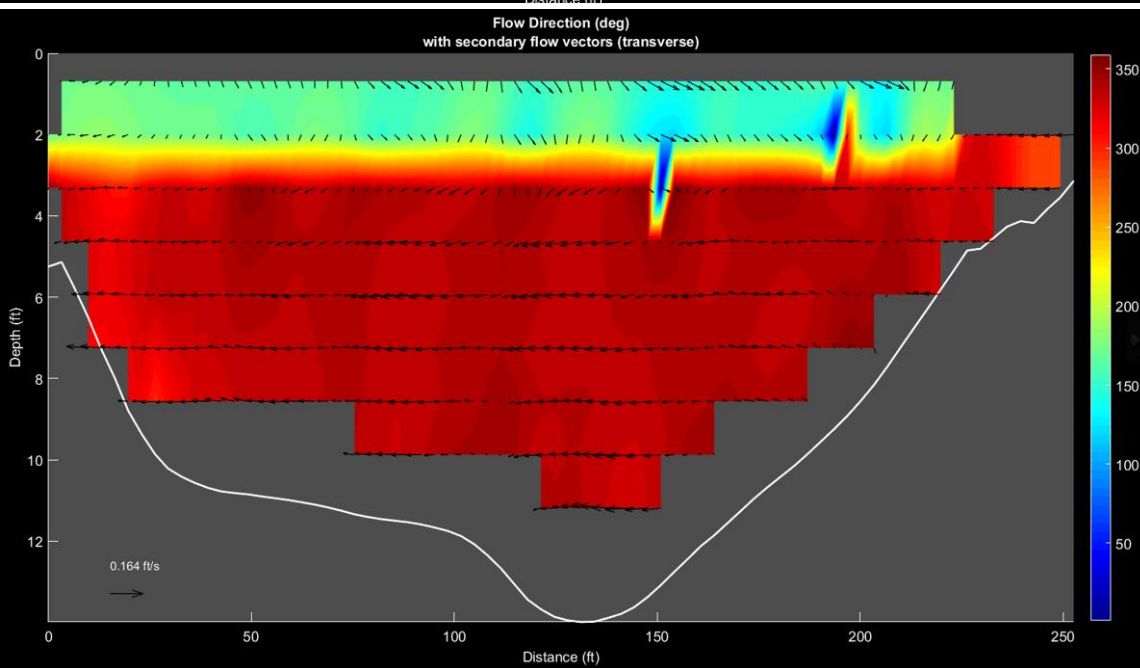
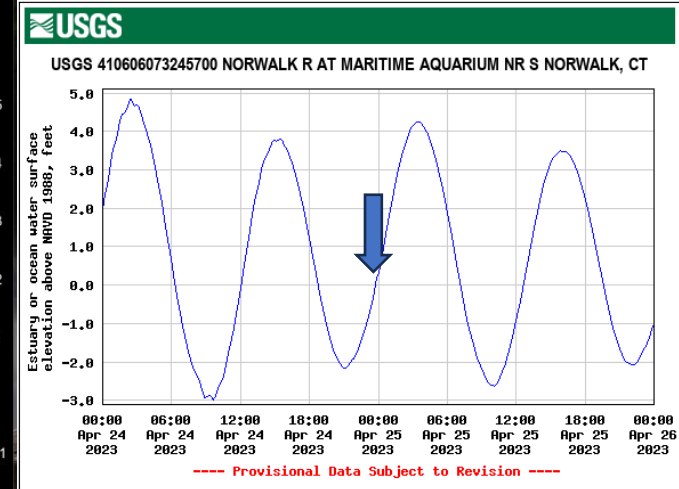
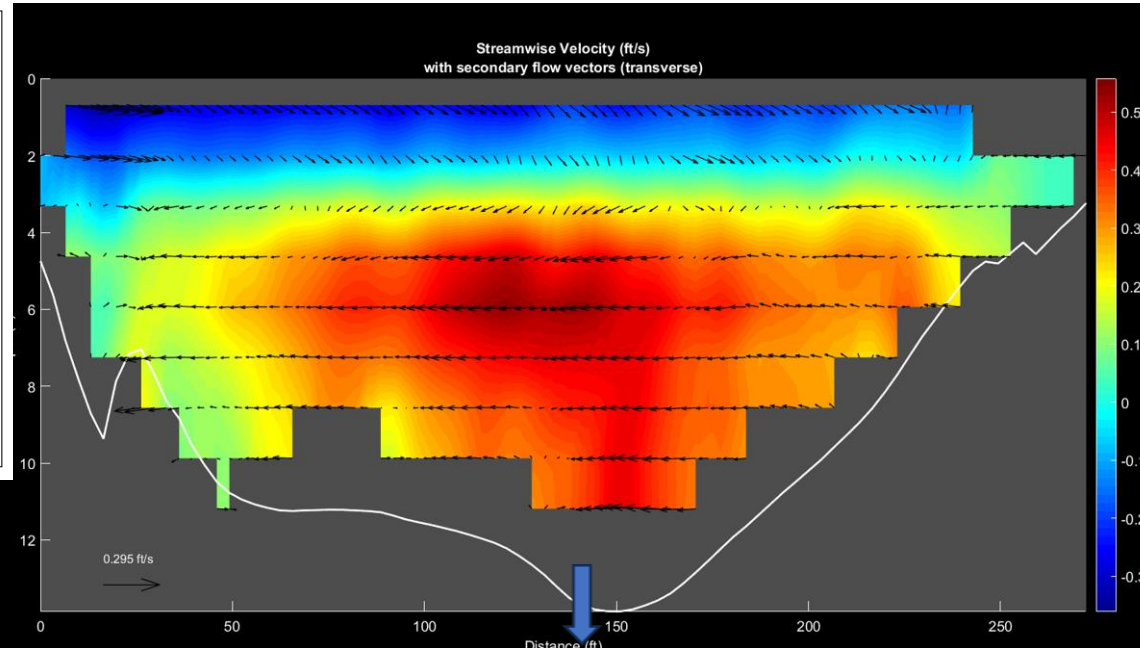
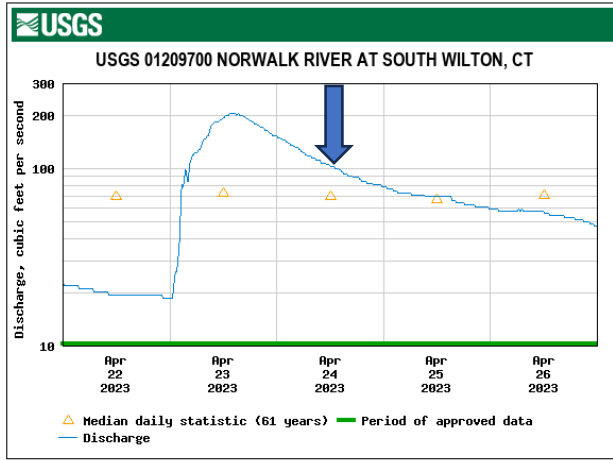


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05 Apr 05 06 Apr 06 08 Apr 08
2023 2023

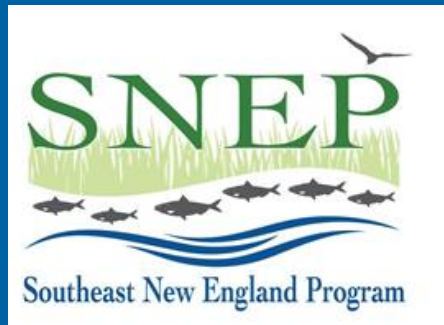
Estuary Elevation and Velocity Data Collection

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Apr 04 Apr 04 Apr 05 Apr 05 Apr 06 Apr 06 Apr 07 Apr 07 Apr 08

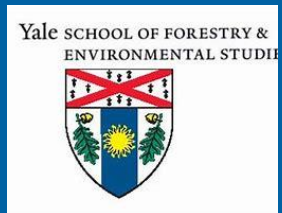
Norwalk River Estuary Velocity Mapping 4/24/23



Select Cooperating Agency Partners



- Connecticut Department of Energy and Environmental Protection
- Massachusetts Department of Environmental Protection
- Rhode Island Department of Environmental Management
- Environmental Protection Agency Region 1
- EPA Long Island Sound Study
- EPA Southeast New England Coastal Watershed Restoration Program.
- Springfield Water and Sewer Commission
- University of Connecticut
- Yale School of Forestry



Questions?

