



A Green Infrastructure-based Approach to Climate Change Resiliency Planning

Eric J. Walberg, AICP, Climate Services Director, Manomet, Inc.

Trish Garrigan, Watershed Coordinator, EPA

Sara Burns, Water Resource Scientist, TNC

Dan Brown, Climate Change Coordinator, Mass Audubon

Jen Hushaw, Forest Scientist, Manomet, Inc.

Bill Napalitano, Director of Environmental Planning, SRPEDD

Stefanie Covino, Coordinator, Shaping the Future of Your Community Program, Mass Audubon

Session Outline

- Trish: EPA approach to watershed management including interconnection of green and gray infrastructure approaches
- Sara: Why we are working in the Taunton, Project Goals, RTWN Structure and Function
- Dan: Climate trends and projections in the Taunton watershed
- Eric: Green Infrastructure Analysis overview
- Jen: Green Infrastructure Analysis technical details
- Bill: Case Studies
- Stefanie: Follow-up Actions and Resources

Session Outline

Transferring the Taunton Approach to Other Watersheds

- Panel Discussion with Audience Polling

Definitions and Orientation

Green Infrastructure: Full spectrum from landscape-scale forests and wetlands to site specific practices such as rain gardens and green roofs

Climate Change Resilience: Utilization of the full suite of services provided by healthy, intact ecosystems. This includes strategic thinking about the interaction of natural and built environments and consideration of cost/benefit tradeoffs.

Planning for Resilience: A New England Perspective

**Trish Garrigan, Watershed
Coordinator, EPA**

An aerial photograph showing a large body of water, likely a bay or estuary, with a dark blue-green hue. The surrounding land is lush green, with some areas appearing more densely vegetated than others. The coastline is irregular, with several inlets and peninsulas. The sky is visible in the upper left corner, showing some white clouds. The overall scene suggests a coastal environment with significant water resources and green space.

Are we Ready?
Are we Planning for Resilience?







**Somerville,
MA**

A more relaxed Tiger Woods faces the media and says he's playing to win at the Masters. **SPORTS CL**



The Providence Journal

Tuesday \$1.00

WEST VIRGINIA
7 killed in mine blast; 19 missing

More than 100 miners designed to provide support as they wait for the rescue of the 19 miners who were trapped in an underground mine in West Virginia after a blast killed seven of them.

THE FLOODS OF 2000 / CLEANUP Moving back to normalcy

How fast business is recovering from the damage of the floods. **By David S. Johnson**



Mall a beehive of activity
By David S. Johnson
The scene at the entrance of the Warwick Mall is a busy one. Workers in hard hats and safety vests are seen moving debris and equipment. The ground is still muddy from the recent flooding.

Warwick Mall co-owner remains upbeat

As the Warwick Mall begins to recover from the damage caused by the floods, the co-owner remains optimistic about the future of the mall. "The people I deal with for are the individual businesses," he says.

Weary residents seek help from FEMA
By David S. Johnson
Residents of the Warwick area are growing weary of the slow progress of recovery. Many are turning to FEMA for assistance with rebuilding and repairs.



Inside today

- WAS IT A CAMERA OR AN AIR-21?
- ...and other news items.



status quo is not enough

Superstorm Sandy West Haven, CT | Oct 2012



Alstead, NH

2005





**Hurricane Irene
Brattleboro, VT Aug 2011**



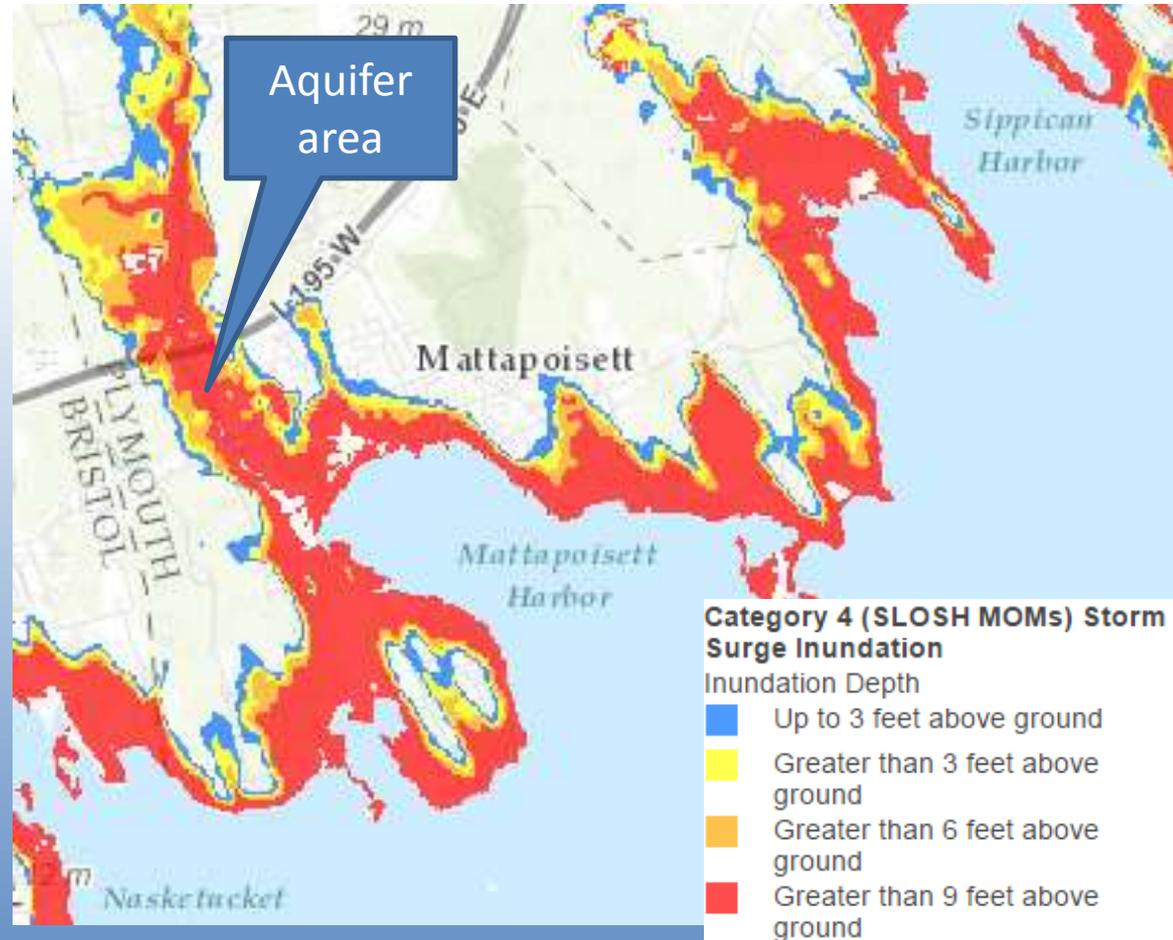
Edward Augustus, Jr. Worcester City
Manager, Quinapoxet Reservoir
September 6, 2016 (Boston Globe



Lake Champlain, VT

Sea Level Rise & Storm Surge Risk in a Coastal Aquifer

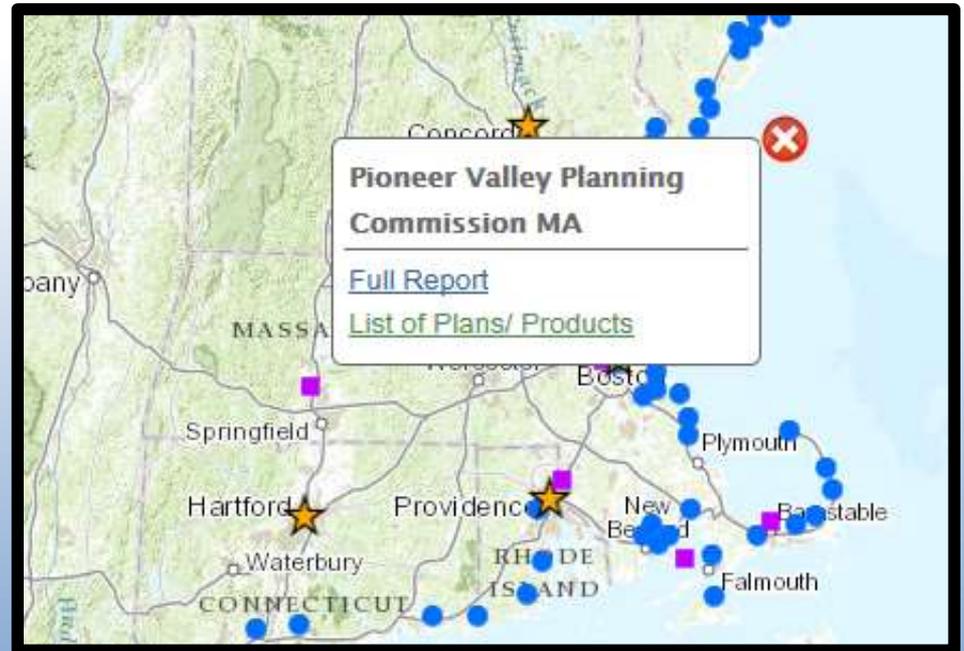
- Mattapoissett River valley aquifer supplies water for several towns
- Vulnerable to salt water intrusion from storm surge
- Surge from Hurricane Bob ('91) = loss of southernmost well field



Resilience and Adaptation in New England

RAINE Database

- Includes 200 New England towns, regions, states
- Information from more than 500 documents
- Data searches can be done on impacts, plan or product, funding, partners



Example: Search on Sea Level Rise

epa.gov/raine



We need to find new
ways to work together

Trish Garrigan, EPA
Garrigan.trish@epa.gov

Resilient Taunton Watershed Network

**Sara Burns, Water Resource
Scientist, TNC**

Resilient Taunton Watershed Network

The **Taunton River Watershed** is in Southeastern Massachusetts.

The Network consists of 20 state, local, non-profit and federal partners.

Overarching goal is to promote the **resiliency** of the Taunton River Watershed.



RTWN Members

Bridgewater State University

Horsley Witten Group

Manomet Inc.

MA Department of Environmental
Protection (DEP)

MA Division of Ecological Restoration
(DER)

MA Executive Office of Energy and
Environmental Affairs (EEA)

Mass Audubon

Metropolitan Area Planning Council
(MAPC)

Narragansett Bay Estuary Program

The Nature Conservancy (TNC)

Old Colony Planning Council (OCPC)

Save the Bay

Southeastern Regional Planning and
Economic Development District
(SRPEDD)

Taunton River Watershed Alliance (TRWA)

Tighe & Bond

US Environmental Protection Agency (EPA)

National Park Service

Wildlands Trust

Why We Work in the Taunton River Watershed

The Taunton River Watershed is developing rapidly.

- It's in the **Sprawl Frontier**

The watershed is home to critical natural resources.

- Taunton Wild and Scenic River is longest undammed coastal river in New England
- One of two largest contributors of fresh water to the Narragansett Bay

There is huge opportunity for resilience planning.

- **60%** of the land is **undeveloped**.
- Only **15%** of the land is protected.



Building Resilience

A resilient watershed is one that can adjust to stresses and disturbances while still being able to provide valuable ecosystem services and functions.

As a resource for resilience, RTWN meets monthly to discuss opportunities and challenges in the watershed.

RTWN provides education and resources to local officials and residents of the watershed.

Planning Ahead for a Changing Environment

RTWN engages with local officials and residents in a variety of ways to encourage holistic planning that involves multiple municipal departments to add resilience to the list of a project's desired outcomes.

Resilience Roundtables

Municipal Training Programs

Assistance with Regulatory Requirements

Prioritizing Culvert Replacement

Assist in pursuing funding opportunities for watershed localities

Green Infrastructure for Resiliency Planning

Working under an EPA Healthy Communities Grant, partners modeled existing unprotected [green infrastructure](#) in the watershed.

Municipalities were engaged in trainings to review climate change impacts and predictions

Participants identified areas of current vulnerability to weather. These vulnerabilities were discussed in the context of climate change and also in terms of the [opportunities offered by the existing green infrastructure network](#).



Climate Change Impacts in the Taunton River Watershed

**Dan Brown, Climate Change
Coordinator, Mass Audubon**

Massachusetts

Key Observed Climate Changes

Temperature:



2.8°F

Since 1895

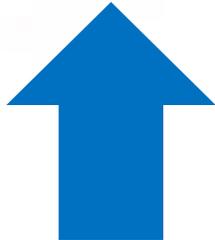
Growing Season:



10 Days

Since 1950

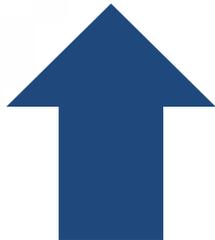
Sea Level Rise:



10 inches

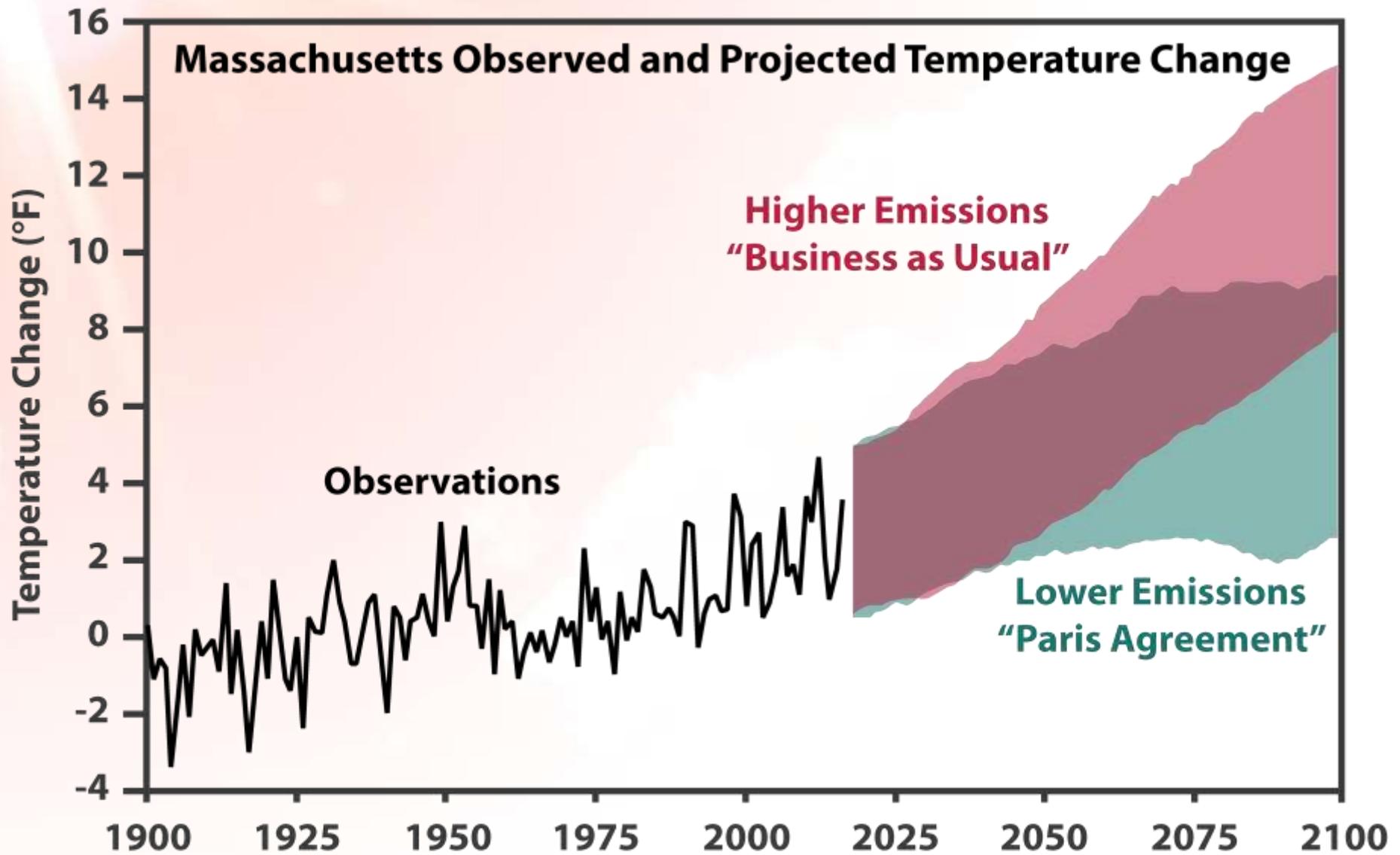
Since 1922

Strong Storms:



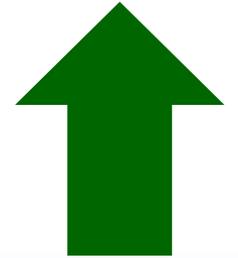
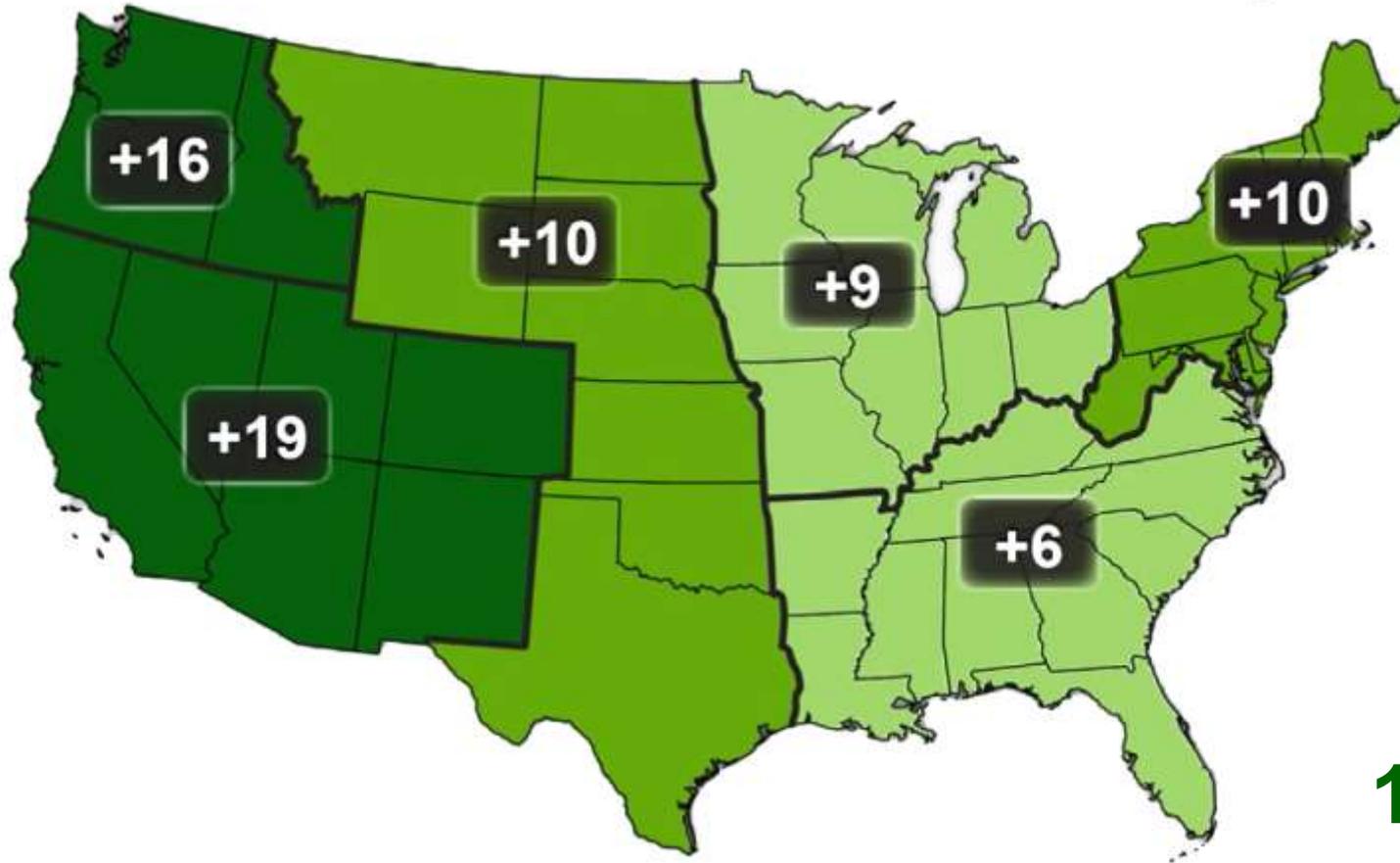
71%

Since 1958



Longer Frost-free Season

Observed Increase in Frost-Free Season Length



10 Days

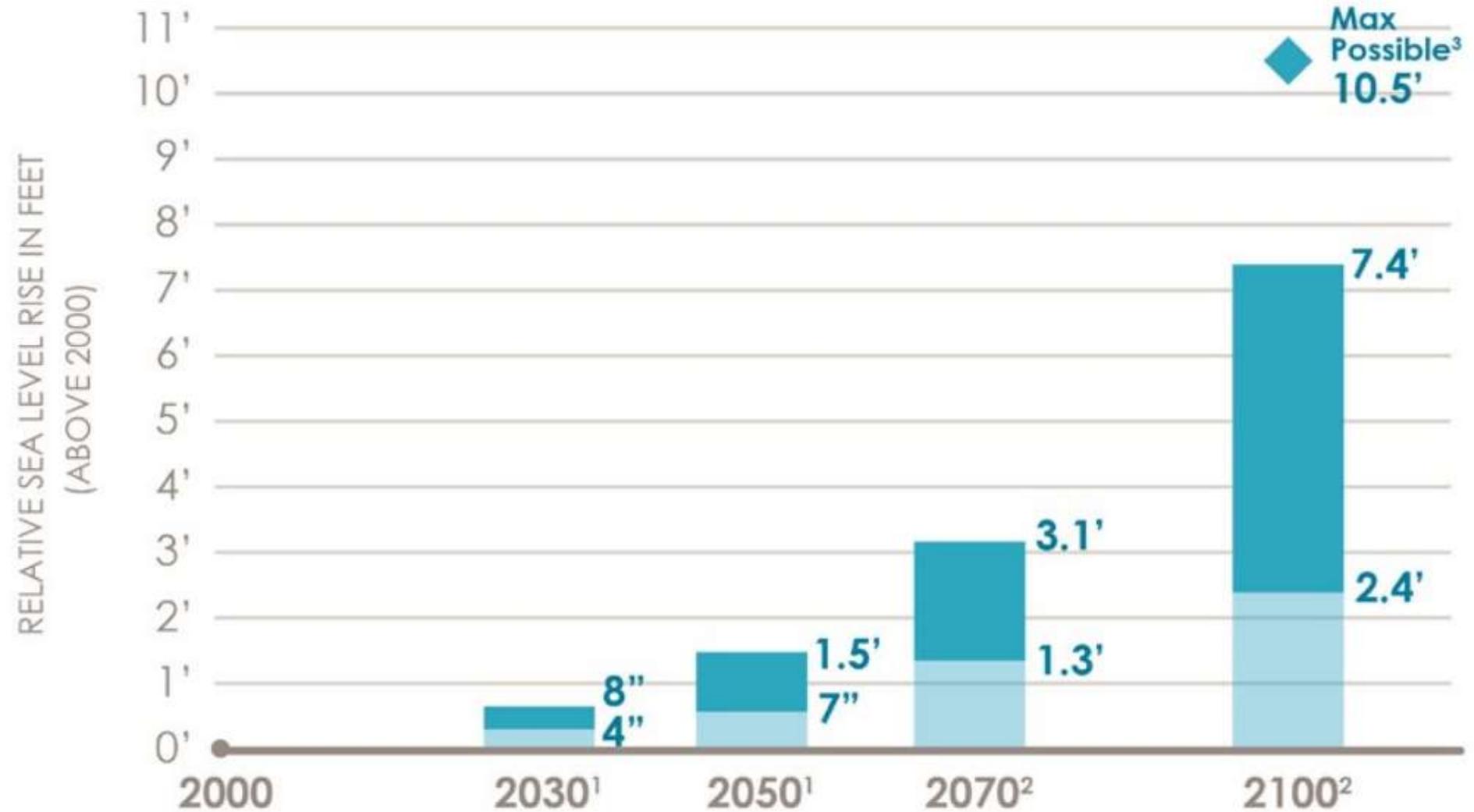
Observed
After 1960



1-2 Months

Projected
2071-2099

SEA LEVEL RISE IN BOSTON DURING THE TWENTY-FIRST CENTURY



1 - Likely under all emission scenarios

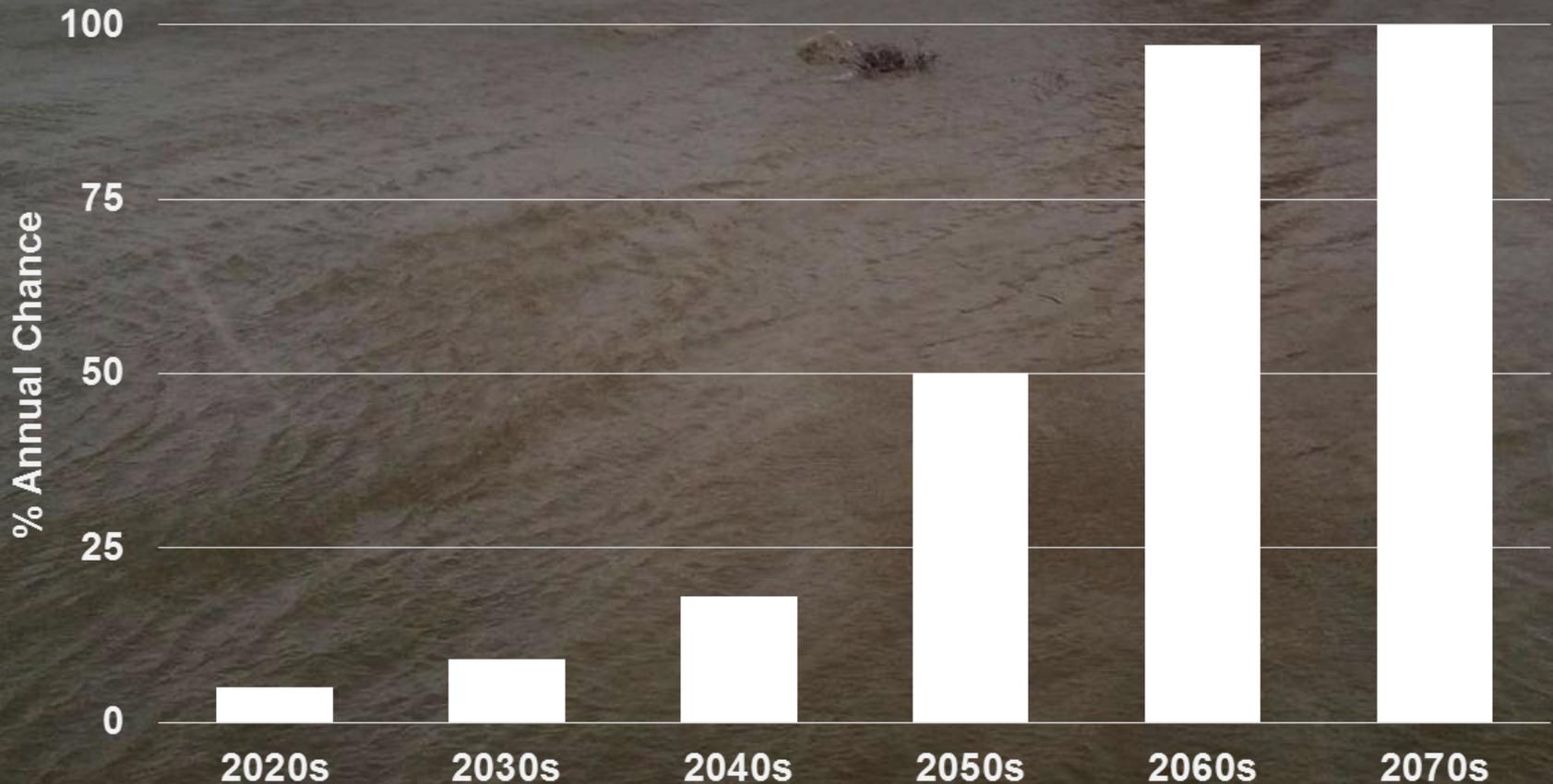
2 - Likely under moderate to high emission scenarios

3 - Low probability under high emission scenario

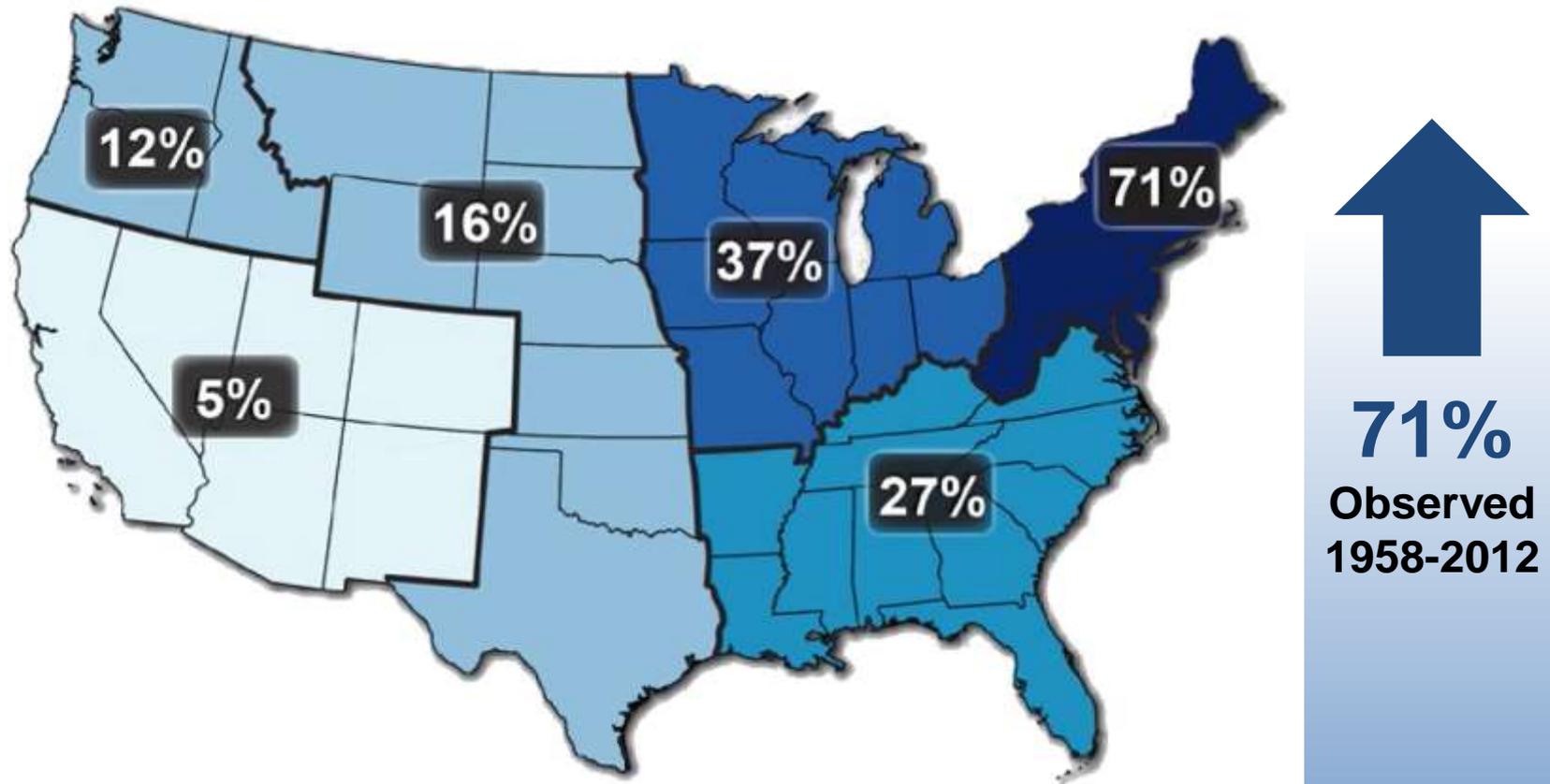
Data Source: BRAG Report, 2016

Coastal Flooding

**Projected Single-year Likelihood of Coastal
Floods Exceeding 4 Feet**
Providence, Rhode Island



More Extreme Precipitation



The amount falling in the heaviest 1% of precipitation events increased by *71% in the Northeast* from 1958 to 2012.

NRCC Change in Design Storms (24-hour, 100-year, inches, %)

	NOAA TP-40	NRCC/Cornell	Change
Taunton	6.9"	7.78"	15%
Boston	6.6"	7.82"	19%
Worcester	6.5"	7.84"	21%

NRCC Cornell Extreme Precipitation in NY and NE:

<http://precip.eas.cornell.edu/>



Taunton Green Infrastructure Network Overview

Eric Walberg, Climate Services Director

What is Green Infrastructure?

Green Infrastructure: A network of waterways, wetlands, woodlands, wildlife habitats, and other natural areas that support native species, maintain natural ecological processes, sustain air and water resources and contribute to health and quality of life.

(McDonald, Benedict and O'Conner, 2005).



Source: Google Earth



Source:
http://www.boston.com/news/local/massachusetts/articles/2011/01/06/state_south_shore_officials_gauge_whether_area_qualifies_for_federal_disaster_aid/

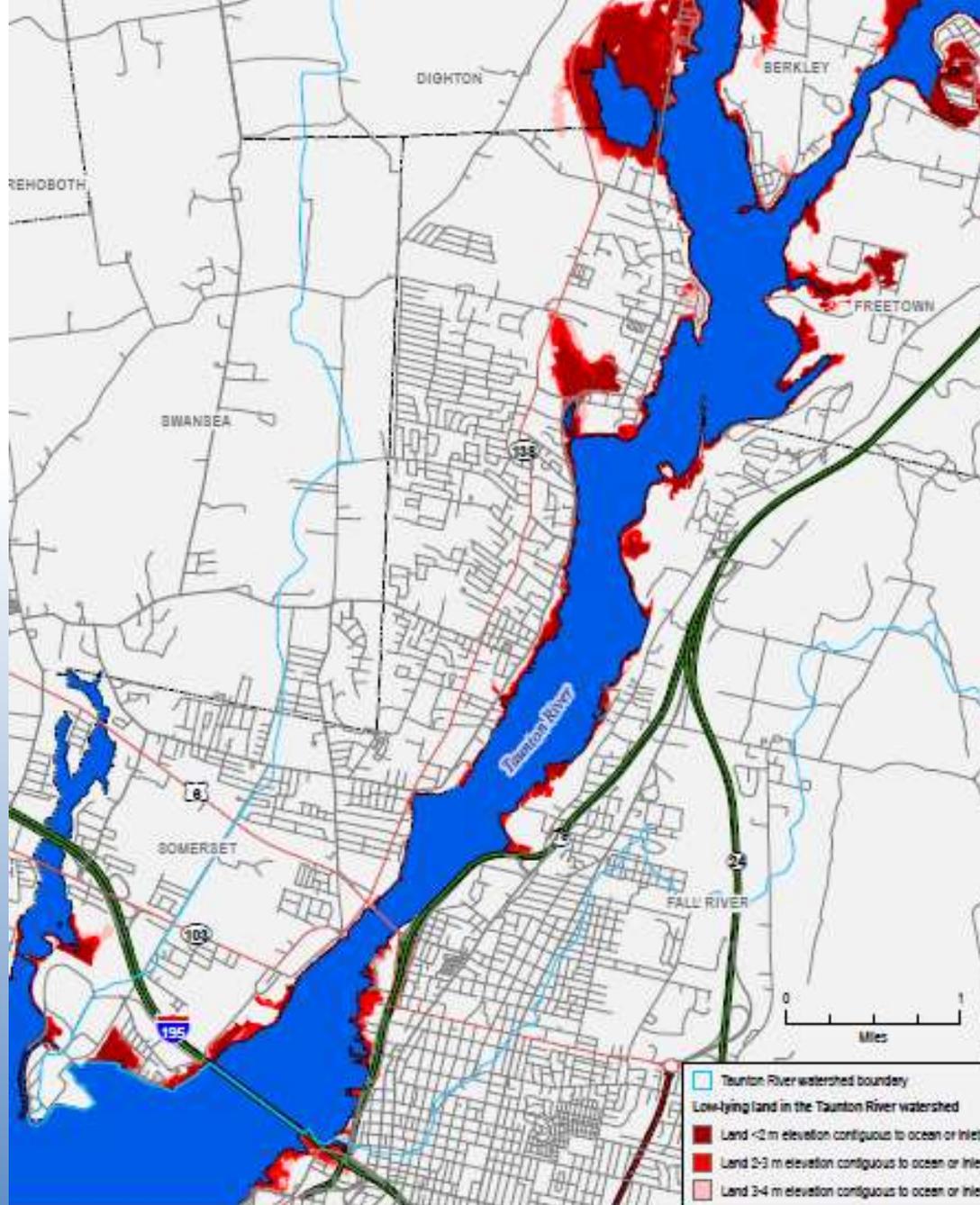
Source:
http://www.boston.com/news/local/articles/2011/05/29/scituate_sea_wall_repairs_to_be_done_in_several_cycles/

Types of Green Infrastructure Features

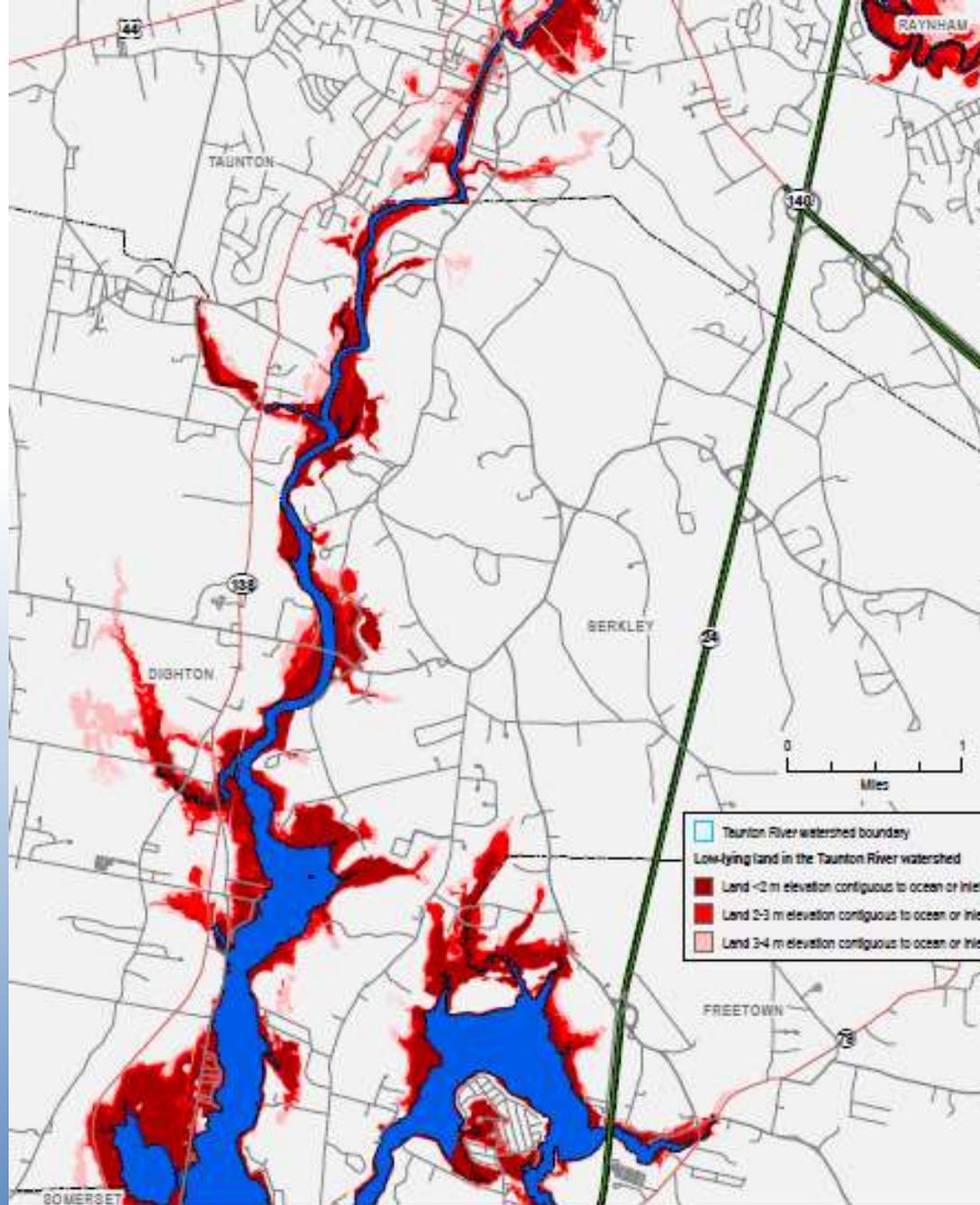
- Undeveloped coastal reaches:
 - Intact dune system
 - Unimpeded sediment transport
 - Healthy tidal and non-tidal wetlands

Types of Green Infrastructure Features

- Undeveloped riparian corridors
 - Mix of wetland and upland features
- Wetlands complexes
- Forested upland



Map showing approximate areas of low elevations in and around the mouth of the Taunton River. 1 m resolution LIDAR data acquired from MassGIS and hydrologically processed using USGS NHD. Hydrography data combined from MassGIS DEP Wetlands and USGS NHD. Road data from MassGIS MassDOT roads. Watershed boundary from NRCS WBD dataset.



Source: Taunton River
Climate Change Adaptation
Plan, Manomet, 2013

Map showing approximate areas of low elevations in and around the mouth of the Taunton River. 1 m resolution LIDAR data acquired from MassGIS and hydrologically processed using USGS NHD. Hydrography data combined from MassGIS DEP Wetlands and USGS NHD. Road data from MassGIS MassDOT roads. Watershed boundary from NRCS WBD dataset.

Types of Green Infrastructure Features

- Reconstructed features:
 - Constructed wetlands and dunes
 - Sediment replenishment (beach nourishment)
 - Restoration of riparian corridors
 - Reforestation

Types of Green Infrastructure Features

- Hybrid features:
 - Living shorelines
 - Constructed reefs, breakwaters and islands

Green Infrastructure Solutions

- Strategic protection and restoration of natural features to:
 - Limit peak runoff rates and volumes
 - Maximize natural resiliency of coastal areas
 - Limit new development in flood prone areas
 - Maximize local groundwater recharge
 - Maintain ecological viability
 - High quality of life for citizens



Delineating a Green Infrastructure Network in the Taunton River Watershed

Context

Legend

 Taunton Watershed Boundary

 Streams

 Town Boundaries

Land Use/Land Cover

 Open (Ag; Bare; Non-forest vegetation)

 Commercial/Industrial/High Dens Res

 Low Density Residential

 Forest (incl. Forested Wetland)

 Wetland

 Water

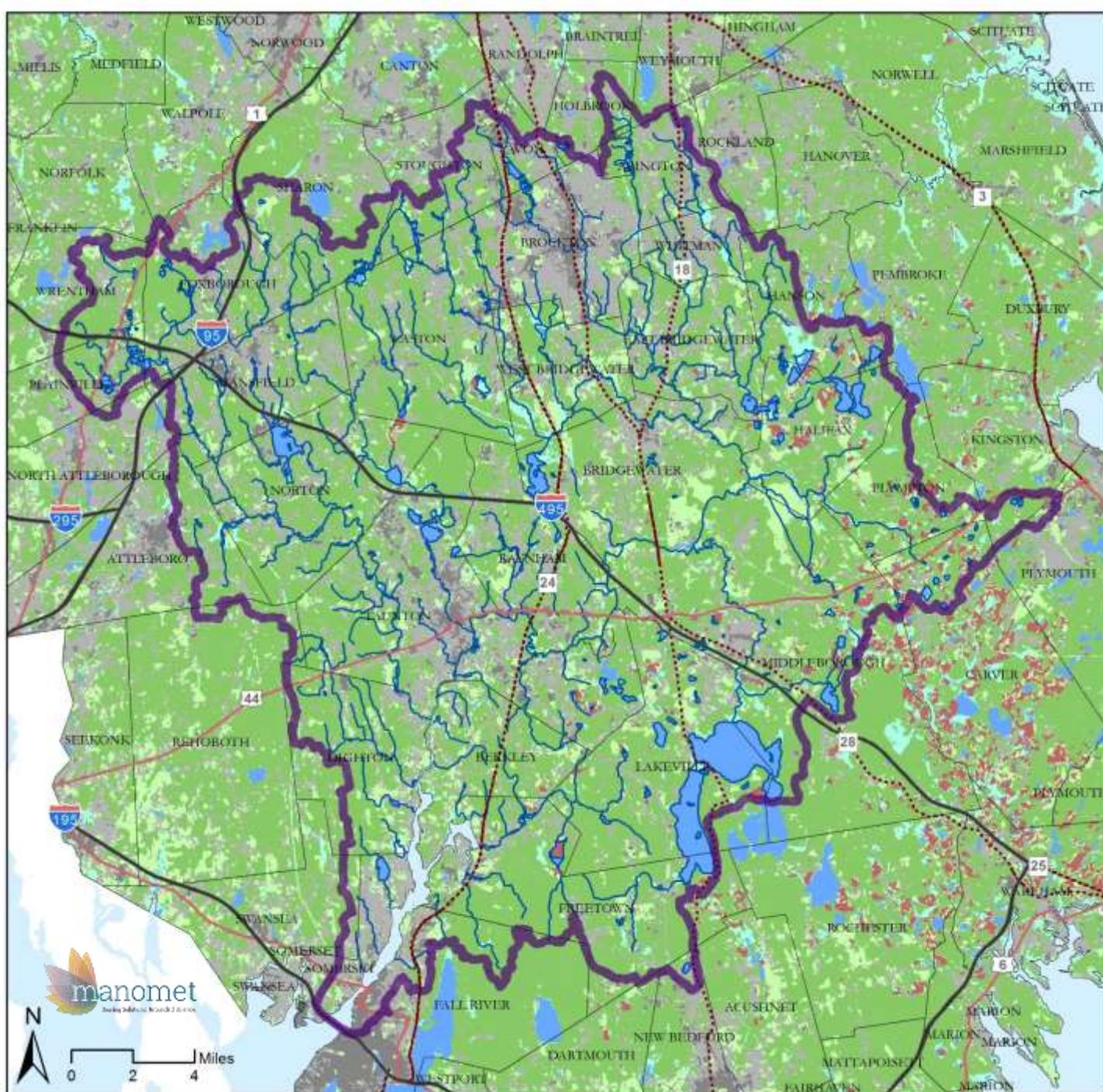
 Cranberry Bog

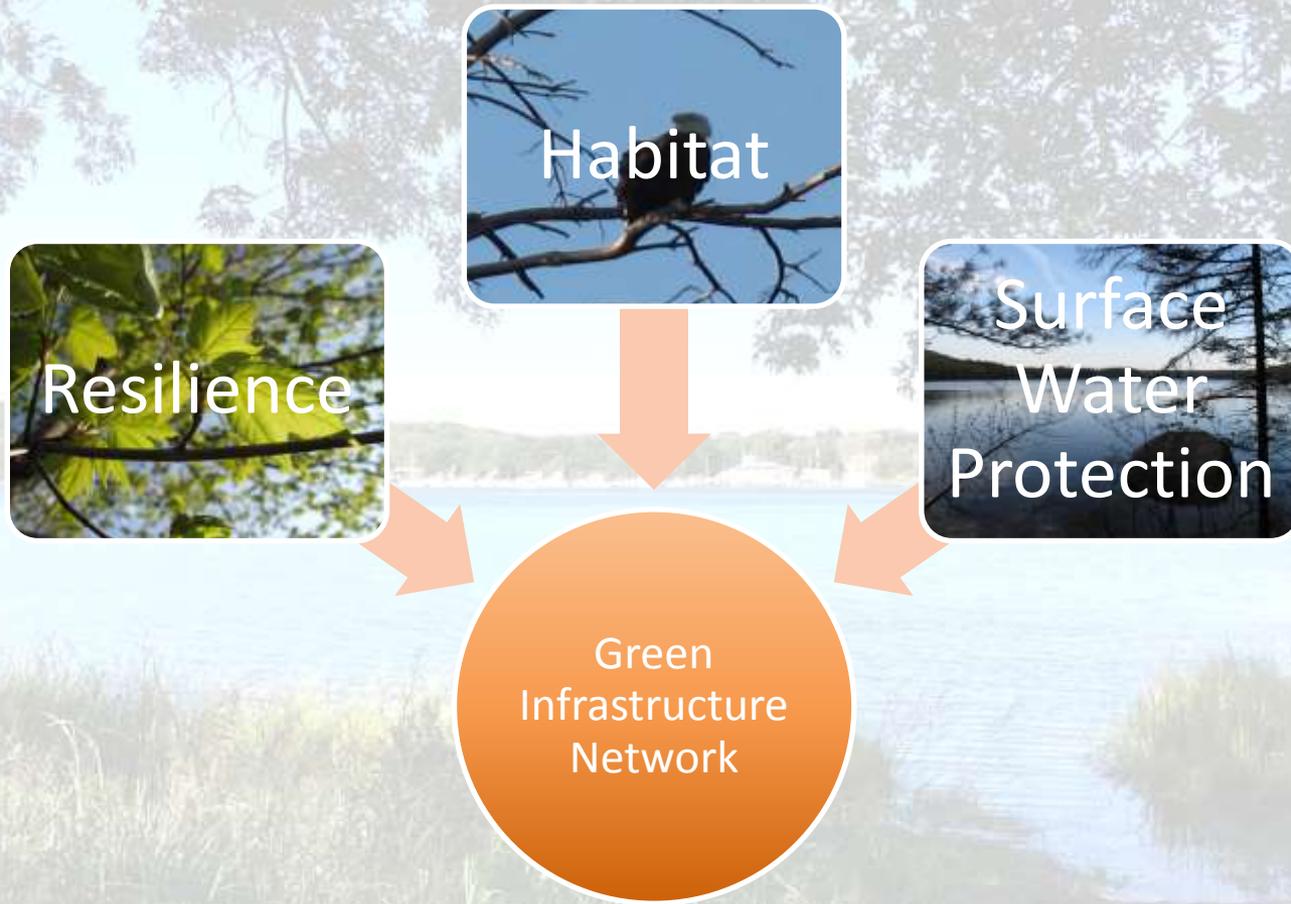
Major Routes, by Administrative Type

 Interstate

 U.S. Highway

 State Route





Resilient Landscape

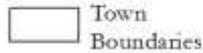


Complex topography
+
Connected natural cover
+
High quality biodiversity features

Legend



Taunton Watershed Boundary

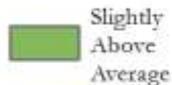


Town Boundaries

Resilience



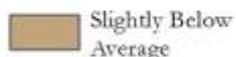
Well Above Average



Slightly Above Average



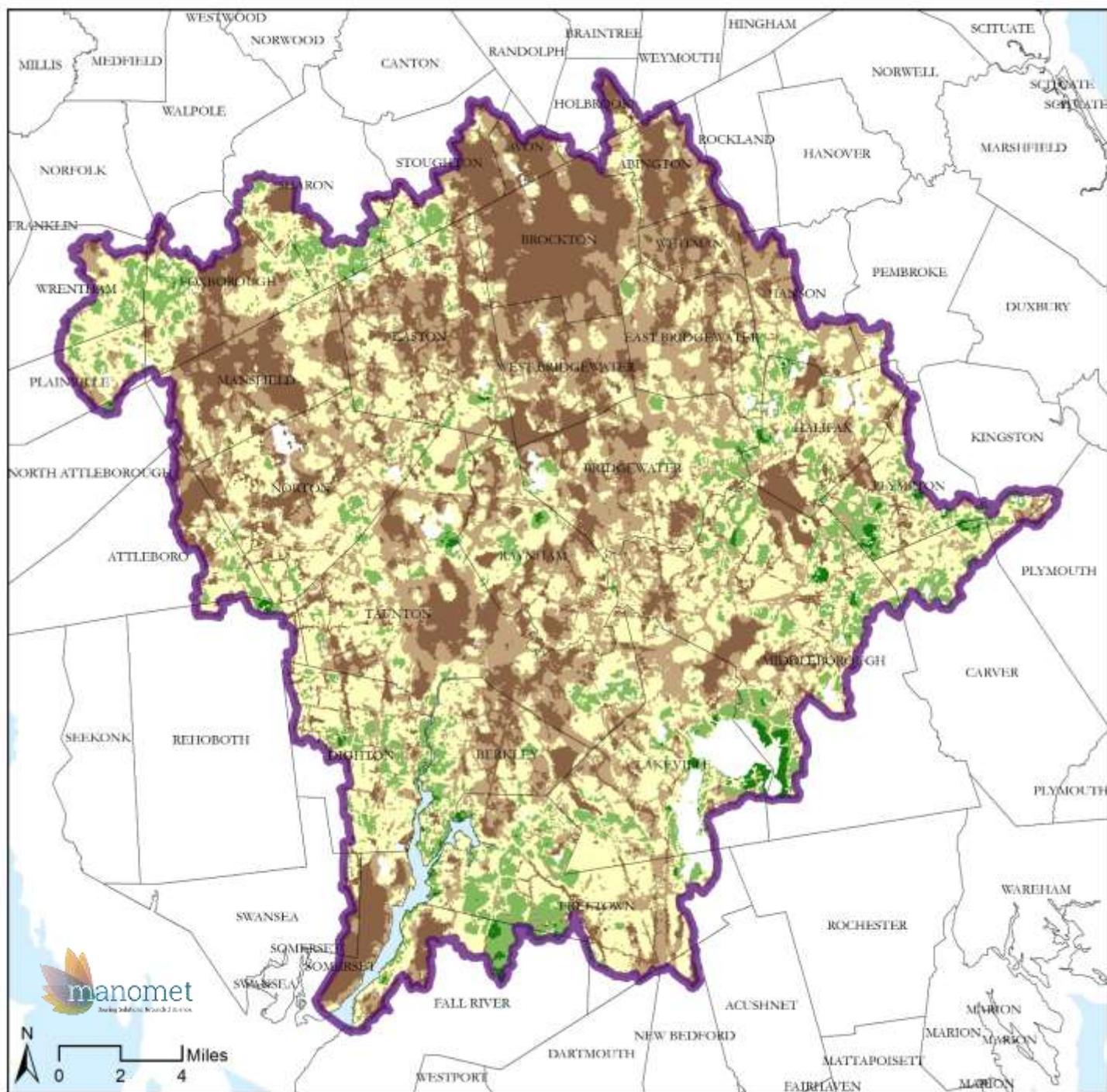
Average



Slightly Below Average



Well Below Average



Resilient Landscapes

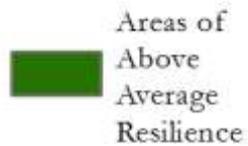
Areas of Above Average Resilience

Legend

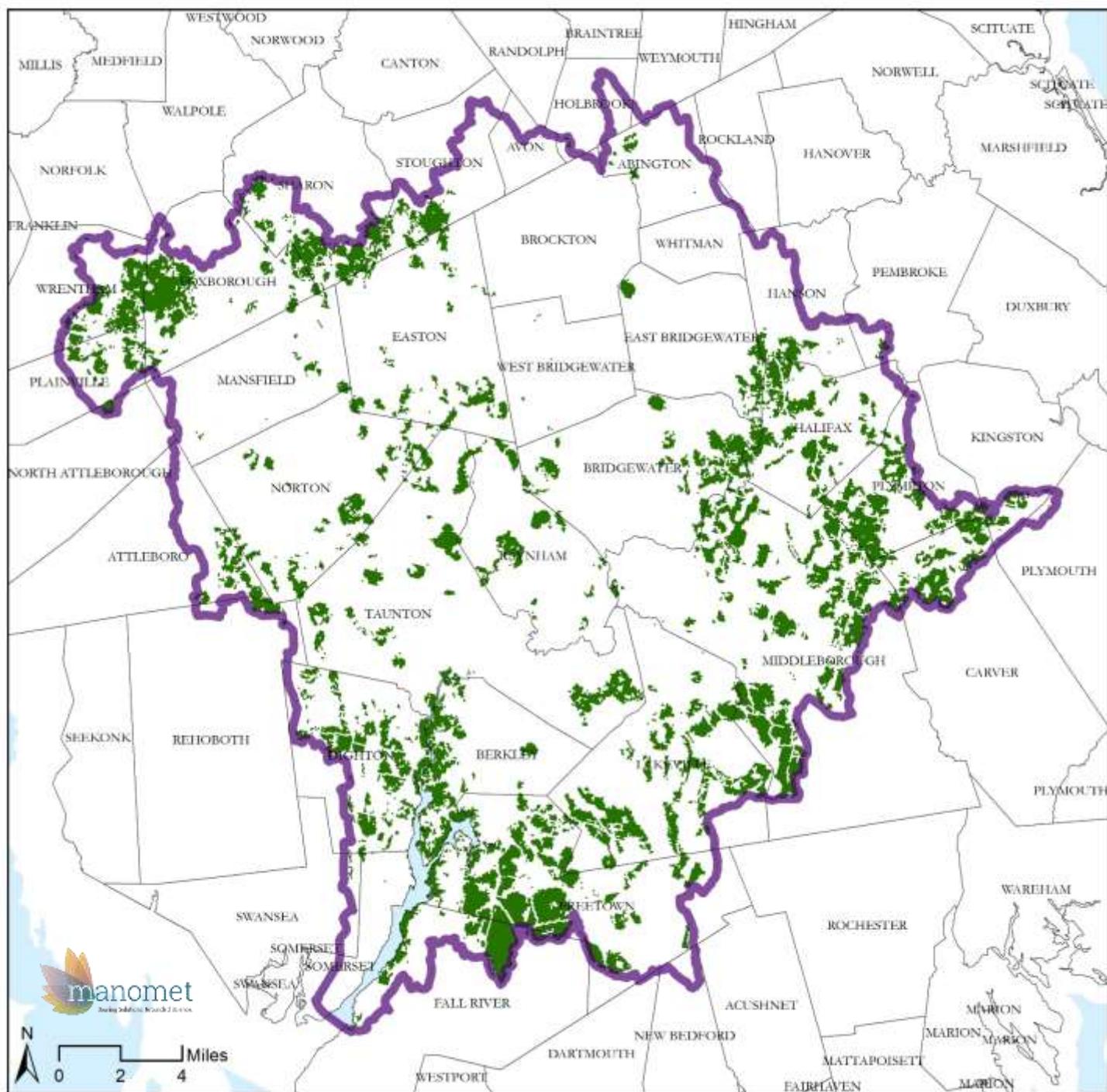


Taunton Watershed Boundary
Town Boundaries

Resilience

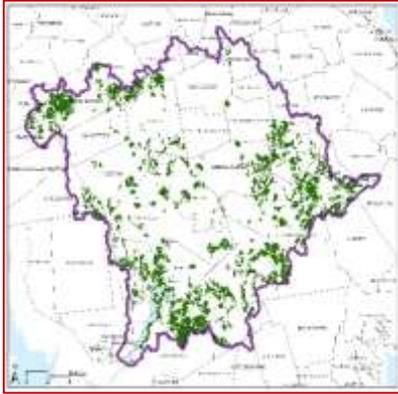


Areas of Above Average Resilience

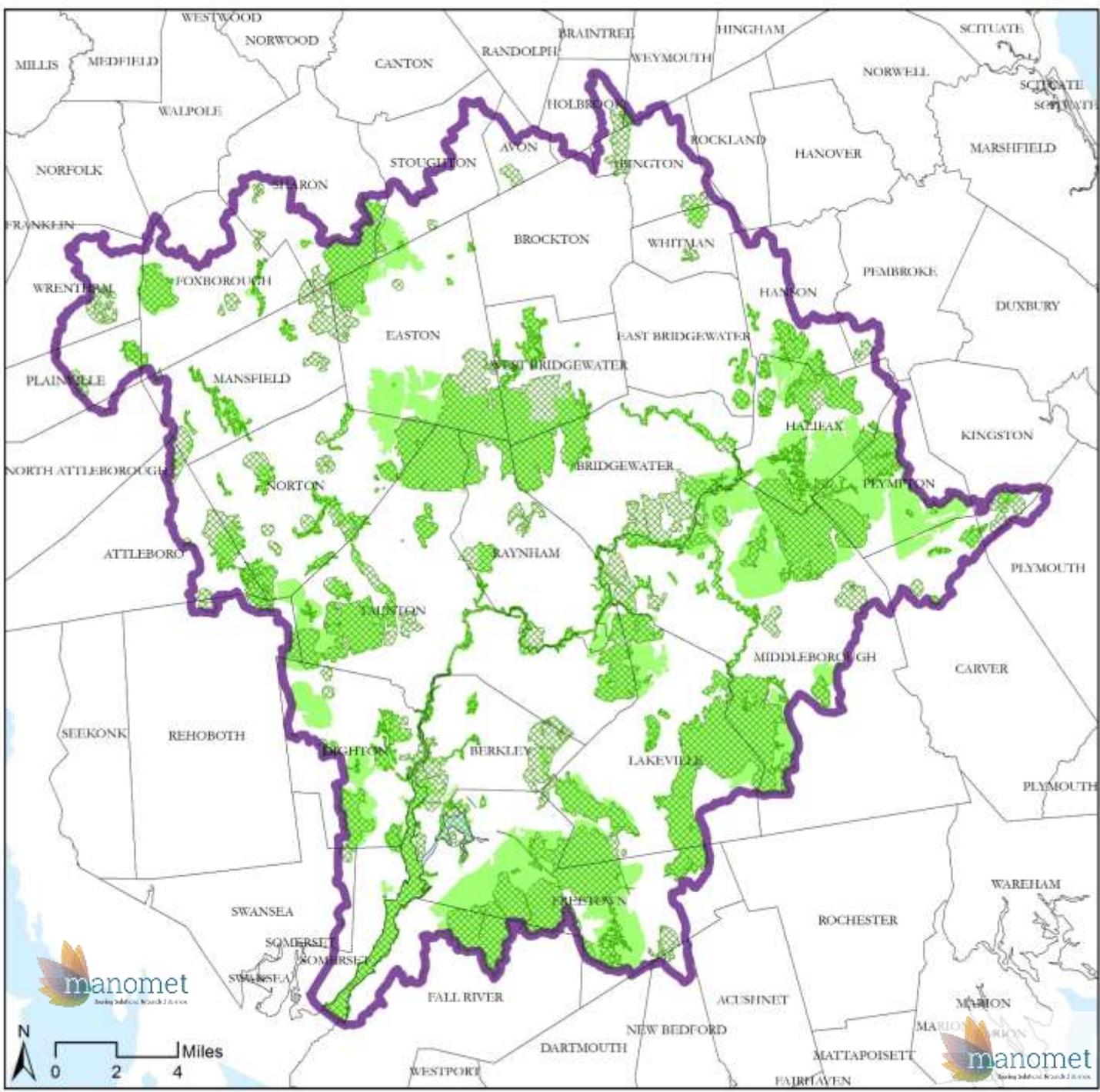
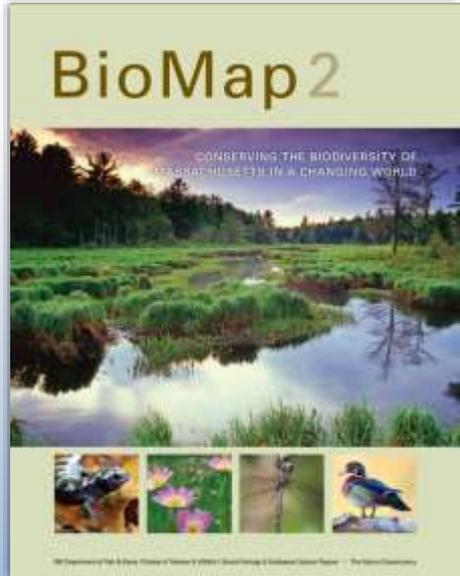


Green Infrastructure Network Components...

Areas of
Above
Average
Resilience



BioMap2: Core & Critical Natural Landscape



Legend

-  Taunton Watershed Boundary
-  Town Boundaries
-  BioMap2 Core Areas
-  BioMap2 Critical Natural Landscape



Green Infrastructure Network Components...

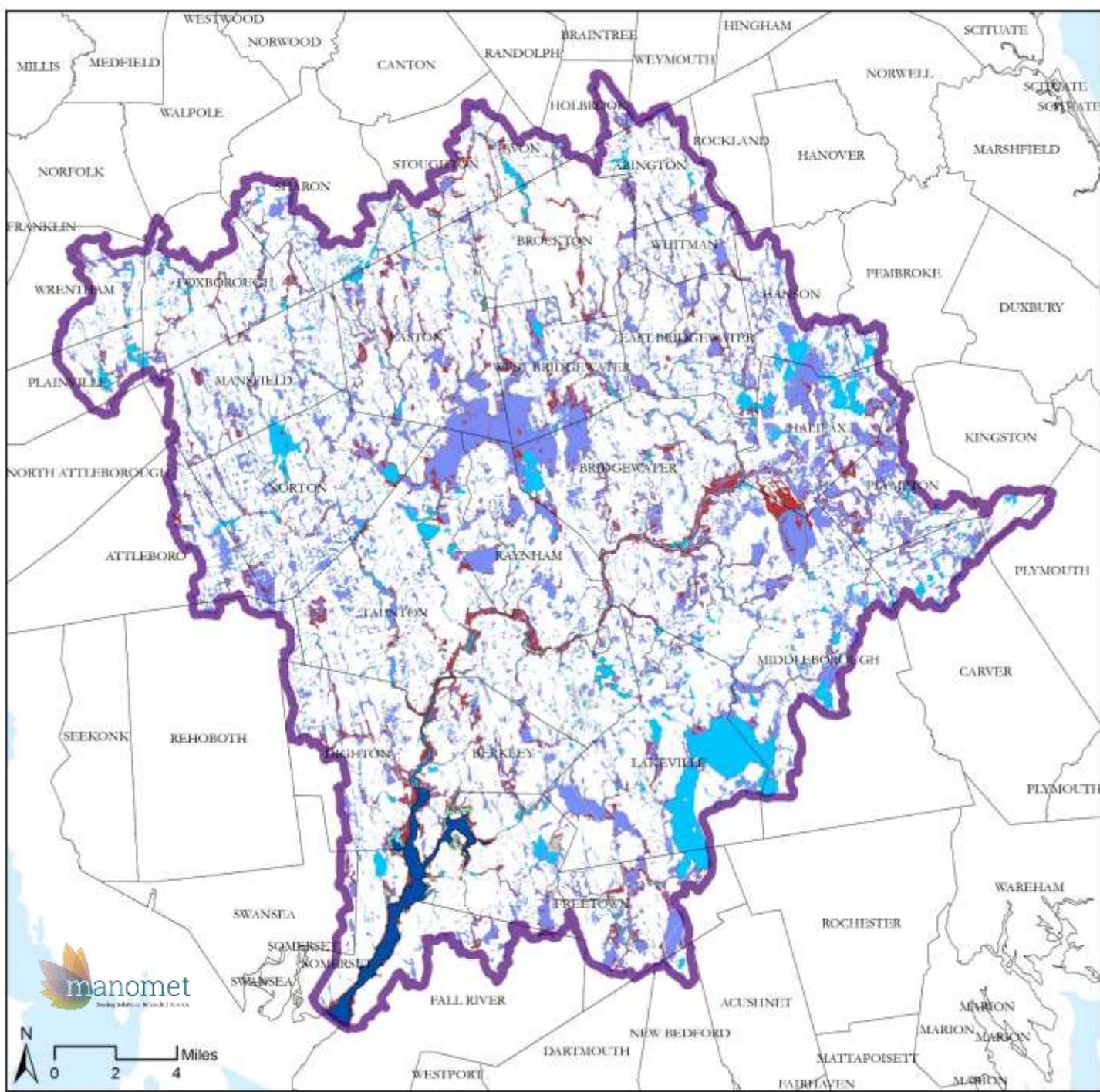
Areas of
Above
Average
Resilience



BioMap2 Core
& Critical
Natural
Landscape



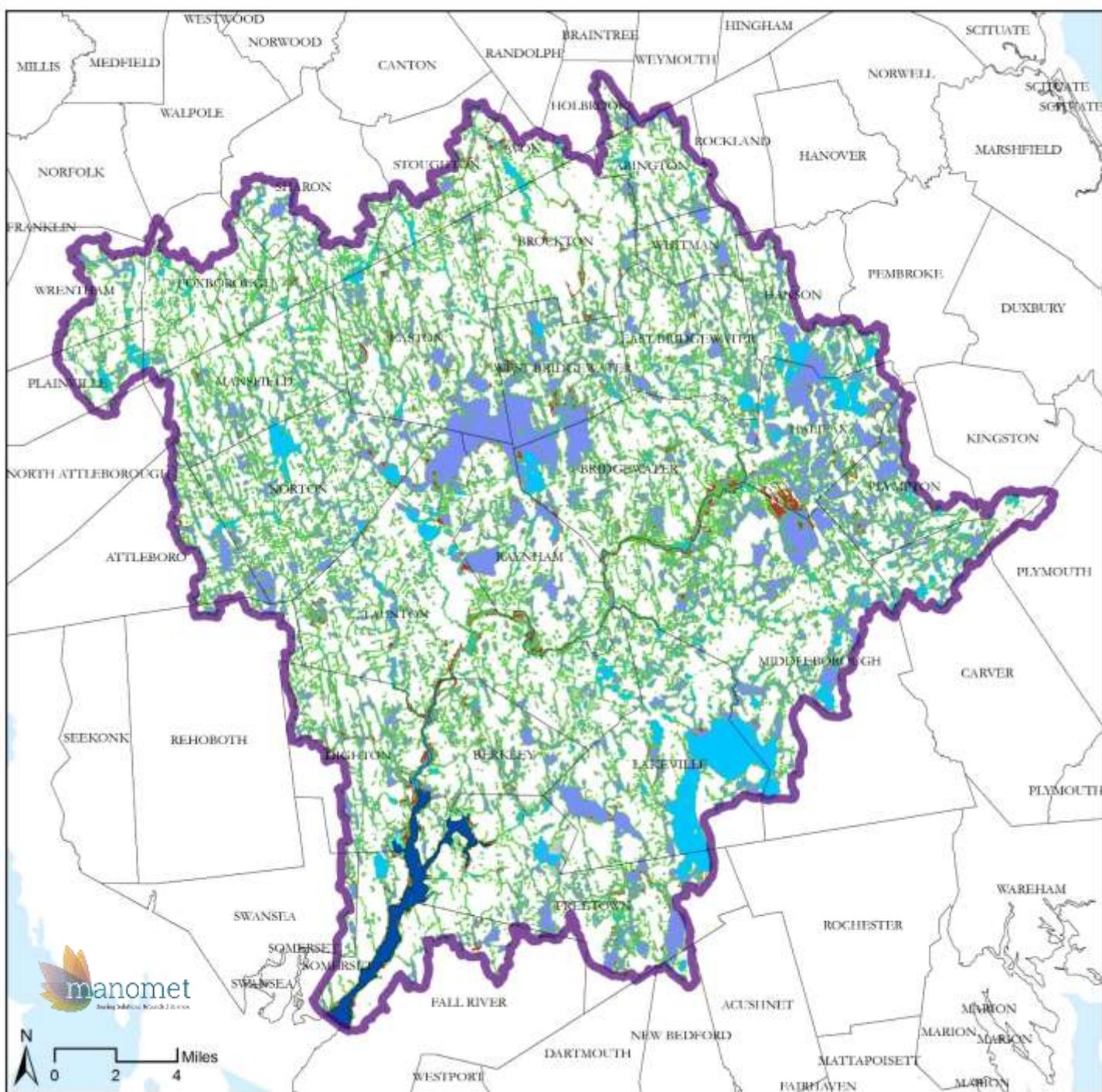
Surface Water, Wetlands, & Flood Areas



Riparian/ Flood Zone Buffers

Legend

-  Taunton Watershed Boundary
 -  Town Boundaries
 -  Areas within 100ft of surface waters, wetlands, and flood zones
 -  100-yr and High Risk Coastal Flood Areas
- ### Surface Waters & Wetlands
-  Freshwater Pond, Lake, or Stream
 -  Freshwater Wetland
 -  Estuarine and Marine Deepwater
 -  Estuarine and Marine Wetland
 -  Other



Green Infrastructure Network Components...

Areas of
Above
Average
Resilience



BioMap2 Core &
Critical Natural
Landscape

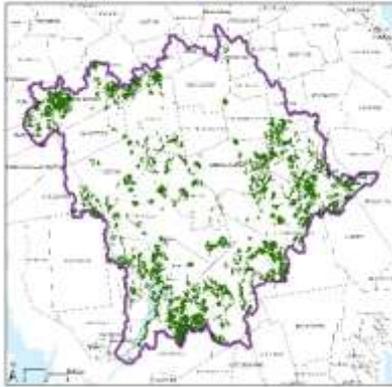


Areas within 100ft
of Surface Waters,
Wetlands, and
Flood Zones; Areas
$\leq 4\text{m}$ elevation
(vulnerable to sea
level rise)



Green Infrastructure Network Components...

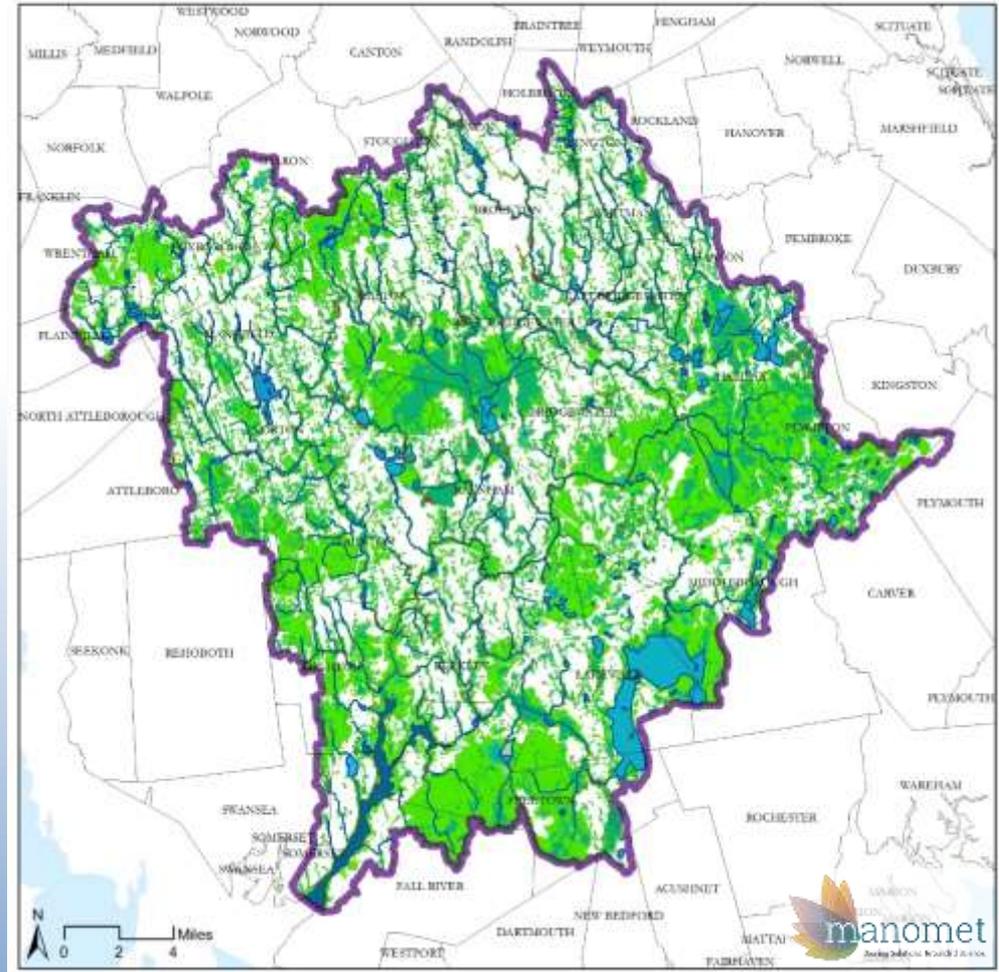
Areas of Above Average Resilience



BioMap2 Core & Critical Natural Landscape



Areas within 100ft of Surface Waters, Wetlands, and Flood Zones; Areas $\leq 4m$ elevation (vulnerable to sea level rise)



Legend

 Green Infrastructure Network	 Town Boundaries	Surface Waters & Wetlands	 Estuarine and Marine Deepwater
 100-yr and High Risk Coastal Flood Areas	 Taunton Watershed Boundary	 Freshwater Pond, Lake, or Stream	 Estuarine and Marine Wetland
	 Major Streams	 Freshwater Wetland	 Other



Taunton Watershed Green Infrastructure Network

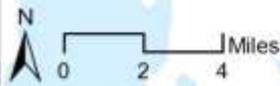
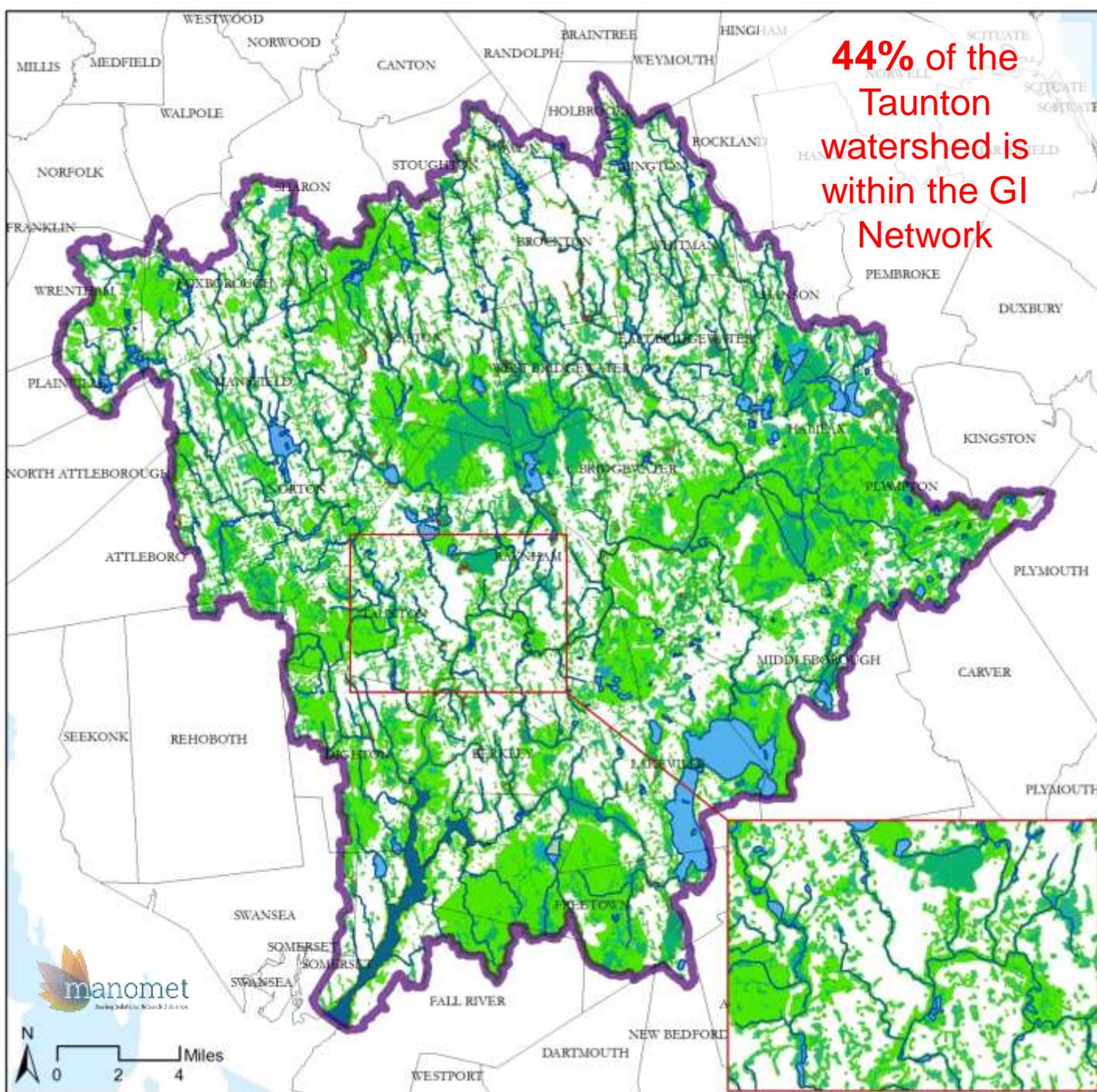
44% of the
Taunton
watershed is
within the GI
Network

Legend

-  Green
-  Infrastructure Network
-  100-yr and High Risk Coastal Flood Areas
-  Town Boundaries
-  Taunton Watershed Boundary
-  Major Streams

Surface Waters & Wetlands

-  Freshwater Pond, Lake, or Stream
-  Freshwater Wetland
-  Estuarine and Marine Deepwater
-  Estuarine and Marine Wetland
-  Other



Taunton Watershed Undeveloped & Unprotected Green Infrastructure Network

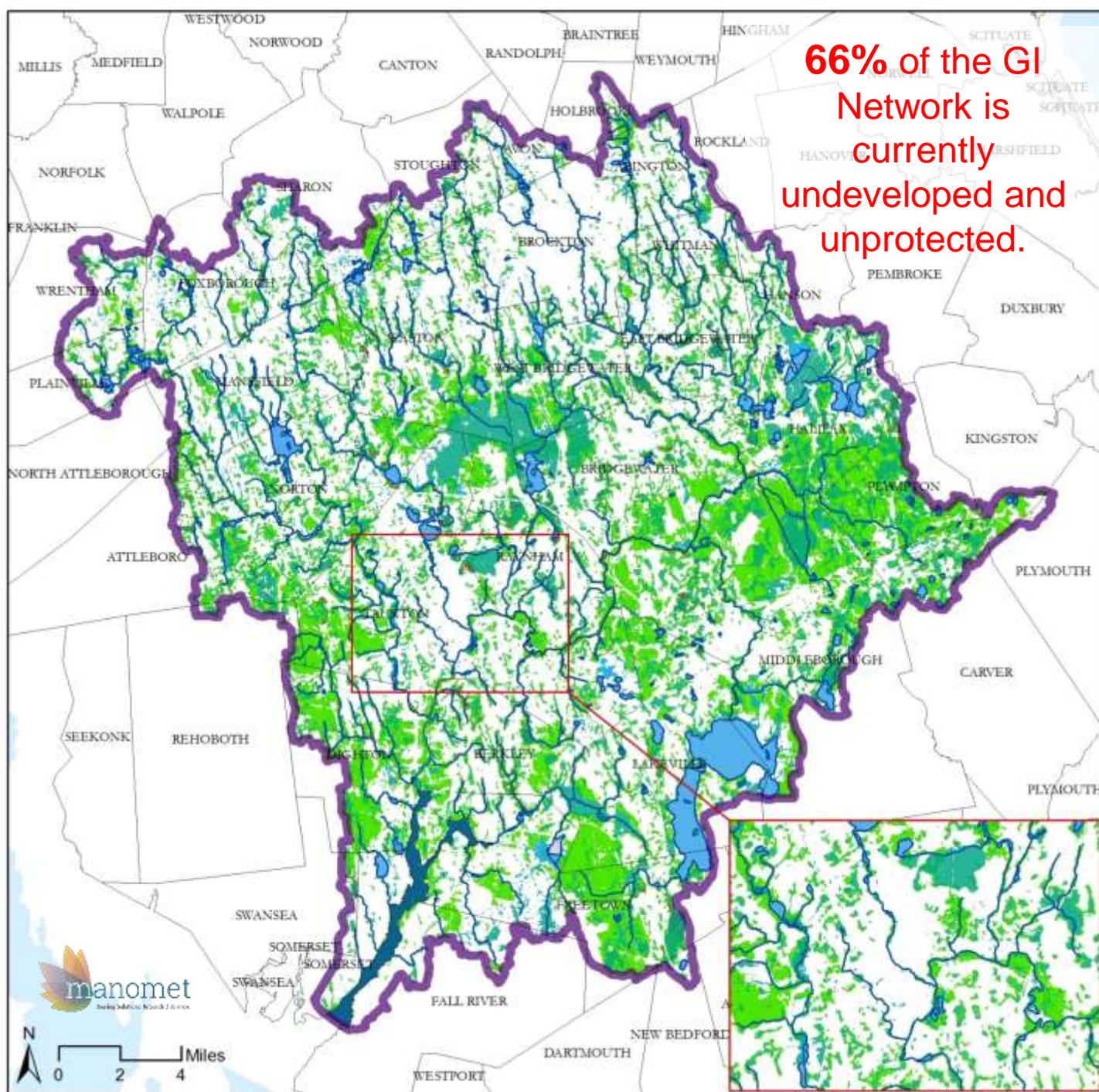
**66% of the GI
Network is
currently
undeveloped and
unprotected.**

Legend

-  Undeveloped and Unprotected Green Infrastructure Network
-  100-yr and High Risk Coastal Flood Areas
-  Town Boundaries
-  Taunton Watershed Boundary
-  Major Streams

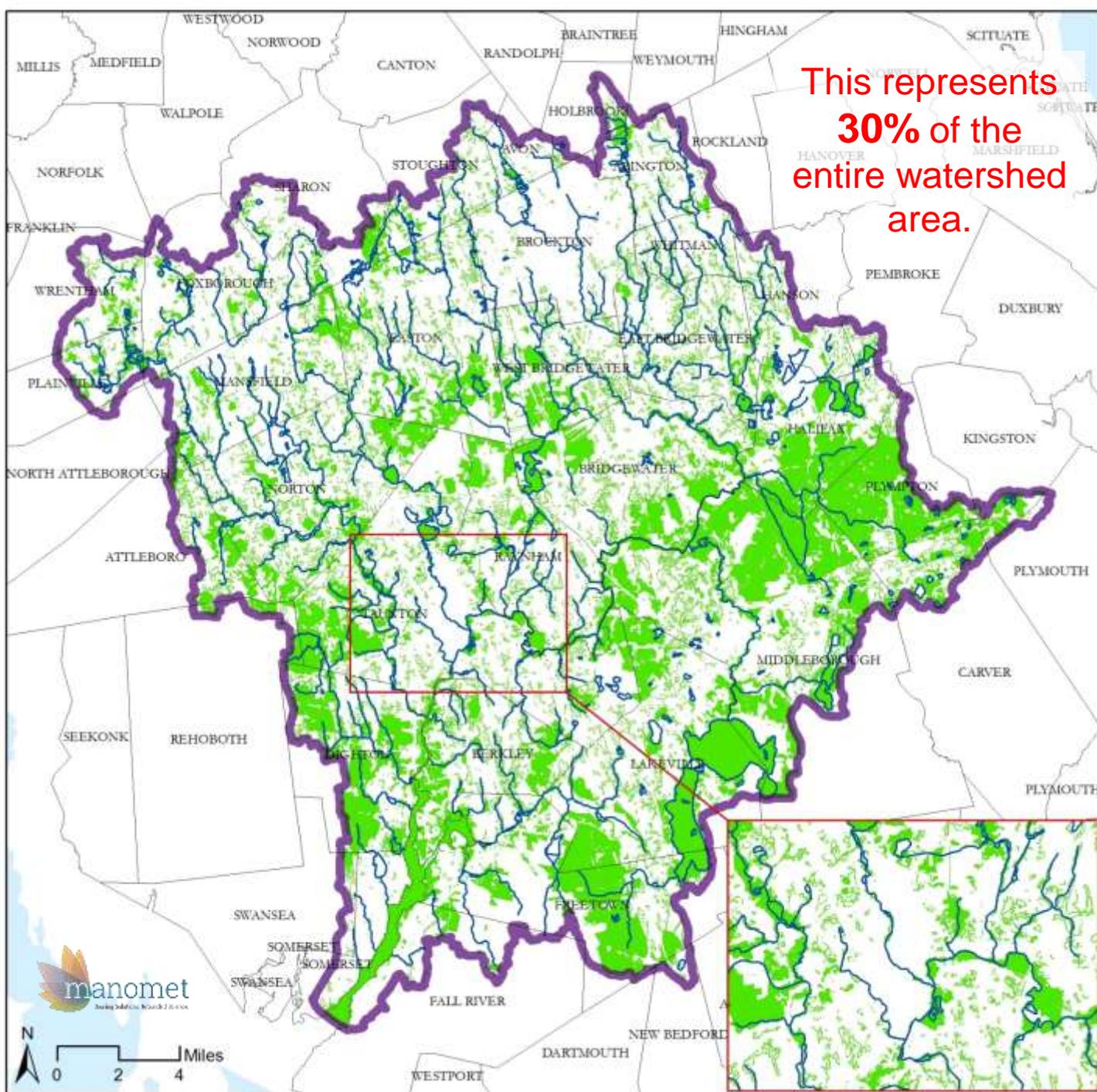
Surface Waters & Wetlands

-  Freshwater Pond, Lake, or Stream
-  Freshwater Wetland
-  Estuarine and Marine Deepwater
-  Estuarine and Marine Wetland
-  Other



Taunton Watershed Undeveloped & Unprotected Green Infrastructure Network

This represents
30% of the
entire watershed
area.



Legend

- Undeveloped and Unprotected Green Infrastructure Network
- Town Boundaries
- Taunton Watershed Boundary
- Major Streams



manomet
Developing Sustainable Watersheds

Integrating Resiliency and Green Infrastructure into Priority Projects: Resilient Taunton Watershed Network Case Studies

Bill Napolitano

Director of Environmental Planning, Southeastern Regional Planning and Economic
Development District

Taunton River Watershed

- Important resources facing many threats
- Fastest growing region in MA
- **OLD** infrastructure- dams, road crossings, culverts, and drainage built *without* growth or the environment in mind



Examples of Case Study Strategies

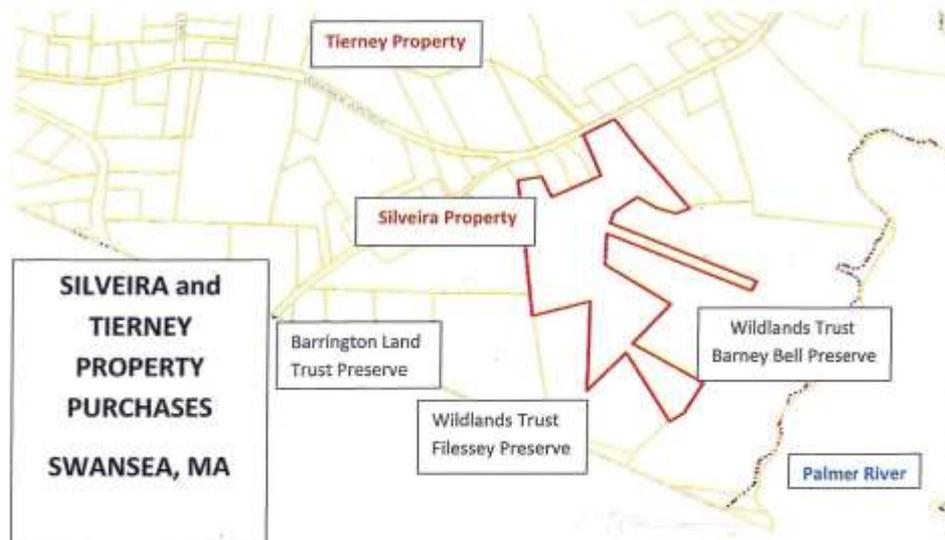
- Identifying and protecting vulnerable areas containing critical green infrastructure
- Removing dams and restoring natural river function/processes
- Reclaiming Floodplain
- Repurposing degraded portions of the built environment while integrating the resiliency built into the natural environment

Marsh and Habitat Preservation, Swansea: Conserving Green Infrastructure

Who: The Town of Swansea, The Wildlands Trust, Blount Fine Foods (Fall River)

Where: Barneyville Road, below the Old Providence Road (Miles) Bridge, southwest Swansea, along the Palmer River. The property abuts the Wildlands Trust's Barney Bell Preserve property, and is in close proximity to the Palmer River and Barrington Land Trust Property.

What: The Town purchased the Silveira property, a 15-acre parcel on Barneyville Road containing a residence, a greenhouse and nursery operation, and vacant land abutting marsh area along the Palmer River. The Silveira property also abuts the Wildland Trust's 38-acre Barney Bell Preserve, which contains substantial marsh land along the Palmer. The Tierney property is a 22-acre parcel located on the northwest side of Barneyville Road, across from the Silveira property. The parcels are connected by a small stream that flows southeasterly into the Palmer River. Both of these properties, which were subject to development pressure, are part of the Palmer River corridor, an area that has been recognized as a local and regional priority protection goal in a number of planning studies over the years.



When: Town Meeting vote unanimously approved the purchase of the Silveira Property in November of 2015. The Wildlands Trust secured the funds to purchase the Tierney Property in January of 2016.

Why: Major storm events (2010, 2012) have caused damage to the transportation infrastructure bridging and abutting the Palmer River. The damage included collapsed culverts, collapsed pavement, streambank erosion and compromised short span bridges, and local roadway flooding. Flood Inundation Studies, conducted by SRPEDD and Save The Bay (2011, 2012), had recommended preserving marshland at the mouth of the Palmer, as part of its green infrastructure, in order to help dissipate wave energy and storm surge impacts. The acquisition of this land will also allow the marsh to migrate with the predicted sea level rise and increased tidal inundation.

The purchase of these two properties was also a key element in the long-term plan of achieving the protection of all this property for conservation, habitat, and public access purposes.

How: The Town had been working with the property owner and the Barrington Land Trust, dating back to the 1990s, regarding conservation preservation of the Silveira property. The owners worked with the Conservation Agent to put together an agreement for purchase that would allow the property to be protected in perpetuity. Conservation Agent Colleen Brown went to the 2015 fall Town Meeting with a request to spend \$100,000 in Community Preservation funds to acquire the Silveira property.

Shortly thereafter, the Tierney property, which is just across Barneyville Road from the Silveira property, and had been under development pressure for a while, was offered to the town for \$10,000. Because the next Town Meeting would not be held for several months, the Wildlands Trust stepped in and worked with a private donor, Blount Fine Foods, to secure the money to purchase the property and donate it to the town.

Benefits: The social, economic, and environmental benefits of the Silveira and Tierney purchases will include:

- Retention of identified green infrastructure in an area where it contributes to the dissipation of energy associated with storm, extreme tidal, and flood events
- Increased amount of conservation land protected in perpetuity in this area along the Palmer (almost 100 acres in total properties that are contiguous or in close proximity to one another)
- Retention of stream continuity and habitat connectivity between parcels in a coastal river corridor
- Eliminated threats to water quality due to development in an area of the river below the desalination plant intake
- Preservation of historically significant land in an area that was the "birthplace" of Swansea and the site of the beginning of King Philip's Wars

Mill River Park, Taunton

Who: The City of Taunton, MA Gateway Park Initiative, Taunton River Steering Committee, Horsley Witten Group

What: The City of Taunton worked with state, regional, local, and non-profit partners (Taunton River Steering Committee, facilitated by Bridgewater State College) to repurpose a former police auto impoundment area, located in a corner of a paved municipal parking lot below and behind Taunton City Hall and the Taunton Police Station. This area of the lot sloped toward the river, contained broken and degraded pavement, was a sediment collection point for the parking lot, and was surrounded by invasive plants and vegetation. The auto impoundment area was also a source of stormwater loading to the adjacent Mill River, resulting in water quality and habitat degradation. The Mill River flows directly into the federally designated Wild & Scenic Taunton River. This source of river pollution was transformed into a public park with green infrastructure based stormwater treatment features, improved parking, lighting, and transportation safety features, and, educational signage explaining the features of the park.



When: The park construction was completed in 2011.

Where: Allens Avenue, off of Spring Street, behind the Taunton City Hall and Taunton Police Station.

Why: The site was selected as a potential demonstration project as part of the second phase of the Taunton River Watershed Study (undertaken by the Horsley Witten Group on behalf of the above-mentioned Steering Committee). The site was in need of a way of managing and treating stormwater runoff from the upgradient parking lot, enhancement of the vegetative buffer between the parking lot and the river, and an invasive species management plan.

How: The \$1.24 million cost of the park was paid for entirely by grants, nearly 80% of which came from the state's Gateway Park Initiative, and the other 20% from the federal Community Development Block Grant Program.



Benefits: The social, economic, and environmental benefits of the Mill River Park project include:

- Mitigation of a source of chronic stormwater pollution to the Mill River, a major tributary of the Wild & Scenic Taunton River, and located in an MS4 area
- The repurposing of a blighted area and source of pollution into an accessible public park in an Environmental Justice area, immediately adjacent to the downtown and center of City government
- Removal of invasive plant species, invasive species management plan, and restoration of the riverbank resource area
- Improved fisheries and wildlife habitat and connectivity
- Reduced risk of localized flooding due to unabated stormwater flow

Whittenton Mill Dam Removal, Taunton, MA



The Mill River at the Whittenton Mill Dam before (above left) and after (above right) dam removal.

Who: A partnership consisting of The Nature Conservancy, NOAA, American Rivers, and the Coastal America Foundation, and the private owner of the Whittenton Mill Dam.

What: Removed a failing dam that threatened to flood Taunton, MA

When: The dam was removed in 2013.

Why: The dam was built in 1832. It was not able to safely impound flood waters in 1968 and 2005. In both storms parts of downtown Taunton, MA were evacuated. The 2005 evacuation cost the City \$1.5 million dollars.

Where: On the Mill River, on the site of the former Whittenton Mill campus, north of Whittenton St., Taunton, MA.

How: Funding of \$440,000 was provided by The Nature Conservancy, NOAA, American Rivers, and Coastal America Foundation to remove the failing dam. The removal was helped by "An Act Further Regulating Dam Safety, Repair, and Removal" passed by Former Governor Deval in 2010.

Benefits:

- *Removing* the Whittenton Dam cost \$440,000. *Repairing* the Whittenton Dam could have cost \$1.9 million. Evacuating Taunton during near dam failure cost \$1.5 million. Owner savings for the Whittenton Dam removal were \$2.2 million.
- The Whittenton Dam property value increased after removal.
- On average it is 60% less expensive to remove dams rather than repair them over a 30-year time period.
- Restored diadromous fish passage, increasing recreational and fishing opportunities.
- Massachusetts Division of Ecological Restoration estimated on average, each \$1 million spent on restoration projects supports 10 – 13 jobs and \$1.5 - \$1.8 million in regional economic output.
- The area of the former reservoir adds flood storage capacity and reduces flood risks.
- Water quality improves without the reservoir, and there are fewer algal blooms and associated fish kills.

Workers stabilize the channel and replant the riverbank area at the former Whittenton Dam site



Funding Projects in the Taunton

- Municipal Funds
- Chapter 90 Funds
- MassWorks Infrastructure Program if related to economic development and jobs creation programs
- TIP Project listing
- FEMA/MEMA
- DEP Section 604(b) and Section 319 Grant Programs
- Division of Ecological Restoration Grants Program
- Public – Private Partnership
- MA CZM Coastal Pollution Remediation Grants (CPR)

Follow-up Actions and Resources

Stefanie Covino

**Coordinator, Shaping the Future of
Your Community Program**

Mass Audubon

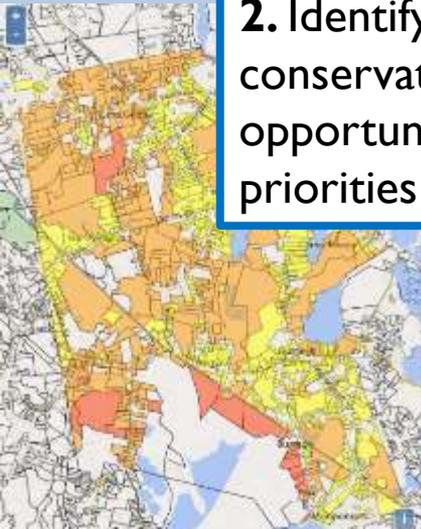
So what do we do now?



1. Identify existing and future problems that GI can help alleviate



5. Prioritize and incentivize sustainable development



2. Identify conservation opportunities and priorities

Planets	Environmental	Urban	Water	Energy	Community Planning	Transportation, Pedestrian & Bicyclist	Greenhouse Gas	Climate Change	Water Quality	Greenhouse Gas
SECTION 1: THE CITY OF DENVER'S ENVIRONMENTAL AND CLIMATE CHALLENGES										
Climate	Water	Energy	Transportation	Community	Greenhouse Gas	Water Quality	Greenhouse Gas	Water Quality	Greenhouse Gas	Water Quality
Water	Energy	Transportation	Community	Greenhouse Gas	Water Quality	Greenhouse Gas	Water Quality	Greenhouse Gas	Water Quality	Greenhouse Gas
Energy	Transportation	Community	Greenhouse Gas	Water Quality	Greenhouse Gas	Water Quality	Greenhouse Gas	Water Quality	Greenhouse Gas	Water Quality
Community	Greenhouse Gas	Water Quality	Greenhouse Gas	Water Quality	Greenhouse Gas	Water Quality	Greenhouse Gas	Water Quality	Greenhouse Gas	Water Quality

4. Educate the public and local boards to encourage sustainable development

3. Include this information in local planning (OS, Comprehensive plans, zoning, etc.)



Everyone can do something

Conserve the natural green infrastructure already providing free ecosystem services

Reduce impact of new development through LID and GI design

Restore the resiliency of urban landscapes through LID in redevelopment



Achieve diverse goals by working together

– Climate change resiliency



– Control of tax burden and infrastructure costs

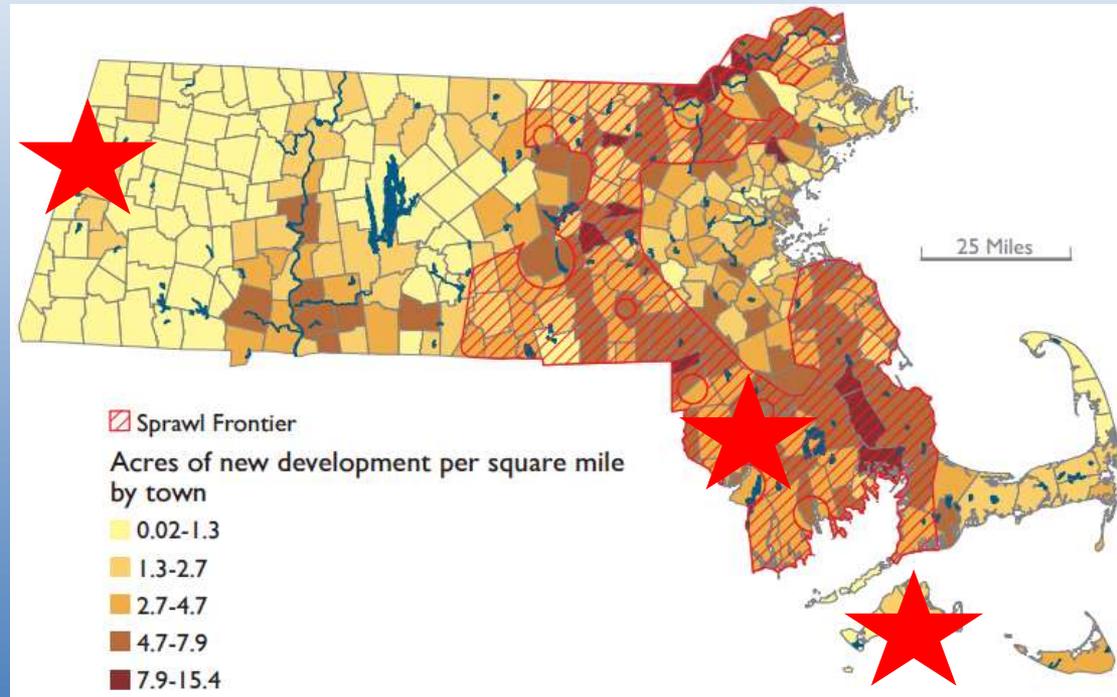


– Improve health and safety, quality of life



Working beyond the watershed

- **EPA Soak Up the Rain Webinar**
 - Over 170 attendees nationwide
- **Citizen Planner Training Collaborative**
- **Municipal Vulnerability Preparedness Program**



More resources available at srpedd.org/rtnw

- Linking local planning, review bylaws
- Mapping layers and methods
- LID fact sheets
- 5 things to do to improve resilience
- Case studies



Audience Polling and Panel Discussion

Audience Polling

- Which of the topics from the first half of the session would you like to learn more about?
 - RTWN organizational structure
 - Rationale for GI analysis
 - Technical details of GI analysis
 - Case studies
 - Workshops

Audience Polling

- What is the primary barrier to you incorporating considerations of climate change into your planning?
 - Accessibility or usability of climate data
 - Project cost or funding availability
 - Pushback from government officials
 - Pushback from community members

Audience Polling

- What is the most significant impediment that you face in implementing a GI-based approach to climate resilience?
 - Insufficient data
 - Lack of expertise in performing analysis
 - Difficulty in stakeholder engagement
 - Lack of regional cooperation

Audience Polling

- Which is your region's most significant opportunity for application of GI?
 - Protection of existing GI
 - Restoration of GI