
# Town of Acton
# 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 Acton. The winter of 2015 brought record-breaking snow, resulting in delays and shutdowns in MBTA service. The following year, Acton was under a drought warning from July to November 2016. The winter of 2018 once again brought severe winter storms with a succession of four nor'easters pummeling the town in March. In March 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 Acton, 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. Concurrent with the MVP program, Acton is updating its Hazard Mitigation Plan (HMP). The HMP is a five-year plan, developed under the auspices of FEMA that identifies strategies to address natural hazards. Upon completion of the two projects, the Town of Acton will be eligible to apply for state and federal grant funds to address identified natural hazards and climate risks.

The Town of Acton partnered with the Metropolitan Area Planning Council (MAPC) to complete the MVP program and the Hazard Mitigation Plan. The MVP Core Planning Team identified and recruited community stakeholders to participate in the one-day CRB Workshop. Thirty-eight people representing Acton town staff, members of Acton Boards and Commissions, and representatives of Acton community organizations gathered on May 9 (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 Acton infrastructure, demographics, and natural resources (see Appendix).


The participants considered Acton'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 Acton's resilience to future extreme weather events.

## Top Hazards and Vulnerable Areas

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

**Top Hazards**

- Flooding
- 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 and snowfall, heavy rain events, and the recent period of drought. The principal challenges of the nor'easters are the threat of power outages from

falling trees and limbs, as well as travel restrictions due to heavy snow. Large rain events result in flooding when local streams exceed their banks, as well as when stormwater drainage capacity is exceeded. The status and capacity of local dams is a concern during extreme rain events. Droughts are harmful to local aquatic resources and vegetation. Participants expressed concern for water quality and quantity as Acton relies on groundwater resources for water supply. As these issues are not new, the Town of Acton 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, and elevate new concerns, particularly water supply and public health issues related to high heat.

## AREAS OF CONCERN

**Geographic:**

Specific geographic areas did not feature prominently in workshop discussions. Participants did highlight the need for a fire station in North Acton. Given the concern for groundwater resources, wellhead protection zones are also areas of concern.

**Societal:**

Populations identified include: seniors and seniors who live alone: residents of nursing homes, assisted living and group homes; non-English speaking communities with a focus the senior Chinese population; low-income residents; renters; isolated individuals; and those with medical needs. Participants were particularly concerned with barriers to emergency communication, and recognized that some residents will have fewer resources to prepare for, endure, and recover from, severe weather events.

**Environmental:**
The need for tree management due to storm damage was a significant concern. Land protection for water quality and quantity, biodiversity, and support of agriculture was also identified. Stormwater management through green infrastructure, land protection, and impervious surface management also emerged as a priority.

**Infrastructure:**
Ensuring that town facilities have adequate backup power and that shelters are in compliance with the ADA, and have showers and emergency food supply is a high priority. The need for a fire station in N. Acton is a priority. Several dams that need assessment and repair or removal were noted. The need to elevate drinking water and waste water pump stations was identified. Also noted was the possibility that deeper wells may be needed when drought conditions apply.

## CURRENT STRENGTHS AND ASSETS

Workshop participants identified numerous Acton strengths and assets that will support resilience to future climate impacts. As show below town strengths identified include civic engagement, town facilities and services, transportation options, strong bylaws, and Acton's natural resources.

- Strong civic engagement including: Town Meeting participation; and, neighborhood, community, land trust, watershed, and volunteer service organizations.
- Crosstown Council on Aging bus.
- High level of service and coordination between the Council on Aging and the Nursing Service.
- Highly educated adult population.
- Strong public school environmental education.
- Private Ham radio network.
- Canine search and rescue.
- Town communications including radio, blackboard connect, reverse 911, Acton TV.
- The moderate climate and town elevation, agricultural lands and high biodiversity.
- Emerson Hospital is nearby.
- Town facilities including: new Social Service facility, municipal shelters, backup generators.
- Many homeowners own generators.
- Town Community Services Coordinator.
- Strong stormwater, groundwater, open space, and septic regulations.
- Transportation options including: commuter rail service in S. Acton, highway access, shuttle bus, and two bike trails.
- Food security provided by local farms, CSA's, farmer's market and local stores.
- Town hall interpreters, Chinese Civic Association, Chinese language school.
- Fire Department has advanced life support.
- Relatively few buildings in flood zones.
- Good sewage treatment plants.

## Top Recommendations to Improve Resilience

Each of the four workshop groups identified vulnerabilities and suggested solutions. The solutions were prioritized as High, Medium, or Low. Each group then identified their four highest priorities. There was overlap in the top priorities of the four groups. The sixteen identified highest priorities resulted in twelve distinct items. The participants each then voted for their top three priorities (see Appendix). The issues identified as highest priorities below reflect the top twelve issues listed in order of the number of votes they received.

### Highest Priorities

**Emergency communications:** Develop an emergency communications network, use multiple sources, have redundancy. Specific suggestions include: enhance the FM station, improve reverse 911 (register cell phones), use text messaging, use social media, do translation, use the ham radio network. Have a live link for emergency communications from town hall, utilize local residents for backup support.

**Outreach to vulnerable populations:** Encourage neighborhood networking, focus on harder to reach populations (non-English speakers, isolated seniors, renters). Reinvigorate the Acton neighborhood network, develop a communication system. Make sure people will have access to food and medicine. Utilize cultural resources. Do outreach through the Acton Disabilities Commission. Activate volunteers, connect with the Junior High student volunteer network.

**Groundwater protection for water supply:** Consider new and innovative recharge options, pursue conservation, new storage and new sources. Address septic issues. Coordinate regionally and among town governments. Educate residents. Consider the need for deeper wells.

**Tree maintenance:** Develop a tree maintenance plan for removal and replacement of trees to address the risk of power outages. The plan should address utilities, street trees and private trees. Include citizen education. Staff is needed to keep up with the workload. Address gas leak impacts on trees.

**Flooding:** maintain or remove dams, utilize green infrastructure, implement beaver diversion strategies.

**Bury power lines:** To reduce the risk of outages, place powerlines underground when doing roadwork.

**Strengthen civic engagement:** establish a CERT team (note: Acton has a CERT team), environmental groups should be more efficient with their resources.

**Update bylaws for climate change:** Specifically look at stormwater and groundwater bylaws, scrutinize the cost/benefit associated with new growth. Develop more green infrastructure. Focus on post-construction enforcement.

**Secure water rights to Nagog Pond:** Maintain pressure for Acton's water rights for long-term security.

**Emergency communications task force:** Establish a task force for emergency communications to all populations.

**Emergency Shelters:** Better equip and prepare municipal buildings for emergency use. Utilize the Human Service building and Senior Center.

**Funding for N. Acton Fire Station:** Town meeting approved funding for design. Follow up with construction funds when design is complete.

### High Priorities

- Elevate pump stations, understand commercial water user demand, and address culvert flooding issues.
- Encourage sustainable landscaping to address water and fertilizer use.
- Work on beaver management for flooding issues.
- Fix natural gas leaks (National Grid).
- Protect land strategically to maintain biodiversity.
- Protect Nagog Pond as a resource.
- Increase emergency food supplies at shelters.
- Protect open space, plan the direction of development.
- Human Service facility needs generator and emergency food supply for sheltering.
- Do more public outreach for utilization of the new Human Service facility.

### Medium Priorities

- Do more outreach for Discovery Museum to support healthy outdoor activity.
- Restrict campfires on conservation lands.
- Promote regional coordination of water supply. Permit solar arrays and microgrids.
- Provide DPW resources needed to clear bike paths of downed trees and branches.
- Confirm generators and shelter capacity for assisted living facilities, public housing, and Avalon.
- Consider risk of water borne illnesses from septic systems, study wastewater needs.
- Encourage groundwater recharge with pervious surfaces, green infrastructure, reduce use of waivers.
- For single access subdivisions, assess the risk of falling trees.
- Encourage translation, networking, and volunteer efforts for communication with residents who don't speak English.
- Expand focus on senior population and those isolated or on limited incomes. Focus on their needs, including medical. Establish a buddy system.
- Establish communication with apartment renters who may be more temporary. Work with landlords and the fire department.
- Use conservation restrictions to protect lands suitable for farming.
- Add showers and backup generators to shelters where needed. Ensure ADA compliance.
- Encourage transportation alternatives and emergency transportation planning.
- Improve collaboration among environmental organizations.
- Increase visibility of the town Nursing Service.
- Encourage emergency planning for families that include members who commute out of town.
- Connect local ham radio network to town emergency planning.
- Encourage the state to reduce salt use on state roadways in Acton.

### Low Priorities

- Assess the 53 River Street dam for possible removal.
- Upgrade privately owned sewage treatment where possible.
- Identify emergency measures for private wells that need pumps.
- Increase parking at the S. Acton commuter rail station.
- Expand use of sewage treatment.
- Have a generator at the transfer station.
- Ensure availability of equipment and storage space for snow management.

## CRB Workshop Invited Participants

* = representative attended
State Senator*
State Representatives*
Acton Nursing Services*
Acton Building Department*
Acton Community Resources
Acton Council on Aging*
Acton Emergency Management
Acton Engineering*
Acton Finance
Action Fire
Action Health
Acton Highway*
Acton Land Use*
Acton Municipal Properties*
Acton Natural Resources*
Acton Planning and Zoning
Acton Public Works*
Acton Police*
Acton Schools*
Acton Town Manager
Acton Veteran's Services
Acton Water District*
Acton Transportation Director
Acton Boxborough School Committee*
Acton Housing Authority*
Acton Board of Health*
Acton Board of Selectmen*
Acton Conservation Commission
Acton Council on Aging Board*
Acton Design Review Board*
Acton Economic Development Committee
Acton Finance Committee*

Acton Green Advisory Board
Acton Land Stewardship Committee
Acton Open Space Committee*
Acton Planning Board*
53 River Street Master Planning*
Transportation Advisory Committee
Water Resources Advisory Committee*
Commission on Disability*
Medical Reserve Corps
League of Women Voters*
Acton- Boxborough United Way
Habitat for Humanity*
Middlesex West Chamber of Commerce
Household Goods*
Acton-Boxborough Food Pantry
Open Table – Maynard
Haartz Corporation*
Acton Conservation Trust*
Green Acton*
OARS*
Discovery Museum
Minuteman Senior Services
Chinese-American Civic Association
Minuteman ARC
Mothers Out Front

## CRB Workshop Project Team

Acton Core Team

| | |
|---|---|
| Corey York | Public Works Director, Project Lead |
| Jim Cogan | Deputy Police Chief |
| Matthew Selby | Land Use and Economic Development Director |
| Sharon Mercurio | Council on Aging Director |
| Frank Ramsbottom | Building Commissioner |
| Steve Long | Green Acton |

Facilitation Team

| | |
|---|---|
| Anne Herbst | Metropolitan Area Planning Council (Lead Facilitator) |
| Martin Pillsbury | Metropolitan Area Planning Council |
| Barry Keppard | Metropolitan Area Planning Council |
| Ralph Wilmer | Metropolitan Area Planning Council |
| Carolina Prieto | Metropolitan Area Planning Council |

## CITATION

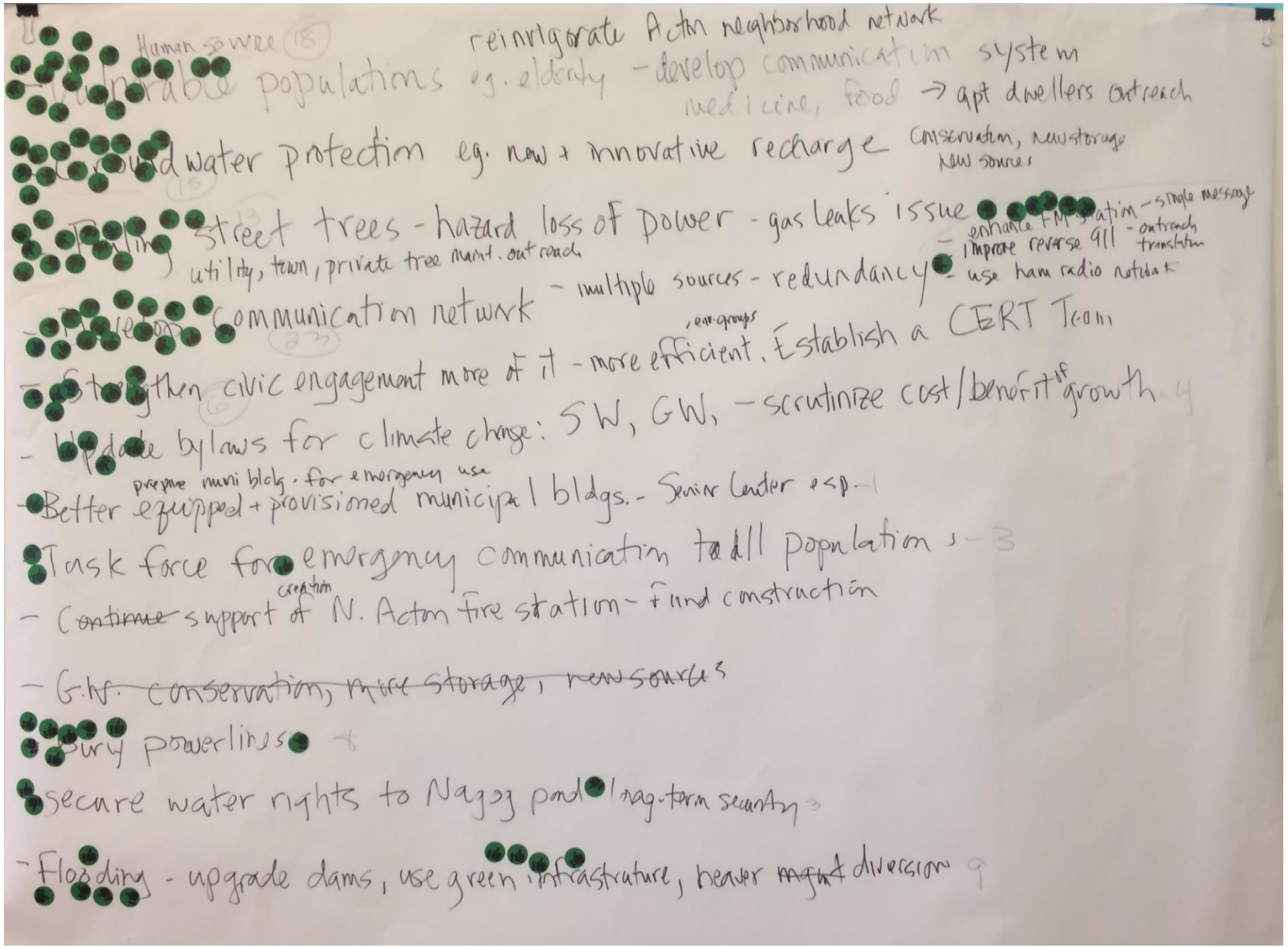
Metropolitan Area Planning Council. 2018. Town of Acton Municipal Vulnerability Preparedness Program. Community Resilience Building Workshop Summary of Findings. Acton, Massachusetts

## ACKNOWLEDGEMENTS

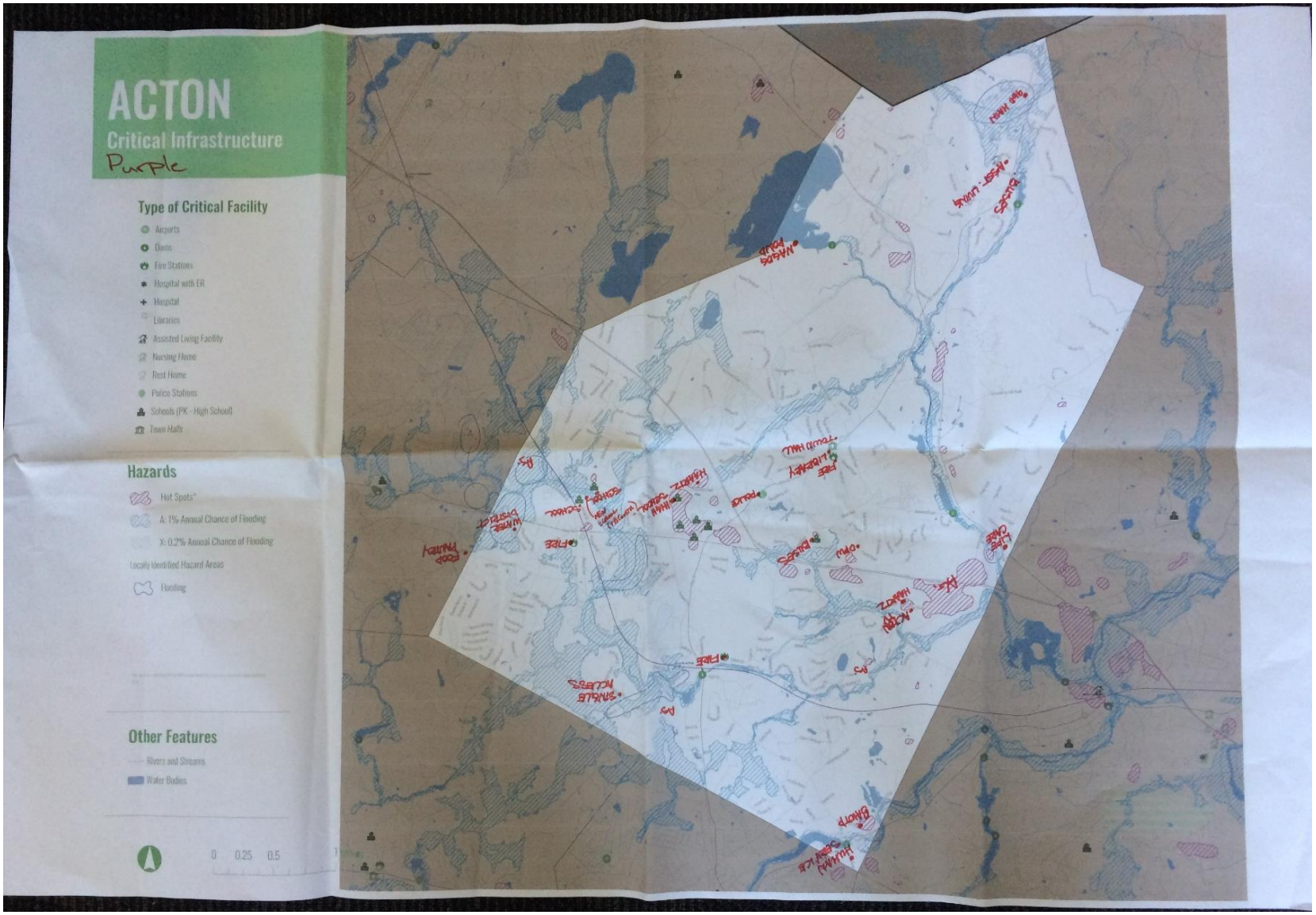
Thanks to the MVP Core Team members, CRB workshop participants, and to Corey York from the Department of Public Works who served as local Project Coordinator. Thank you to Deputy Police Chief Jim Cogan who addressed the workshop. Funding for the CRB Workshop was provided by the Commonwealth of Massachusetts through a grant from the Municipal Vulnerability Preparedness program.

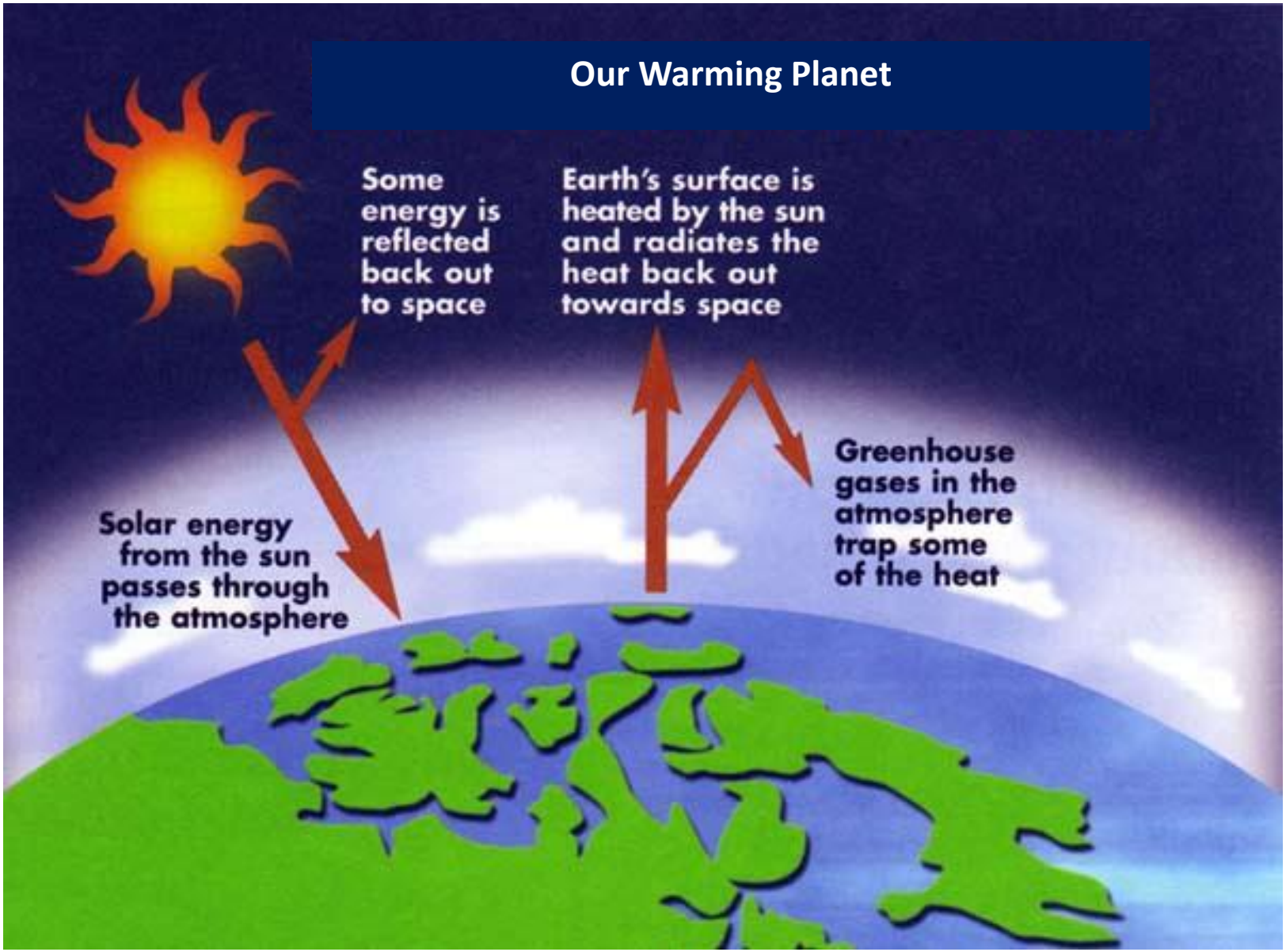
# APPENDIX –ACTION PRIORITIZATION, BASE MAP, AND WORKSHOP MATERIALS

## Actions Prioritization

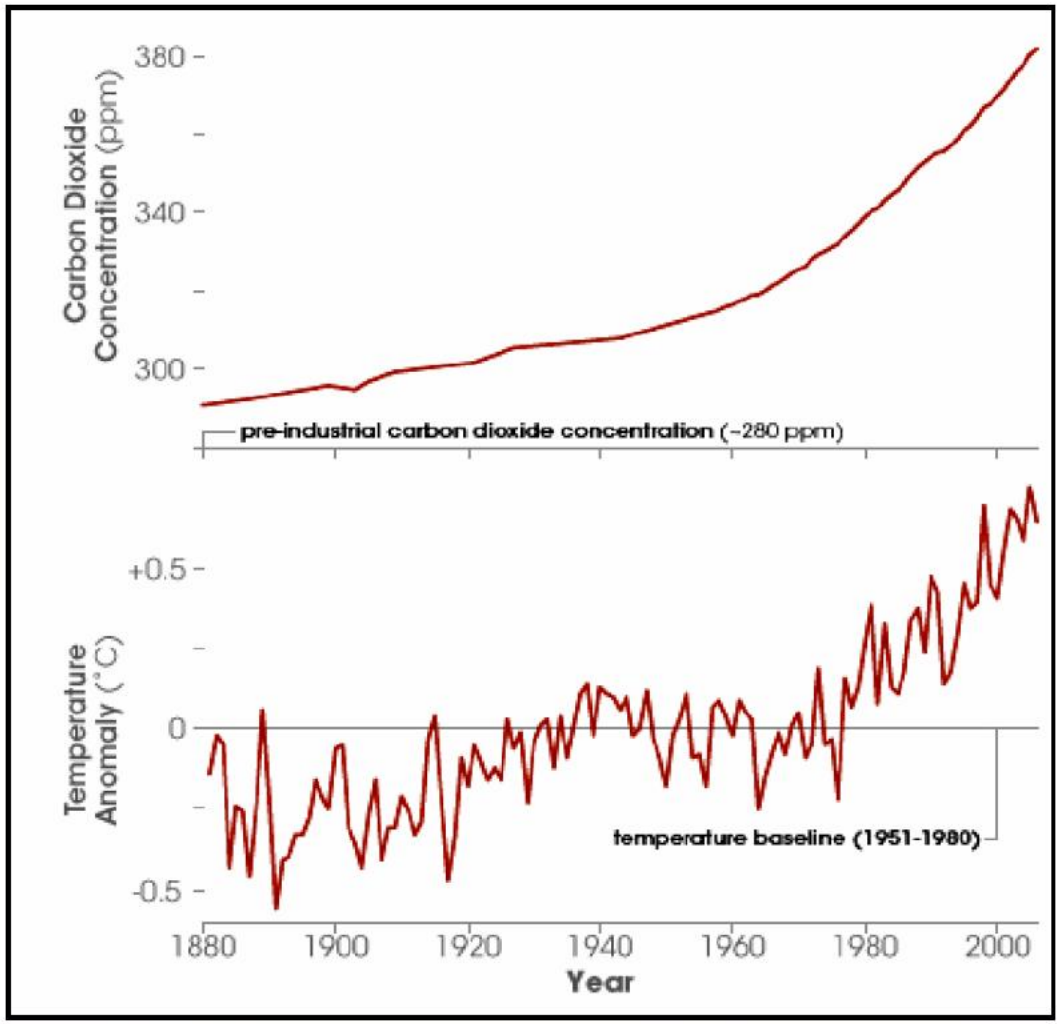


# Base Map


ACTON
Critical Infrastructure
Purple
Type of Critical Facility
Airports
Dams
Fire Stations
Hospital with ER
Hospital
Libraries
Assisted Living Facility
Nursing Home
Rest Home
Police Stations
Schools (PK - High School)
Town Halls
Hazards
Hot Spots*
A: 1% Annual Chance of Flooding
X: 0.2% Annual Chance of Flooding
Locally Identified Hazard Areas
Flooding
Other Features
Rivers and Streams
Water Bodies
0 0.25 0.5

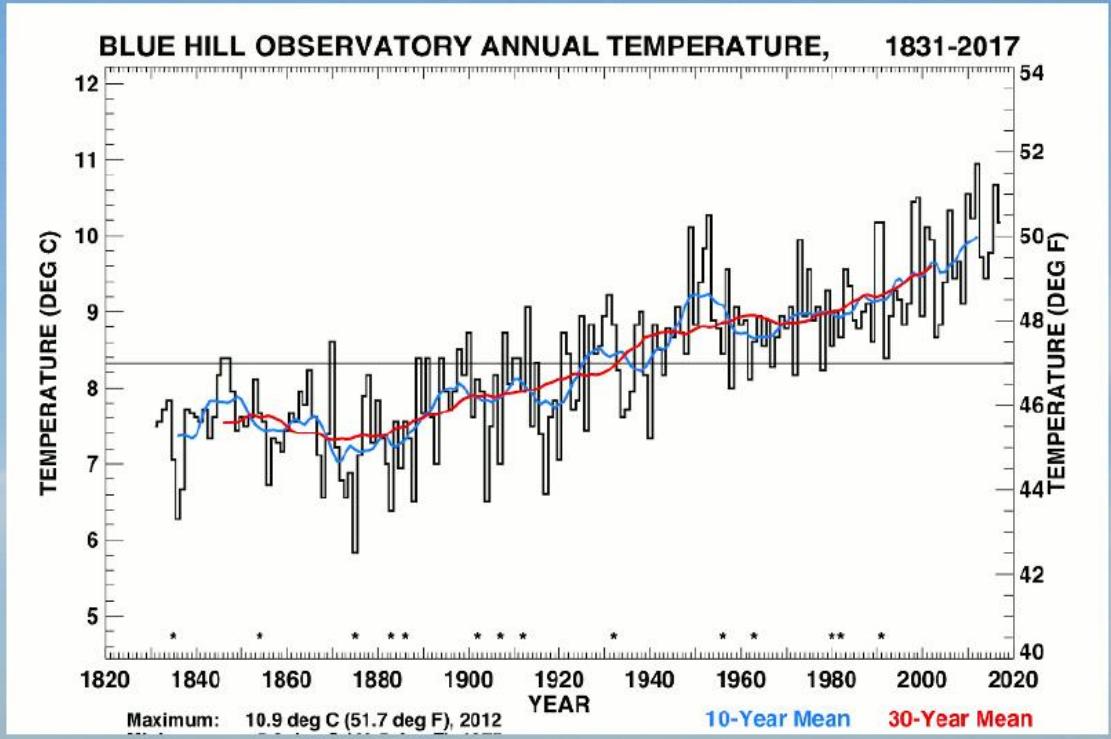

Our Warming Planet
Some energy is reflected back out to space
Earth's surface is heated by the sun and radiates the heat back out towards space
Greenhouse gases in the atmosphere trap some of the heat
Solar energy from the sun passes through the atmosphere

# Global Temperature and $CO_2$ Trends



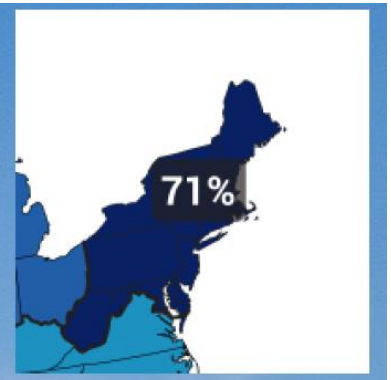
# Temperature change: observed

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



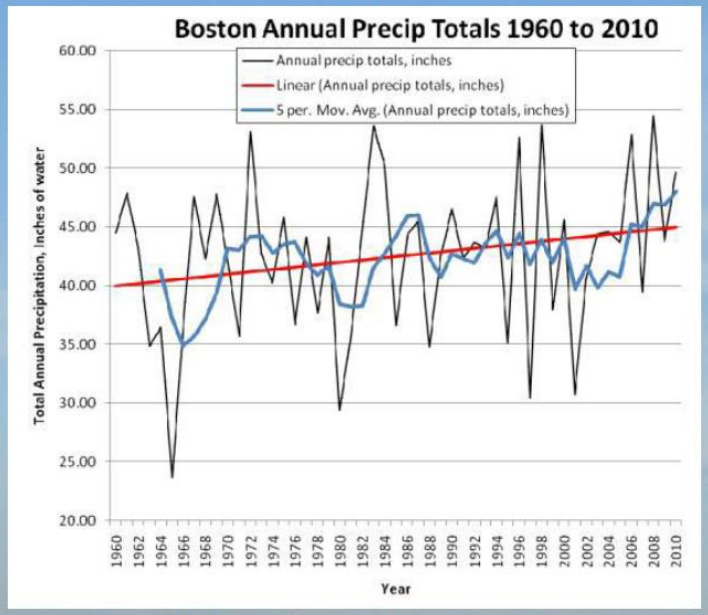

Blue Hill Observatory Annual Temperature, 1831-2017

# 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

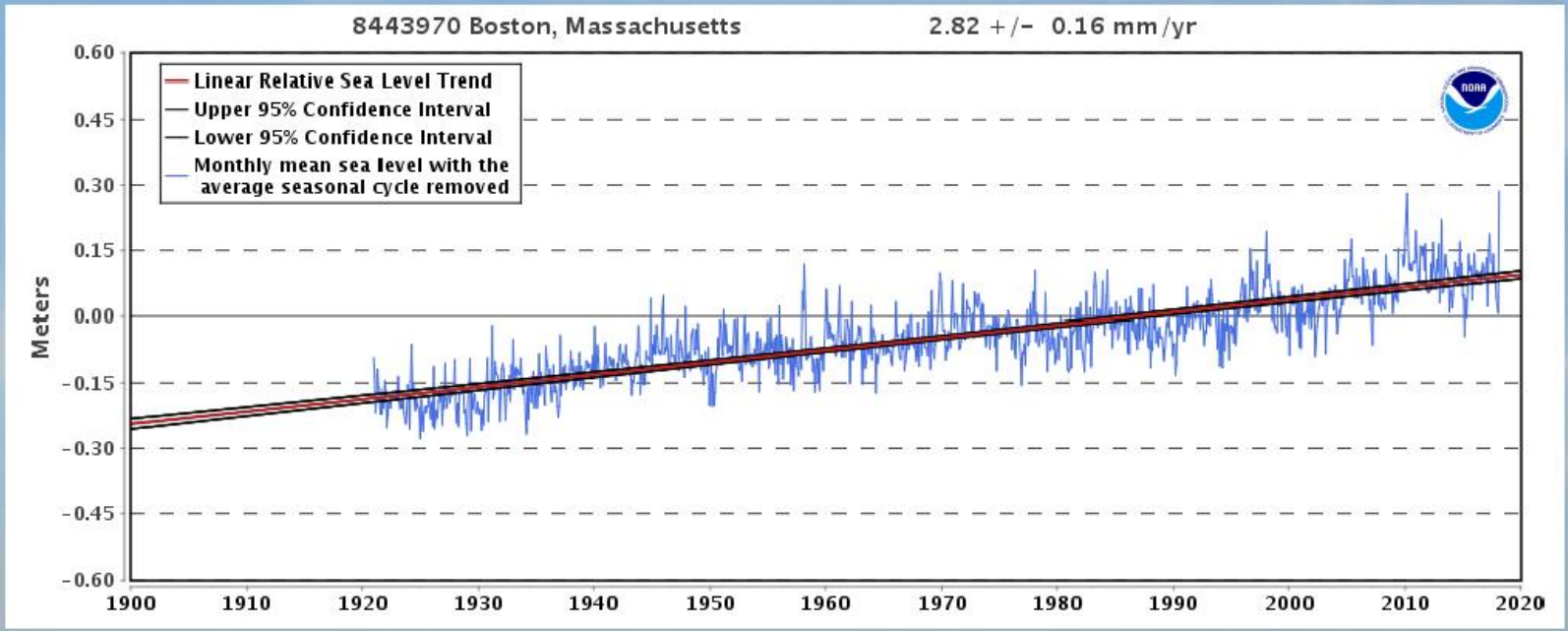



Source: MA Climate Change Adaptation Report 2011

**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

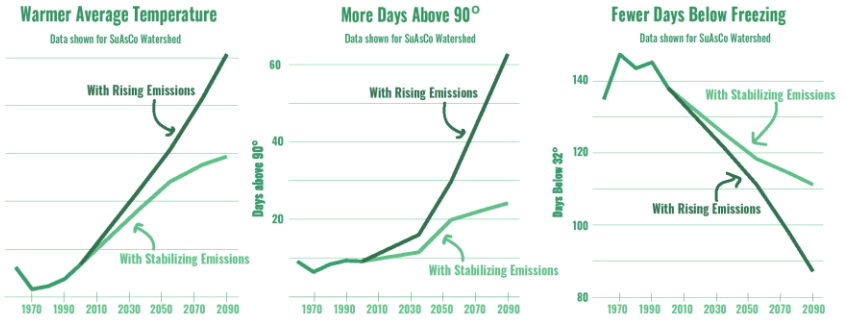


# Climate Change

Acton and the SuAsCo 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, Acton can expect...

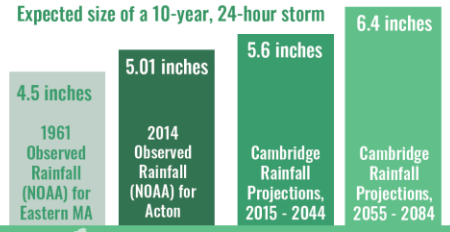
### More Large Storm Events

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.

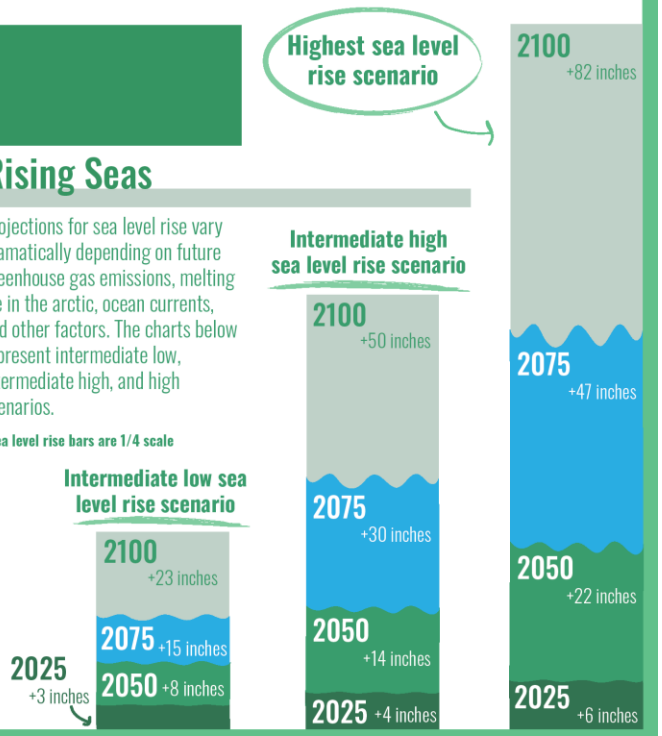
**And more frequent droughts...**

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




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

# ACTON

## Critical Infrastructure

### Type of Critical Facility

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

### Hazards

- Hot Spots*
- A: 1% Annual Chance of Flooding
- X: 0.2% Annual Chance of Flooding
- Locally Identified Hazard Areas (Flooding)

*Hot Spots are areas identified by MAPC as the hottest 5% of land area in the MAPC region. Data from 2010.

### Other Features

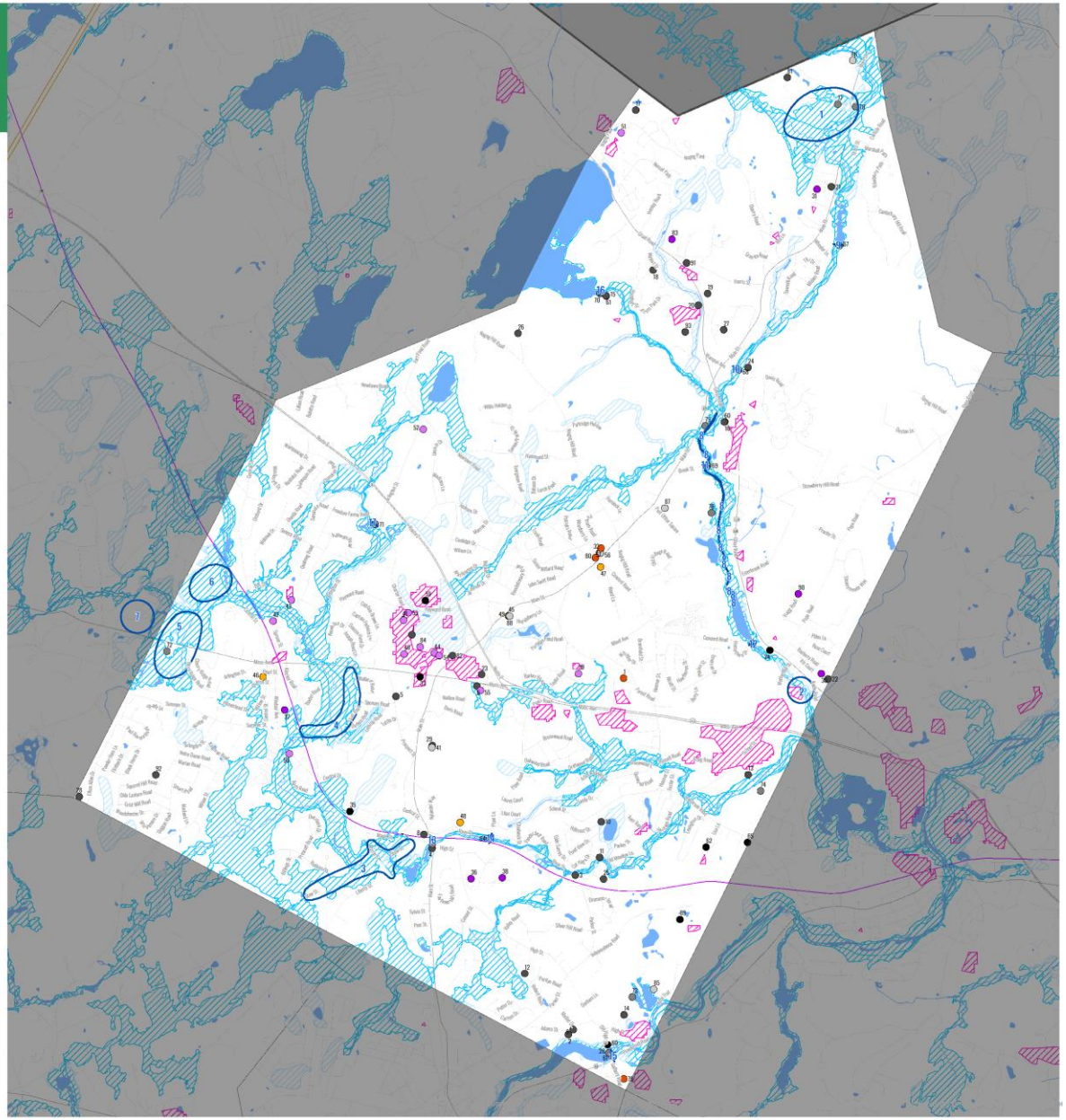
- Rivers and Streams
- Water Bodies

| Label | Facility | Label | Facility | Label | Facility |
|---|---|---|---|---|---|
| 1 | Acton Department of Public Works Garage | 34 | Barrow Gas and Oil | 67 | Robbins Mill Pond Dam |
| 2 | Acton Wastewater Treatment Plant | 35 | Concord Oil | 68 | Pencil Factory Dam |
| 3 | Pump Station 1 | 36 | Recreation Department | 69 | Brook Street Dam |
| 4 | Pump Station 2 | 37 | Windsor Green Apartments | 70 | Nagog Pond Dam |
| 5 | Pump Station 3 | 38 | Audubon Hill Condominiums | 71 | Grassy Pond Brook Dam |
| 6 | Pump Station 4 | 39 | Conant School | 72 | Wild Clapp Wellfield |
| 7 | Pump Station 5 | 40 | RJ Grey Junior High School | 73 | Assabet Wellfield |
| 8 | Pump Station 6 | 41 | Acton-Boxborough Regional High School | 74 | School Street Wellfield |
| 9 | Pump Station 7 | 42 | Gates School | 75 | Conant I Well |
| 10 | Pump Station 8 | 43 | Douglas School | 76 | Conant II Wellfield |
| 11 | Pump Station 9 | 44 | Merriam School | 77 | Kennedy Wellfield |
| 12 | Pump Station 10 | 45 | Acton Public Safety Building | 78 | Marshall Well |
| 13 | School Street Water Treatment Plant | 46 | West Acton Fire Station | 80 | Mw-3A Water Pump Station |
| 14 | Assabet Water Treatment Plant | 47 | Center Acton Fire Station | 81 | Nagog Water Treatment Plant |
| 15 | Hayshed Street Donation Plant | 48 | South Acton Fire Station | 28 | Assabett River Dam |
| 16 | Concord Water Pump Station | 49 | Acton Public Safety Building | 79 | Human Services and Senior Center |
| 17 | North Acton Wastewater Treatment Plant | 50 | Infant Toddler Children's Center | 80 | Municipal Properties and Engineering |
| 18 | Acorn Park Wastewater Treatment Plant | 51 | Acton Boxs Cooperative Nursery School | 81 | N. Acton Water Treatment |
| 19 | Woodside Wastewater Treatment Plant | 52 | Montessori Country Day School | 82 | S. Acton Water Treatment |
| 20 | Great Road Condos Wastewater Treat. Plant | 53 | Children's World Learning Center | 83 | McCarthy Village |
| 21 | Robbins Brook Wastewater Treatment Plant | 54 | McCarthy-Towne | 84 | Colbrook High School |
| 22 | Life Care Center Wastewater Treat. Plant | 55 | The Victor School | 85 | Cell Tower |
| 23 | Yankee Village Wastewater Treat. Plant | 56 | Community Notification Ctr. | 86 | Cell Tower |
| 24 | Fairebrook Wastewater Treatment Plant | 57 | Library/ R | 87 | Cell Tower |
| 25 | Brookside Apts. Wastewater Treat. Plant | 41 | Cell Tower | 88 | Cell Tower |
| 26 | Nagog Hill Water Storage Tank | 58 | Hoarle Auto Fabric | 89 | Goose Superfund Site |
| 27 | Wampas Hill Water Storage Tank | 60 | RH Products | 90 | 55+ Housing |
| 28 | Flagg Hill Water Storage Tank | 61 | Assabet River Dam | 93 | Private Wastewater Treatment |
| 29 | Great Hill Water Storage Tank | 62 | BOC Gases | 91 | Private Wastewater Treatment |
| 30 | Life Care Center | 63 | Edwards Grain Mill Dam | 92 | Private Wastewater Treatment |
| 31 | Robbins Brook Assisted Living Facility | 64 | River Street Dam | | |
| 32 | Acton Town Hall | 65 | Keyspan/Tennessee Gas Regulator Station | | |
| 33 | Baker-Whitney Oil Company | 66 | Ice House Pond Dam | | |

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

May 2018

0 0.275 0.55 1.1 Miles



# Acton
## 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.

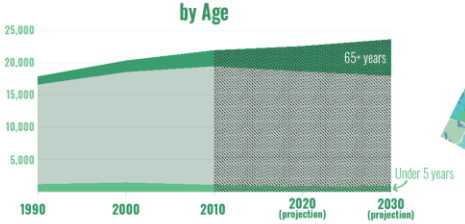
**People who may have more difficulty adapting to, preparing for, or recovering from extreme weather events:** Socioeconomic characteristics such as income and race can influence vulnerability to climate change. Low-income people are often more susceptible to financial shocks, which can occur after extreme 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.

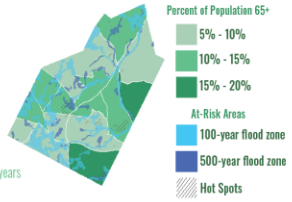
## Older Adults and Young Children

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.

### Acton Recent and Projected Population by Age



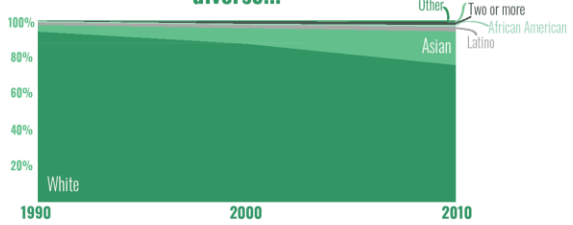

### Where Do Seniors Live?



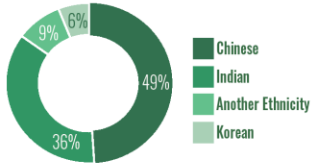

## Communities of Color

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.

### Acton is becoming more diverse...



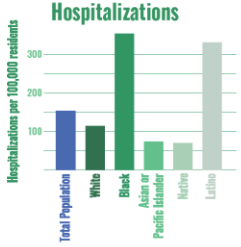

### Asian Populations in Acton




### 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

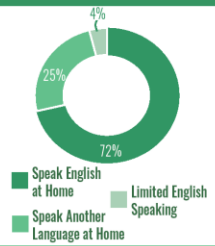



## People Living Alone  Limited English Speakers

People who live alone or people with limited English proficiency may have limited access to critical information, municipal resources, and social support systems that can bolster emergency response.


As of 2010, approximately 25% of Acton households consisted of someone living alone.

About one-third of people living alone were over 65.




## 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.

**24%** ± 3% Households in Acton that are low-income

**6%** ± 1.8% Households in Acton 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

## People Who Work Outside

People who work outside, including first responders, some town employees, construction workers, or farmers, may be at added risk from extra exposure to high heat and poor air quality.

MAPC

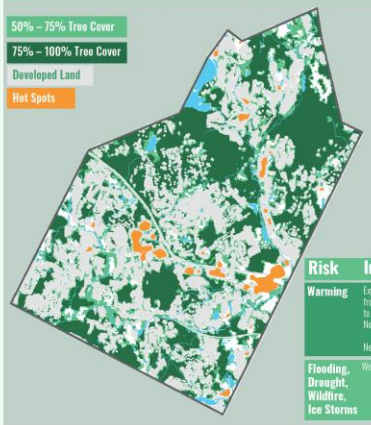
Sources:
American Community Survey (ACS) 2012-2016: United States Census 1990, 2000, 2010: MAPC Projections: Massachusetts Department of Public Health Asthma Data, 2008-2012

# Acton
## 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

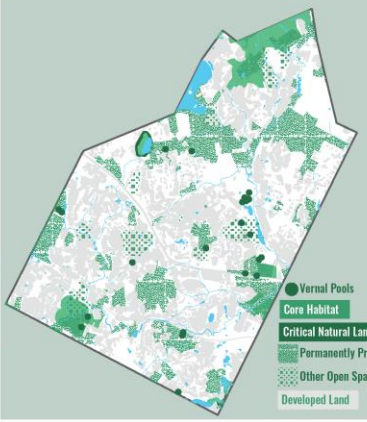
Trees are important in mitigating the impact of heat waves. According to the EPA, suburban areas with mature trees are 4-6 degrees cooler than new suburbs without trees. Shaded surfaces can be 25-40 degrees cooler than the peak temperatures of unshaded surfaces. Trees also absorb remarkable quantities 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).




| Risk | Impact |
|---|---|
| Warming | Expected to shift forest type from Maple/Birch/Beech forest to Oak/Hickory forest similar to New Jersey.<br>New pests and diseases |
| Flooding, Drought, Wildfire, Ice Storms | Weakens and damages trees |

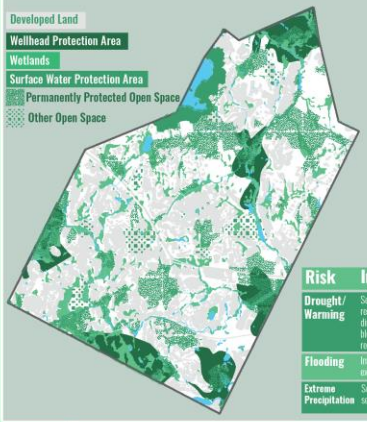
### Valuable Habitat

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.




### Freshwater Resources

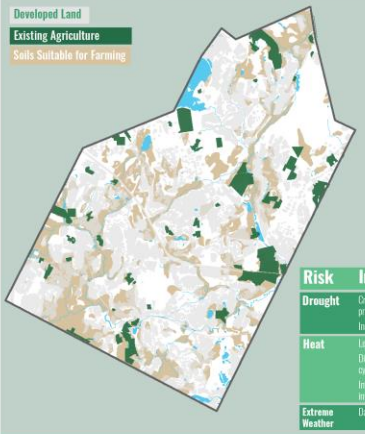
Acton contains, healthy, intact freshwater wetland systems that sustain critical ecosystem functions in climate change. These ecological assets protect drinking water quality and quantity, provide flood control, and maintain overall ecosystem health for climate resilience.




| 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 |

### Agricultural Resources

Acton has numerous farms and significant soils suitable for farming. This is a significant strength for public health, food supply, and natural resource economies.




| Risk | Impact |
|---|---|
| Drought | Crop failure or reduced production<br>Increased need for irrigation |
| Heat | Longer growing season<br>Disruption of timing of life cycles of plants and animals<br>Introduction of new pests and invasive species |
| Extreme Weather | Damage to crops |

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)