

Stage Harbor Group



Baseline Conditions & Needs Assessment

What is the 208 Plan?

Clean Water Act Section 208



The Commission was directed to update the 1978 Plan

The Commonwealth provided \$3 million to fund the project

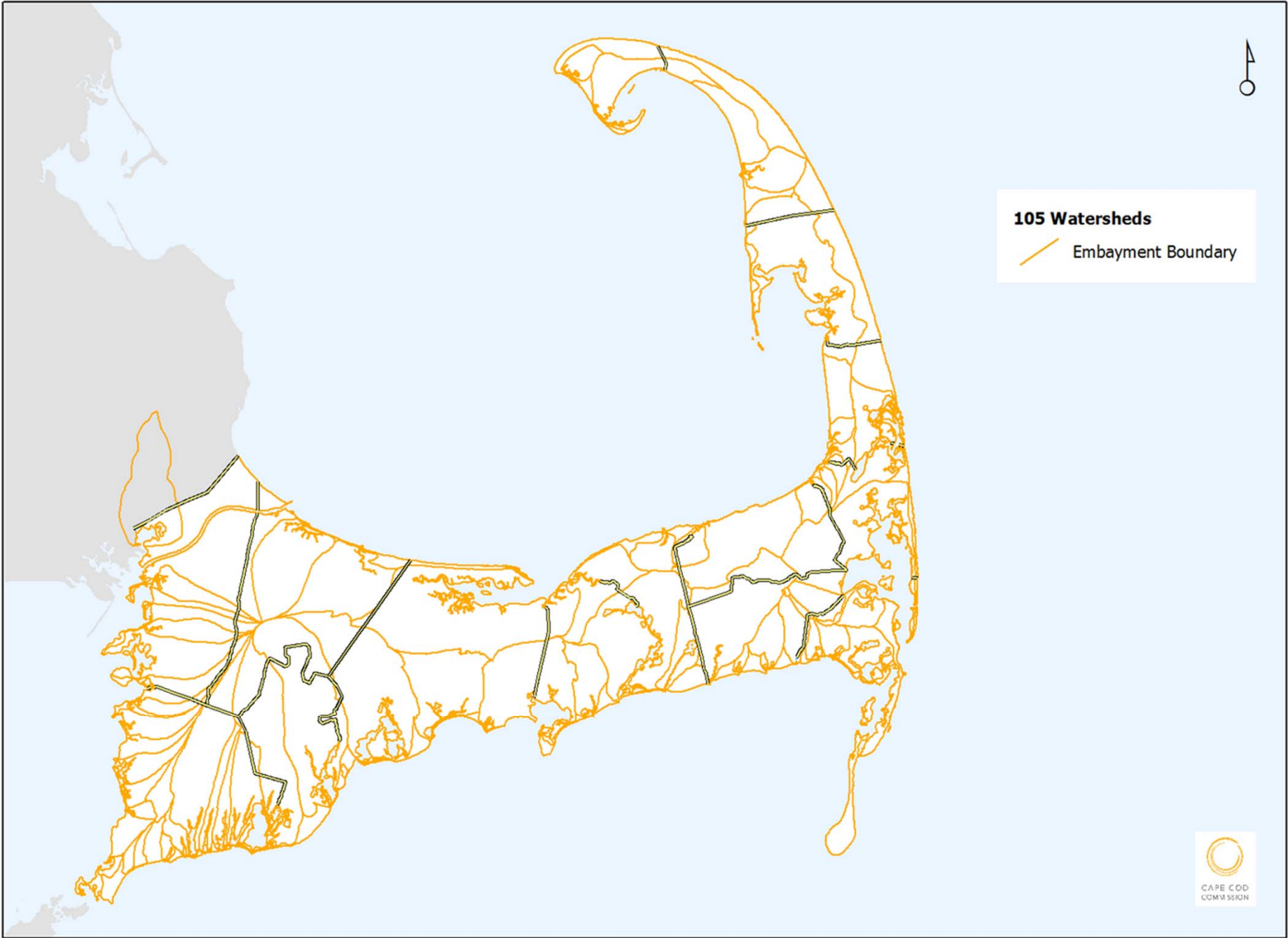
Focus on 21st Century Problems



Nitrogen:
Saline Waters

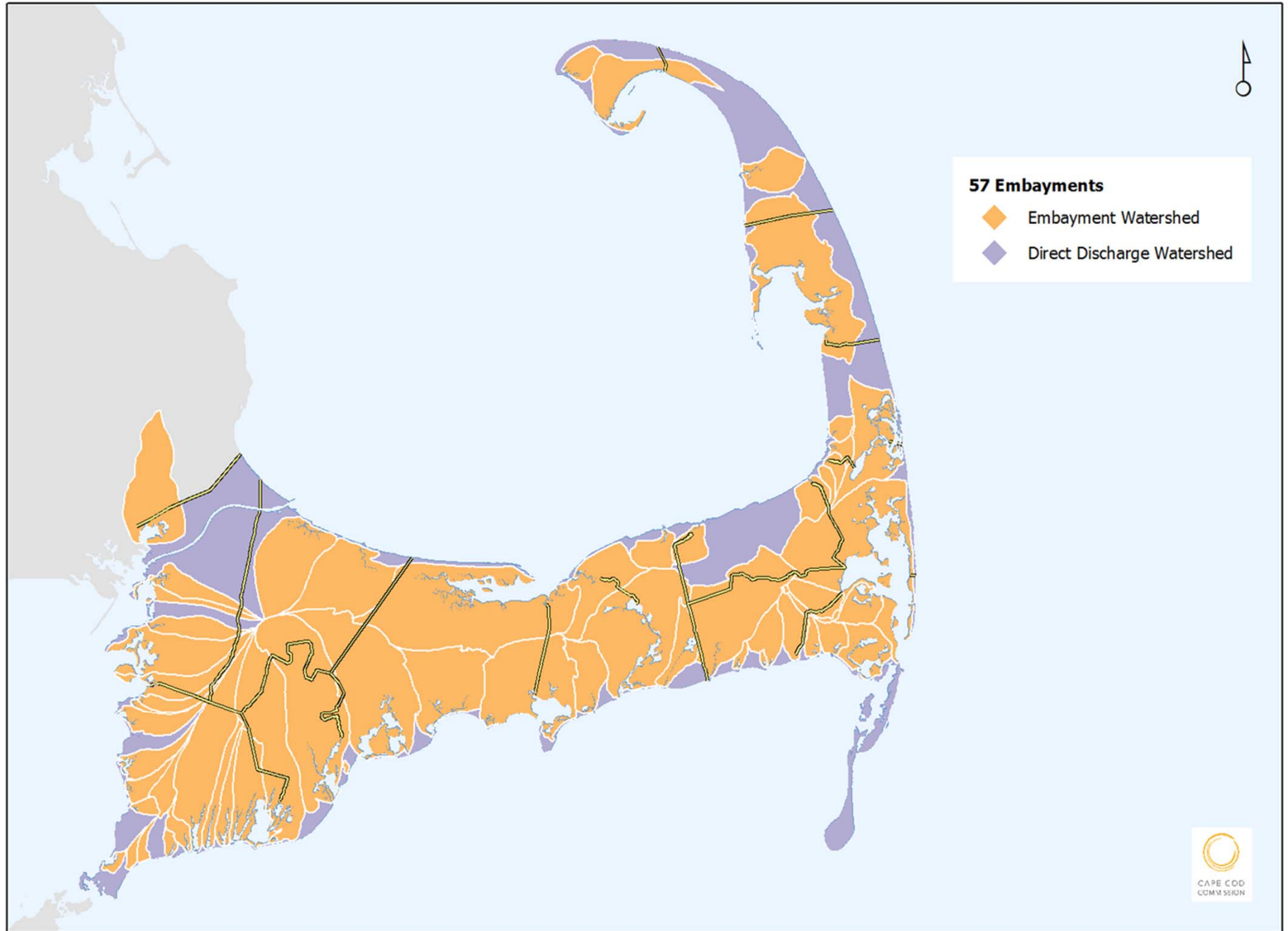
Phosphorus:
Fresh Waters

Growth &
Title 5
Limitations



105 Watersheds
— Embayment Boundary

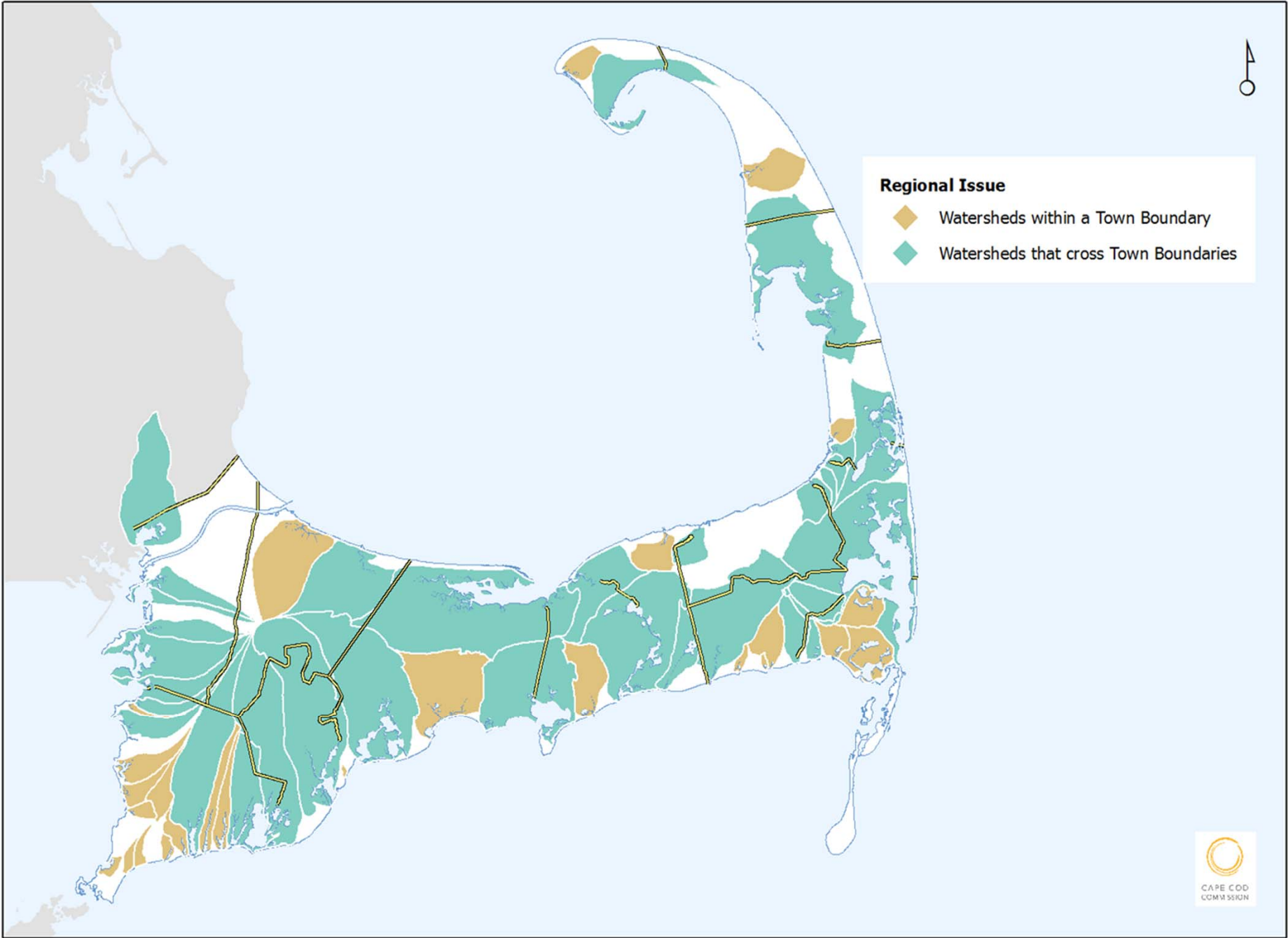




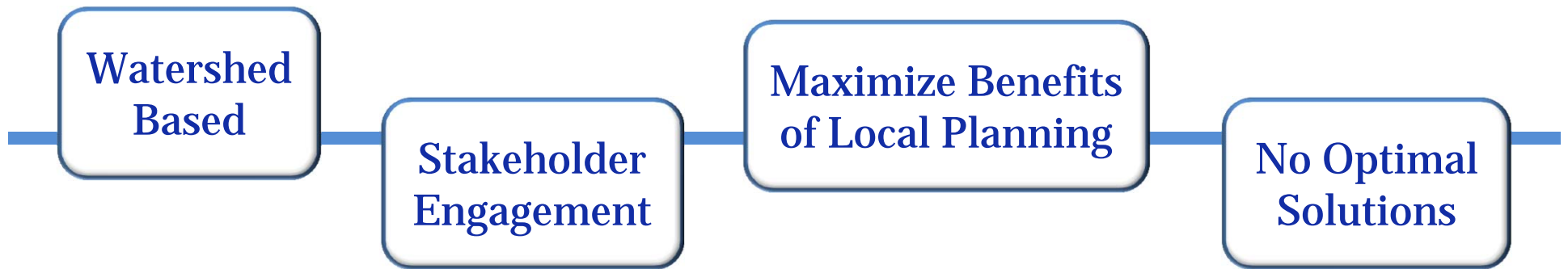
Nitrogen Removal Required

Studied Watersheds

- ◆ Excess Nitrogen Watersheds
- ◆ Watersheds Without Excess Nitrogen



Approach to the 208 Plan Update

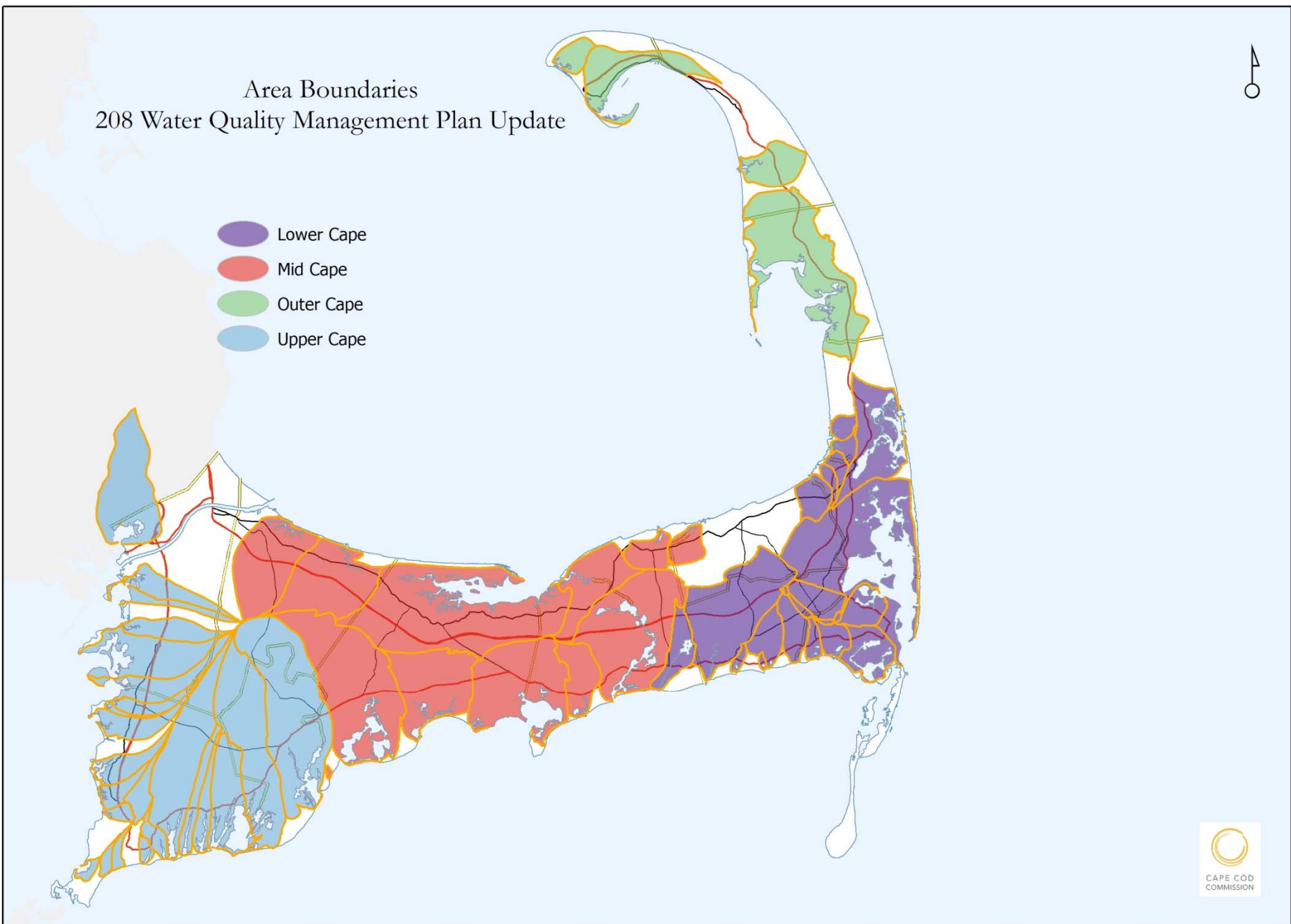


Goal:

To generate a series of approaches in each watershed that will meet water quality standards

Area Boundaries
208 Water Quality Management Plan Update

- Lower Cape
- Mid Cape
- Outer Cape
- Upper Cape



Subgroup Boundaries 208 Water Quality Management Plan Update



Lower Cape

- Herring River
- Pleasant Bay
- Stage Harbor Group
- Nauset and Cape Cod Bay Marsh Group

Mid Cape

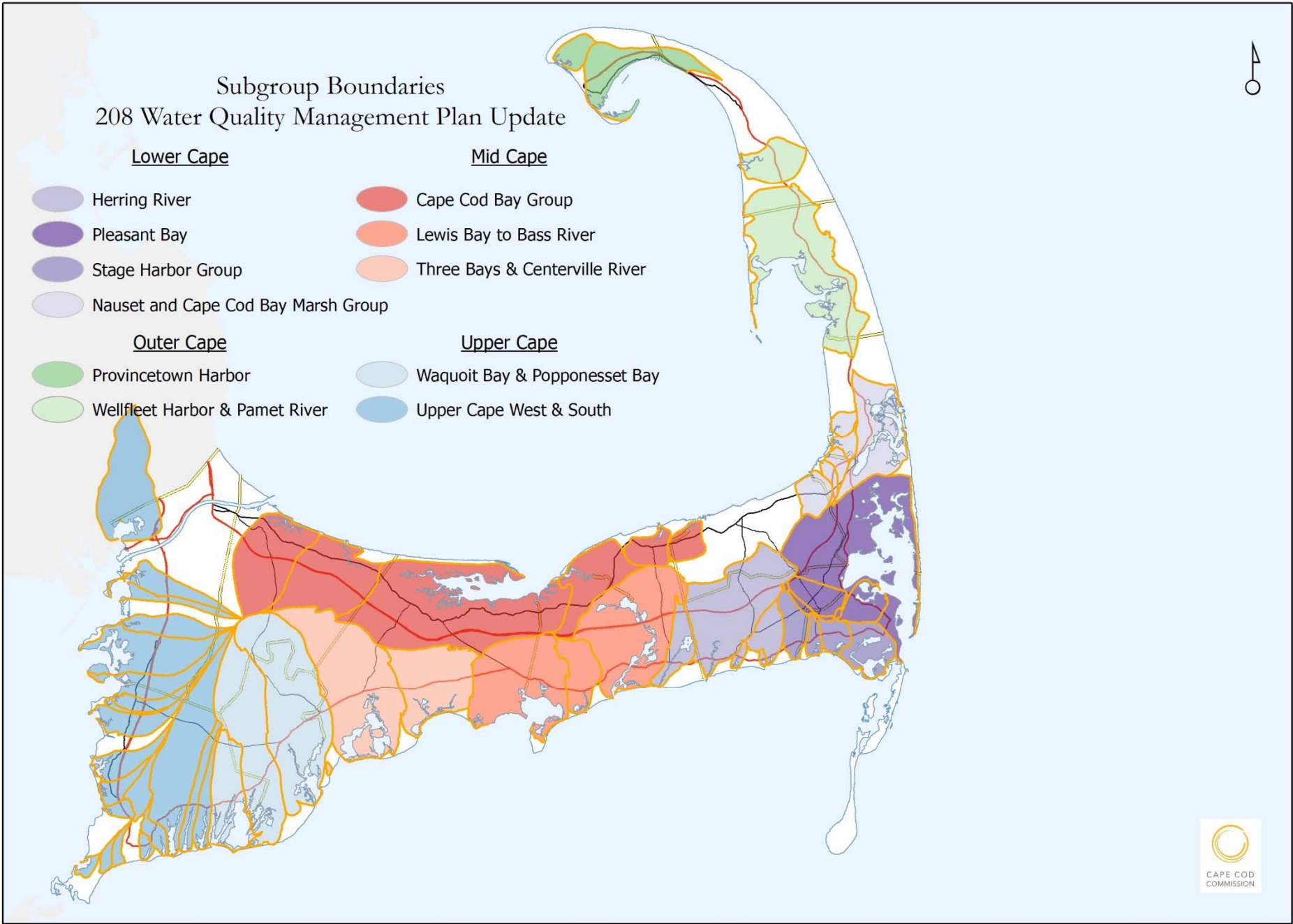
- Cape Cod Bay Group
- Lewis Bay to Bass River
- Three Bays & Centerville River

Outer Cape

- Provincetown Harbor
- Wellfleet Harbor & Pamet River

Upper Cape

- Waquoit Bay & Popponesset Bay
- Upper Cape West & South



What is the stakeholder process?

Public Meetings

Watershed Working Groups



July

August

September

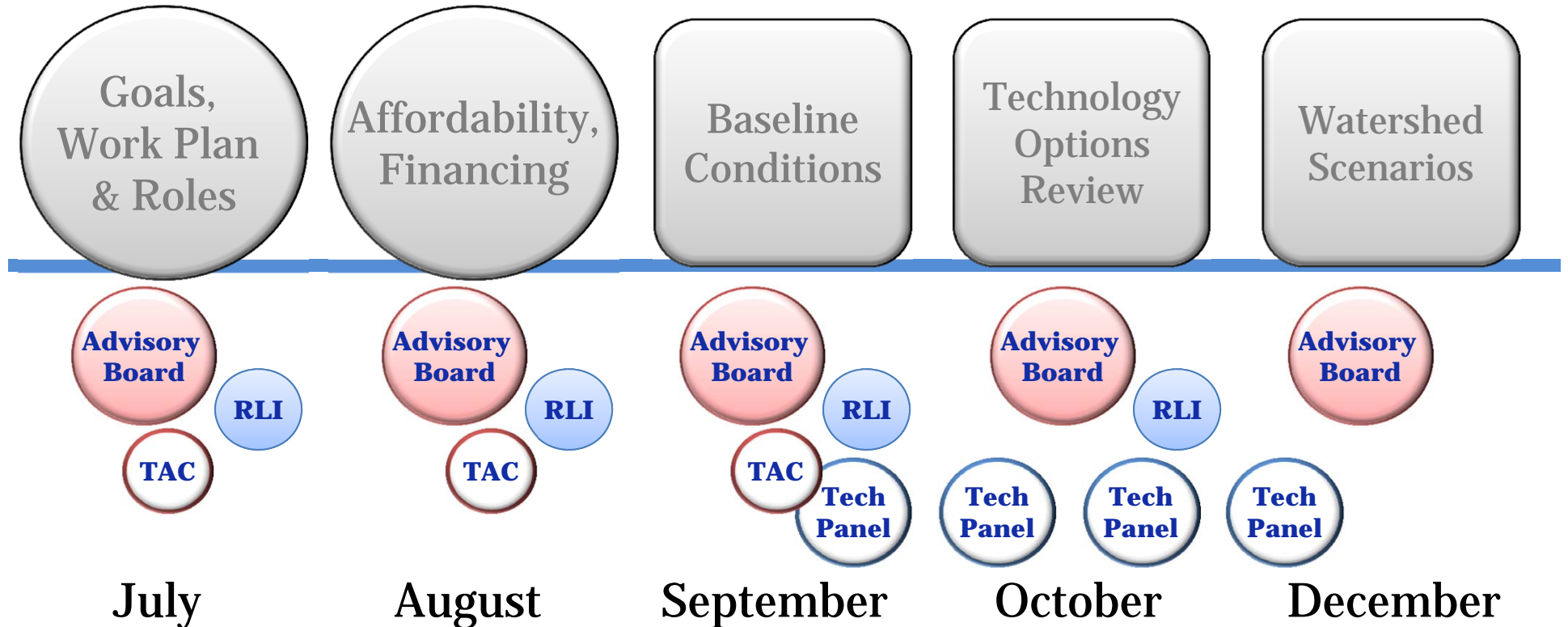
October

December

208 Planning Process

Public Meetings

Watershed Working Groups



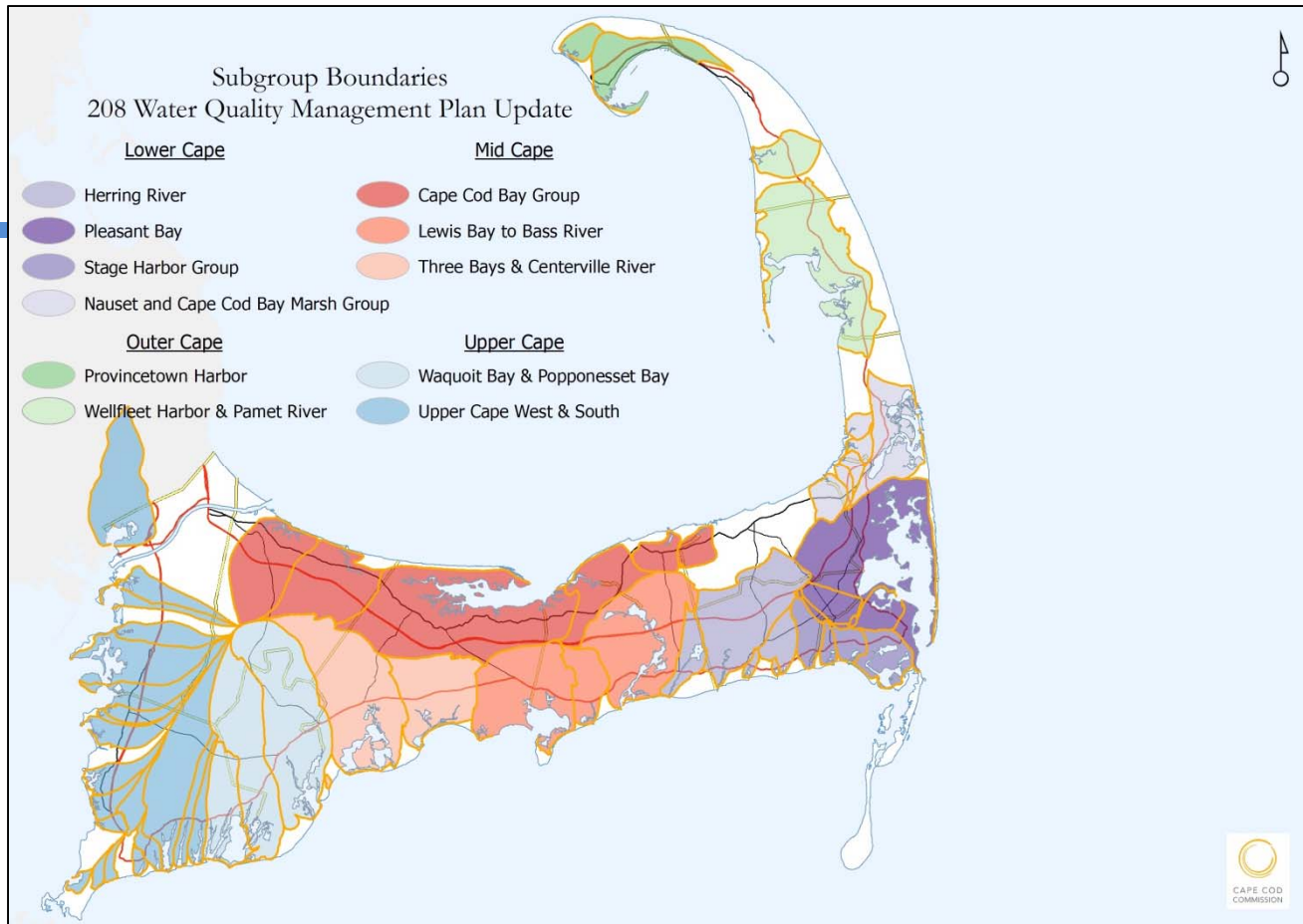
RLI Regulatory, Legal & Institutional Work Group

TAC Technical Advisory Committee of Cape Cod Water Protection Collaborative

208 Planning Process

Baseline Conditions

11 Working
Group Meetings:
Sept 18-27



208 Planning Process

Baseline Conditions

11 Working Group Meetings:
Sept 18-27

Technology Options Review

11 Working Group Meetings:
Oct 21-Nov 5



208 Planning Process

Baseline
Conditions

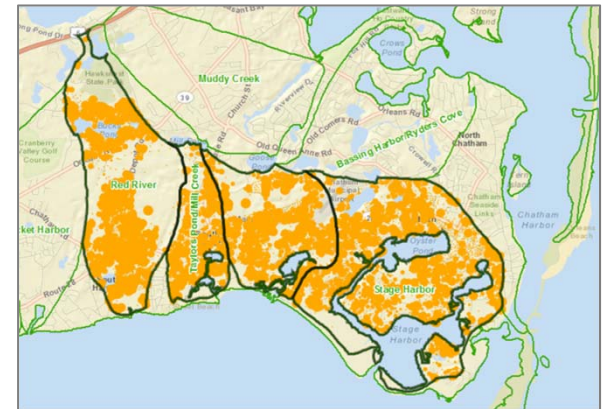
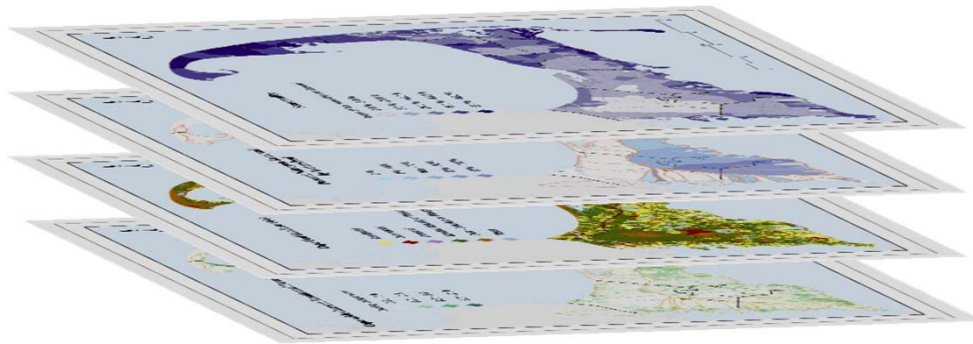
11 Working
Group Meetings:
Sept 18-27

Technology
Options
Review

11 Working
Group Meetings:
Oct 21-Nov 5

Watershed
Scenarios

11 Working
Group Meetings:
Dec 2-11



208 Planning Process

**Baseline
Conditions**

**11 Working
Group Meetings:
Sept 18-27**

Goal of Today's Meeting:

To review and develop shared understanding of the characteristics of these watersheds, the work done to date, existing data and information available, and how to apply all of this to planning for water quality improvements for these watersheds moving forward.

208 Planning Process

Local Progress to Date

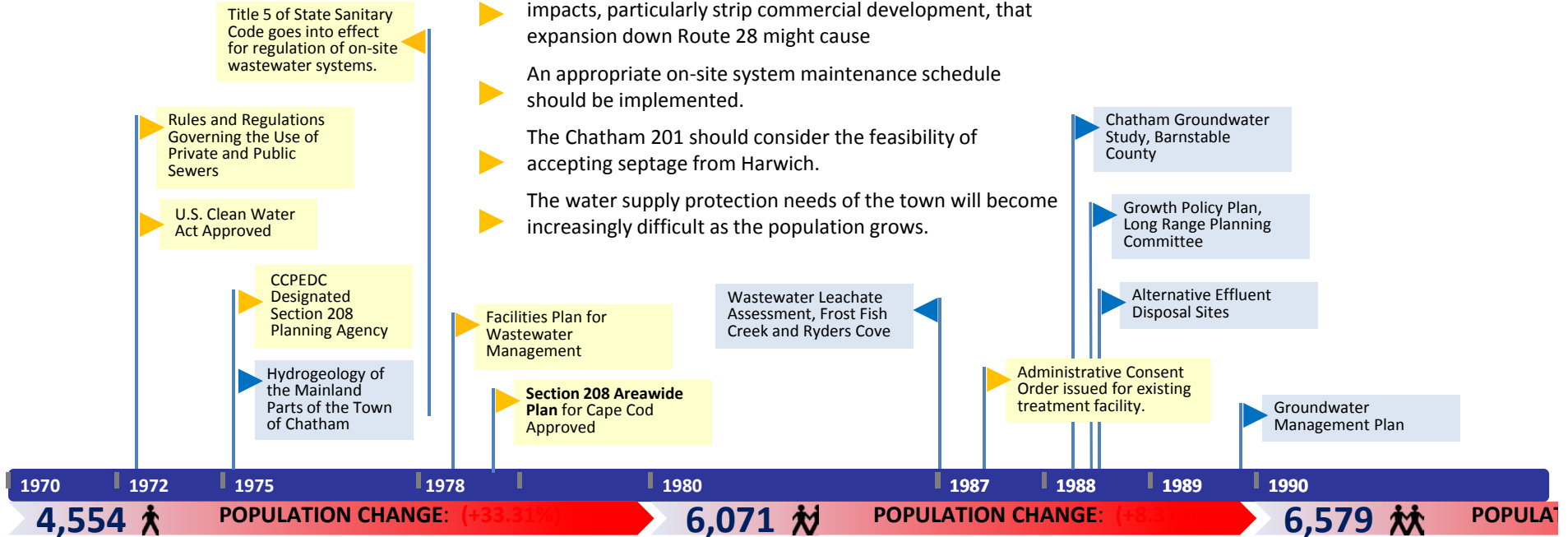


**Red River
Stage Harbor
Sulfur Springs/Bucks Creek
Taylors Pond/Mill Creek**

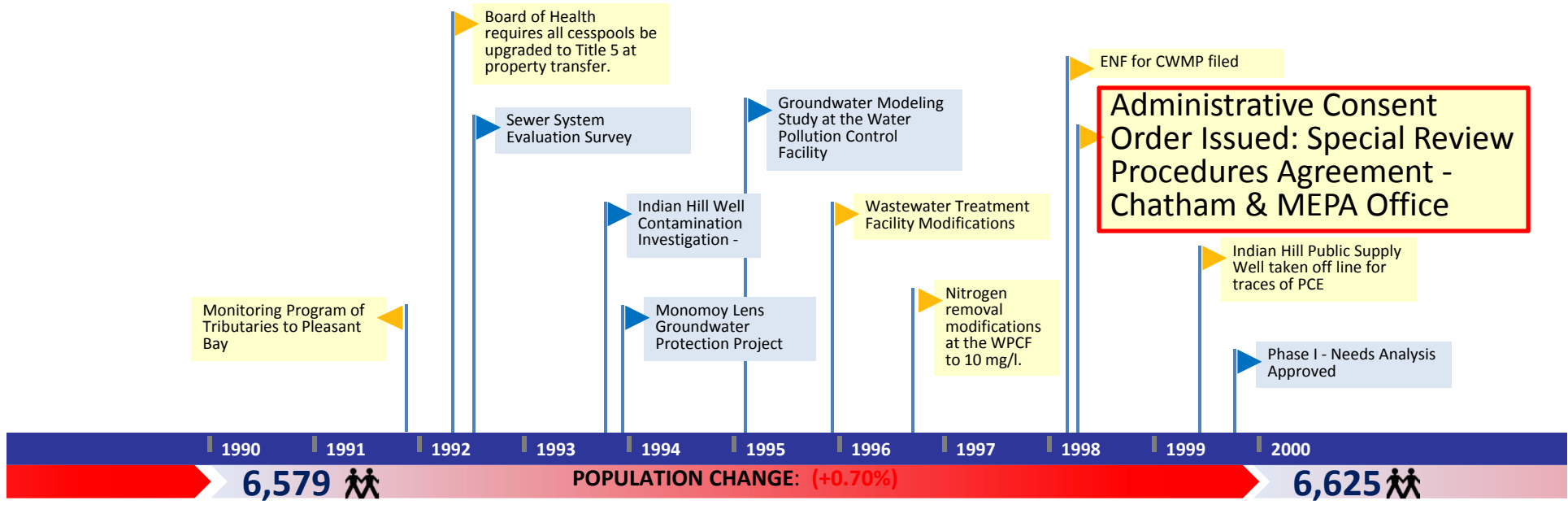
Chatham

From 1978 Section 208 Plan

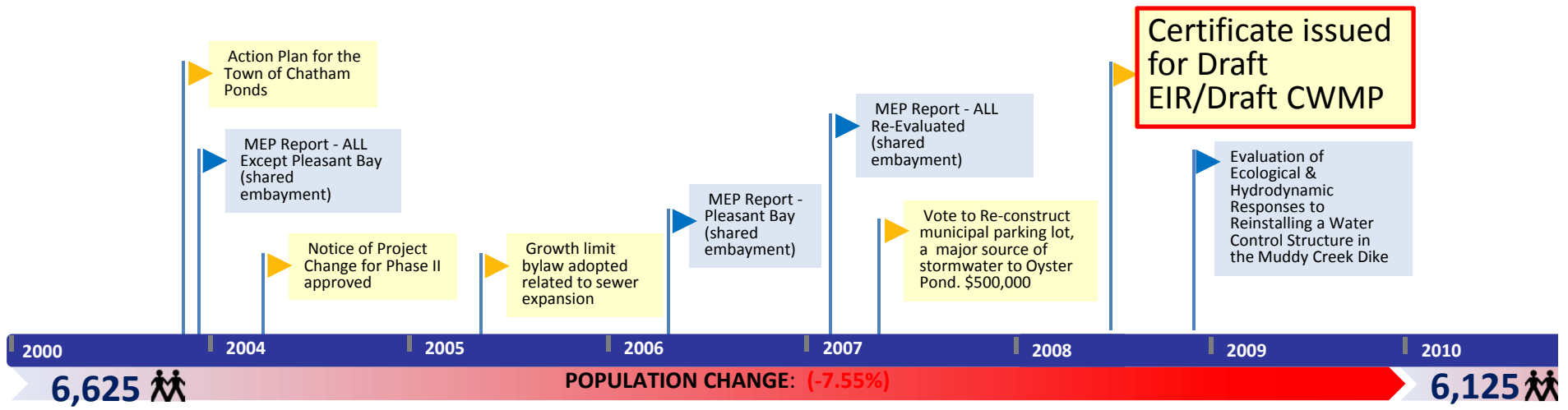
- ▶ A study is needed to examine the present capacity of the town's sewage treatment plant and the possible need to expand the present collection system.
- ▶ The 201 facility plan should be town-wide in scope and should fully evaluate all problem areas in the town including coastal water problems.
- ▶ The town should fully examine all problem areas considered for expansion in terms of present EPA criteria for determining sewer needs. Since most of the costs for such expansion are not eligible for 201 funding, the town is likely to find the cost of extensive expansion is very high.
- ▶ The 201 study should also address the secondary growth impacts, particularly strip commercial development, that expansion down Route 28 might cause
- ▶ An appropriate on-site system maintenance schedule should be implemented.
- ▶ The Chatham 201 should consider the feasibility of accepting septage from Harwich.
- ▶ The water supply protection needs of the town will become increasingly difficult as the population grows.



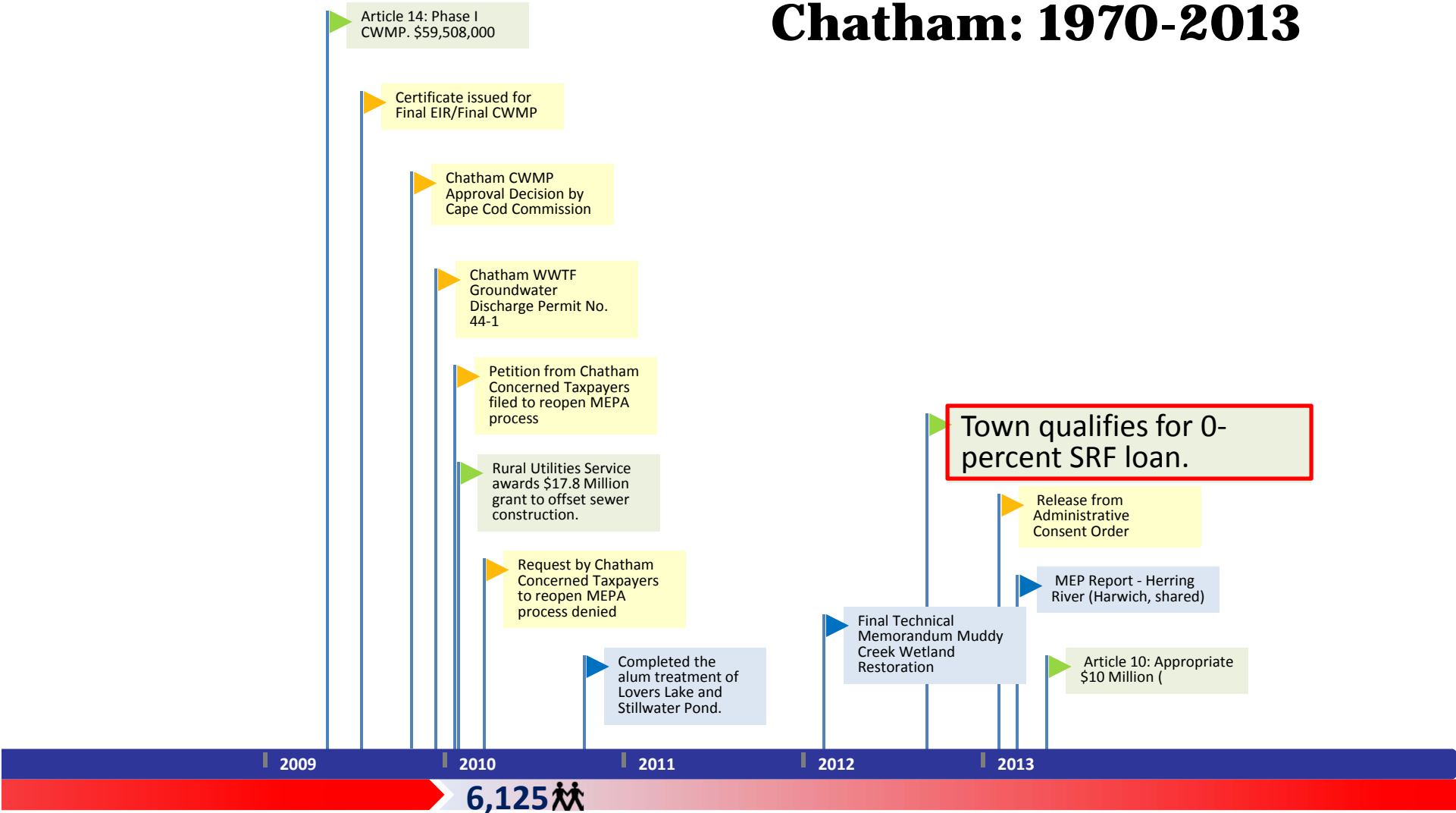
Chatham: 1970-2013



Chatham: 1970-2013



Chatham: 1970-2013

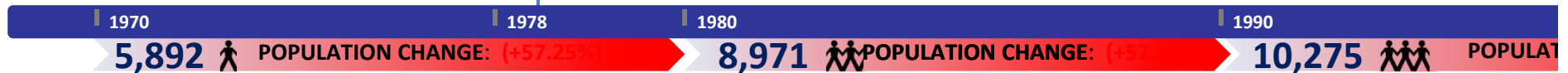


Harwich

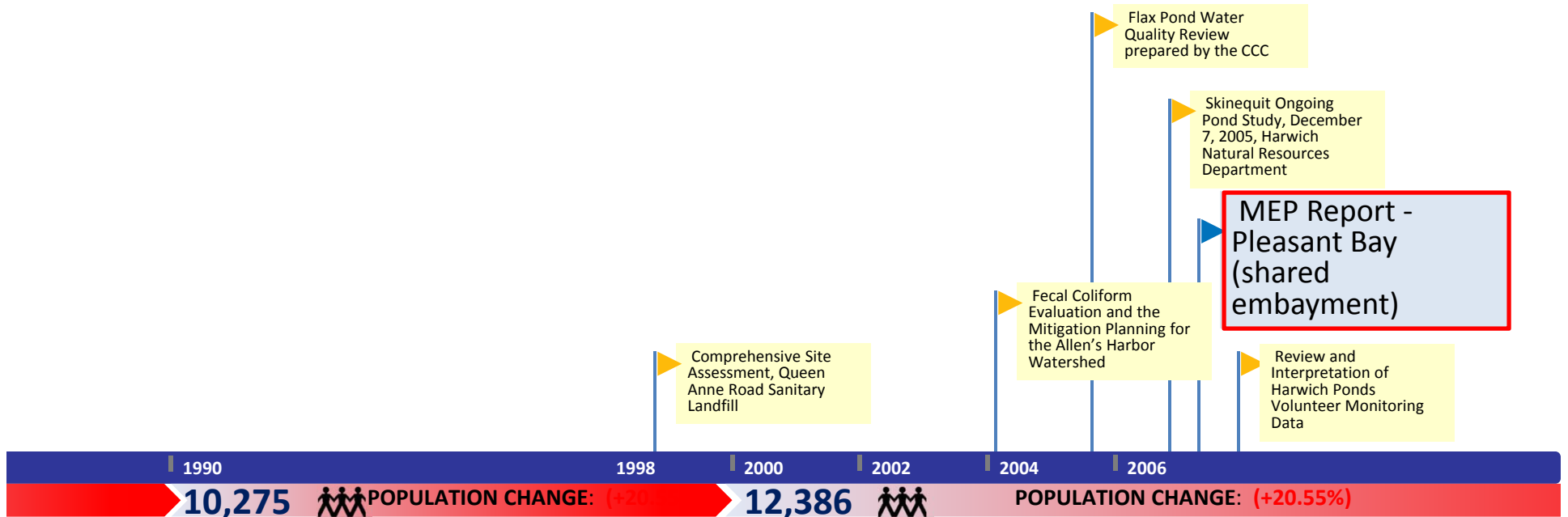
From 1978 Section 208 Plan

- ▶ That the town recognize that the Category 2 problem areas on the south side of town need special attention.
- ▶ It is also suggested that the town consider establishing "Seasonal Residential Districts" in this area to control the conversion of seasonal dwellings to year-round occupancy.
- ▶ The 208 plan does not indicate a sewer need in Harwich. This means that the town will not be eligible for a major central collection system for twenty years.
- ▶ New wastewater management problems created by the town's failure to take recommended actions for on-site system management will not be eligible for future 201 construction funds.
- ▶ While Harwich presently has a state approved interim lagoon, the town should not view this system as a long-term solution to its septage treatment problems.
- ▶ There has been considerable concern raised over the possible development of a large subdivision and golf course upgradient of the town's wellfield.
- ▶ The town should also consider purchasing additional areas to protect the town wells.

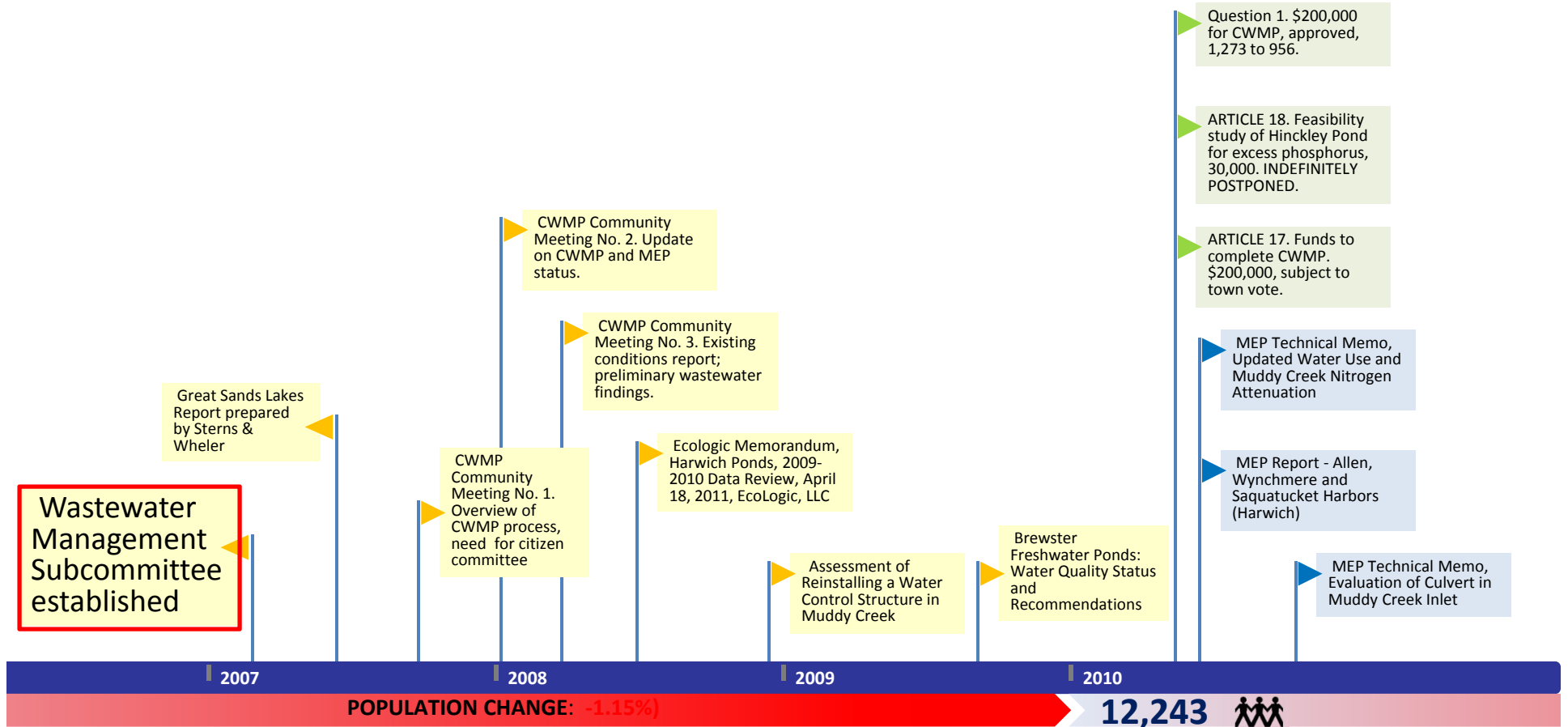
▶ Section 208 Areawide Plan for Cape Cod Approved



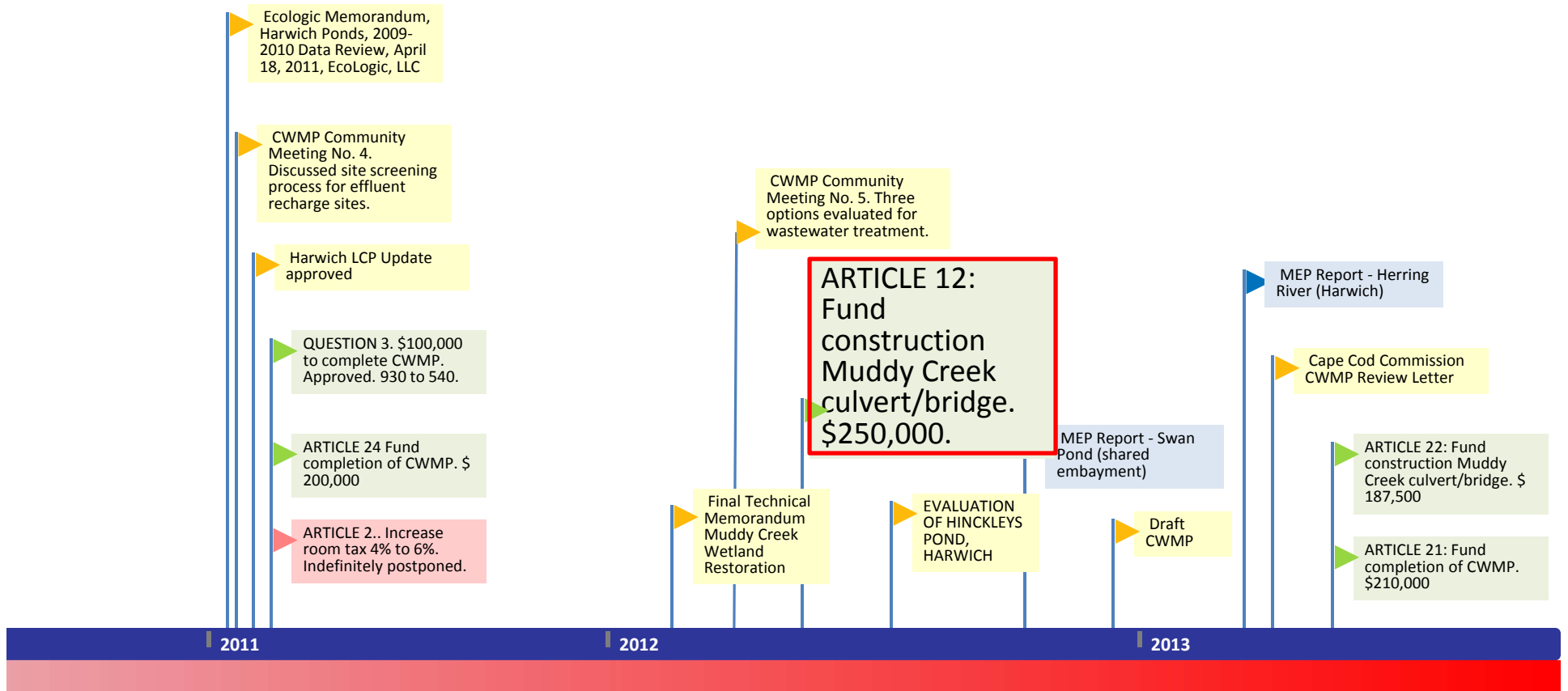
Harwich: 1970-2013



Harwich: 1970-2013



Harwich: 1970-2013

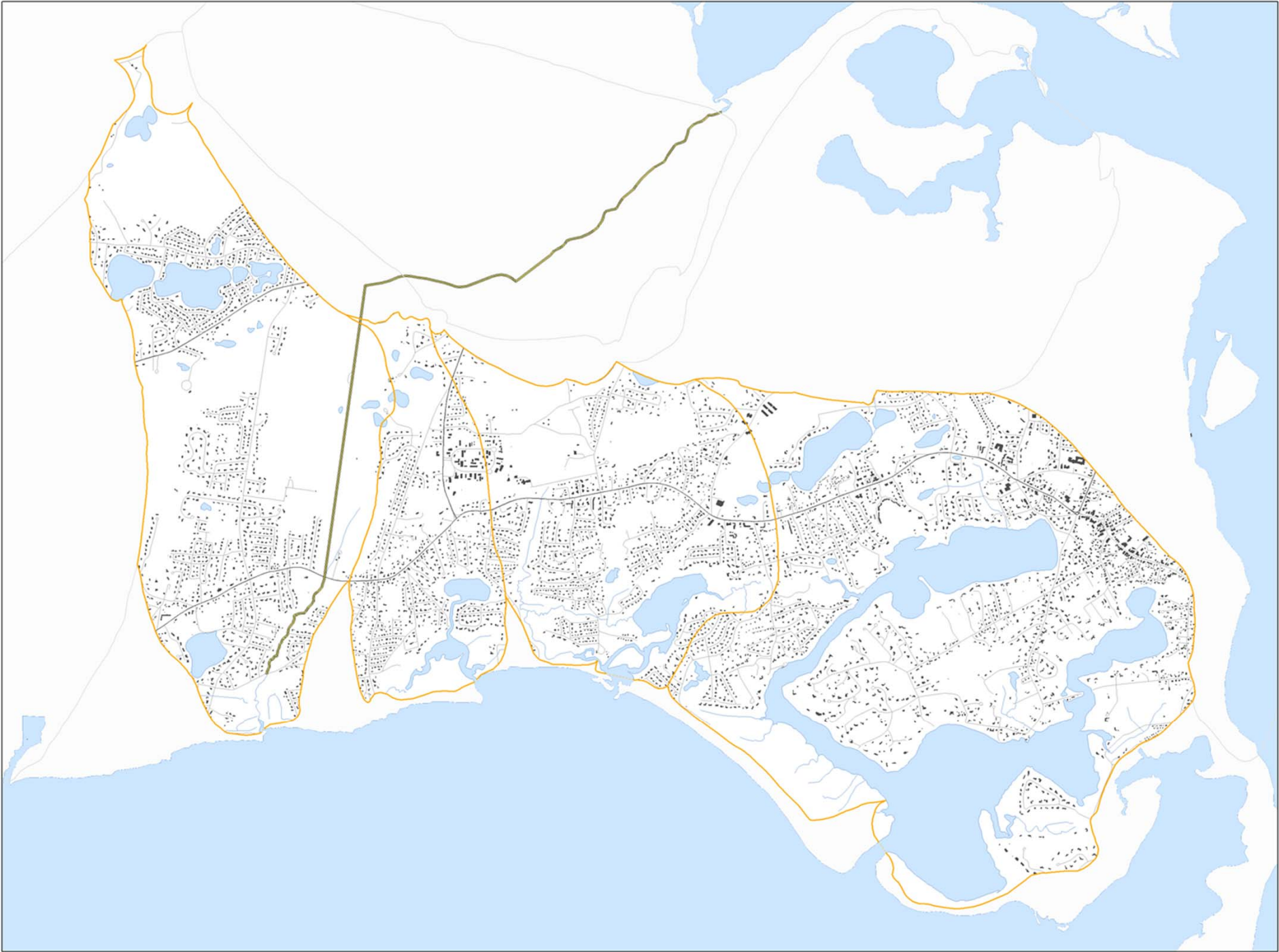


Did we miss anything?

Your Watersheds

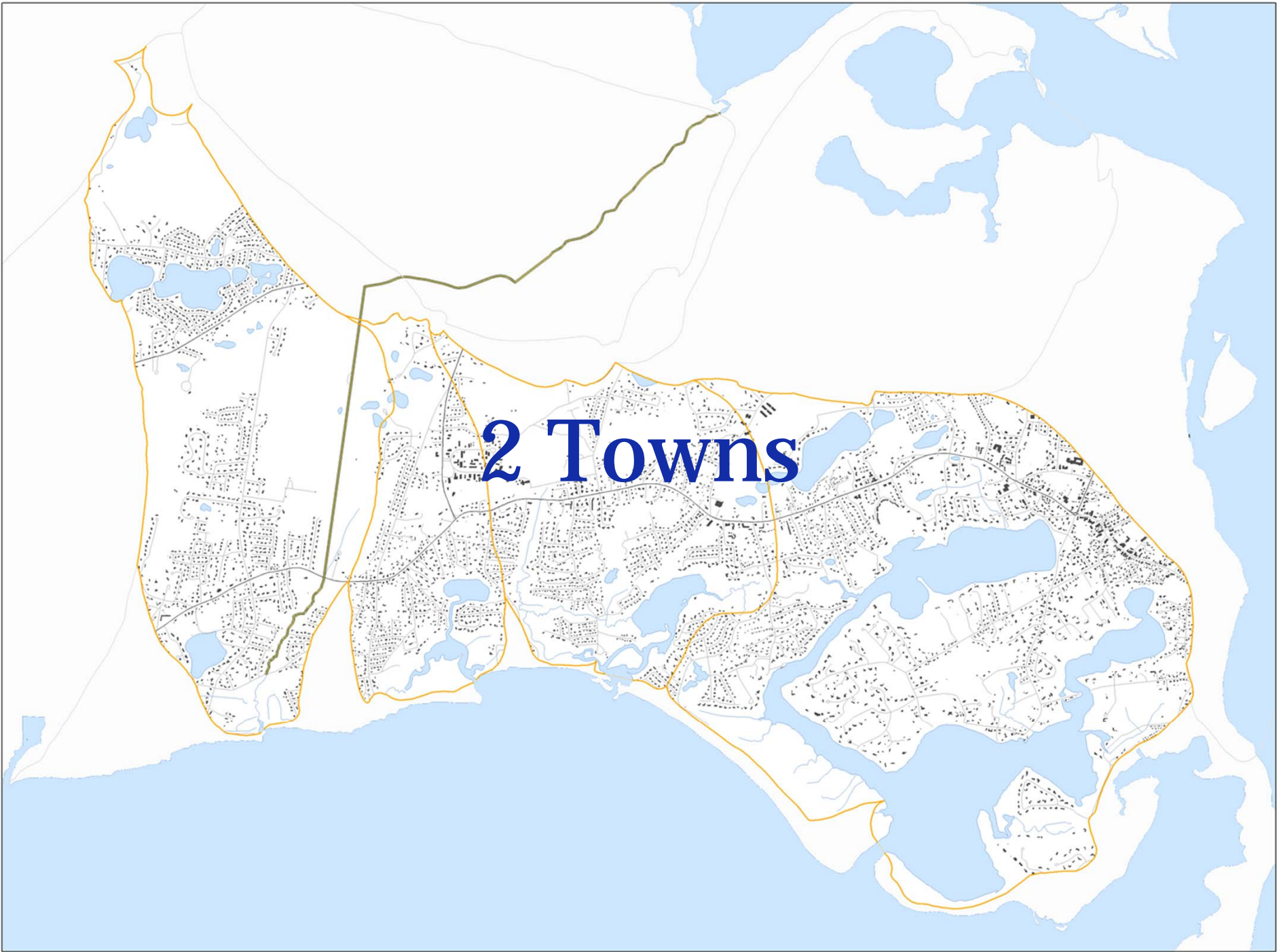


**Red River
Stage Harbor
Sulfur Springs/Bucks Creek
Taylors Pond/Mill Creek**



A map of a coastal region with a highlighted area in orange. The highlighted area contains a dense network of roads and several bodies of water. A dark green line runs along the northern and western boundaries of the highlighted area. The text "8.8 square miles" is overlaid in the center of the highlighted area.


8.8 square miles



2 Towns


Natural Features


Base Map

 Town Lines


 Rivers


Embayment Boundary


 On Land


 On Sea

Major Roads

 US Highway


 State Highway


 Roads


 Structures

 Ponds


Natural Areas


 Natural Heritage & Endangered Species Program (NHESP) Certified Vernal Pools

 Water Table Contours

 Cranberry Bogs


 Wetlands

 Sea, Lake, & Overland Surges from Hurricanes (SLOSH) Update 2013

 Preliminary FEMA Flood Insurance Rate Map (FIRM) Zones 2013


Managed Surfaces


Base Map

 Town Lines


 Rivers


Embayment Boundary


 On Land


 On Sea

Major Roads

 US Highway


 State Highway


 Roads


 Structures


 Ponds

Managed Surfaces

 Approximate Managed Ground Surfaces

 Approximate Residential Managed Lawns

 Approximate Managed Golf Courses

 Approximate Municipal Managed Natural Surfaces


Regulatory


Base Map

 Town Lines


 Rivers


Embayment Boundary

 On Land


 On Sea

Major Roads

 US Highway


 State Highway


 Roads


 Structures

 Ponds


Regulatory


 Areas of Critical Environmental Concern

 DEP Approved Wellhead Protection Areas (Zone IIs)

 Growth Incentive Zone


OpenSpace: Level of Protection


 In Perpetuity

 Limited

 None


Landuse Vision Map


 Economic Center

 Industrial and Service Trade Area

 Village


 Resource Protection Area

 Other

 Undesignated


Land Use Change


Base Map

 Town Lines


 Rivers


Embayment Boundary


 On Land


 On Sea

Major Roads

 US Highway


 State Highway


 Roads


 Structures


 Ponds


LandUse Change

 Residential

 Commercial

 Industrial

 Wooded, Natural, or Wetlands

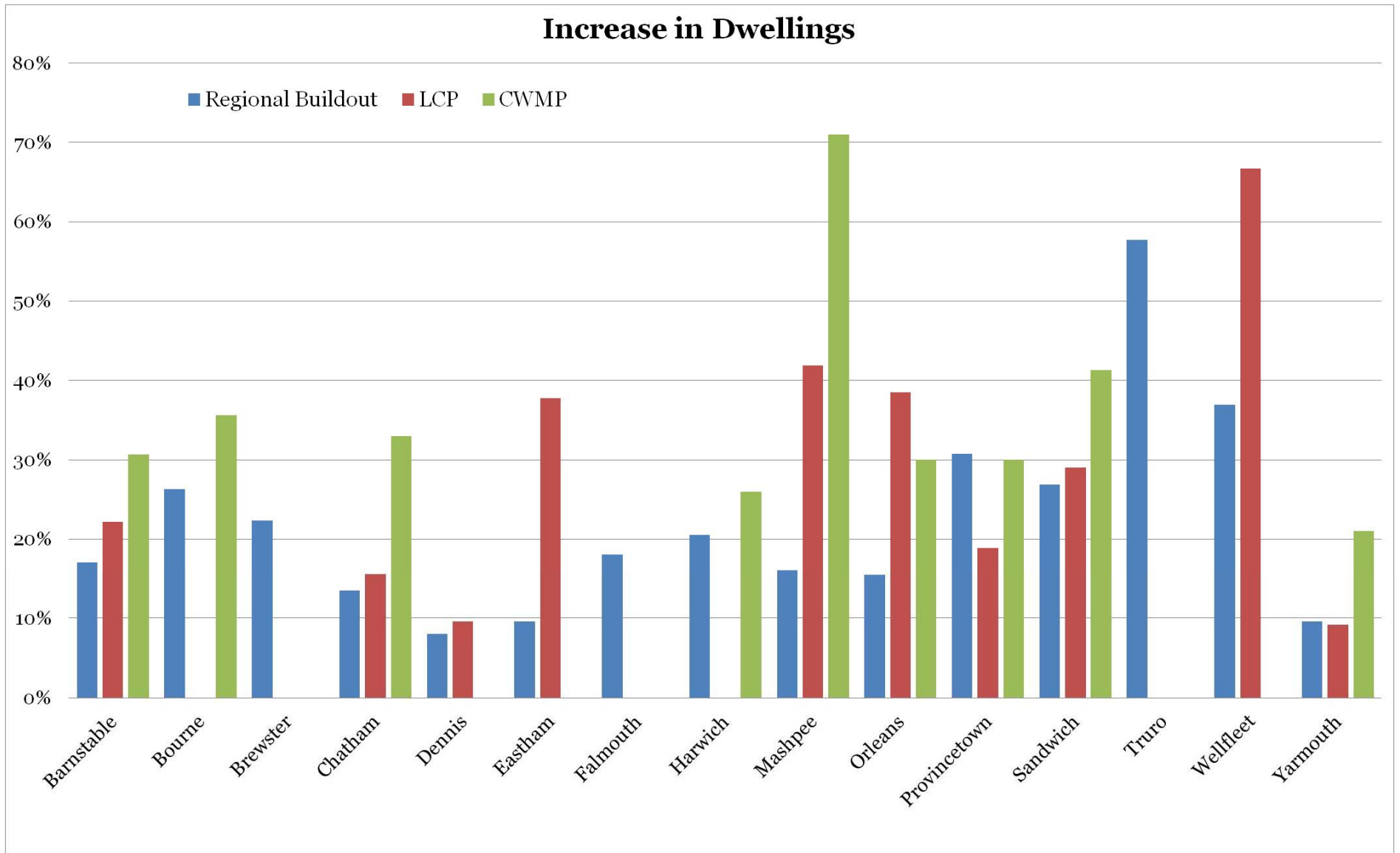
 Open - Disturbed or Managed

 Water

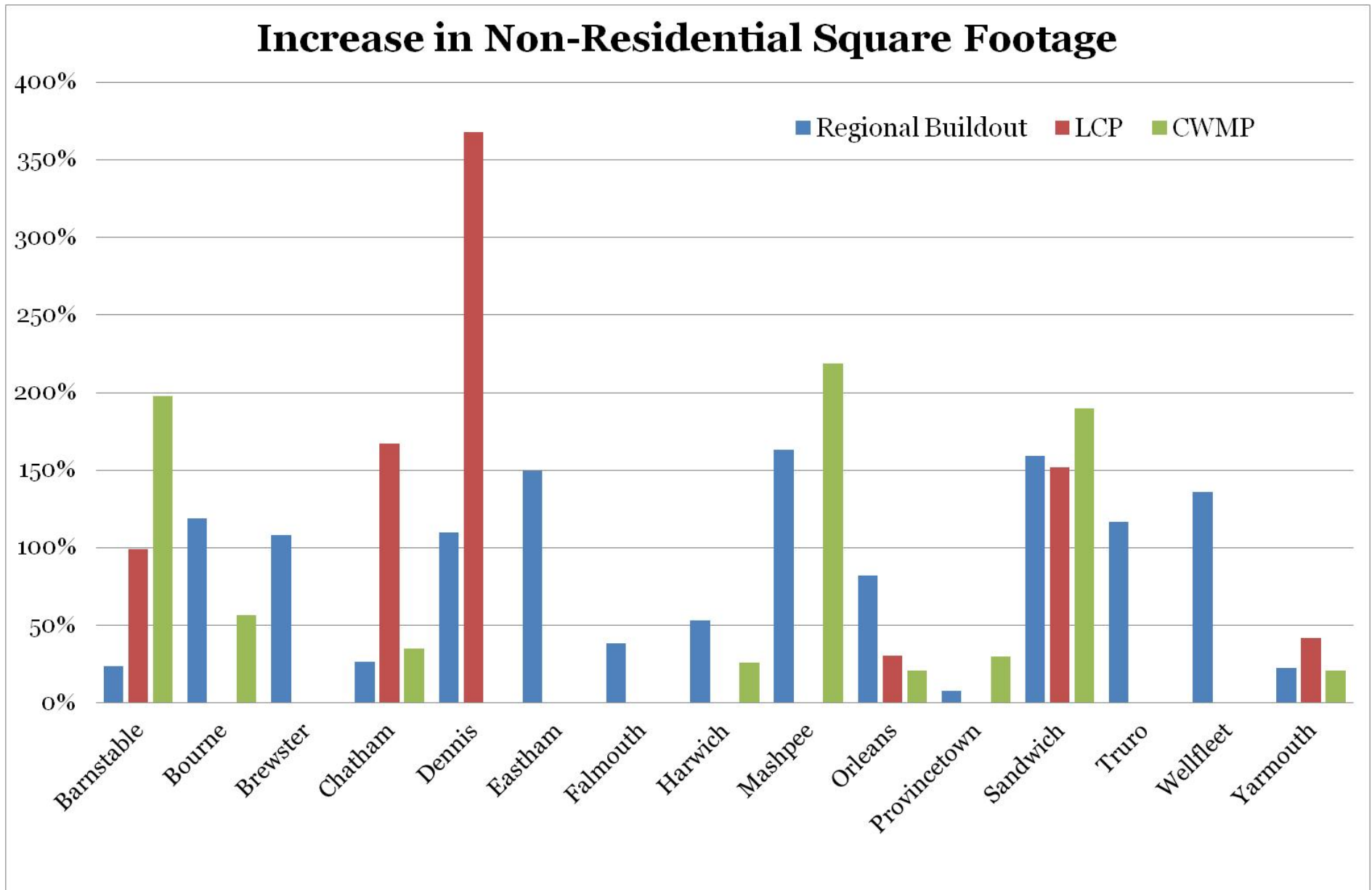
Density

**Cape Wide Cost Estimate:
30% growth will increase
capital costs by 40%**

Buildout



Buildout



The People



**Red River
Stage Harbor
Sulfur Springs/Bucks Creek
Taylors Pond/Mill Creek**

A map of a coastal region, possibly a town or village, showing a network of roads and numerous small blue ponds or lakes. The land is light gray, and the surrounding water is light blue. A thick orange line outlines a specific area within the map, which is the focus of the population data. A dark green line also outlines a larger area. The text 'Total Population (2010) = 4,442' is overlaid in the center in a large, bold, blue font.

Total Population (2010) = 4,442

Population (2010)

2.1% of the Total Cape Cod
Population

1,6
1,4
1,2
1,0
8
6
4
200
-

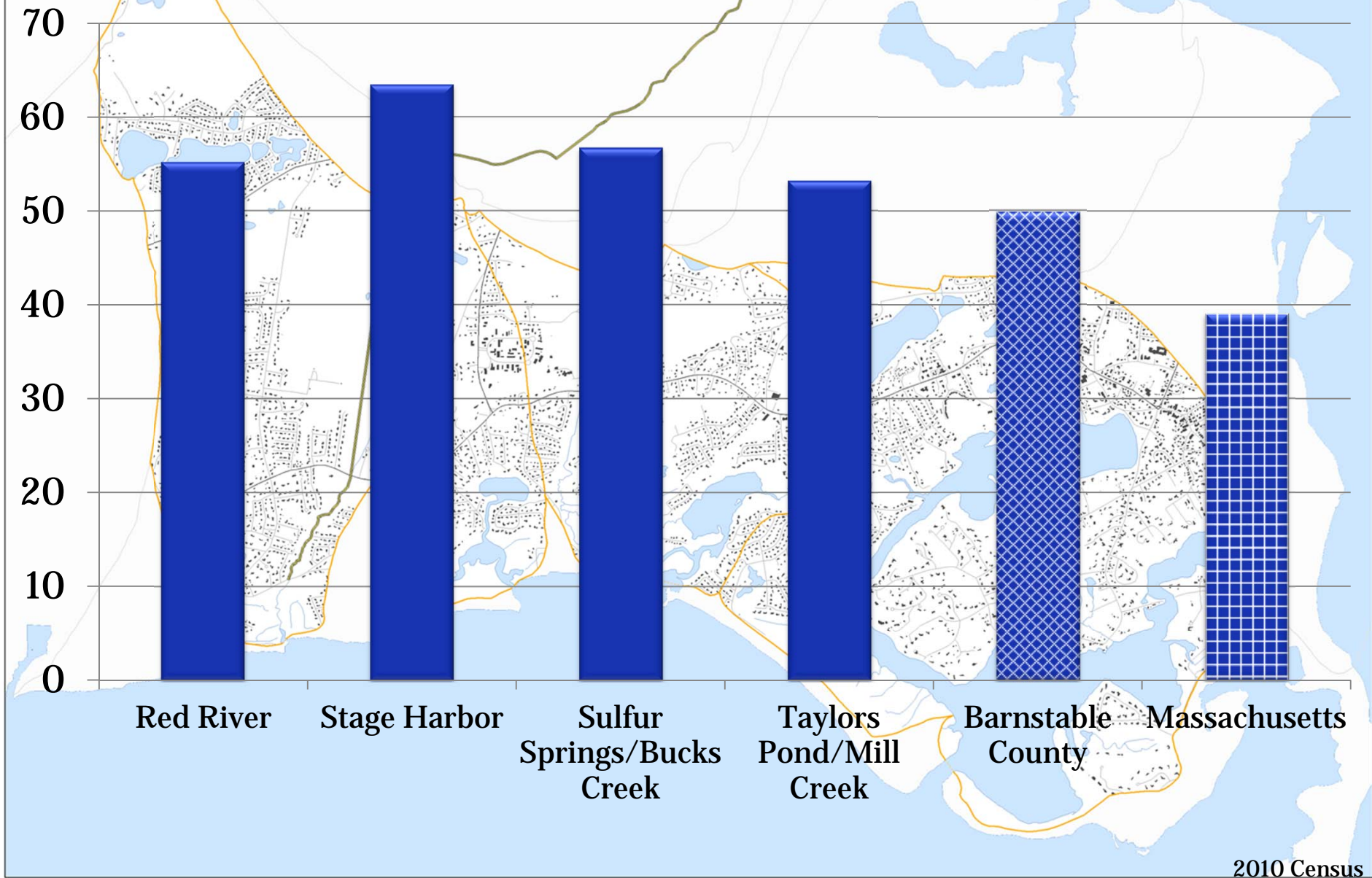
Red River

Stage Harbor

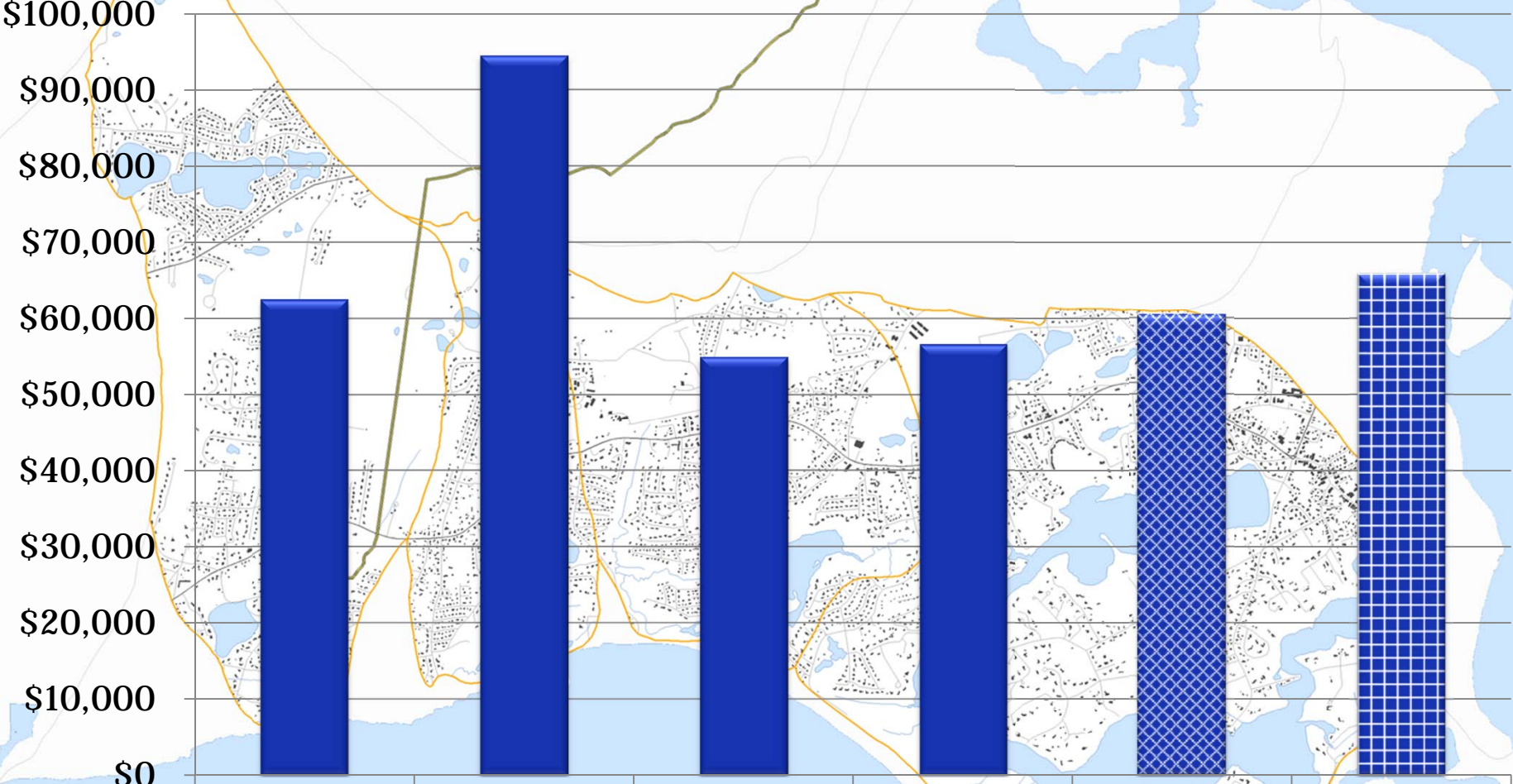
Sulfur Springs/Bucks
Creek

Taylor's Pond/Mill
Creek

Median Age (2010)



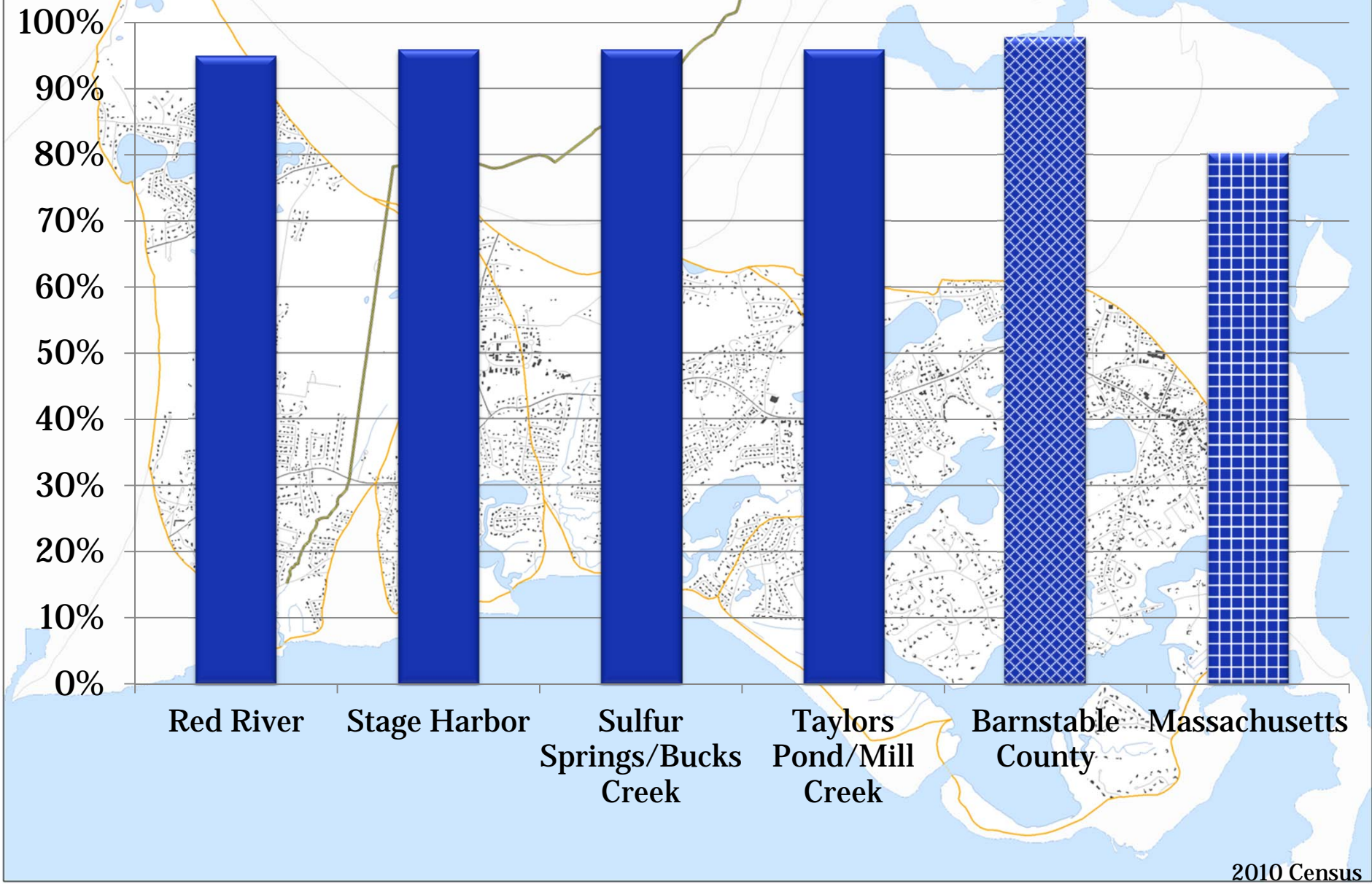
Median Income (2010)



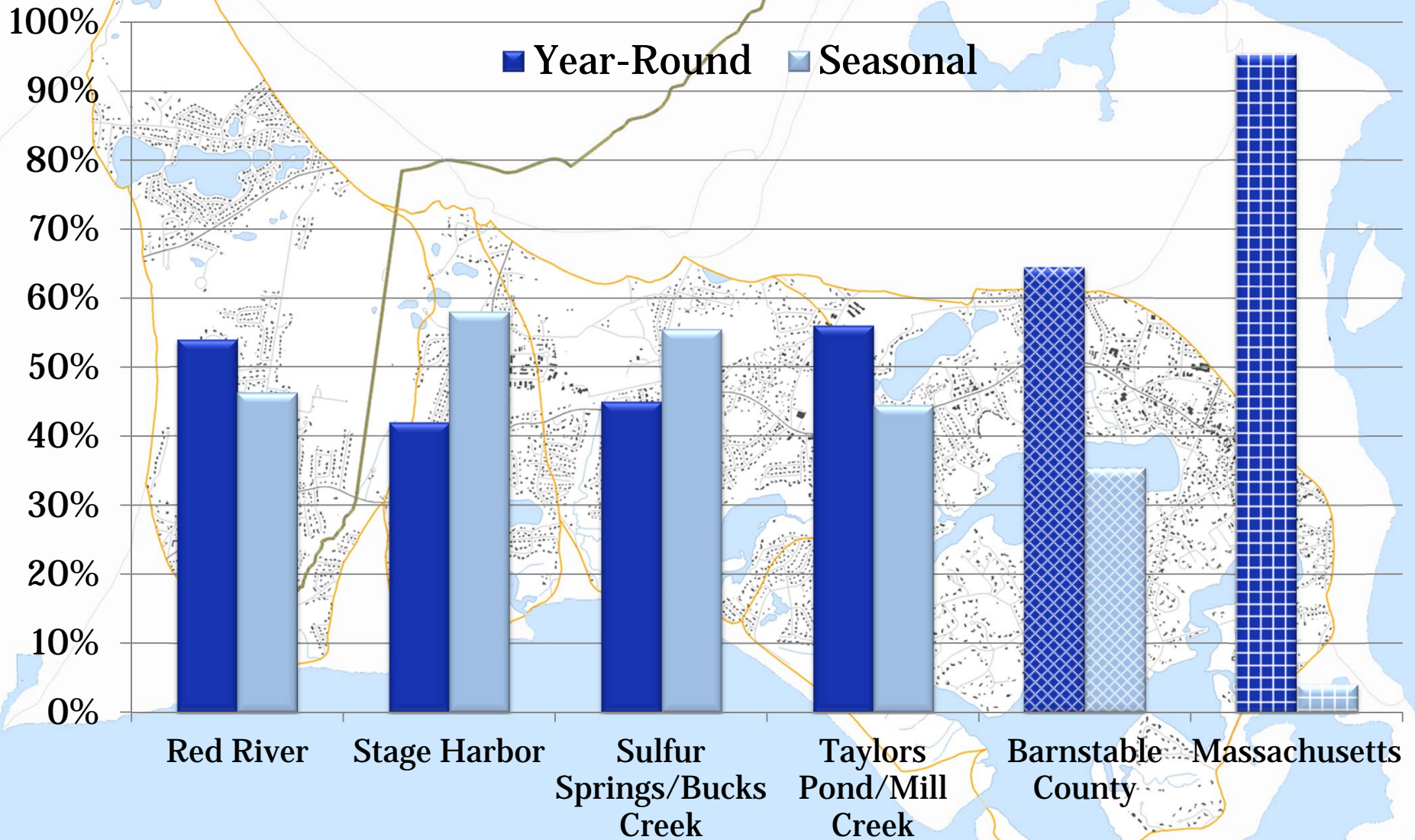
Red River Stage Harbor Sulfur Springs/Bucks Creek Taylors Pond/Mill Creek Barnstable County Massachusetts

American Community Survey

Race - % White (2010)



Seasonal vs. Year Round Housing (2010)



Average Assessed Home Value (2010)

\$1,200,000

\$1,

\$

\$

\$

\$

Total Assessed Value of
Residential Homes=
\$2,936,727,200

\$0

Red River

Stage Harbor

Sulfur
Springs/Bucks
Creek

Taylors
Pond/Mill
Creek

Barnstable
County

Massachusetts

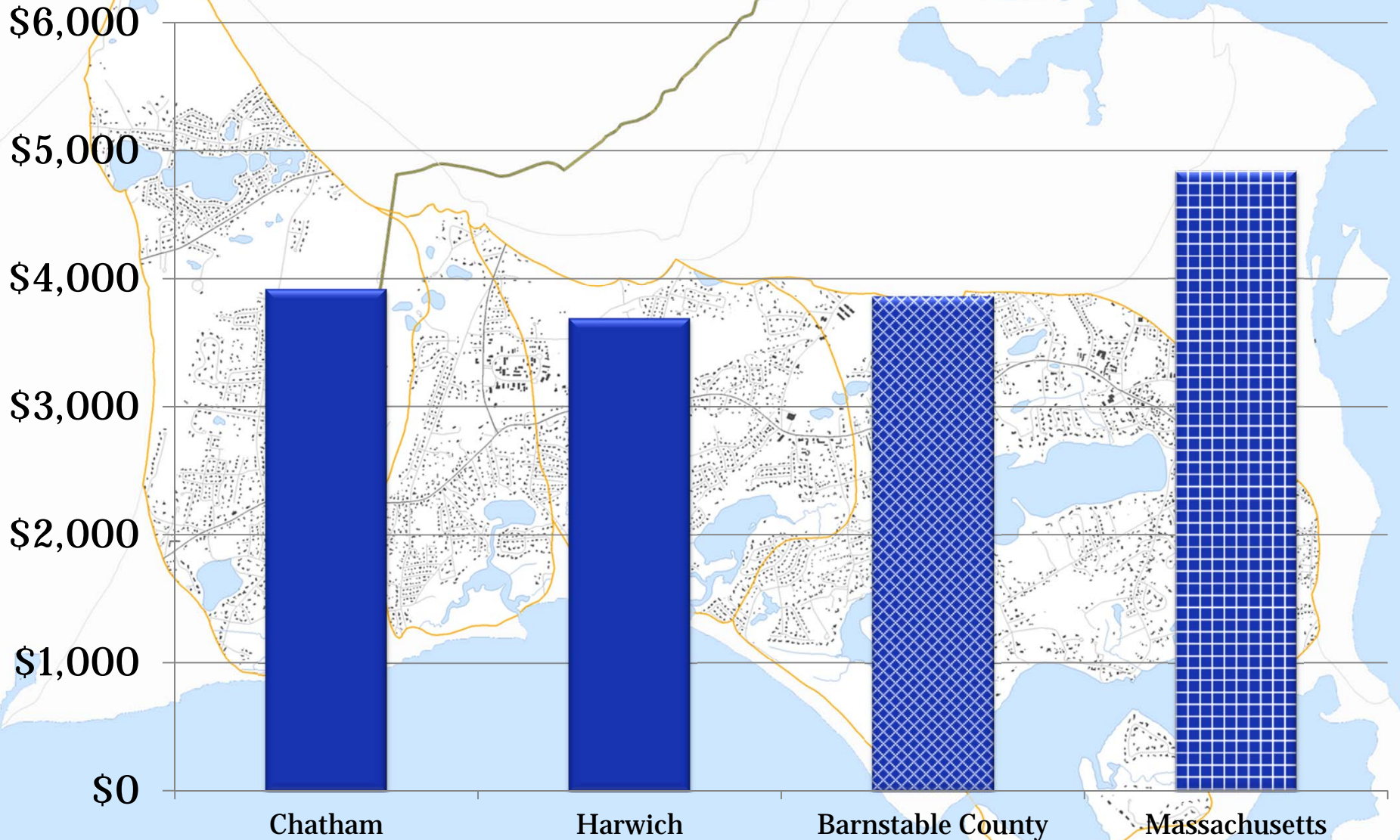
Your Government & Taxes



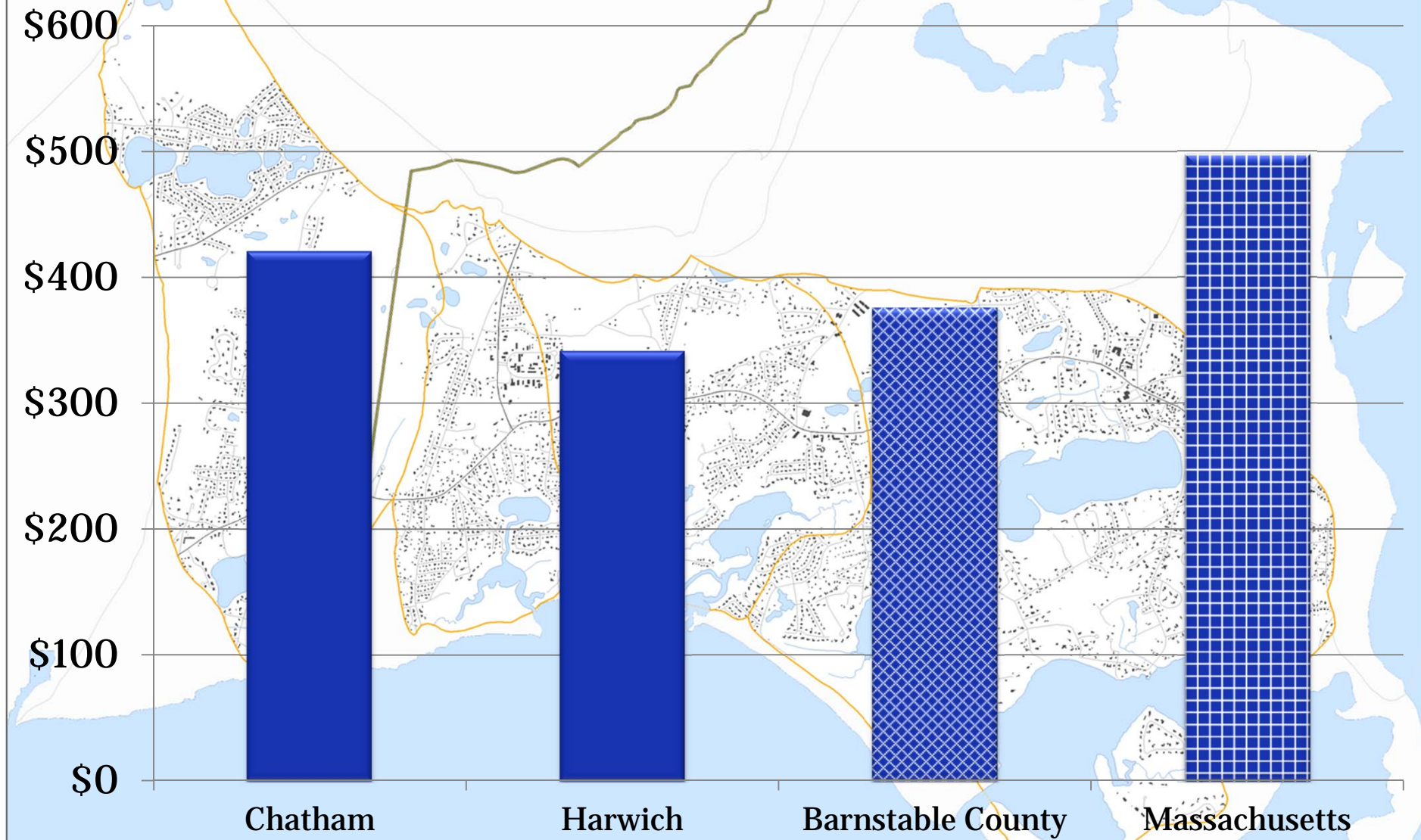
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**Red River
Stage Harbor
Sulfur Springs/Bucks Creek
Taylors Pond/Mill Creek**

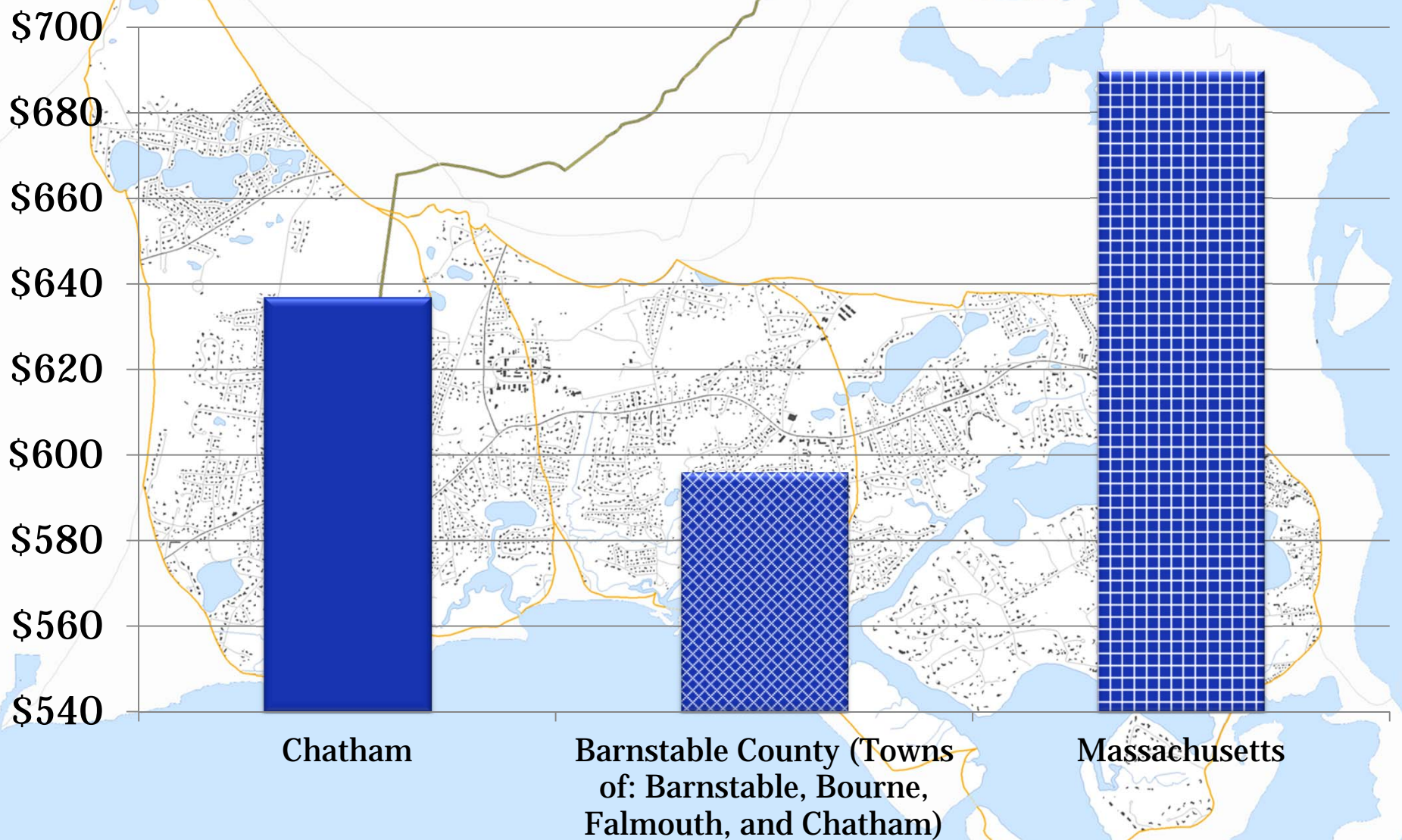
Average Single Family Property Tax Bill (2013)



Average Annual Water Bill (2012)



Average Annual Sewer Bill (2012)



The Problem



**Red River
Stage Harbor
Sulfur Springs/Bucks Creek
Taylors Pond/Mill Creek**



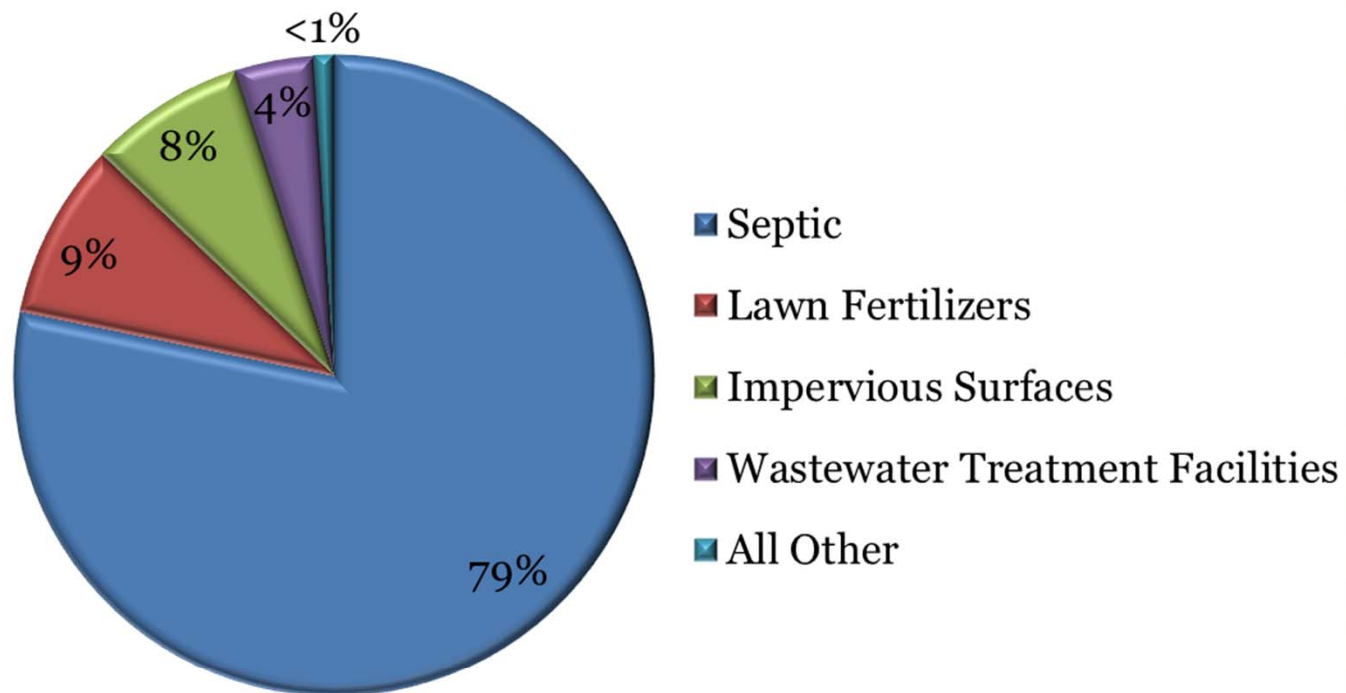
Photo credit: US Army Corps of Engineers



Massachusetts Estuaries Project

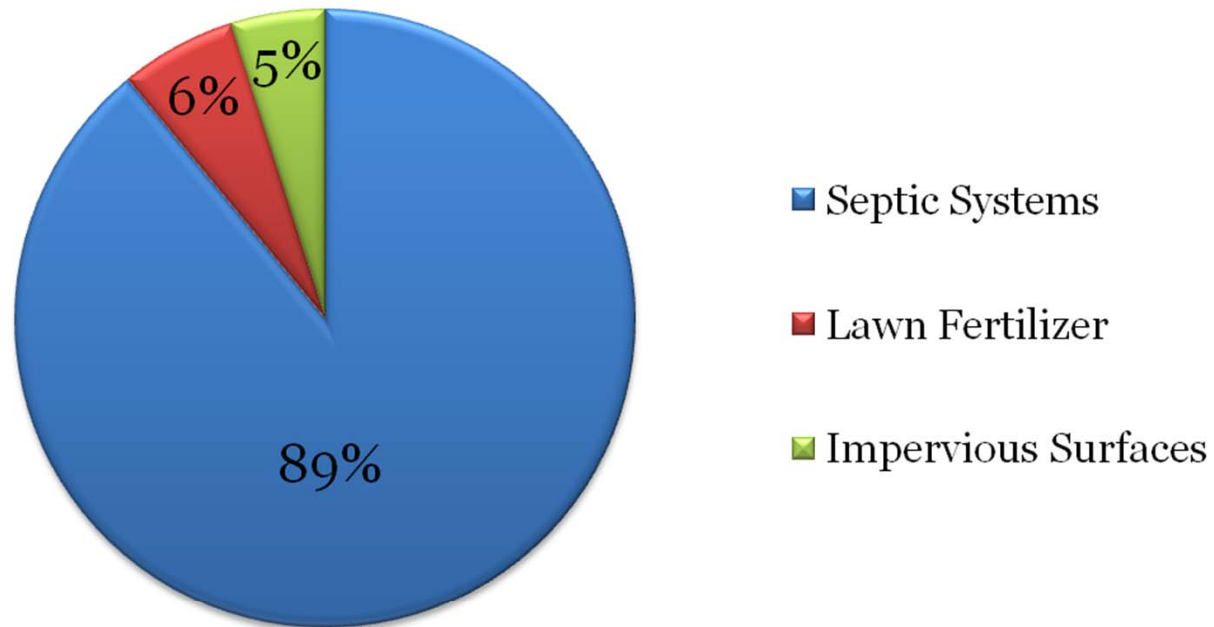
- Opportunity for towns to obtain independent analysis of nitrogen loading and its impact on water quality
- Provides water quality, nutrient loading, and hydrodynamic information
- Water quality monitoring – minimum of 3 years of data for each embayment
- Watershed model links water quality data to nitrogen loads

Cape-Wide Controllable Nitrogen Loads



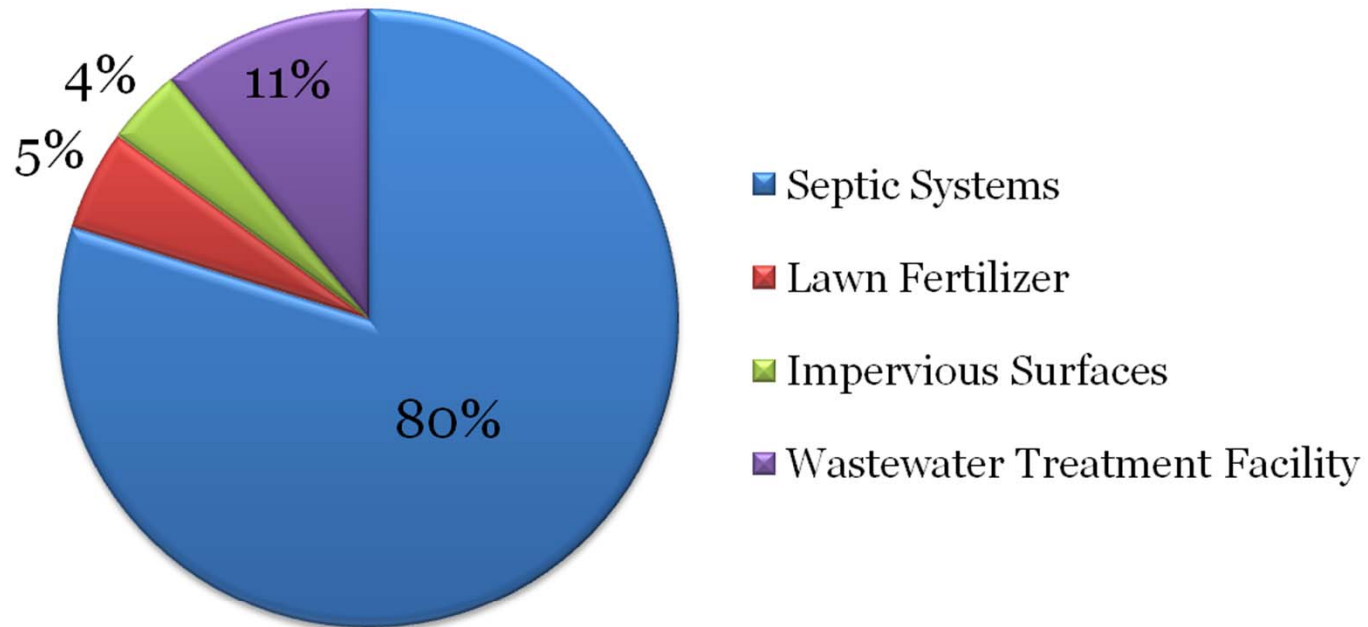
Note: Data averaged from existing Massachusetts Estuaries Project Reports

Stage Harbor Controllable Nitrogen Loads



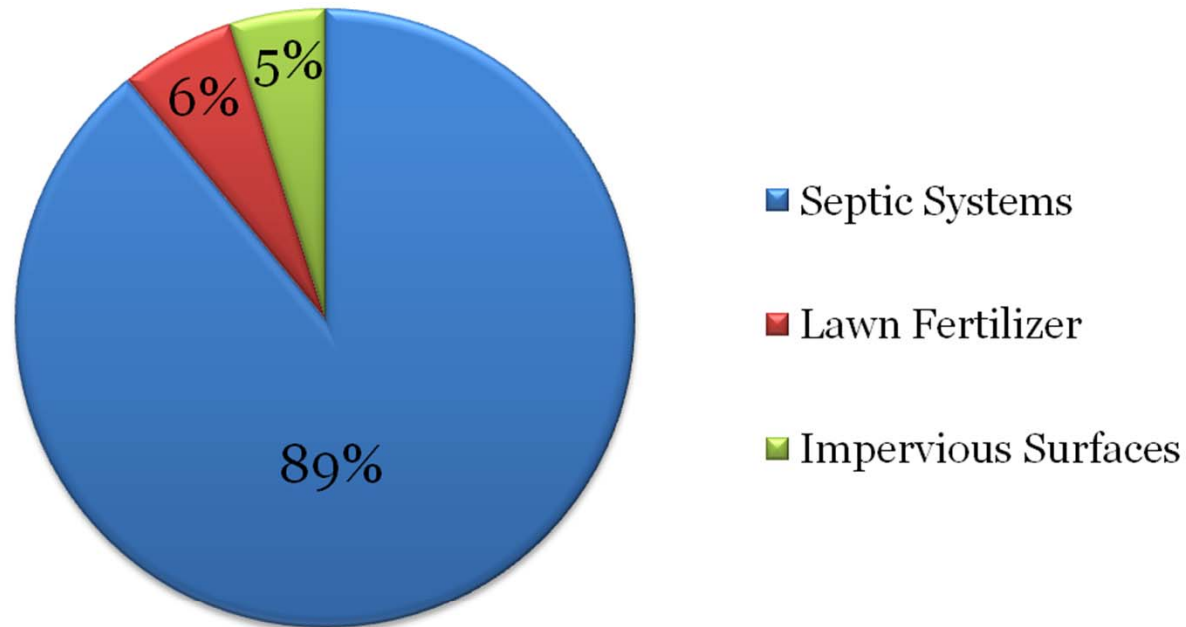
Massachusetts Estuaries Project, Mar 2007

Sulphur Springs/Bucks Creek Controllable Nitrogen Loads



Massachusetts Estuaries Project, Mar 2007


Taylor's Pond/Mill Creek Controllable Nitrogen Loads



Massachusetts Estuaries Project, Mar 2007


Nitrogen Problem


Base Map

 Town Lines


 Rivers


Embayment Boundary

 On Land


 On Sea

Major Roads

 US Highway

 State Highway




 Roads

 Structures

 Ponds

Nitrogen

Ecological Indicators

-  Healthy
-  Healthy/Moderately Impacted
-  Healthy/Significantly Impacted
-  Moderately Impacted
-  Moderately Impacted/Significantly Impacted
-  Significantly Impacted
-  Significantly Impacted/Significantly Degraded
-  Significantly Degraded


Yearly Nitrate Concentration Averages


-  0 - 0.5 mg/l
 -  0.5 - 1 mg/l
 -  1 - 2.5 mg/l
 -  2.5 - 5 mg/l
- in Public Supply Wells**


Embayments with Removal Target


Total NLoad Percent Removal

0 %

 1 - 52 %


 53 - 72 %


 73 - 86 %


 87 - 100 %


Subwatersheds with Removal Target


Total NLoad Percent Removal

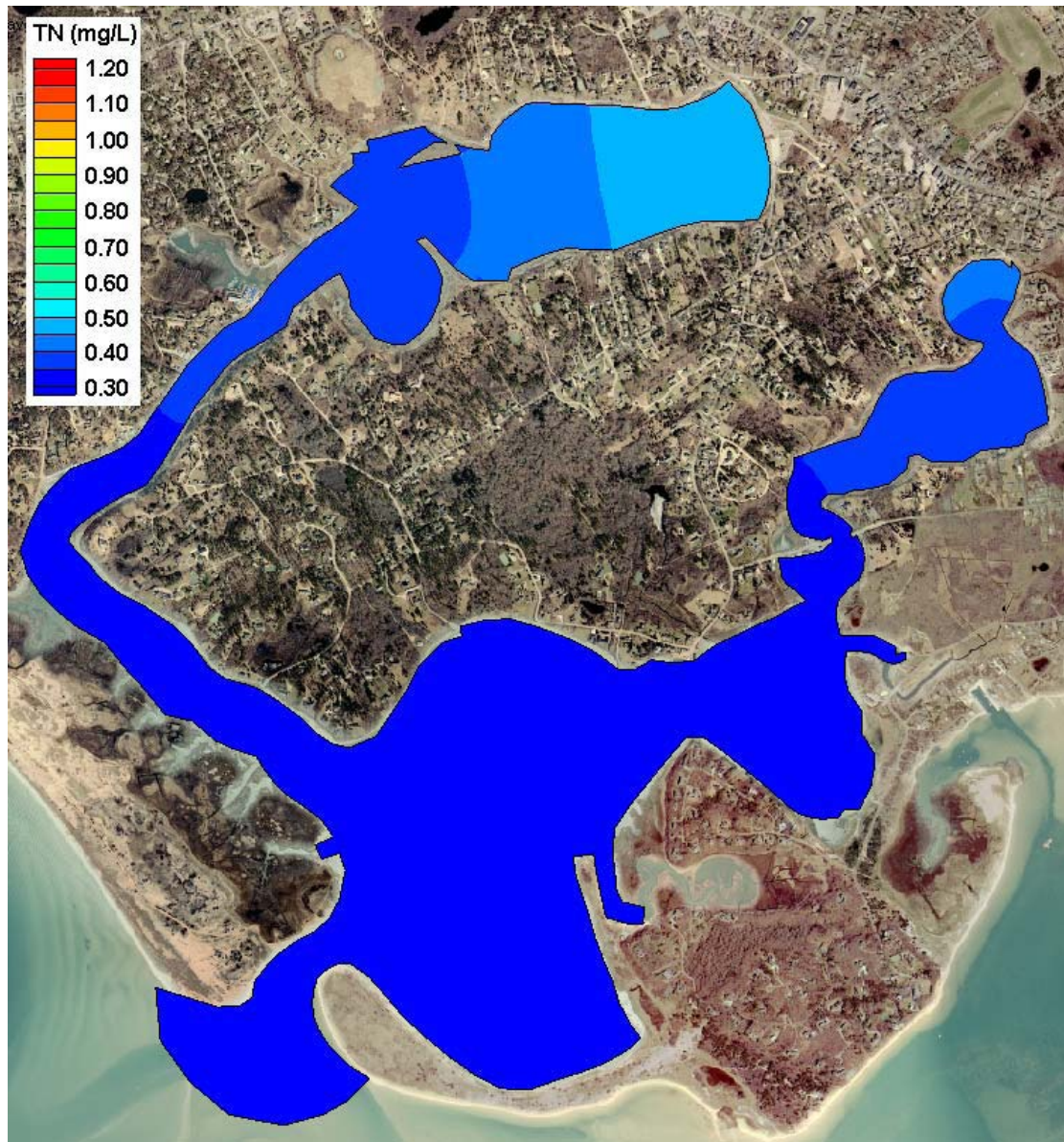
 0.1 % - 9%

 9.1 % - 38 %

 38.1 % - 62 %

 62.1 % - 86 %

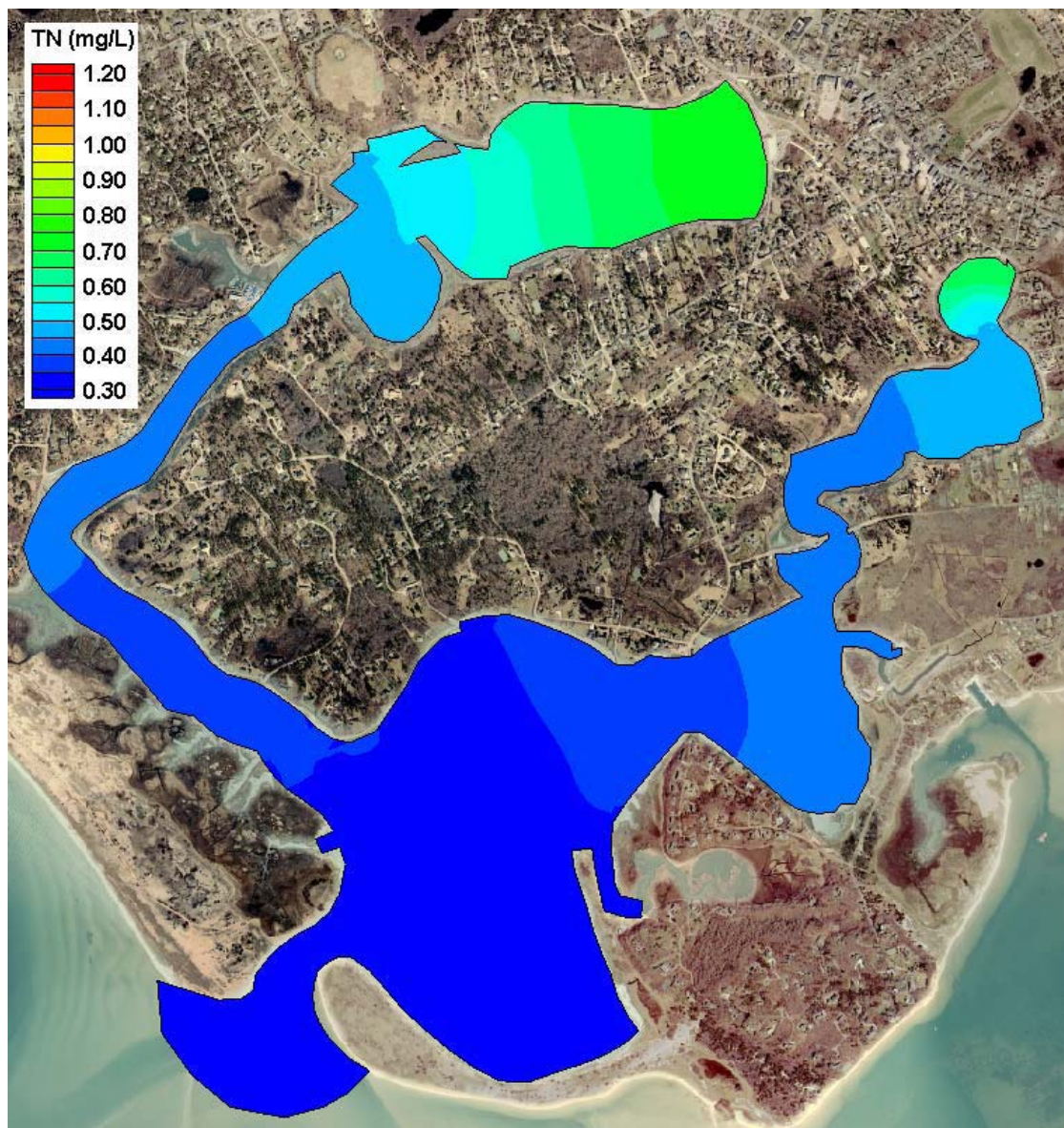
 86.1 % - 100%



Contour Plot of modeled **total nitrogen concentrations (mg/L)** in the Stage Harbor system, for no anthropogenic loading conditions.

(Source: MEP 2007)

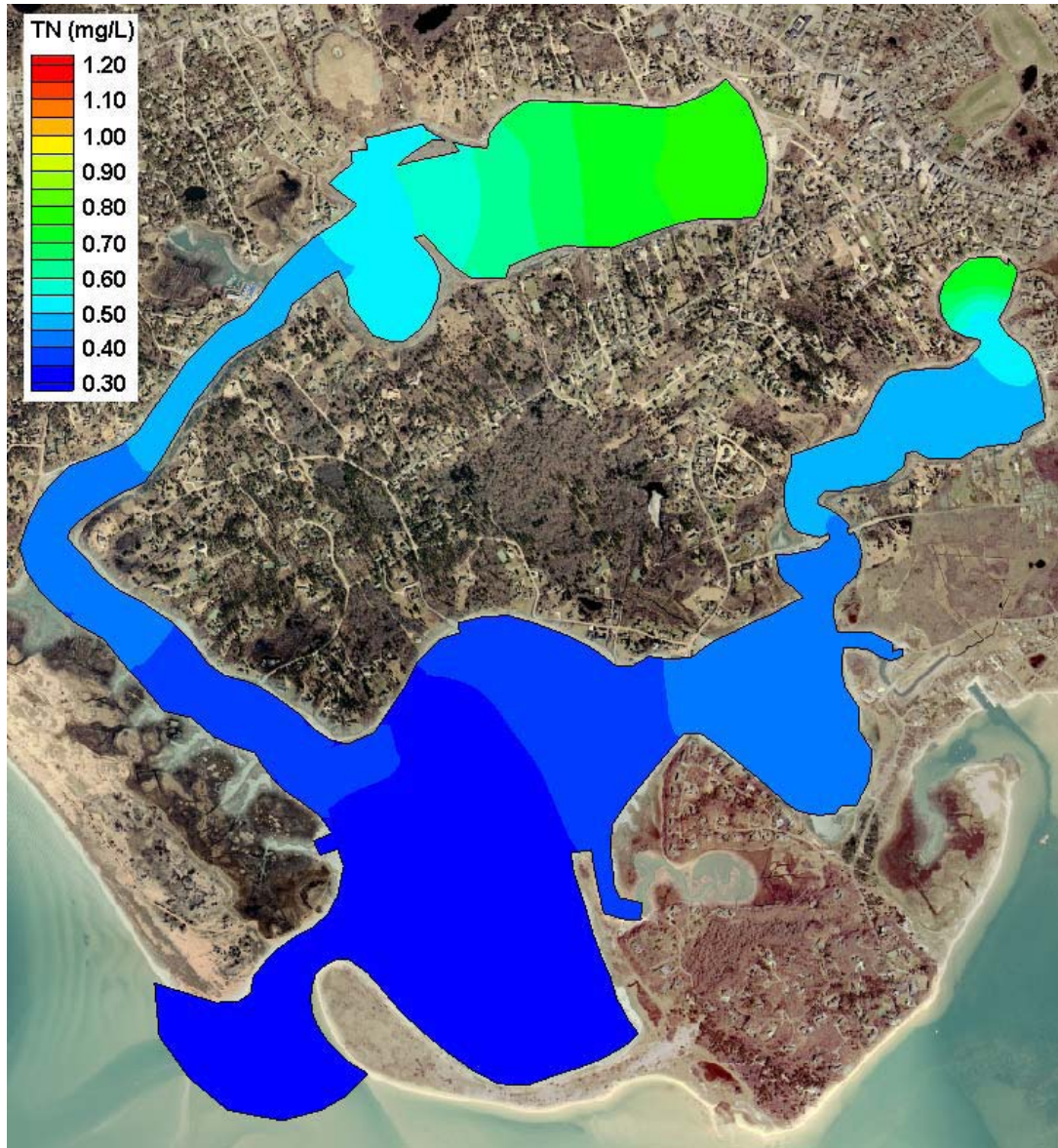
Pre-Colonial Conditions: Stage Harbor



Contour plot of **average total nitrogen concentrations** from results of the present conditions loading scenario, for the Stage Harbor system.

(Source: MEP 2007)

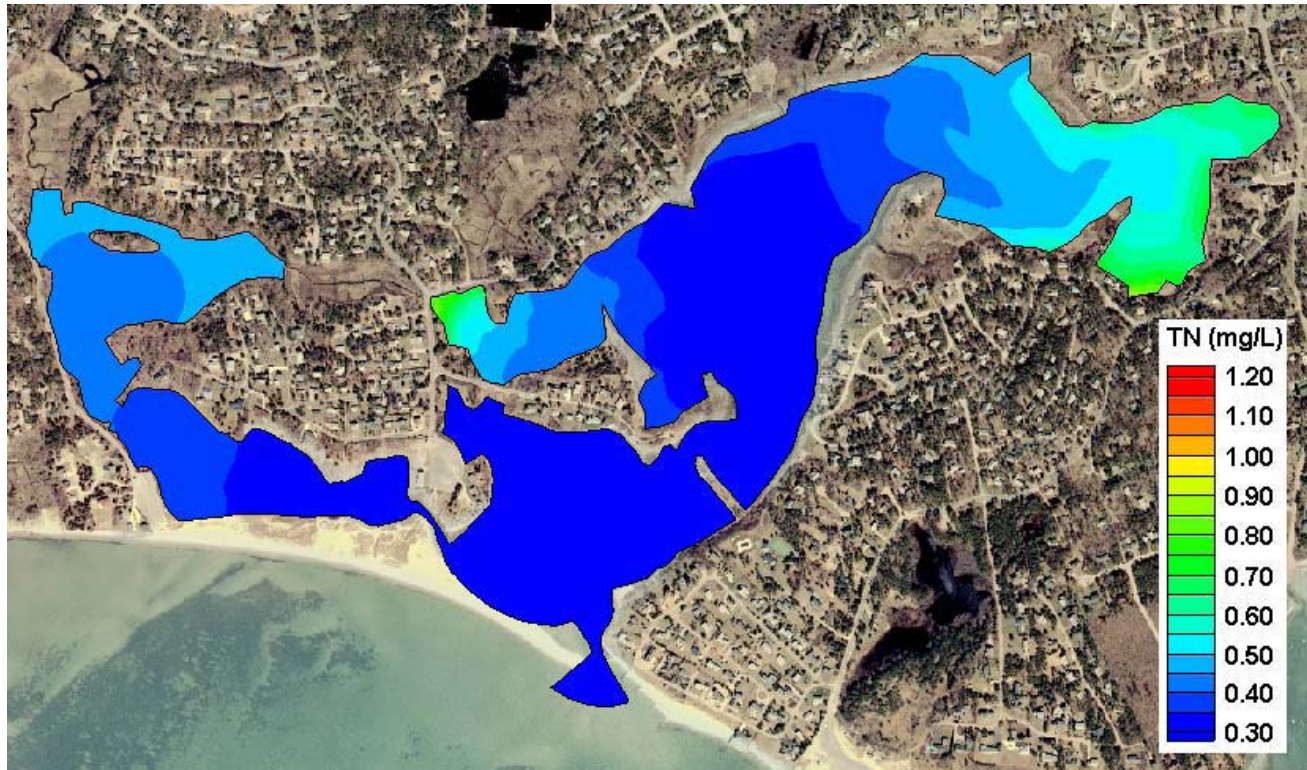
Present Conditions: Stage Harbor



Contour Plot of **modeled total nitrogen concentrations (mg/L)** in the Stage Harbor system, for projected build out loading conditions.

(Source: MEP 2007)

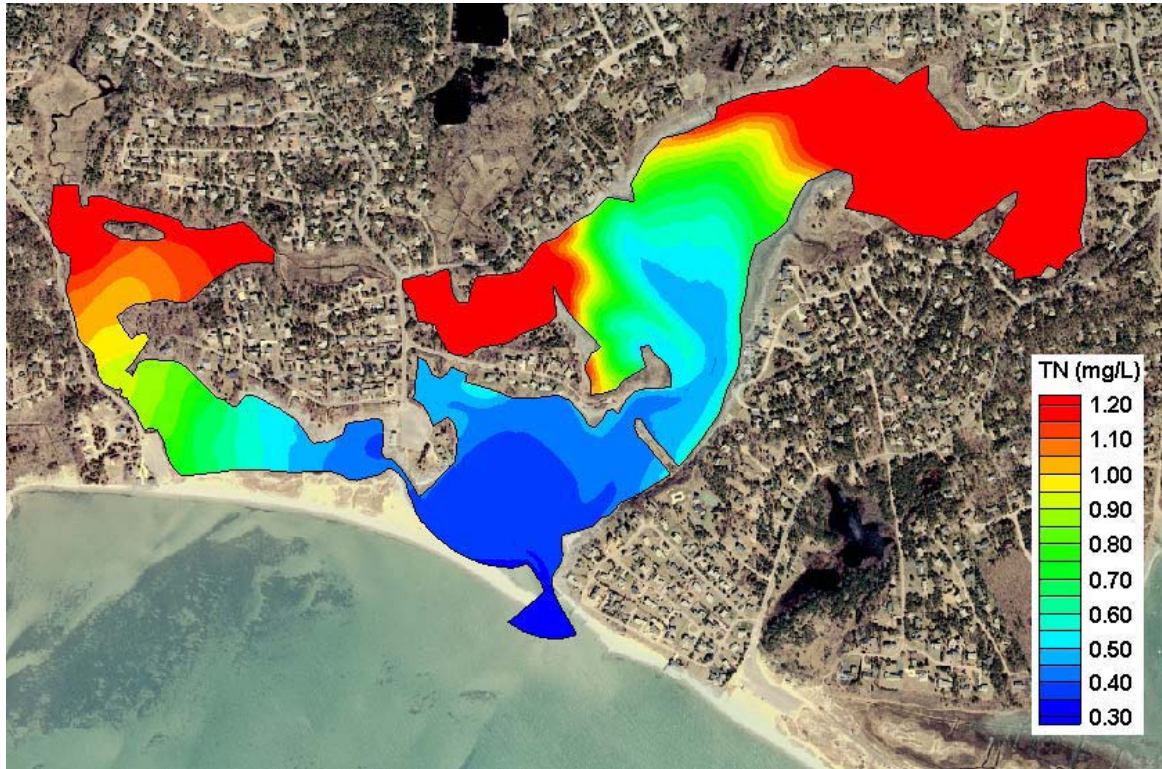
Build-out Conditions: Stage Harbor



Contour Plot of **modeled total nitrogen concentrations (mg/L)** in the Sulphur Springs/Cockle Cove Creek system, for no anthropogenic loading conditions.

(Source: MEP 2007)

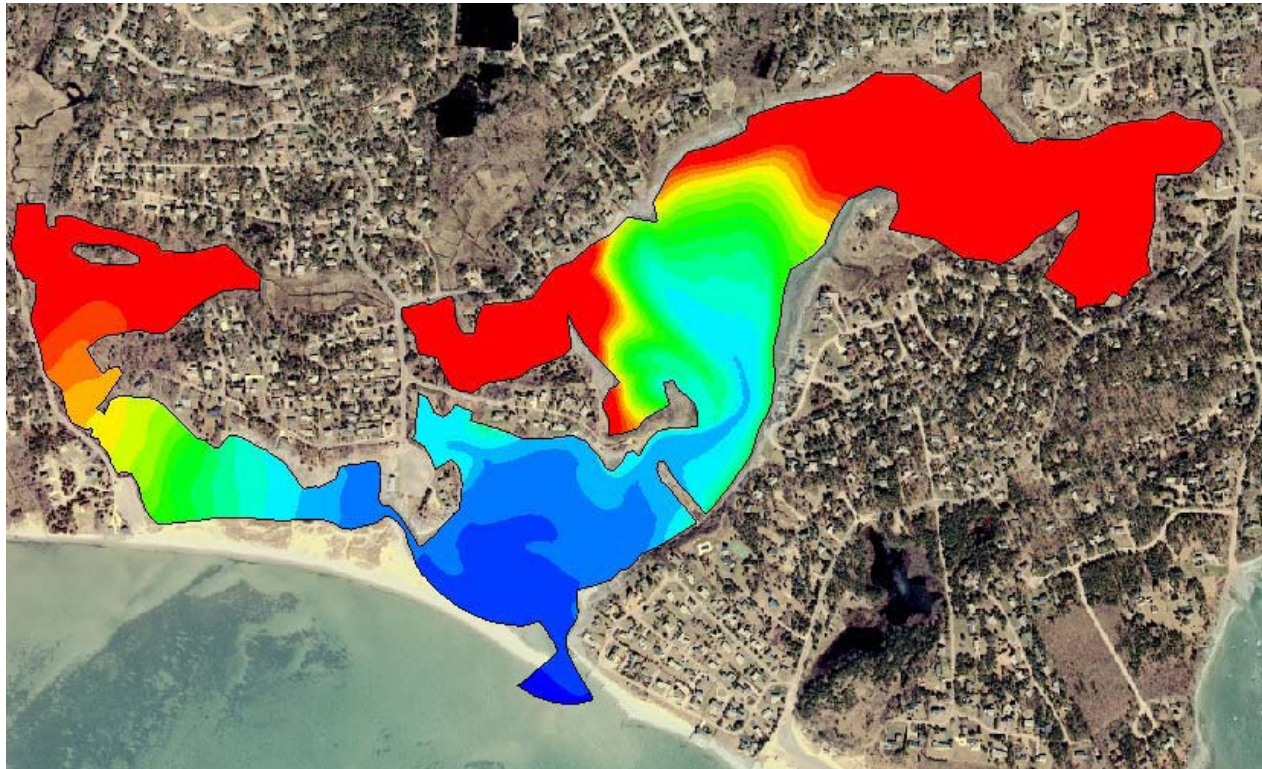
Pre-Colonial Conditions: Sulfur Springs/Bucks Creek



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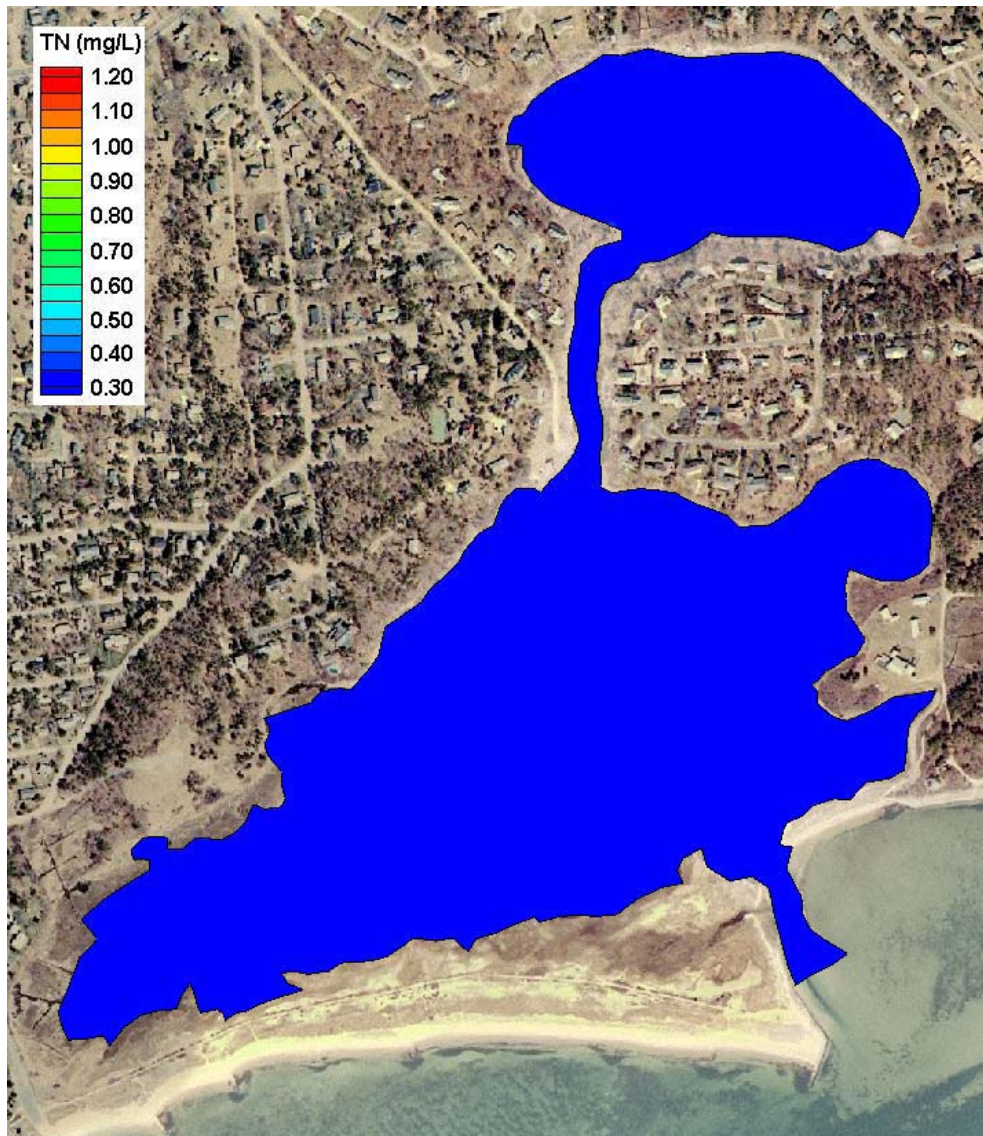
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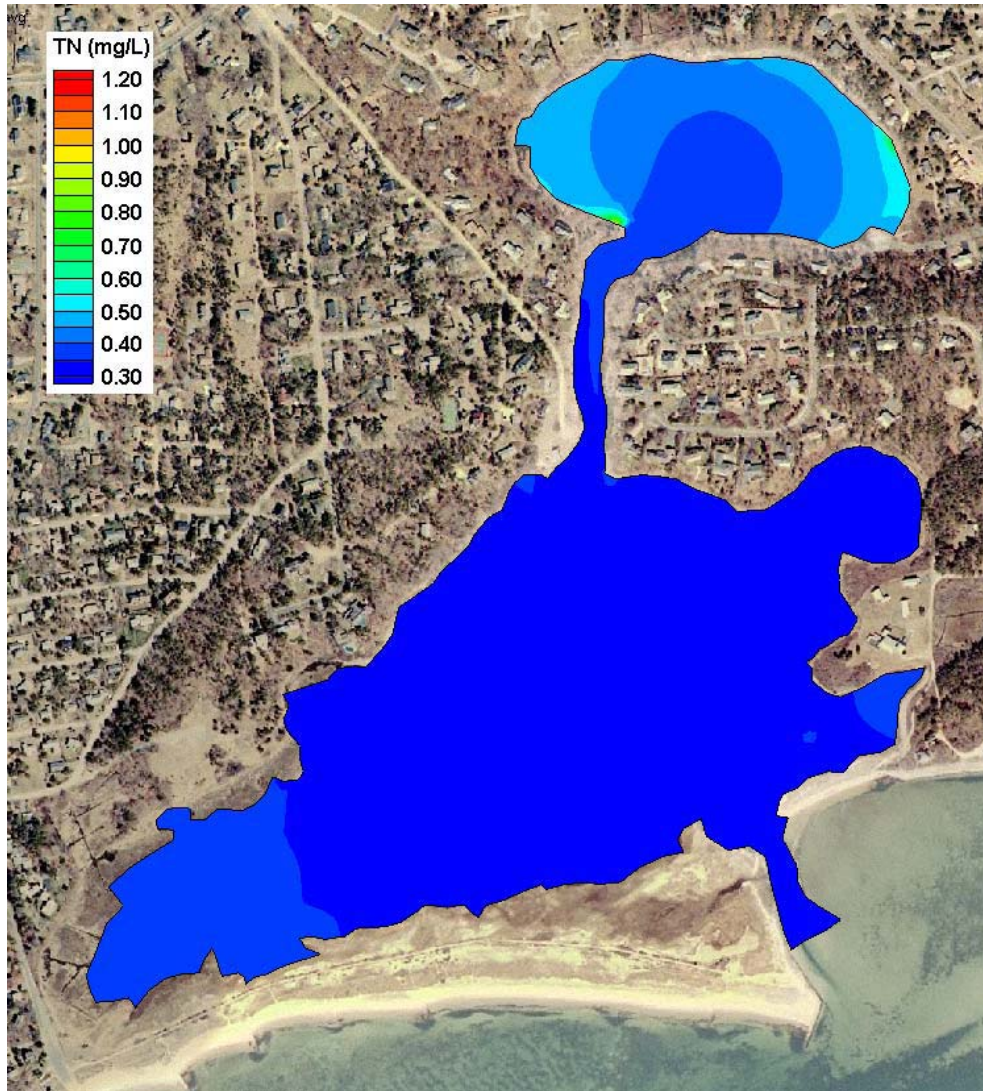
Build-out Conditions: Sulfur Springs/Bucks Creek



Contour Plot of **modeled total nitrogen concentrations (mg/L)** in the Taylor's Pond/Mill Creek system, for no anthropogenic loading conditions.

(Source: MEP 2007)

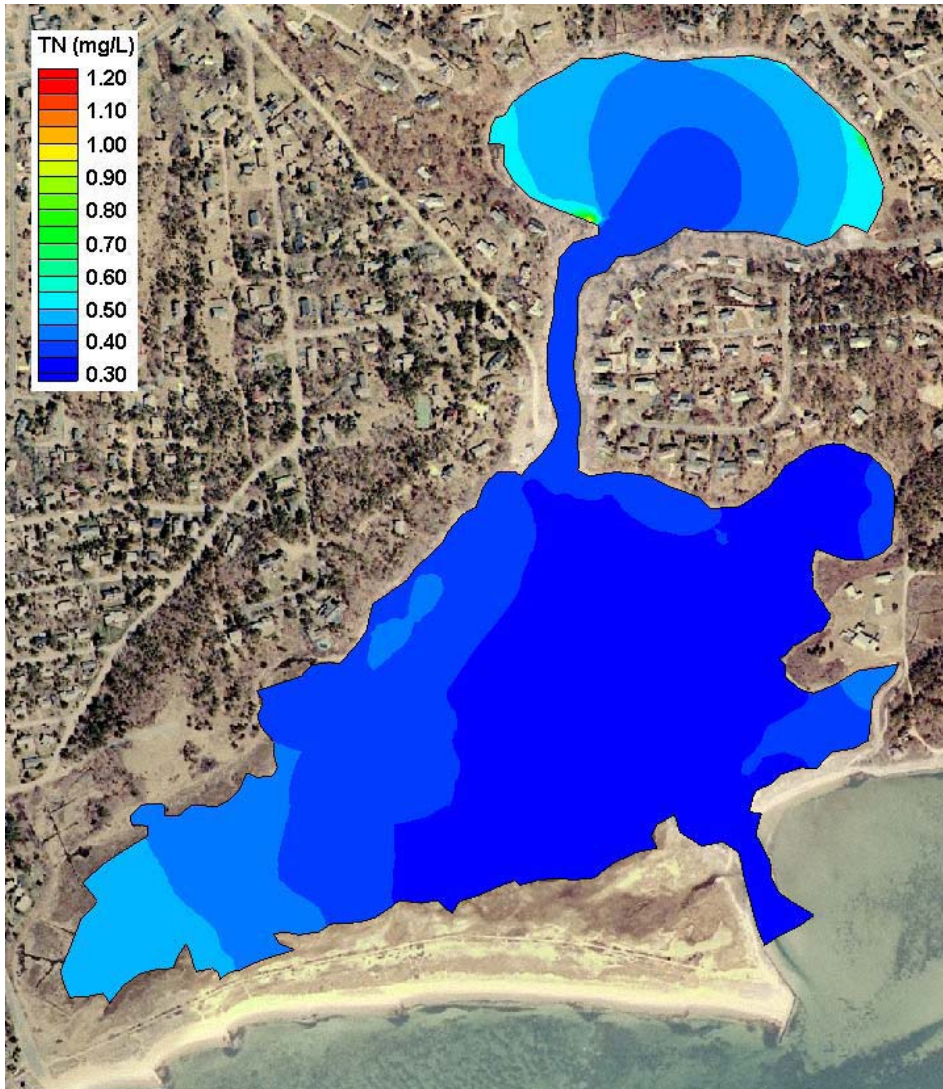
Pre-Colonial Conditions: Taylor's Pond/Mill Creek



Contour Plot of **modeled total nitrogen concentrations (mg/L)** in the Taylors Pond/Mill Creek system, for present loading conditions.

(Source: MEP 2007)

Present Conditions: Taylors Pond/Mill Creek




Contour Plot of **modeled total nitrogen concentrations (mg/L)** in the Taylors Pond/Mill Creek system, for projected build out loading conditions.

(Source: MEP 2007)

Build-out Conditions: Taylors Pond/Mill Creek


Nitrogen Problem


Base Map

 Town Lines


 Rivers


Embayment Boundary

 On Land


 On Sea

Major Roads

 US Highway

 State Highway






 Roads

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 Ponds

Nitrogen

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Eelgrass Extent


Base Map

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 Rivers


Embayment Boundary


 On Land


 On Sea

Major Roads

 US Highway


 State Highway

 Roads

 Structures


 Ponds

Eelgrass

 Eelgrass Extent


Phosphorus Problem


Base Map

 Town Lines


 Rivers


Embayment Boundary

 On Land


 On Sea

Major Roads

 US Highway

 State Highway

 Roads


 Structures


 Ponds


Phosphorus


Priority Ponds

Trophic Status

 Eutrophic *Most Impacted*


 Mesotrophic

 Oligotrophic *Least Impacted*

 Not Interpreted


Title 5 Compliance Issues


Base Map

 Town Lines


 Rivers


Embayment Boundary


 On Land


 On Sea

Major Roads

 US Highway


 State Highway


 Roads

 Structures


 Ponds


Existing Conditions

 Approx. Locations of Loans Issued for Title 5 Repair

 Potential Title 5 Compliance Issues

 Wastewater Treatment Facility

 Groundwater Discharge Points

 Sewered Parcels

Existing & Proposed Solutions



**Red River
Stage Harbor
Sulfur Springs/Bucks Creek
Taylors Pond/Mill Creek**


Existing Infrastructure


Base Map

 Town Lines


 Rivers


Embayment Boundary


 On Land


 On Sea

Major Roads

 US Highway


 State Highway


 Roads


 Structures


 Ponds


Existing Conditions

 Approx. Locations of Loans Issued for Title 5 Repair

 Potential Title 5 Compliance Issues


 Wastewater Treatment Facility

 Groundwater Discharge Points


 Sewered Parcels

Enhanced Attenuation Sites

 Pipe


 Stormwater


Public Supply Wells

 Public Water Supply Well

 Small Volume Wells, Non-Transient


 Proposed Public Water Supply Well

 Surface Water Supply

 Small Volume Wells, Transient


Proposed Infrastructure


Base Map

 Town Lines


 Rivers


Embayment Boundary

 On Land


 On Sea

Major Roads

 US Highway

 State Highway

 Roads


 Structures

 Ponds

Proposed Conditions


Natural Attenuation Sites


 Bridge

 Culvert


 Inlet

 Pipe


 Sewer Alternatives


 Stormwater


CWMP Sewershed Phasing


 No Date Set


Phase Date

 2001 - 2010

 2011 - 2020

 2021 - 2030

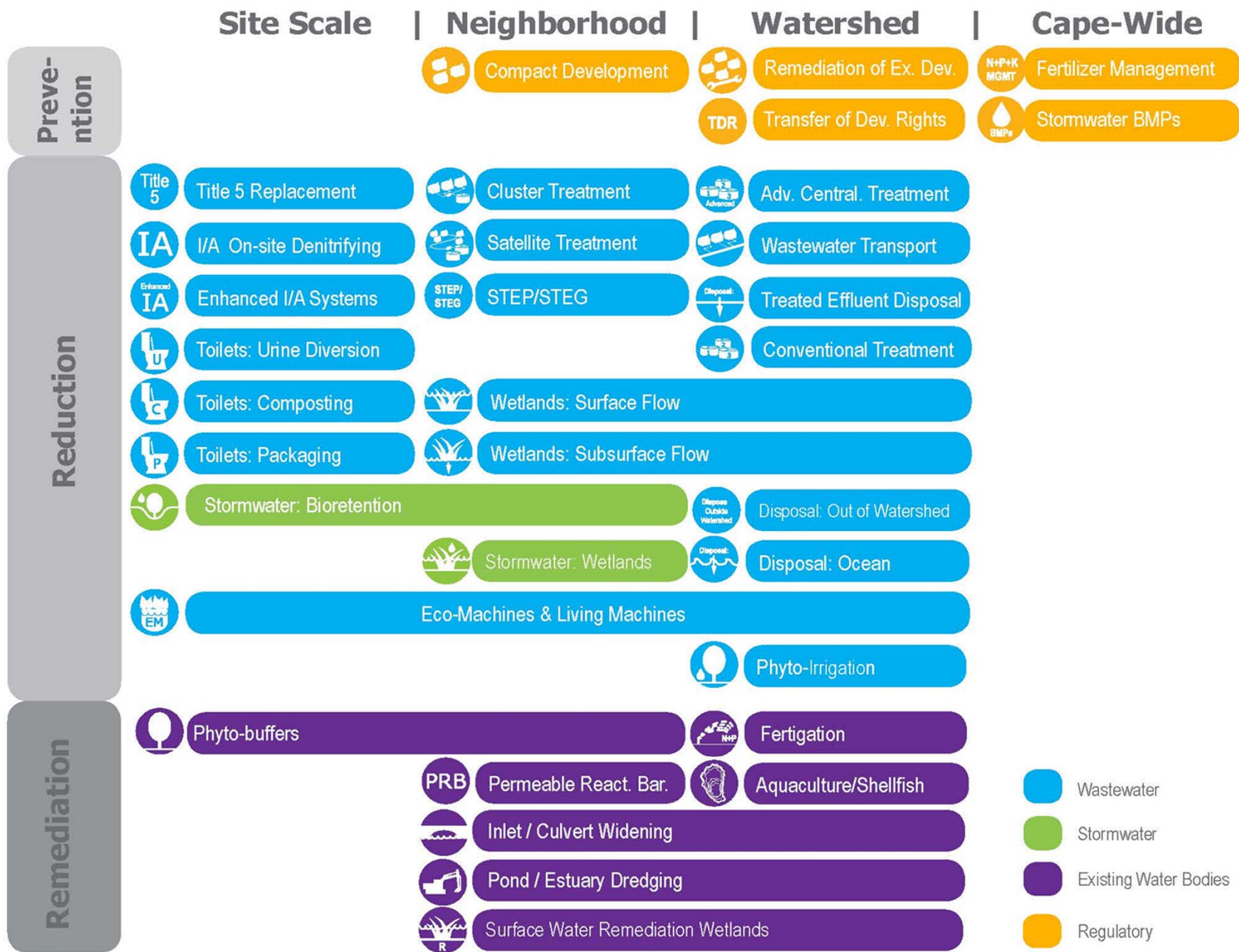
 2031 - 2040

 2041 - 2050



Framework for Addressing Solutions Moving Forward

**Red River
Stage Harbor
Sulfur Springs/Bucks Creek
Taylors Pond/Mill Creek**



- Wastewater
- Stormwater
- Existing Water Bodies
- Regulatory

Alternatives: Screening Method

1
2
3
4
5
6
7



Wastewater



Existing Water Bodies



Regulatory

Targets/ Goals

Present Load: X kg/day **—** **Target:** Y kg/day **=** **Reduction Required:** N kg/day

Composite Target Areas

- A. High Nitrogen Reduction Areas
- B. Pond Recharge Areas
- C. Title 5 Problem Areas

Low Barrier to Implementation

- A. Fertilizer Management
- B. Stormwater Mitigation



Watershed/Embayment Options

- A. Permeable Reactive Barriers
- B. Inlet/Culvert Openings
- C. Constructed Wetlands
- D. Dredging



Alternative On-Site Options

- A. Eco-toilets (UD & Compost)
- B. I/A Technologies
- C. Enhanced I/A Technologies
- D. Shared Systems



Priority Collection/High-Density Areas

- A. Greater Than 1 Dwelling Unit/acre
- B. Village Centers
- C. Economic Centers
- D. Growth Incentive Zones



Supplemental Sewering



All materials and resources for the Stage Harbor Group will be available on the Cape Cod Commission website:

<http://watersheds.capecodcommission.org/index.php/watersheds/lower-cape/stage-harbor-group>

Red River
Stage Harbor
Sulfur Springs/Bucks Creek
Taylors Pond/Mill Creek