Town of Cohasset
Community Resilience Building Workshop
Summary of Findings
June 2018

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Community Resilience Building Workshop
Municipal Vulnerability Preparedness Program
Summary of Findings

OVERVIEW

Recent years have seen notable weather extremes in Cohasset. The winter of 2015 brought record-breaking snow, resulting in delays and shutdowns in MBTA service. The following year, Cohasset was under a drought warning from July to November 2016. The winter of 2018 once again brought severe winter storms; the January nor'easter coastal storm surge exceeded the Blizzard of '78; in March a succession of four nor'easters pummeled the town. In March/April 2010 rainfall was so significant that a federal disaster was declared for eastern Massachusetts, resulting in $59 million in assistance to individual households and $26 million in reimbursements to the state and municipalities. Globally, the years 2012 through 2017 all rank among the ten hottest on record.

In 2017, the Commonwealth of Massachusetts inaugurated the Municipal Vulnerability Preparedness (MVP) program to assist municipalities in planning for and implementing strategies to adapt to predicted changes in our warming climate. The predicted changes include both increased flooding from large rain events and a greater likelihood of drought, increased extreme heat days and heat waves, and increased flooding from sea level rise.

The Town of Cohasset, seeking to be proactive in addressing future climate threats, applied for a state grant to complete the Community Resilience Building (CRB) Workshop under the MVP program. Upon completion of the MVP program the Town will be eligible to apply for state grants to address identified climate risks.

The Town of Cohasset partnered with the Metropolitan Area Planning Council (MAPC) to complete the MVP program. The MVP Core Planning Team identified and recruited community stakeholders to participate in the CRB Workshop. Forty-six people representing Cohasset town staff, members of Cohasset Boards and Commissions, and representatives of Cohasset community organizations gathered on the evenings of June 4th and 5th (see Workshop Participants page 8). The Workshop's central objectives were to:

- Define top local natural and climate-related hazards of concern;
- Identify existing and future strengthen and vulnerabilities;
- Develop prioritized actions for the Community;
- Identify immediate opportunities to collaboratively advance actions to increase resilience.

Materials provided for the workshop included local and regional data for changes in temperature, precipitation, and sea level recorded to date, as well as future projections to the end of the century. Posters provided data and mapping specific to Cohasset infrastructure, demographics, and natural resources (see Appendix).

The participants considered Cohasset's strengths and vulnerabilities focusing on infrastructure, society, and the environment. Working in small groups and then together as a large group they prioritized actions designed to increase Cohasset's resilience to future extreme weather events.

Top Hazards and Vulnerable Areas

The Core Planning Team identified the top natural hazards. Based the review of workshop materials and recent experience, the team identified flooding (coastal and inland), heat waves, severe storms (wind, snow, ice) and drought as the climate hazards of greatest concern facing Cohasset. Flooding, drought, and severe storms have all affected Cohasset in recent years. Considering town demographics, the team also included extreme heat as a top hazard.

Top Hazards

- Flooding (inland and coastal)
- Severe Storms (wind, snow, ice)
- Drought
- Extreme Heat

Current Concerns and Challenges Presented By Hazards

Participants and town officials noted the increasing frequency and intensity of storms, including nor'easters that brought damaging winds, snowfall, and coastal flooding; as well as the recent period of drought. The principal challenges of the nor'easters included extended power outages, transportation impacts, and flooding along coastal roads and properties. During the drought of

2016 mandatory water restrictions were implemented and the water level in Lily Pond was so low that no flow was entering Bound Brook. As these issues are not new, the Town of Cohasset through its emergency management activities and hazard mitigation planning, has taken many steps to prepare for extreme weather and prevent harm to people and property. Workshop participants shared concerns that climate projections will heighten current challenges, particularly damage to infrastructure and natural resources along the coast, and power outages.

Areas of Concern

Geographic:
Participants highlighted the vulnerability of harbor area businesses and infrastructure to damage from coastal storm surge as a critical concern. Other geographic concerns noted included the need for a replacement Police and Fire facility centrally located on Route 3A near Pond Street to improve town-wide emergency response time, and the need to improve cell service in areas of town so that emergency communications are maintained.

Societal:
Populations identified included: Seniors, people with medical needs, and low-income residents. While Cohasset's public health and senior services were noted as a town strength, participants were concerned with barriers to emergency communication, and suggested options to increase knowledge of specific needs and improve social connections. Participants also noted that some residents will have fewer resources to prepare for, endure, and recover from, severe weather events. Suggestions included identifying financial resources and social services.

Environmental:
Protecting water quality and quantity was a top concern. Stormwater management and wetlands protection were highlighted as management strategies. Protecting and restoring salt marsh areas

was also a key concern. Tree management was also a priority – relating primarily to power outages, but also to fire hazards.

Infrastructure:
The need to address power failures was a top concern. Participants focused on the need for backup power, and for investing in microgrids, managing tree canopy, and generally increasing energy resilience. The Elm Street sewage treatment plant was highlighted for vulnerability to flooding, as well as for failures due to stormwater infiltration. As noted above, harbor area seawalls and other infrastructure are a top priority.

Current Strengths and Assets

Workshop participants identified numerous Cohasset strengths and assets that will support resilience to future climate impacts. As shown below town strengths identified include its natural resources, civic engagement, strong communications and elder services, as well as community resources and infrastructure.

- Salt marshes provide flood protection
- The rocky elevated coast is a natural flood buffer (600 million years of stability)
- Ample water supply
- Healthy tree canopy
- Limited amount of coastal hardening (sea walls)
- Small community with good civic engagement and communication
- Close knit community that is volunteer oriented
- Well-educated community
- Cohasset Cares, Willcutt Commons, and public health, provide important services
- Cohasset/Scituate agency cooperation
- Town communication: police, cable television, Facebook, town website, and Reverse 911
- Pre-storm town planning; good connection between the Weymouth Shelter and Willcutt Commons
- Meals on Wheels and elder outreach
- Generators at the schools
- Emergency Planning Center
- Recycling Transfer Facility and solar array
- Greenbush Commuter Rail
- Community resources: Cohasset Center for Student Research, Garden Club

Top Recommendations to Improve Resilience

Each of the five workshop groups identified vulnerabilities and suggested solutions. The solutions were prioritized as High, Medium, or Low. Each group then identified their three highest priorities. There was overlap in the top priorities of the five groups. The fifteen identified highest priorities resulted in eleven distinct items. The participants each then voted for their top three

priorities (see Appendix). The issues identified as highest priorities below reflect the eleven top issues listed in order of the number of votes they received.

Highest Priorities

Reliable Power: Work with other towns to build resilience and redundancy. Have generators for critical facilities. Develop multi-modal power sources utilizing new technologies for resilience. Develop microgrids. Consider underground lines. Have an aggressive tree management plan. Gain answers from utilities regarding power failures.

Coastal Flooding Protection: Ensure harbor structures provide improved protection. Enhance salt marshes for flood protection. Enhance marshes with dredged material. Map salt marsh migration potential.

Sea Level Rise planning: Account for future sea level rise in town permits and planning.

Emergency Response: Improve emergency response time with a new facility on Route 3A between Stop & Shop and Pond Street.

Protect Water Quality: Manage sewage, septic, and fertilizer contamination of water resources.

Emergency Communication and Assistance: Assure that communication, transportation, and shelter assistance is reaching vulnerable populations. Develop a more comprehensive contact list. Make sure the high school has an alternative energy source.

Manage tide gates, stormwater, and wastewater systems: Identify points of vulnerability and develop plans.

Protect Lily Pond: Protect water quality and water supply. Ensure protection from runoff and potential contaminants from Route 3A.

Elm Street sewage treatment plant: Address infiltration through manhole covers. Consider the need for a wall or other protection for the plant.

Cell phone service: Study solutions for areas of town with poor service. Add leaky cable or repeater. Improve cell towers. Work with Comcast and Verizon.

Sea walls and drainage: Seek grants for improved drainage and sea wall repairs.

High Priorities

- Protect fish stocks from storm surge impacts.
- Seeks grants to protect Jacob's Meadow from flooding. Investigate new technology options; seawall.
- Promote affordable housing in-house. Protect green space.
- Enforce bylaws for wetlands and marsh protection. Restrict fertilizers. Have strong stormwater management for new construction.

- Consider moving wastewater treatment plan to higher ground. Repair pipes to reduce infiltration. Pursue regionalization.
- Need a plan for a local shelter. Modify Cohasset Middle-High School for solar and a microgrid.
- Utilize EMTs to assist police with emergency response.
- Develop a transportation/evacuation plan for elders and others. Work with MEMA and the town.
- Study whether storms and rising seas will increase the frequency of needed dredging.

Medium Priorities

- Address displacement of people with pets. Consider shelter needs.
- Maintain fire roads. Work with Trustees, State, and private landowners to address fire risk.
- Assure that pollutants at Wompatuck have been remediated. Utilize waste consuming vegetation solutions.
- For Sandy Cove and other low-lying areas: research and install appropriate drainage systems.
- Check zoning laws to make sure they discourage new development in flood zones.
- Study option of using treated water to replenish supply.
- Encourage use of rain gardens to treat stormwater from Route 3A and protect the water supply. Consider working with the Garden Club.
- Promote wetland protection through strong bylaws and enforcement.
- Analyze the vulnerability of the sewer pump stations.
- Look for opportunities to expand wetland water storage to improve capacity of Aaron River Dam Reservoir
- Be sure that at least one gas station has a generator for fuel supplies during power outages.
- Have a plan for regular surveys to remove damaged trees.
- All schools should have backup power. Consider updates to the Middle-High School.
- Utilize town volunteers to supplement efforts of town staff. Be proactive and forward thinking.
- Consider those who may need financial assistance during emergencies. Coordinate social services. Consider the Rotary Club.
- Provide public service safety messaging for owners of generators.

Low Priorities

- Study roads and bridges subject to flooding.
- Ensure Beechwood Dam has a backup generator.
- Town Hall does not have backup power – emergency command central is needed.

No priority listed

- Maintain or remove Fort Pond Brook Dam.
- Provide education about ticks and invasive plants.
- Do more public education regarding stormwater and sewage overflow.

- Address unhealthy trees and dead undergrowth. Harvest firewood, develop a management plan.
- Address contamination of Musquashicut Pond due to failed septic systems. Focus on South Main Street, Briggs Harbor, and Gulf River. Ensure septic systems are functioning.
- Rain gardens need a maintenance plan.
- Encourage water conservation and fixture replacement.
- Address excessive water use. Utilize public education and irrigation permits.
- Inventory critical facilities to ensure they have generators.
- For sewer and grinder pumps consider microgrids, education, and access to generators.
- Railroad crossing gates stay closed when power is out: MTBA issue.
- Develop heat advisory plan for high school (as it is in a heat zone).
- Investigate possibility of municipal power plant and battery storage.
- Raise all seawalls; raise and extend jetty; have an on-going dredge plan.
- Make sure all tide gates will be functional in extreme conditions.
- Encourage white roofs, shade landscaping to address heat, permeable parking for stormwater, and solar energy.
- Create a plan to use the Music Circus as a staging area.
- Organize neighbor to neighbor connections. Identify community needs.
- Assure that elder housing has backup generators.

CRB Workshop Invited Participants

* = representative attended
State Senator*
State Representatives*
Advisory Committee*
Affordable Housing Committee
Alternative Energy Commission*
Capital Budget Committee*
Board of Health*
Board of Selectmen*
Town Hall Building Committee
Community Preservation Committee*
Conservation Commission*
Design Review Board*
Elder Affairs*
Government Island Advisory Committee*
Harbor Committee*
Historical Commission*
Housing Authority*
Long Range Planning Group
Master Plan Committee*
Open Space and Recreation*
Planning Board*
Recreation Commission

School Committee
Sewer Commission*
Stormwater Advisory
Water Commission*
Zoning Board of Appeals
Building and Inspections*
Conservation*
Public Works*
Elder Affairs
Emergency Management*
Fire Department*
Harbormaster*
Health*
IT
Planning*
Police*
Public Health Nurse*
Procurement
Schools
Sewer*
Town Manager*
Veterans
Water
Safe Harbors Coalition*
South Shore Sustainability
Sotherby Real Estate Agency*
South Shore Music Circus
Gulf River Watershed Association
Straits Pond Watershed Association
Stop & Shop
Shaw's
Cavanaro Consulting*
South Shore Art Center
Second Congregational Church*
Cohasset Food Pantry
Cohasset Conservation Land Trust
Mass Coastal Zone Management*
Mass Bays*
Sandy Beach Association
Cohasset Land Trust

CRB Workshop Project Team

Cohasset Core Team

Peter Matchak	Planning Director, Project Lead
Michelle Leary	Sewer Department
Jack Buckley	Cohasset Student Coastal Research Center

Facilitation Team

Anne Herbst	Metropolitan Area Planning Council (Lead Facilitator)
Jack Buckley	Cohasset Student Coastal Research Center
Peter Afanasiw	Cohasset Student Coastal Research Center
Laura Humphrey	Cohasset Student Coastal Research Center
Susan Bryant	Cohasset Student Coastal Research Center
Russell Sears	Cohasset Student Coastal Research Center

Citation

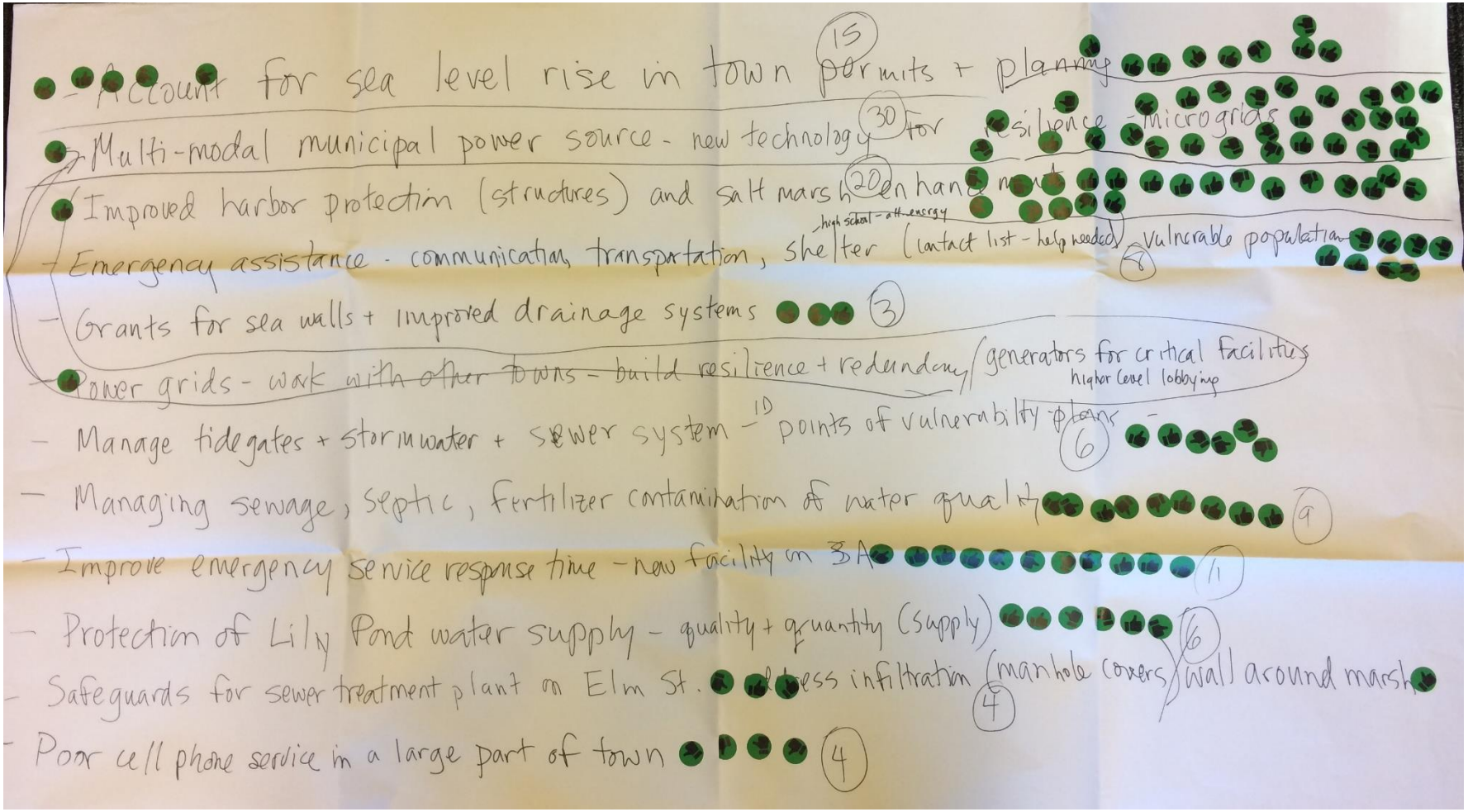
Metropolitan Area Planning Council. 2018. Town of Cohasset Municipal Vulnerability Preparedness Program. Community Resilience Building Workshop Summary of Findings. Cohasset, Massachusetts

Acknowledgements

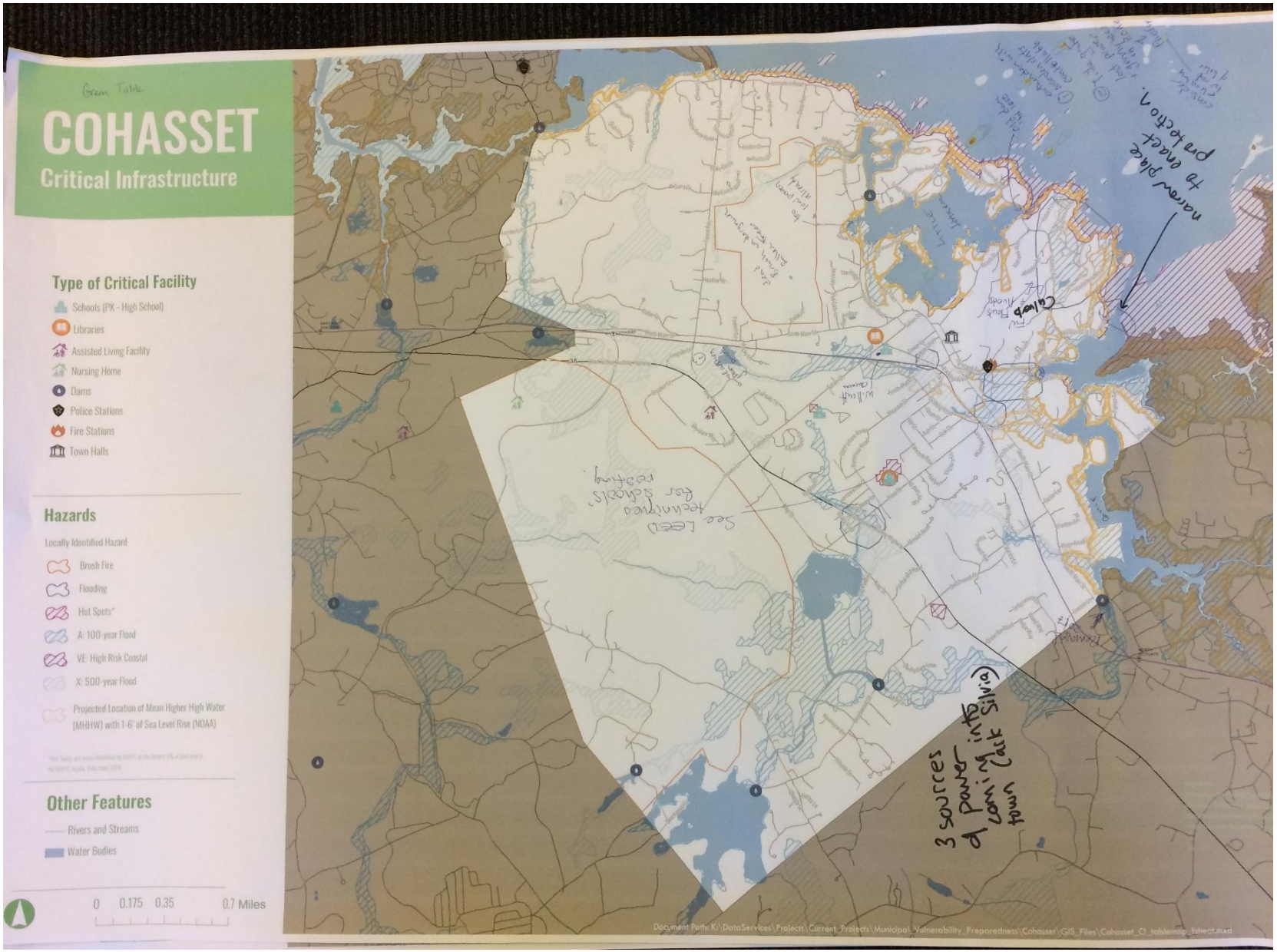
Thanks to the MVP Core Team members, CRB workshop participants, and to Peter Matchak from the Planning Board who served as local Project Coordinator. Thank you to the Cohasset Student Coastal Research Center facilitators, most of whom are also Cohasset High School teachers. Thank you to Fire Chief Quigley addressing the workshop. Funding for the CRB Workshop was provided by the Commonwealth of Massachusetts through a grant from the Municipal Vulnerability Preparedness program.

APPENDIX –ACTION PRIORITIZATION, BASE MAP, AND WORKSHOP MATERIALS

Actions Prioritization



Base Map


Green Table
COHASSET
Critical Infrastructure
Type of Critical Facility
Schools (PK - High School)
Libraries
Assisted Living Facility
Nursing Home
Dams
Police Stations
Fire Stations
Town Halls
Hazards
Locally Identified Hazard
Brush Fire
Flooding
Hot Spots*
A: 100-year Flood
VE: High Risk Coastal
X: 500-year Flood
Projected Location of Mean Higher High Water (MHHW) with 1-6' of Sea Level Rise (NOAA)
Other Features
Rivers and Streams
Water Bodies
0 0.175 0.35 0.7 Miles
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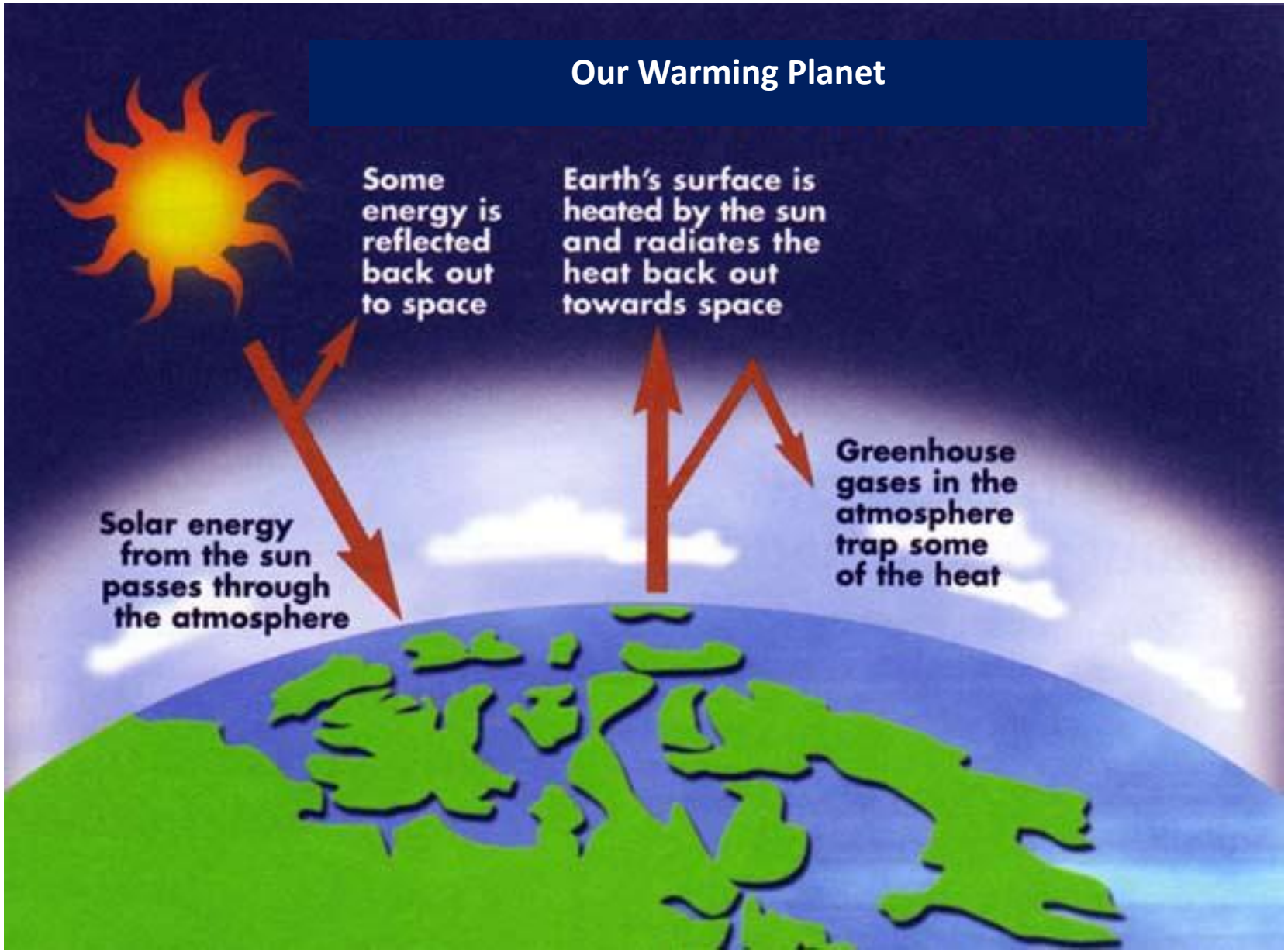
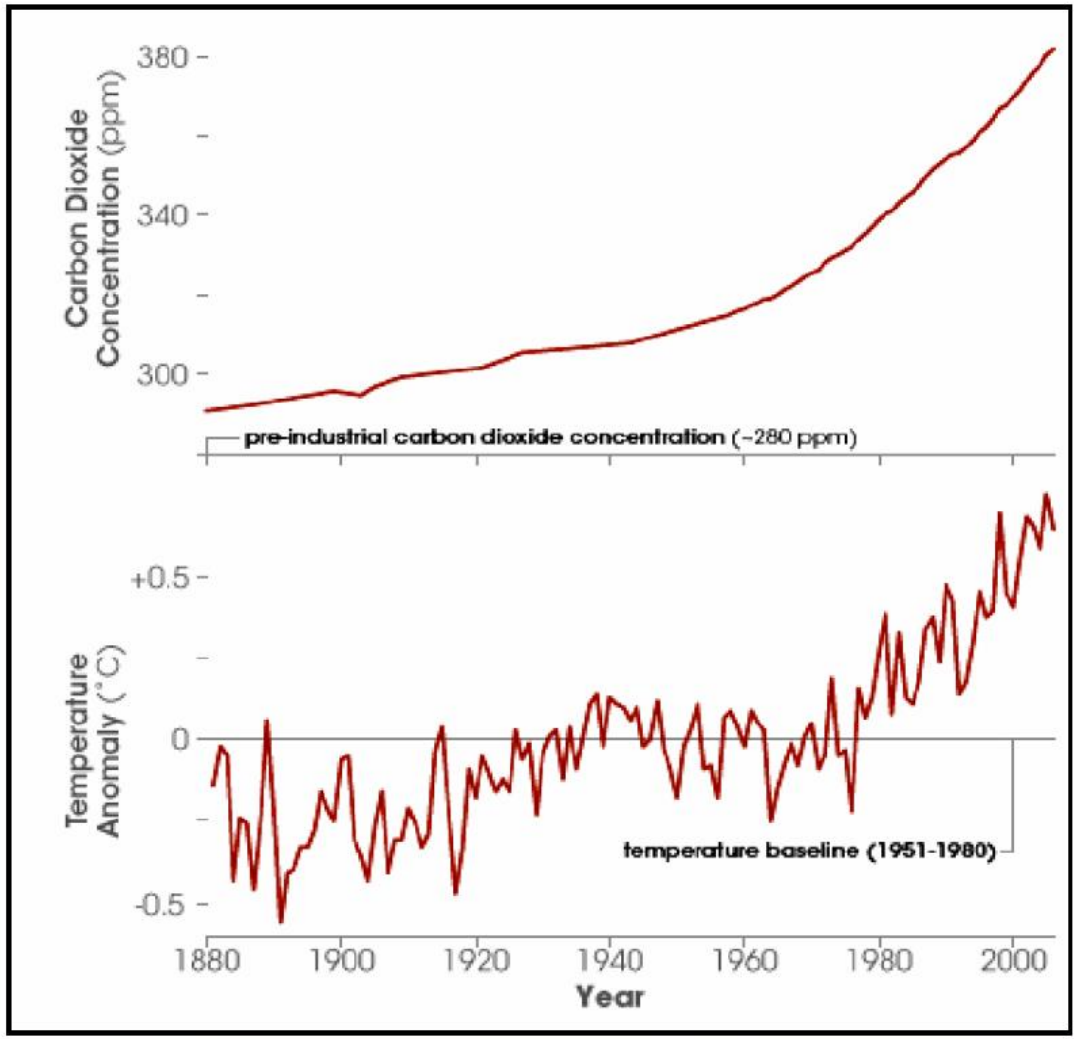
PowerPoint

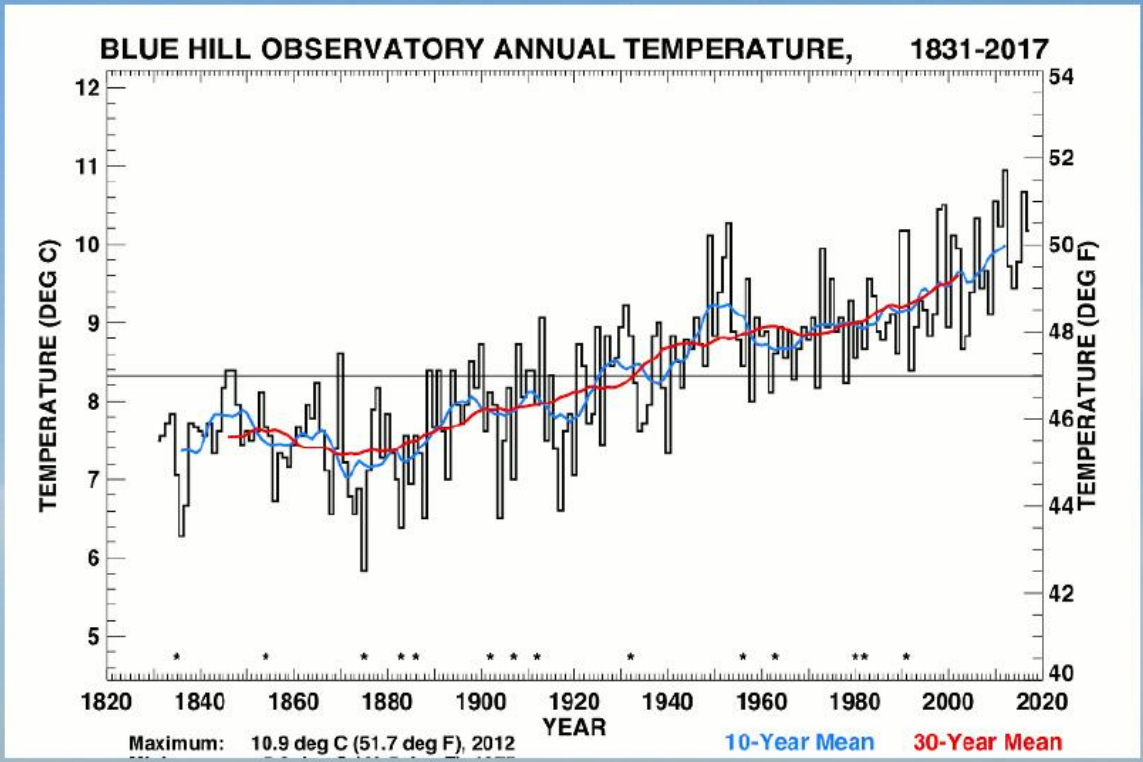

Our Warming Planet
Some energy is reflected back out to space
Earth's surface is heated by the sun and radiates the heat back out towards space
Greenhouse gases in the atmosphere trap some of the heat
Solar energy from the sun passes through the atmosphere

Global Temperature and CO_2 Trends



Temperature change: observed

For the Northeast United States: temperature increased by almost 2 degrees, between 1895 and 2011 (US National Climate Assessment 2014)

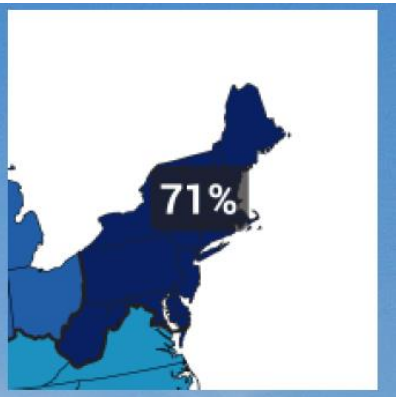


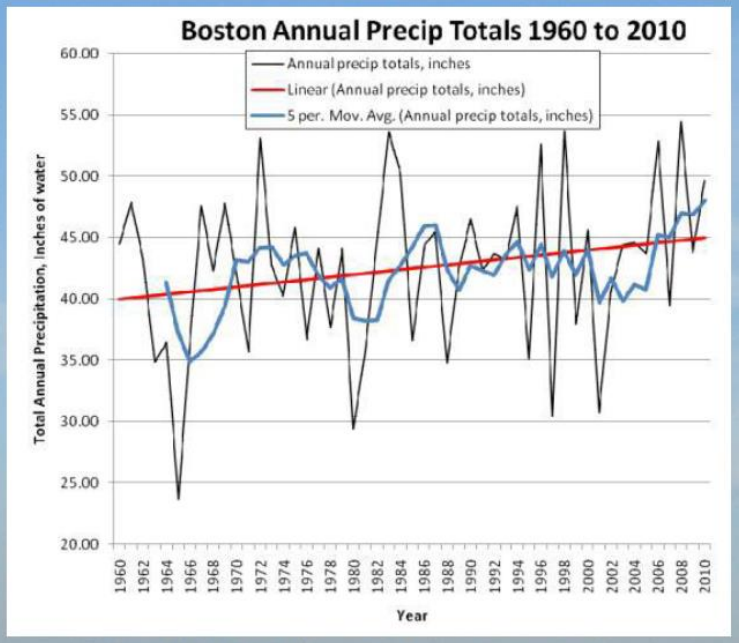
Blue Hill Observatory Annual Temperature, 1831-2017

Precipitation change: observed

For the Northeast United States: 71% increase in the amount of rain that falls in the top 1% events from 1958 – 2012.

Source: US National Climate Assessment 2014



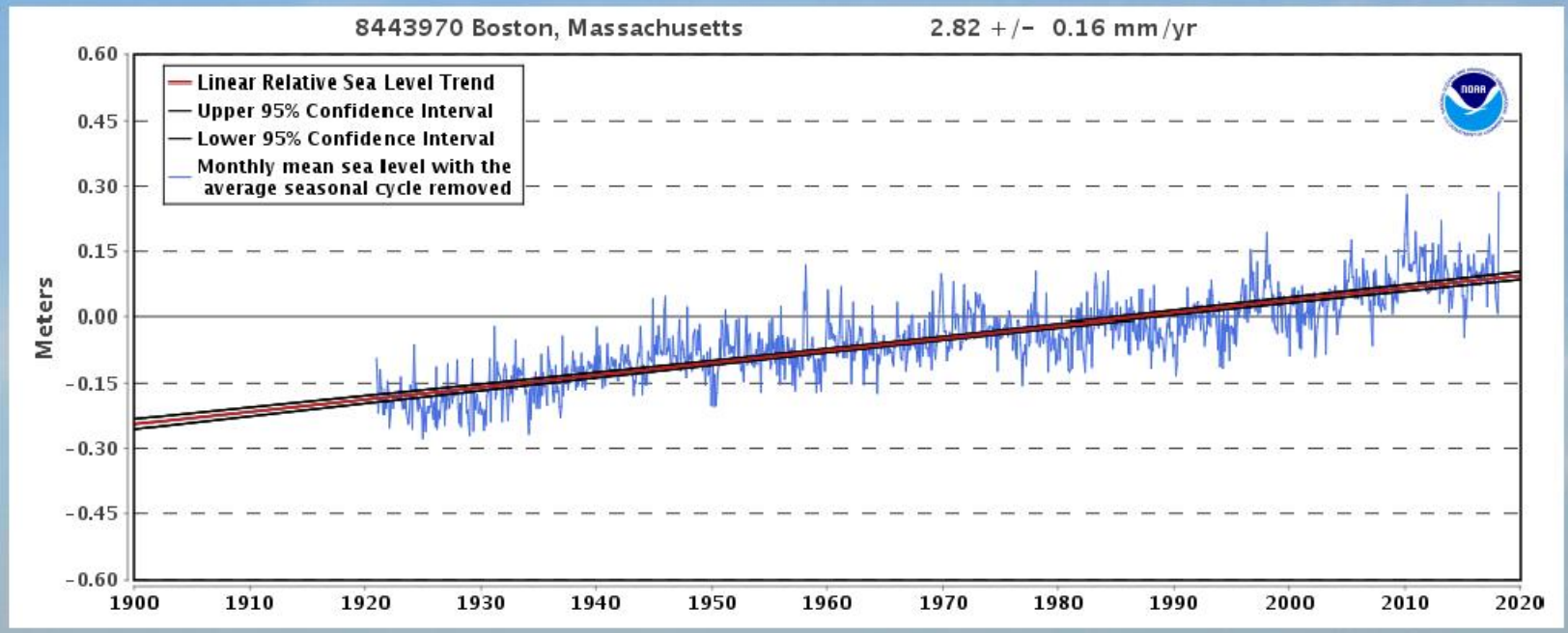


Source: MA Climate Change Adaptation Report 2011

For Boston area: 10% increase over the past 50 years

Sea level rise: observed

- Boston tide station
- Record from 1921-2017
- Equivalent to 11 inches in 100 years

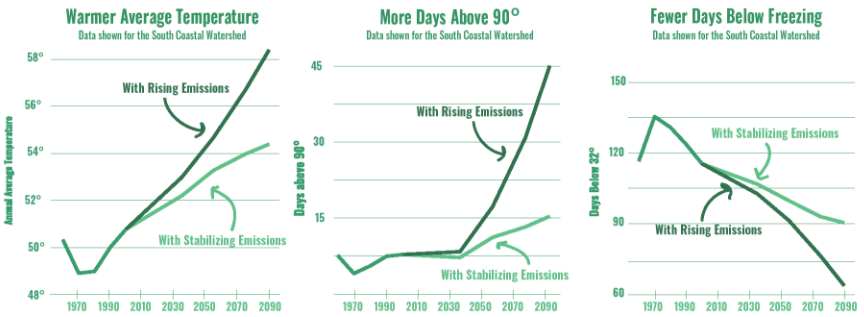


Climate Change

Cohasset and the South Coastal Watershed

Our climate is regulated by "greenhouse gases (GHGs)" that trap heat, including carbon dioxide, methane, and nitrous oxide. In the past century, the combustion of fossil fuels, our primary energy source in the age of industrialization, has increased the concentration of GHGs in the atmosphere, which has caused global temperatures to rise. If people stabilize GHG emissions, global temperatures may rise more slowly. If emissions continue increasing at the same rate, we can expect more extreme changes in the climate.

Higher Temperatures



As the climate changes, Cohasset can expect...

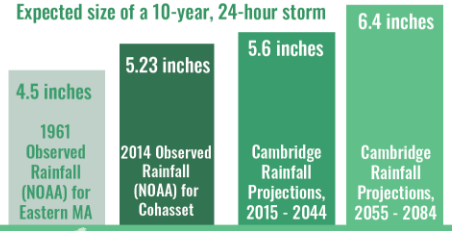
More Large Storm Events

In addition to increasing annual precipitation, climate change will bring more large rain and snow events.

This will lead to more stormwater flooding, as most stormwater drainage is not sized for larger rain events.

10-year, 24 hour storms refer to the 24-hour rainfall total for the biggest storm expected in a 10-year period.

Storm drains built for 1961 standards will be inadquate



More Annual Precipitation

But less in the summer and fall...

While total annual rainfall and large rainfall events are projected to increase, summer and fall rain is projected to decrease slightly.

And more frequent droughts...

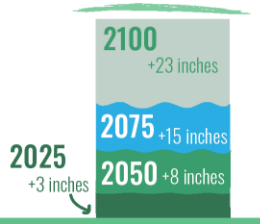
Due to the combined effects of earlier snowmelt, less rain, and higher temperatures, summer and fall droughts may become more frequent.

Rising Seas

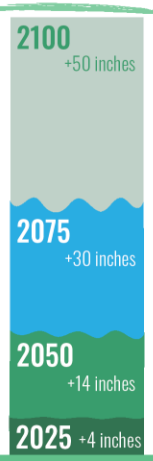
Projections for sea level rise vary dramatically depending on future greenhouse gas emissions, melting ice in the arctic, ocean currents, and other factors. The charts below represent intermediate low, intermediate high, and high scenarios.

*Sea level rise bars are 1/4 scale

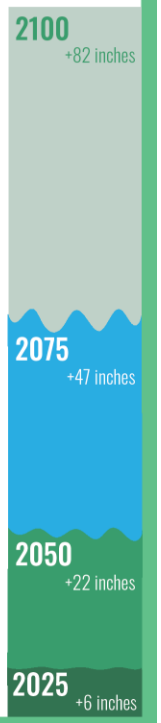
Intermediate low sea level rise scenario



Intermediate high sea level rise scenario



Highest sea level rise scenario



Sources:
Massachusetts Executive Office of Energy and Environmental Affairs; Northeast Climate Science Center; National Ocean and Atmospheric Administration TP 40; National Ocean and Atmospheric Administration Atlas 14; Cambridge CCVA as cited by Boston Research Advisory Group 2016; Massachusetts Office of Coastal Zone Management, "Sea Level Rise: Understanding and Applying Trends and Future Scenarios for Analysis and Planning 2013

COHASSET

Critical Infrastructure

Type of Critical Facility

- Schools, Child Care
- Elder Housing
- Public Safety
- Municipal
- Communications
- Dam
- Water Infrastructure
- Hazardous Material Site

Hazards

- Brush Fire (Locally Identified Hazard Areas)
- Flooding (Locally Identified Hazard Areas)
- Projected Location of Mean Higher High Water (MHHW) with 1-6' of Sea Level Rise (NOAA)
- Hot Spots*
- A: 100-year Flood Zone
- VE: High Risk Coastal Area
- X: 500-year Flood Zone

*Hot Spots are areas identified by MAPC as the hottest 5% of land area in the MAPC region. Data from 2016.

Other Features

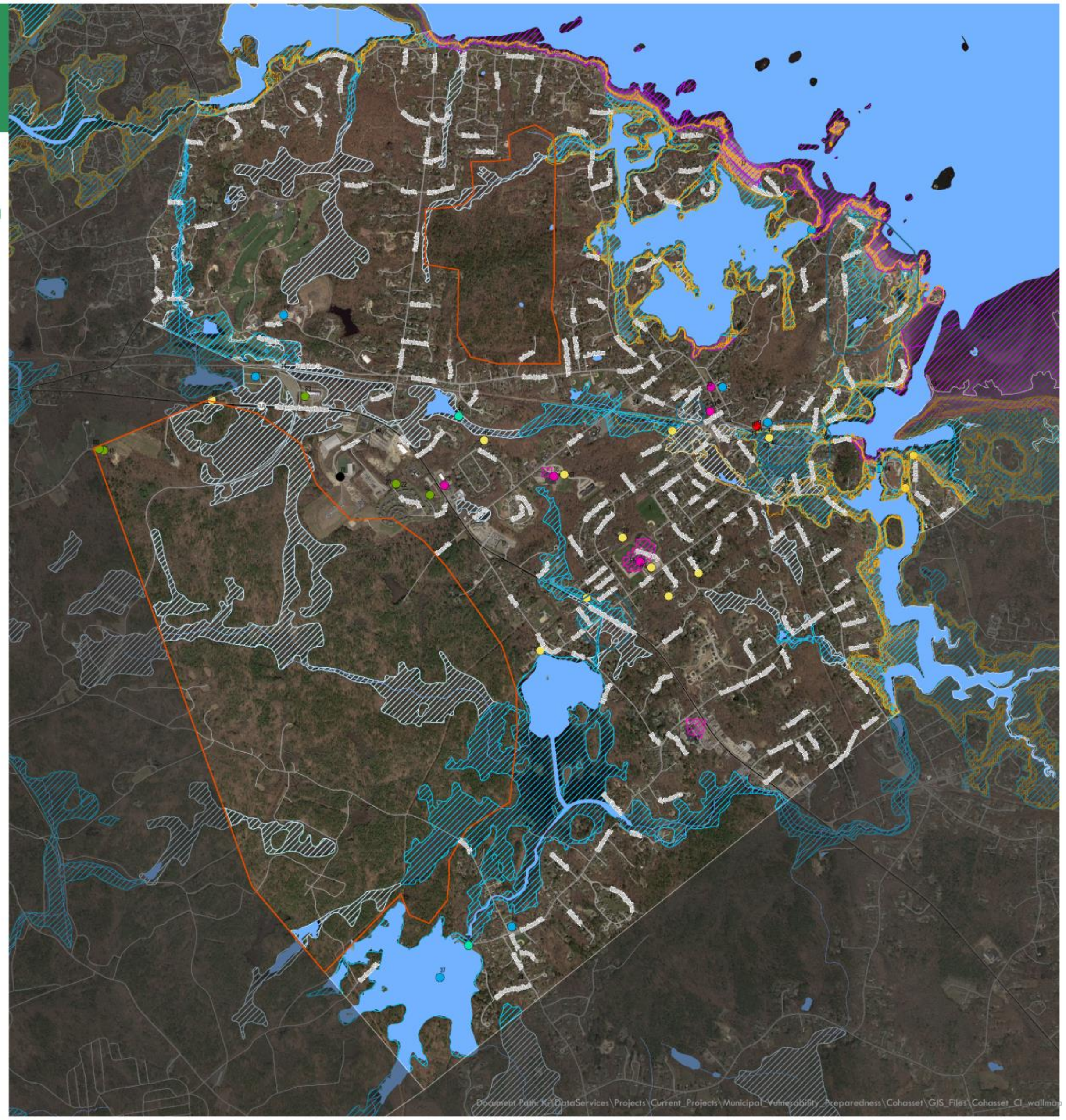
- Rivers and Streams
- Water Bodies

Label	Facility	Label	Facility
1	Milliken Field	43	Vedanta Centre
2	Joseph Osgood School	44	Greek Orthodox Church
3	Cohasset Knoll Nursing Home	45	Edward Mason Landing
4	Cohasset Civil Defense	46	Cohasset Marina
5	Town Hall	47	Harbor Master Building
6	United States Post Office	48	Cohasset Sailing Club
7	Second Congregational Church Of Cohasset	49	Cohasset Yacht Club
8	CVS Pharmacy	50	Brass Kettle Med Bldg
9	Human Service Options	51	Cohasset Harbor Inn
10	Human Service Options	52	Red Lion Inn
11	Human Service Options	53	Breakwater
12	Harborview Elder Housing	54	Border St. Pump Station
13	Cohasset Town Of Police Dep	55	Holly Lane Pump Station
14	Cohasset Town Of Fire Dept	56	Smith Place Pump Station
15	Sohier Street Well	57	Veterans (Tupelo Road) Pump Station
16	Deer Hill	58	Parker Avenue Pump Station
17	Stop & Shop	59	Woodland Drive Pump Station
18	Sunrise Assisted Living	60	Cohasset Middle-High School Pump Station
19	Cohasset Middle-High School	61	Deer Hill School Pump Station
20	Walgreens	62	Waste Water Treatment
21	Water Treatment Plant	63	Influent Pump Station
22	Water Storage Tank	64	Mill Bridge
23	Communications Tower (Police)	65	Cunningham Bridge
24	Library	66	Beechwood Cemetery
28	Water Storage Tank	67	Woodside Cemetery
29	Sand Castle Child Care	68	Cohasset Central Cemetery
30	South Shore Community Ctr	69	North Cohasset Cemetery
31	First Parish Church/Hall	70	Cedar Street Cemetery
32	First Parish Church	71	Ellms Meadow Wells
33	St Stephens Episc. Church	72	South Shore Music Circus
34	St Anthony's Parish House	73	Water Department Pump Station
35	St Anthony's Church	74	Railroad Station
36	Aaron River Dam	75	Atlantic Avenue Causeway
37	Aaron River Reservoir	77	Sandy Beach
38	Beechwood St Bridge & Bound Brook Ctrl Structure	78	Graham Waste/Mass Highway
39	Beechwood Congregational Church	79	Aaron River Reservoir Emergency Spillway
40	Sanctuary Pond Dam	80	Cell Tower
41	Cell Tower	81	Cell Tower
42	Shaws Supermarket	82	DPW Facility
		83	Cell Tower

Data Sources:
Metropolitan Area Planning Council (MAPC)
Massachusetts Geographic Information System (MassGIS)
Massachusetts Department of Transportation (MassDOT)
Federal Emergency Management Agency (FEMA)

June 2018

0 0.175 0.35 0.7 Miles



Cohasset
Social Vulnerability

Social vulnerability refers to social, economic, demographic, or health factors that may make groups of people less resilient to climate change impacts. Certain vulnerabilities tend to be correlated: for example, older adults are more likely to have a disability and live alone than younger adults.

Our strategies for adapting to a changing climate should protect these populations in addition to our natural and built environment.

Who is most at risk from climate change impacts?

People who may be more susceptible to negative health effects: These can include older adults, young children, pregnant women, people with disabilities, and people with pre-existing health conditions, as they are more likely to be physically vulnerable to the health impacts of extreme heat and poor air quality caused by climate change. Individuals with physical mobility constraints, such as people with disabilities and seniors, may need additional assistance with emergency response.

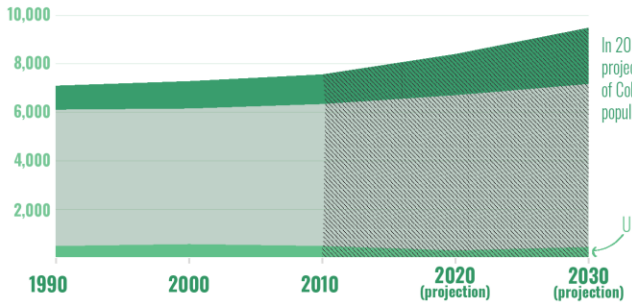
People who may have more difficulty adapting to, preparing for, or recovering from extreme weather events: Socioeconomic characteristics such as income and race can influence vulnerability to climate change. Low-income people are often more susceptible to financial shocks, which can occur after extreme weather and which can impact financial security and the ability to secure safe shelter and meet medical needs. Social isolation can also influence vulnerability, as it limits access to critical information, municipal resources, and social support systems. People at the most risk for social isolation include those living alone and people with limited English language proficiency.

People who live or work in vulnerable locations: Historic or predicted floodplain, urban flooding locations, areas prone to wildfire, heat islands, neighborhoods prone to power outages. Outdoor workers, first responders, those working in hot indoor environments.

Older Adults and Young Children

Adults over 65 and children under 5 are more likely to develop health problems on very hot days or during heat waves. Older adults are also more likely to have disabilities or mobility contraints and may need additional assistance during emergencies. They are also more likely to live alone than younger adults.

Cohasset Recent and Projected Population by Age

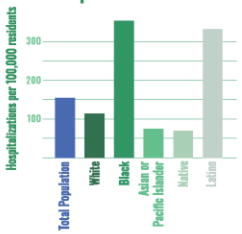


In 2030, seniors are projected to be 25% of Cohasset's total population.

People with Health Conditions

People who are already in poor health are more likely to be harmed by hot weather and resulting poor air quality.

Massachusetts Asthma Hospitalizations



People Living Alone

As of 2010, about 1/4 of Cohasset households consisted of someone living alone.

Over 50% of people living alone were over 65.

Communities of Color

Particular racial or ethnic groups may also be more likely to have certain social vulnerabilities than others. For example, Black and Latino populations have a much higher rate of asthma hospitalizations than other groups.

Cohasset is becoming more diverse...

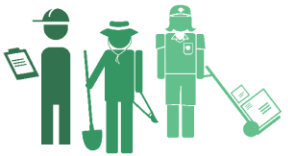
Although over 96% of the town's population is white...

Populations of color have increased since 1990.

2x Latino population increase since 1990

2x Asian population increase since 1990

People Who Work Outside



People who primarily work outside, such as parcel delivery people, construction workers, or farmers, may be at added risk from extra exposure to high heat and poor air quality.

Low Income Households

Households that earn low incomes are more susceptible to financial shocks triggered by extreme weather, which can cause long-lasting financial insecurity and can make it hard to secure safe shelter, sufficient food, and medical care.

21% ± 6% Households in Cohasset that are low-income

4.5% ± 2% Households in Cohasset that are below poverty level

*A four-person household earning less than $78,150 is considered low-income; a four-person household earning less than $24,563 is below poverty level

MAPC Metropolitan Area Planning Council

Sources:
American Community Survey (ACS) 2012-2016; United States Census 1990, 2000, 2010; MAPC Projections; Massachusetts Department of Public Health Asthma Data, 2008-2012

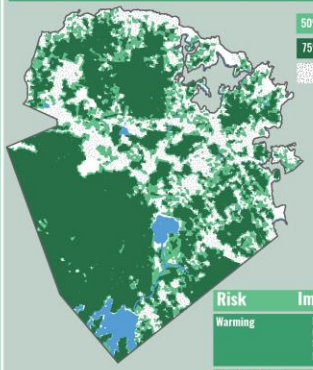
Cohasset

Natural Resources

Natural Resources lessen climate impacts by absorbing and storing carbon dioxide and by serving vital protective functions. Forests, open space, wetlands, rivers, and streams protect drinking water quality and quantity, provide flood control, and give relief from extreme heat. Healthy ecosystems are more resistant to stresses from a changing climate and better able to protect against heat and flooding.

Trees

Trees are important in mitigating the impact of heat waves. According to the EPA, suburban areas with mature trees are 4-6 degrees cooler than new suburbs without trees. Shaded surfaces can be 25-40 degrees cooler than the peak temperatures of unshaded surfaces. Trees also absorb remarkable quantities of precipitation. Research has shown that a typical medium-sized tree can intercept as much as 2,380 gallons of rain per year (USDA Forest Service).

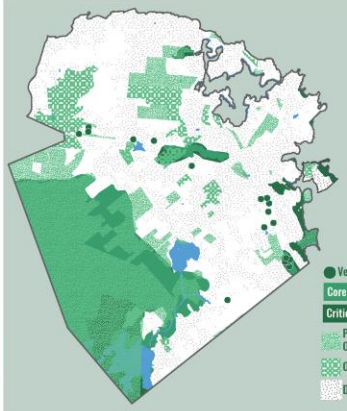


- 50% – 75% Tree Cover
- 75% – 100% Tree Cover
- Developed Land

Risk	Impact
Warming	Expected to shift forest type from Maple/Birch/Beech forest to Oak/Hickory forest similar to New Jersey. New pests and diseases
Flooding, Drought, Wildfire, Ice Storms	Impaired waters, toxic exposure, contaminant leaching

Valuable Habitat

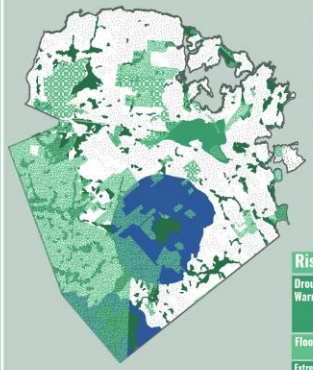
Core Habitat and Critical Natural Landscapes are state-identified intact landscapes, or exemplary natural communities, that are better able to withstand climate stresses, and support the long-term survival of rare species and natural habitats.



- Vernal Pools
- Core Habitat
- Critical Natural Landscape
- Permanently Protected Open Space
- Other Open Space
- Developed Land

Freshwater Resources

Cohasset contains, healthy, intact freshwater wetland systems that sustain critical ecosystem functions in climate change. These ecological assets protect drinking water quality and quantity, provide flood control, and maintain overall ecosystem health for climate resilience.

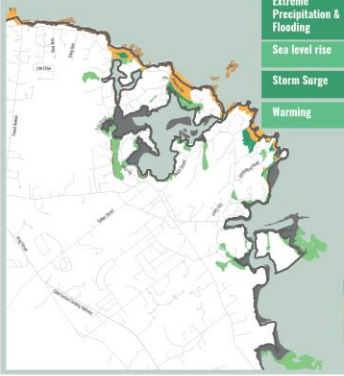


- Wetlands
- Wellhead Protection Areas
- Surface Water Protection Area
- Permanently Protected Open Space
- Other Open Space
- Developed Land

Risk	Impact
Drought/ Warming	Seasonal no-flow/ low-flow, reduced absorption capacity, diminished fish habitat, algal blooms, low dissolved oxygen, reduced drinking water supply
Flooding	Impaired waters, toxic exposure, contaminant leaching
Extreme Precipitation	Scouring, impaired waters, sewer overflows

Coastal Resources

Cohasset coastal resources include open ocean, bluffs, estuary, tidal flats, salt marsh, beach, and dunes. Coastal areas are highly productive ecosystems that provide critical habitat for fish, shellfish, and birds. Salt marsh and other coastal areas provide floodwater storage, storm surge protection, carbon sequestration, and nutrient removal.



- Salt Marsh
- Tidal Flats
- Coastal Dune
- Beach
- Rocky Intertidal Shore
- Coastal Bluff

Risk	Impact
Extreme Precipitation & Flooding	Extreme storms threaten to harm salt marshes; flooding increases non-point pollution to bays
Sea level rise	Tidal flats, salt marsh, and dunes need to migrate upland
Storm Surge	Erodes beaches, dunes, and salt marshes
Warming	Changing ocean species, new invasives, ocean acidification

MAPC

Sources
MassGIS (Bureau of Geographic Information); BioMap2: Conserving the Biodiversity of Massachusetts in a Changing World; Massachusetts Department of Fish and Game; Massachusetts Department of Environmental Protection; MassGIS (Bureau of Georgraphic Information); National Land Cover Database (NLCD)