



Provincetown Harbor

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

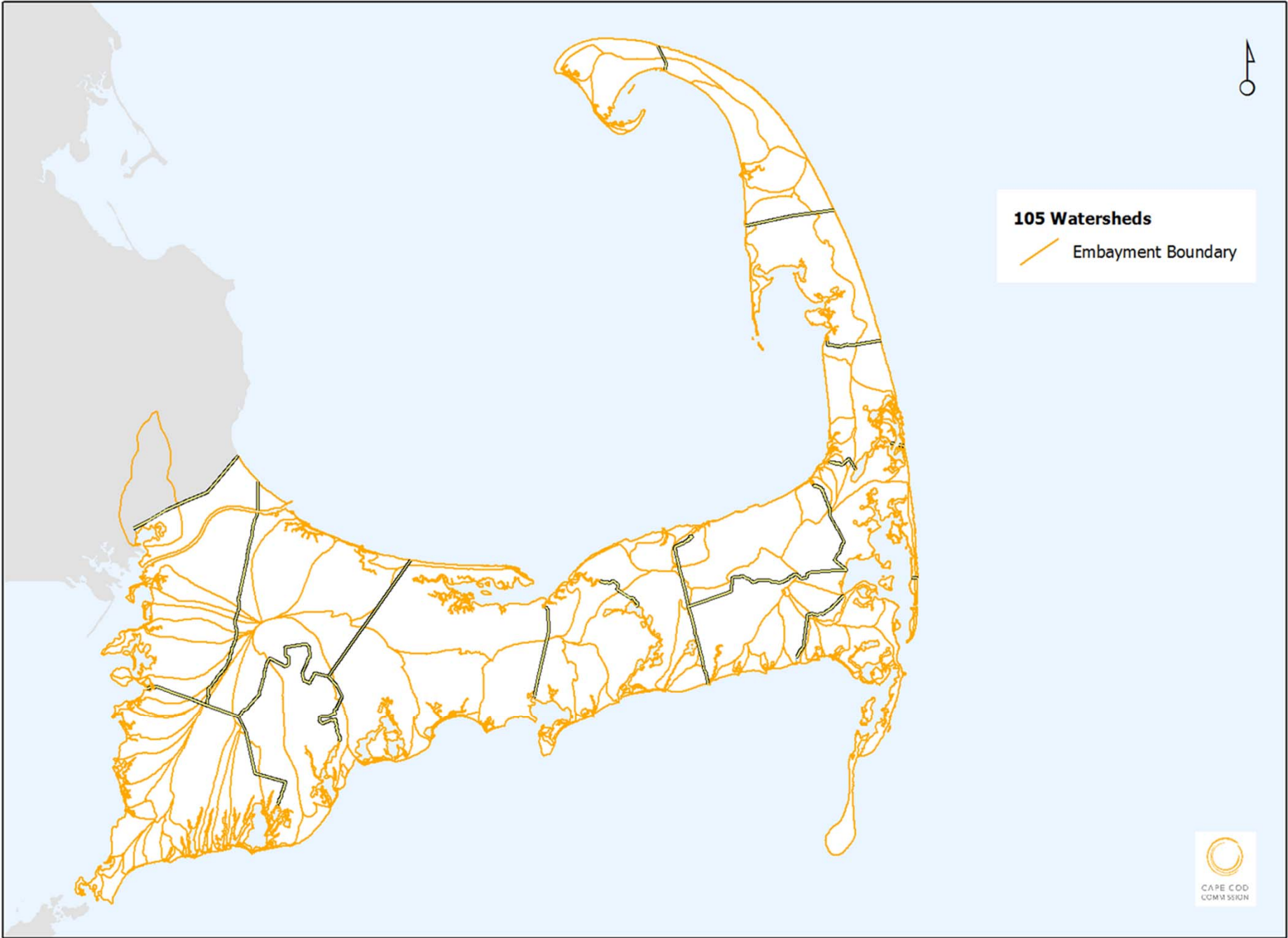
Focus on 21st Century Problems



Nitrogen:
Saline Waters

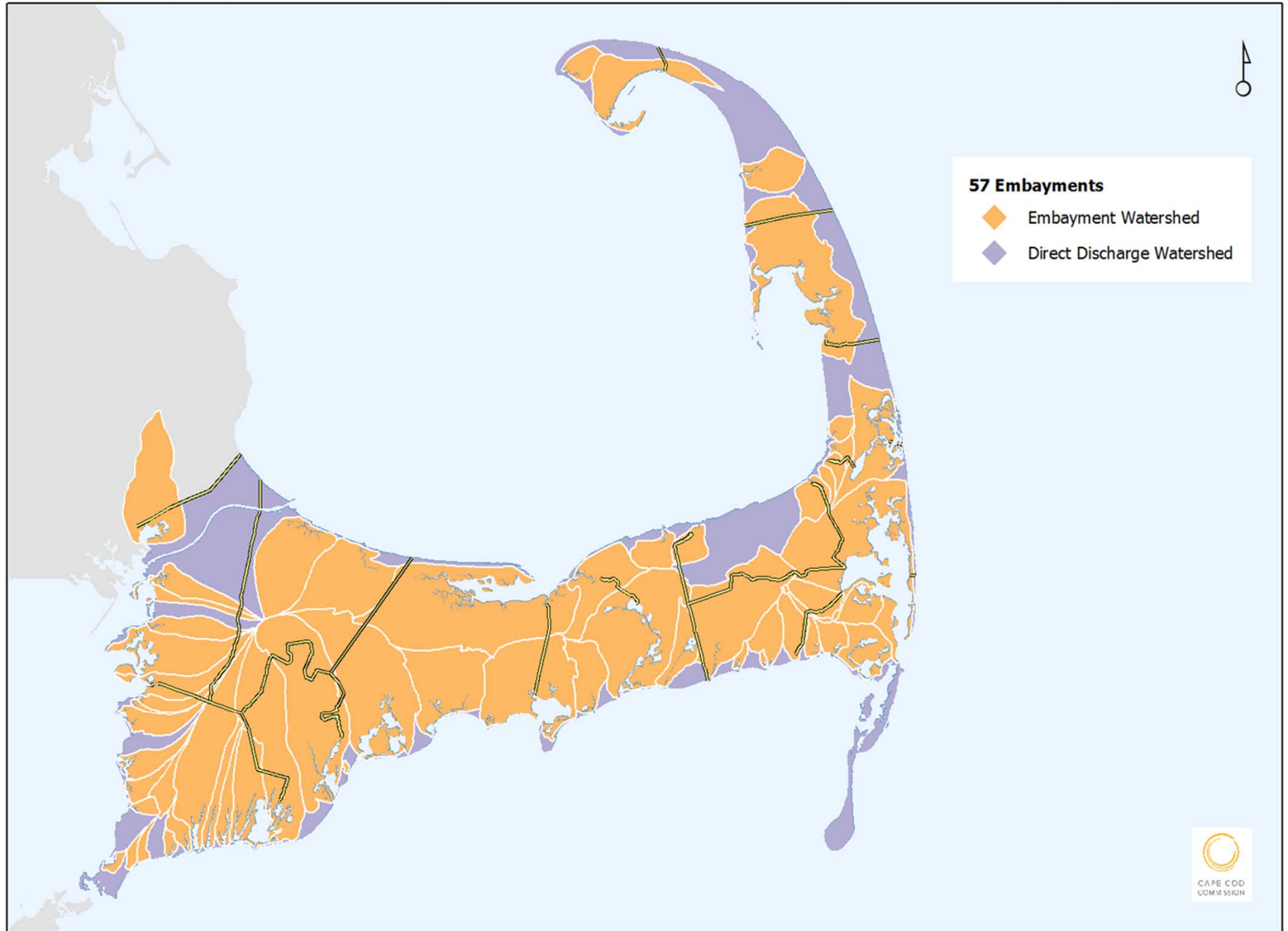
Phosphorus:
Fresh Waters

Growth &
Title 5
Limitations



105 Watersheds
— Embayment Boundary

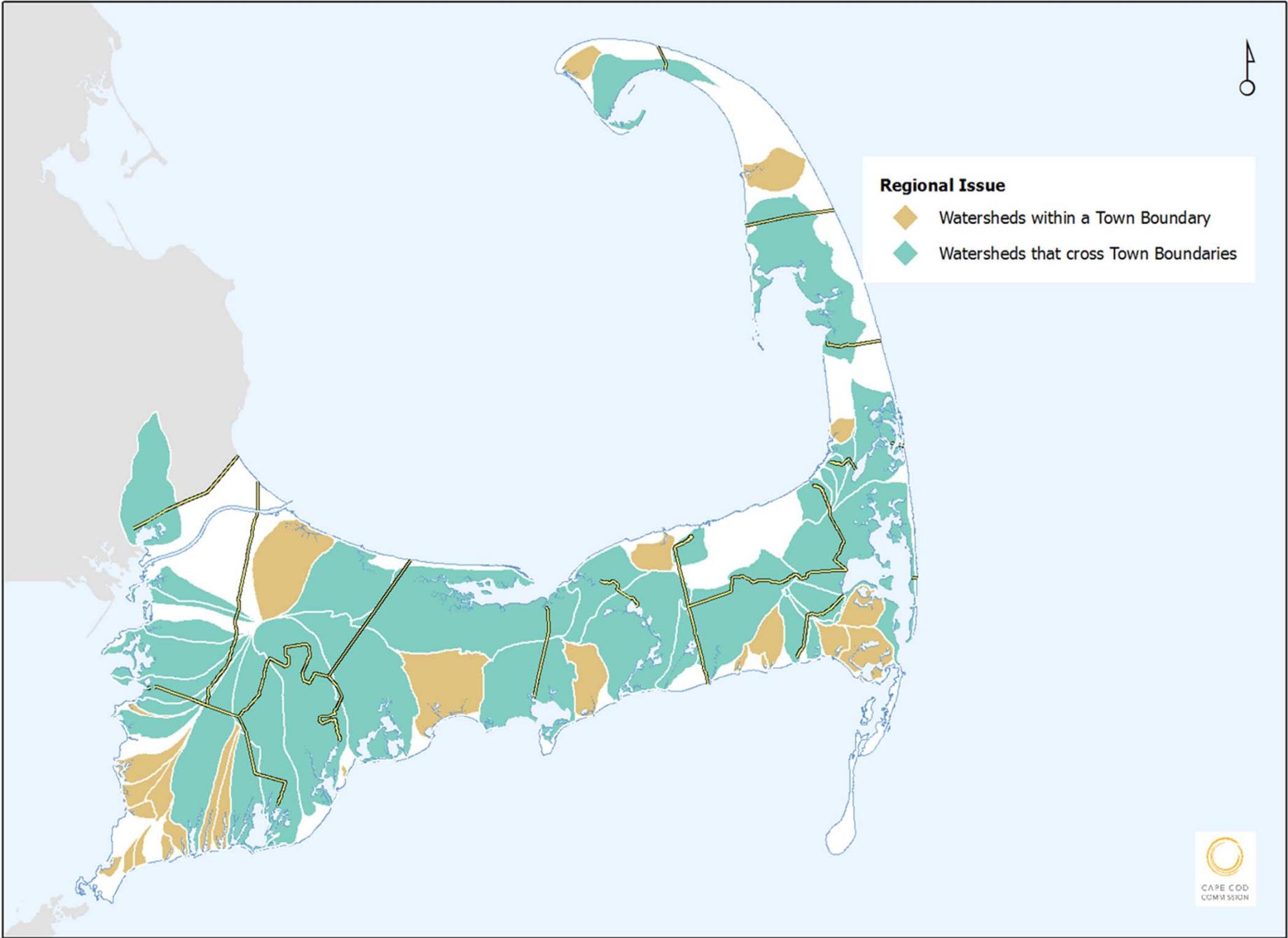




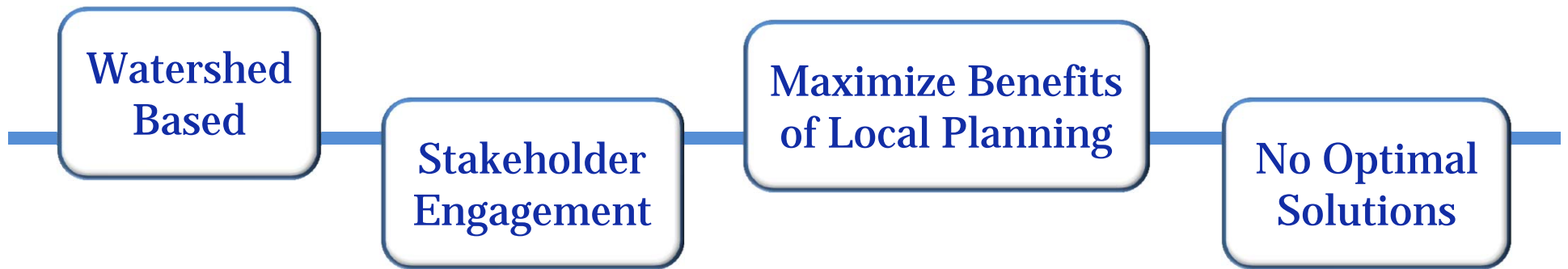
Nitrogen Removal Required

Studied Watersheds

- ◆ Excess Nitrogen Watersheds
- ◆ Watersheds Without Excess Nitrogen



Approach to the 208 Plan Update

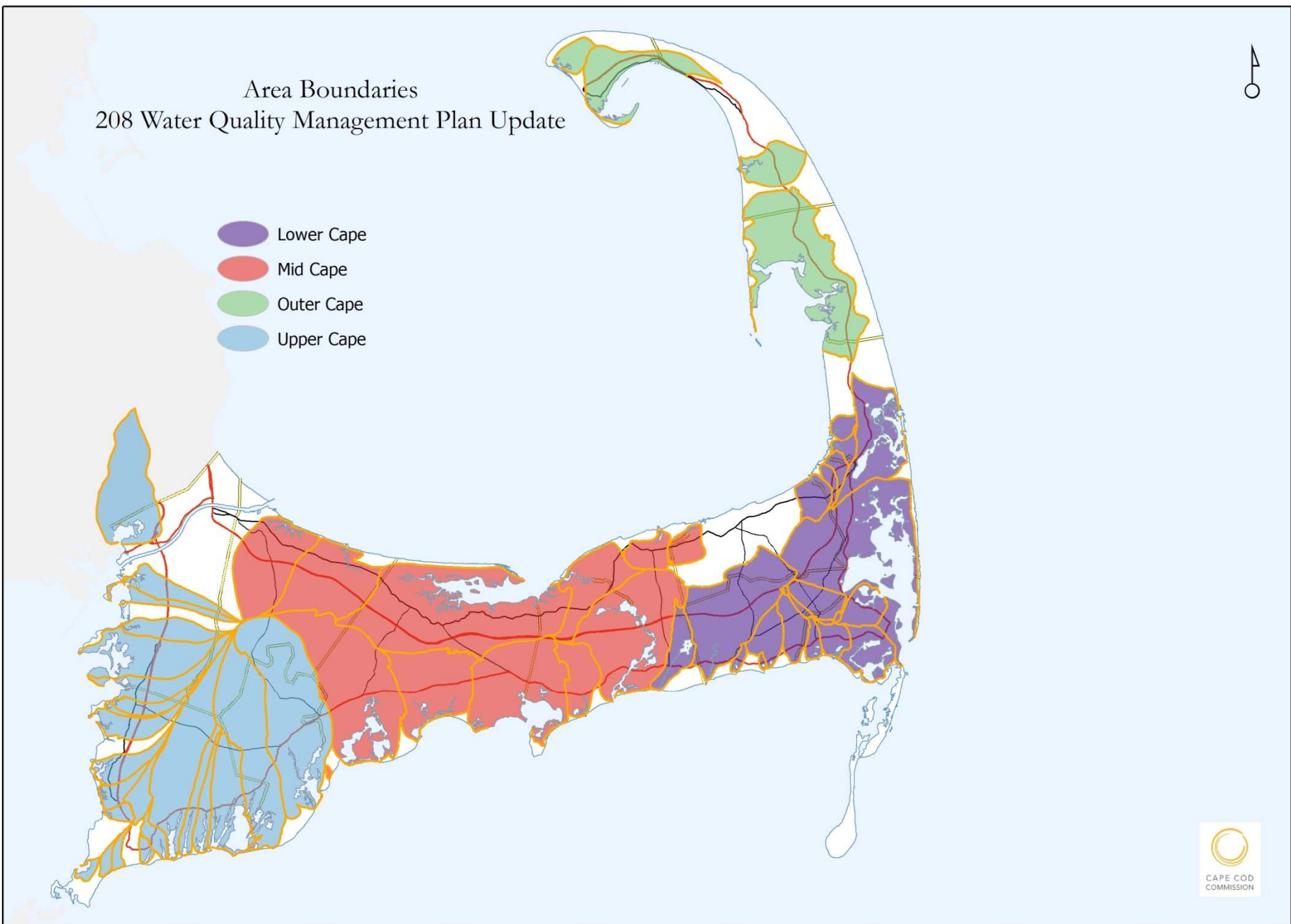


Goal:

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

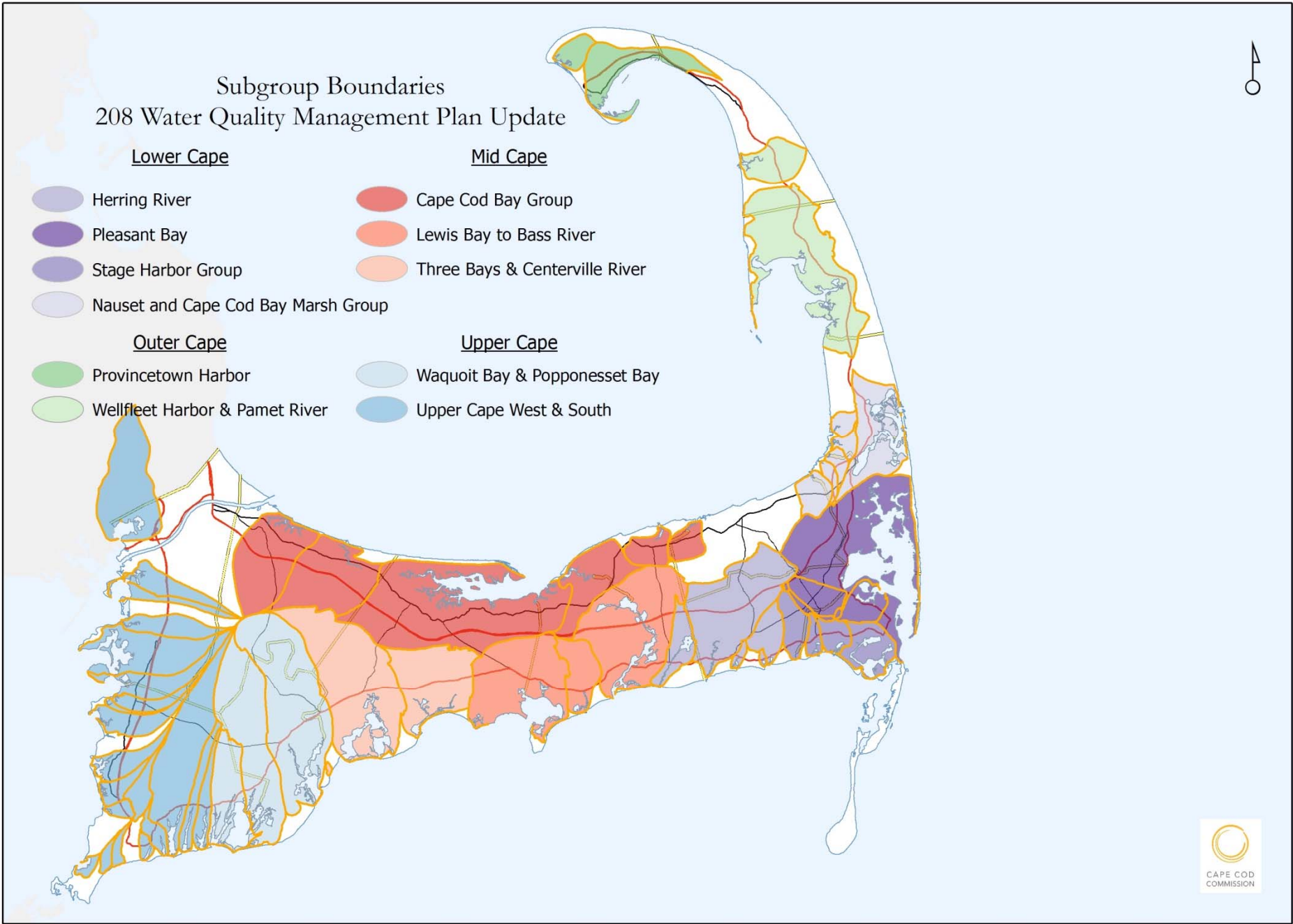
- Cape Cod Bay Group
- Lewis Bay to Bass River
- Three Bays & Centerville River

Outer Cape

- Provincetown Harbor
- Wellfleet Harbor & Pamet River

Upper Cape

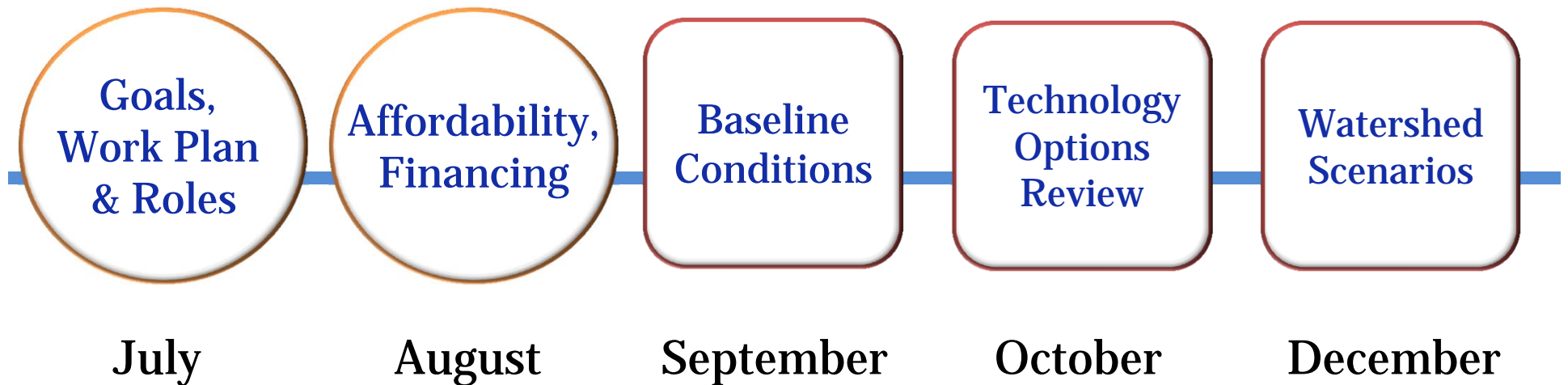
- Waquoit Bay & Popponesset Bay
- Upper Cape West & South



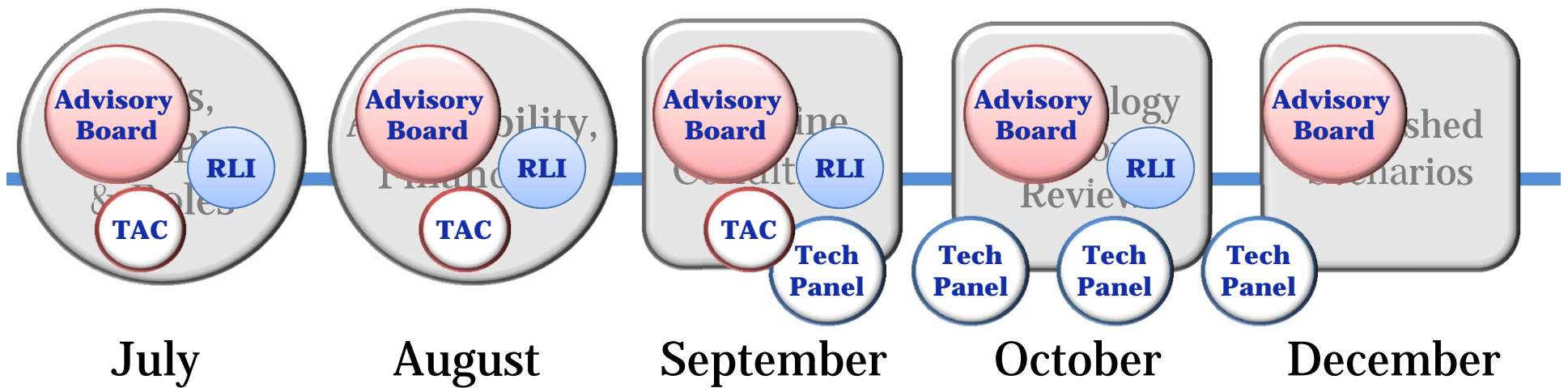
What is the stakeholder process?

Public Meetings

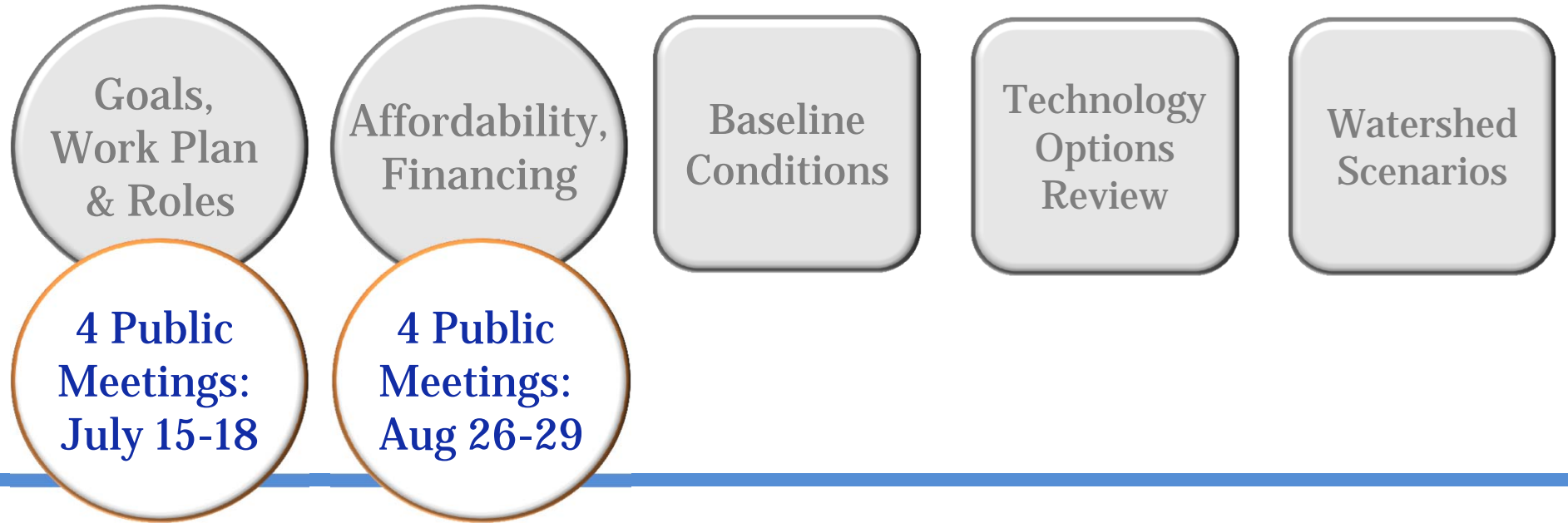
Watershed Working Groups



208 Planning Process



208 Planning Process



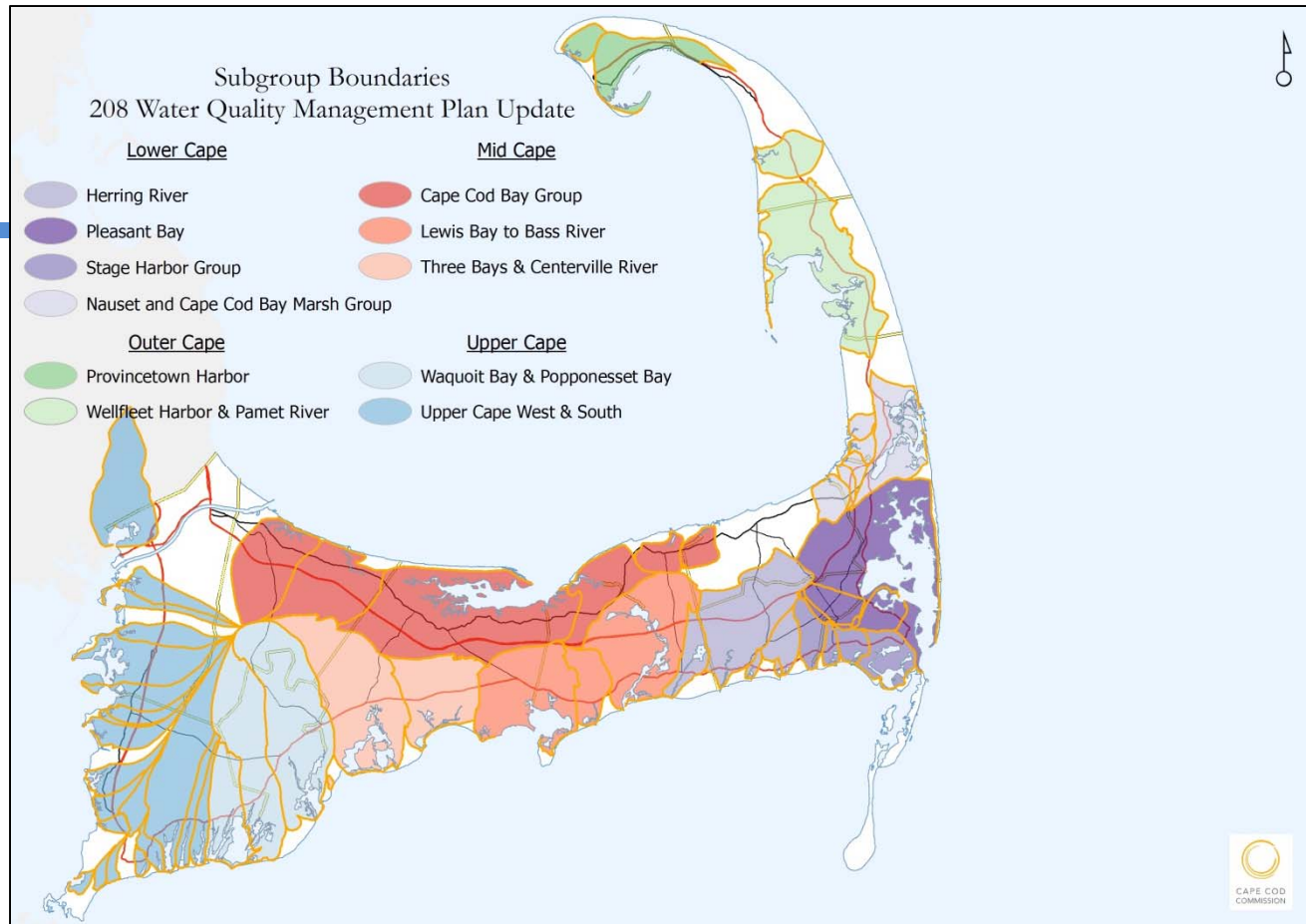
208 Planning Process

Baseline
Conditions

11 Working
Group Meetings:
Sept 18-27

Technology
Options
Review

Watershed
Scenarios



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



- Wastewater
- Stormwater
- Existing Water Bodies
- Regulatory

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

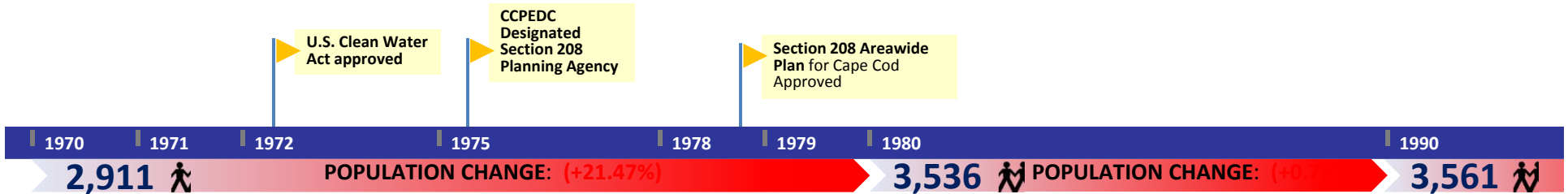


**Provincetown Harbor
Hatches Harbor**

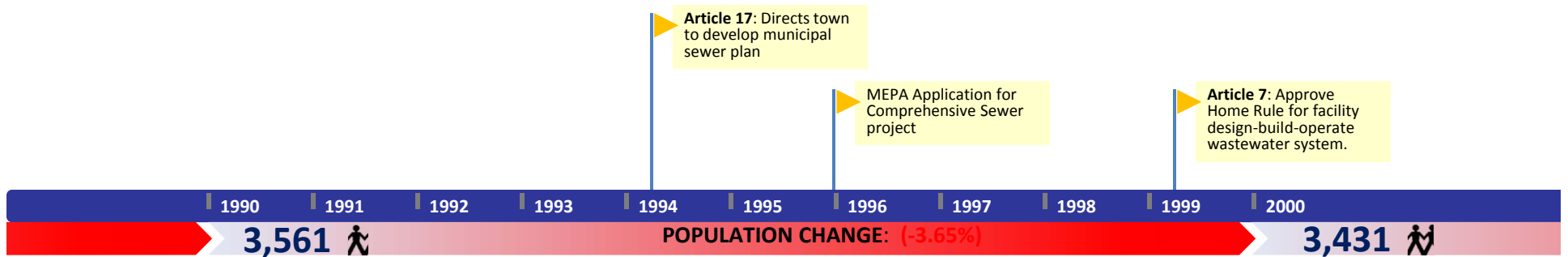
Provincetown

From 1978 Section 208 Plan

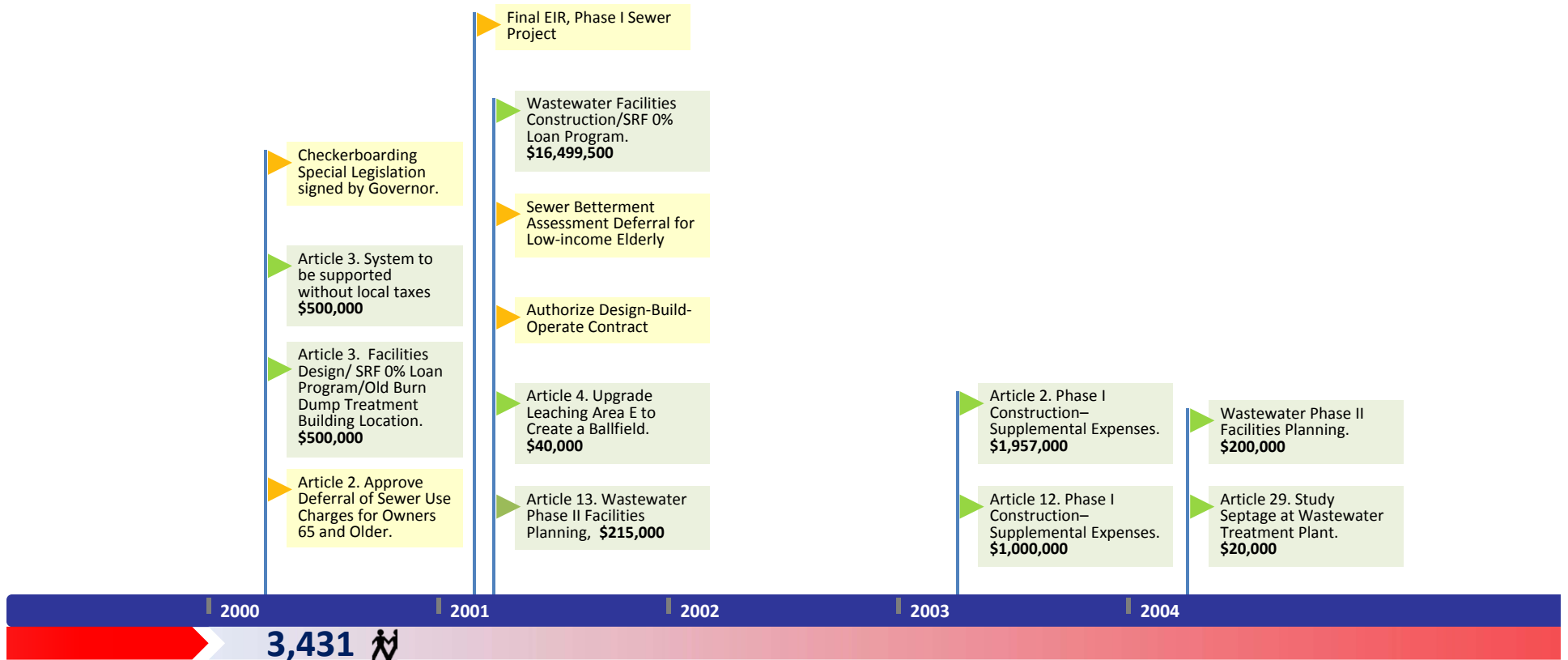
- ▶ Provincetown also has a serious wastewater management problem in the downtown area.
Several private studies of water quality ... concluded that contamination threatening public health exists in the harbor. Storm drains have been cited as the major source, to which septic system overflows are believed to be contributors.
- ▶ It is public knowledge that failing cesspools are widely used by commercial establishments and are pumped as often as three times a day during the summer.
It is recommended that if the town fails to initiate a 201 study to update and implement facility plans completed for the town ... by 1980, the DEQE should take enforcement action against the town for violations of Title 5.
- ▶ Augmentation of water supply to be disposed of on-site will raise the water table in downtown Provincetown, aggravating on-site system problems.
- ▶ Finally, the limitations of the water supply must be recognized and firm measures taken to prevent stimulation of growth by sewer construction.



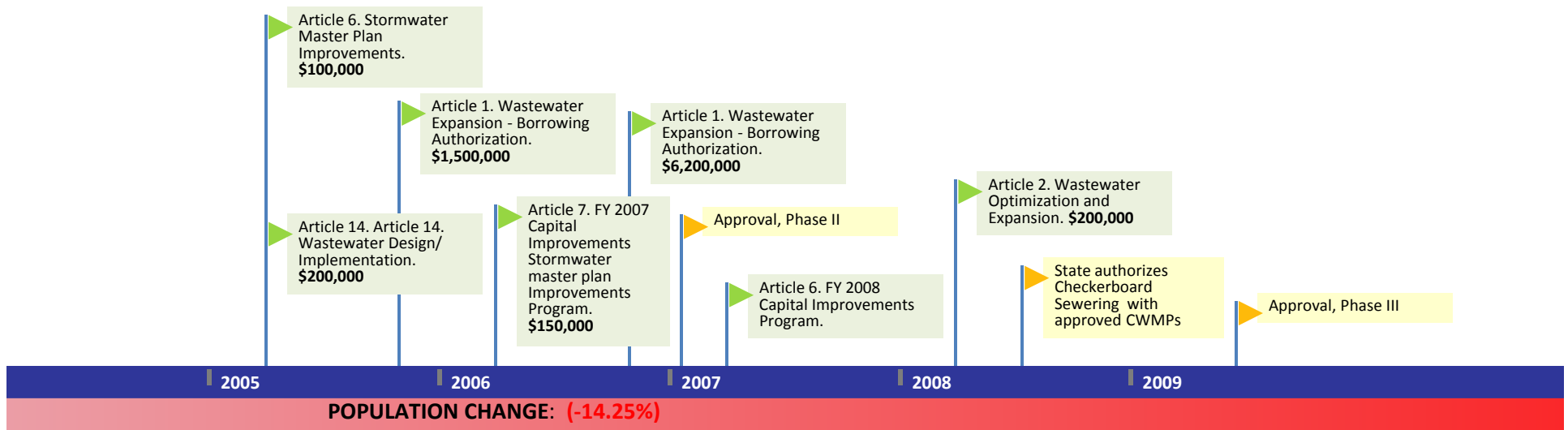
Provincetown: 1970-2013



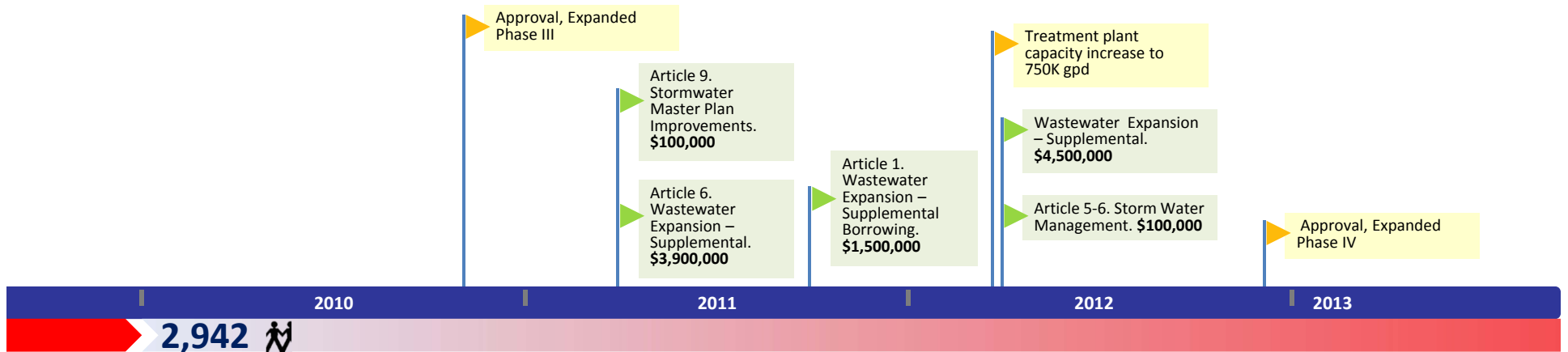
Provincetown: 1970-2013



Provincetown: 1970-2013



Provincetown: 1970-2013



Truro: 1970-2013

From 1978 Section 208 Plan

- ▶ A recent gasoline spill from a leaking service station storage tank has resulted in contamination of the groundwater approximately 600 feet from the South Hollow Well field.
- ▶ Even if the South Hollow Wellfield is put back into production, however, Provincetown presently needs an additional permanent water supply.
- ▶ Development of a water supply plan for the outer Cape groundwater basins should be given immediate priority by

local, regional and federal agencies.

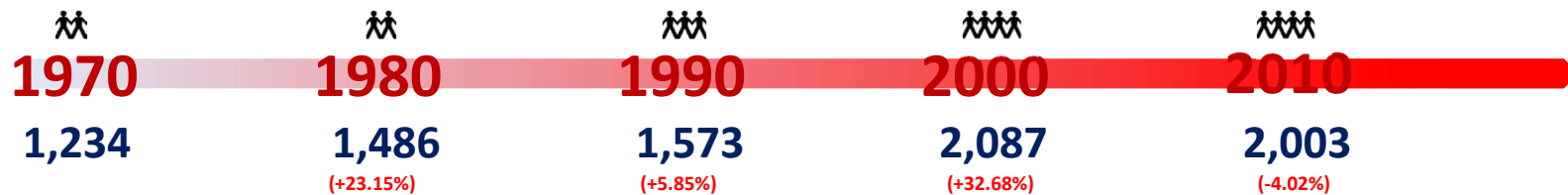
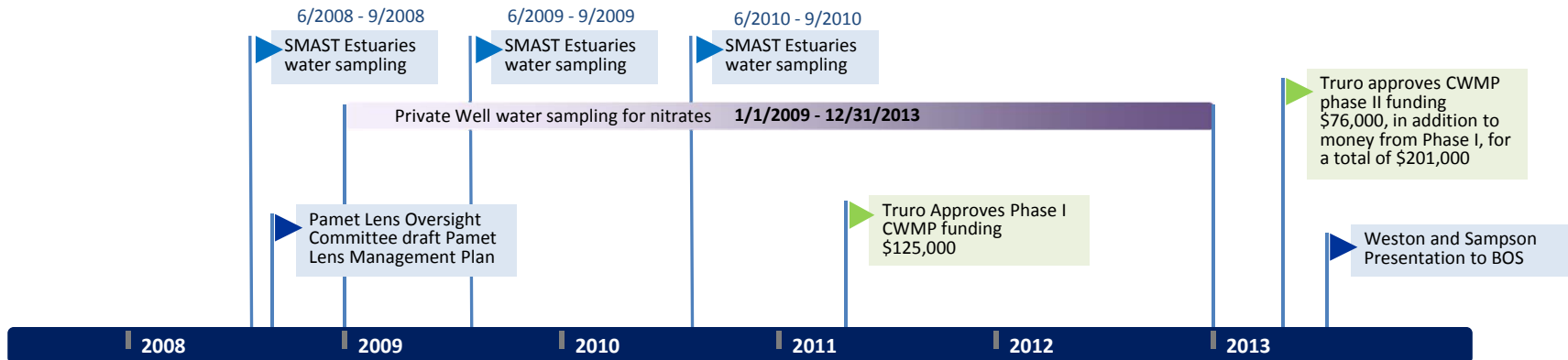
- ▶ Growth controls and water conservation must be given full consideration in such a planning effort to assure that the groundwater resource is not overdeveloped.
- ▶ With Truro's naturally sandy soils, the town's wastewater problems are limited to a small strip of commercial development along a low-lying barrier beach known as Beach Point.

This area of was included in the Sewer Service Areas Map on the basis of the

likely cost-effectiveness if a sewer is built for Provincetown.

- ▶ Local officials of Truro expressed concern over possible growth impacts of sewerage. A means of growth control should be included in any facility plan for this reason.

Further investigation is also recommended of the water quality impacts of the landfill and septage pits.

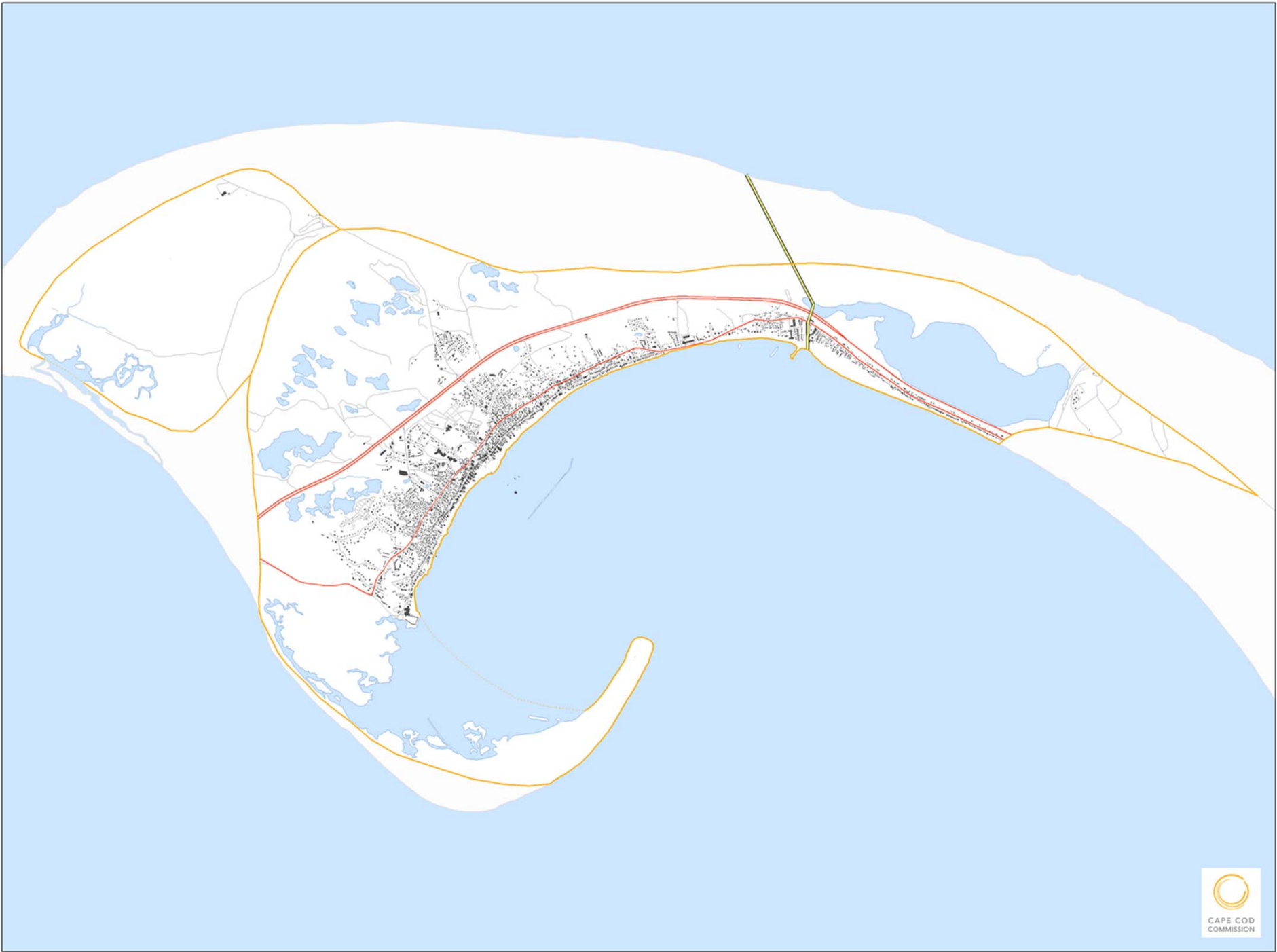


Did we miss anything?

Your Watersheds



**Provincetown Harbor
Hatches Harbor**



A map of Cape Cod, Massachusetts, showing the coastline and major roads. A specific area is highlighted with a red outline, representing 8.4 square miles. The text "8.4 square miles" is overlaid in blue on this area. The map also shows other roads in orange and yellow, and a green line extending from the highlighted area towards the top of the map.

8.4 square miles


2 Towns

A map of Cape Cod, Massachusetts, showing the coastline and major roads. The Cape is oriented horizontally, with the tip pointing to the right. The land is shown in white, and the surrounding water is light blue. A network of roads is overlaid on the map, with a prominent red line following the coastline and other roads in orange and yellow. The text "Cape Cod National Seashore" is superimposed in a large, bold, blue serif font across the center of the map.

Cape Cod National Seashore


Natural Features


Base Map

 Town Lines


 Rivers


Embayment Boundary

 On Land


 On Sea

Major Roads

 US Highway


 State Highway

 Roads


 Structures


 Ponds


Natural Areas

 Cranberry Bogs

 Wetlands


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

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

 Preliminary FEMA Flood Rate Insurance 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


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

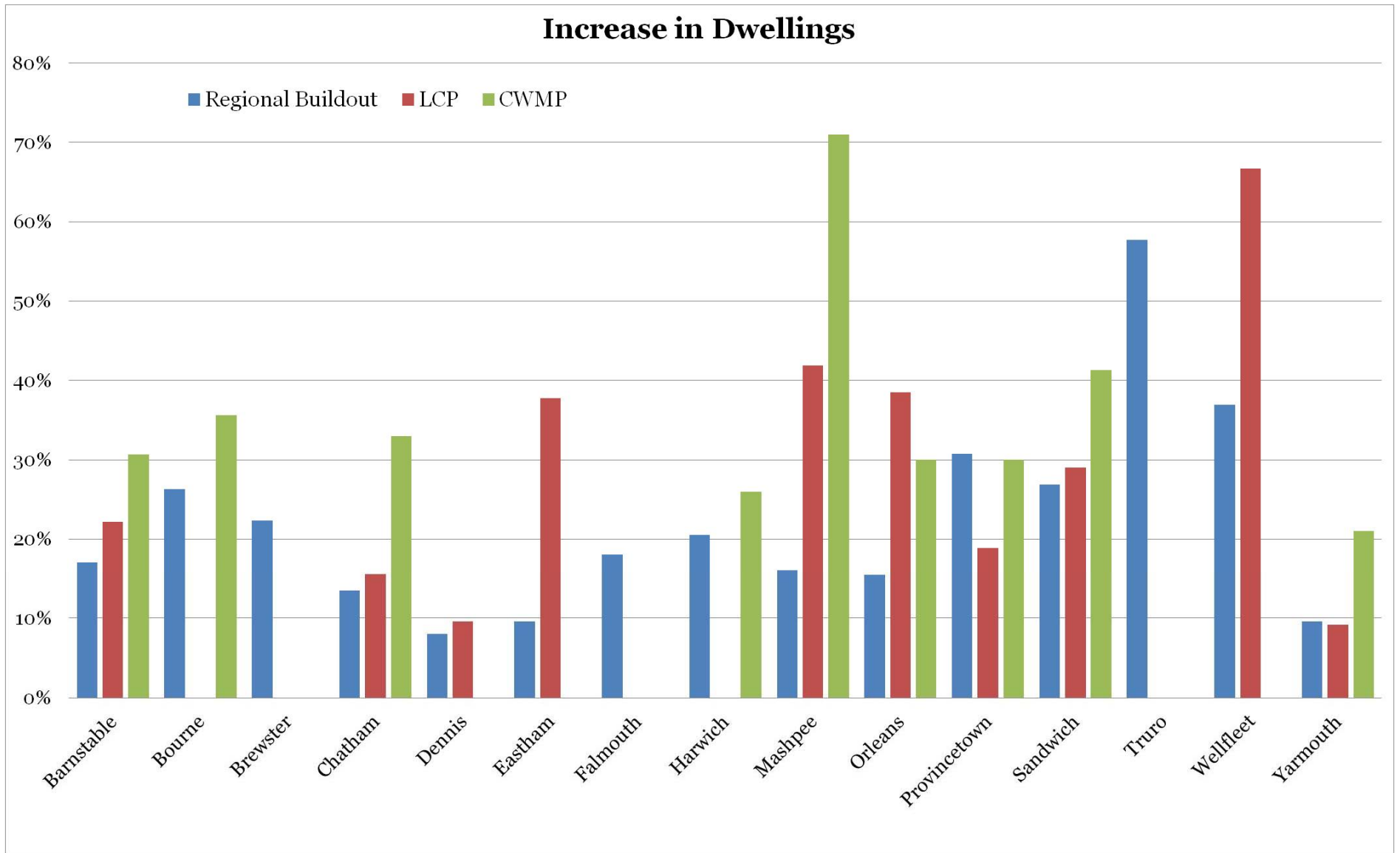
 Open - Disturbed or Managed

 Water

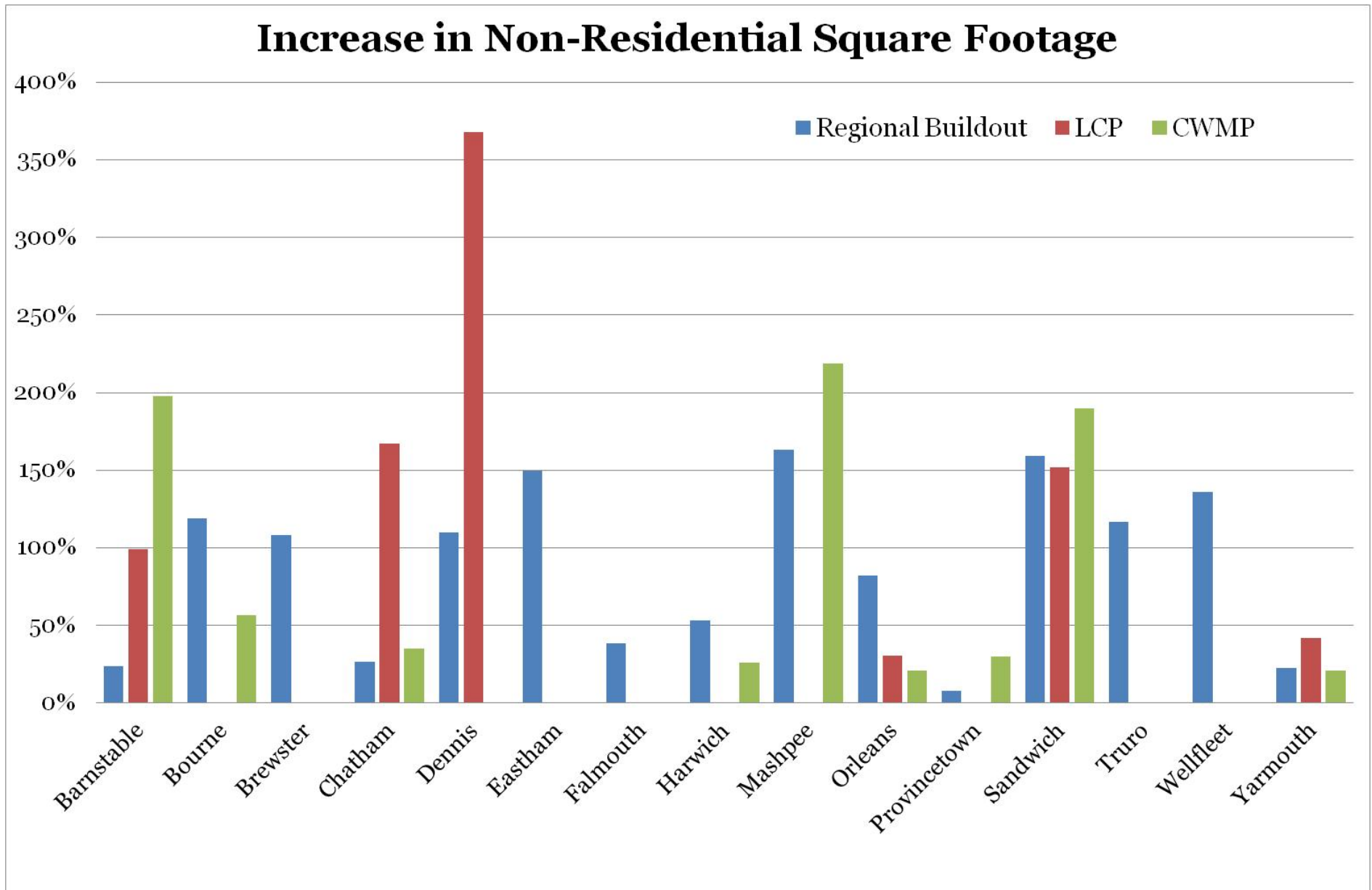
Density

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

Buildout



Buildout



The People



**Provincetown Harbor
Hatches Harbor**

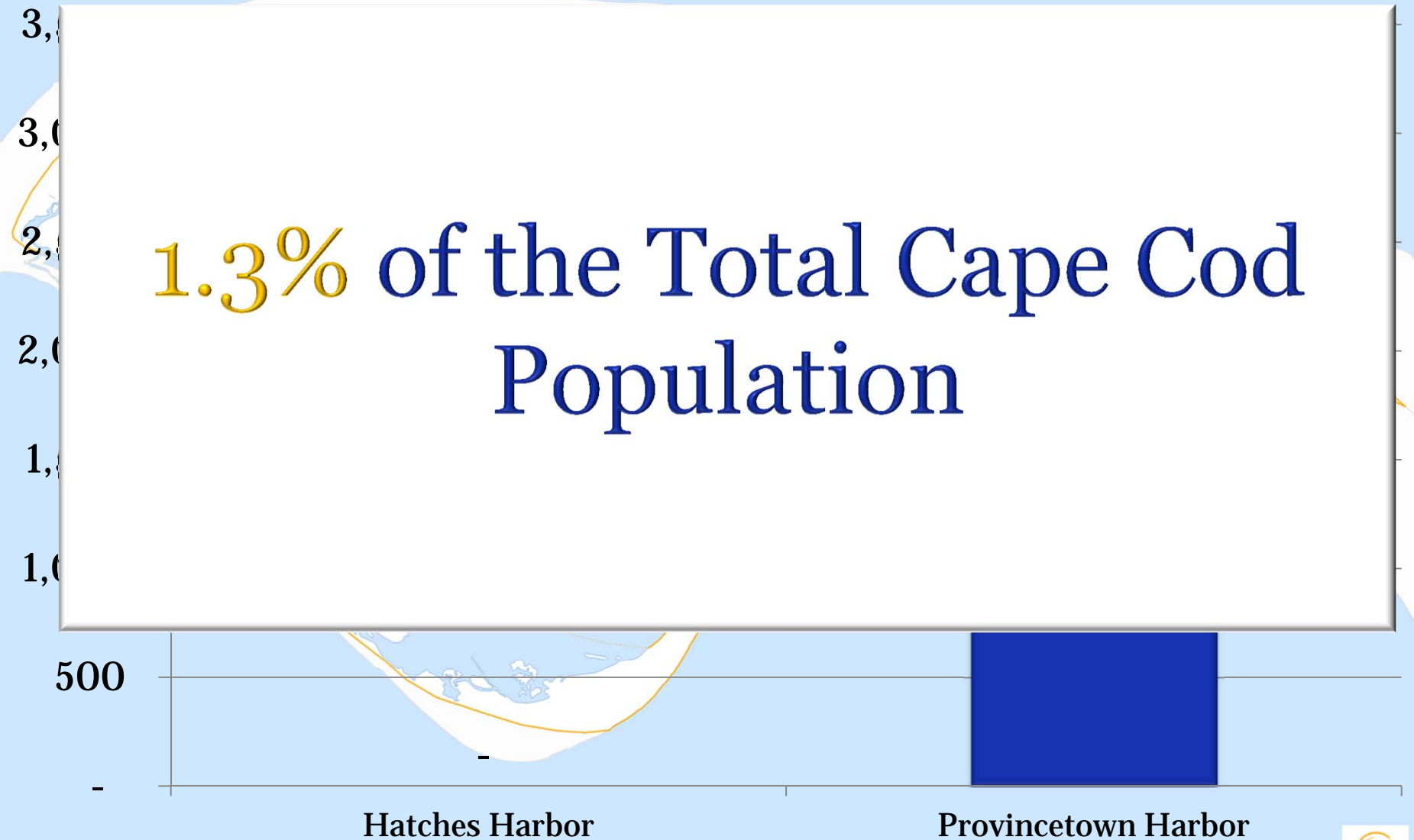
A map of Cape Cod, Massachusetts, showing the coastline and major roads. The map is overlaid with a large blue text box containing the population data. The text is centered over the main body of the cape. The map shows the coastline in white, the interior in light blue, and the surrounding ocean in a darker blue. Major roads are shown in red and orange. The population data is presented in a large, bold, blue font.

Total Population (2010) = 2,896

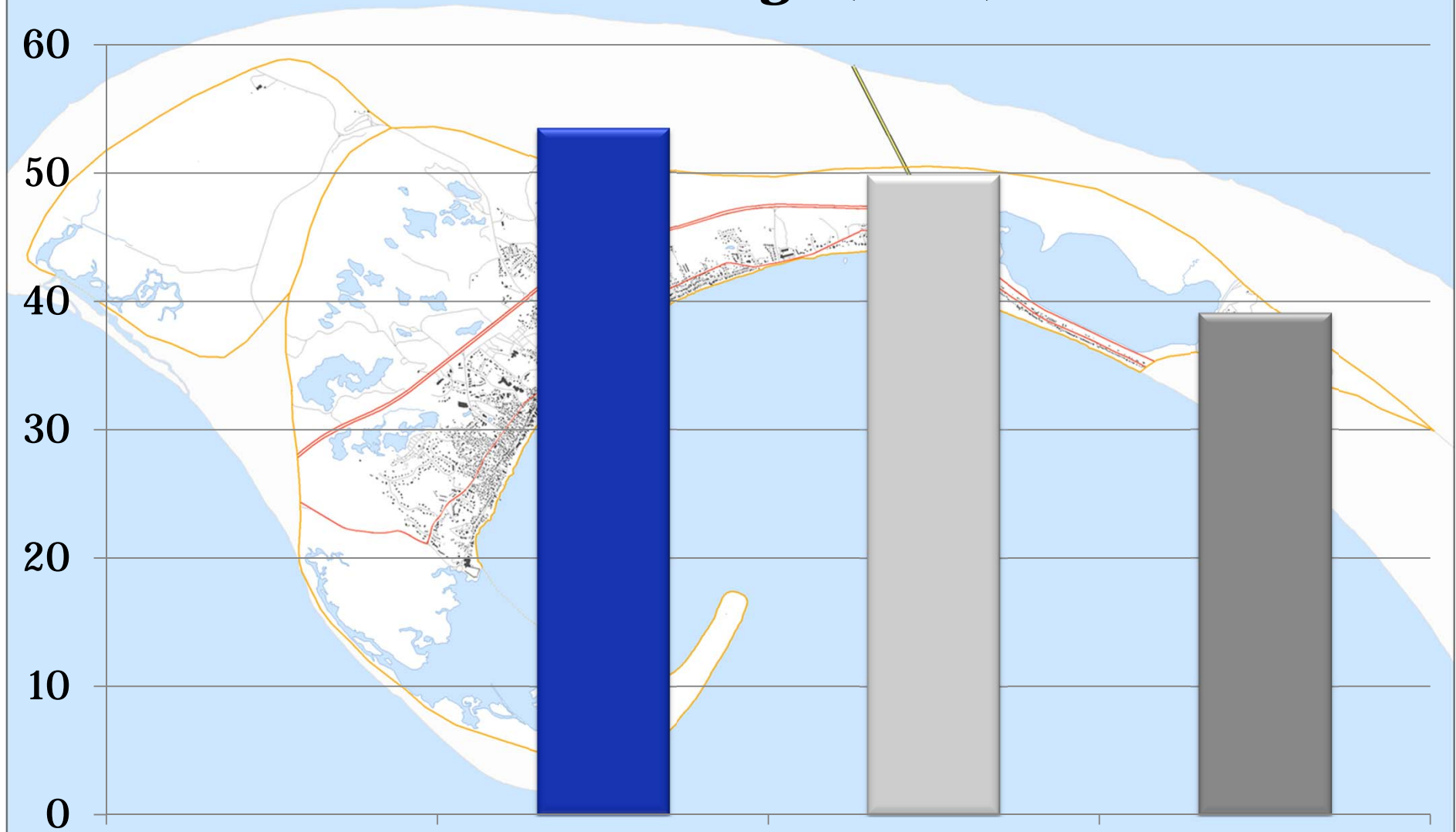


Population (2010)

1.3% of the Total Cape Cod
Population



Median Age (2010)



Hatches Harbor

Provincetown Harbor

Barnstable County

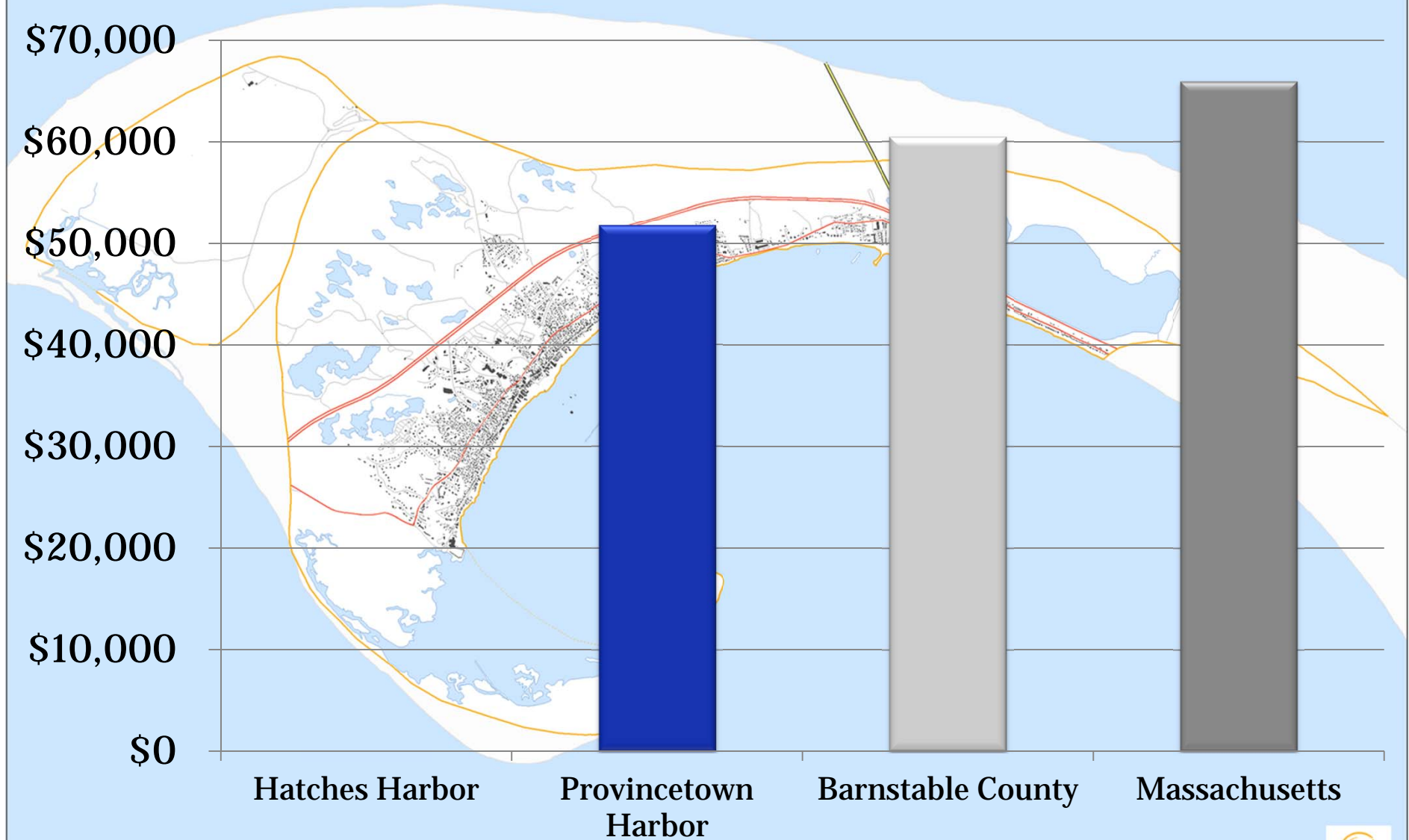
Massachusetts



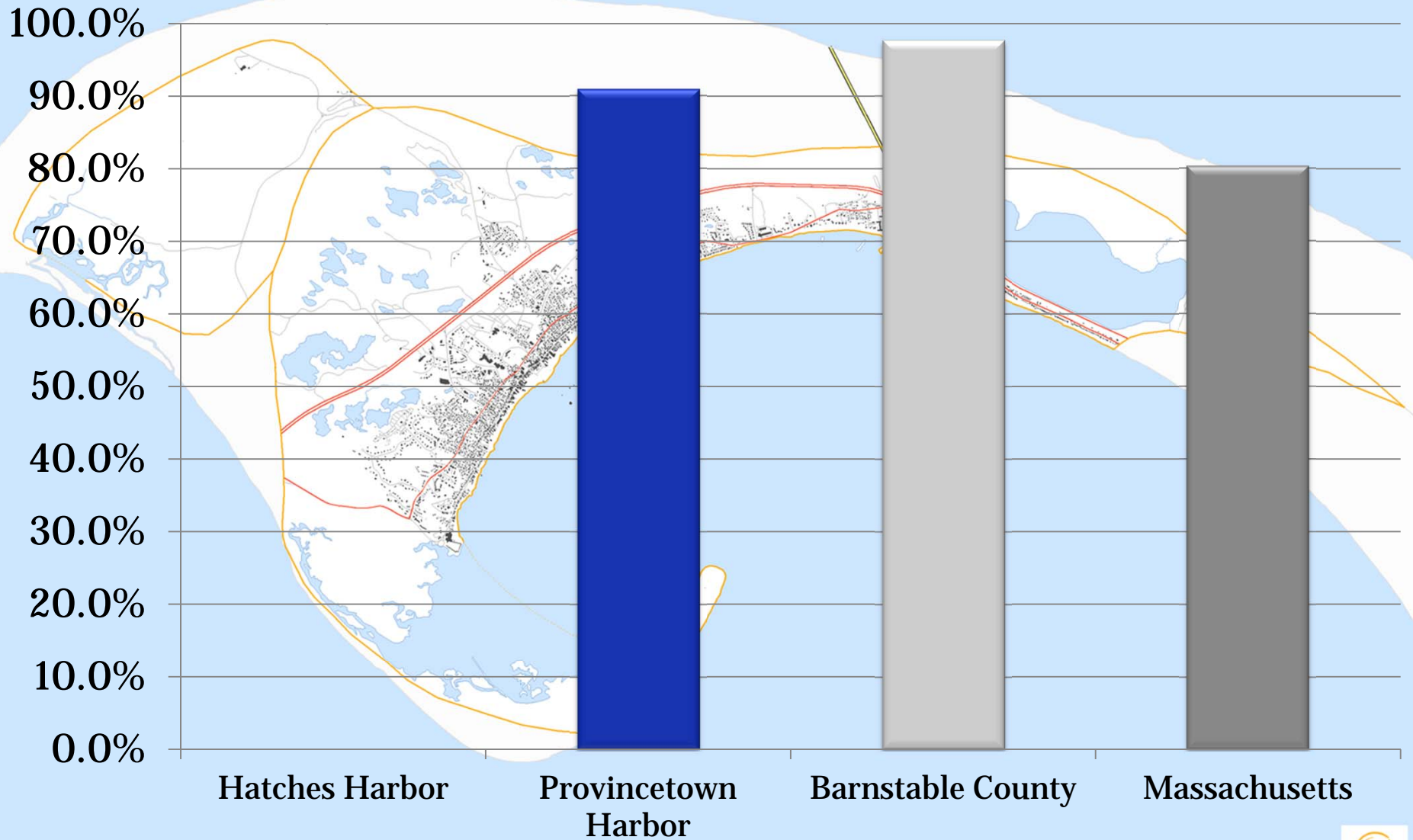
CAPE COD
COMMISSION

2010 Census

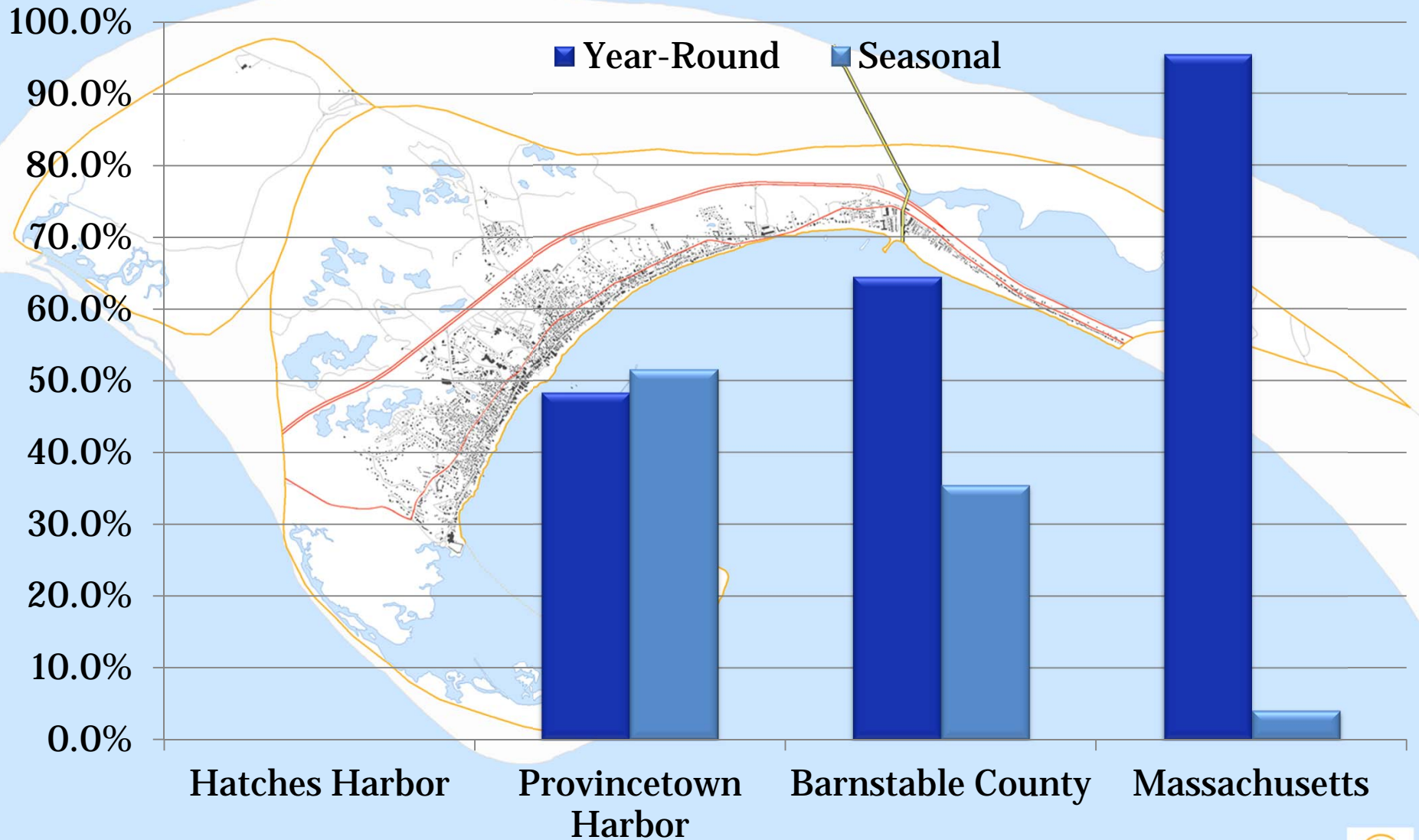
Median Income (2010)



Race - % White (2010)



Seasonal vs. Year Round Housing (2010)



Average Assessed Home Value (2010)

\$1,200,000

\$1

Total Assessed Value of
Residential Homes=
\$1,984,079,400

\$0

Hatches Harbor

Provincetown
Harbor

Barnstable County

Massachusetts



2010 Census

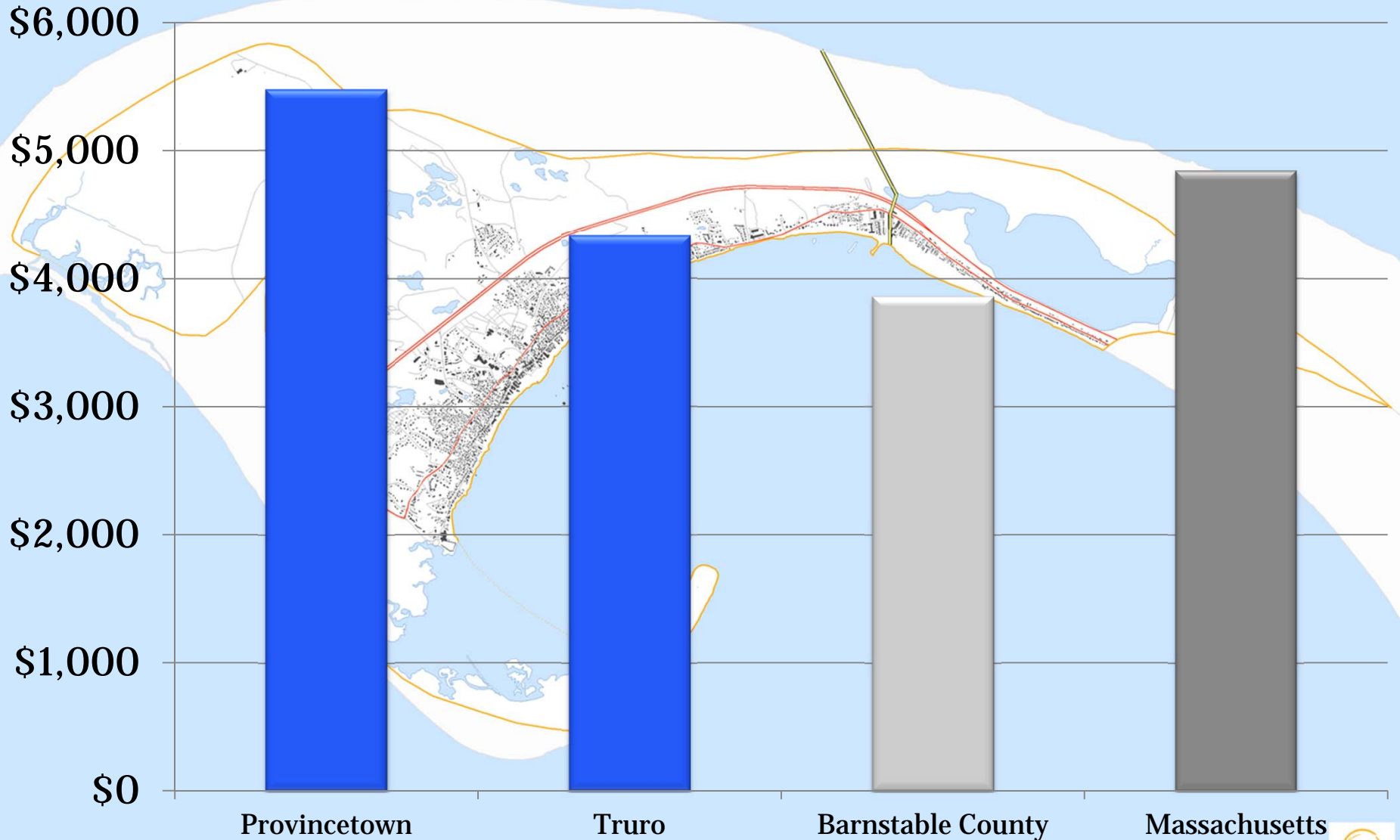
Your Government & Taxes



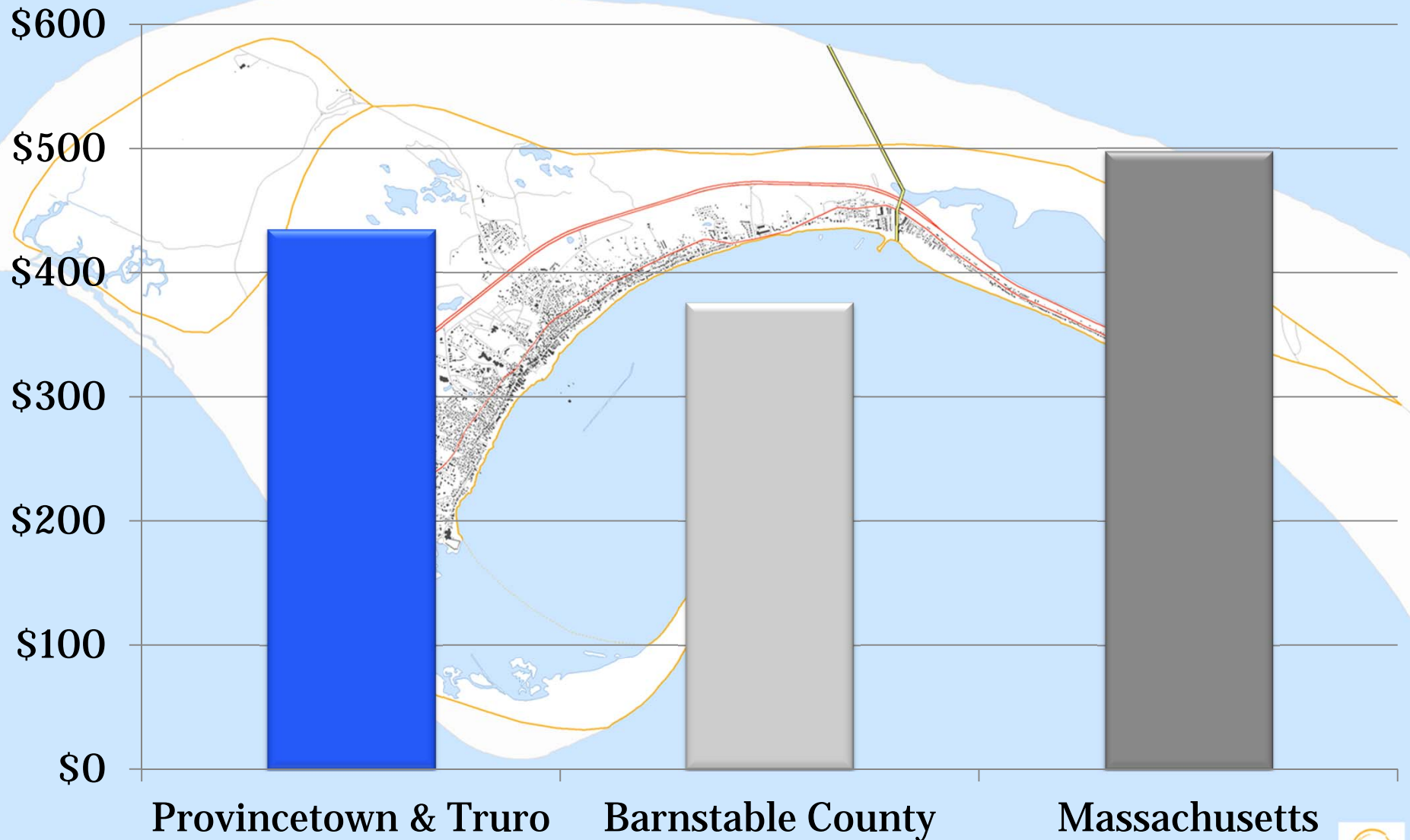
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**Provincetown Harbor
Hatches Harbor**

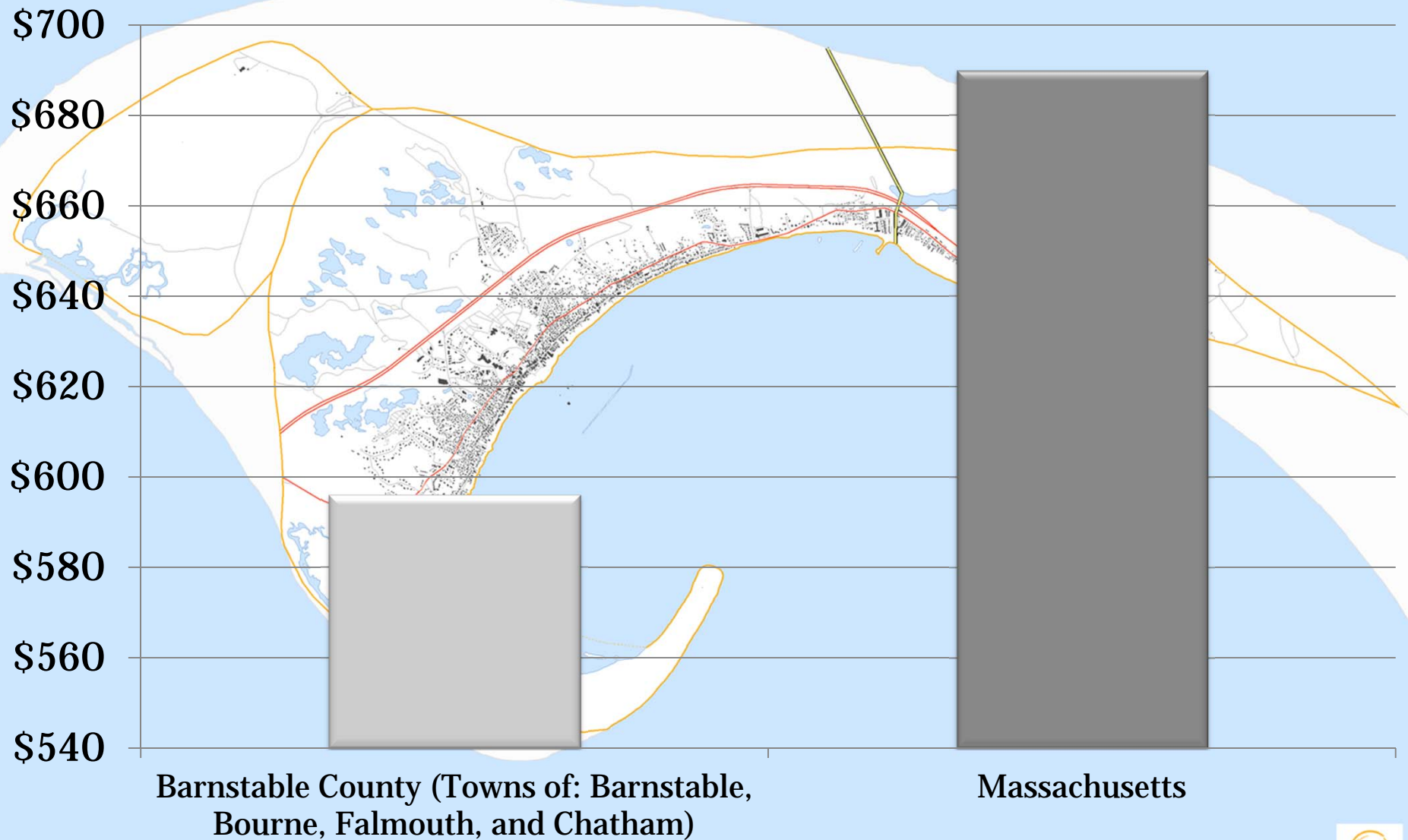
Average Single Family Property Tax Bill (2013)



Average Annual Water Bill (2012)



Average Annual Sewer Bill (2012)



The Problem



**Provincetown Harbor
Hatches Harbor**



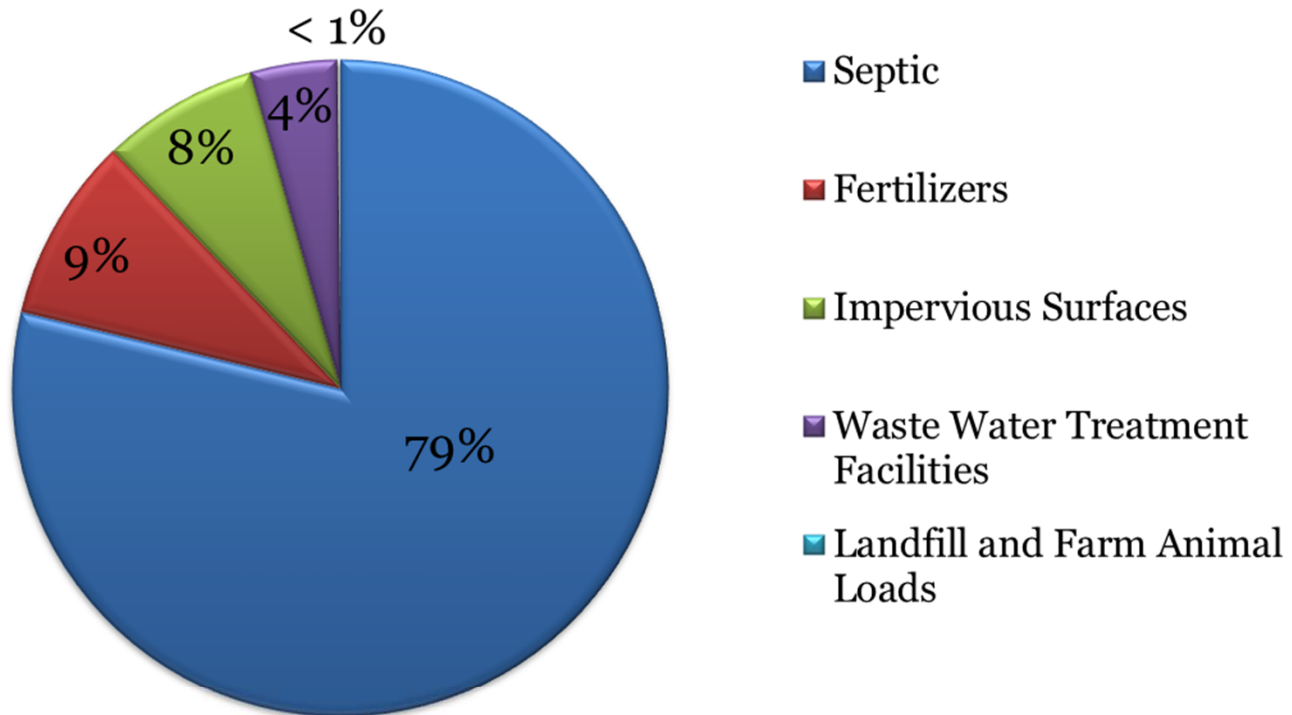
Photo credit: National Park Service

An aerial photograph of a coastal embayment, likely in Massachusetts, showing a mix of green land and blue water. A white rectangular text box is centered on the image, containing the title and a bulleted list. The background image is partially obscured by the text box.

Massachusetts Estuaries Project

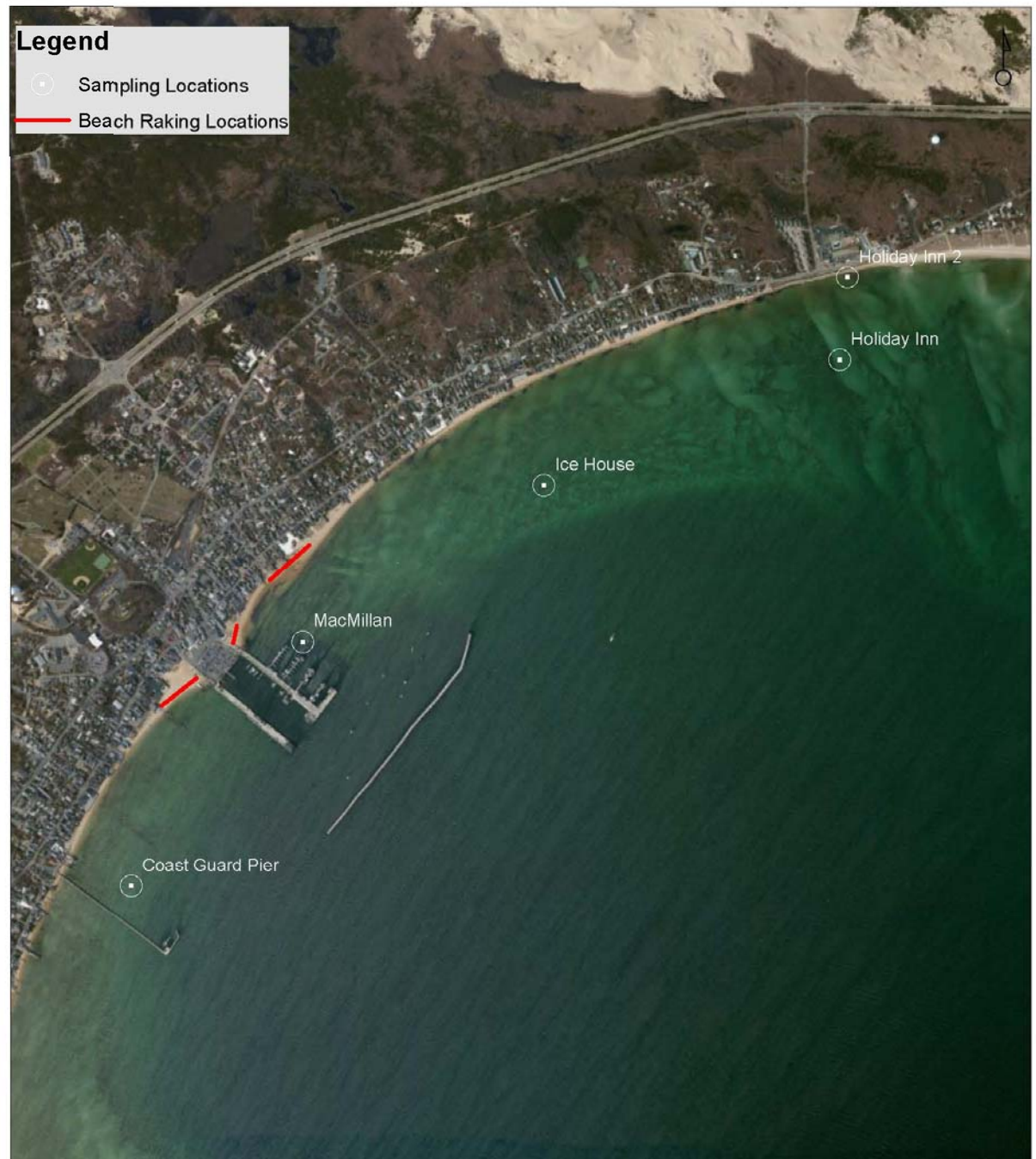
- Opportunity for towns to obtain independent analysis of nitrogen loading and its impact on water quality
- Provides water quality, nutrient loading, and hydrodynamic information
- Water quality monitoring – minimum of 3 years of data for each embayment
- Watershed model links water quality data to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

Cape Wide Controllable Nitrogen Loads

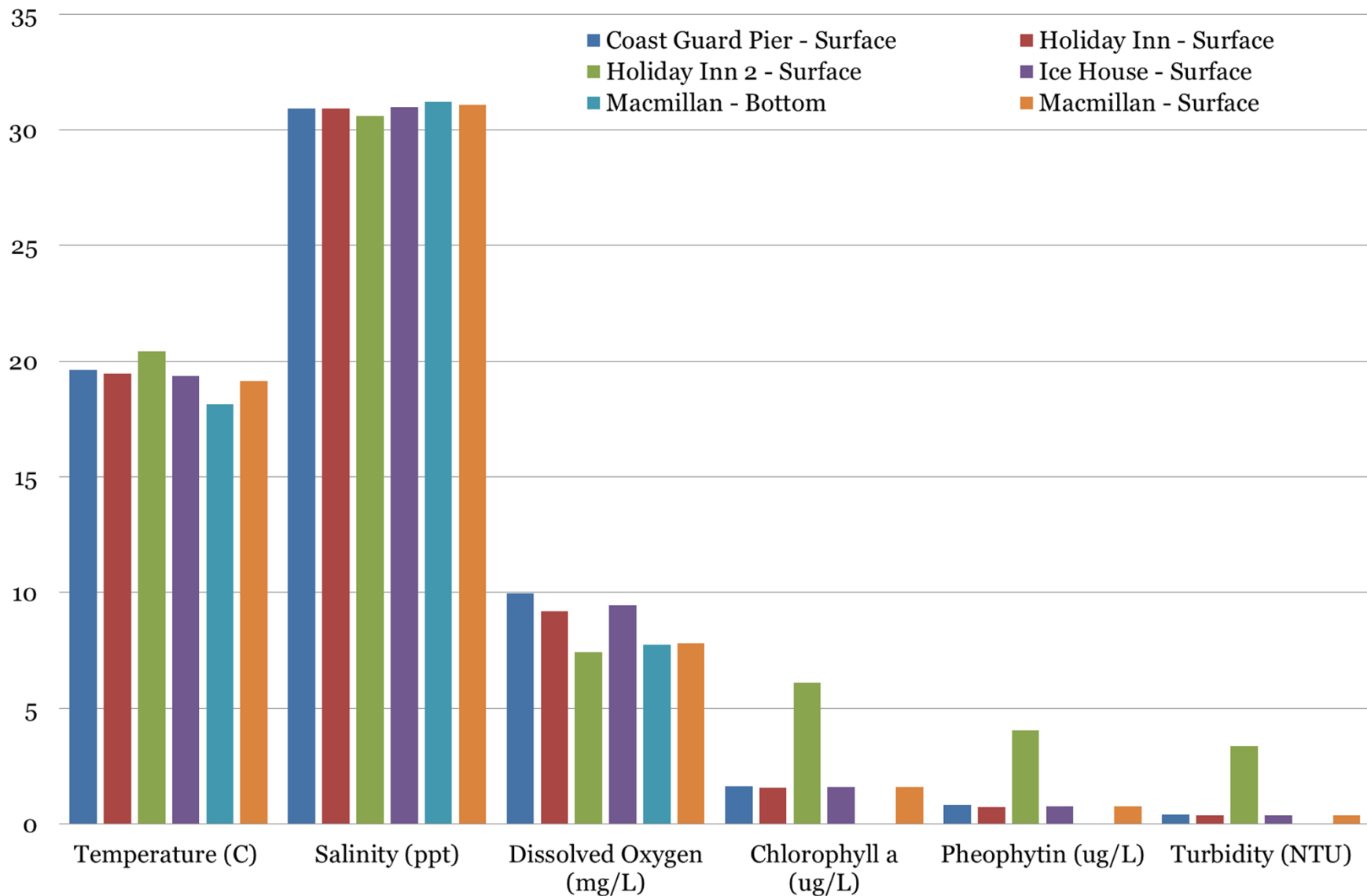


Note: Data Averaged from Existing Massachusetts Estuaries Project Reports

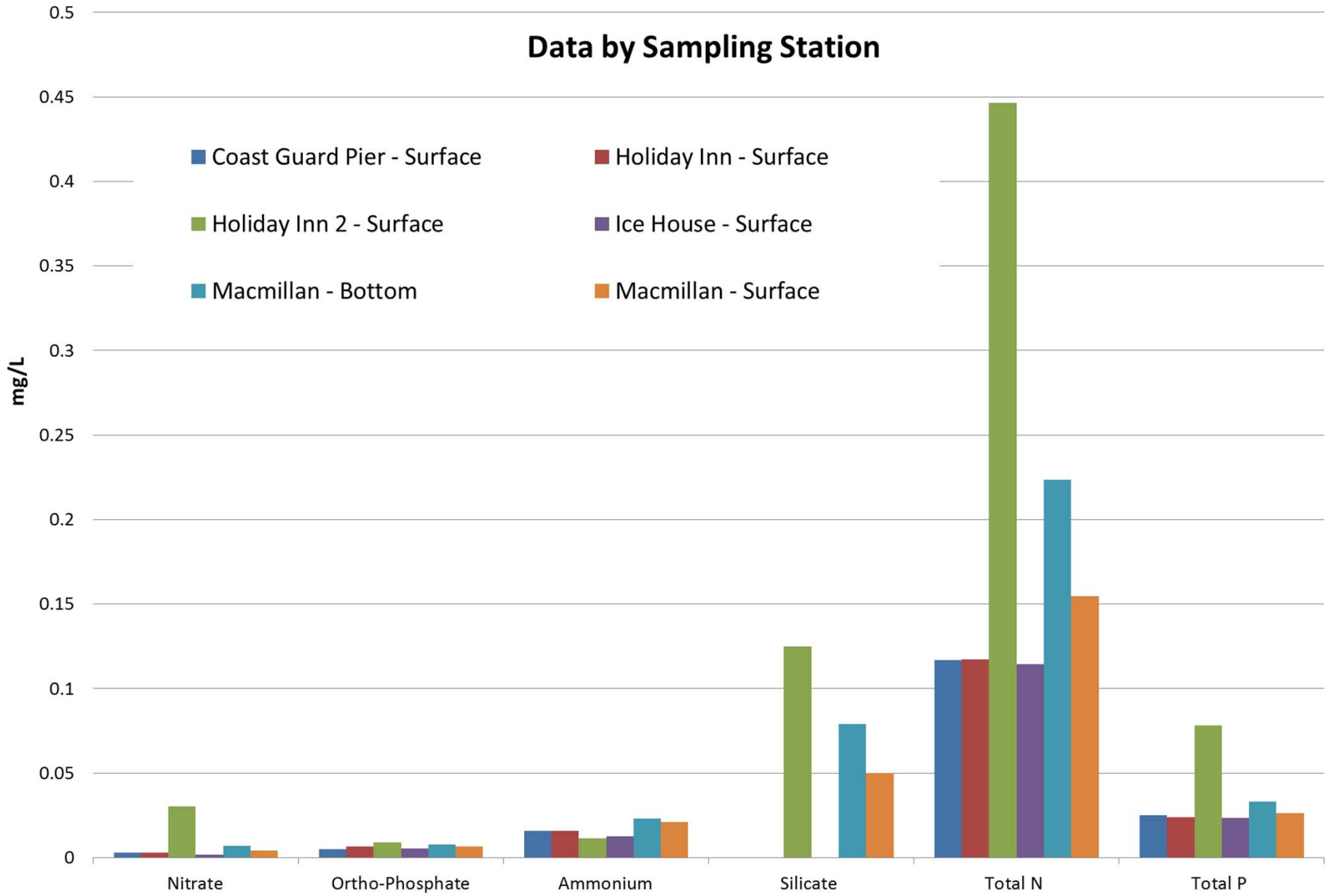
Water Quality Sampling Stations



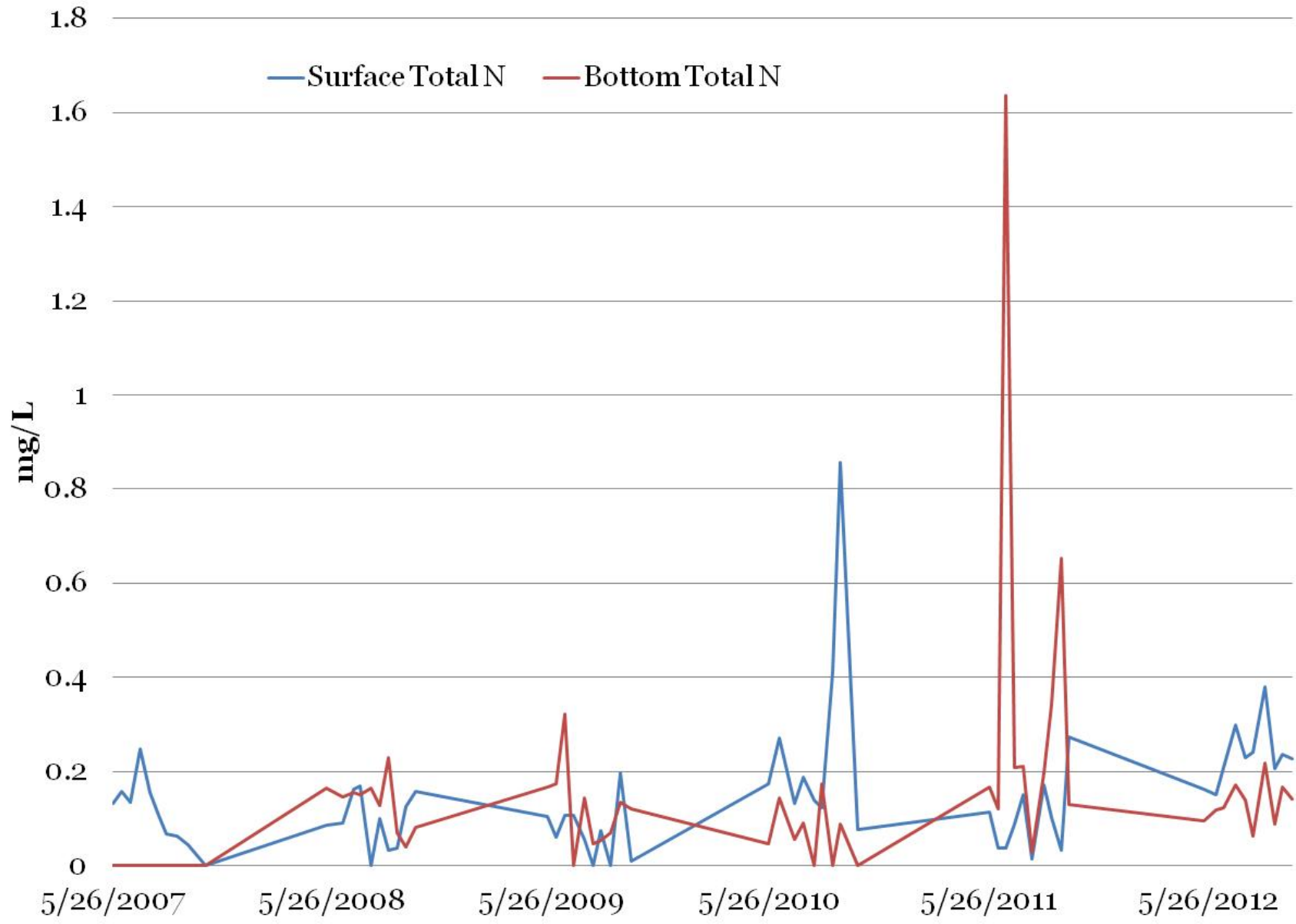
Average Water Quality Measurements for Provincetown Harbor



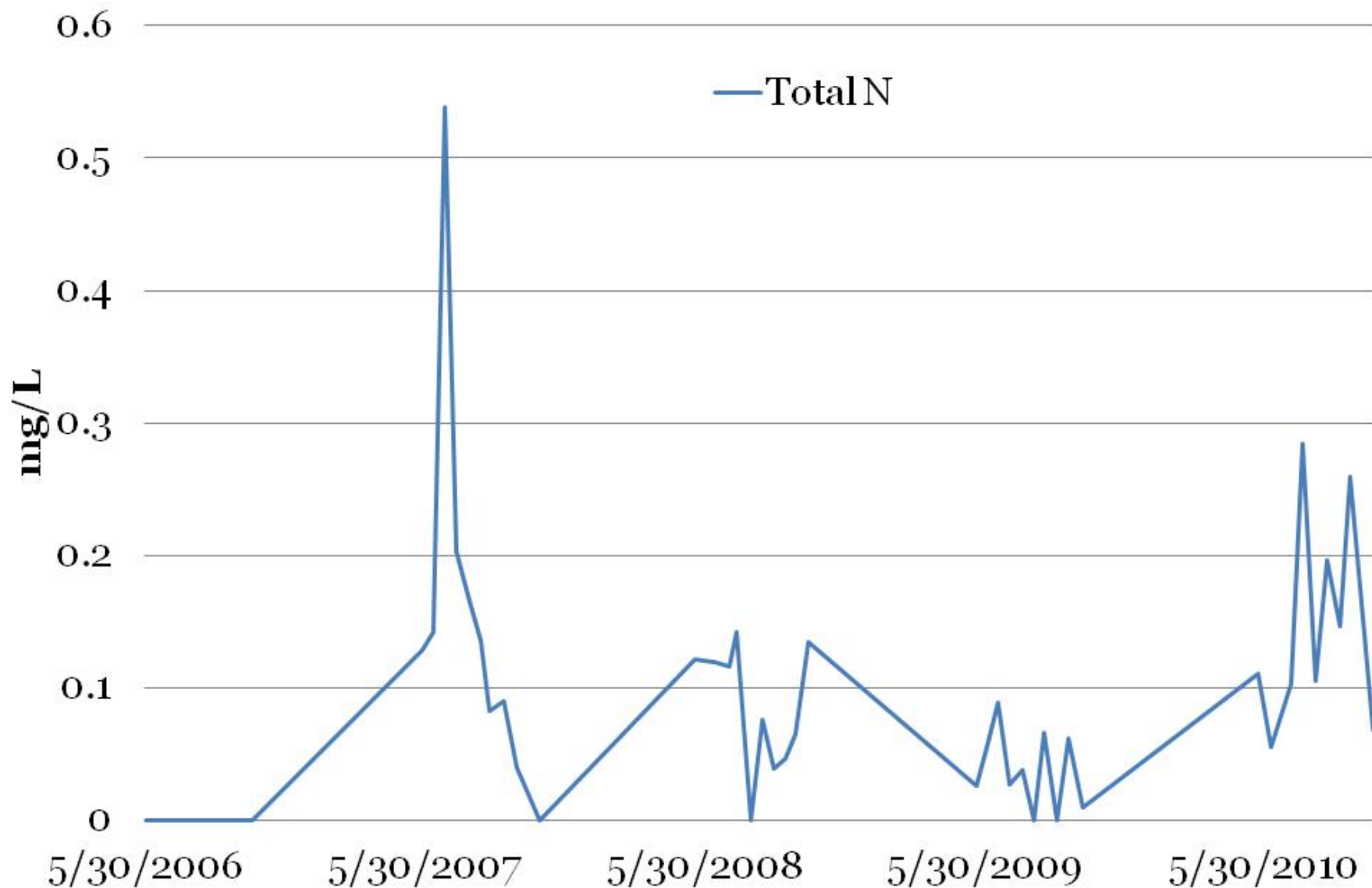
Data by Sampling Station



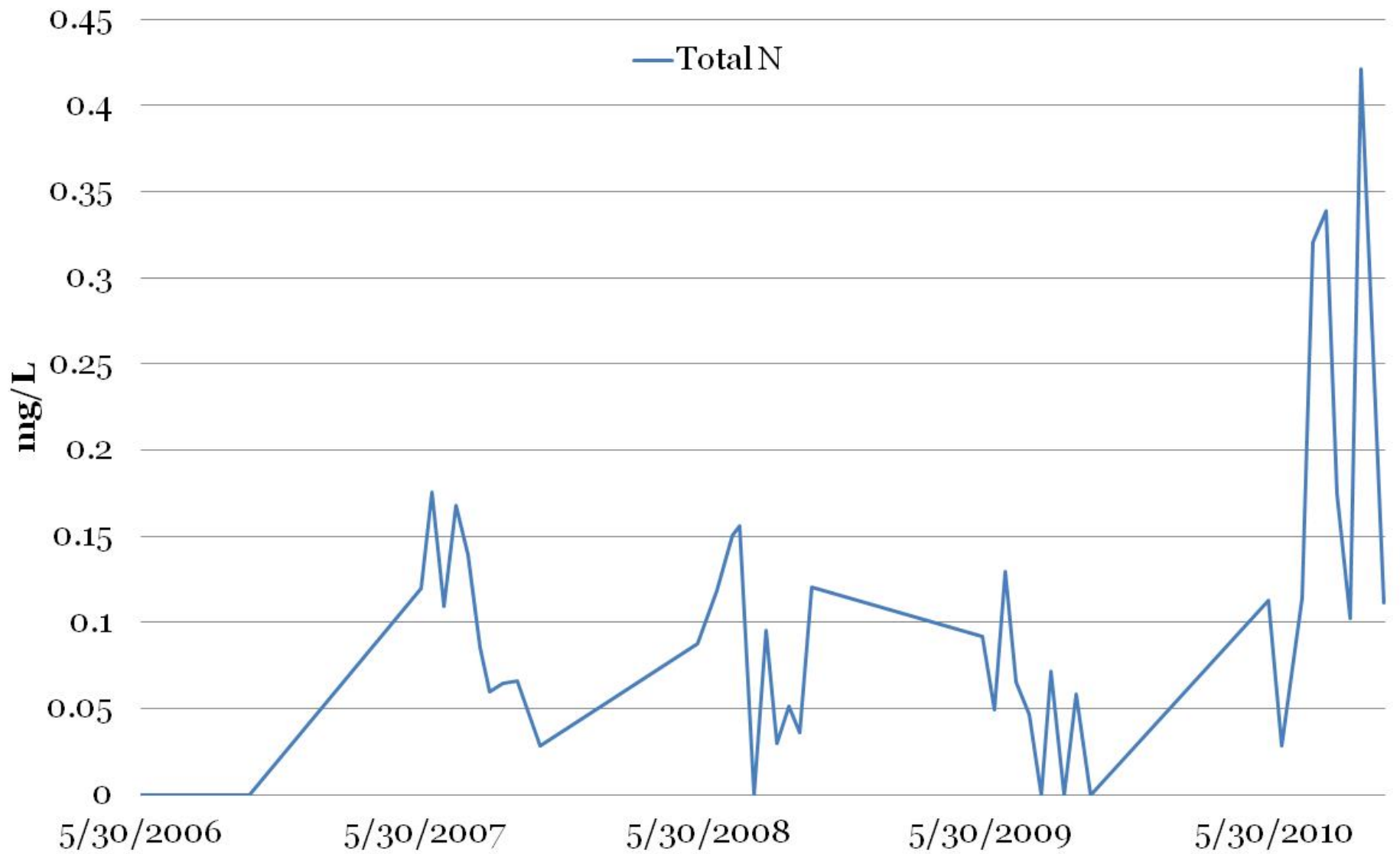
MacMillan



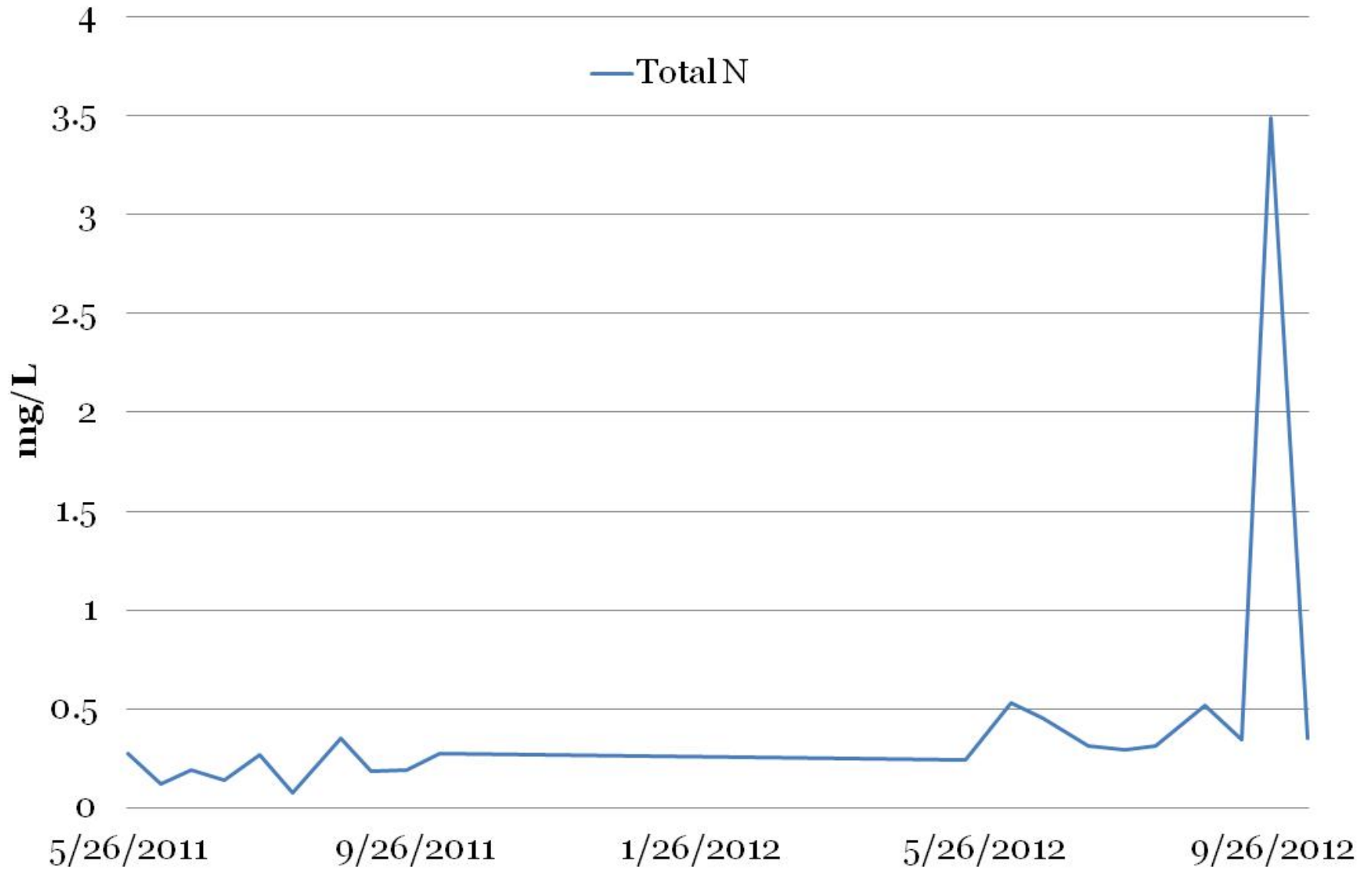
Coast Guard Pier



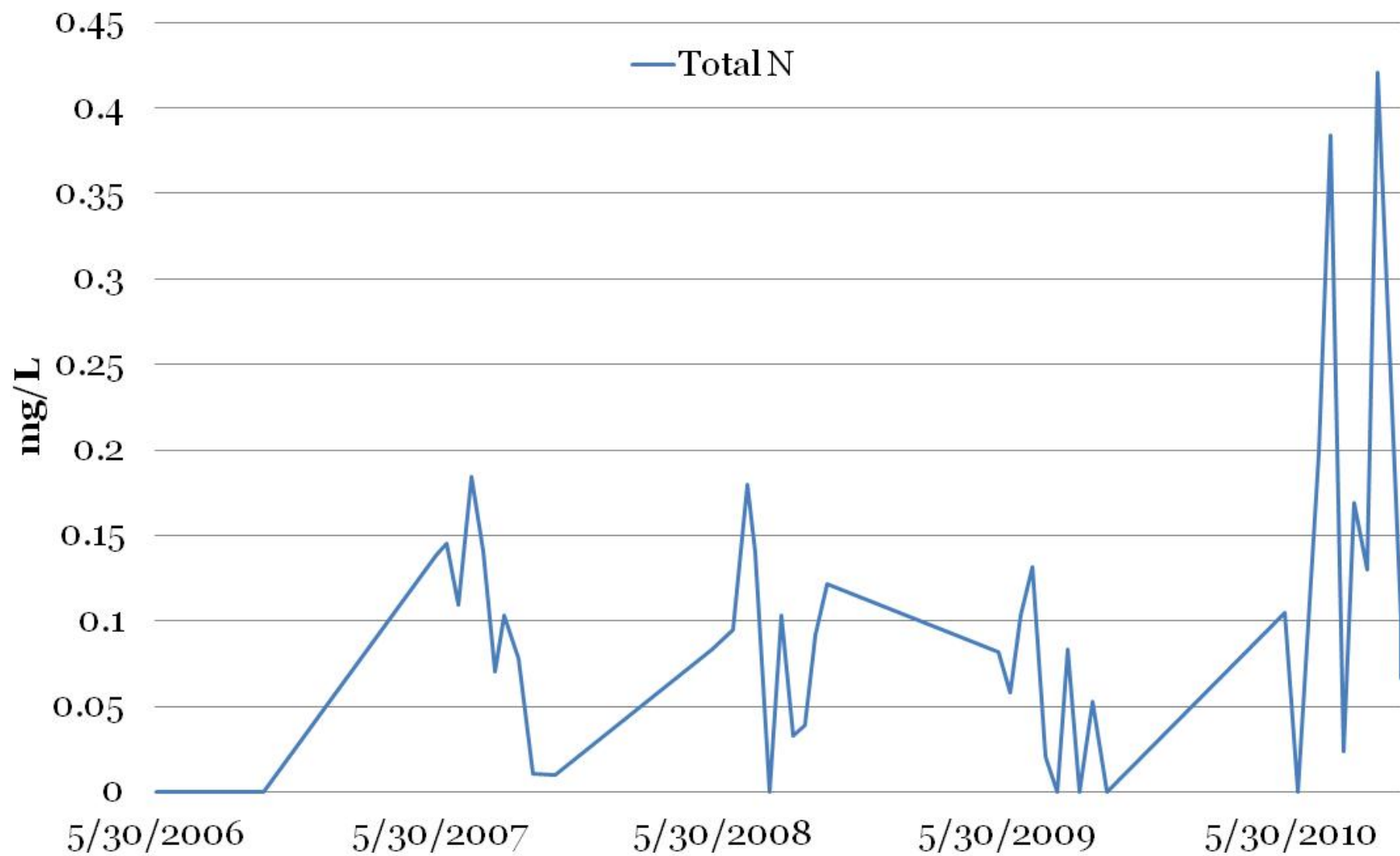
Holiday Inn



Holiday Inn 2

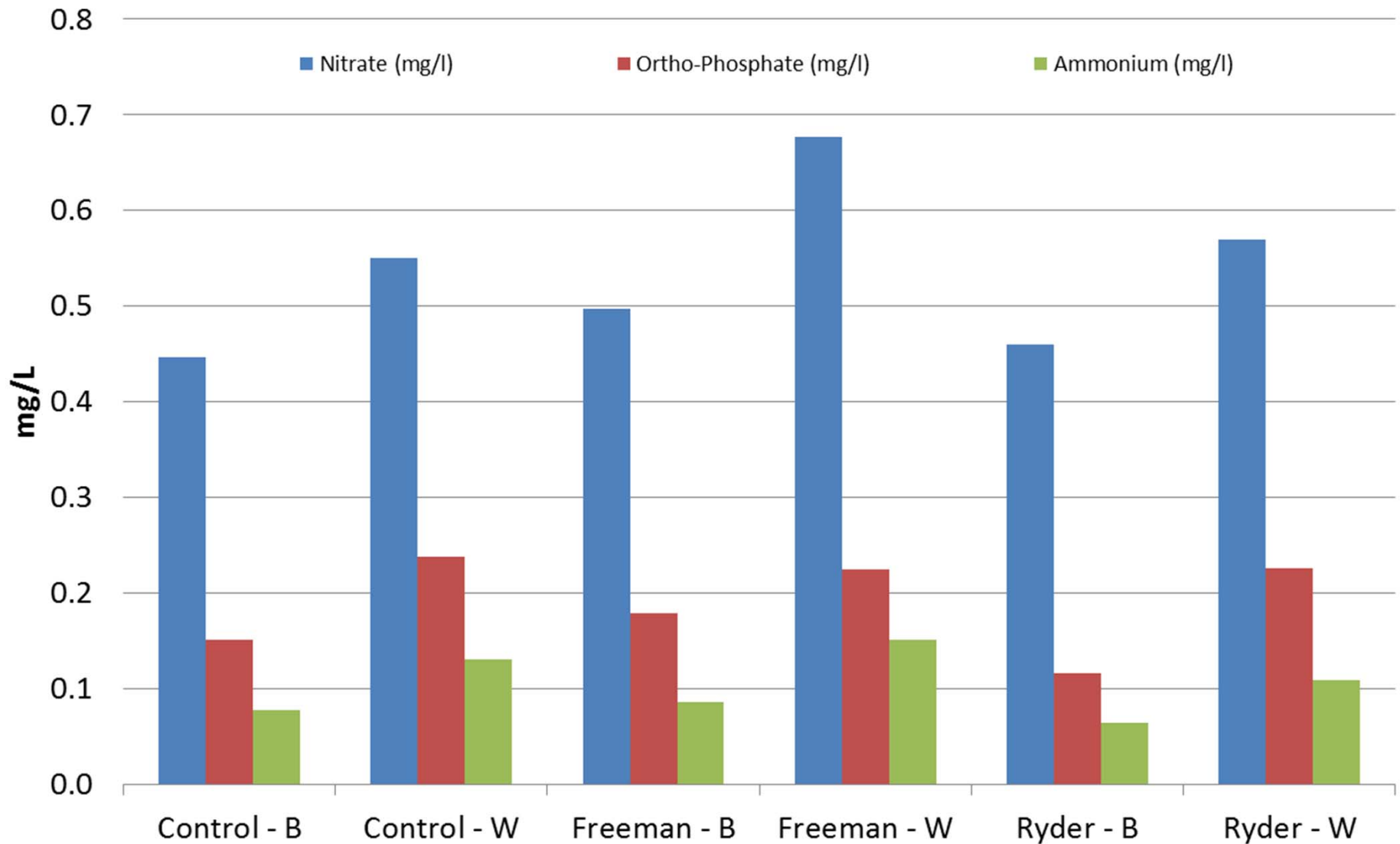


Ice House



Averaged Pore Water Quality Measurements for Beaches along Provincetown Harbor

Stations denoted "B" and "W" are located below and within the wrack line, respectively.




Nitrogen Problem


Base Map

 Town Lines


 Rivers


Embayment Boundary

 On Land


 On Sea

Major Roads

 US Highway

 State Highway







 Roads

 Structures





 Ponds

Nitrogen

Water Quality Stations






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






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%


Eelgrass Extent


Base Map

 Town Lines


 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



**Provincetown Harbor
Hatches Harbor**


Existing Infrastructure


Base Map

 Town Lines


 Rivers


Embayment Boundary

 On Land


 On Sea

Major Roads

 US Highway


 State Highway


 Roads


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 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

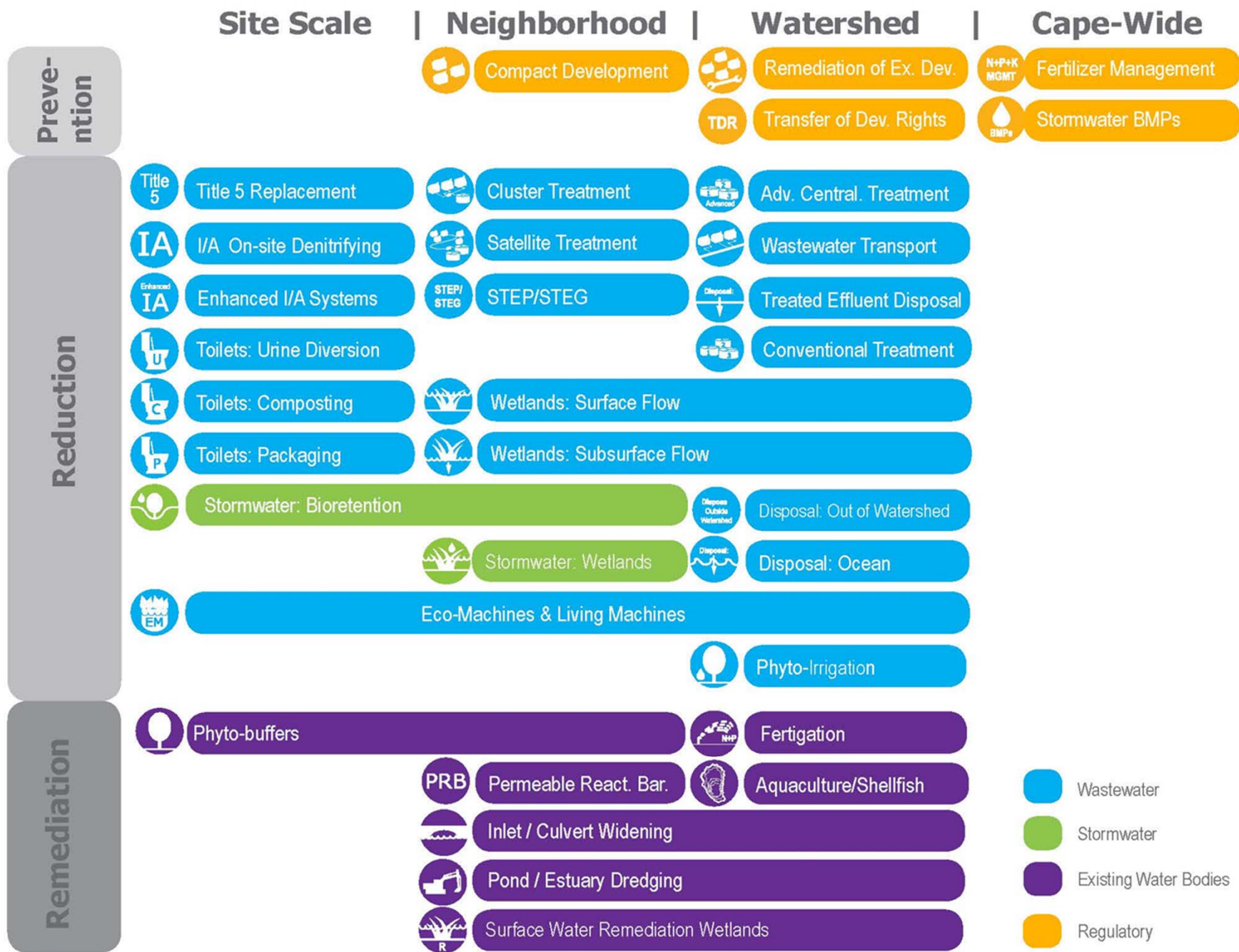
 2031 - 2040

 2041 - 2050



Framework for Addressing Solutions Moving Forward

**Provincetown Harbor
Hatches Harbor**



- 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 Provincetown Harbor Group
will be available on the Cape Cod Commission website:**

<http://watersheds.capecodcommission.org/index.php/watersheds/outer-cape/provincetown-harbor>

Provincetown Harbor
Hatches Harbor