TMDL Information Session

November 28, 2023

Massachusetts Department of Environmental Protection

Wareham River Estuary System Total Maximum Daily Load for Total Nitrogen

Note this TMDL was approved by the United States Environmental Protection Agency on June 4, 2024. The TMDL Information Session powerpoint is for informational purposes. See Final TMDL for details.

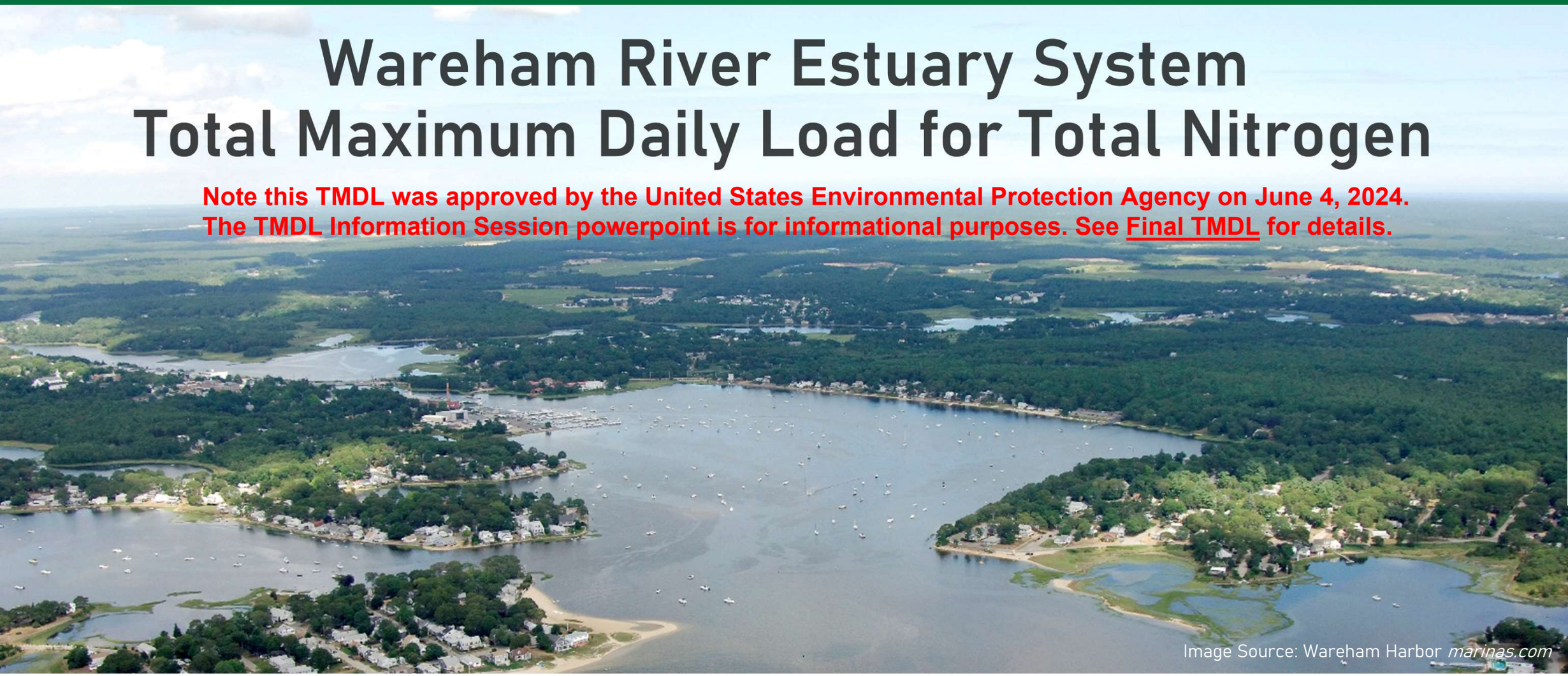


Image Source: Wareham Harbor *marinas.com*

Zoom meeting recording disclaimer

Please note that we will be recording this meeting and will retain the recording in accordance with the Commonwealth's records retention rules. The recording will be used internally to review the comments and suggestions provided during the meeting. We will not post the recording online.

TMDL Information Session

November 28, 2023

Massachusetts Department of Environmental Protection

Wareham River Estuary System
Total Maximum Daily Load for Total Nitrogen

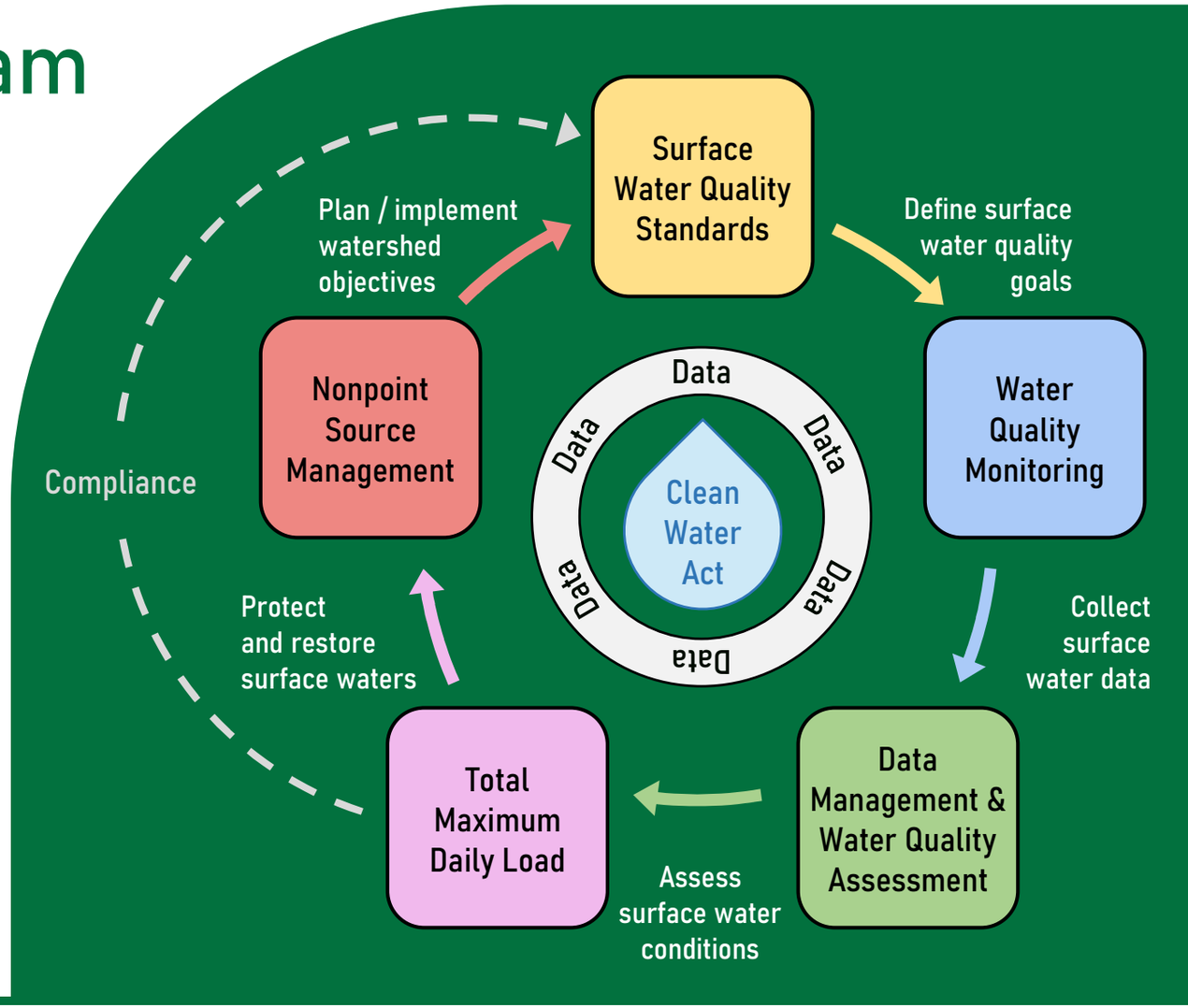
Agenda:

- Overview of the Clean Water Act & TMDLs
- Massachusetts Estuary Project (MEP)
- Total Nitrogen TMDL for the Wareham River Estuary System
- Nitrogen Management & Implementation
- Public Comments

Image Source: Wareham Harbor *marinas.com*

MassDEP Watershed Planning Program

- Develop and implement the Massachusetts Surface Water Quality Standards (314 CMR 4.00)
- Monitor the physical, chemical, and biological characteristics of surface waters in the Commonwealth of Massachusetts
- Manage data and report the results of monitoring. Assess surface water quality conditions and attainment of existing and designated uses as defined in the Surface Water Quality Standards
- Develop TMDLs and other plans to restore impaired surface waters and to protect high quality waters
- Watershed planning through implementation of the Nonpoint Source (319) and Water Quality Management Planning (604b) programs



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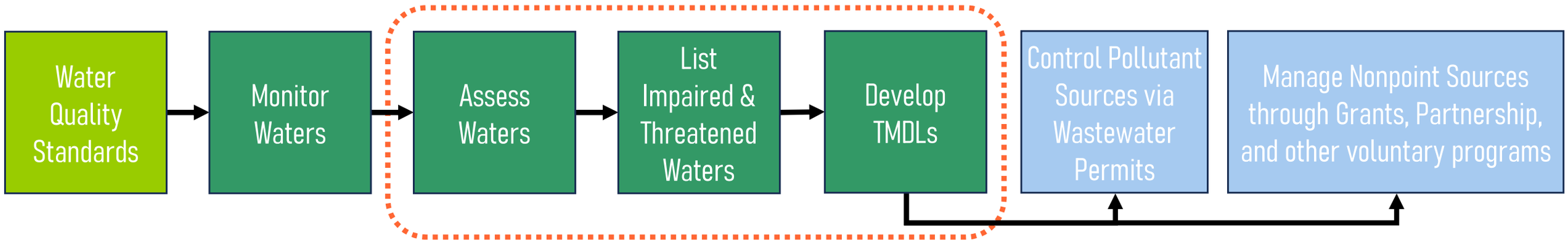
Clean Water Act (CWA)

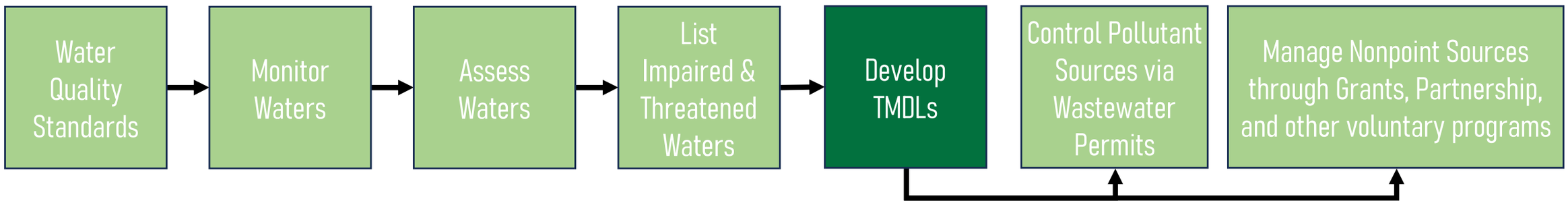
The federal Clean Water Act requires states to monitor and report on the condition of their water resources and whether they are healthy or impaired relative to their designated uses.



Section 303(d) of the federal Clean Water Act requires states to identify those waterbodies that do not meet surface water quality standards and to prioritize them for the development of a **total maximum daily load (TMDL).**

Total Maximum Daily Load (TMDL)

A TMDL establishes the maximum amount of a pollutant that a waterbody can receive and still attain water quality standards.



- "Pollutant Budget" designed to restore the health of a waterbody
- Useful, long-range planning tool for managing water quality

Total Maximum Daily Load (TMDL)

The TMDL is **not** a permitting document.

The TMDL does **not** require owners of septic systems to upgrade their systems within a certain number of years.

The TMDL is **separate** from a Title 5 Natural Resource Area Nitrogen Sensitive Area Designation

Title 5 – Nitrogen Sensitive Areas (NSA)

The current Title 5 regulations only designate Natural Resource Nitrogen Sensitive Areas to watersheds on Cape Cod with final Total Nitrogen TMDLs or a Scientific Evaluation and a public process.

Designation of the Wareham River Estuary as a Natural Resource Nitrogen Sensitive Area would require a public process and regulatory revisions.

There is currently no timeline for expanding the Title 5 NSA designations or requirements outside of Cape Cod.

Total Maximum Daily Load (TMDL)

The TMDL is a **planning** document that provides a framework for water quality restoration and nutrient management.

Municipalities work with MassDEP to implement the TMDL with Comprehensive Wastewater Management Planning (CWMP) or Targeted Watershed Management Planning (TWMP).

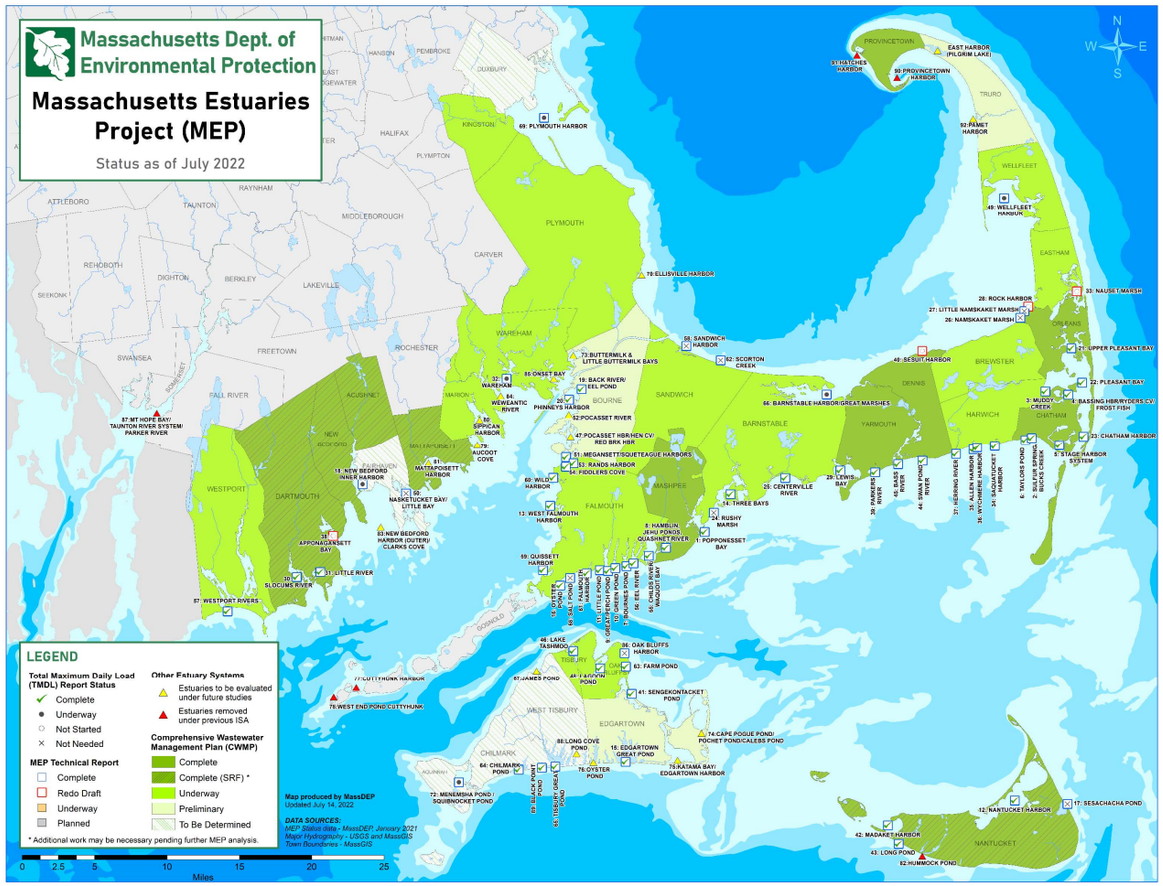
Why do we need TMDLs for estuaries?

Nitrogen is the critical nutrient in controlling excessive nuisance plant growth in coastal waterbodies.

Coastal habitat quality has declined due to **increased nitrogen loading**.

Increased loading is the result of **changes in watershed land use.**

The Massachusetts Estuaries Project (MEP)



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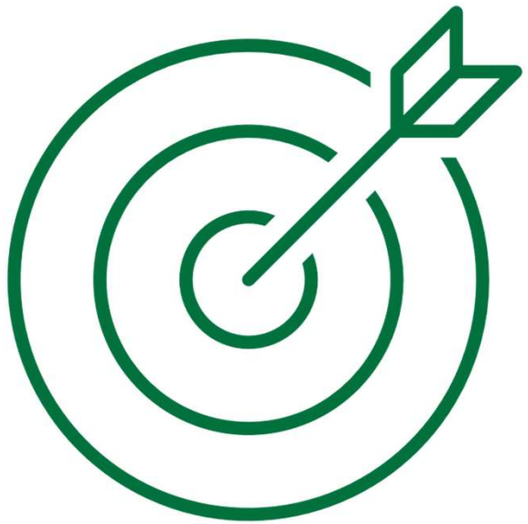
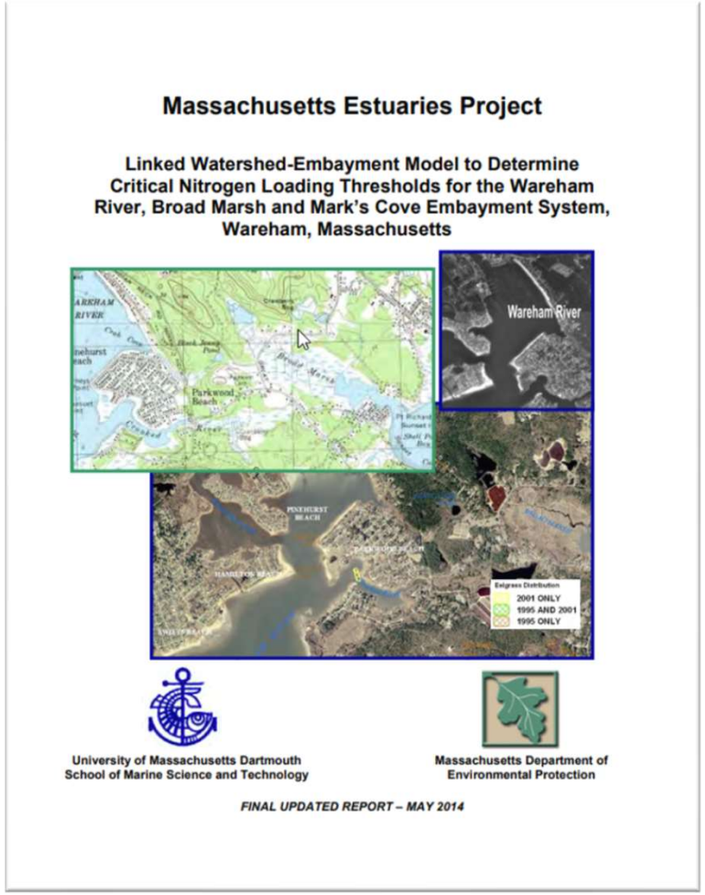
MEP Goals

- Evaluate the **water quality status** of each embayment system
- Develop protective **nitrogen thresholds** and **loading limits** for each embayment
- Provide a consistent methodology and tools to investigate and define acceptable **nitrogen management strategies**.



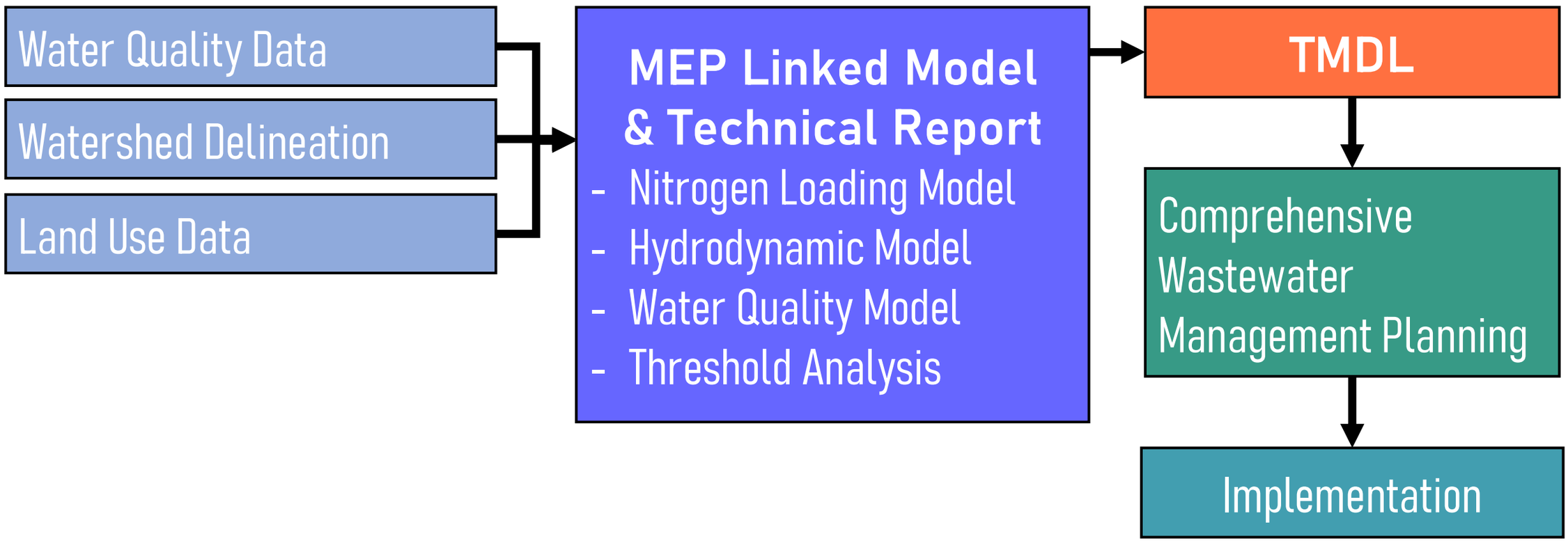
Wareham River MEP Technical Report

- SMAST completed Technical Report for Wareham River (2014)
- Technical Report includes the **Critical Nutrient Threshold Analysis**
- Technical Report serves as basis for the **TMDL**



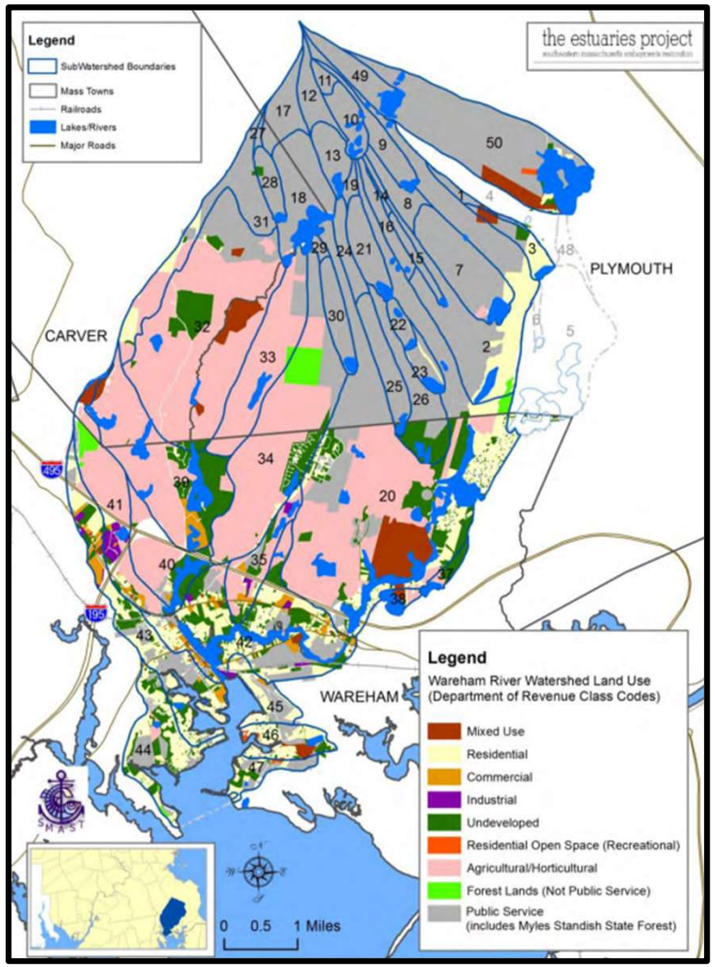
- Estuary Habitat Health
- Nitrogen Loading to Groundwater
- Groundwater Flow to Estuaries
- Estuary Circulation, Tides & Currents
- Nitrogen Concentrations in Estuaries

MEP Linked Watershed Embayment Approach

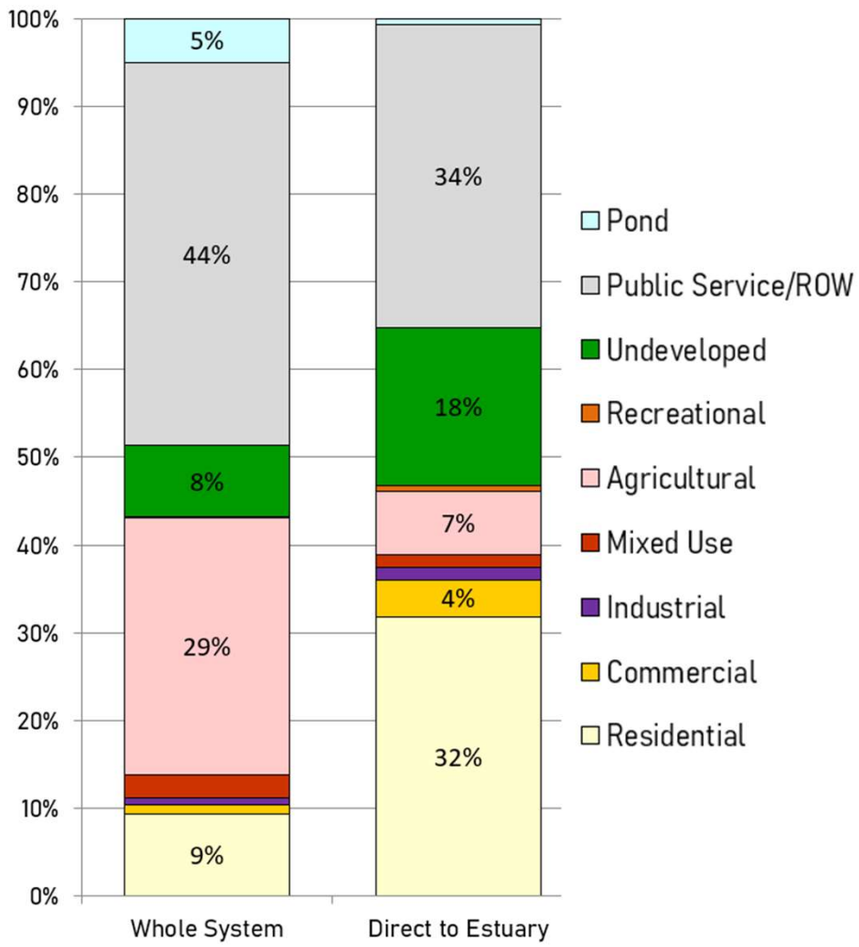


MEP Nutrient Loading Model

- Watershed delineation
- Land cover & use
- Property parcels
- Water usage
- Municipal WWTF



Watershed Delineation



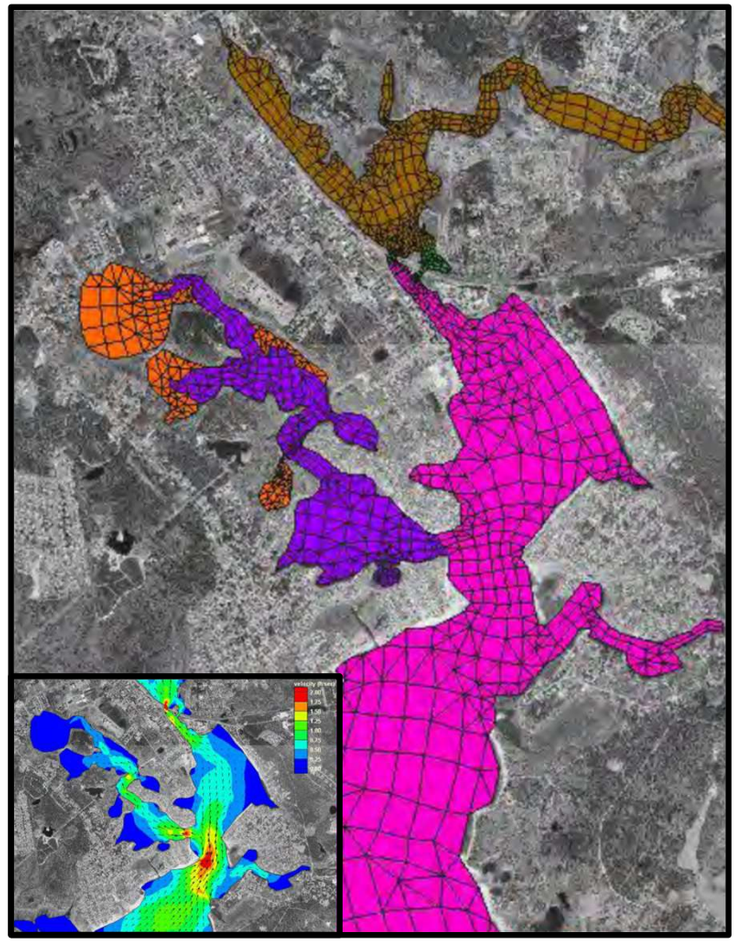
Land Use Classification

Hydrodynamic Modeling

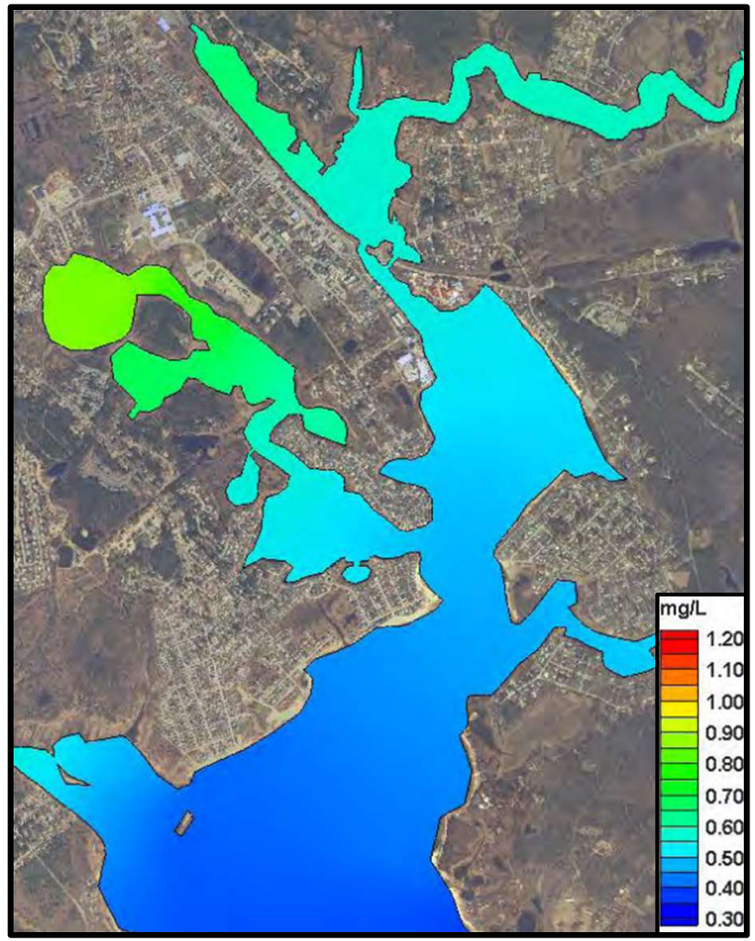
- Bathymetry
- Surface water discharge
- Tidal elevation

Water Quality Modeling

- Simulates nitrogen concentrations within the embayment in response to the existing flushing conditions and nitrogen loadings

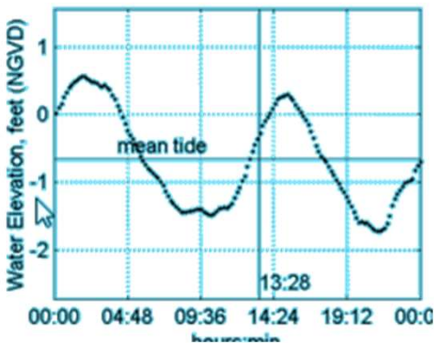


Hydrodynamic Model Grid Mesh & Example Model Output



Nitrogen Concentration Contour from Water Quality Model

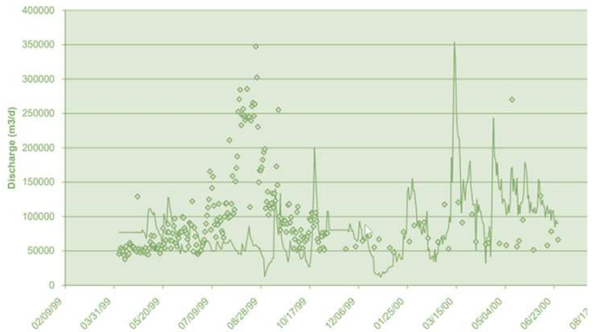
MEP Critical Nutrient Threshold Analytical Approach

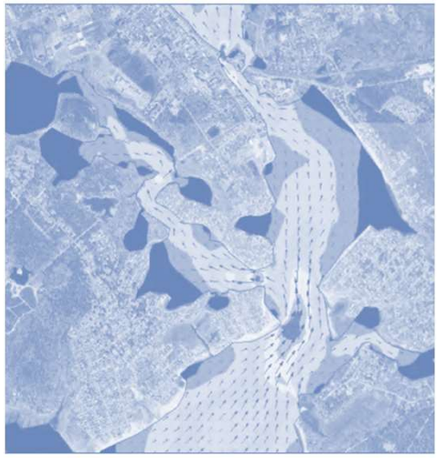


Tide, Bathymetry, Current, & Flow Measurements

Benthic Flux & Water Column Measurements

Watershed Delineation & Nitrogen Loading

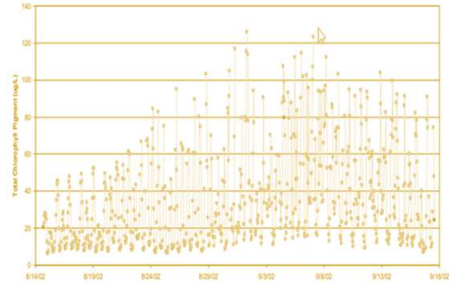


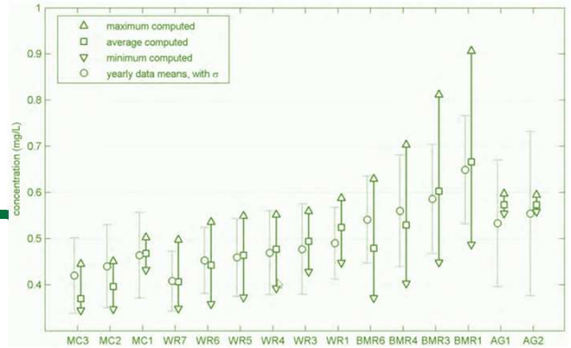


Hydrodynamic Modeling

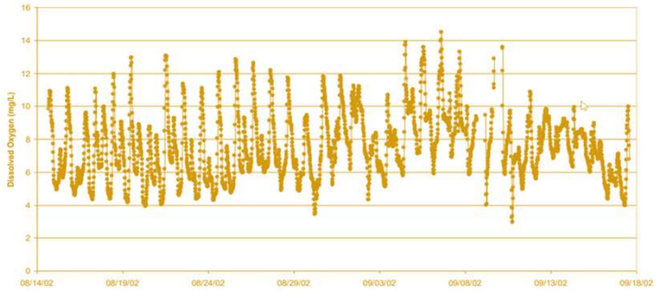
Total Nitrogen Modeling

Dissolved Oxygen, Eelgrass, & Infaunal Surveys

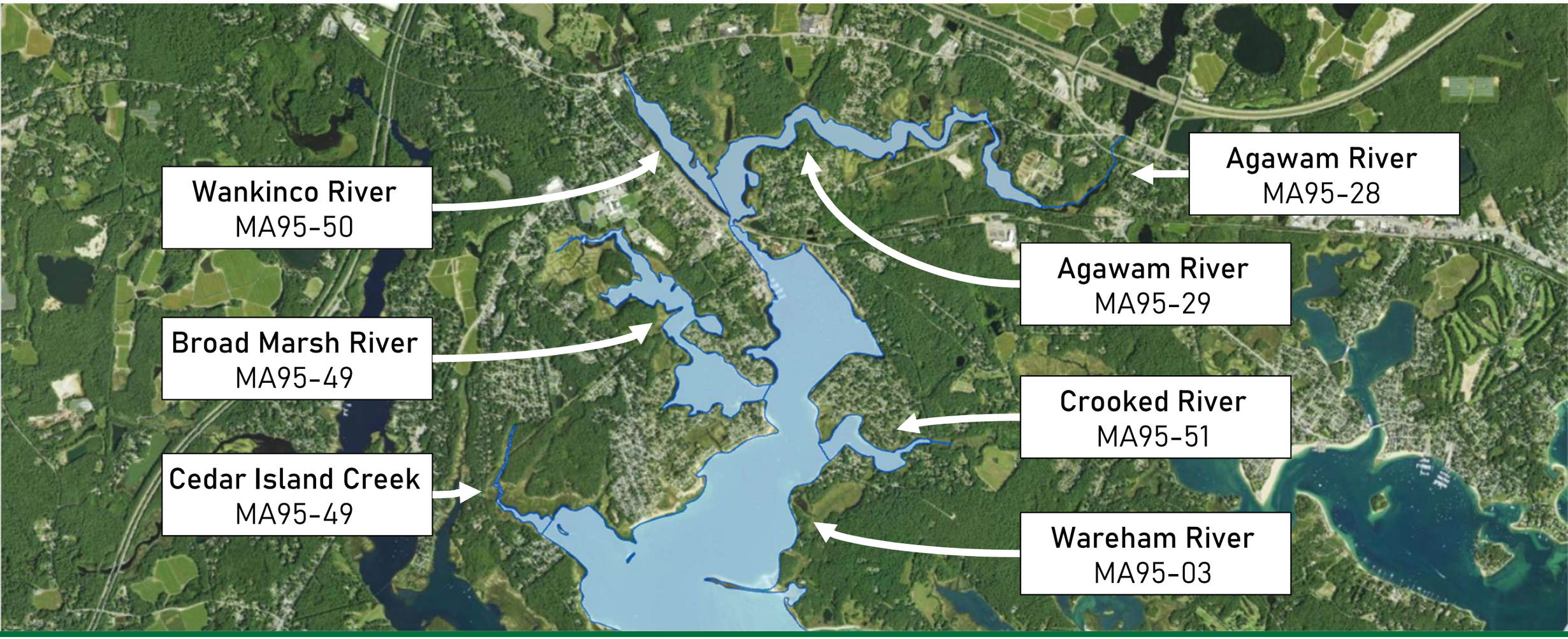




Threshold Nitrogen Concentration Development



Wareham River Estuary System



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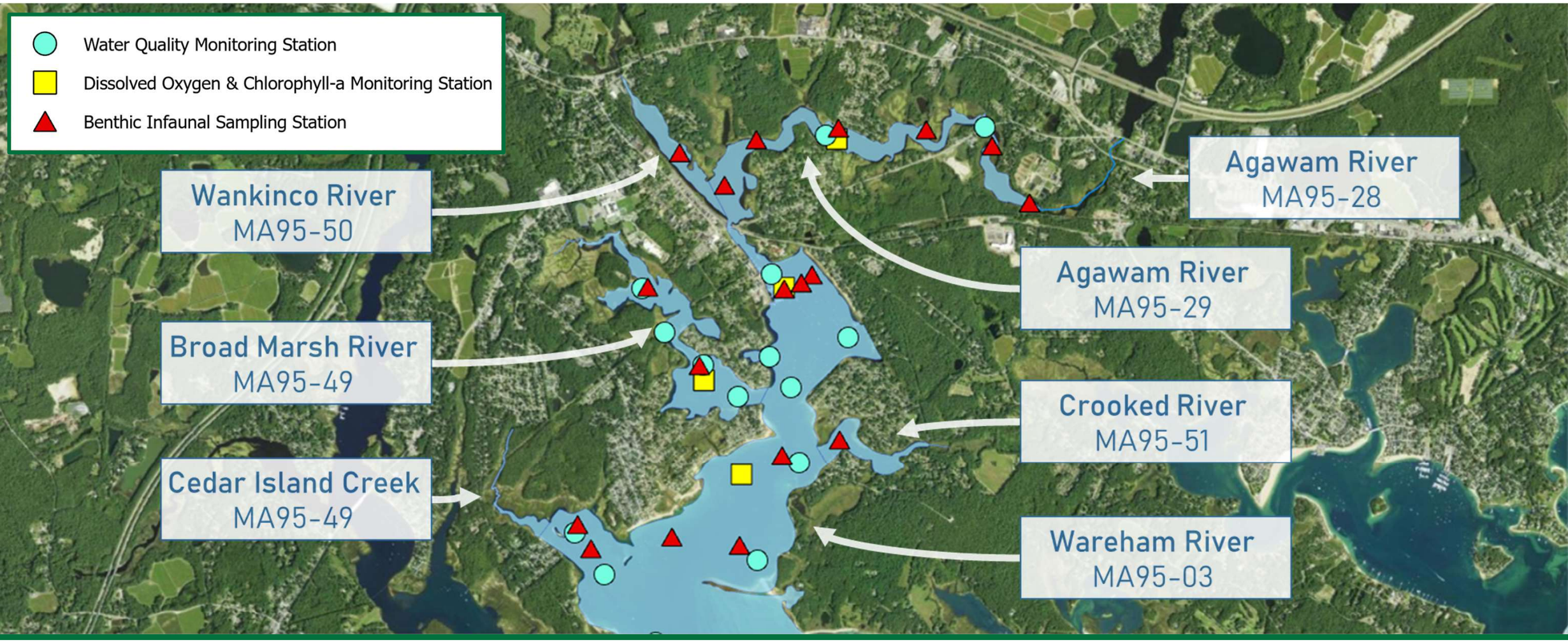
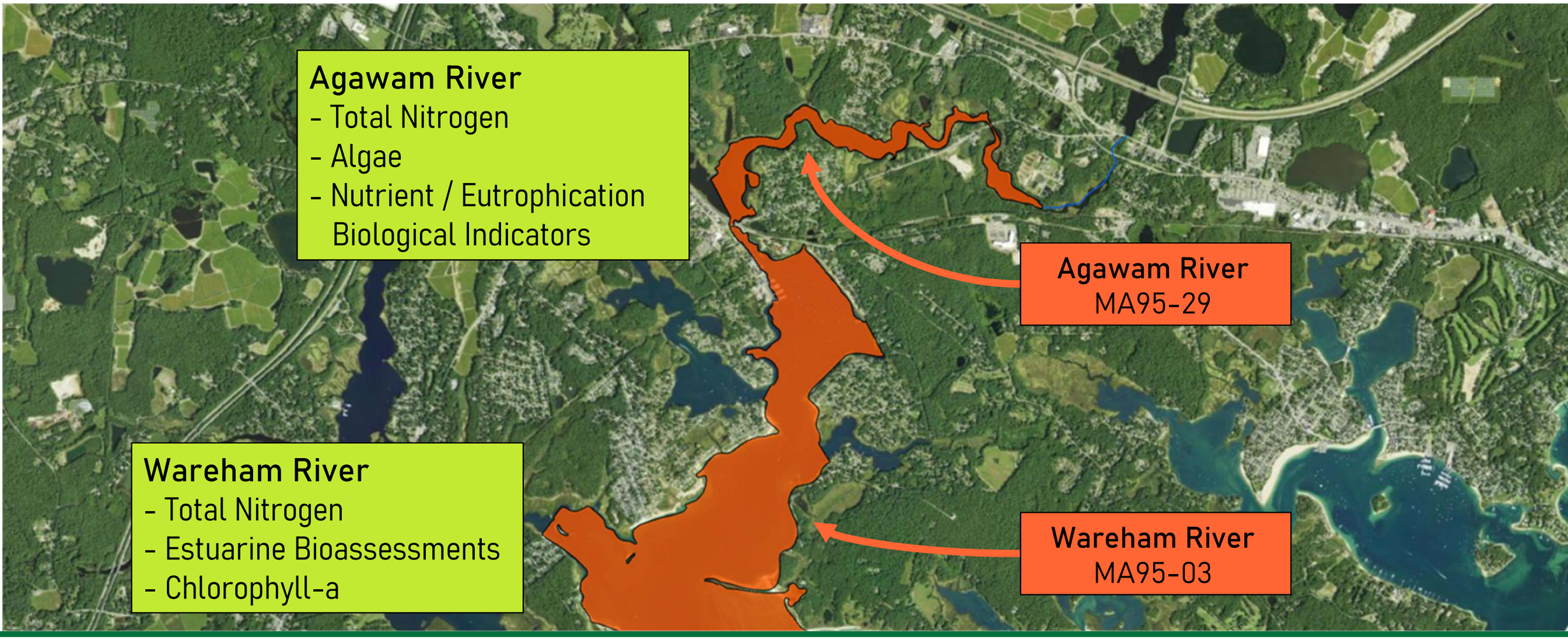
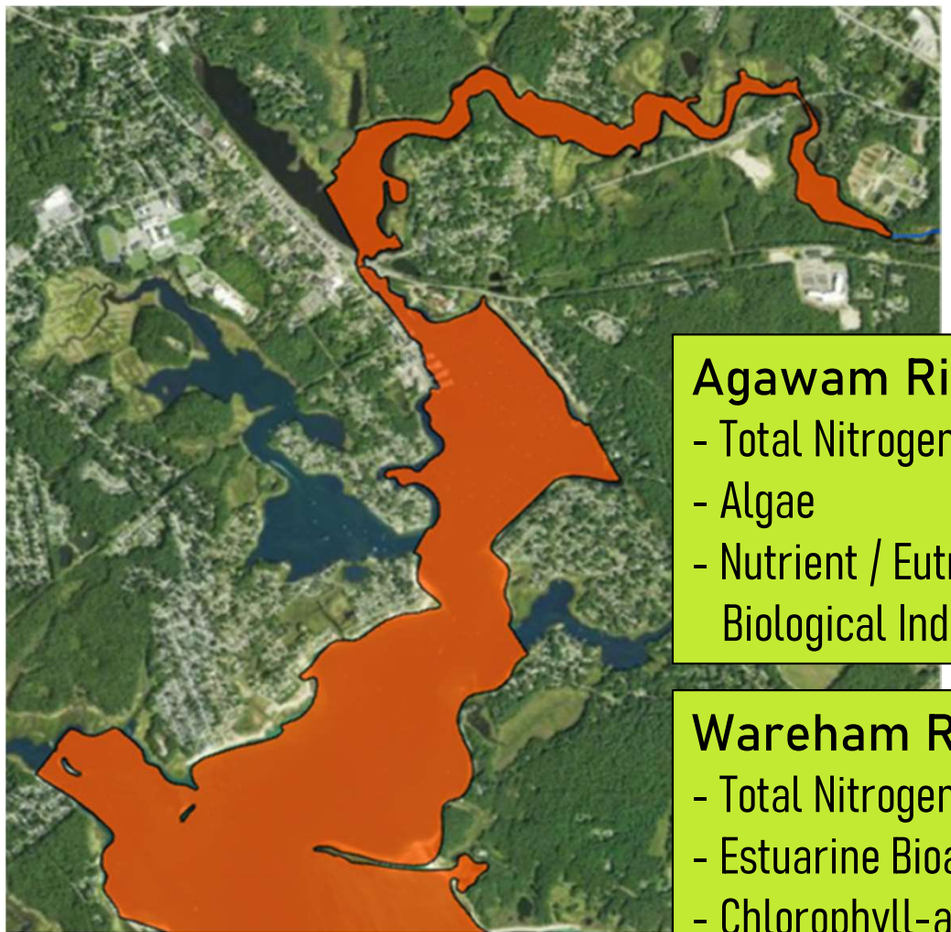
Monitoring & Data Collection



2022 Integrated List Impairments



Excessive Nitrogen Loading



Agawam River
- Total Nitrogen
- Algae
- Nutrient / Eutrophication Biological Indicators

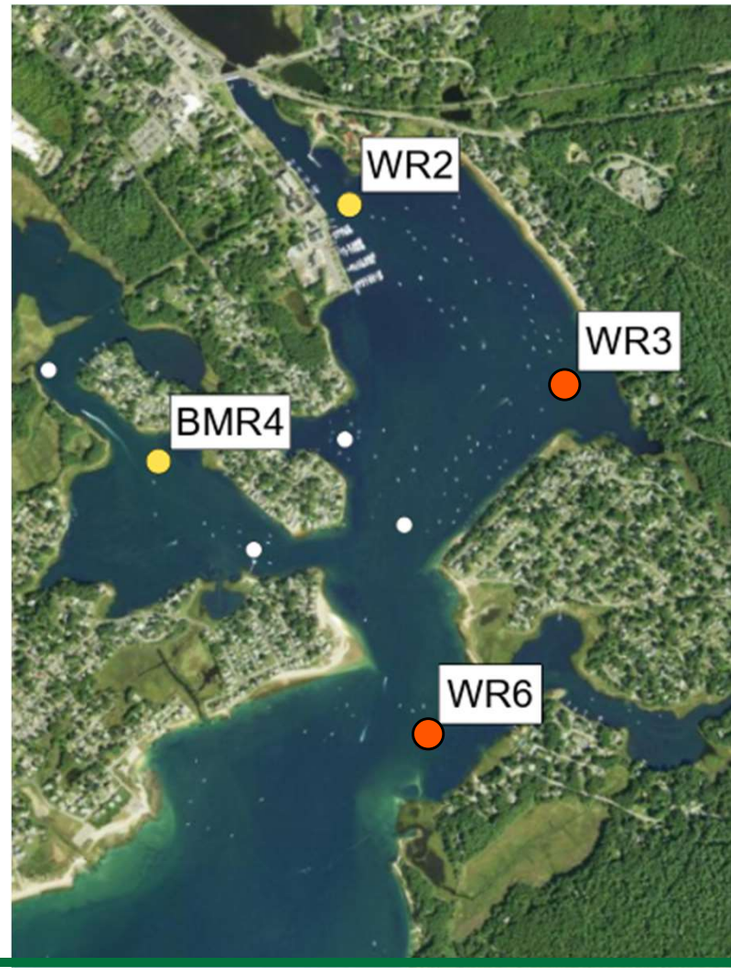
Wareham River
- Total Nitrogen
- Estuarine Bioassessments
- Chlorophyll-a

Excessive nitrogen originating from a range of sources has impaired the Wareham River Estuary System.

Effects of Excess Nitrogen:
- Algae Blooms
- Loss of Eelgrass
- Increased Macro-Algae
- Low Dissolved Oxygen
- Organic Enrichment of Sediments
- Lack of Plant & Animal Diversity
- Fish Kills

Wareham River Sentinel Stations

- Located at or near a long-term monitoring station
- Location based on historic eelgrass & macroinvertebrate information
- Target threshold nitrogen concentration applied at sentinel station



Achieving the Target Threshold Nitrogen Concentration at the Sentinel Stations will result in:

- Eelgrass Habitat Restoration
- Reduced Algal Blooms
- Improved Dissolved Oxygen Concentration
- Healthy Benthic Animal Assemblages

Wareham River Target Threshold Nitrogen Concentration

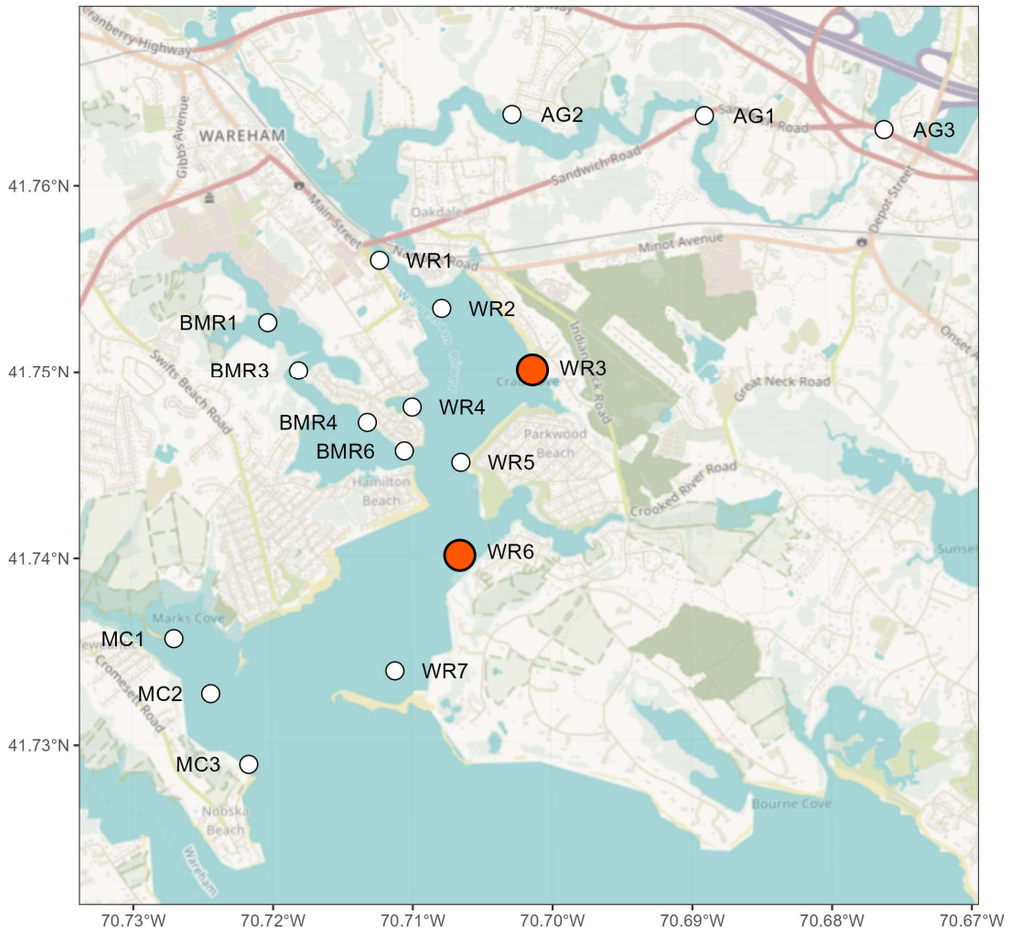
The TN targets are based upon the primary goal of **restoring eelgrass habitat** within the central estuary with the parallel goal of **restoring and protecting benthic habitat** throughout the entire system.

Primary Sentinel Stations

- 0.40 mg/L at the Lower Wareham River (WR-6)
- 0.42 mg/L at the Upper Wareham River (WR-3)

Water Quality Monitoring Data

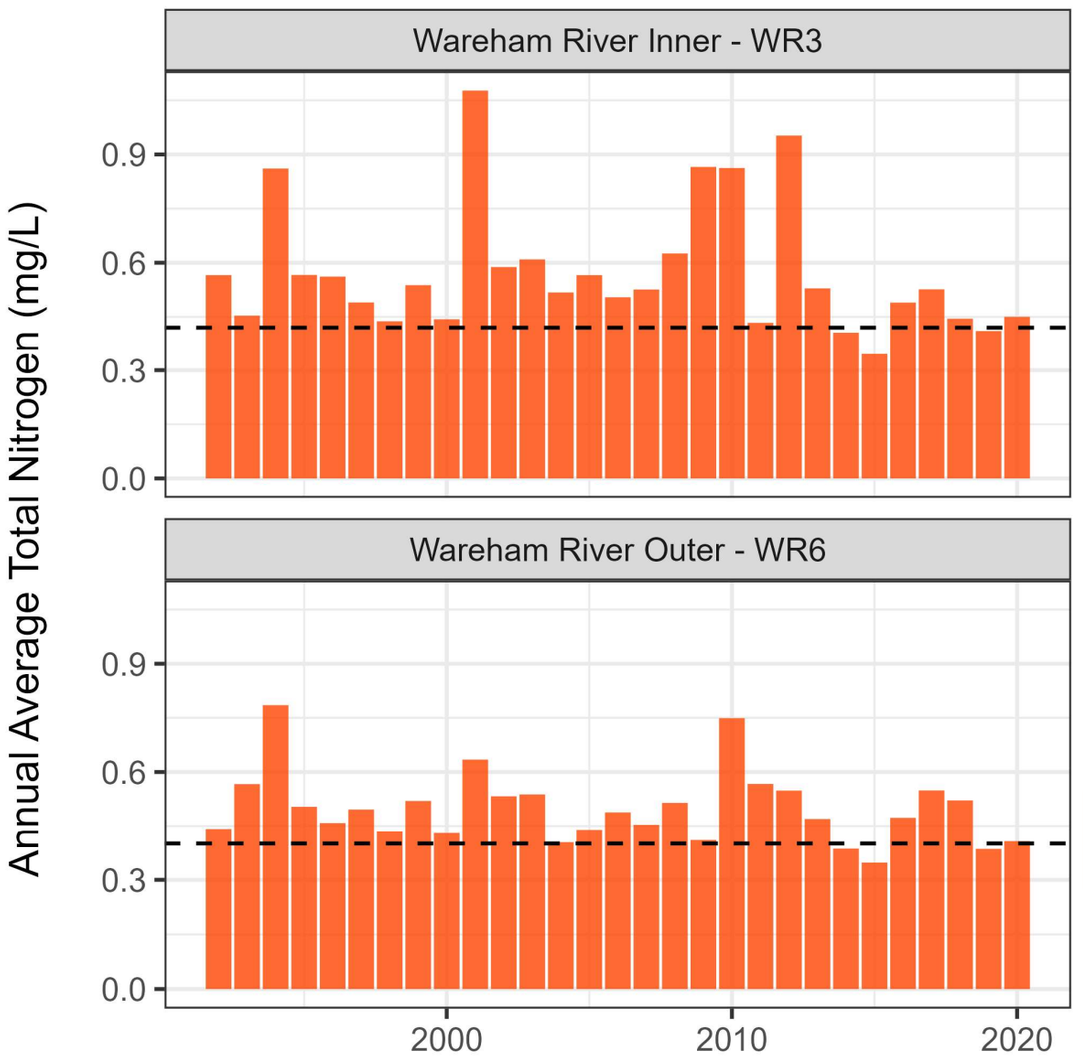
Buzzards Bay Coalition (BBC) Monitoring Stations



Data source:
Buzzards Bay Water Quality Data from the Buzzards Bay Coalition's Baywatchers Program 1992-2020
https://hdl.handle.net/1912/27325

Annual Average Total Nitrogen Concentration

Wareham River Estuary System TMDL



0.42 mg/L

0.40 mg/L

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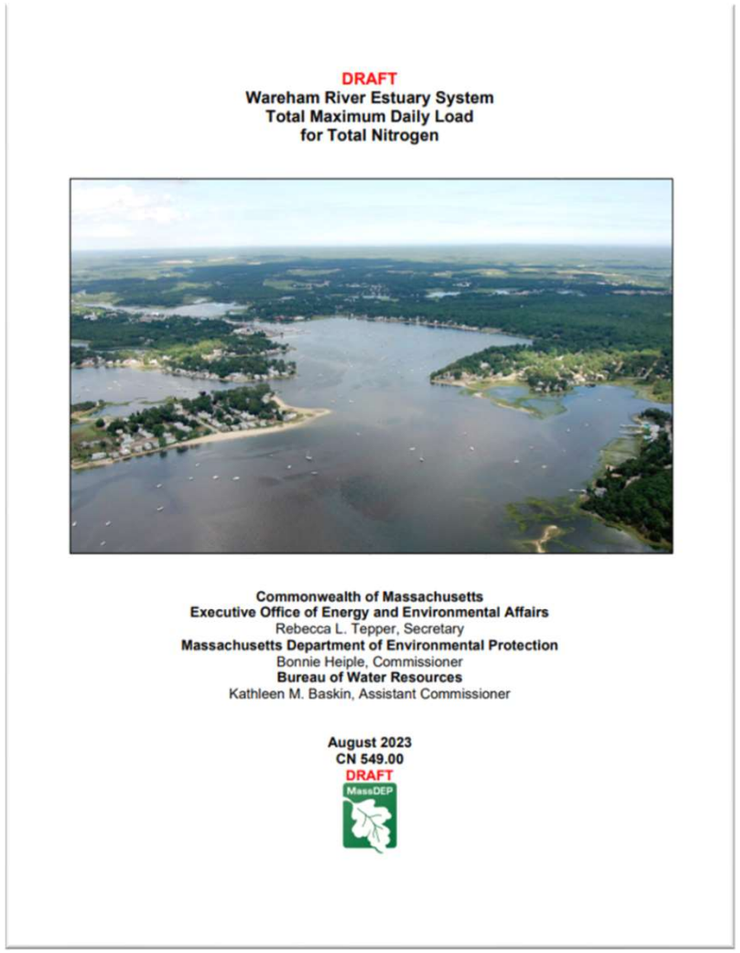
Wareham River Estuary System TMDL for Total Nitrogen

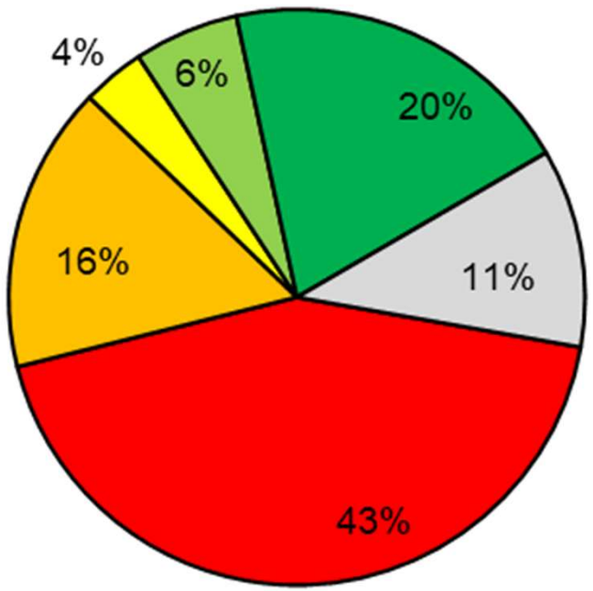
- Summarizes information from the MEP Technical Report
- Documents the basis for the development of TMDL values
- Allocates the allowable loadings to point and nonpoint sources of nitrogen


DRAFT
Wareham River Estuary System
Total Maximum Daily Load
for Total Nitrogen

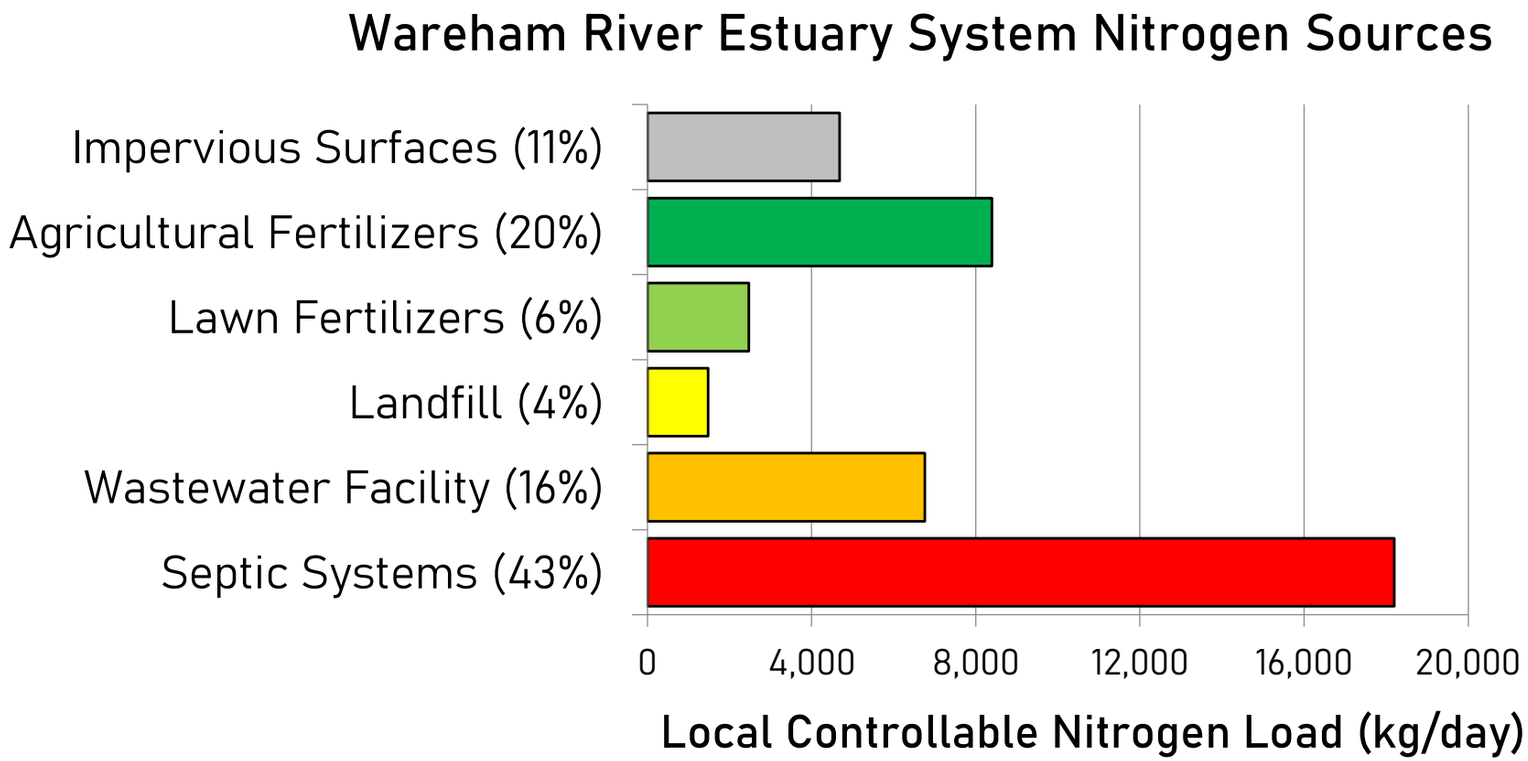
Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
Rebecca L. Tepper, Secretary
Massachusetts Department of Environmental Protection
Bonnie Heiple, Commissioner
Bureau of Water Resources
Kathleen M. Baskin, Assistant Commissioner

August 2023
CN 549.00
DRAFT

Percent Contribution of Watershed Nitrogen Sources



Local Controllable Nitrogen Load



Target Watershed Load & Total Maximum Daily Load (TMDL)

System Component	Target Threshold Watershed Load (kg N/day)	Atmospheric Deposition (kg N/day)	Load from Sediments (kg N/day)	TMDL (kg N/day)
Broad Marsh River	4.10	1.681	12.168	17.95
Marks Cove	4.07	0.959	2.407	7.44
Crab Cove	2.29	1.614	-	3.91
Crooked River	2.55	0.333	-	2.88
Wareham River (Lower)	0.47	5.18	58.8	64.45
Wareham River (Upper)	19.12	1.803	-	20.92
Agawam River	22.11	-	-	22.11
Wankinco River	25.85	-	-	25.85
System Total	**80.63**	**11.57**	**73.375**	**165.52**

Percent Reductions Necessary to Achieve the Target Threshold Loadings

System Component	Existing Watershed Load (kg/day)	Target Threshold Watershed Load (kg/day)	Percent Watershed Load Reductions Needed to Achieve Target
Broad Marsh River	7.945	4.10	-48.4%
Marks Cove	4.87	4.07	-16.4%
Crab Cove	3.54	2.29	-35.2%
Crooked River	5.35	2.55	-52.3%
Wareham River (Lower)	0.71	0.46	-34.7%
Wareham River (Upper)	42.18	19.12	-54.7%
Agawam River	34.26	22.11	-35.4%
Wankinco River	30.58	25.85	-15.5%
System Total	**129.47**	**80.63**	**-37.7%**

Septic Reductions Necessary to Achieve the Target Threshold Loadings

System Component	Present Septic Load (kg N/day)	Threshold Septic Load (kg N/day)	Threshold Septic Load % Change
Broad Marsh River	4.27	0.43	-90%
Marks Cove	1.60	0.80	-50%
Crab Cove	2.50	1.25	-50%
Crooked River	4.00	1.20	-70%
Wareham River (Lower)	0.50	0.25	-50%
Wareham River (Upper)	18.14	1.81	-90%
Agawam River	12.16	0.00	-100%
Wankinco River	4.68	3.27	-30%
System Total	47.85	9.01	**-79%**

TMDL Summary

The goal of the TMDL is to **lower nitrogen concentrations** in the Wareham River Estuary System.

TMDL of **165.5 kg/day** of nitrogen will achieve the target concentration.

One load reduction combination to achieve the threshold nitrogen concentrations includes:

- Reduction of septic load from 48 kg/day to 9 kg/day
- Reduction of the load from the Wareham Wastewater Control Facility to 11.8 kg/day

Implementation

- Watershed-Wide Focus
- Prioritize Efforts
- Technical Approaches
- Planning Approaches

Implementation

- Watershed-Wide Focus
- Prioritize Efforts
- Technical Approaches
- Planning Approaches

Comprehensive Wastewater Management Plan (CWMP)

- Based on acceptable nitrogen loading
- Identifies wastewater management options
- Schedules implementation
- Targeted Watershed Management Plan (TWMP)

Implementation

- Watershed-Wide Focus
- Prioritize Efforts
- **Technical Approaches**
  - Sewer Extensions & Removal of Existing Conventional Septic Systems
  - Enhanced Wastewater Treatment
  - Stormwater Runoff Control & Treatment
  - Modeled Inlet Widening/Culvert Opening
  - Enhanced Nitrogen Attenuation
- Planning Approaches

Options for Achieving the Target Threshold Nitrogen Concentration

Conventional Approaches

- Sewer Extensions
- Enhanced Nitrogen Reduction Treatment Facility Upgrades
- Neighborhood "package" treatment plant
- General use approved I/A septics systems

Alternative Approaches

- Inlet Widening or Constriction/dike removal
- Enhanced natural attenuation
- Aquaculture
- Pilot & Provisional use approved I/A septic systems

Implementation

Watershed-Wide Focus

Prioritize Efforts

Technical Approaches

Planning Approaches

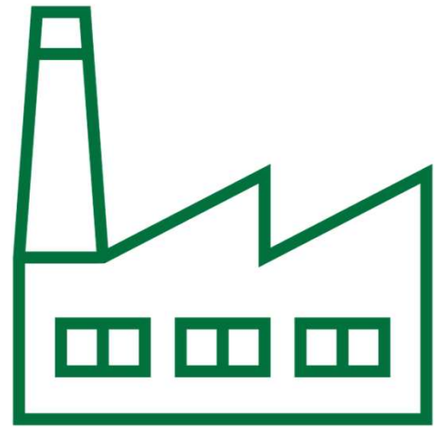
Planning Strategies

- Management of Growth
- Zoning Bylaws
- Inter-municipal agreements & Nitrogen Trading
- Deed restrictions or local regulations for land preservation

Financing Opportunities

- State Revolving Fund (SRF) can cover planning & construction
- USDA Rural Development Grants
- SRF Points for a Wastewater Management District
- 604(b) Water Quality Management Planning Grants
- 319 Nonpoint Source Pollution Grants
- Buzzards Bay National Estuary Program Grants
- CZM Coastal Pollution Remediation Grants
- SNEP Watershed Grants

Wareham Wastewater Control Facility



- NPDES general permit MAG590005

- Seasonal nutrient limits:
  - Total Nitrogen of 4 mg/l and 52 lbs/day
  - April 1st through October 31st.

- 2022 upgrades of filters have doubled capacity to better manage wet weather flows

- 2024 State Revolving Fund (SRF) for continued treatment facility improvements

- Wareham Wastewater Control Facility woodchip biofilter pilot

Developing Alternative & Conventional Strategies

- Little Harbor Beach on Great Neck Neighborhood Wastewater System
- Cranberry Bog Restoration, Fertilizer Management, and other BMPs
- Nitrogen Reducing I/A Septic System By-Laws for New Construction
- Watershed Permit and TWMP (CWMP Update) and Nutrient Loading Model Run Update

TMDL Timeline

Public / Towns:
Submit comments to MassDEP by **December 28, 2022**

MassDEP:
Revise draft TMDL (based on public input)

EPA:
Review TMDL and approve within 30 days of receiving

MassDEP:
Submit final TMDL to EPA

Towns:
Continue Comprehensive Wastewater Management Planning (CWMP)

Public Comment Period

Comments due by Thursday – **December 28, 2023** at 5:00 pm

Email Address:
dep.wpp@mass.gov

Email Subject:
Wareham River TMDL (CN 549.0) comments

Mailing Address:

MassDEP
Watershed Planning Program
8 New Bond Street
Worcester, MA, 01606

Thank You

Massachusetts Department of Environmental Protection