Lewis Bay to Bass River

Baseline Conditions & Needs Assessment

What is the 208 Plan?

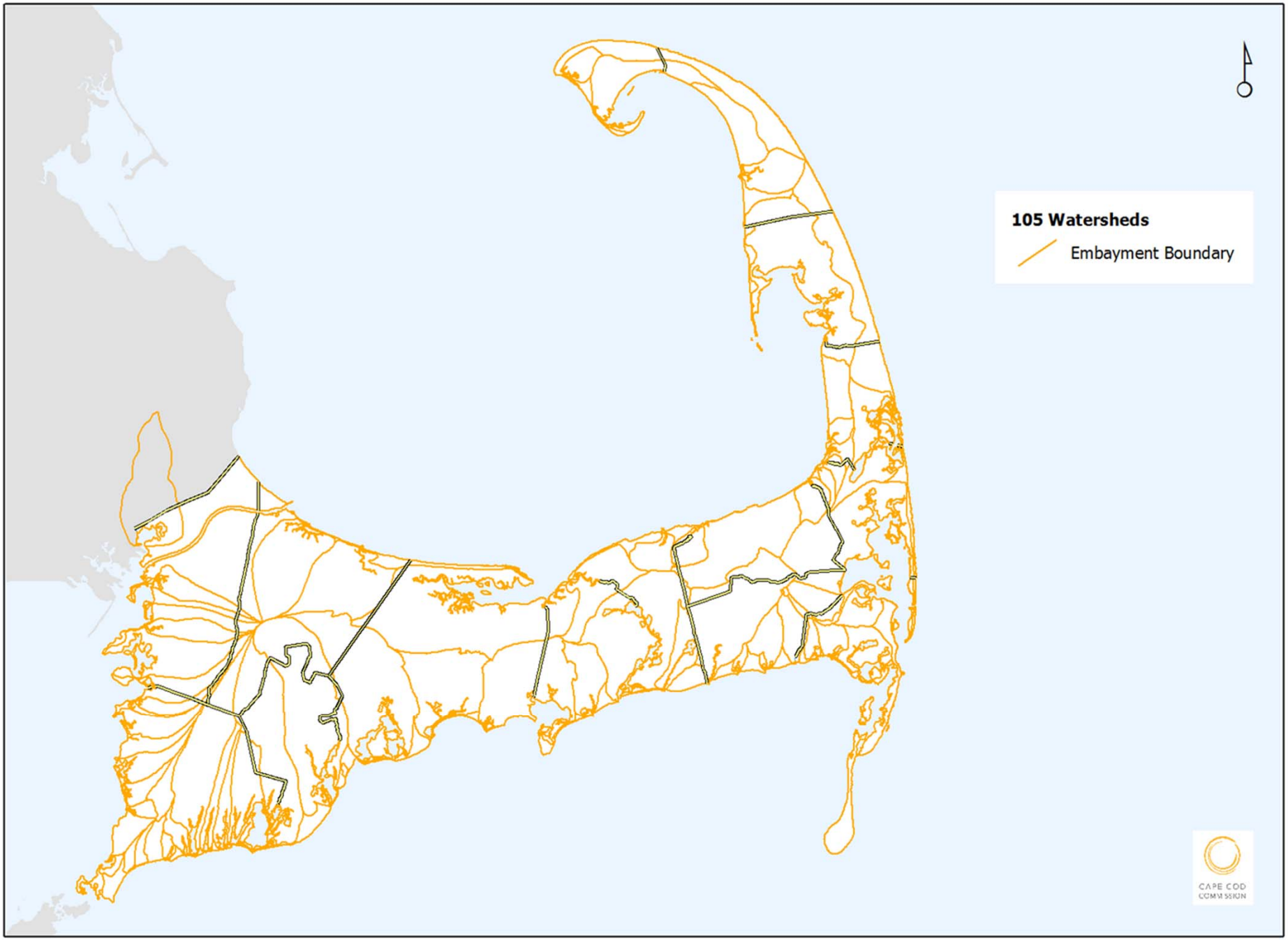
Clean Water Act Section 208

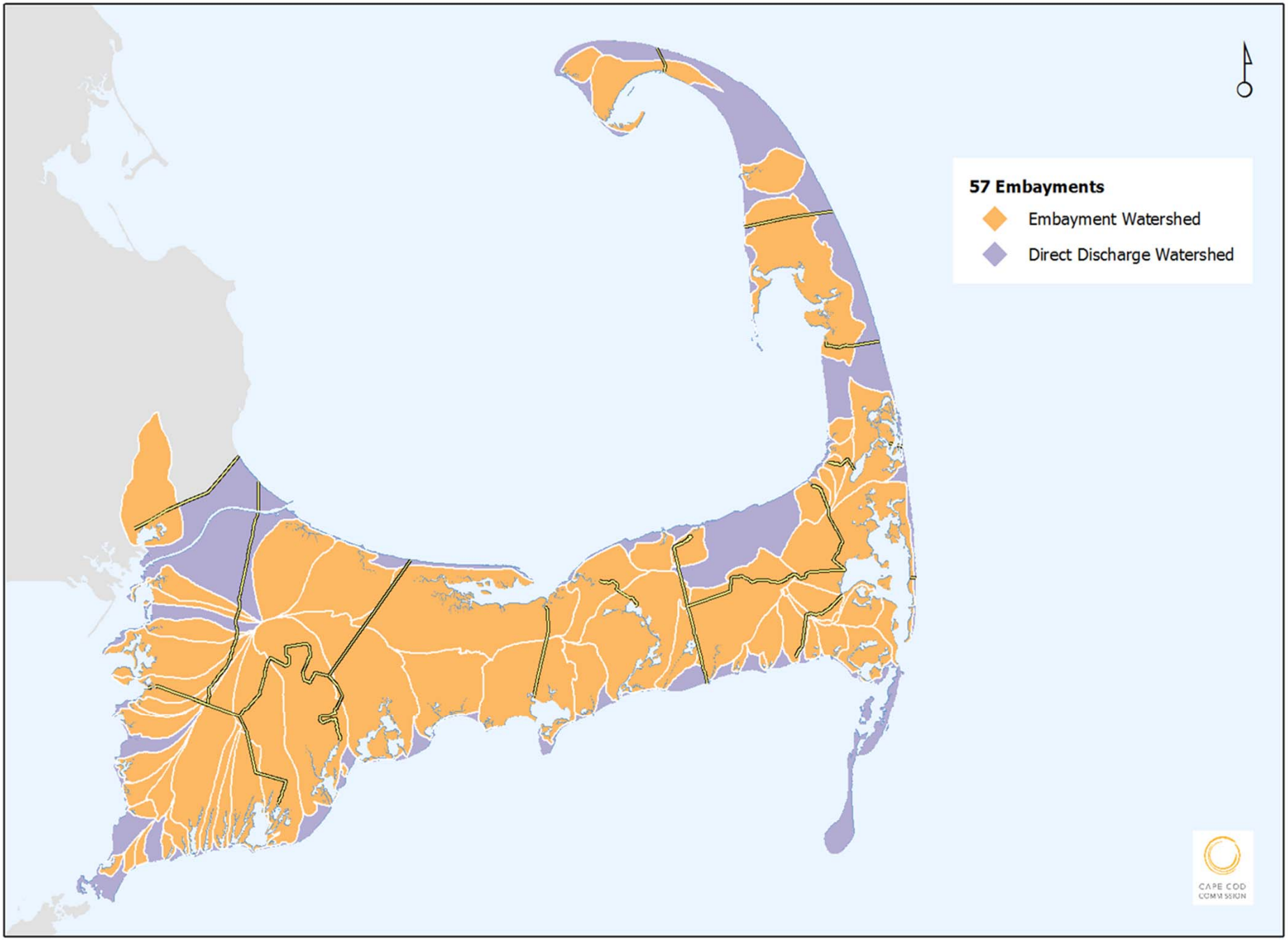
The Commission was directed to update the 1978 Plan

The Commonwealth provided $3 million to fund the project

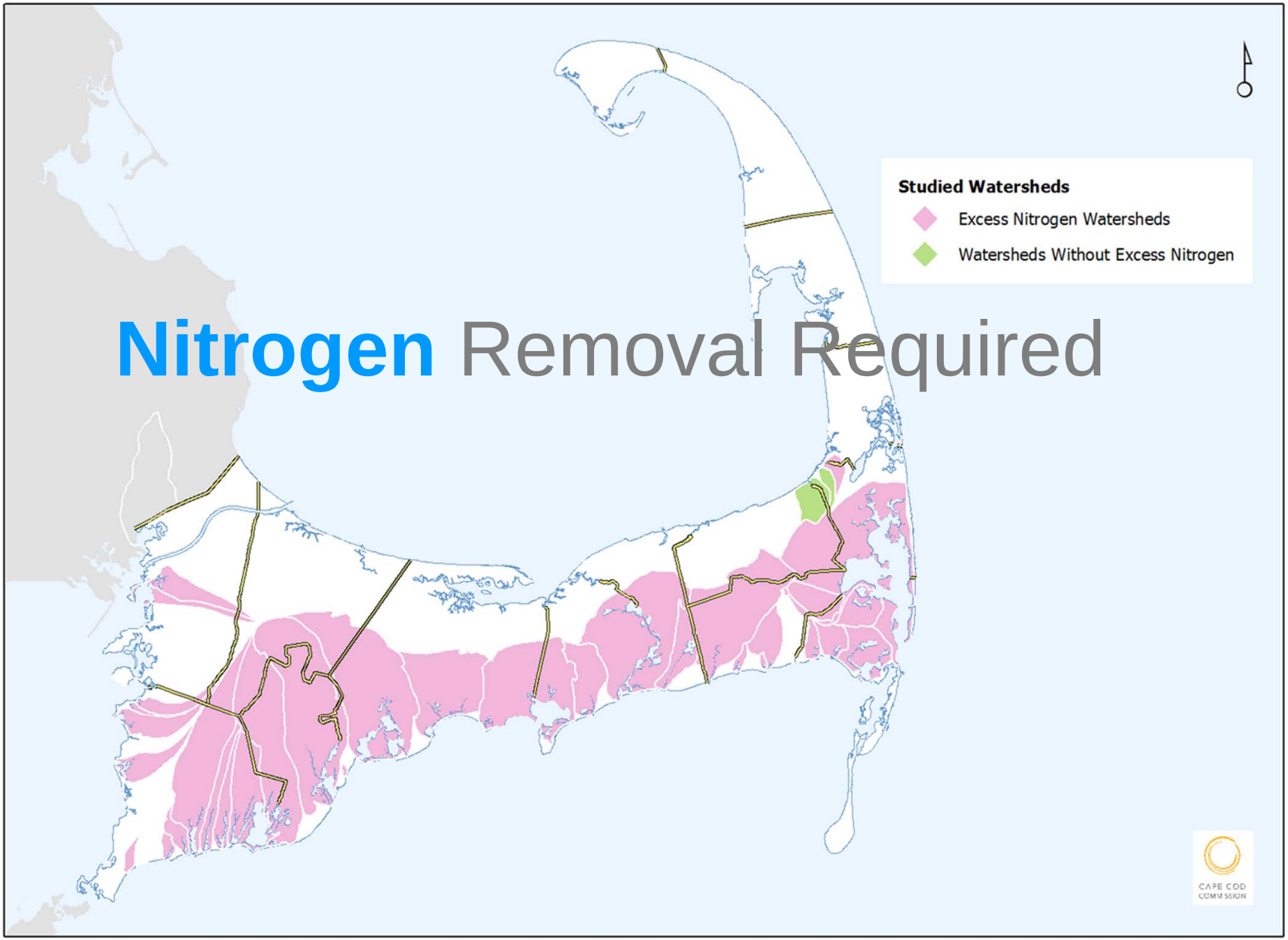
Focus on 21st Century Problems

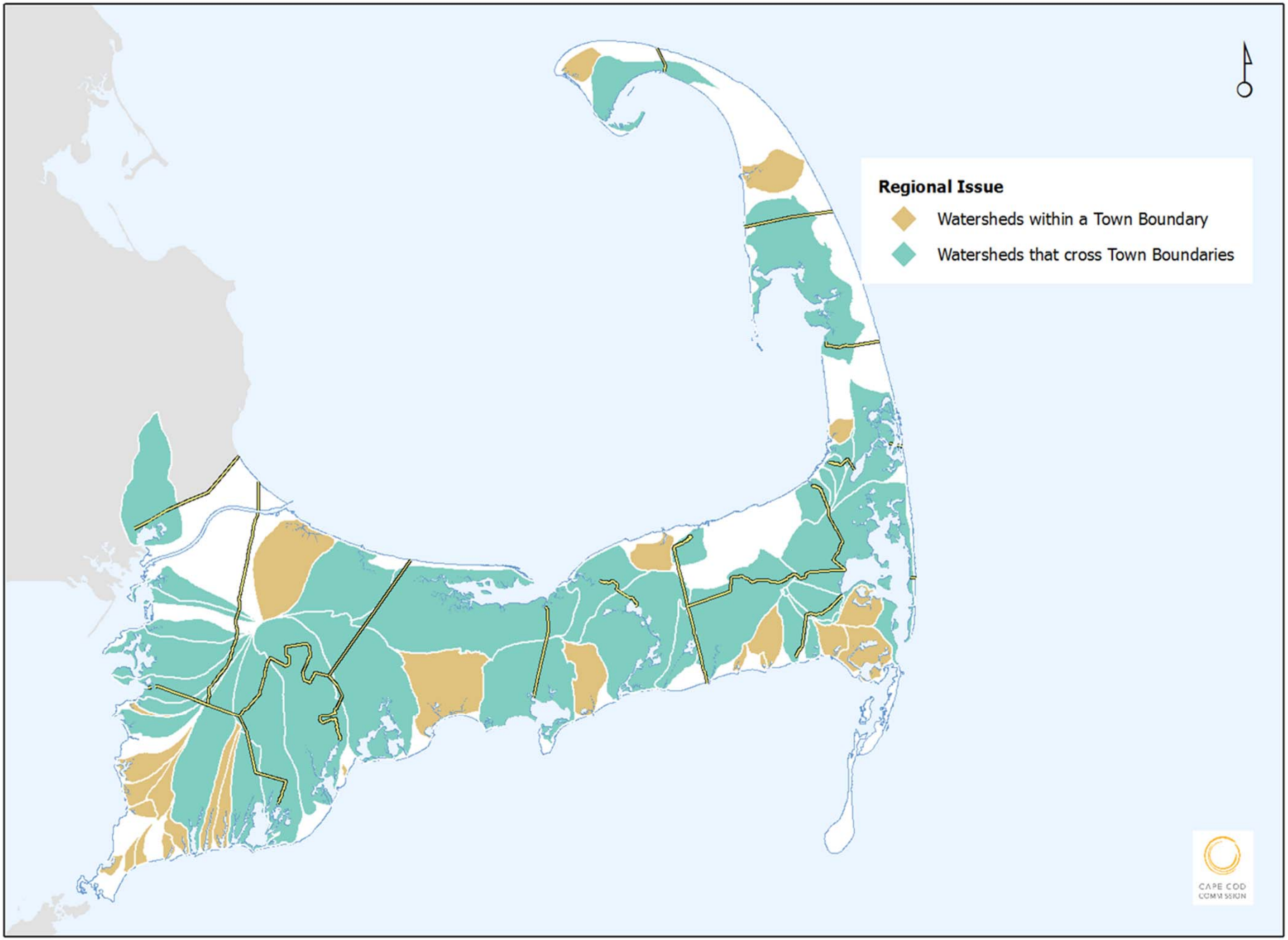
- Nitrogen: Saline Waters
- Phosphorus: Fresh Waters
- Growth & Title 5 Limitations


105 Watersheds
Embayment Boundary
CAPE COD
COMMISSION

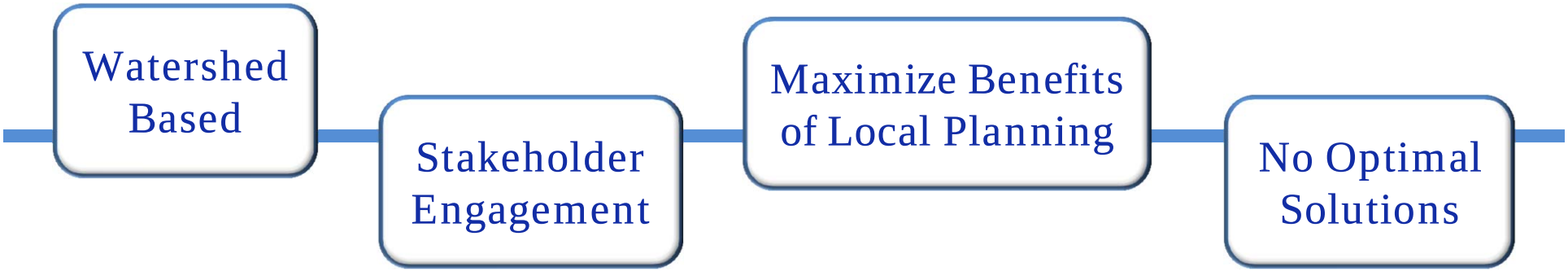

57 Embayments
Embayment Watershed
Direct Discharge Watershed
CAPE COD COMMISSION

Nitrogen Removal Required

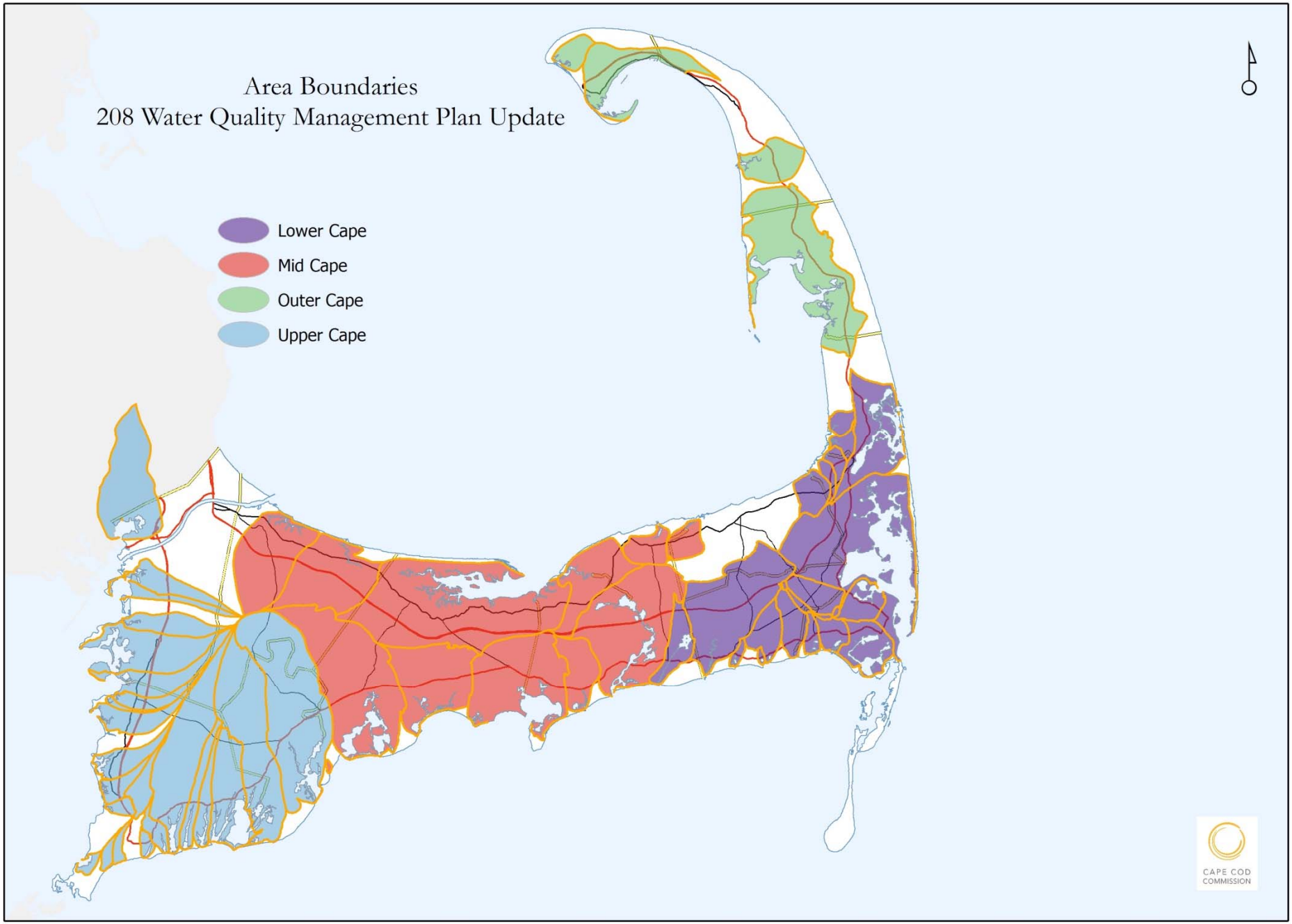


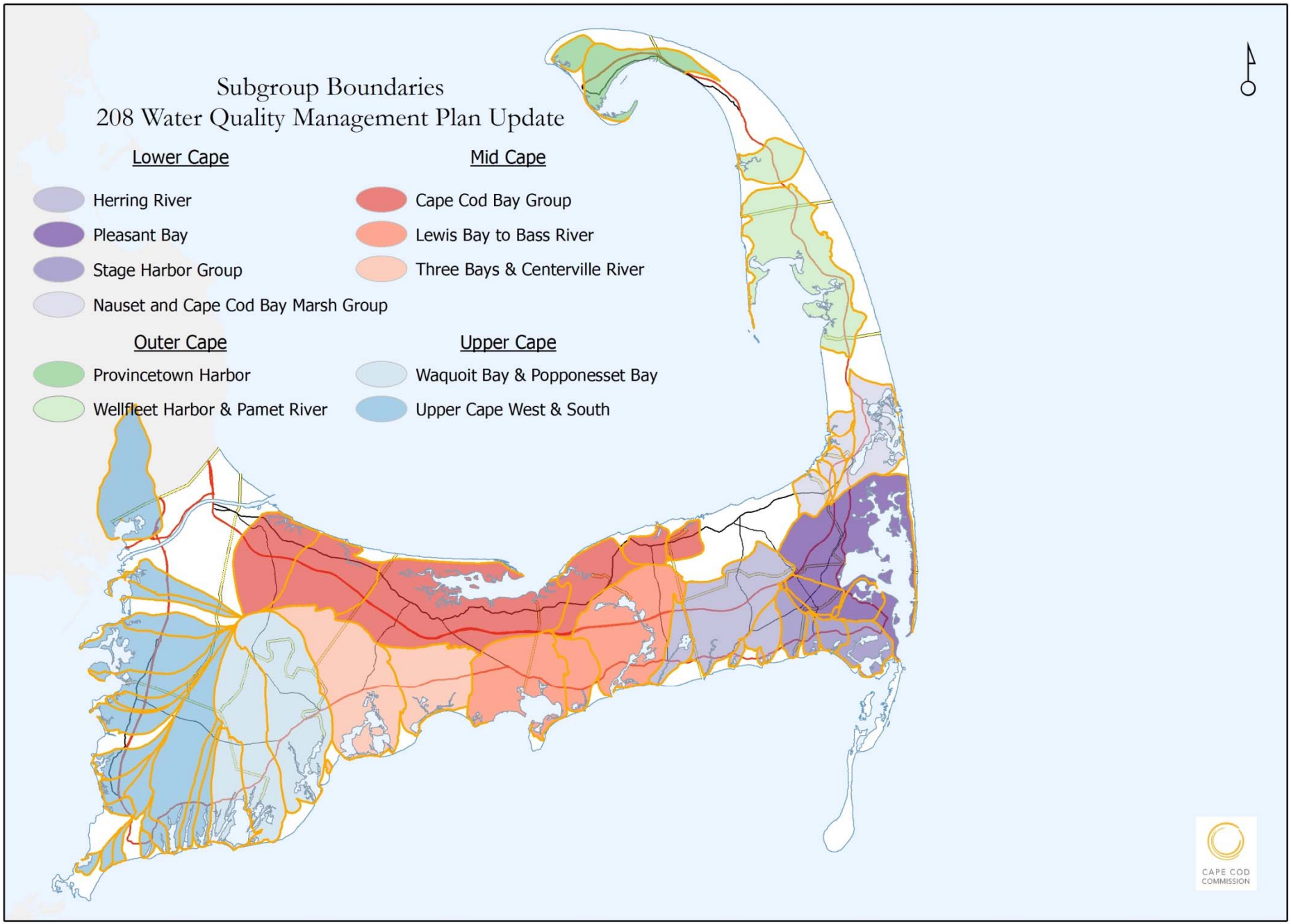

Regional Issue
Watersheds within a Town Boundary
Watersheds that cross Town Boundaries
CAPE COD
COMMISSION

Approach to the 208 Plan Update



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

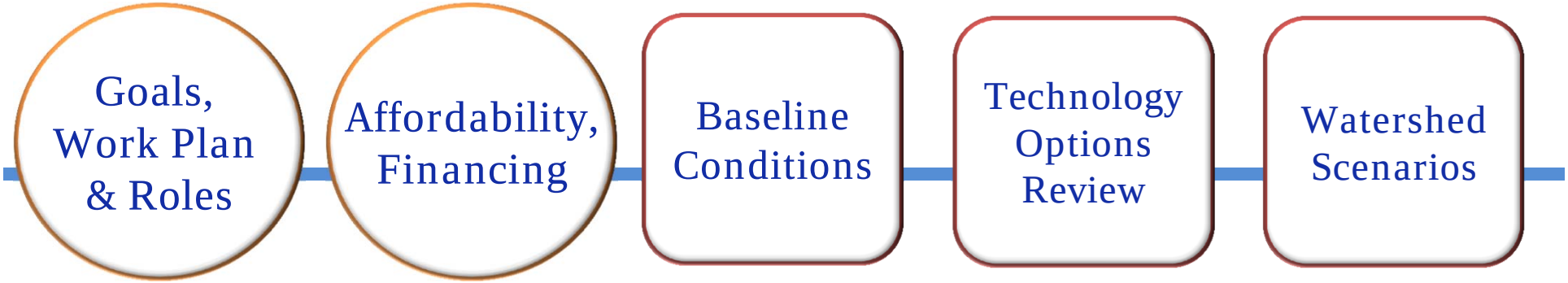

Area Boundaries
208 Water Quality Management Plan Update
Lower Cape
Mid Cape
Outer Cape
Upper Cape
CAPE COD
COMMISSION


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
CAPE COD COMMISSION

What is the stakeholder process?

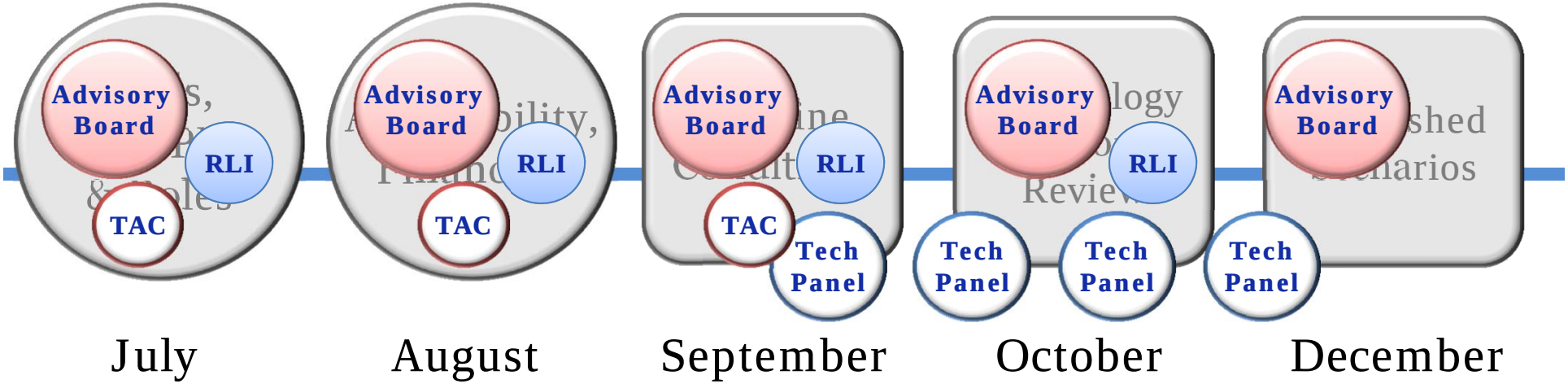
Public Meetings

Watershed Working Groups



July August September October December

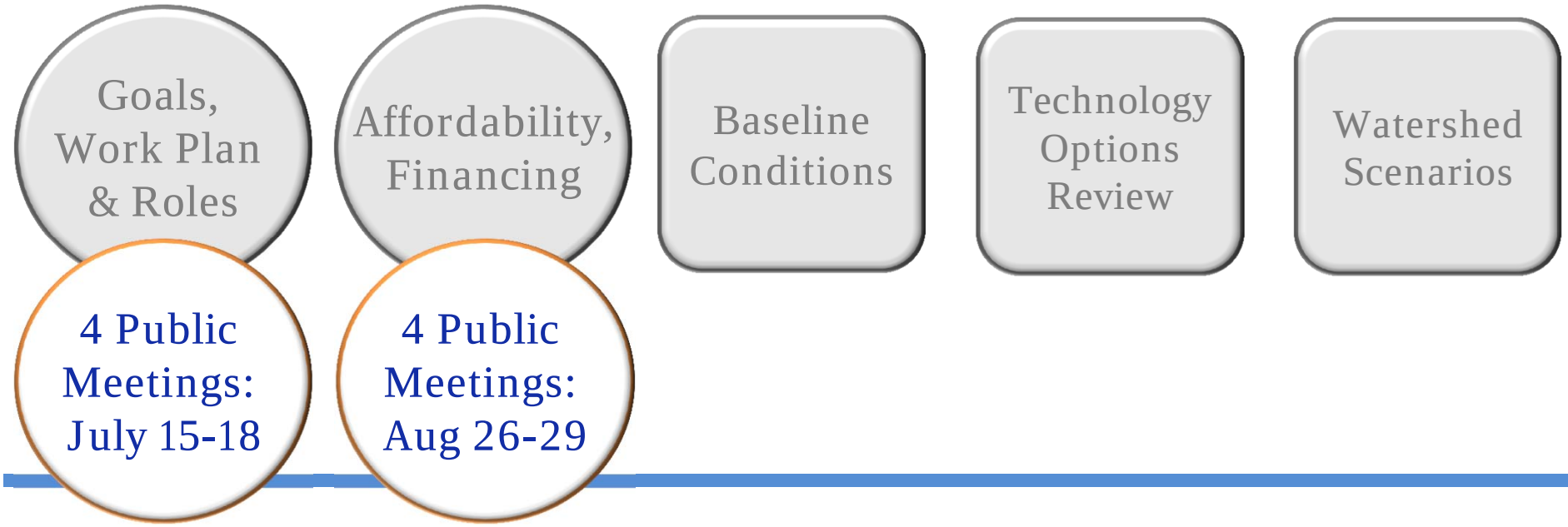
208 Planning Process



RLI — Regulatory, Legal & Institutional Work Group

TAC — Technical Advisory Committee of Cape Cod Water Protection Collaborative

208 Planning Process



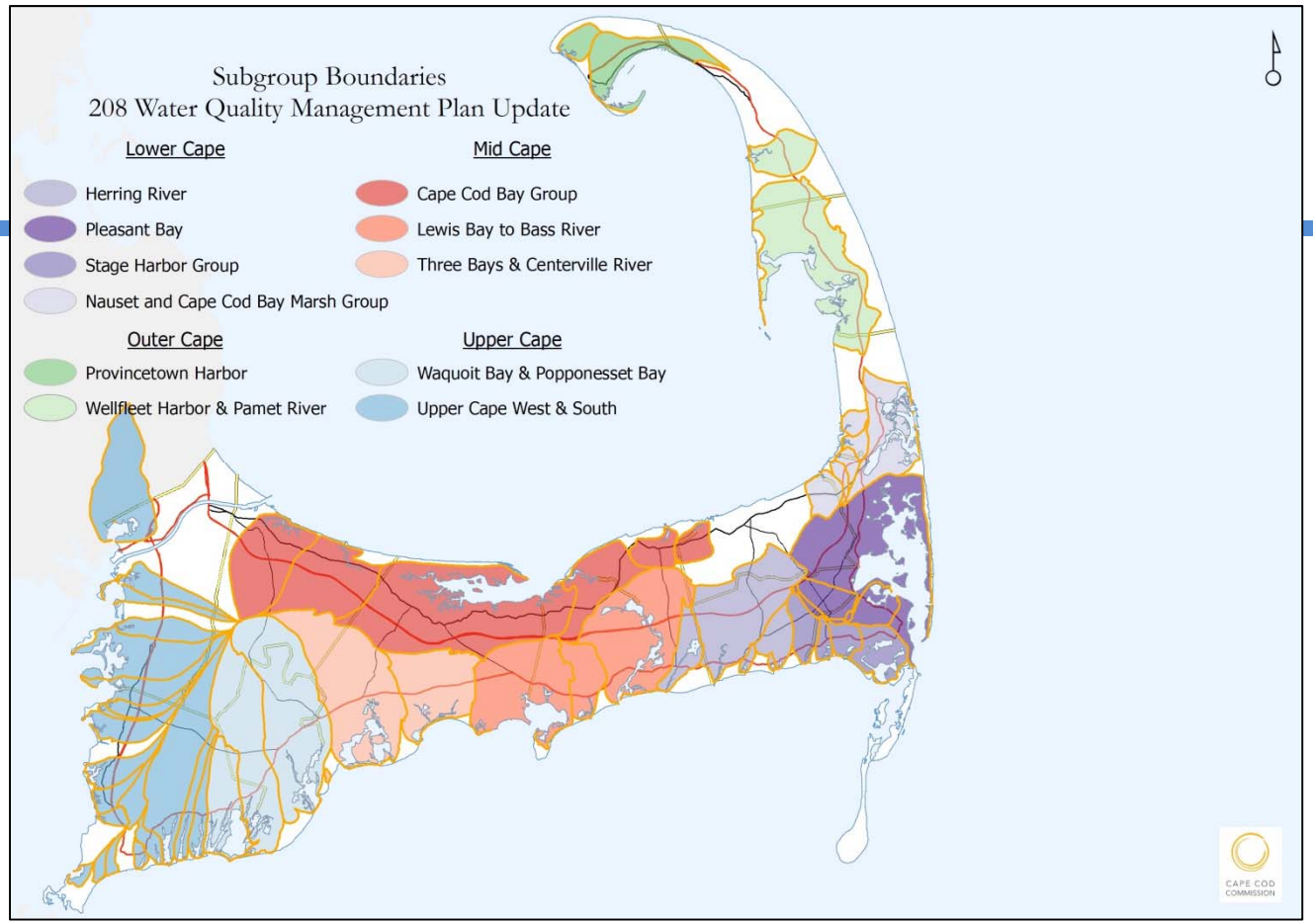
208 Planning Process

Baseline Conditions

11 Working Group Meetings: Sept 18-27

Technology Options Review

Watershed Scenarios



208 Planning Process

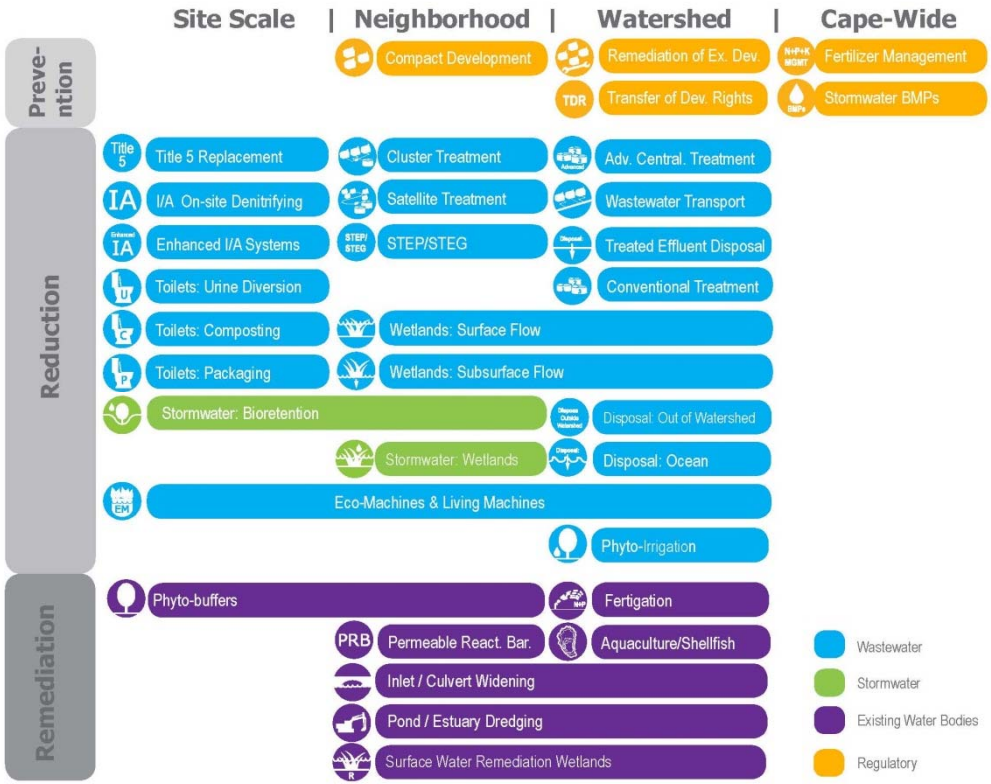
Baseline Conditions

11 Working Group Meetings: Sept 18-27

Technology Options Review

11 Working Group Meetings: Oct 21-Nov 5

Watershed Scenarios



208 Planning Process

Baseline Conditions

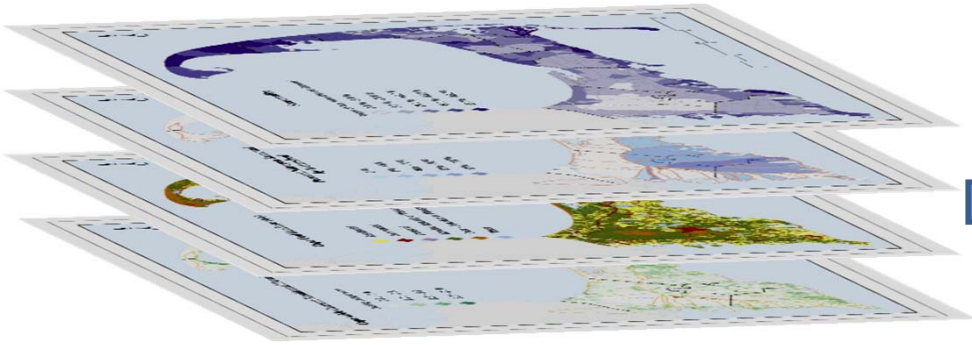
11 Working Group Meetings: Sept 18-27

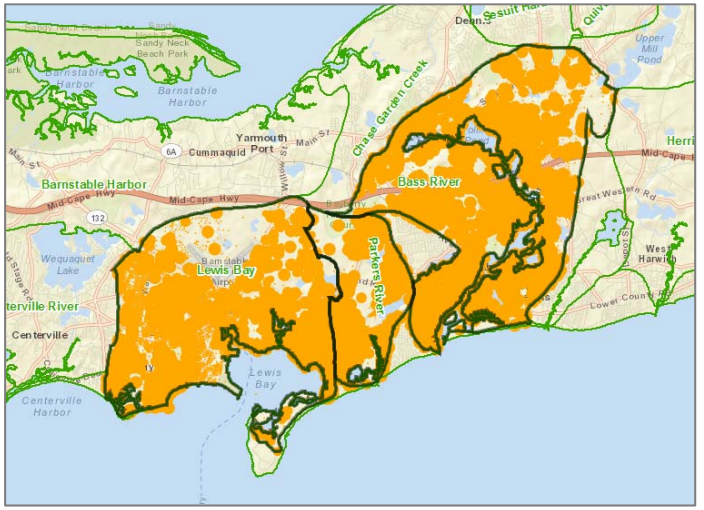
Technology Options Review

11 Working Group Meetings: Oct 21-Nov 5

Watershed Scenarios

11 Working Group Meetings: Dec 2-11





208 Planning Process

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

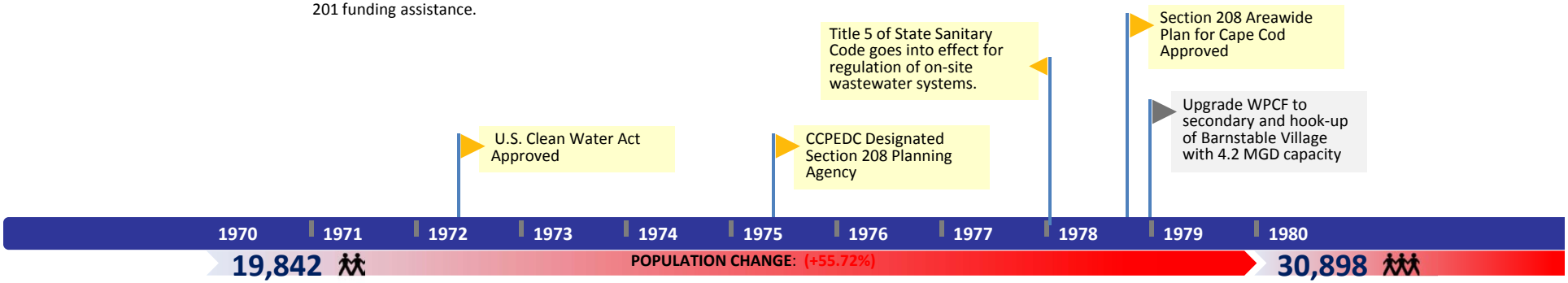
Local Progress to Date

Bass River
Lewis Bay
Parkers River

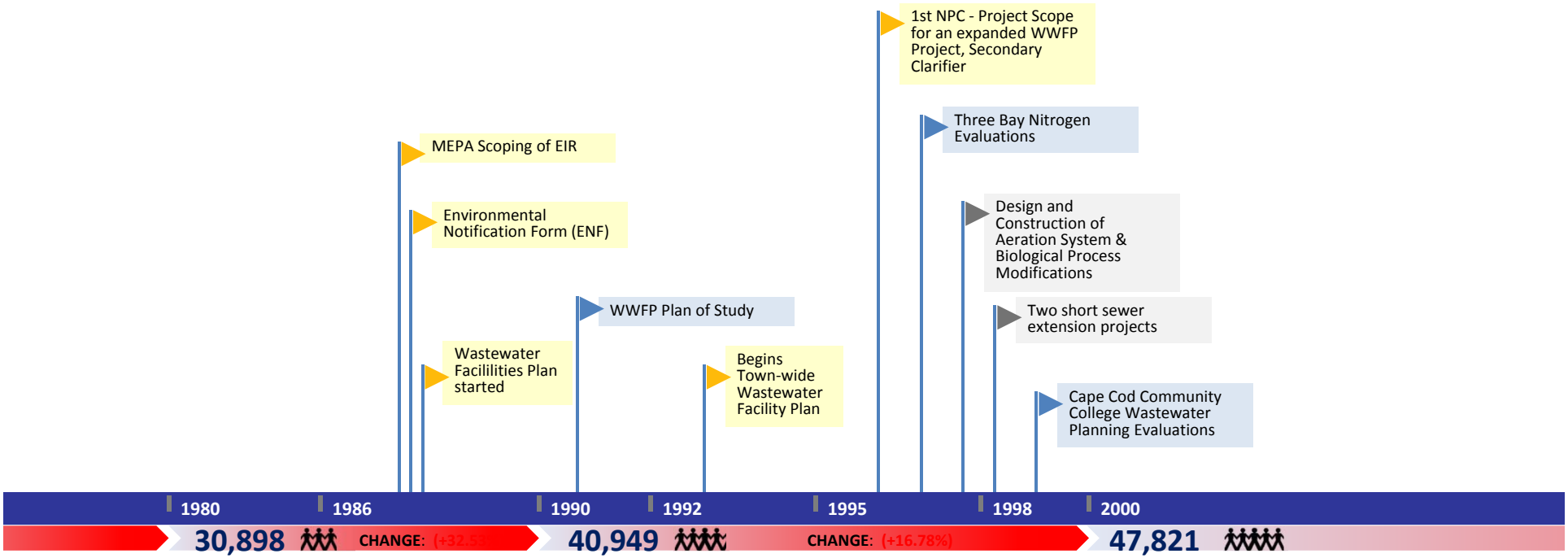
Barnstable: 1970-2013

From 1978 Section 208 Plan

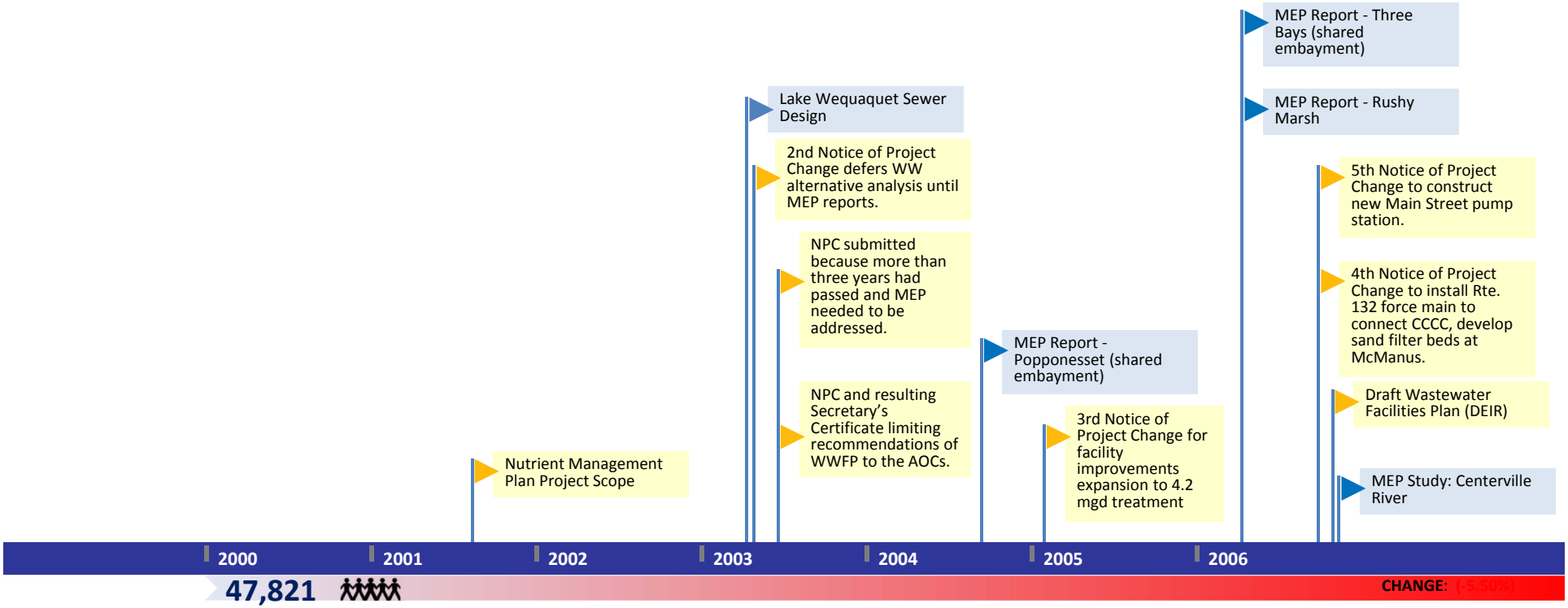
- The major 208 concern for Barnstable is the protection of its public water supply wells.
- The Planning Board appears to be interested in water supply protection as indicated by its recent zoning proposals. The coordination of town boards and the water utilities is essential to the success of this effort in Barnstable.
- Possible consolidation of the water utilities or some formal coordinative mechanism should be seriously considered to insure efficient and effective protection of the town's water resources.
- While the town is presently constructing an expansion of the sewage treatment plant and collection system with EPA 201 funds, it has not addressed all of the wastewater management problem areas in the town. Additional 201 facilities planning must be carried out to demonstrate a sewer need exists under present EPA criteria.
- Certain problem areas are included as future phases of the sewer collection system expansion in the "Sewer Service Areas" delineated in the 208 plan and would be eligible for 201 funding assistance.
- The present Hyannis treatment plant has the necessary capacity to handle all sewer service area needs in Hyannis. Should the town want to expand the collection system beyond these sewer service areas, 201 funds will not be available for these expansions or for an additional treatment plant.
- The need for collection system expansion in the Hyannis area should be carefully considered in assessing the plant's ability to accept wastewater from Yarmouth since the Hyannis treatment plant cannot be expanded beyond its present capacity.
- The town should consider, in the near future, entering into a 201 facilities plan to resolve the present Category 2 problem areas possibly through decentralized solutions.
- The 201 study and efforts of town board should address the coastal water quality problems of the town, particularly Lewis Bay.



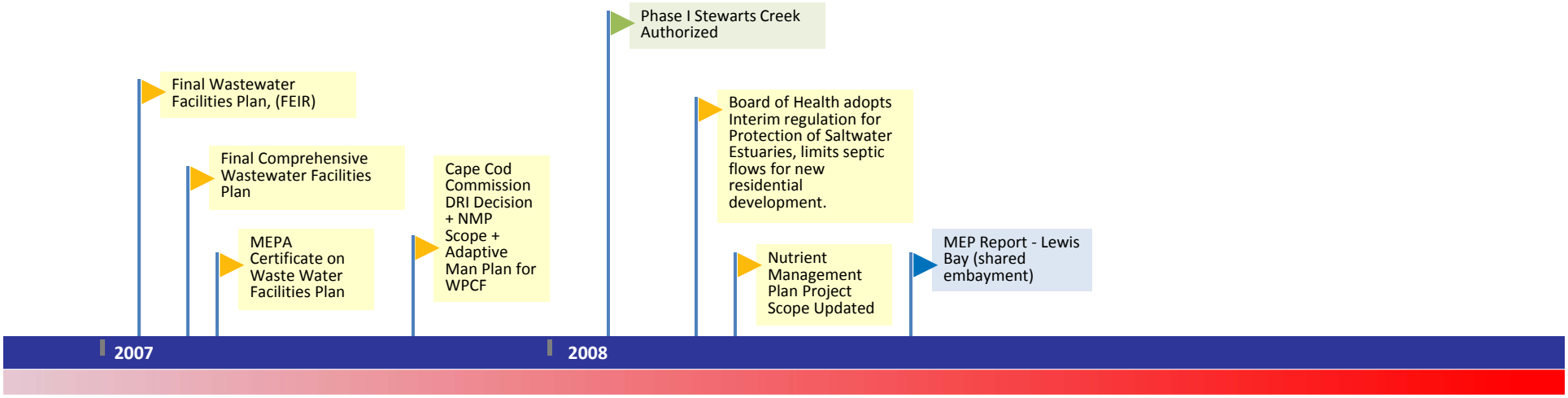
Barnstable: 1970-2013



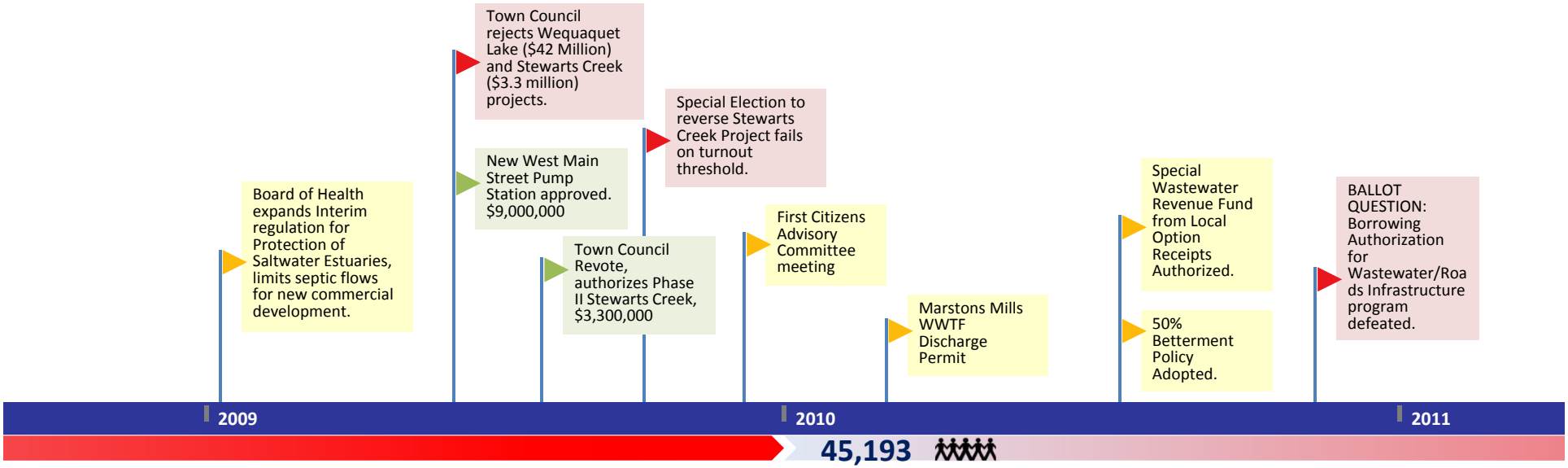
Barnstable: 1970-2013



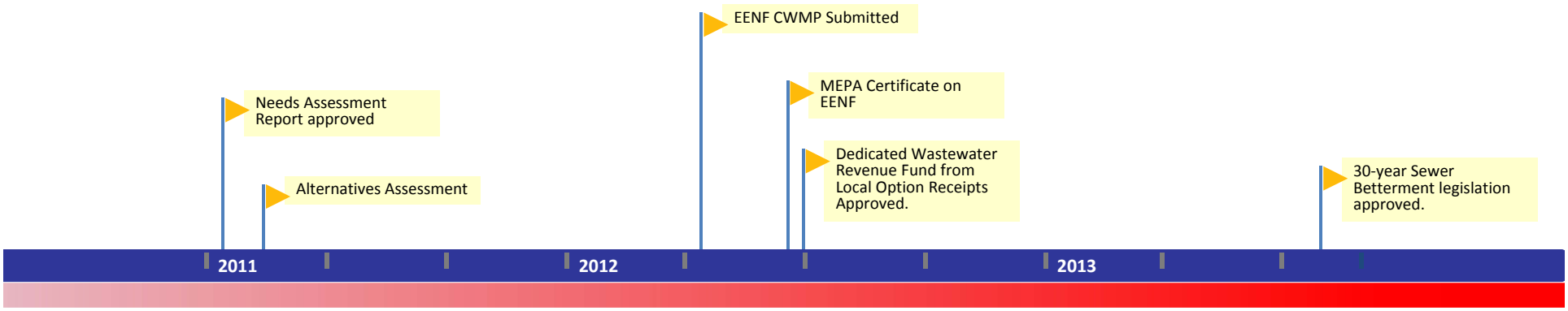
Barnstable: 1970-2013



Barnstable: 1970-2013



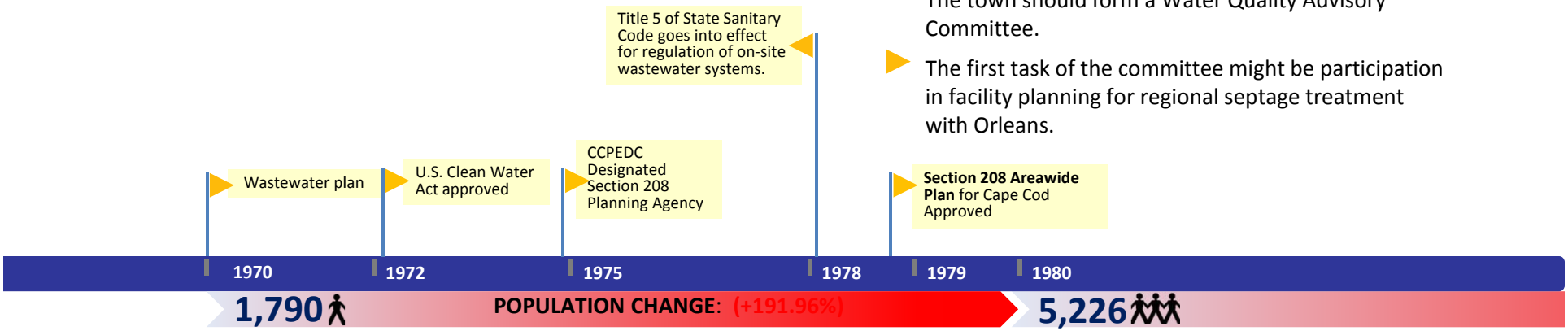
Barnstable: 1970-2013



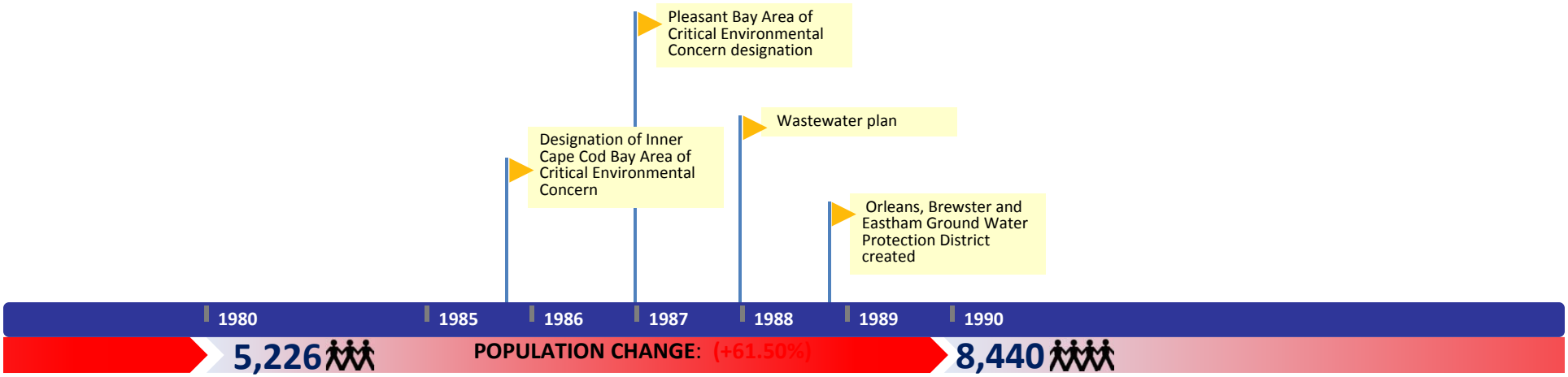
Brewster

From 1978 Section 208 Plan

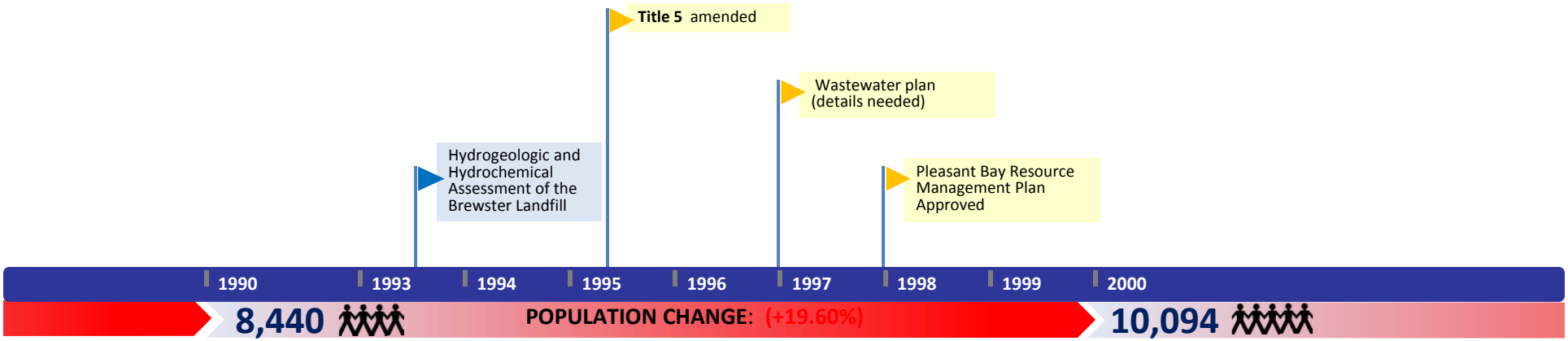
- Present and future town well sites should be protected from the non-point sources resulting from New development by creating Watershed Protection Districts.
- The town should cooperate in regional water supply planning to determine future water supply needs of neighboring towns and whether it can assist.
- WASTEWATER: It is expected that no new problem areas will develop and that present problem areas will be controlled during the planning period.
- The Orleans 201 facility plan will soon be underway and the cooperation of Brewster in the planning of a septage facility in Orleans that can meet Brewster's septage treatment needs is highly recommended.
- It is recommended that Brewster consider cooperating in a regional landfill monitoring program.
- The town should form a Water Quality Advisory Committee.
- The first task of the committee might be participation in facility planning for regional septage treatment with Orleans.



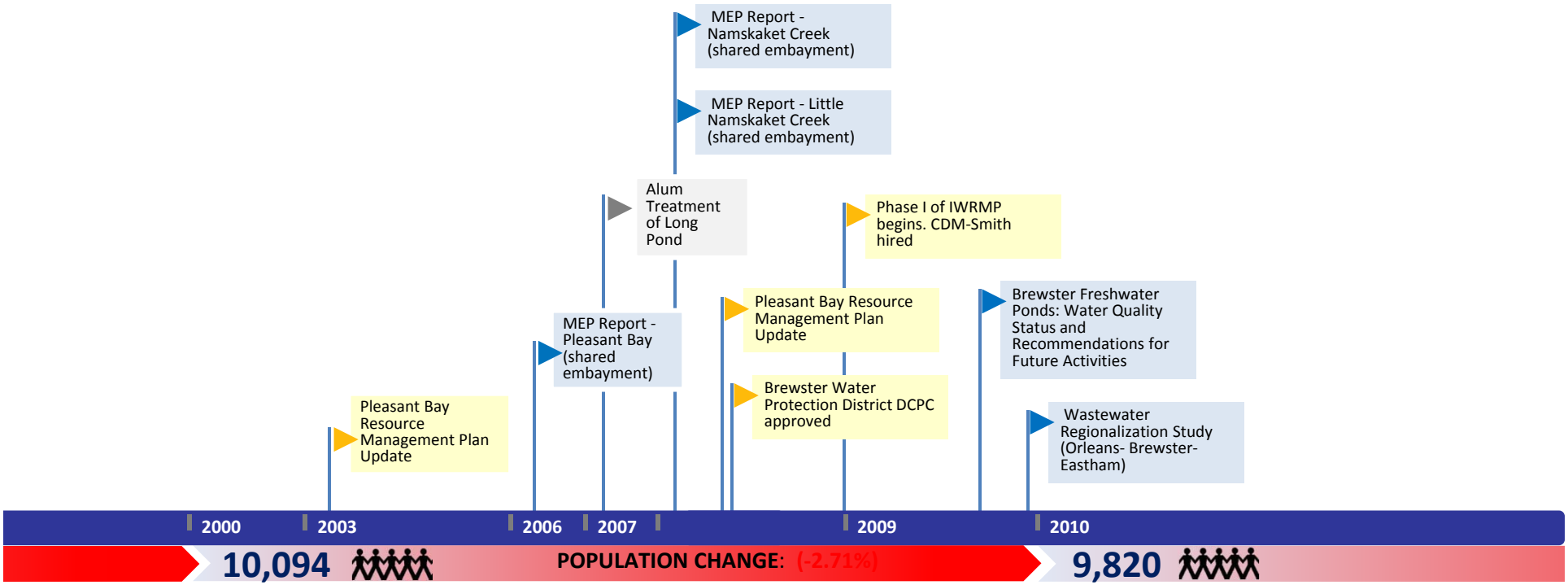
Brewster: 1970-2013



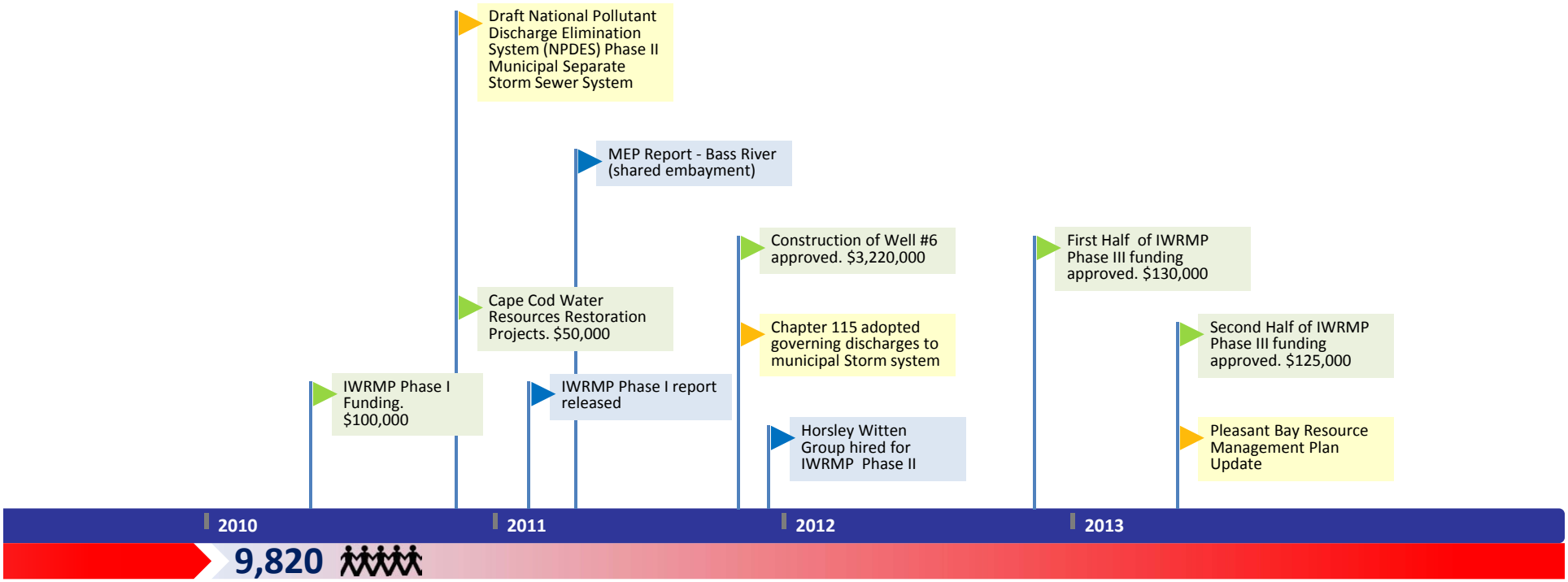
Brewster: 1970-2013



Brewster: 1970-2013



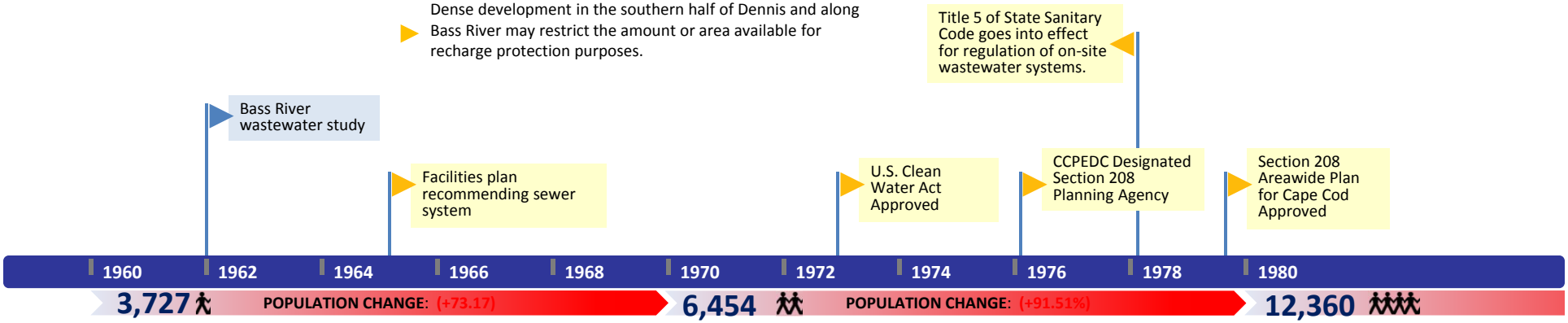
Brewster: 1970-2013



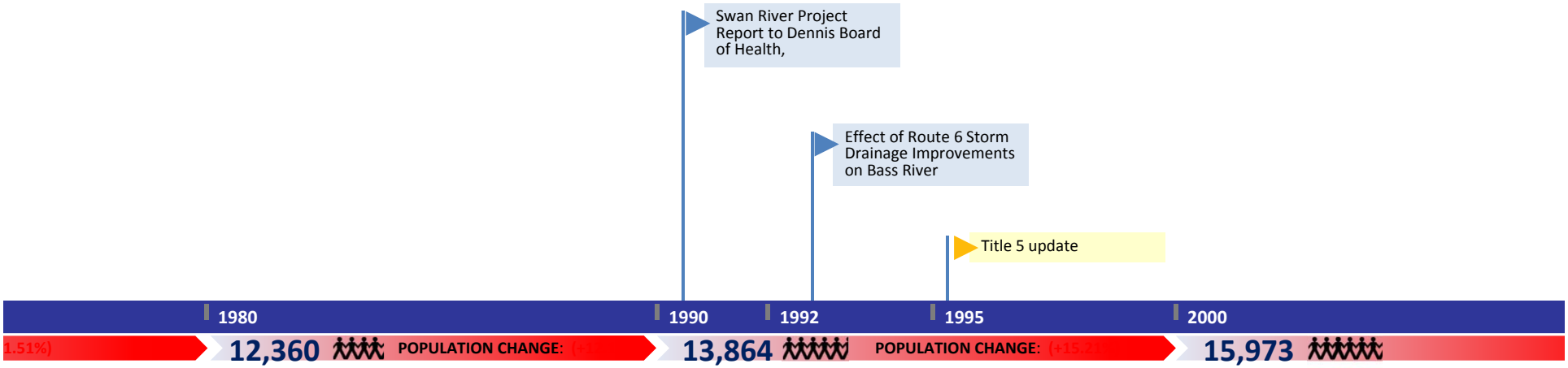
Dennis

From 1978 Section 208 Plan

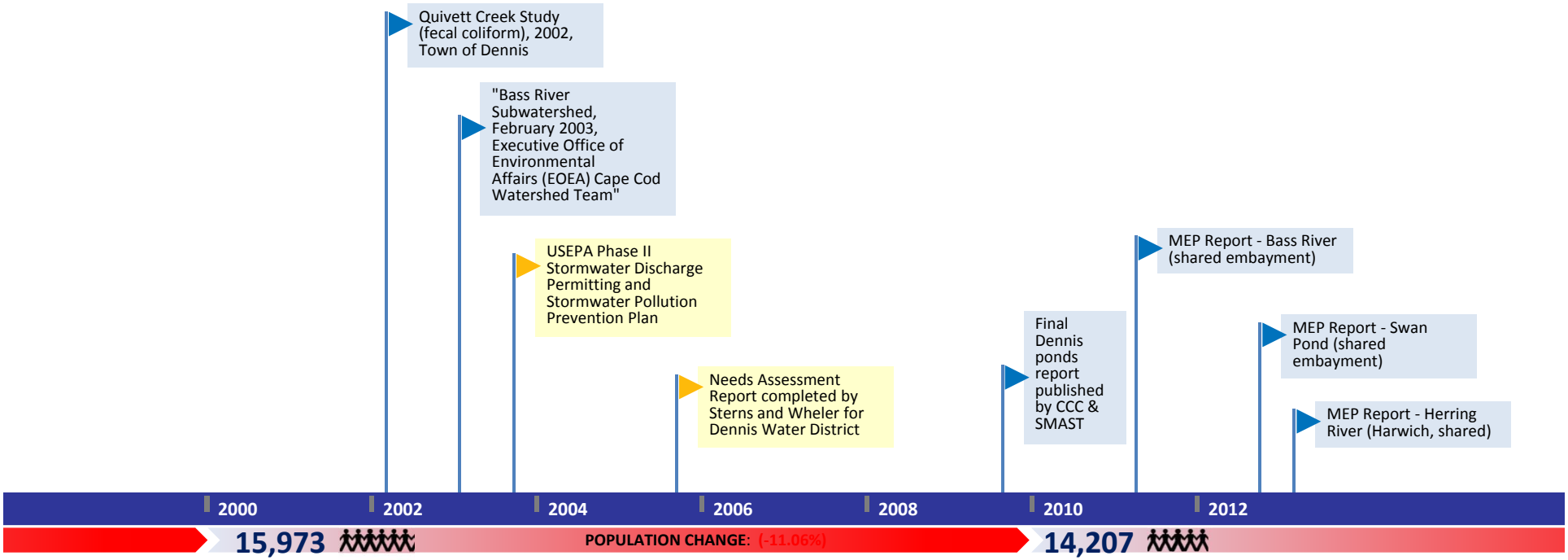
- Dennis has a professional health agent and the town's health regulations already implement many of the 208 plan recommendations.
- It is recommended that the town consider creating a "Seasonal Residential District" in the area south of Lower County Road and carefully control the conversion of seasonal dwellings in this area.
- Septage treatment is a problem in Dennis. It is recommended in the discussion of "Facility Planning in Non -Sewered Areas" that Dennis should join with Yarmouth in a regional facility.
- Since the town is not planning to construct any sewage collection systems, septage flows may be large enough to make a separate facility cost-effective. Another possibility that should be investigated is regionalization with Harwich.
- Implementation of the 208 water quality plan in Dennis should give priority to establishing watershed protection districts and implementing on -site system management and septage treatment.
- The Water District has developed extensive wellfields and pumping capacity, which should require little expansion to serve the 1995 population
- Dennis may have water resources in excess of its needs, which could be called upon to supply other towns in the future.
- Dense development in the southern half of Dennis and along Bass River may restrict the amount or area available for recharge protection purposes.



Dennis: 1970-2013



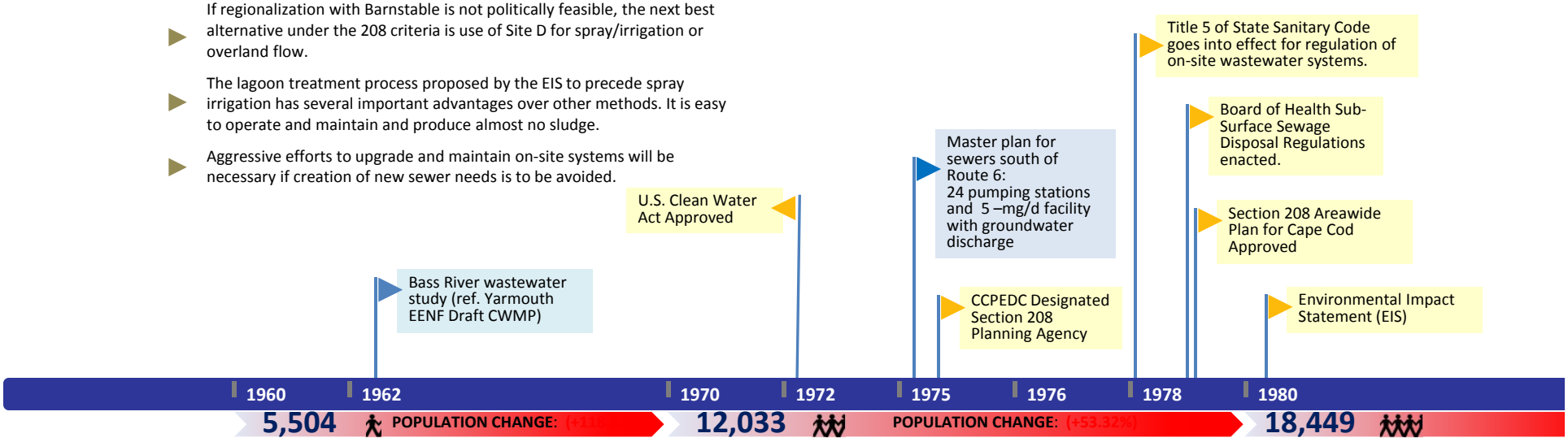
Dennis: 1970-2013



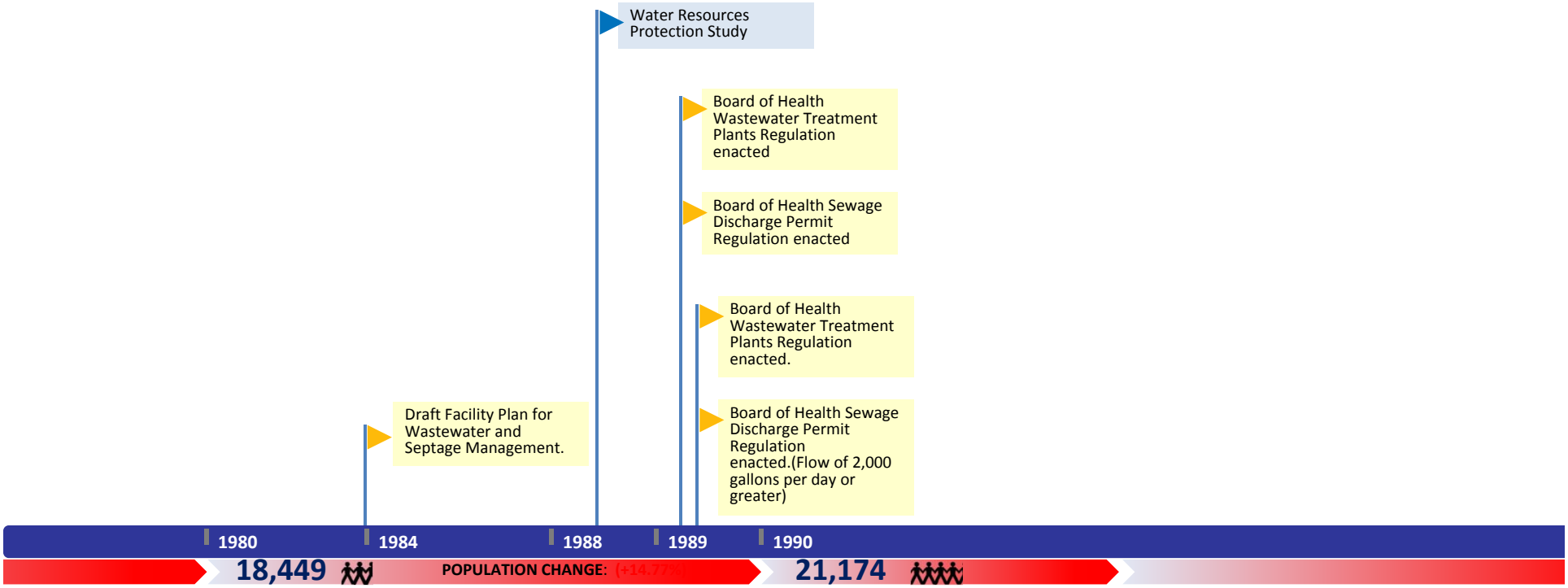
Yarmouth: 1960-2013

From 1978 Section 208 Plan

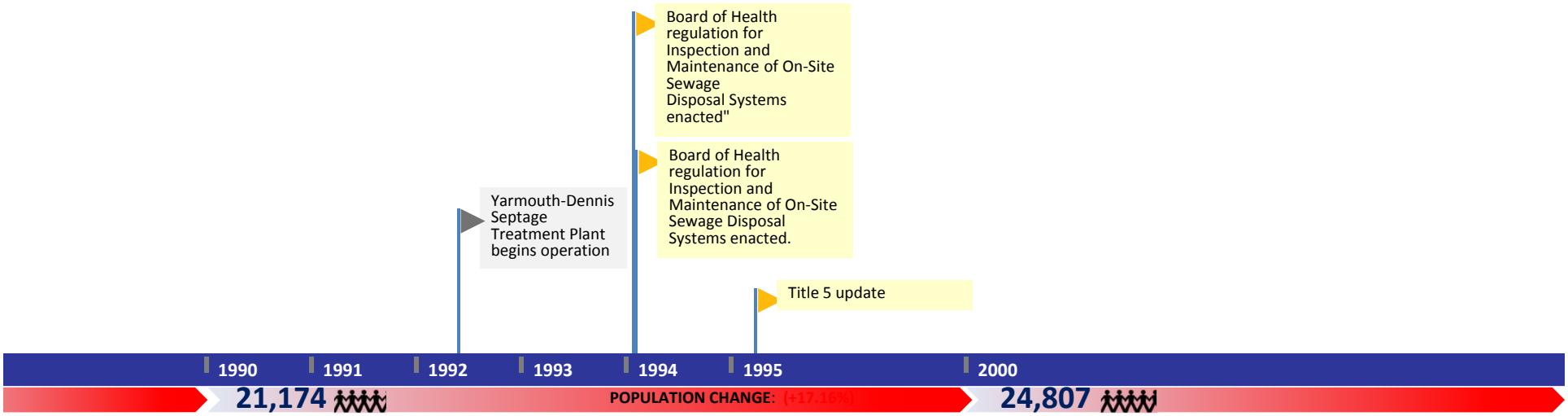
- The Wastewater management problems are reported to be severe in the commercial zone along Route 28. Water supply protection is also of critical concern to the town since development is rapidly encroaching upon existing and future wellfield areas.
- On-site system rehabilitation in problem areas is recommended, and would be eligible for funding.
- A sewer to serve the commercial Route 28 strip is necessary and cost-effective. The projected plan is approximately 0.5 MGD.
- Regionalization with Barnstable, (i.e. purchase of capacity at the Barnstable treatment plant) is desirable.
- It is recommended that the town immediately investigate the possibilities for regionalization with Barnstable. A separate septage facility would then be necessary, and regionalization with Dennis should be considered.
- If regionalization with Barnstable is not politically feasible, the next best alternative under the 208 criteria is use of Site D for spray/irrigation or overland flow.
- The lagoon treatment process proposed by the EIS to precede spray irrigation has several important advantages over other methods. It is easy to operate and maintain and produce almost no sludge.
- Aggressive efforts to upgrade and maintain on-site systems will be necessary if creation of new sewer needs is to be avoided.
- As soon as construction of the sewage/septage facilities is underway, the town should begin setting up a mandatory on-site system pumping program.
- Non-structural controls, including control of multi-family dwellings and possibly larger lot zoning, could help to prevent the development of serious problems.
- The town will have to face growth control issues in the implementation of its sewer construction project and water quality planning efforts.
- If limited sewage treatment and disposal capacities are available, the town will have to pass special bylaws to control the rate of hook-up and to allocate capacities to abutters.
- The planning board is proposing to eliminate the grandfather clause on substandard lots south of Route 28, and should also consider a "Seasonal Residential District" overlay to control conversions.



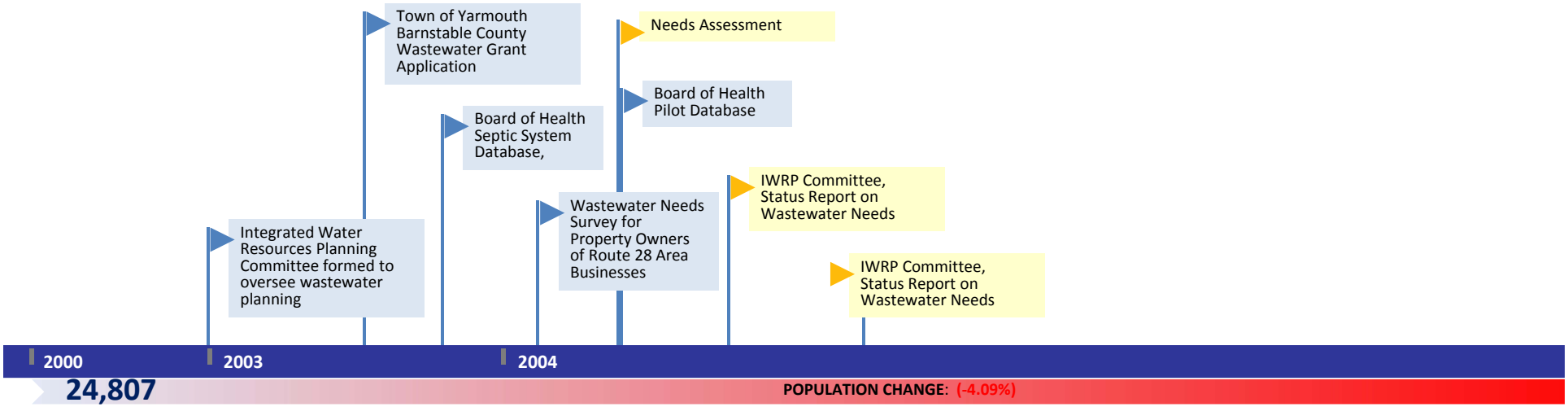
Yarmouth: 1960-2013



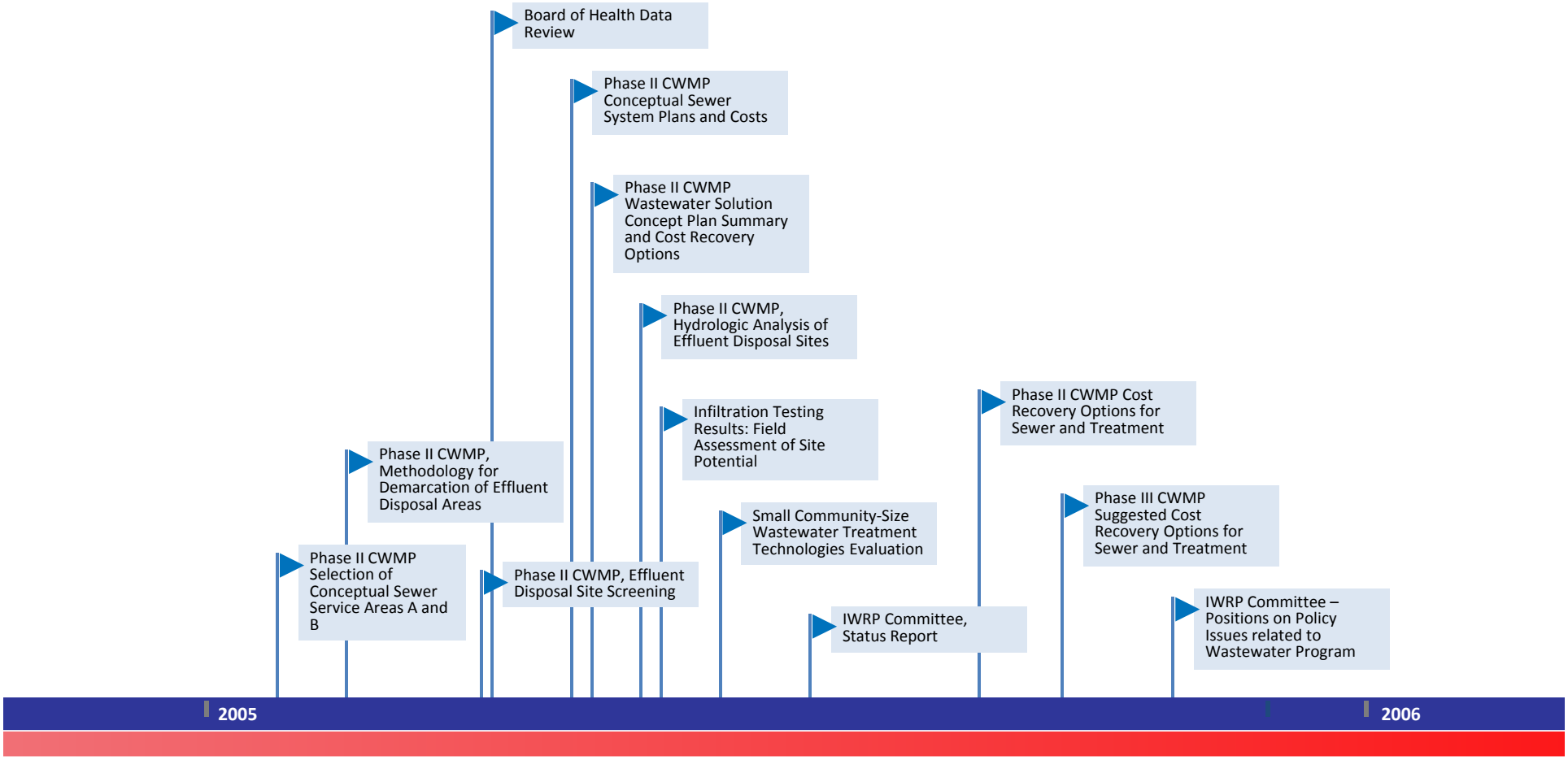
Yarmouth: 1960-2013



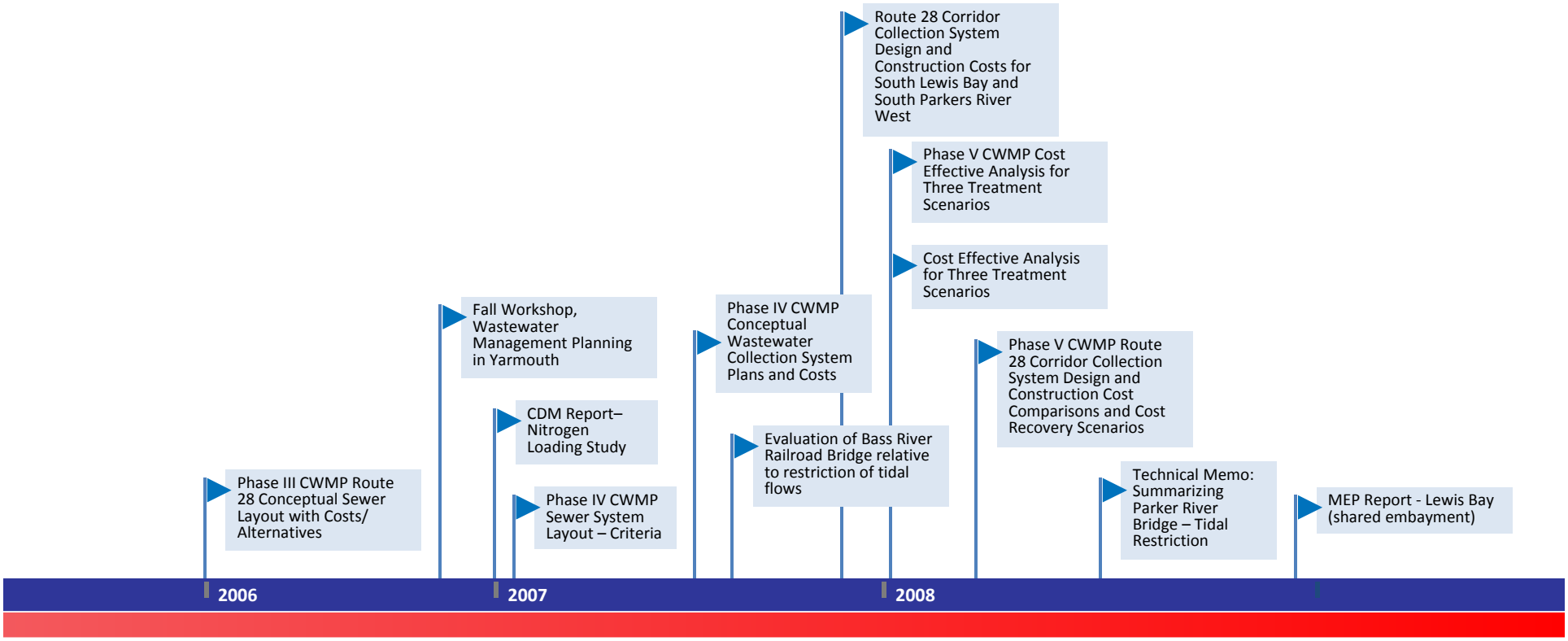
Yarmouth: 1960-2013



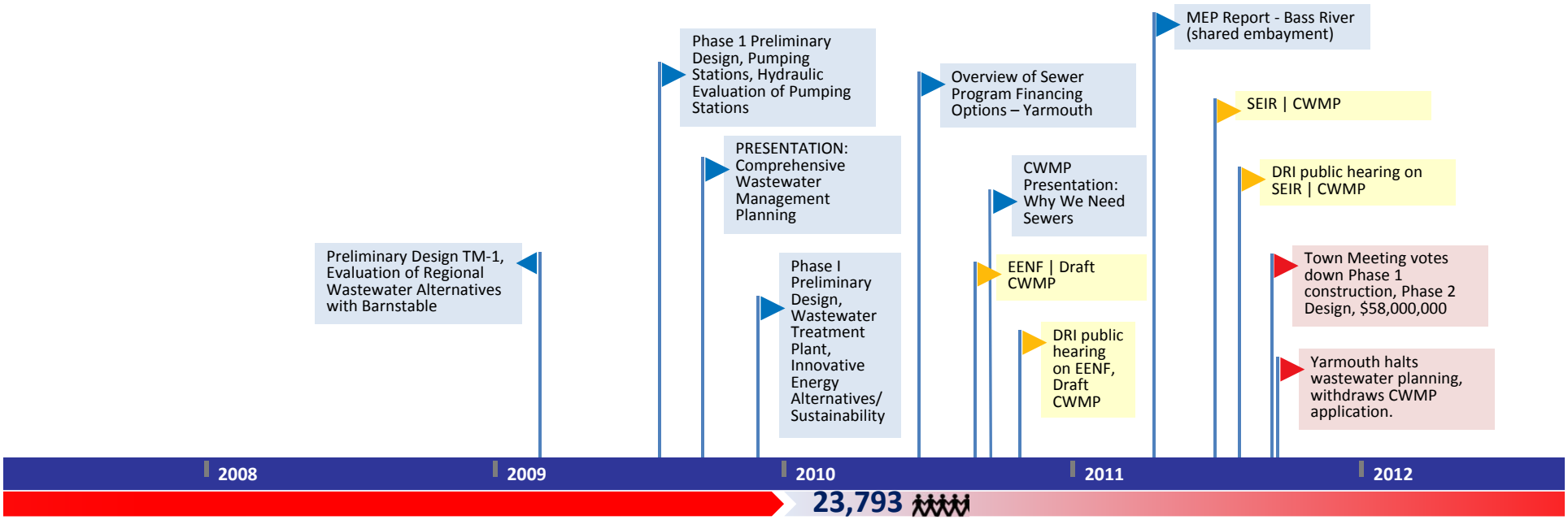
Yarmouth: 1960-2013



Yarmouth: 1960-2013



Yarmouth: 1960-2013

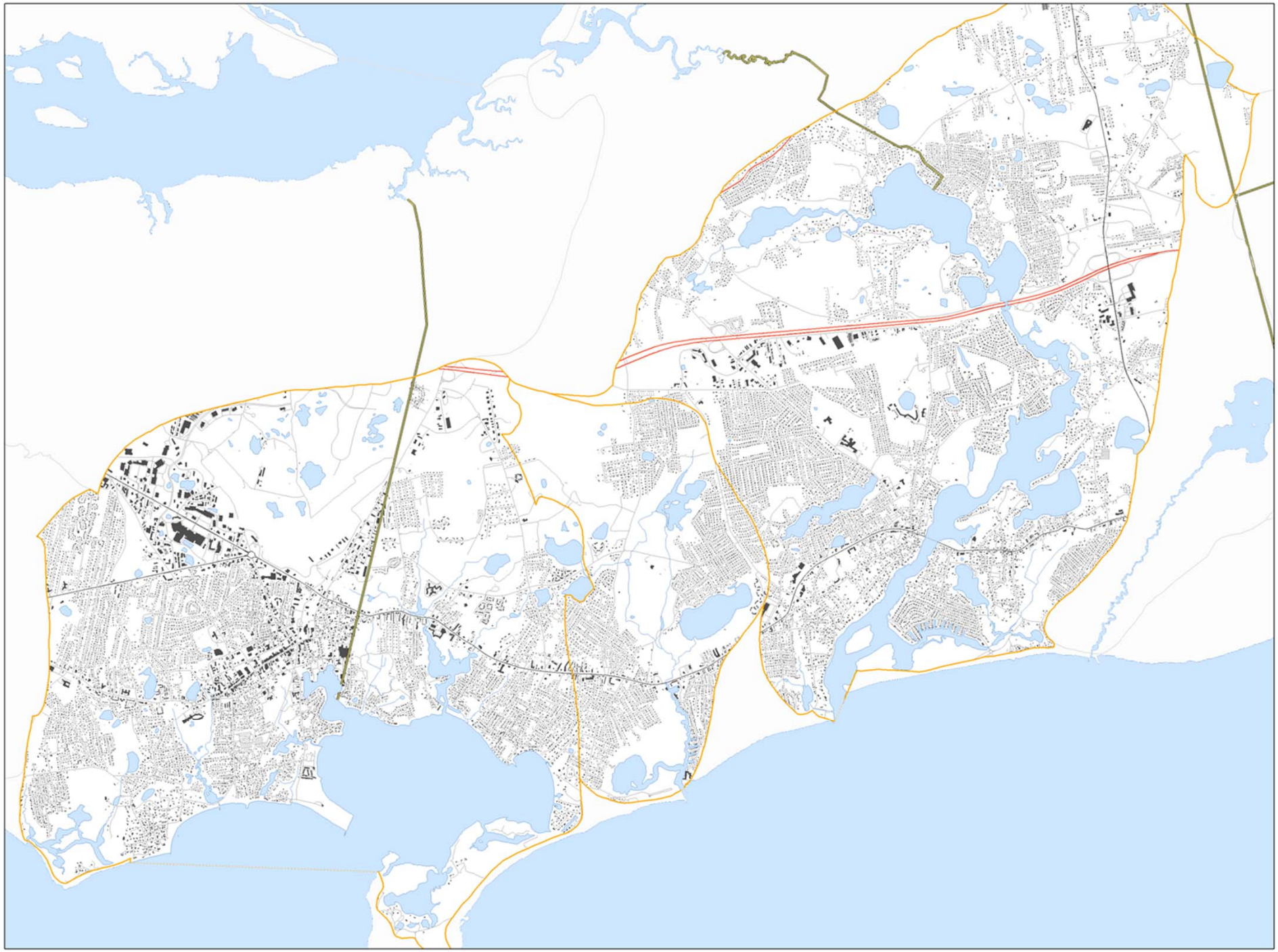


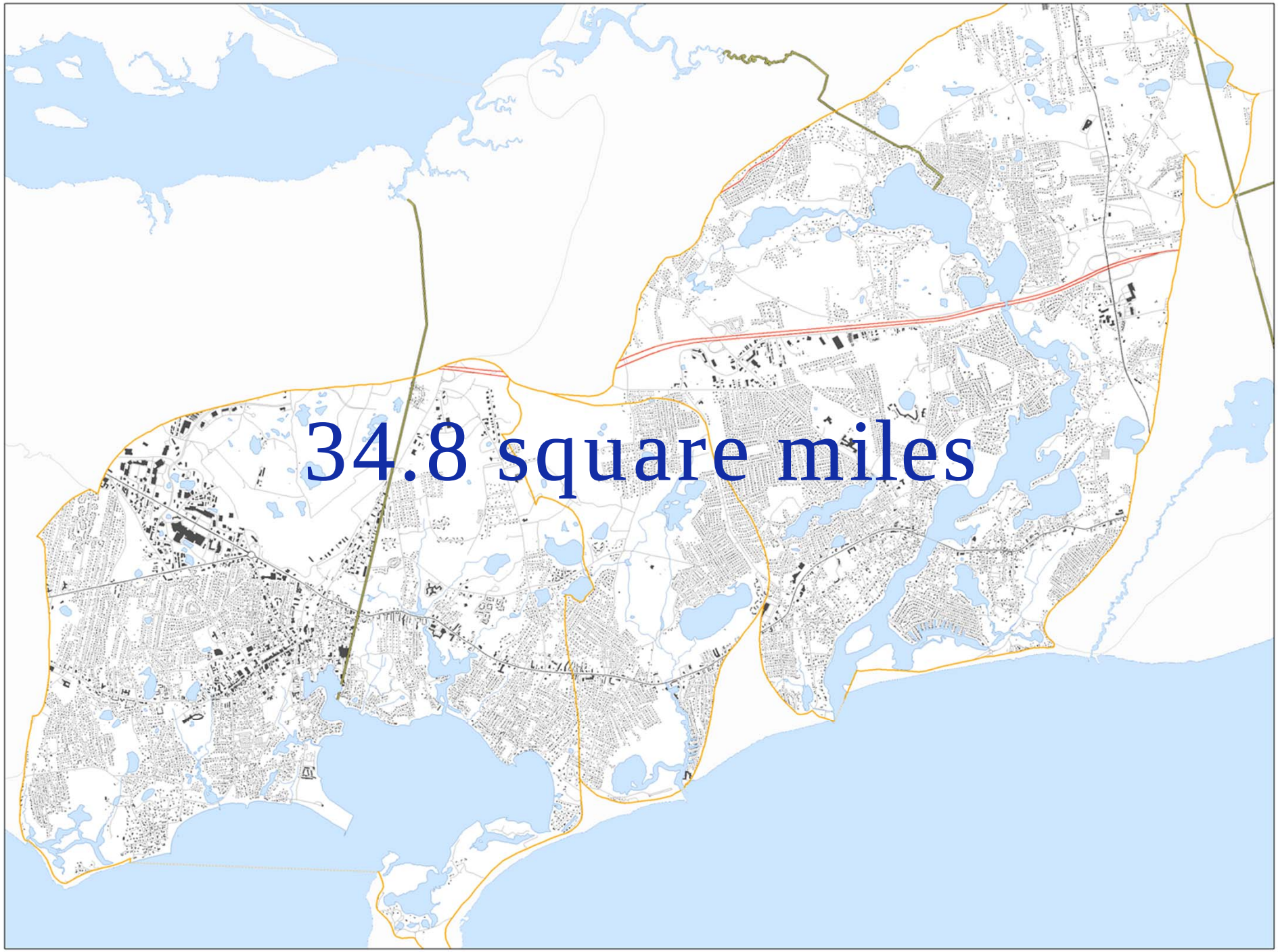
POPULATION: 23,793
(-4.09%)

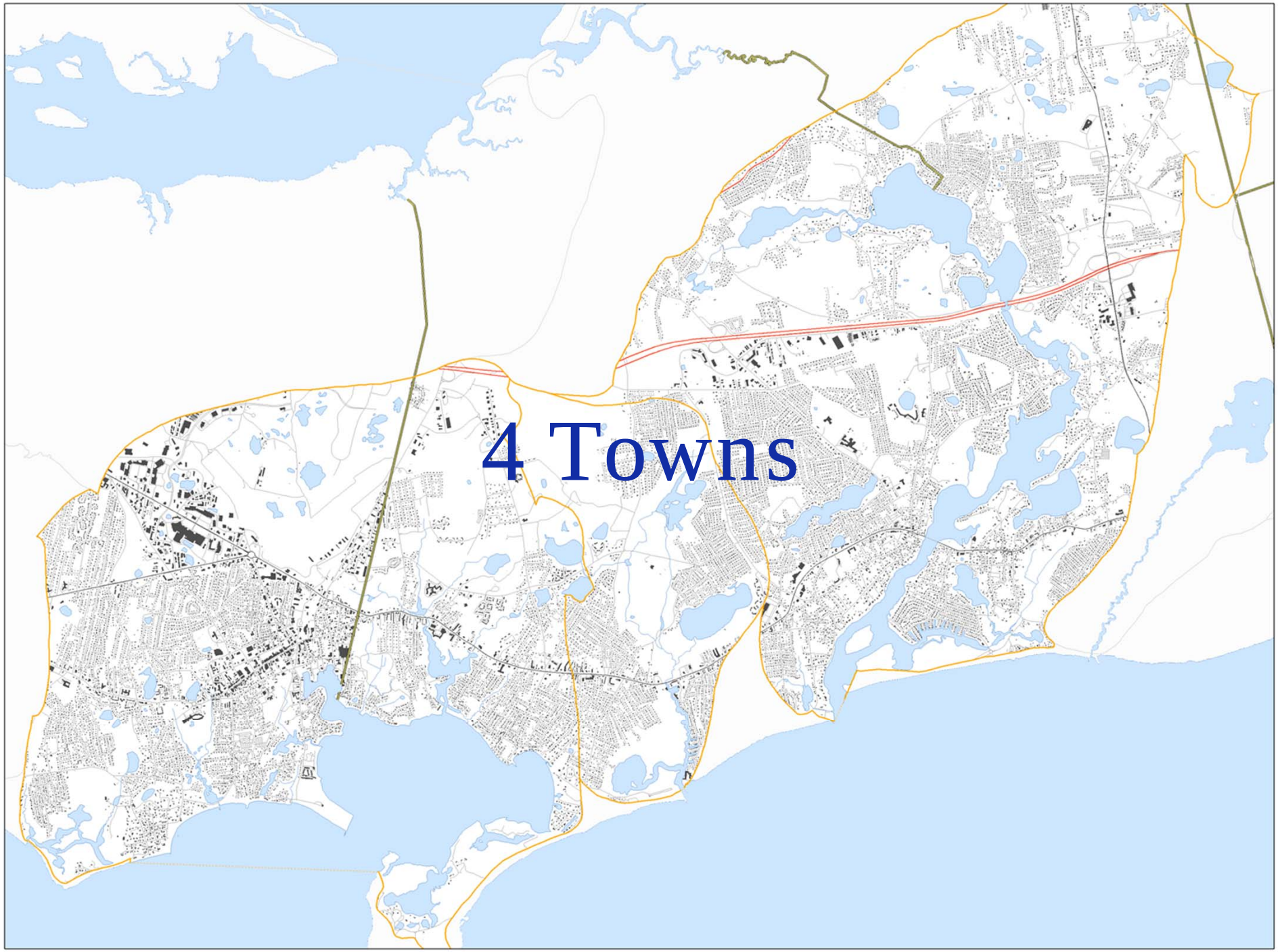
Did we miss anything?

Your Watersheds

Bass River
Lewis Bay
Parkers River




34.8 square miles


4 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 Sprcies 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

Sources: MassGIS, MassDOT, ICCOH, FEMA, CCC

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 Golf Course Managed Lawns
- Approximate Municipal Managed Lawns

Sources: MassGIS, MassDOT, CCC

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

Sources: MassGIS, MassDOT, CCC

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

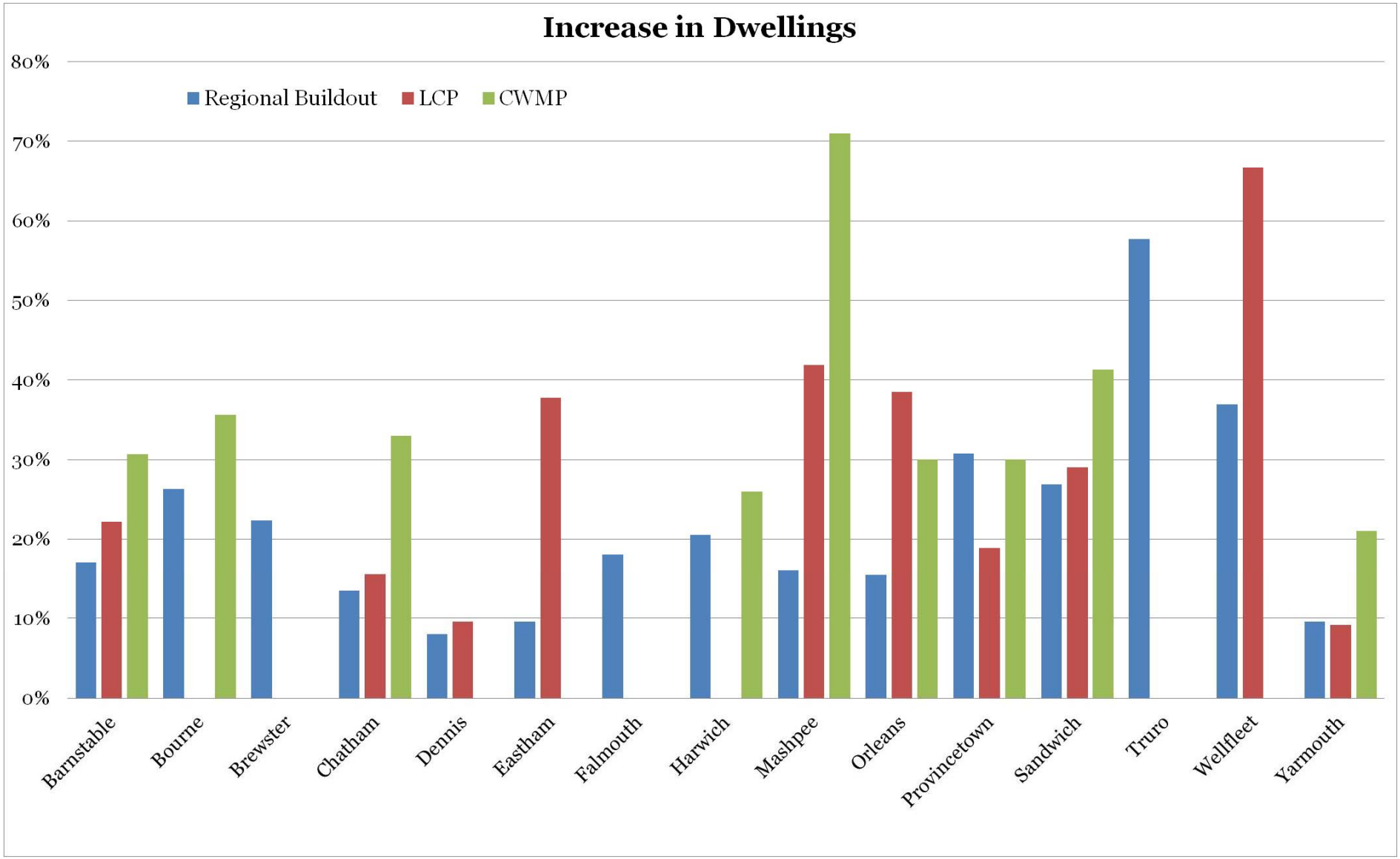
Sources: MassGIS, MassDOT

Density

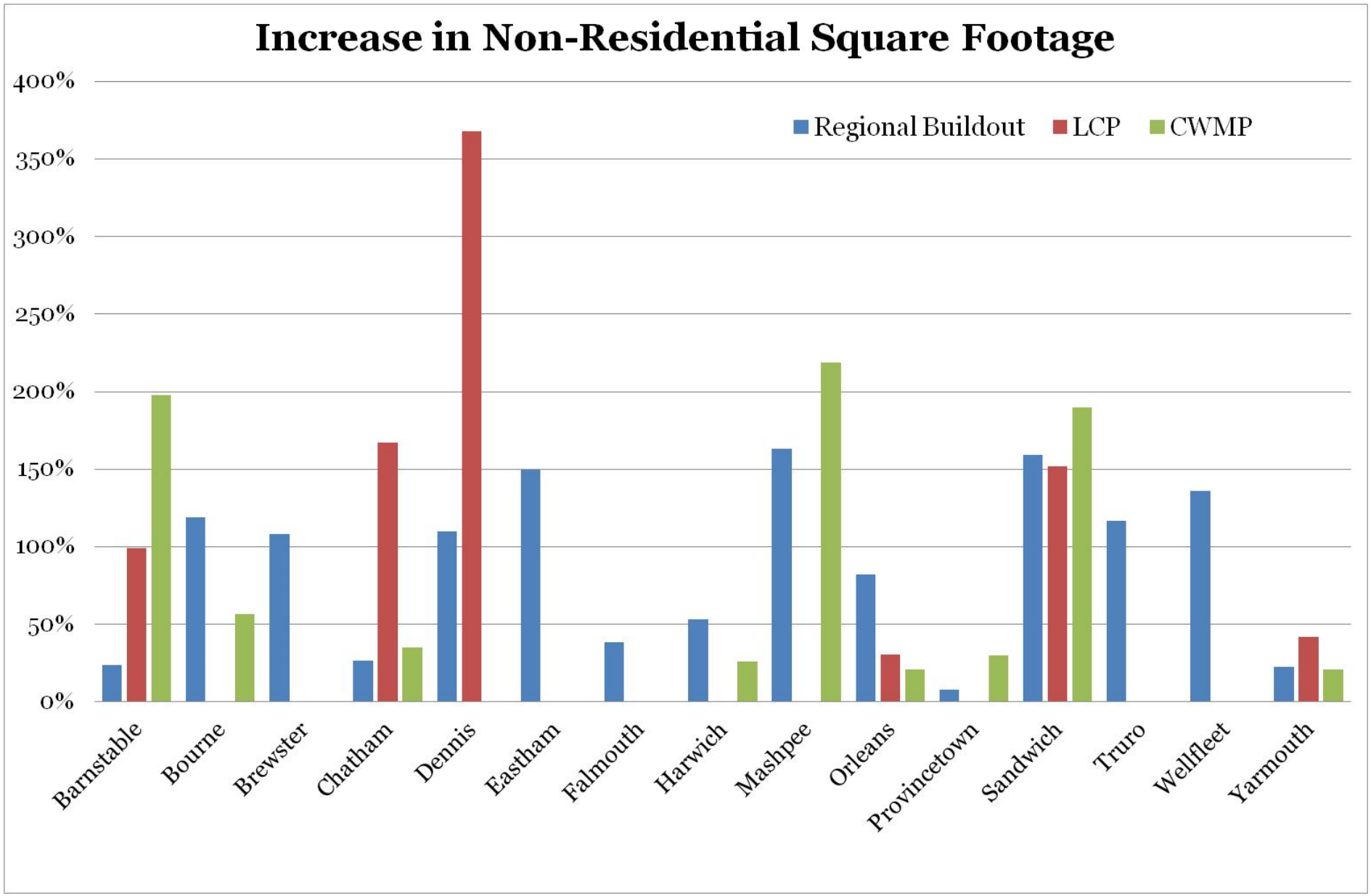
Cape Wide Cost Estimate:

30% growth will increase capital costs by 40%

Buildout

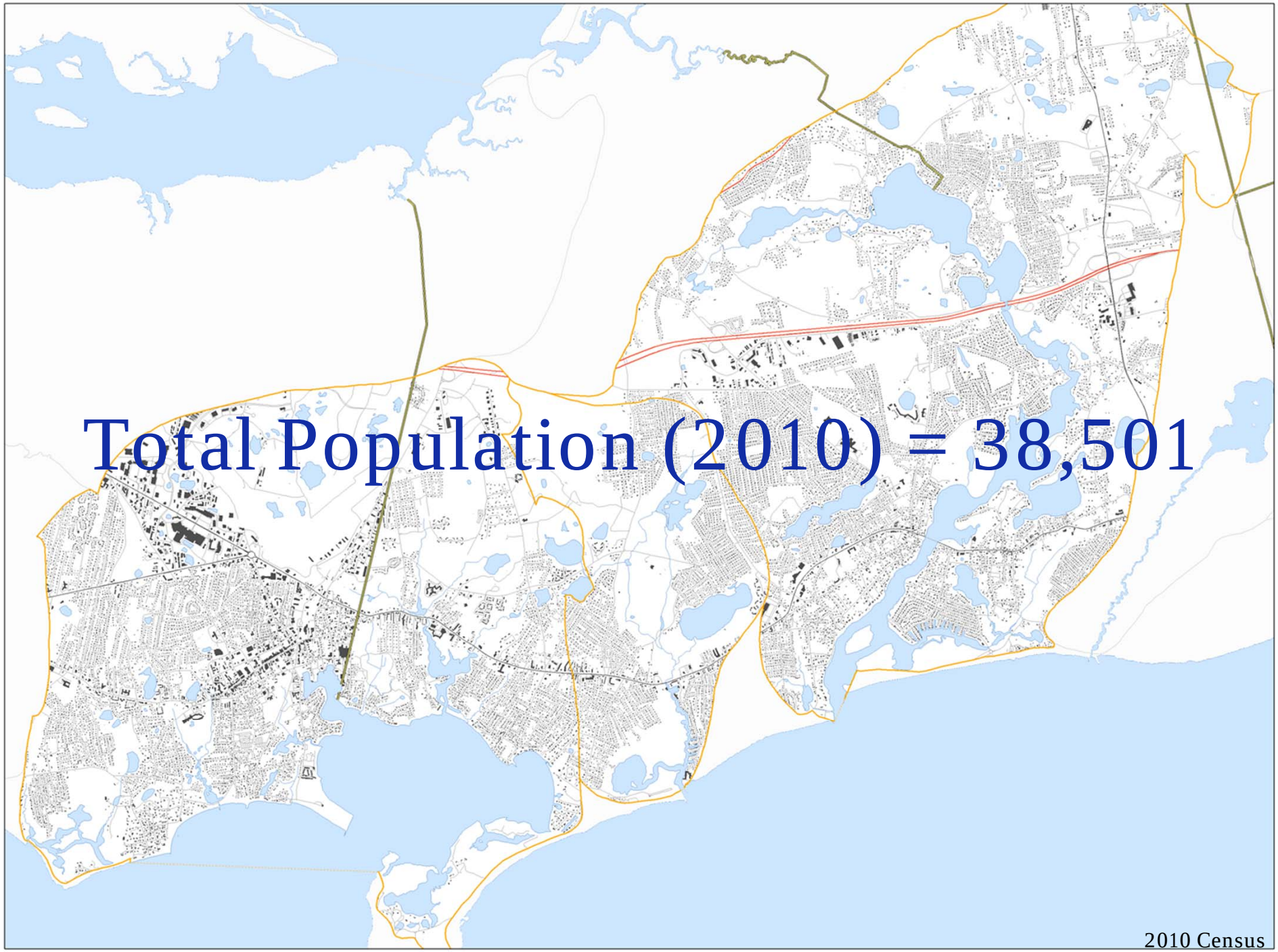

Increase in Dwellings
80%
70%
60%
50%
40%
30%
20%
10%
0%
Regional Buildout
LCP
CWMP
Barnstable
Bourne
Brewster
Chatham
Dennis
Eastham
Falmouth
Harwich
Mashpee
Orleans
Provincetown
Sandwich
Truro
Wellfleet
Yarmouth

Buildout

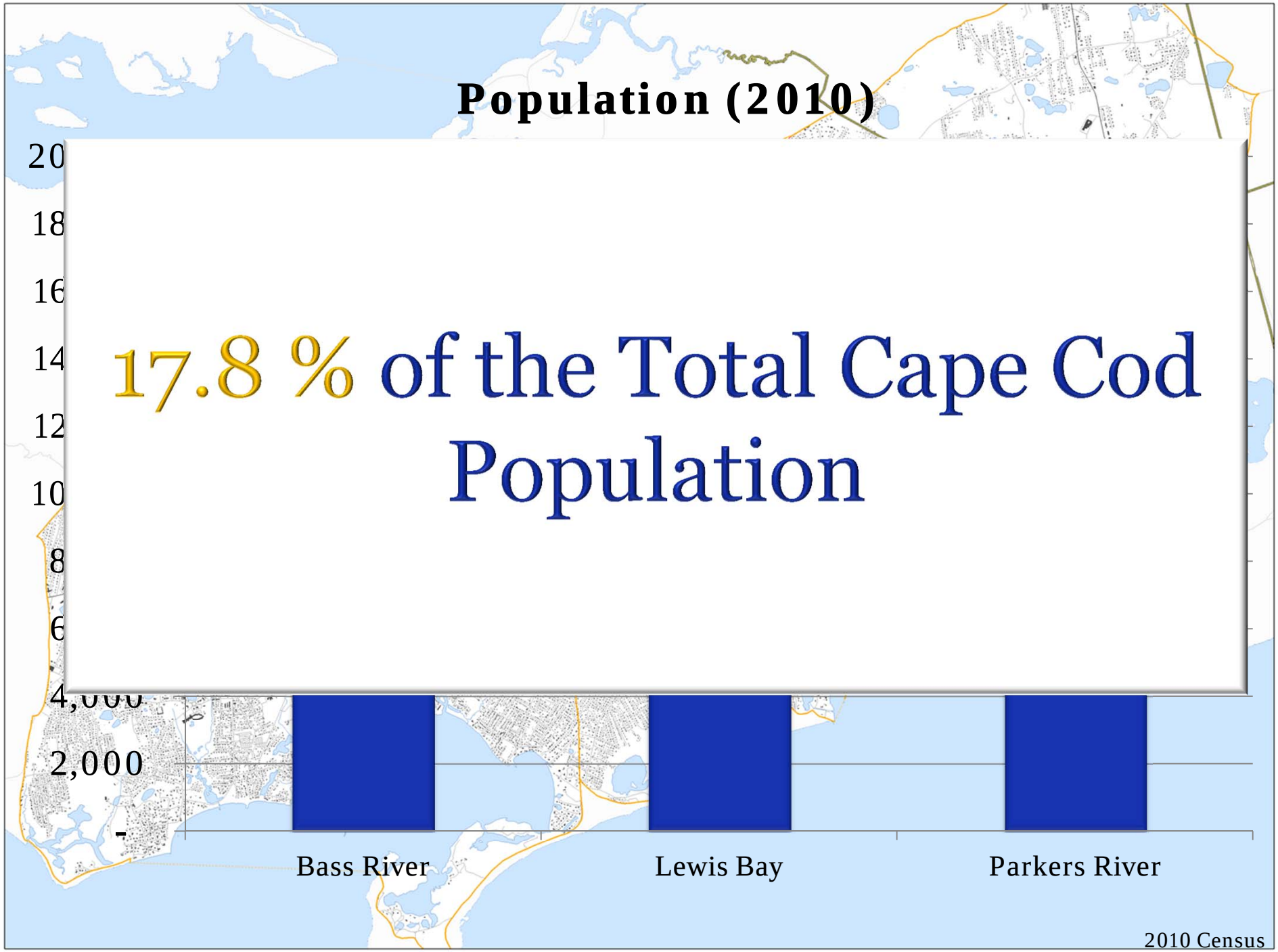

Increase in Non-Residential Square Footage
400%
350%
300%
250%
200%
150%
100%
50%
0%
Regional Buildout
LCP
CWMP
Barnstable
Bourne
Brewster
Chatham
Dennis
Eastham
Falmouth
Harwich
Mashpee
Orleans
Provincetown
Sandwich
Truro
Wellfleet
Yarmouth

The People

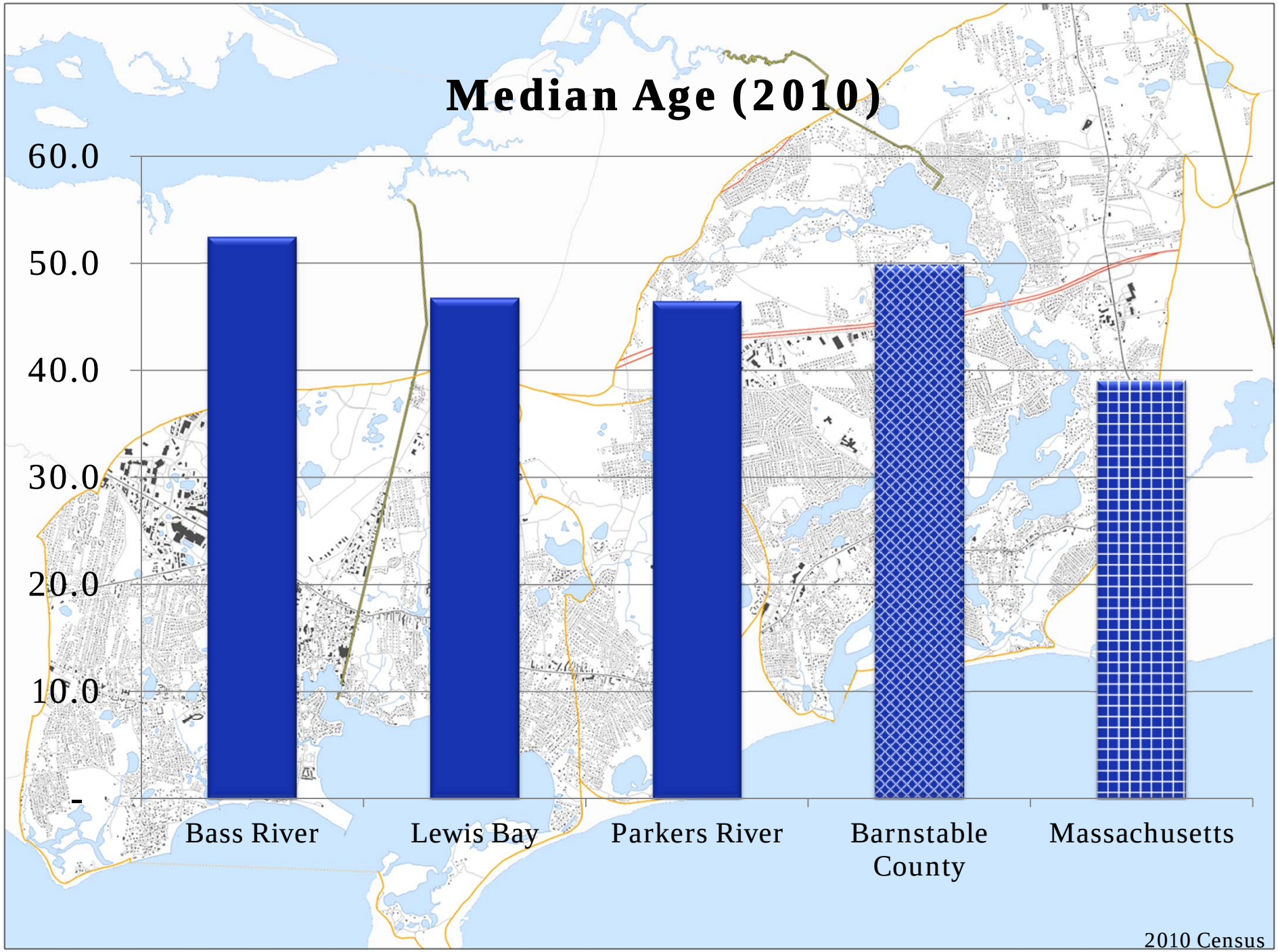
Bass River
Lewis Bay
Parkers River

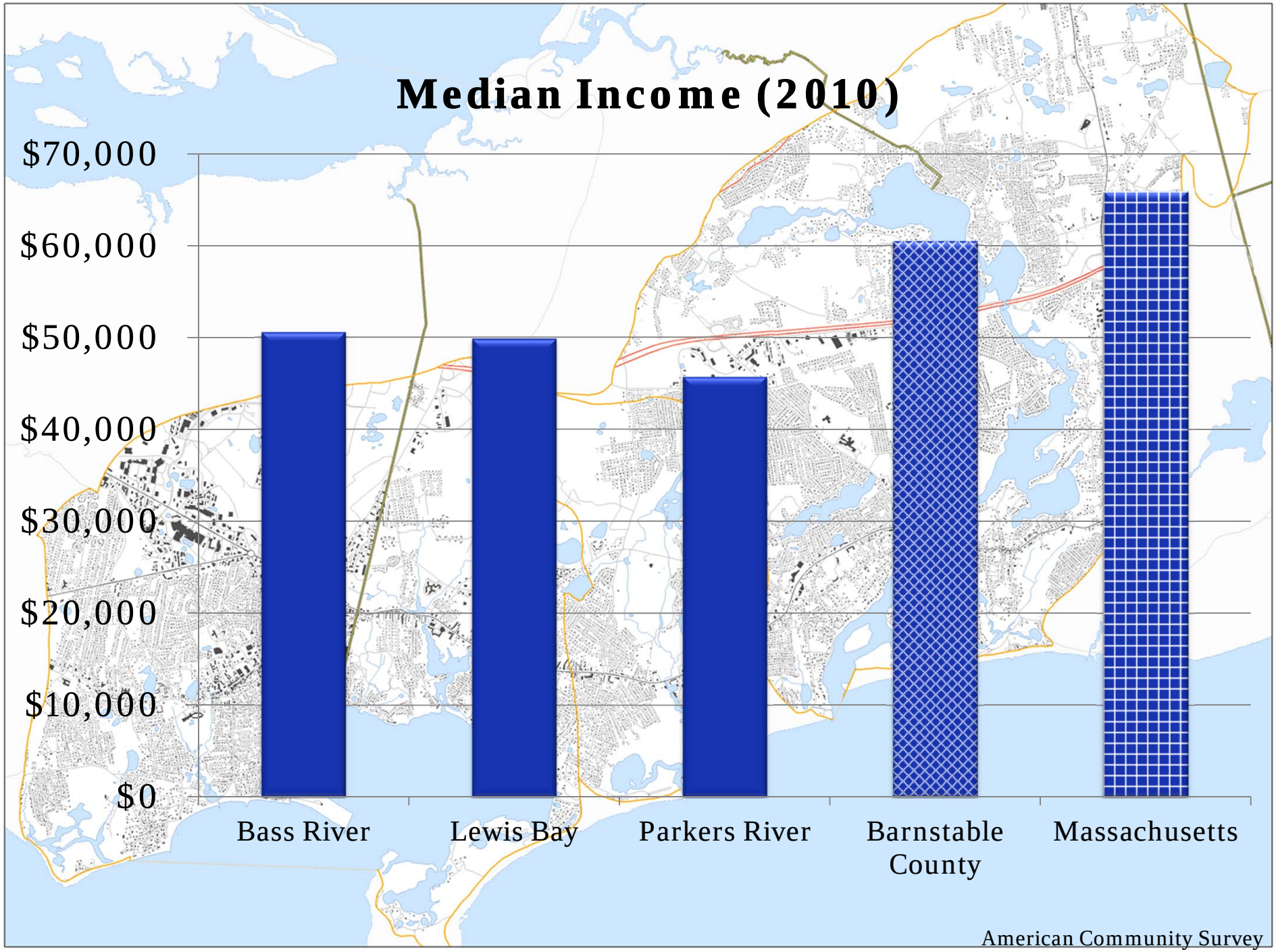

Total Population (2010) = 38,501
2010 Census

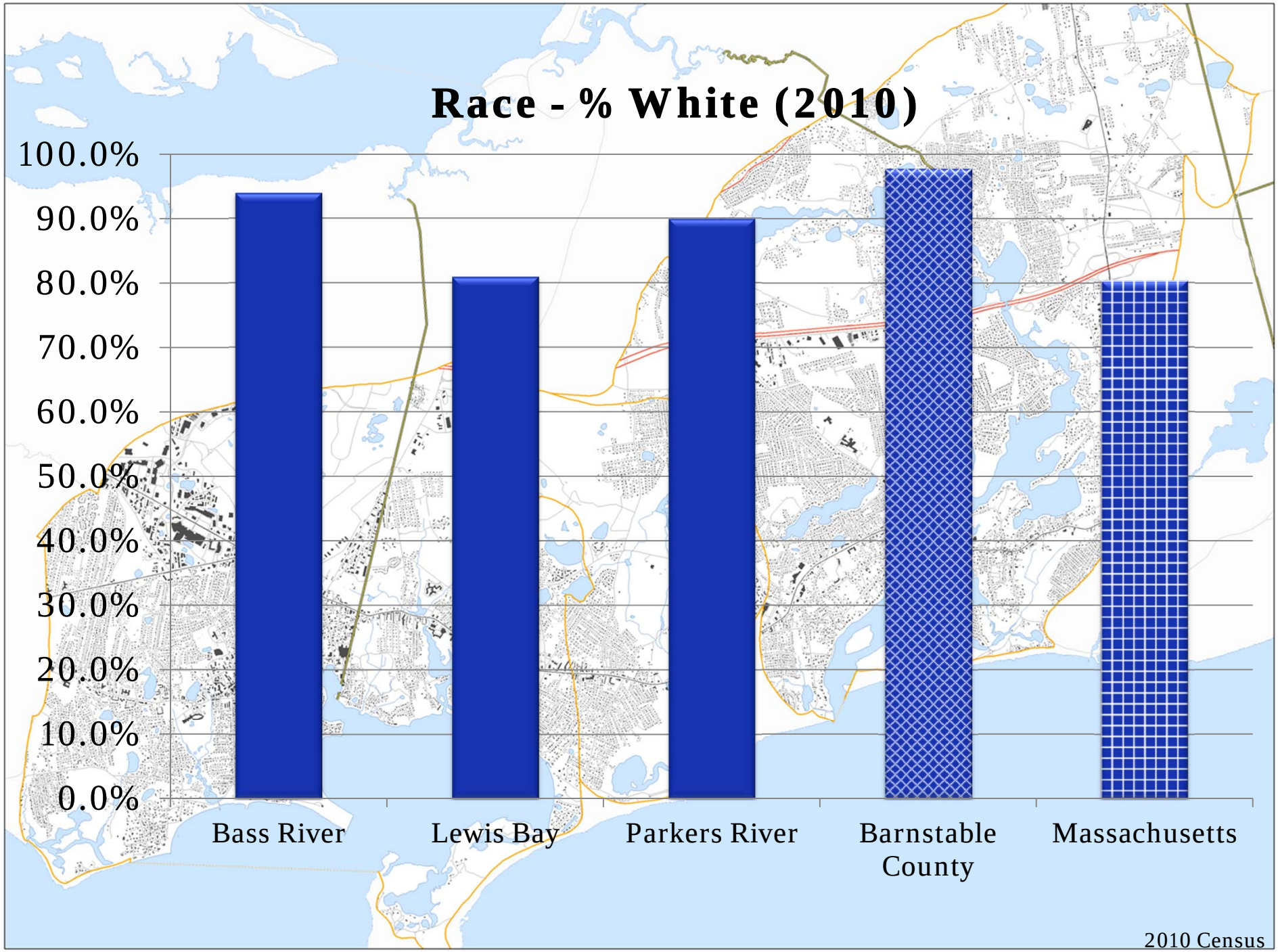
Population (2010)

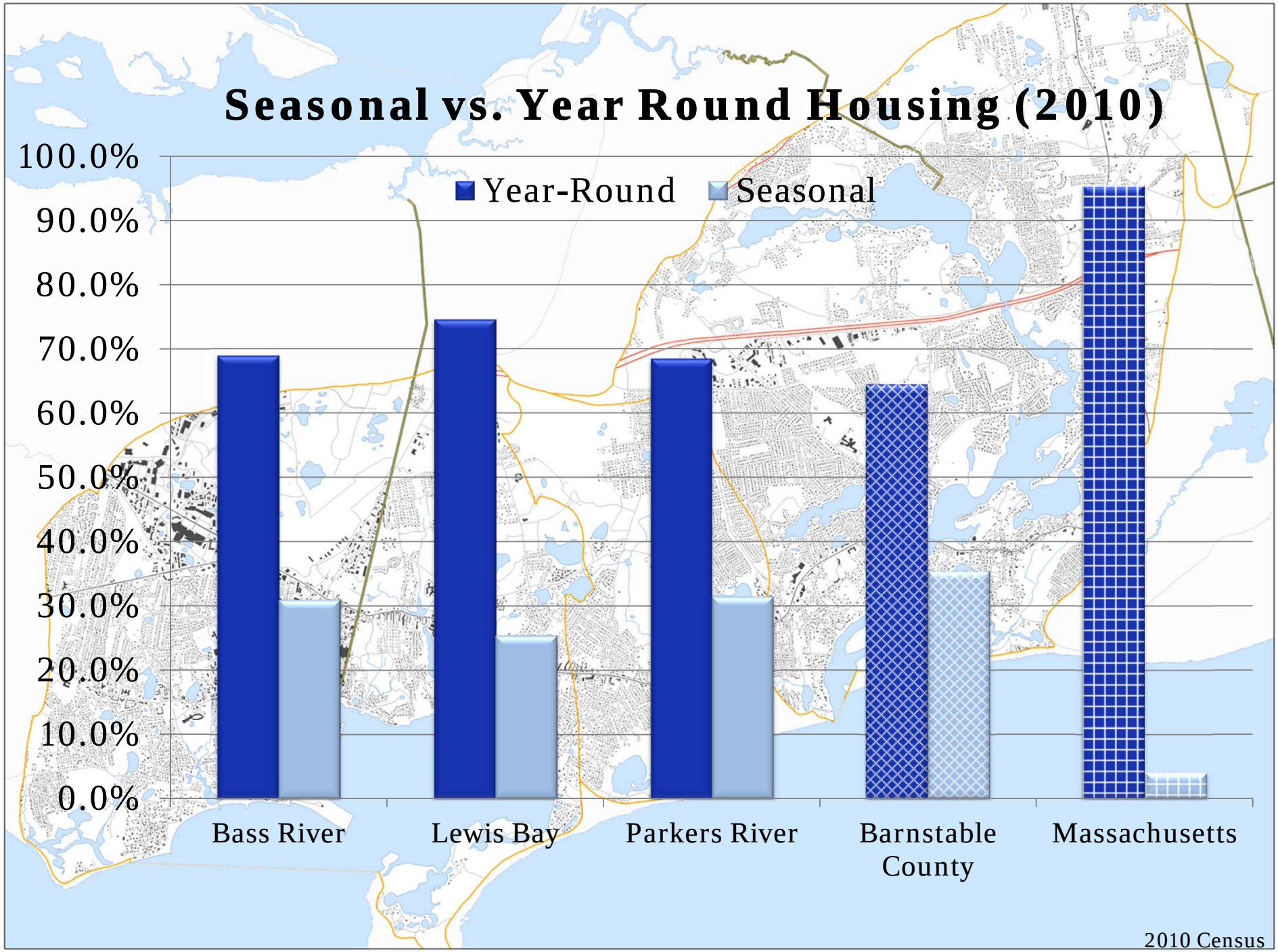


17.8 % of the Total Cape Cod Population

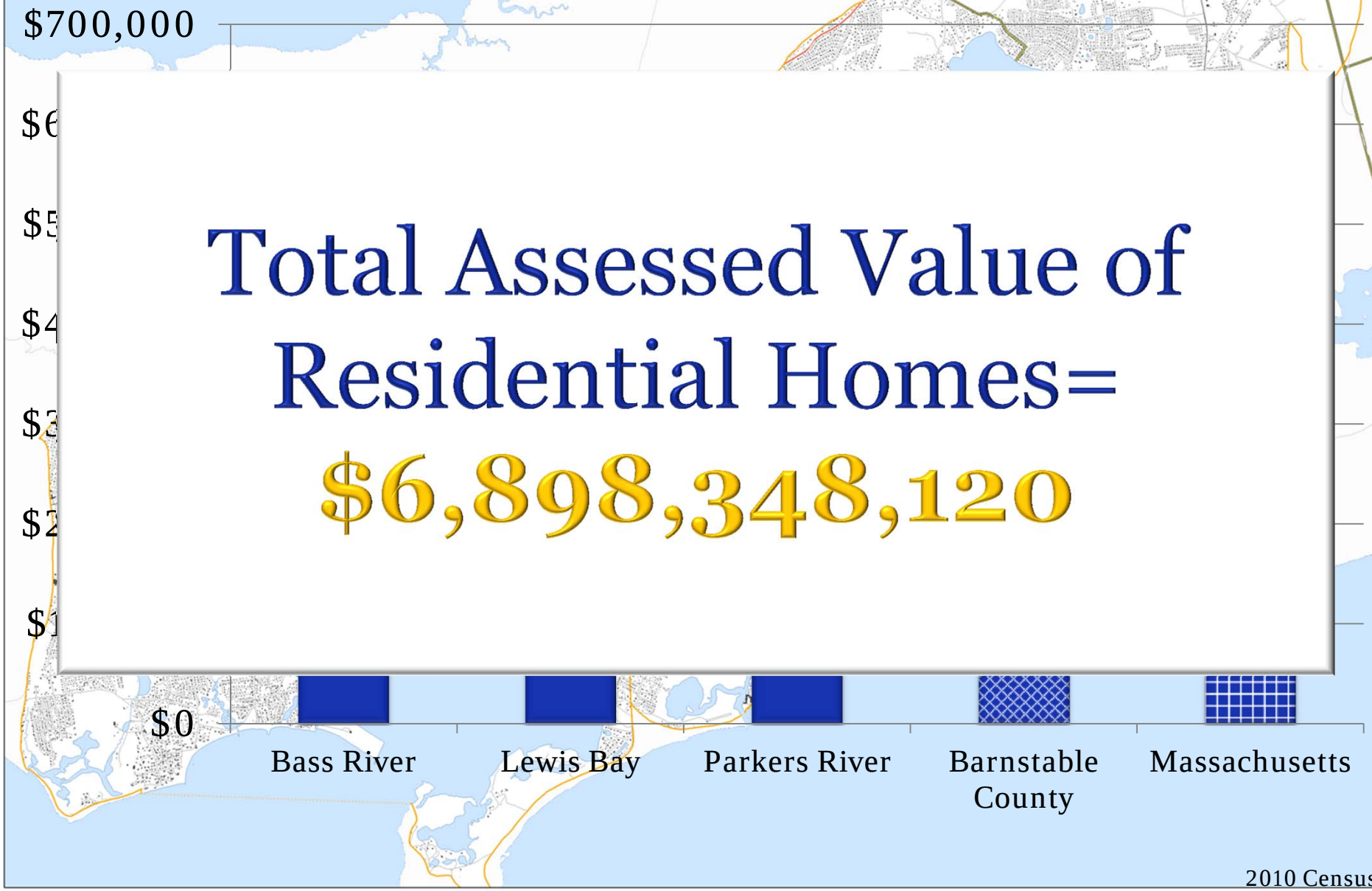

Median Age (2010)
60.0
50.0
40.0
30.0
20.0
10.0
-
Bass River
Lewis Bay
Parkers River
Barnstable County
Massachusetts
2010 Census


Median Income (2010)
$70,000
$60,000
$50,000
$40,000
$30,000
$20,000
$10,000
$0
Bass River
Lewis Bay
Parkers River
Barnstable County
Massachusetts
American Community Survey


Race - % White (2010)
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Bass River
Lewis Bay
Parkers River
Barnstable County
Massachusetts
2010 Census


Seasonal vs. Year Round Housing (2010)
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Year-Round
Seasonal
Bass River
Lewis Bay
Parkers River
Barnstable County
Massachusetts
2010 Census

Average Assessed Home Value (2010)



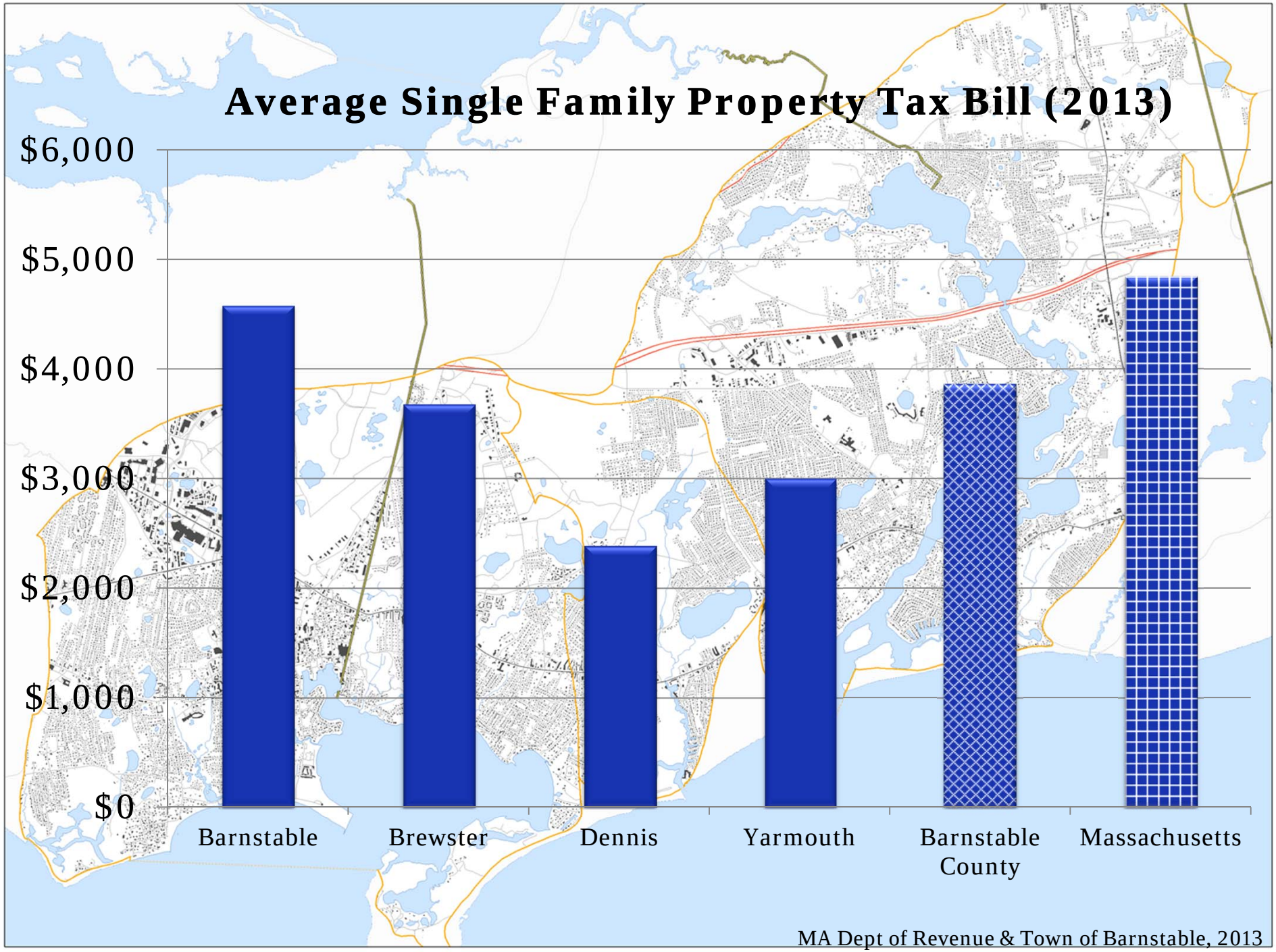
Total Assessed Value of Residential Homes=

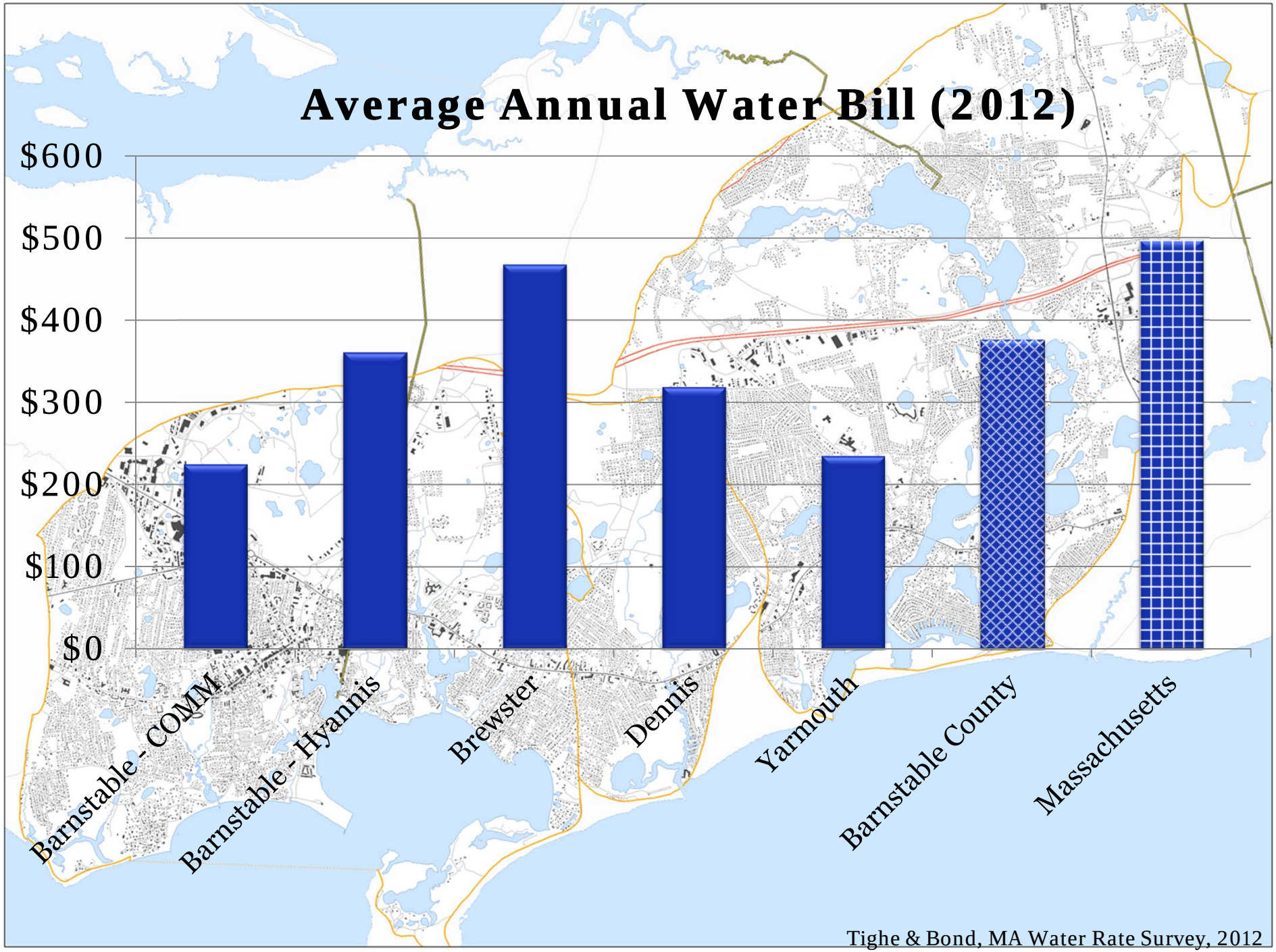
$6,898,348,120

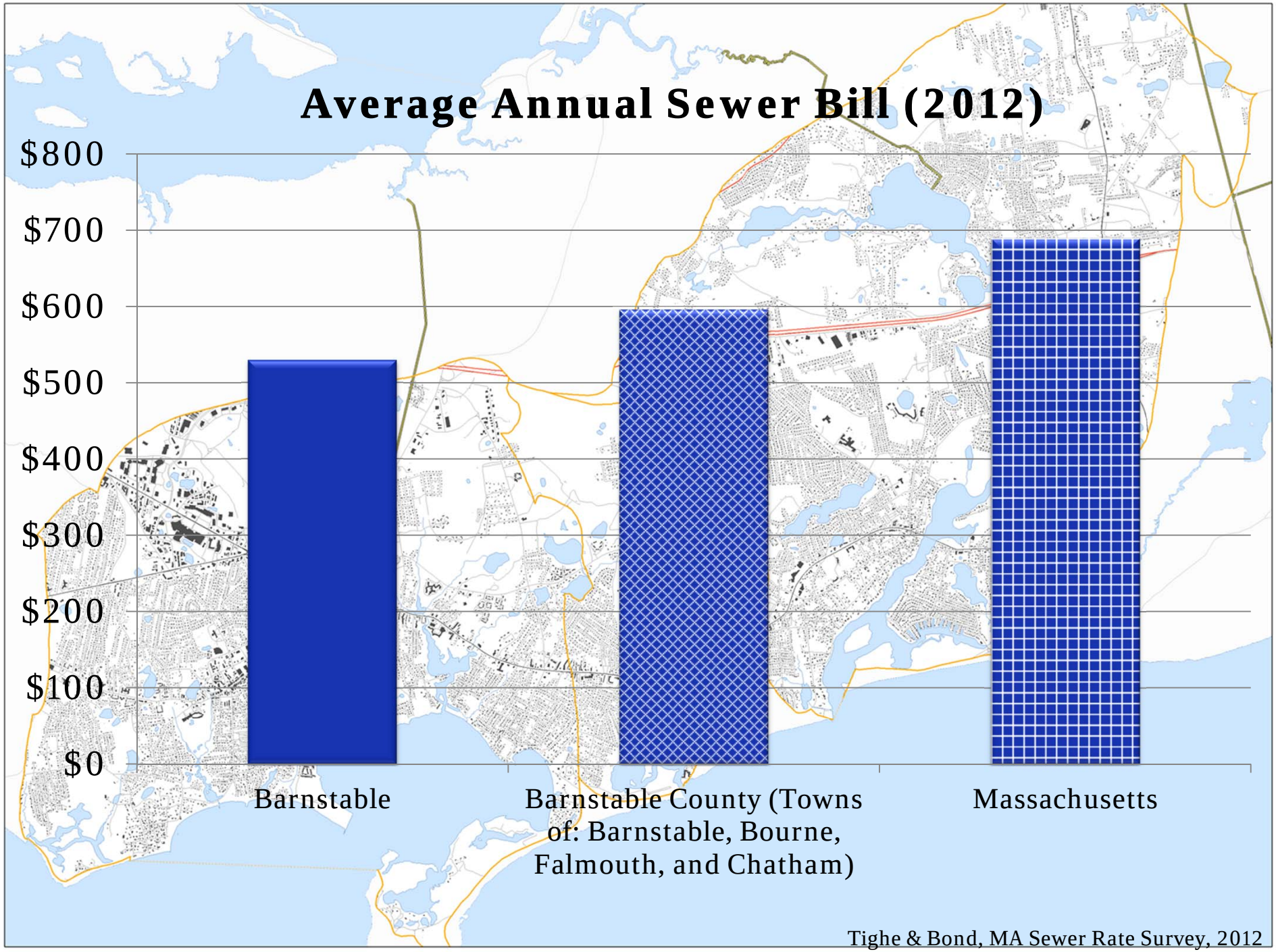
2010 Census

Your Government & Taxes

Bass River
Lewis Bay
Parkers River


Average Single Family Property Tax Bill (2013)
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
Barnstable
Brewster
Dennis
Yarmouth
Barnstable County
Massachusetts
MA Dept of Revenue & Town of Barnstable, 2013


Average Annual Water Bill (2012)
$600
$500
$400
$300
$200
$100
$0
Barnstable - COMM
Barnstable - Hyannis
Brewster
Dennis
Yarmouth
Barnstable County
Massachusetts
Tighe & Bond, MA Water Rate Survey, 2012


Average Annual Sewer Bill (2012)
$800
$700
$600
$500
$400
$300
$200
$100
$0
Barnstable
Barnstable County (Towns of: Barnstable, Bourne, Falmouth, and Chatham)
Massachusetts
Tighe & Bond, MA Sewer Rate Survey, 2012

The Problem

Bass River
Lewis Bay
Parkers River


Photo credit: APCC

Massachusetts Estuaries Project

- Opportunity for towns to obtain independent analysis of nitrogen loading and it's 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

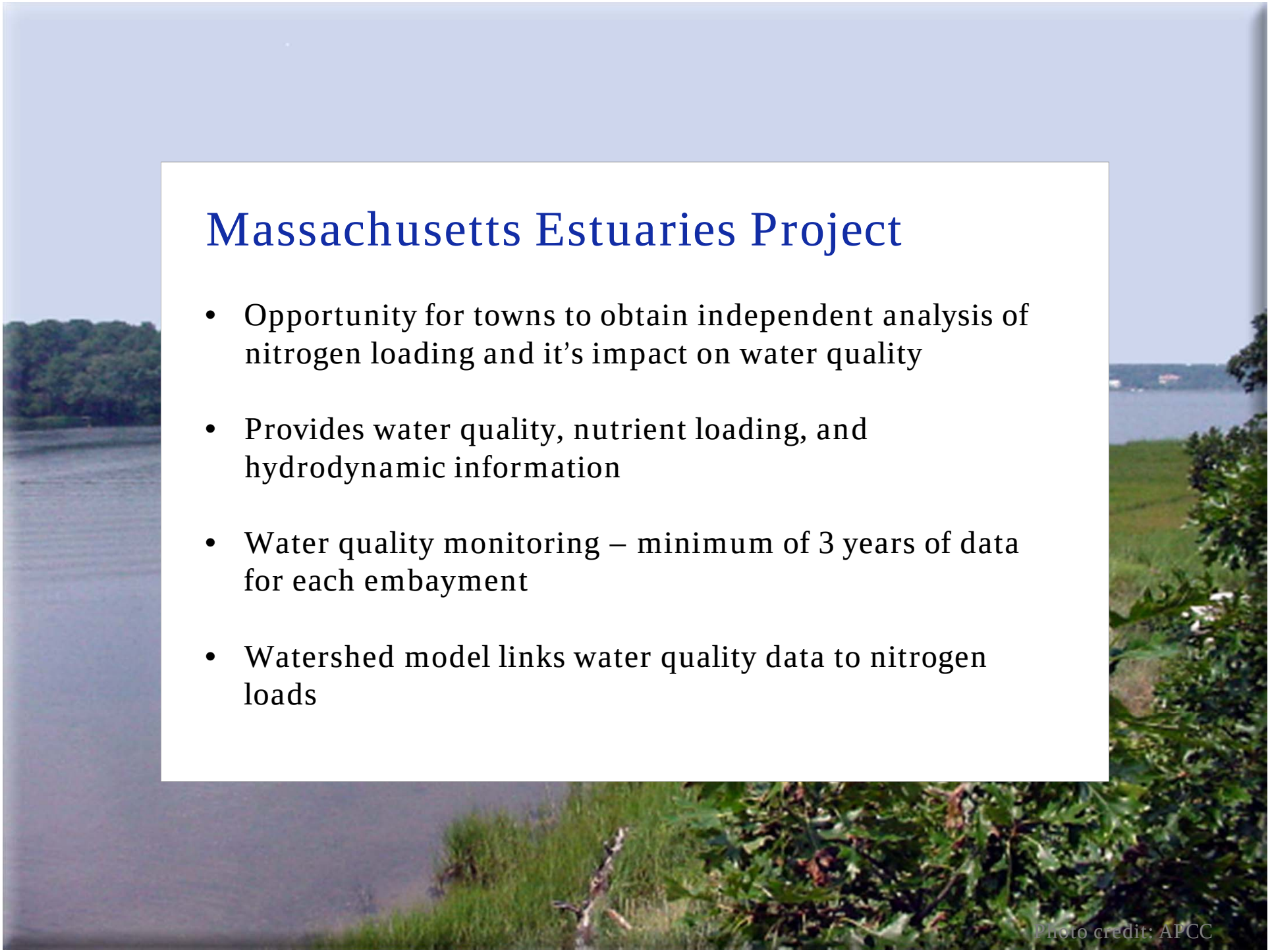
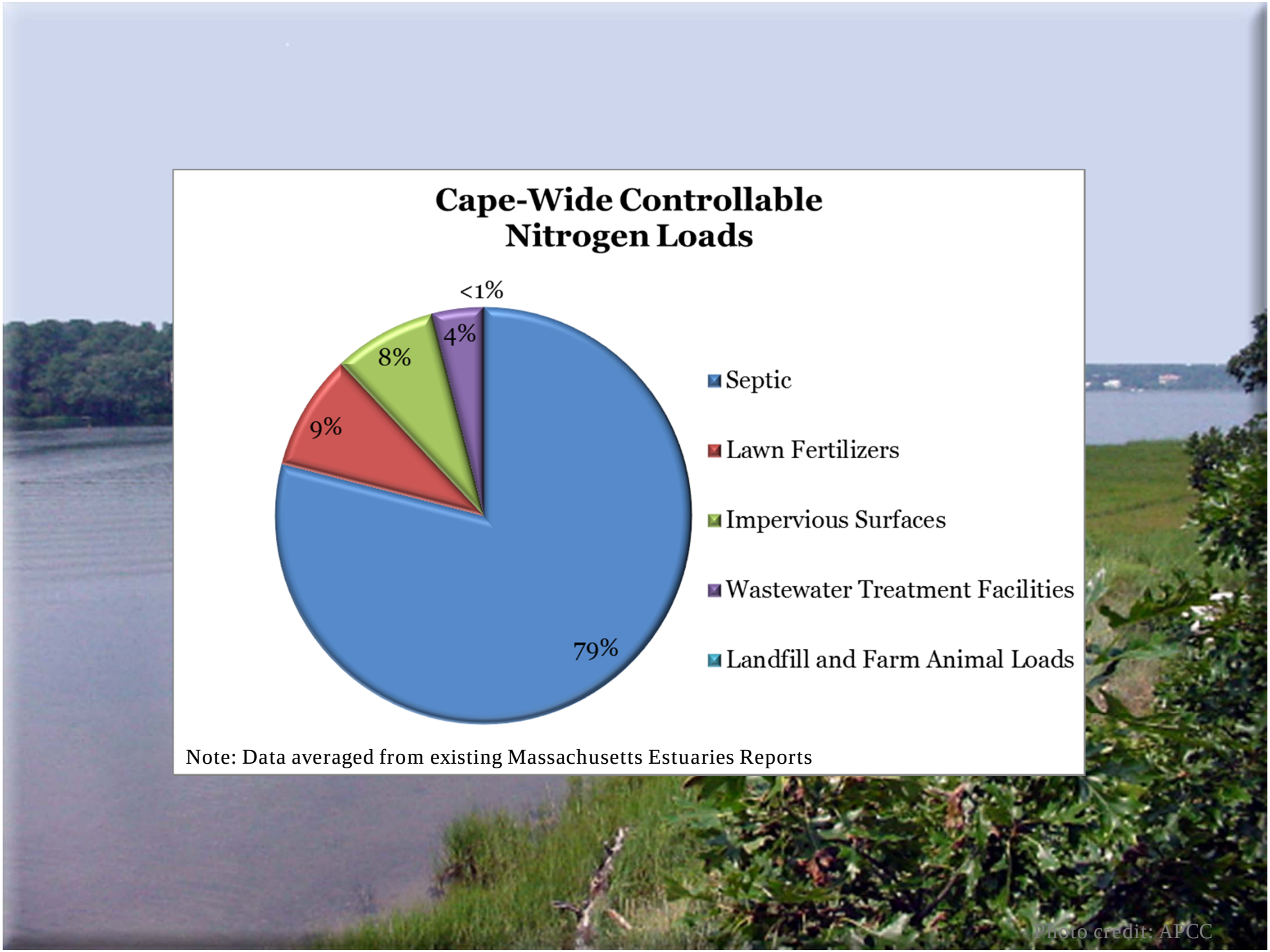
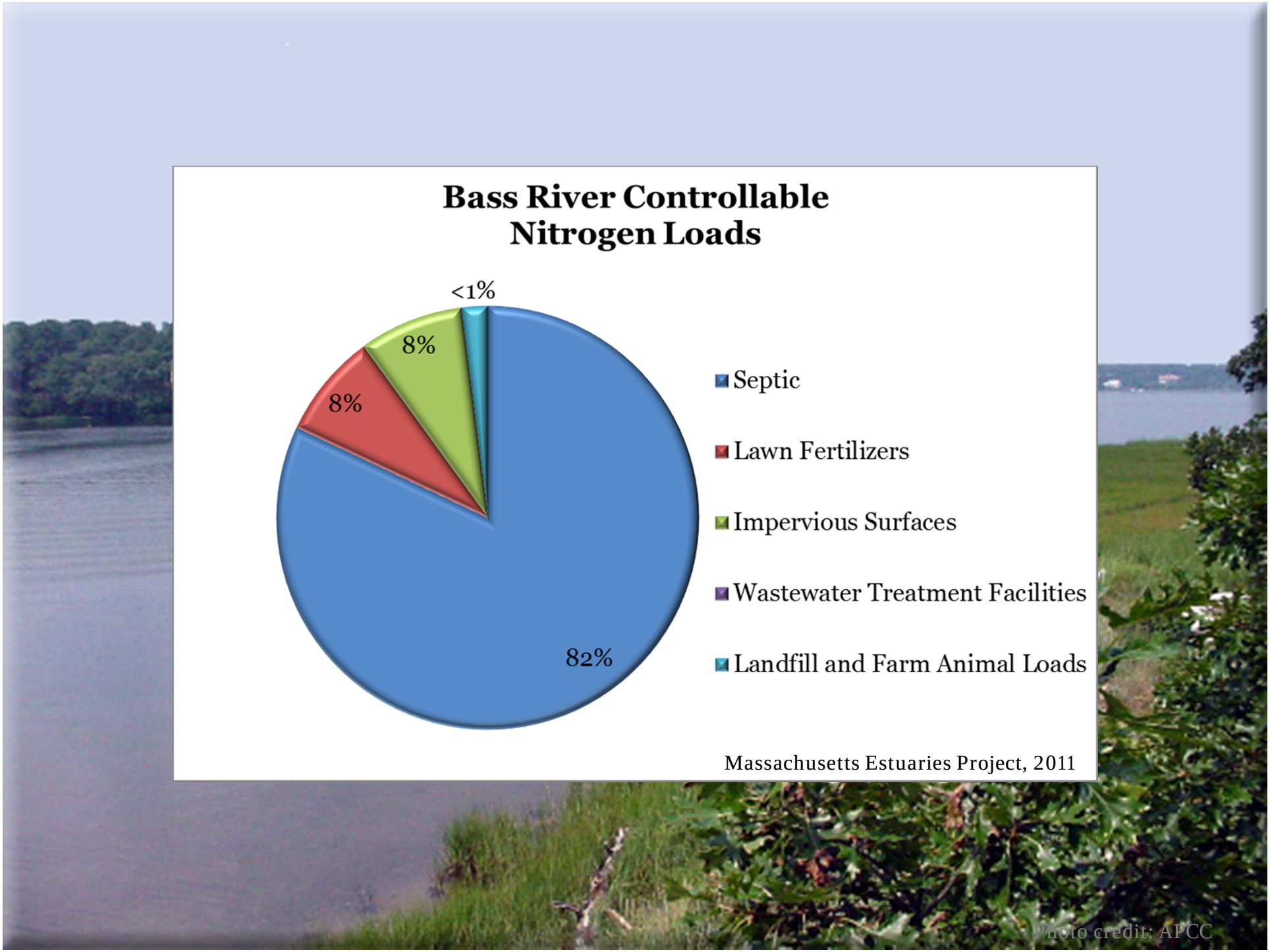
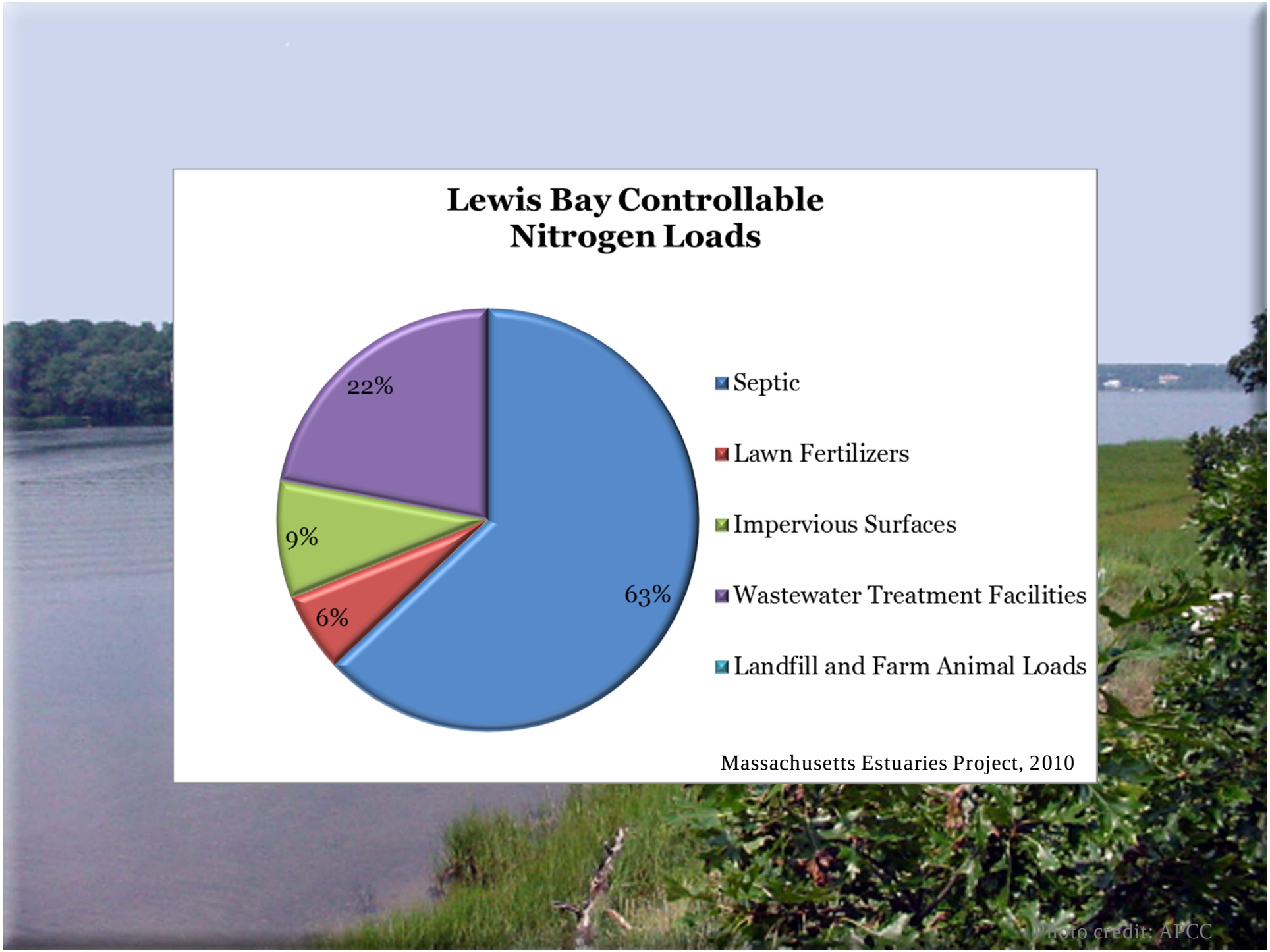
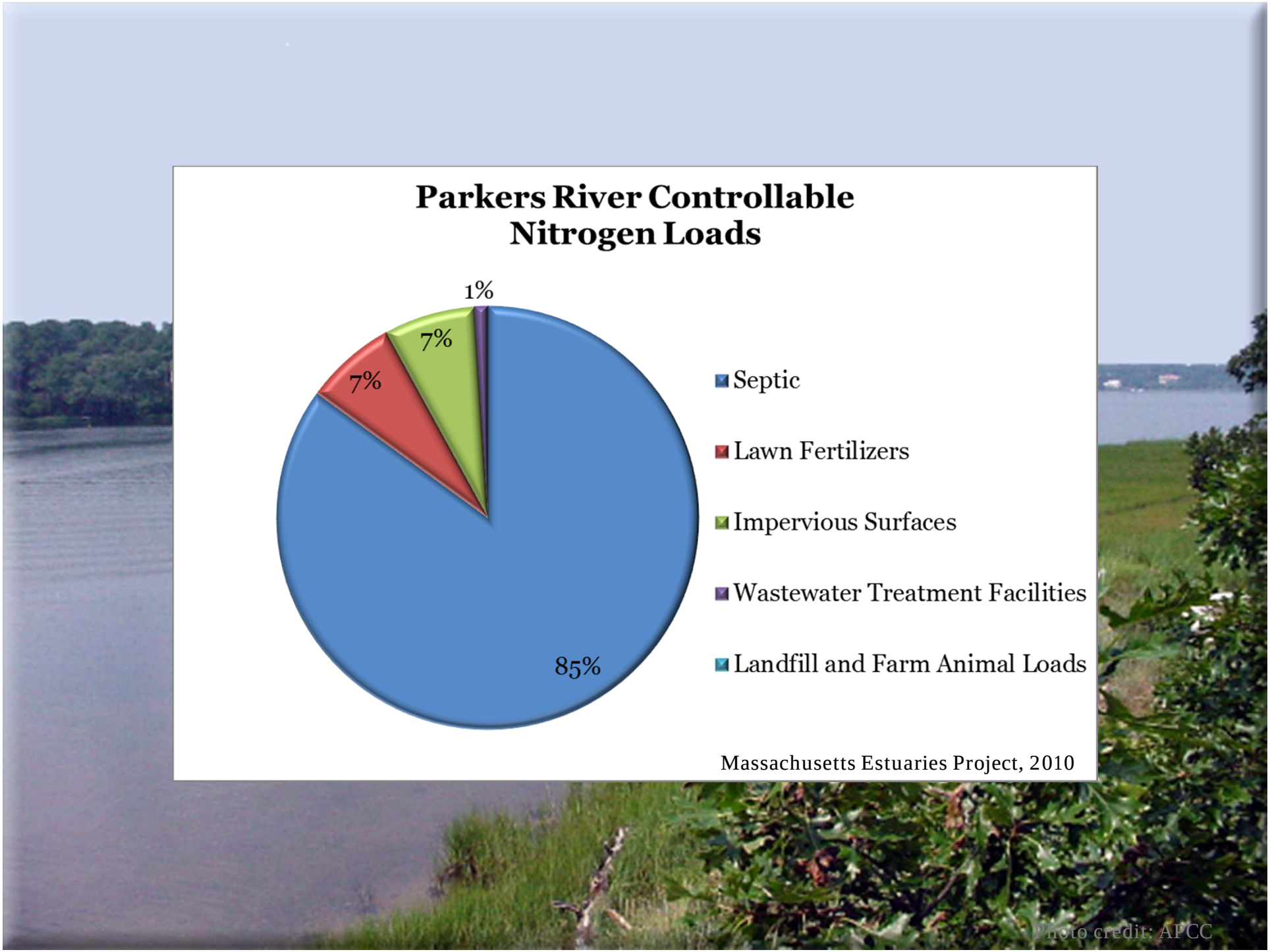


Photo credit: APCC

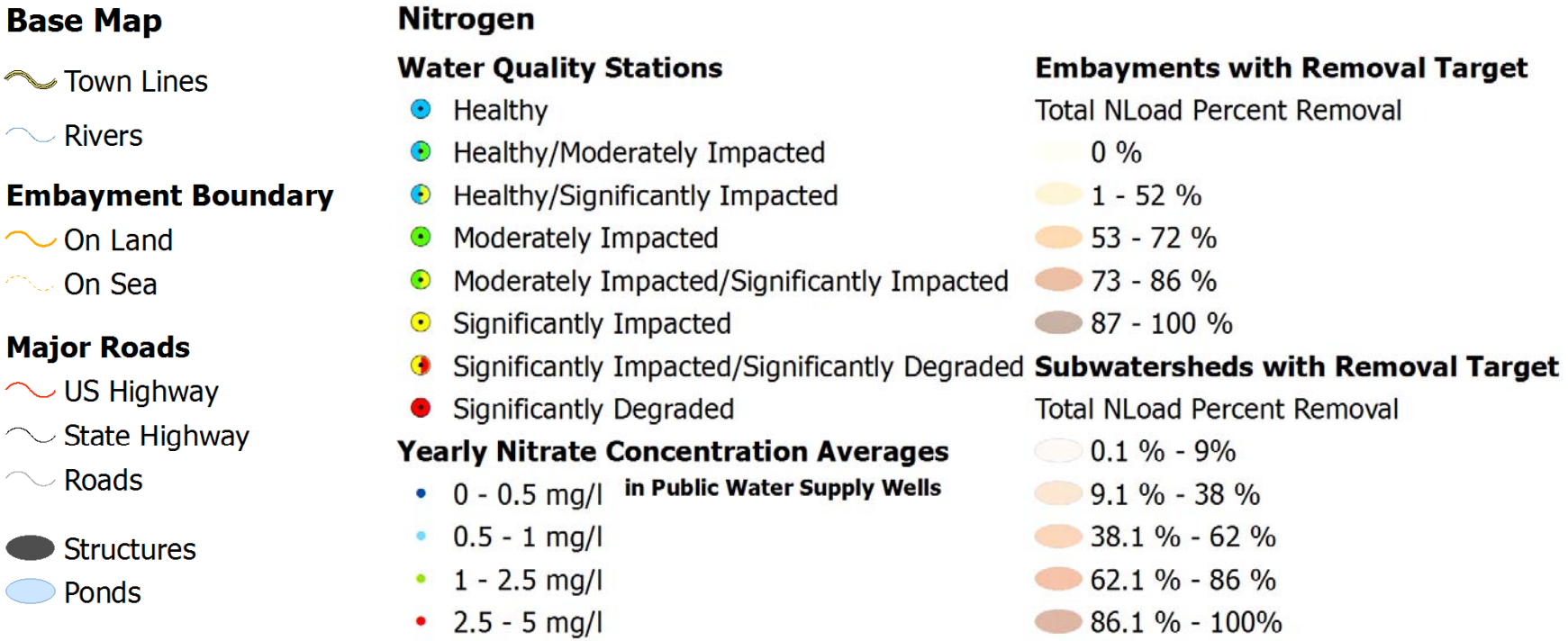

Cape-Wide Controllable Nitrogen Loads
<1%
4%
8%
9%
79%
Septic
Lawn Fertilizers
Impervious Surfaces
Wastewater Treatment Facilities
Landfill and Farm Animal Loads
Note: Data averaged from existing Massachusetts Estuaries Reports
Photo credit: APCC


Bass River Controllable Nitrogen Loads
<1%
8%
8%
82%
Septic
Lawn Fertilizers
Impervious Surfaces
Wastewater Treatment Facilities
Landfill and Farm Animal Loads
Massachusetts Estuaries Project, 2011
Photo credit: APCC

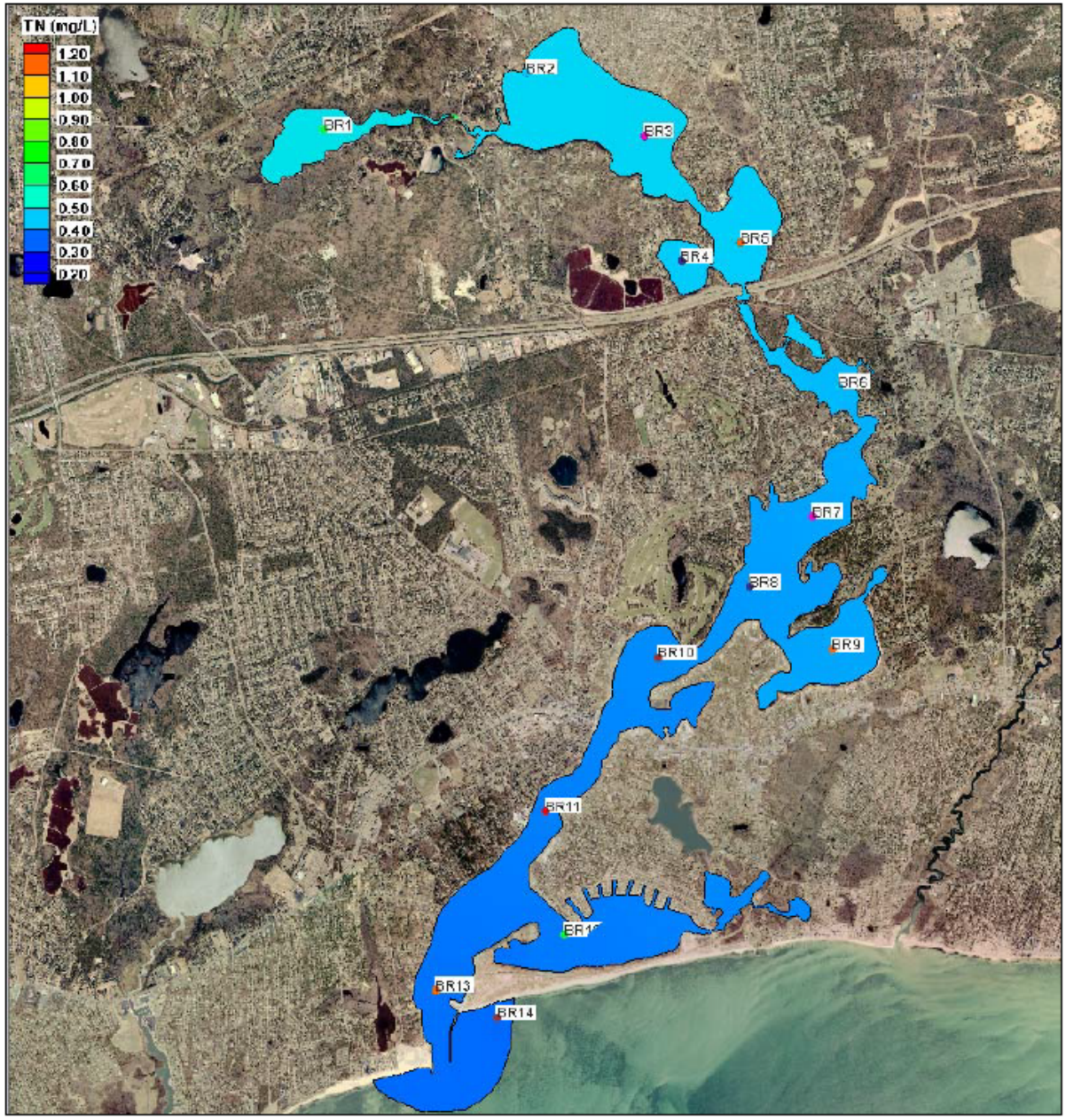

Lewis Bay Controllable Nitrogen Loads
22%
9%
6%
63%
Septic
Lawn Fertilizers
Impervious Surfaces
Wastewater Treatment Facilities
Landfill and Farm Animal Loads
Massachusetts Estuaries Project, 2010
Photo credit: APCC


Parkers River Controllable Nitrogen Loads
1%
7%
7%
85%
Septic
Lawn Fertilizers
Impervious Surfaces
Wastewater Treatment Facilities
Landfill and Farm Animal Loads
Massachusetts Estuaries Project, 2010
Photo credit: APCC

Nitrogen Problem



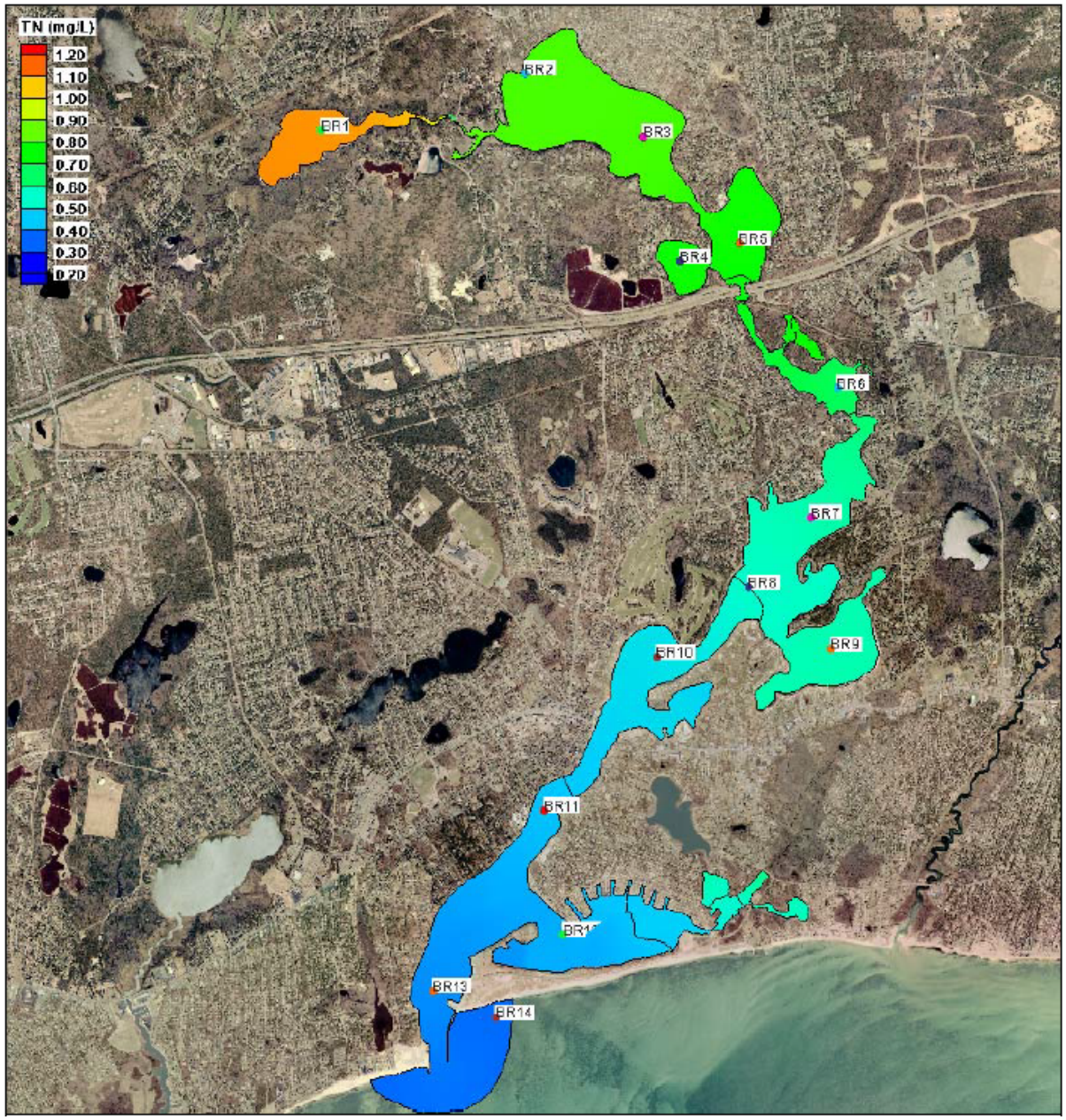
Sources: MassGIS, MEP, CCC



Pre-Colonial Conditions: Bass River

Contour plots of **modeled total nitrogen concentrations (mg/L)** in Bass River System, for no anthropogenic loading conditions, and bathymetry. The approximate location of the sentinel threshold station for Bass River System (BR7) is shown.

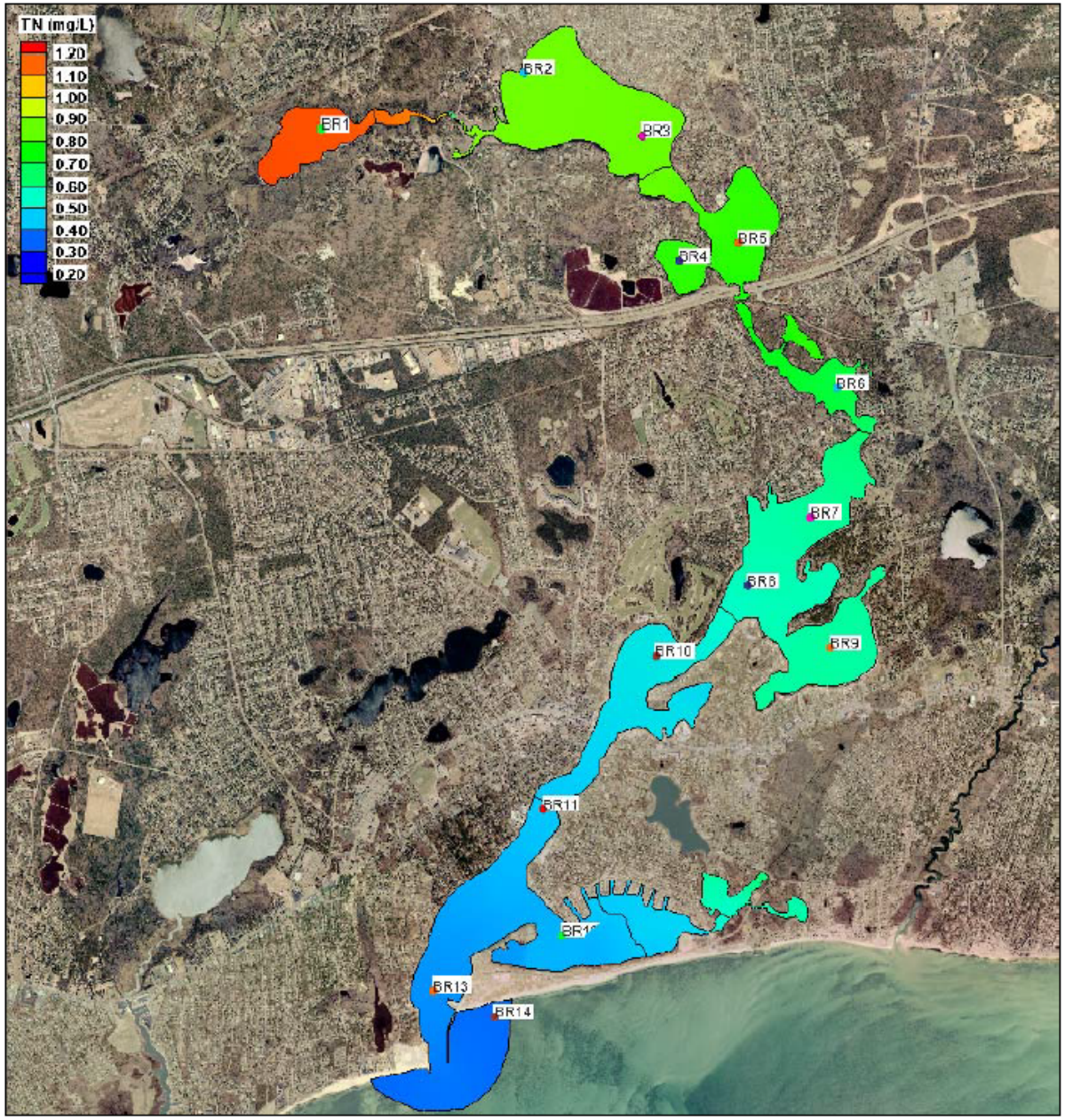
(Source: MEP 2011)



Present Conditions: Bass River

Contour plots of **average total nitrogen concentrations (mg/L)** from results of the present conditions loading scenario, for Bass River System. The approximate location of the sentinel threshold station for Bass River System (BR7) is shown.

(Source: MEP 2011)



Build-out Conditions: Bass River

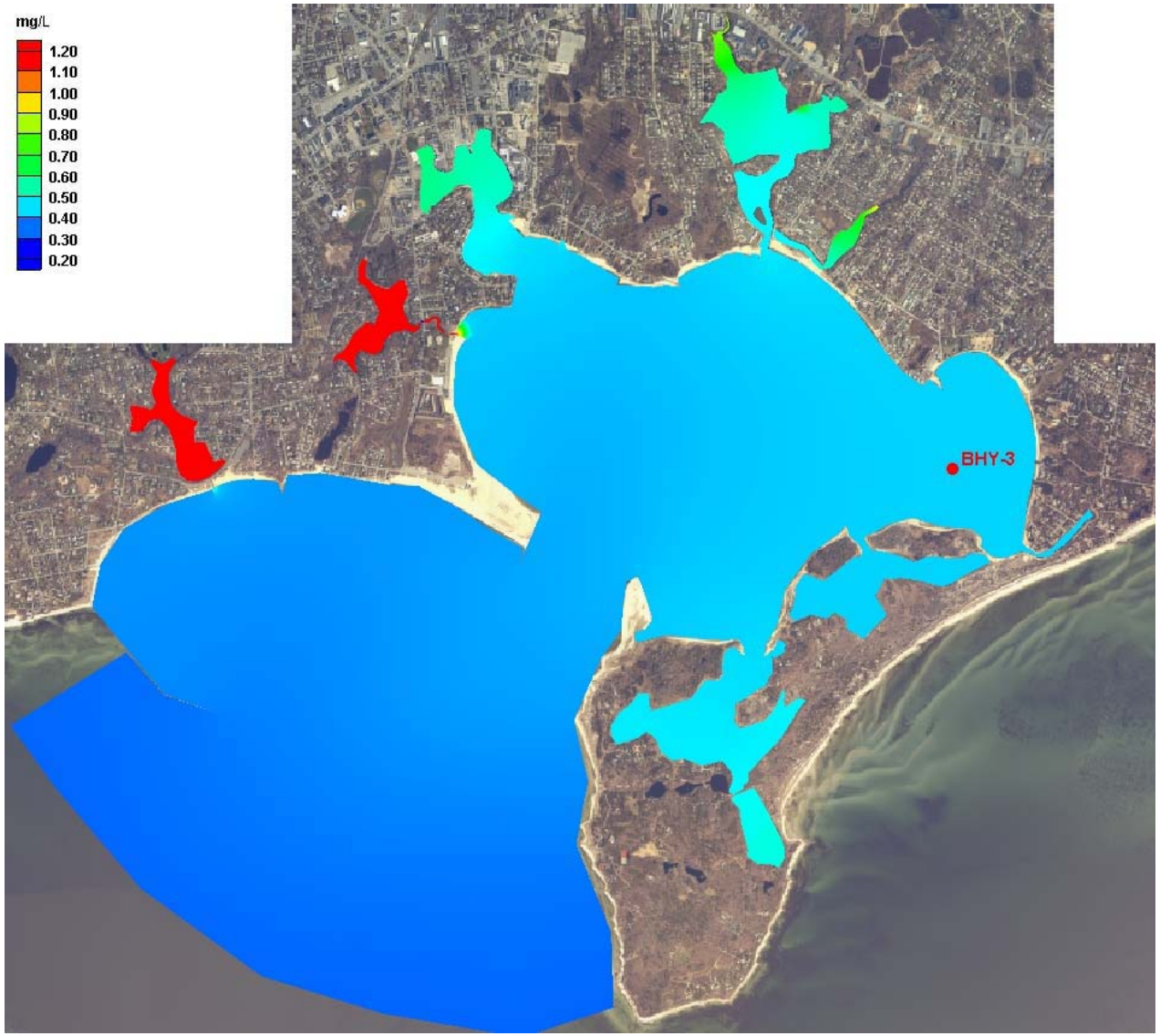
Contour plots of **modeled total nitrogen concentrations (mg/L)** in Bass River System, for projected build-out loading conditions, and bathymetry. The approximate location of the sentinel threshold station for Bass River System (BR7) is shown.

(Source: MEP 2011)

Contour plots of **modeled total nitrogen concentrations (mg/L)** in the Lewis Bay system, for no anthropogenic loading conditions, and bathymetry. The approximate location of the sentinel threshold station for the Lewis Bay system (BHY-3) is shown.

(Source: MEP 2010)

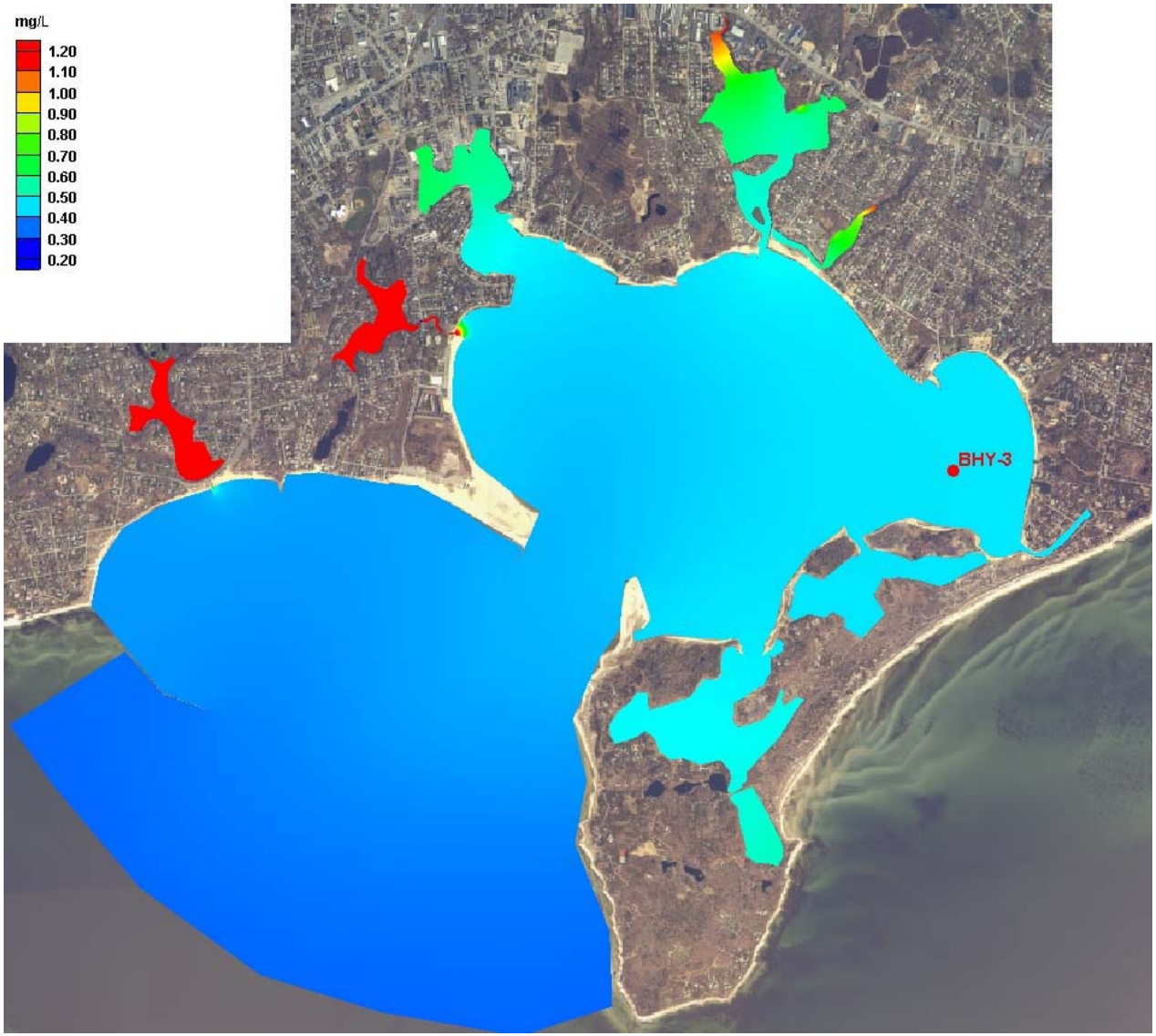
Pre-Colonial Conditions: Lewis Bay



Contour plots of **average total nitrogen concentrations** from results of the present conditions loading scenario, for the Lewis Bay system. The approximate location of the sentinel threshold station for the Lewis Bay system (BHY-3) is shown.

(Source: MEP 2010)

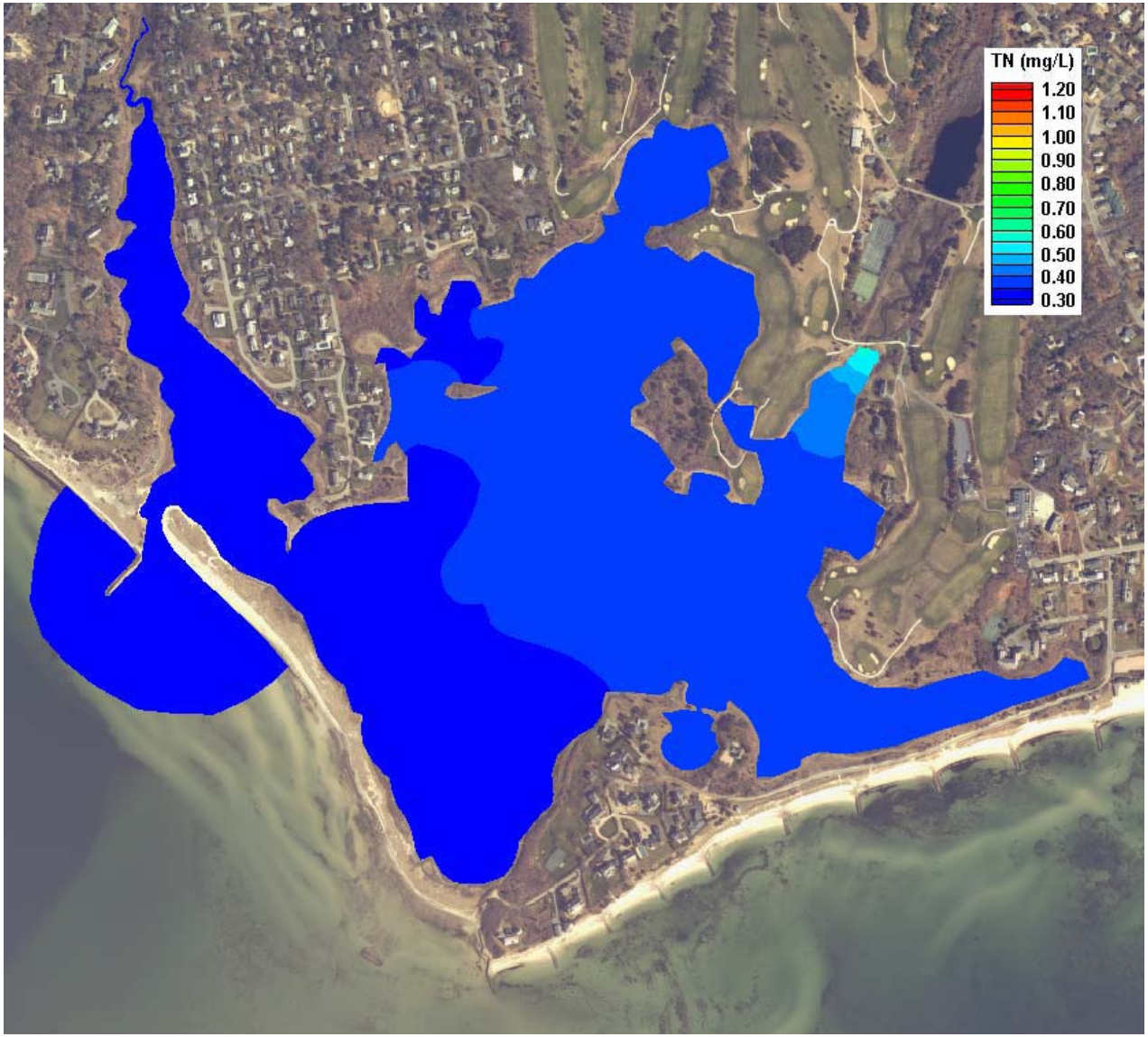
Present Conditions: Lewis Bay



Contour plots of **modeled total nitrogen concentrations (mg/L)** in the Lewis Bay system, for projected build-out loading conditions, and bathymetry. The approximate location of the sentinel threshold station for the Lewis Bay system (BHY-3) is shown.

(Source: MEP 2010)

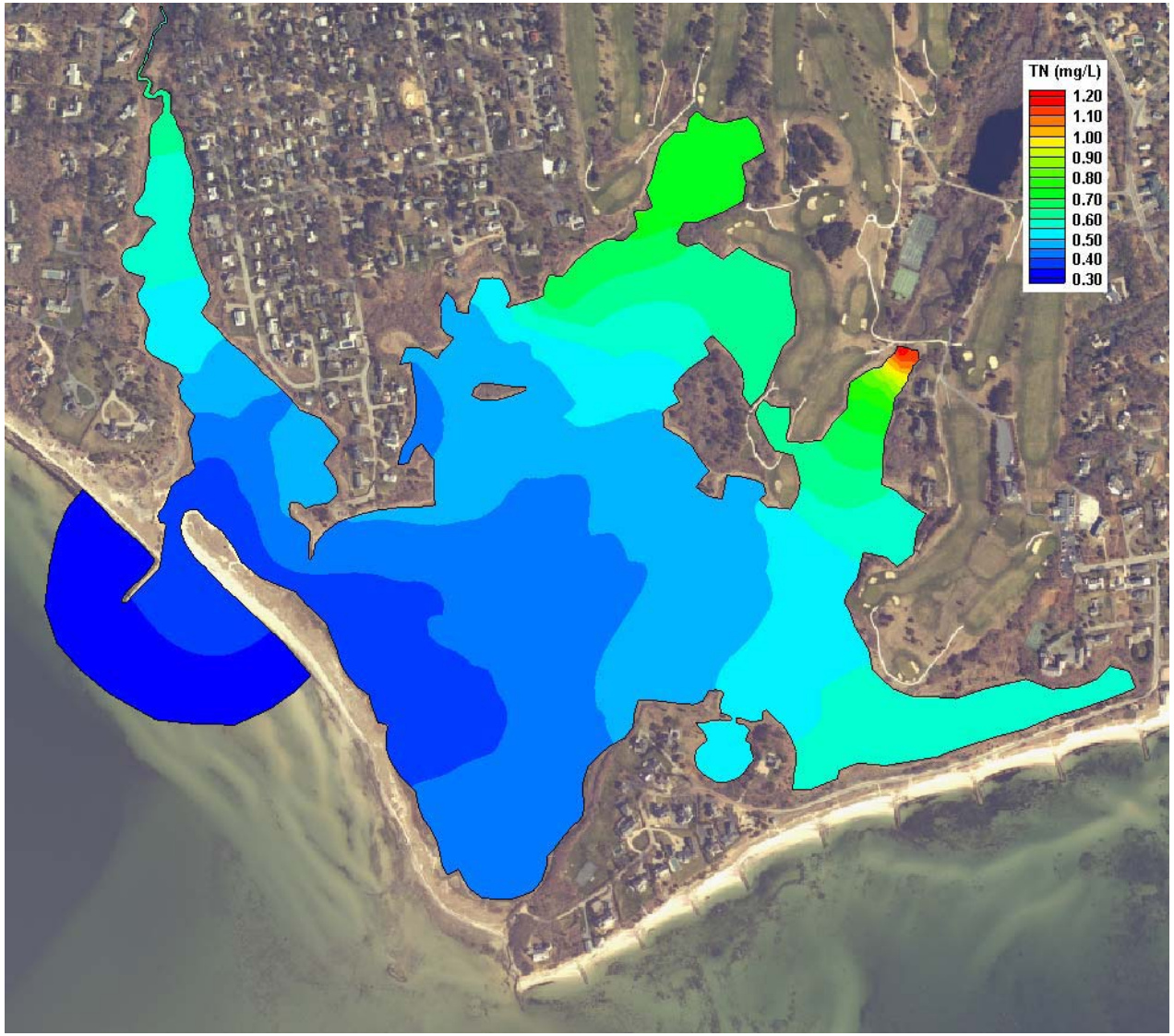
Build-out Conditions: Lewis Bay



Contour plot of **modeled total nitrogen concentrations (mg/L)** in Halls Creek, for no anthropogenic loading conditions.

(Source: MEP 2010)

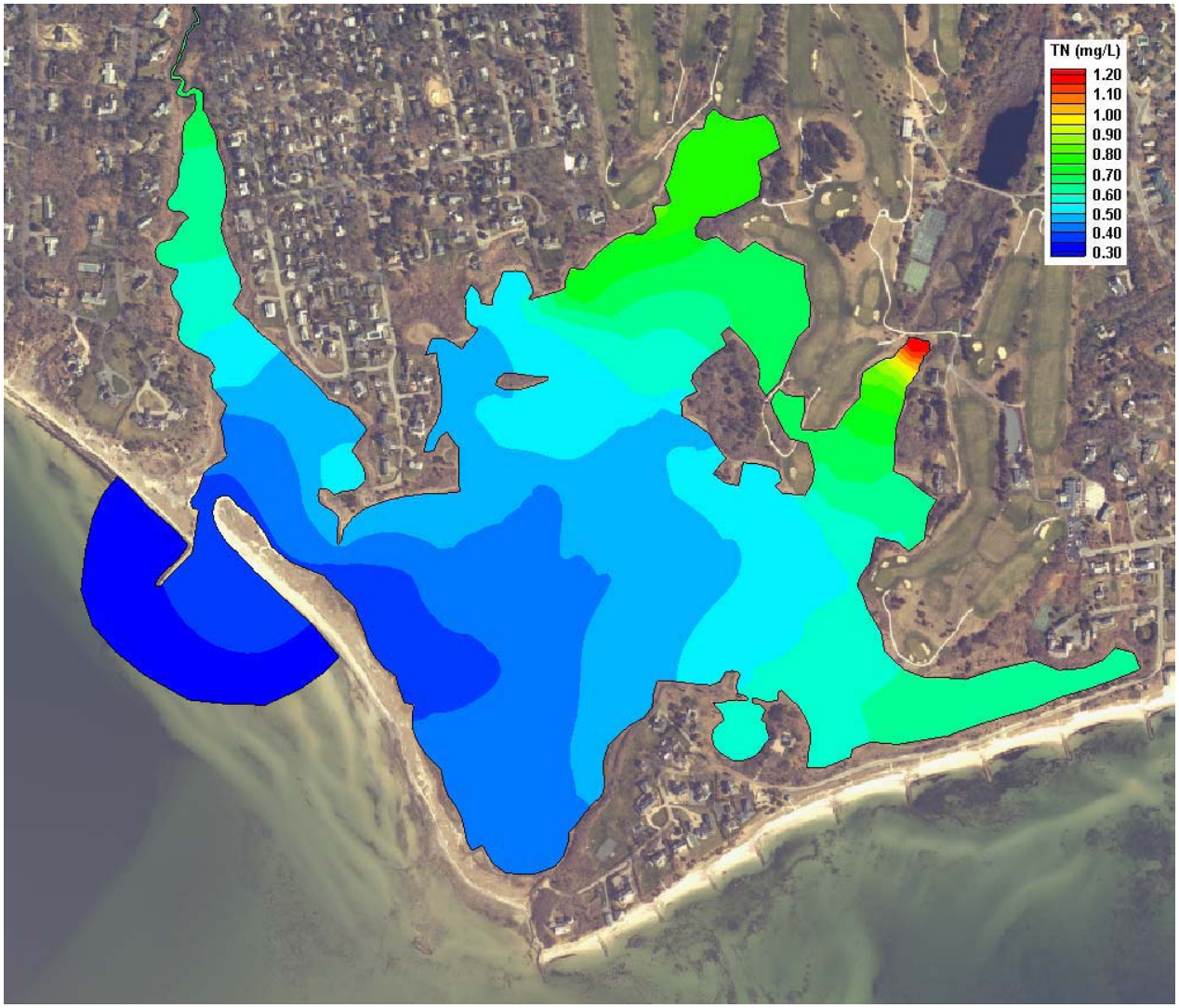
Pre-Colonial Conditions: Halls Creek



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

(Source: MEP 2010)

Present Conditions: Halls Creek



Contour plot of **modeled total nitrogen concentrations (mg/L)** in the Halls Creek system, for projected build-out loading conditions.

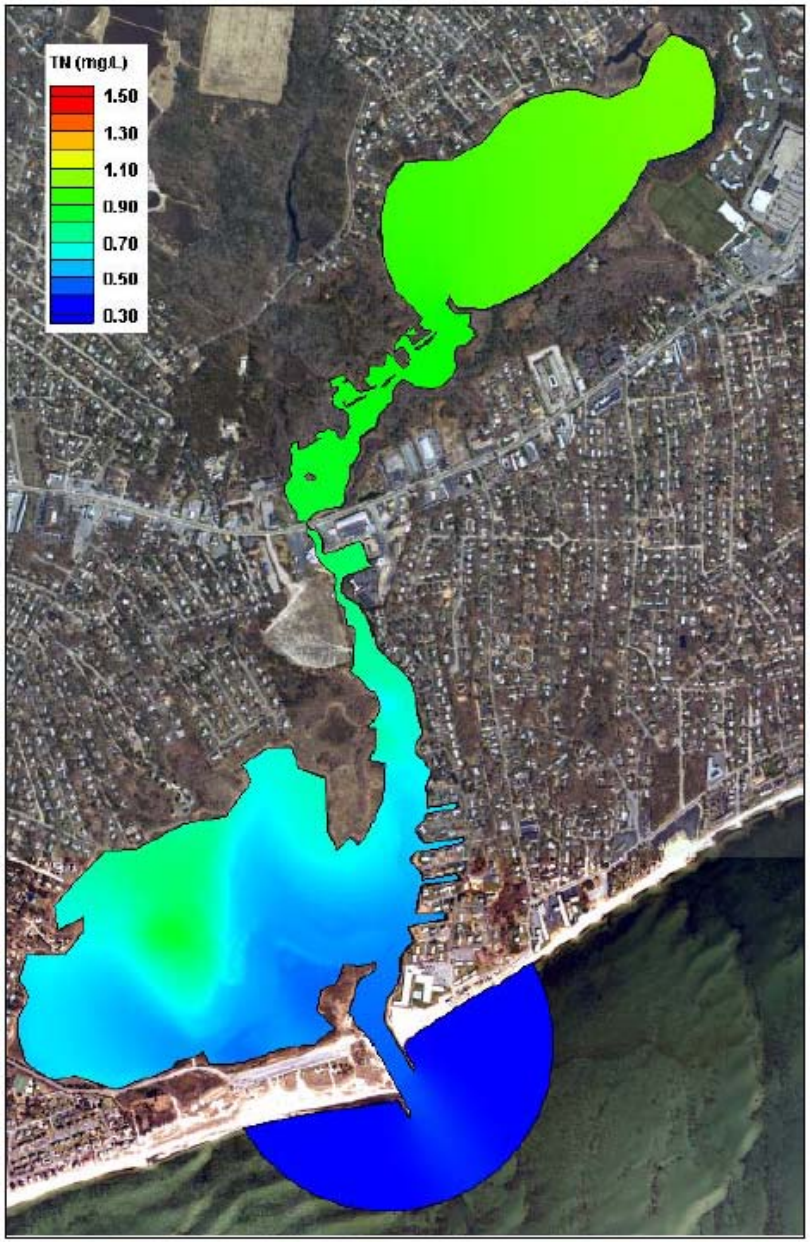
(Source: MEP 2010)

Build-out Conditions: Halls Creek

Contour plot of **modeled total nitrogen concentrations (mg/L)** in Parkers River, for no anthropogenic loading conditions.

(Source: MEP 2010)

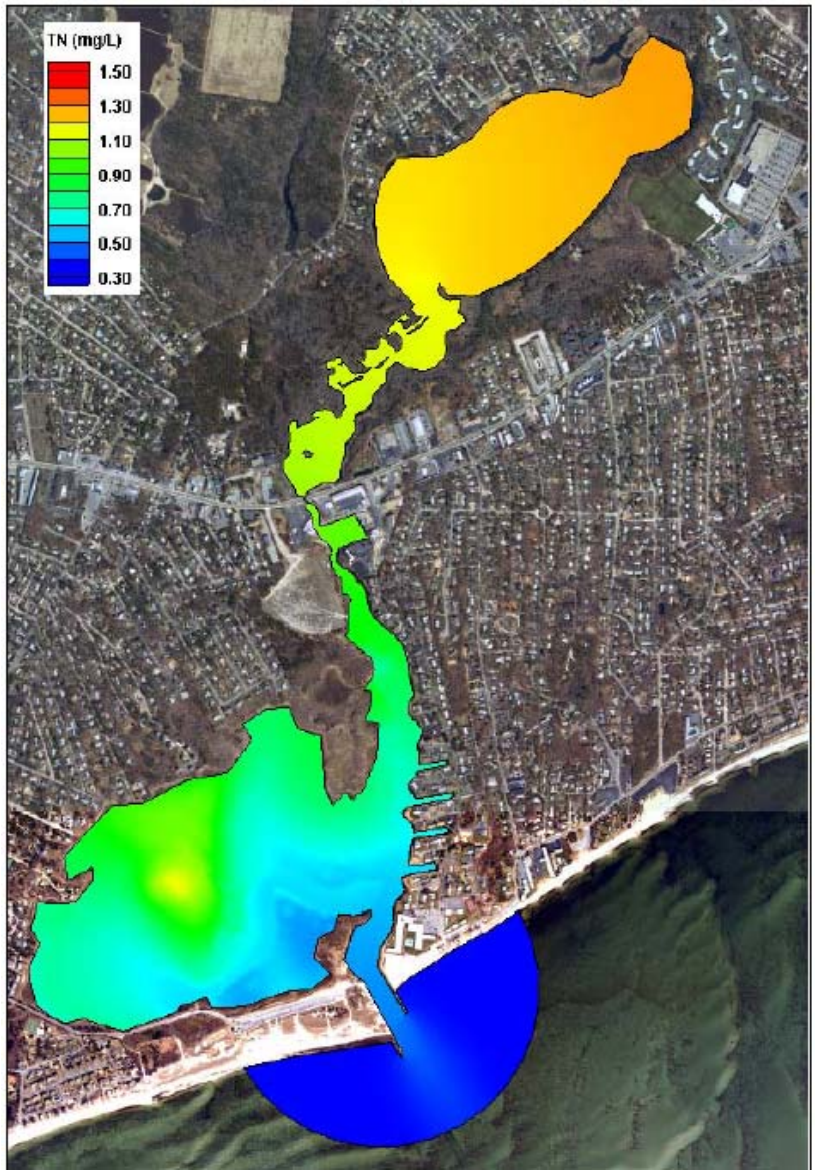
Pre-Colonial Conditions: Parkers River



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

(Source: MEP 2010)

Present Conditions: Parkers River

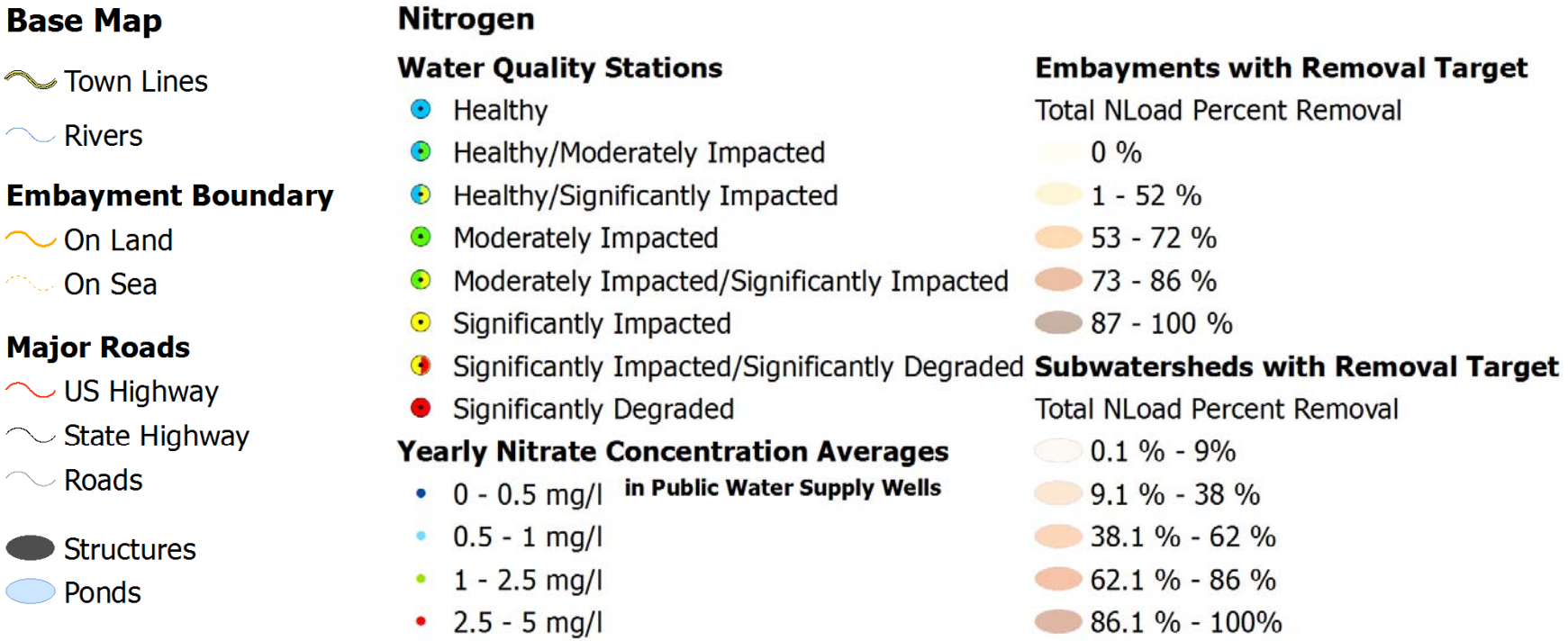


Contour plot of modeled **total nitrogen concentrations (mg/L) in** the Parkers River system, for projected build-out scenario loading conditions.

(Source: MEP 2010)

Build-out Conditions: Parkers River

Nitrogen Problem



Sources: MassGIS, MEP, CCC

Eelgrass Extent

Base Map

Town Lines

Rivers

Embayment Boundary

On Land

On Sea

Major Roads

US Highway

State Highway

Roads

Structures

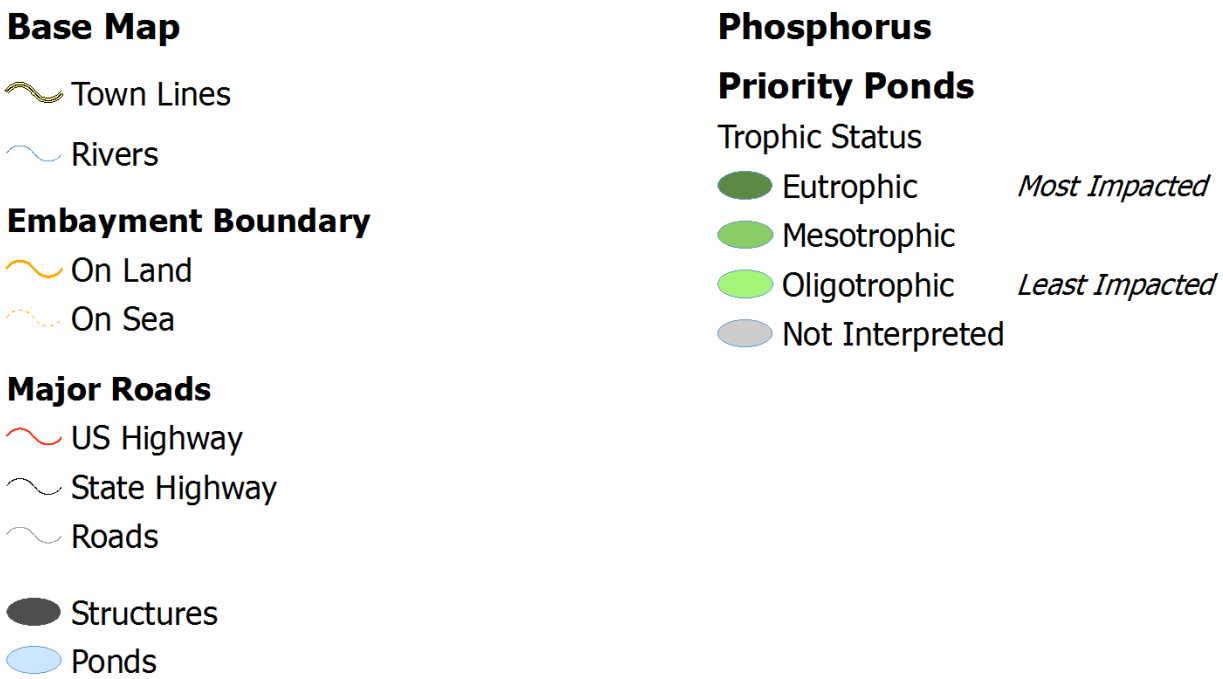
Ponds

Eelgrass

Eelgrass Extent

Sources: MassGIS

Phosphorus Problem



Sources: MassGIS, MassDOT, CCC

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

Sources: MassGIS, MassDOT, MassDEP, Barnstable County Community Septic Loan Program, CCC

Existing & Proposed Solutions

Bass River
Lewis Bay
Parkers River

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

Sources: MassGIS, MassDOT, MassDEP, Barnstable County Community Septic Loan Program, CCC

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

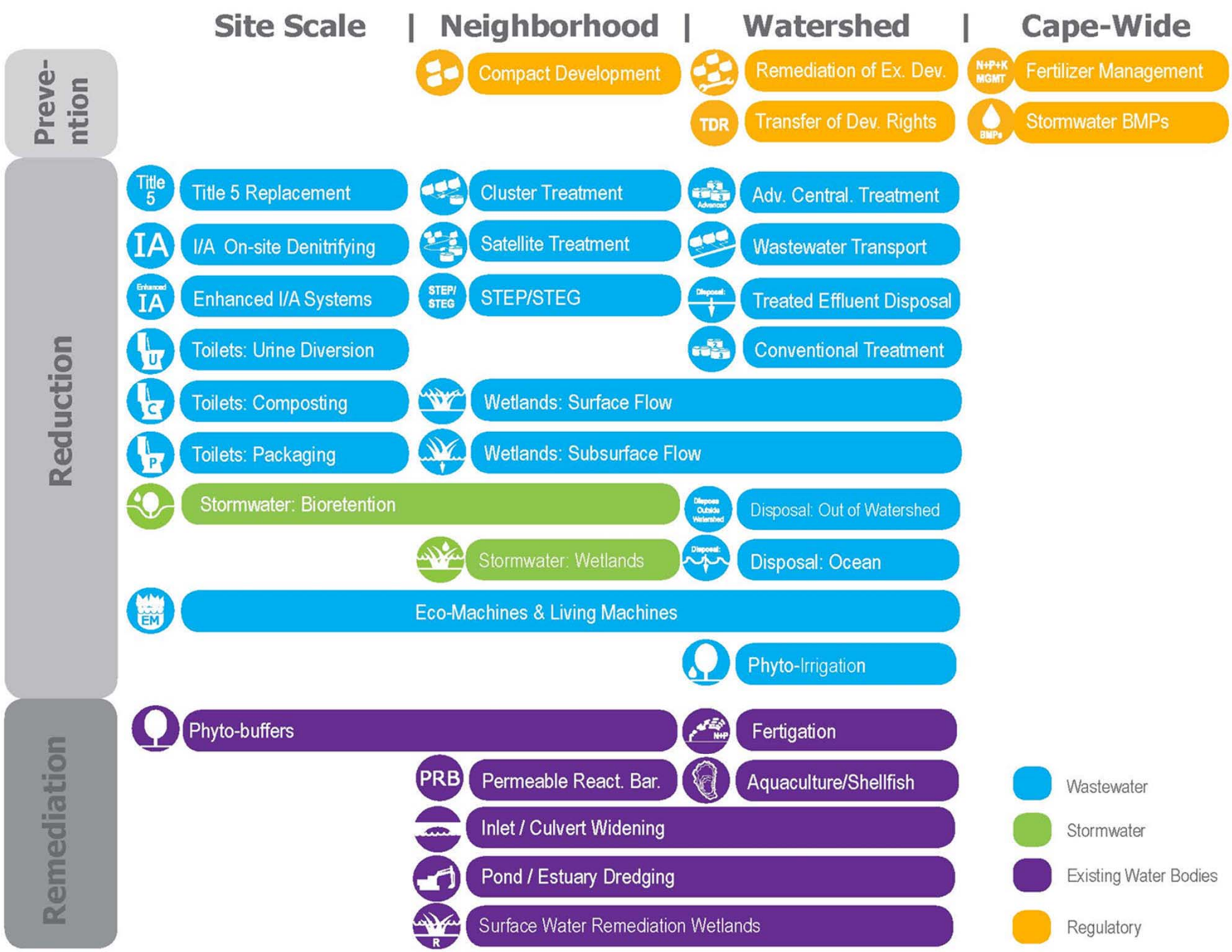
2031 - 2040

2041 - 2050

Sources: MassGIS, MassDOT, CCC

Framework for Addressing Solutions Moving Forward

Bass River
Lewis Bay
Parkers River


Site Scale
Neighborhood
Watershed
Cape-Wide
Preve-ntion
Reduction
Remediation
Compact Development
Remediation of Ex. Dev.
Fertilizer Management
Transfer of Dev. Rights
Stormwater BMPs
Title 5 Replacement
Cluster Treatment
Adv. Central. Treatment
I/A On-site Denitrifying
Satellite Treatment
Wastewater Transport
Enhanced I/A Systems
STEP/STEG
Treated Effluent Disposal
Toilets: Urine Diversion
Conventional Treatment
Toilets: Composting
Wetlands: Surface Flow
Toilets: Packaging
Wetlands: Subsurface Flow
Stormwater: Bioretention
Disposal: Out of Watershed
Stormwater: Wetlands
Disposal: Ocean
Eco-Machines & Living Machines
Phyto-Irrigation
Phyto-buffers
Fertigation
Permeable React. Bar.
Aquaculture/Shellfish
Inlet / Culvert Widening
Pond / Estuary Dredging
Surface Water Remediation Wetlands
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
N+P+K MGMT
BMPs
Watershed/Embayment Options
A. Permeable Reactive Barriers
B. Inlet/Culvert Openings
C. Constructed Wetlands
D. Dredging
PRB
R
Alternative On-Site Options
A. Eco-toilets (UD & Compost)
B. I/A Technologies
C. Enhanced I/A Technologies
D. Shared Systems
Title 5
Enhanced IA
IA
Priority Collection/High-Density Areas
A. Greater Than 1 Dwelling Unit/acre
B. Village Centers
C. Economic Centers
D. Growth Incentive Zones
Advanced
Disposal:
STEP/ STEG
Supplemental Sewering
Advanced

All materials and resources for the Lewis Bay to Bass River Group will be available on the Cape Cod Commission website:

http://watersheds.capecodcommission.org/index.php/watersheds/mid-cape/lewis-bay-to-bass-river

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Bass River
Lewis Bay
Parkers River