Town of Hamilton
Community Resilience Building Workshop
Summary of Findings

October 24, 2019

Community Resilience Building Workshop
Municipal Vulnerability Preparedness Program
Summary of Findings

OVERVIEW

Recent years have seen notable weather extremes in Hamilton. The winter of 2015 brought record-breaking snow, resulting in delays and shutdowns in MBTA service. The following year, Hamilton was under a drought warning from August 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 2018 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 for coastal communities.

The Town of Hamilton, 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. Upon completion of the plan and certification by the MVP program, the Town of Hamilton will be eligible to apply for MVP action grants to address identified natural hazards and climate risks.

The Town of Hamilton partnered with the Metropolitan Area Planning Council (MAPC) to complete the MVP. The MVP Core Planning Team identified and recruited community stakeholders to participate in the one-day CRB Workshop. Twenty-three people representing Hamilton Town staff, members of Hamilton Boards and Commissions, and representatives of Hamilton community organizations gathered on October 24. (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 Hamilton infrastructure, demographics, and natural resources (see Appendix).

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

TOP HAZARDS AND VULNERABLE AREAS

The Core Planning Team identified the top climate hazards facing Hamilton. Based on the review of workshop materials, the team identified flooding, severe storms (wind, snow, ice), drought and fire drought as the climate hazards of greatest concern facing Hamilton. Flooding, drought, and severe storms have all affected Hamilton in recent years. Town demographics, and the heat and tree canopy mapping pointed to extreme heat as an additional key concern.

Top Hazards

- Inland and Riverine Flooding
- Extreme Cold/Winter Storms/Snow
- Drought/Fire
- Extreme Heat and Heat Waves

CURRENT CONCERNS AND CHALLENGES PRESENTED BY HAZARDS

Participants and City 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 from nor'easters are the threat of power outages and, secondarily, difficulty clearing snow. Heavy rains result in flooding when local streams as well as locations where stormwater drainage capacity is exceeded. Primary concerns included improving water supply sources and distribution, emergency communications and cell phone service as well as improving the reliability of local electrical services and exploring other power options such as

microgrids; it was stressed that better tree and forest management was key for addressing power reliability issues.

The recent drought and extreme weather events also sparked questions about tree and forest management, stormwater management, the completion and implementation of the Miles River Vegetation Management Plan as well as the addition and management of additional open space properties to conserve water supplies and buffer against extreme heat. There was also concern about providing more diverse housing options and offering a wider array of transportation options, particularly for senior and disabled persons.

As these issues are not new, the Town of Hamilton through its emergency management activities and past 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.

AREAS OF CONCERN

Geographic:

Participants showed concern about dam safety in light of more severe precipitation events experienced under climate change. The privately owned Willowdale Dam located nearby in Ipswich on the Ipswich River could pose a risk to the Winthrop Street neighborhood if the dam failed. Also, the Winthrop Street Bridge was listed as a concern as water backs up around it during high precipitation storm events and blocks the street. Updating the bridge is one of the top priorities listed in the 2019 Hamilton Natural Hazard Mitigation Plan Update.

High heat areas shown in orange on the Natural Resources map (see Appendix) were identified as a concern. The areas are included in the hottest 5% of land area in MAPC's 101-City region. They were identified using thermal satellite imagery. As the map makes clear, these areas have relatively less tree cover. They tend to have more pavement and dark roofs. The majority of these areas are located in the downtown area of Hamilton along State Route 1A (Bay Road).

Town and nearby woodlands such as Bradley Palmer State Forest were felt to be more vulnerable to brush fires as high winds, invasive species and increased temperatures have left more brush and dead trees available for potential fires.

Societal:

Populations at risk under climate change included: seniors, the 15% of Town residents that live alone, non-English speaking residents and lower-income residents, renters, and people with health problems or disabilities. Also noted were populations living in residential facilities, senior housing and public housing. Participants were particularly concerned with barriers to emergency communication and transportation, recognized that some residents have fewer resources to prepare for, endure, and recover from, severe weather events. There was a concern that the Town has limited transportation services for people who don't drive and the effects of severe weather on those who rely heavily on automobiles to commute. There was also concern regarding the spread and impact of climate change related illnesses such as EEE and Lyme disease and how to protect exposed populations such as youth and elders.

Overall, the need for better communication on climate change preparation and emergency response between local, state and federal official and those populations with limited awareness or constrained access to information, transportation options and resources was stressed.

Environmental:

Participants noted several vulnerabilities around water issues in Hamilton including increased protection and capacity assessment of the Town's ground water supplies, particularly in regard to development pressures near Chebacco Road and the eastern part of Hamilton, the need to investigate additional water supply sources in the face of withdrawal limits and the extensive use of private wells within the Ipswich River watershed and climate induced stress to the river, and improving overall treatment and

storage capacity. Funding and implementing the Miles River Vegetation Management study as well as continuing with beaver management programs were seen as important to control flooding. The Towns' reliance on septic systems to treat wastewater and its potential impact on groundwater quality were also noted concerns but septic systems were also noted by some as a strength.

In addition, better management of both forest and the preservation/acquisition of open space to help mitigate the effects of climate change, particularly near areas prone to flooding or high heat were also listed as issues that need to be addressed. The need to update zoning to better protect critical remaining open space areas such a wetlands, floodplains, farms, subdivisions or redevelopment areas was a concern.

Infrastructure:

The need to study and take appropriate action on the Town's water supply system was highlighted. Hamilton currently relies on a single well field within the Ipswich River watershed which is regulated for withdrawals by the state. The existing water storage system doesn't currently provide adequate flow to fight fires. There was concern that groundwater regulations protecting the well field should be reviewed and that the Town plan for backup supplies in case of an extended drought. Participants stressed the need to look and plan for the overall water system-supply, treatment, waste water, storm water and infrastructure in an integrated fashion to ensure long-lasting safe operation.
In addition, Hamilton's reliance on unreliable and outdated power lines, and the need to better incorporate tree management within the electrical system, was noted as well as the lack of emergency communications capacity and overall cell phone coverage for the Town. The reliance on septic systems for wastewater treatment was felt to be a possible threat to safe water supplies for in the future. The need for a larger range of affordable housing options was noted as well as improving the Town's existing emergency shelter capacity and backup generating capacity at some of the Town's schools. The high reliance on car use for meeting almost all transportation needs was noted; some felt this limited access to medical help, and existing business and grocery stores. Other locations noted for backup generating capacity were: senior housing, and gas stations.

CURRENT STRENGTHS AND ASSETS

Workshop participants identified numerous Hamilton strengths and assets that will support resilience to future climate impacts.

- DPW Annual Tree Trimming.
- Recent Update to the Open Space and Recreation Plan.
- Capped landfill/Solar/Form/Field.
- Muni Engineering Efficiency Study.
- Fire breaks at Bradley Palmer State Forest.
- District Forest Fire Warden based out of Bradley Palmer State Forest.
- Protected forested areas.
- Water conservation practices.
- Backup Generators for Senior Centers & Public Safety Building.
- Main Roads are accessible during floods.

- Library has power during storms.
- Culverts- recently improved.
- Generators at various locations (housing authority)
- Septic waste water treatment offers flexible wastewater treatment option- seen as both strength and vulnerability.
- MBTA Commuter Rail Station & rail access.
- Swimming pool at Patton Park provides cooling option.
- Senior Center cooling room w/ generator.
- Generators throughout town at individual homes.
- New public safety facility.
- Road flooding less of a concern.
- High School/ Middle School Emergency Shelter.
- Emergency equipment on hand.
- Library shelter.
- Senior center program to provide seniors w/ phones.
- Senior lockbox program.
- Senior center teen volunteer program.
- 5 active churches.
- The Community House (Community asset & Programming)
- 4 Daycares in town.
- Town Social media.
- Code Red program Calls/ Text/ Email.
- Active food pantries: Accord, Open Door.
- Gatherings/Community spot at Senior Center.
- Opt-in outreach service during storms by Police department.
- Public housing in Town center near facilities.
- Senior Care provides site visits & services.
- Council on Aging: connecting w/older adult population during emergencies.

TOP ACTIONS TO IMPROVE RESILIENCE

Each of the four workshop groups identified vulnerabilities and suggested solutions. There was considerable overlap between the elements suggested actions. Each group then identified their three highest priorities for each of the three categories, which were reported out to the larger group and recorded by MAPC. Participants then voted for the top three actions overall using sticky dots. See Appendix A to for final results.

Top Actions

Environmental

Forestry Management- Additional funding should be directed towards Town forestry management, tree assessment and planting, pest control and overall health maintenance.

Open Space: Increase resources for open space protection. Maintain existing open space areas and prioritize future open space areas in climate vulnerable areas; help limit climate change impacts to surrounding areas by increasing the use of open space as a buffer against the effects of flooding, extreme heat, and lack of wildlife habitat.

Flooding: Complete and implement the Mile River Vegetation Management Plan.

Social

Transportation Access: Identify vulnerable populations (seniors, low income, those without landlines, immigrants, people who don't speak English) who may not be getting full access to local transportation options and help provide information about and assistance in access to these resources.

Housing: Provide a more diverse array of housing options for Town workforce, seniors and younger people; build social resilience through stronger community housing options.

Infrastructure

Utilities Plan: Upgrade electrical and cell phone service reliability. Coordinate with gas, electric and communications utilities on actions needed to improve local utility resilience in light of climate change; develop emergency preparation and action responses prior to the occurrence of extreme climate events.

Radio Communication and Emergency Response Plan: Work with Town departments to create an internal Emergency Response Memo that assesses Town radio communication needs and includes action steps to address internal communications in the face of preparing for and facing severe weather events and potential evacuation scenarios. The Memo should include multi-media coordination steps to vulnerable populations such as seniors, those living alone, disabled, non-English speaking residents and those without access to automobiles.

Water Infrastructure: Conduct a comprehensive review of the Town's water supply, regulatory protection, water delivery, water recharge, sewer and storm drain infrastructure(including roadways) for climate resilience improvements, examining back up water resources to the current ground water supplies, determining whether a water supply feasibility study is needed, improving and increasing adherence to existing and future stormwater regulations, incorporating Green Infrastructure policies and regulations, and addressing fixes to outdated stormwater drainage structures to the greatest degree possible.

Other Highly Ranked Actions

- Update the High School and Middle School emergency shelter to accommodate more people for longer emergency stays; increase kitchen amenities and add staffing.

- Increase funding for and hire additional public safety personnel.

- Continue to upgrade drainage culverts, including upgrade at Patton Park culvert. Identify and implement specific stormwater mitigation and drainage projects such as rain gardens, porous pavement and green roofs.

- To deal with the large senior aging in place population, promote the use of the Police Department's safety checklist of those who live alone, have a disability or other circumstance that would make them a good candidate for the safety checklist.

- Reduce water withdrawals, promote the use of rain barrels and cisterns, look for opportunities to reuse water for irrigation to increase stream flows and protect wetlands.

- Work with Gordon College to map the school's emergency shelters, identify where emergency generation capacity exists, evaluate medical and evacuation needs and establish coordination with the Town's public safety and emergency planning process.

Other Actions

- Update the Library's shelter capacity with generator using, use of renewable energy and satellite phone calling capacity.

- Re-evaluate and adjust the Town's zoning bylaws to make them less restrictive and allow growth of the Town's base.

- Provide more contracted van services for seniors and disabled; explore option of the Town joining the Cape Ann Transit Authority (CATA) to expand transit options.

- Create a Council on Aging neighbor to neighbor system to supplement its existing check-in program.

- Explore a larger alternate facility to using the Council on Aging facility; increase the hours and overnight staffing capacity.

- Improve communication and working relationship with the Housing Authority to better serve the needs of residents.

- Engage home health agencies in emergency preparedness training opportunities/planning.

- Engage property owners with livestock on water quality impacts generated by livestock.

- Provide backup power generation for Town Hall and the Library.
- Replace or repair the Winthrop Street Bridge.
- Explore solar farm opportunities to prevent brownout reoccurrences.
- Investigate plowed snow storage options as the Town currently does not have a site.
- Consider rooftop solar, Green Infrastructure, Green Roofs, shade structures with solar installed, cooling stations, benches, trees and landscaping to reduce paved hot spots in the downtown area.
- Install generator backup, rooftop solar and implement buddy system at all elderly housing facilities.
- Install backup generation at the Winthrop and Cutler school

12/5/16 LISTENING SESSION SUMMARY

To be added following the listening session.

CRB WORKSHOP PARTICIPANTS

Christine Berry	Division of Conservation and Recreation
Late McGuire	Housing Director-Ipswich Hamilton and Salisbury
Gary Dean	Director of Maintenance (same as above)
John Harrington	CFO Pingree School
Chris LaPointe	Essex County Greenbelt Assoc.
Wayne Costonguay	Ipswich River
Patrick Gray	Christ Church
Lorrie Manganaro	Christ Church
Patrick Wolczik	Hamilton Wenham Schools
Kim Butler	HW Library
Patrick Reffett	Planning Director
Tim Olson	DPW Director
Sean Timmons	Recreation Department
Joe Domelowicz	Town Manager
Scott Janes	Police
Ray Burnett	Fire
Anne Gero	Resident
Richard Boroff	Open Space Committee
Tom Geary	Resident
Michelle Rowdon	Resident

CRB WORKSHOP PROJECT TEAM

Hamilton Core Team

Patrick Reffet	Director of Planning and Inspections, primary contact
Scott Janes	Police Department
Joe Domelowicz	Town Manager
Michelle Lee Carroll	Assistant to the Town Manager, primary contact
Peter Cobb	DPW
Anne Gero	Resident
Kristen Grubbs	Ipswich River Watershed Association
Joan Wolkin	Resident
Raymond Burnett	Fire Department

Facilitation Team

Sam Cleaves	Metropolitan Area Planning Council (Lead Facilitator)
Ella Wise	Metropolitan Area Planning Council
Courtney Lewis	Metropolitan Area Planning Council
Jeanette Pantoja	Metropolitan Area Planning Council
Lizzie Grobbel	Metropolitan Area Planning Council

CITATION

Metropolitan Area Planning Council. 2019. Town of Hamilton Municipal Vulnerability Preparedness Program. Community Resilience Building Workshop Summary of Findings. Hamilton, Massachusetts

ACKNOWLEDGEMENTS

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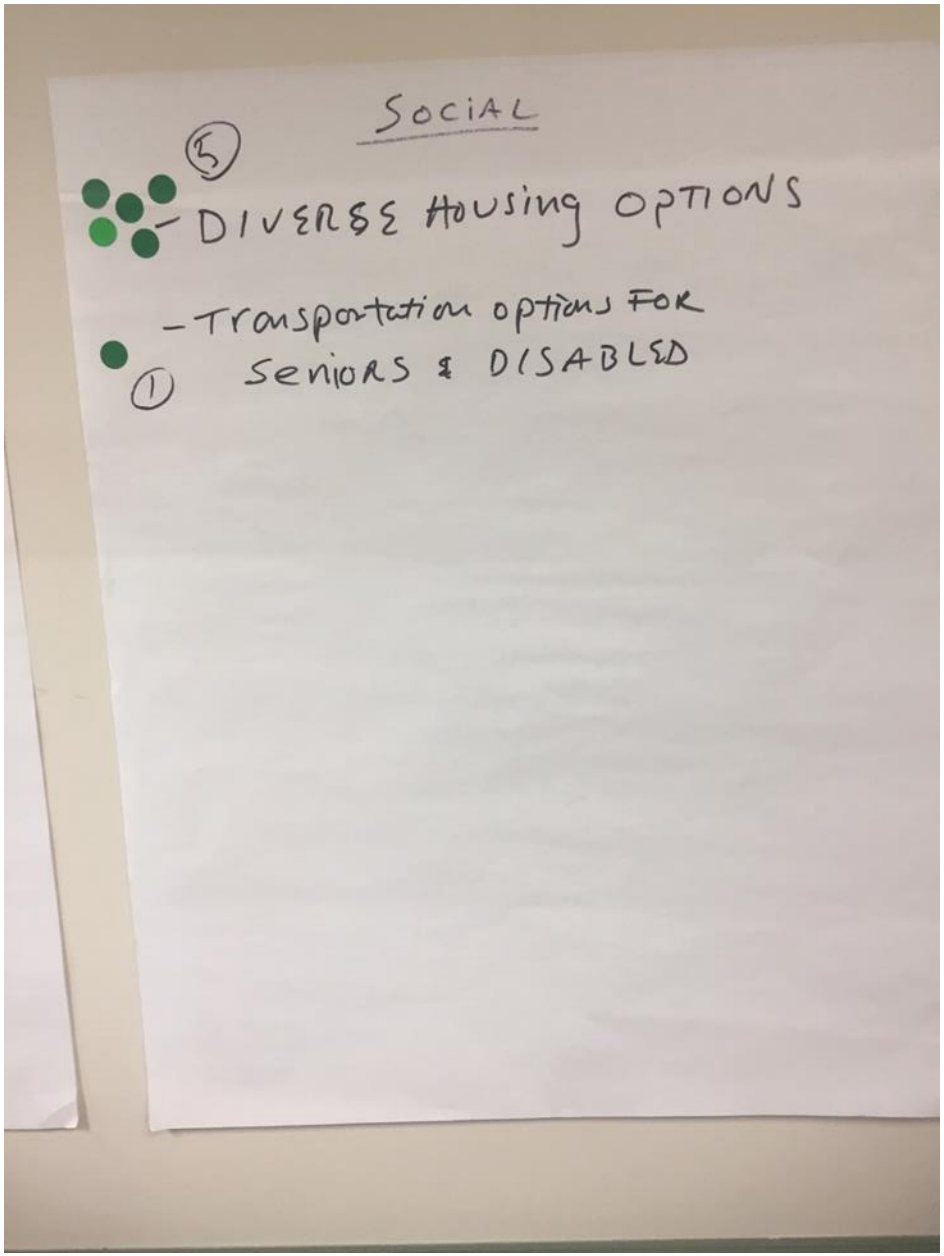
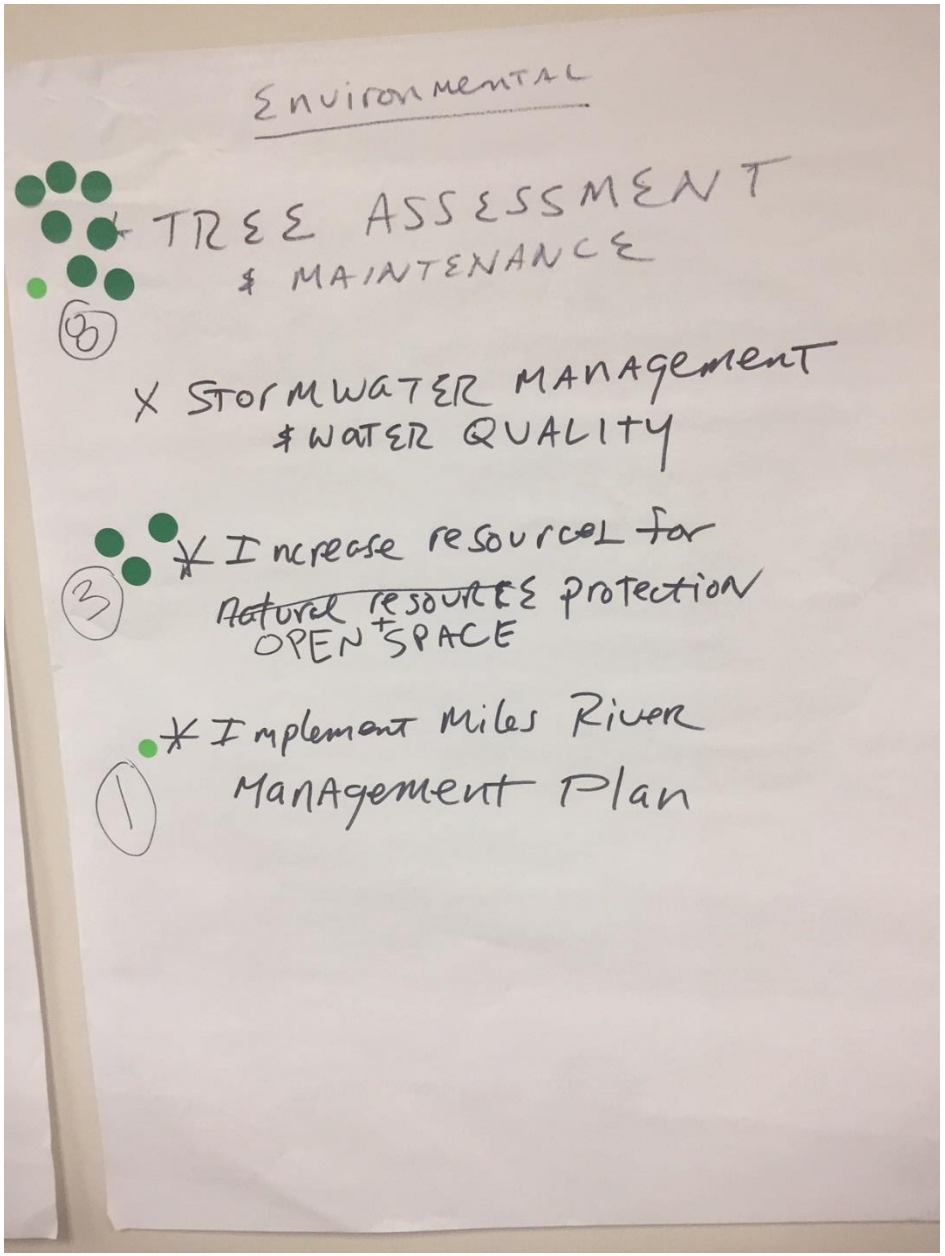
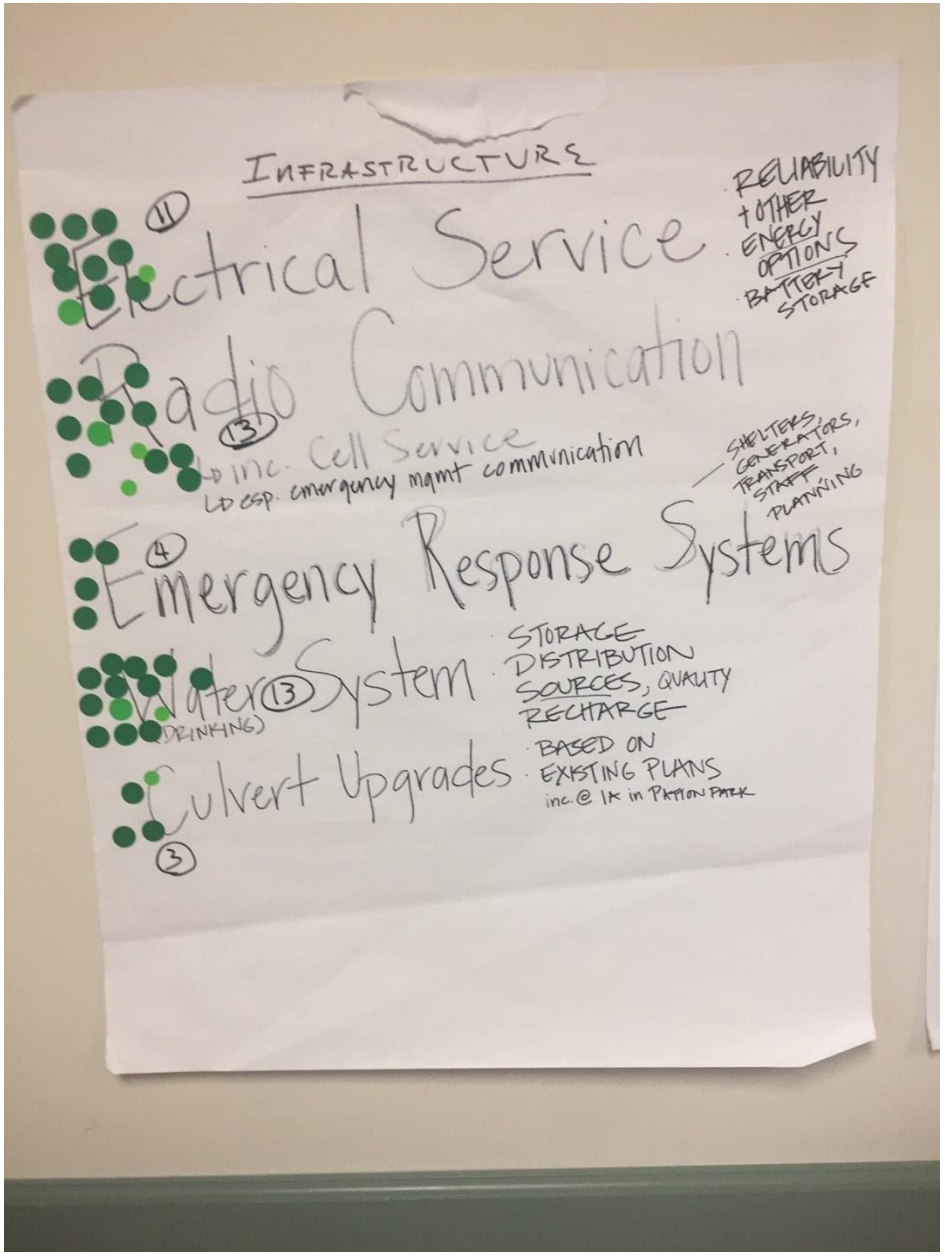
APPENDIX A – ACTION PRIORITIZATION, BASE MAP, AND WORKSHOP MATERIALS

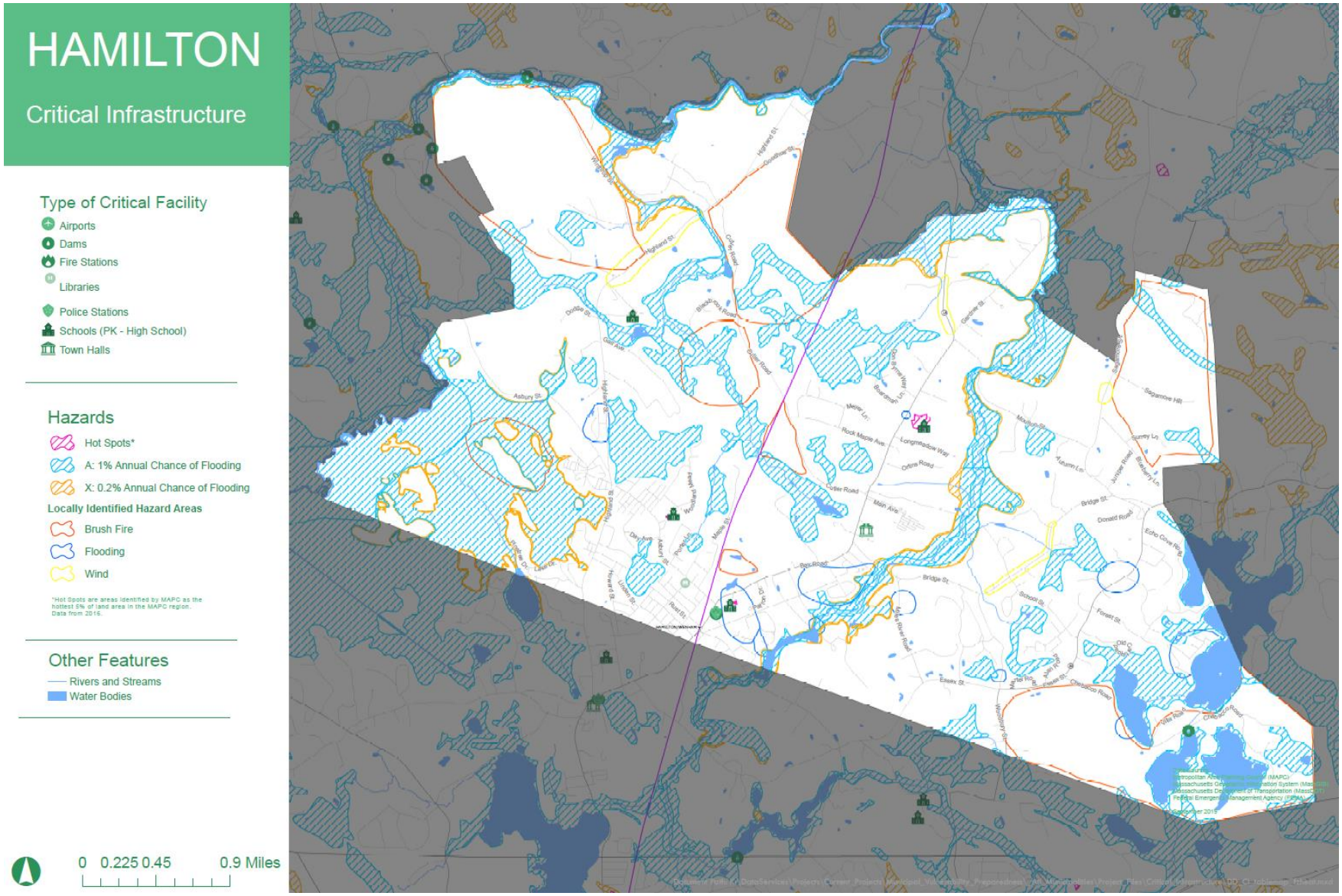
Action Prioritization




Environmental
* TREE ASSESSMENT & MAINTENANCE
8
X STORMWATER MANAGEMENT & WATER QUALITY
3
* Increase resources for ~~Natural resource~~ protection OPEN SPACE
1
* Implement Miles River Management Plan

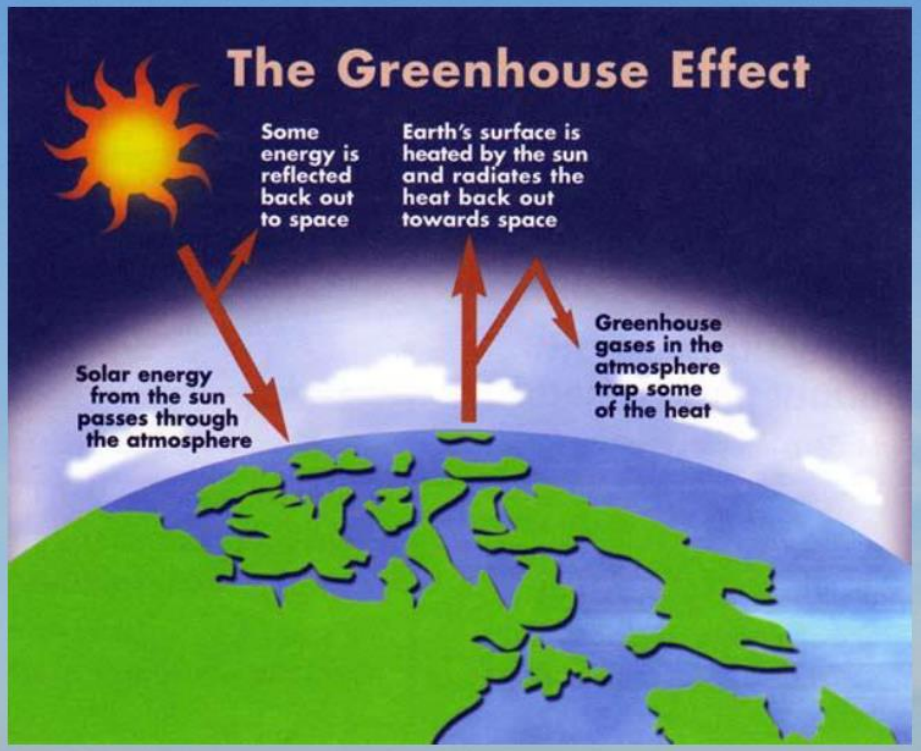

INFRASTRUCTURE
11
Electrical Service
· RELIABILITY + OTHER ENERGY OPTIONS
· BATTERY STORAGE
Radio Communication
13
→ inc. Cell Service
↳ esp. emergency mgmt communication
4
Emergency Response Systems
— SHELTERS, GENERATORS, TRANSPORT, STAFF PLANNING
Water (DRINKING) 13 System
· STORAGE
· DISTRIBUTION
· SOURCES, QUALITY
· RECHARGE
Culvert Upgrades
· BASED ON EXISTING PLANS
inc. @ 1K in PATION PARK
3

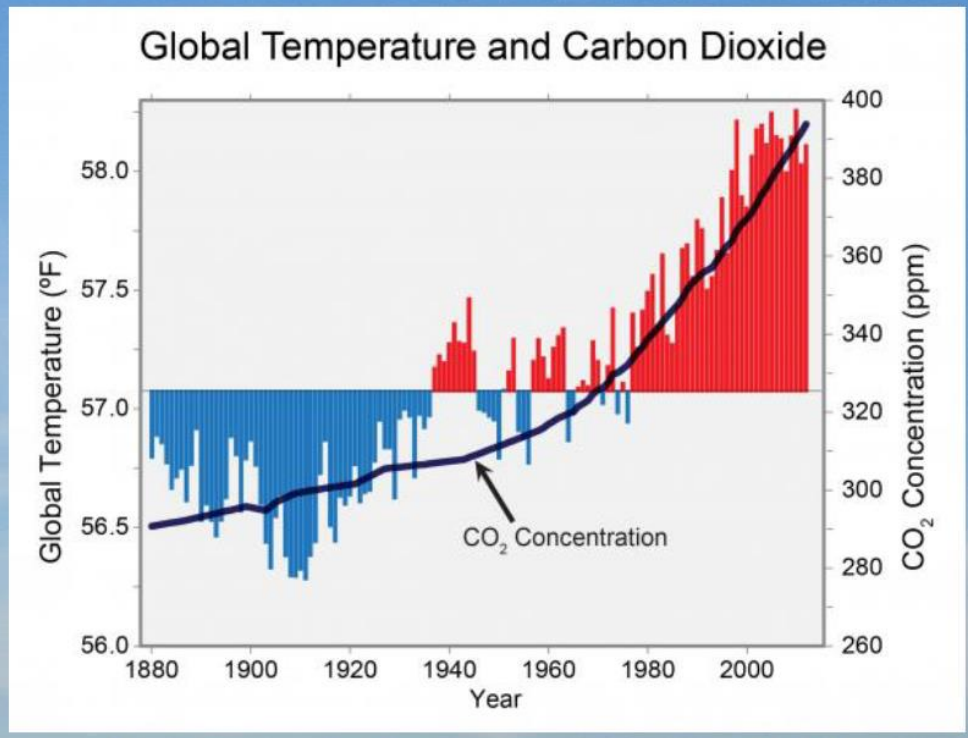
Base Map


HAMILTON
Critical Infrastructure
Type of Critical Facility
Airports
Dams
Fire Stations
Libraries
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
Brush Fire
Flooding
Wind
*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
0 0.225 0.45 0.9 Miles

Power Point

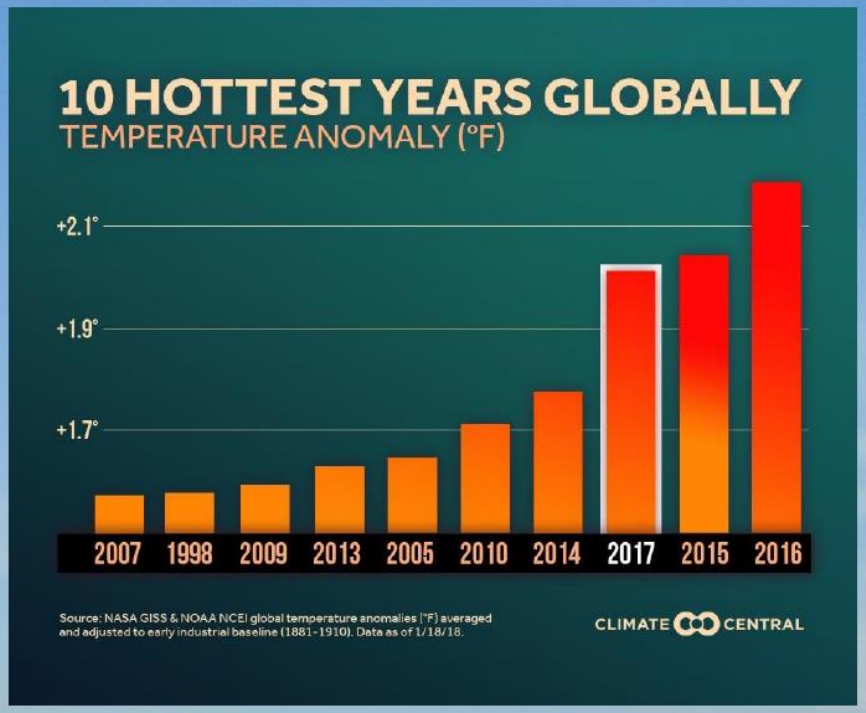
Our Warming Planet



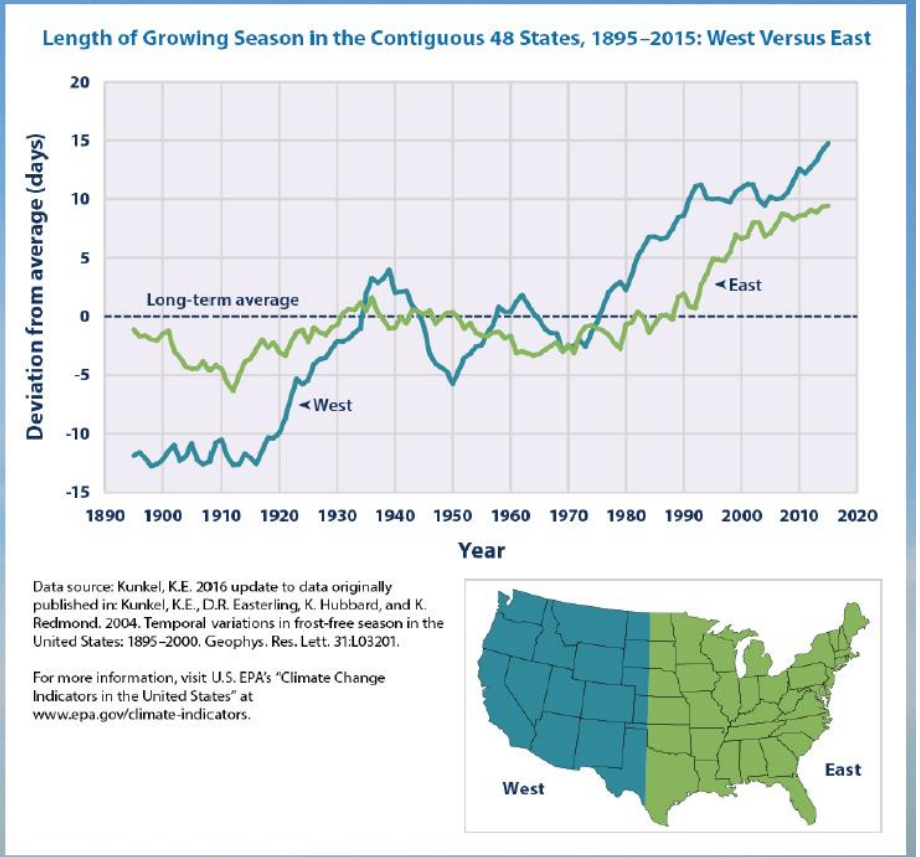


US National Climate Assessment 2018

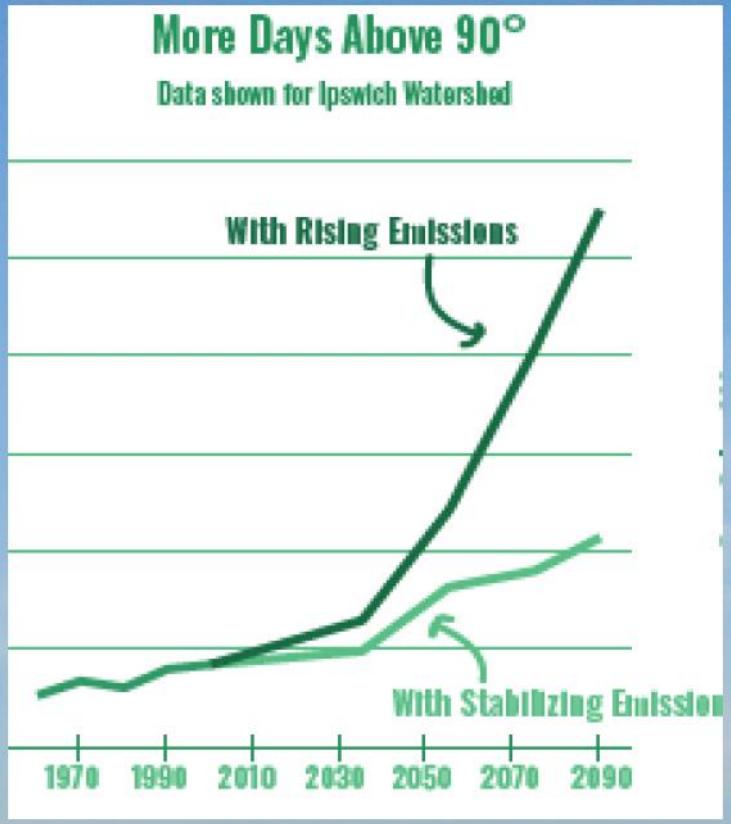
Climate Change: Temperature Observed

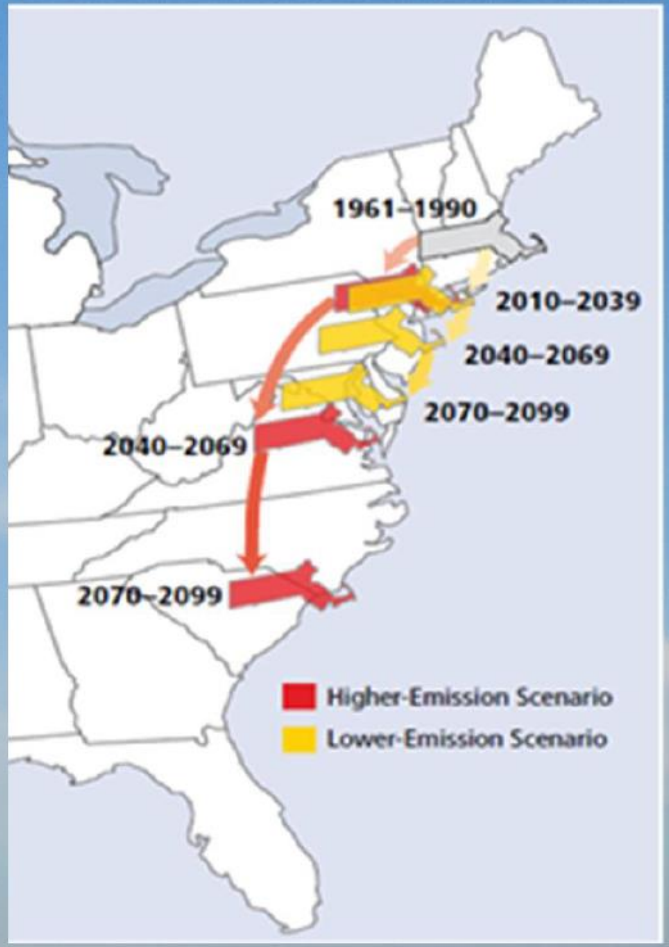


Source: Nasa GISS & NOAA NCEI global temperature anomalies adjust to early industrial baseline (1881-1910)



Climate Change: Temperature Projected





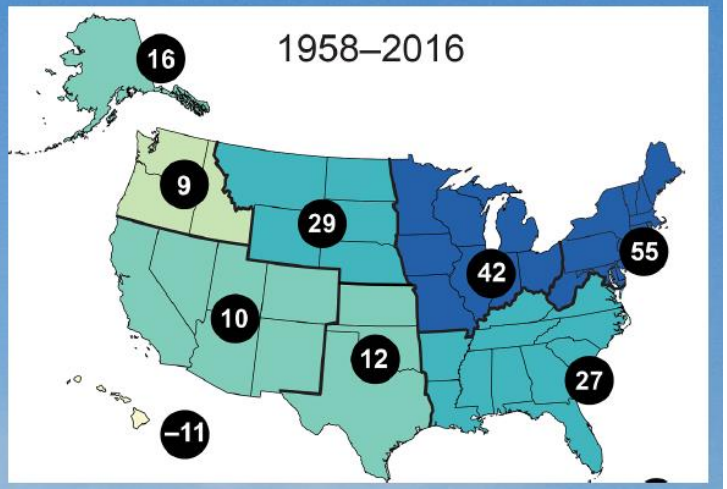
Nearly 39 days > 90 degrees by 2050

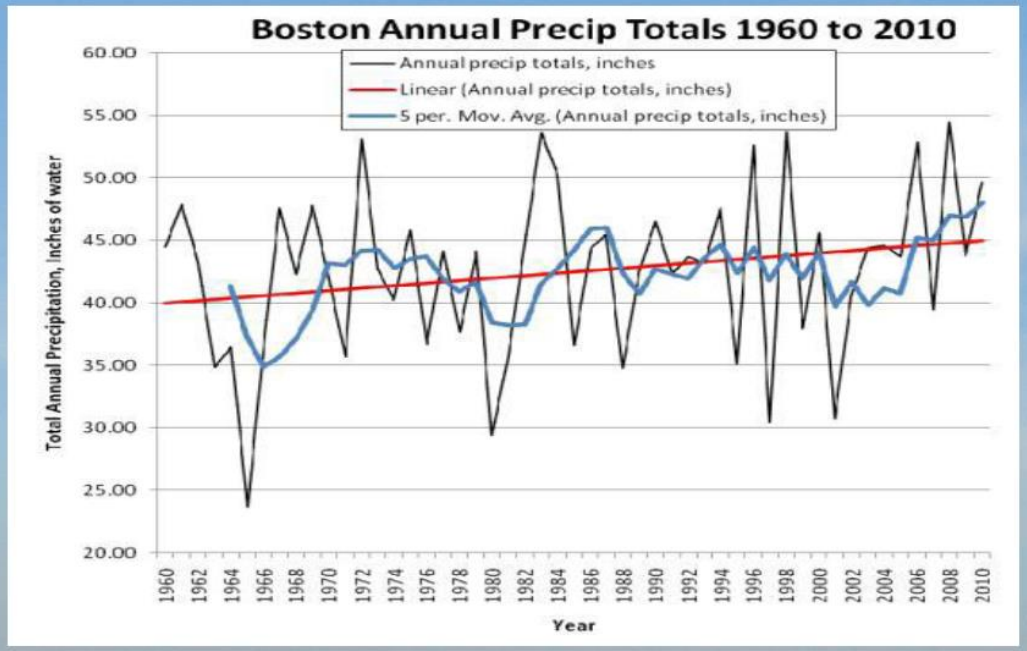
Nearly 59 days > 90 degrees by 2090

Precipitation Change: Observed

For the northeast US: 55% increase in the amount of rain that falls in the top 1% events from 1958 – 2016

(Source: The Fourth National Climate Assessment, 2018).

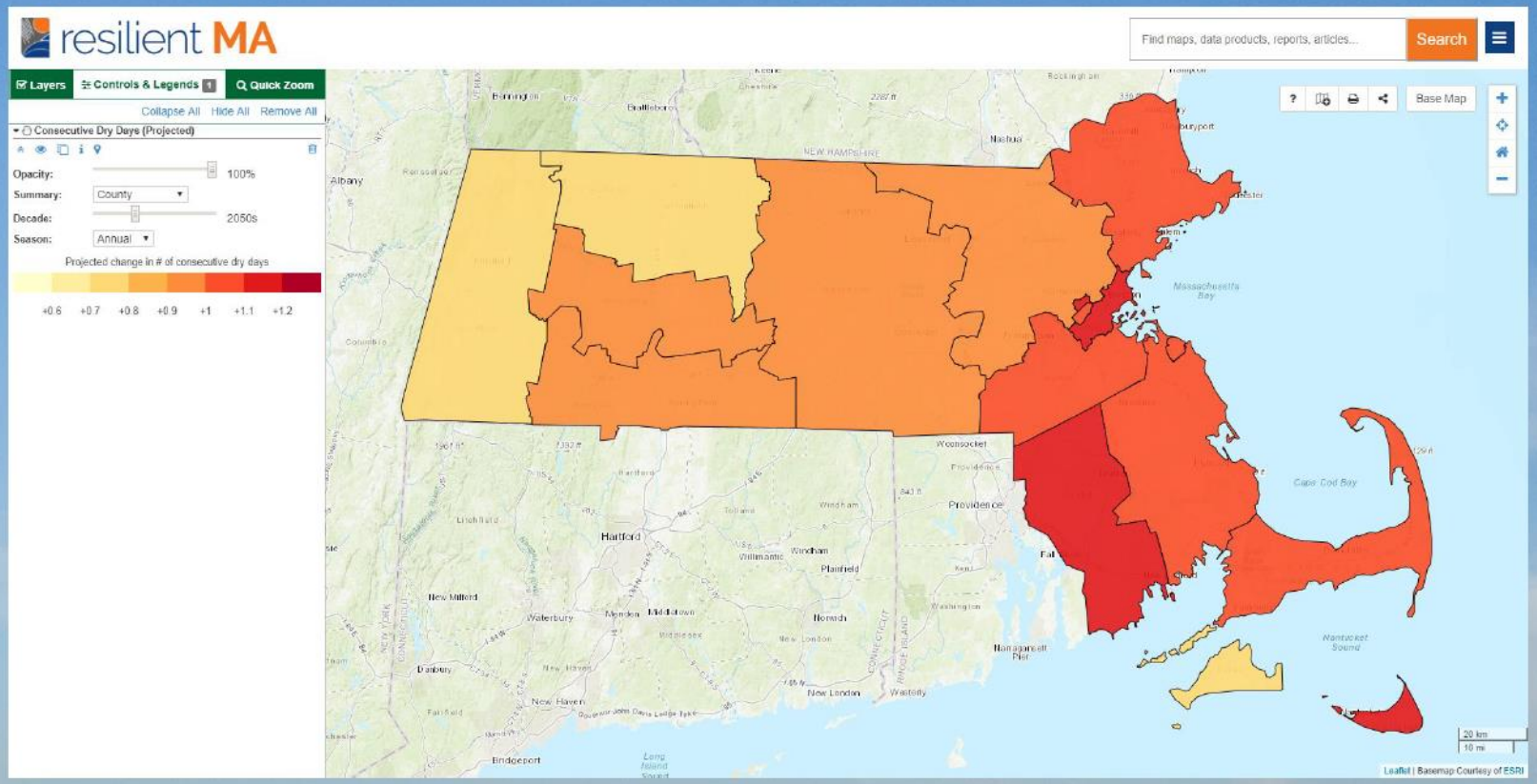




Source: MA Climate Change Adaptation Report 2011

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

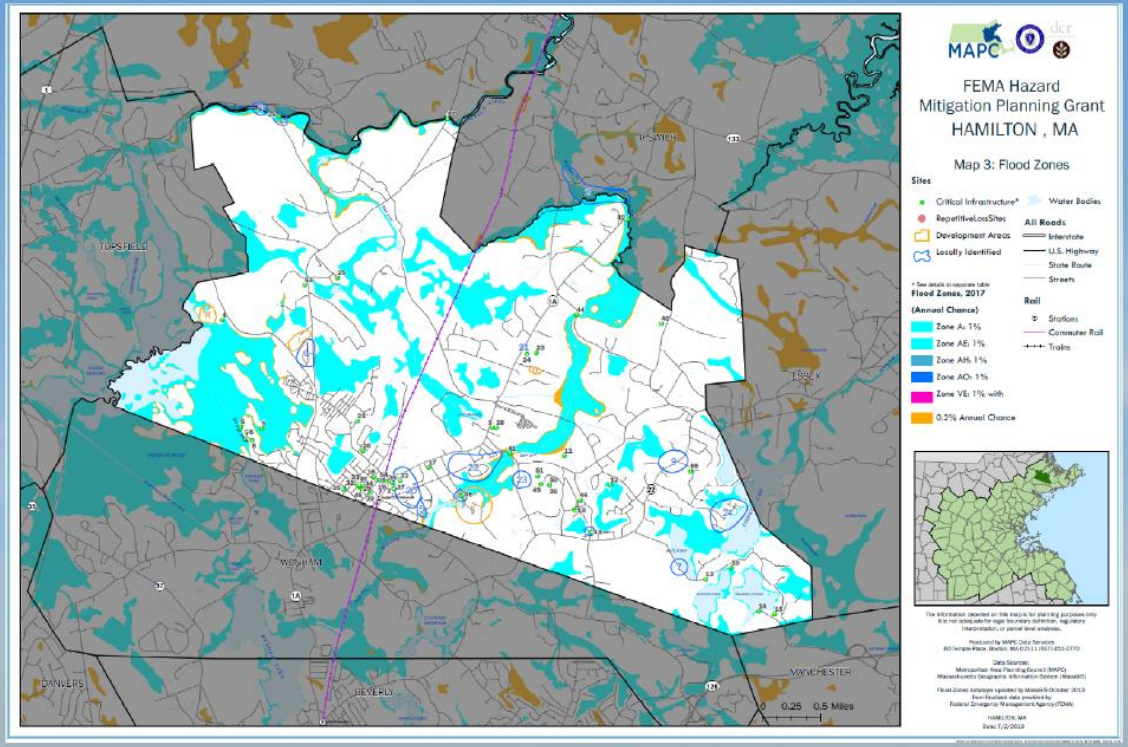
Precipitation Change: Projected Dry Days 2050



Consecutive dry days increase from 17 days to 18 days annually by 2050.

www.resilientma.org/map

Building on Recent Work: Hamilton Hazard Mitigation Plan



Flood Hazard Areas

- Woodbury Street culvert/ beaver-induced flooding
- Beaver dam at New England Biolabs
- Winthrop Street Bridge
- Flooding at Bay Road and Patton Park
- Miles River Road
- Bay Road across from High School

Critical Facilities

55 sites identified including:

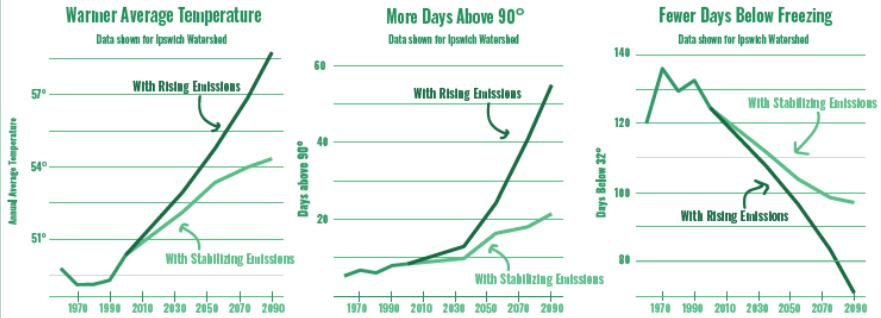
- **Disaster response sites (Fire and Police stations, DPW)**
- **Sites requiring assistance such as elderly housing**
- **Places of assembly**
- **Critical infrastructure (dams, pump stations)**

Climate Change

Hamilton and the Ipswich 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, Hamilton 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 inadequate as rainfall increases

Expected size of a 10-year, 24-hour storm

- **4.5 inches** — 1961 Observed Rainfall (NOAA) for Eastern MA
- **5.12 inches** — 2017 Precipitation Frequency (NOAA) for Hamilton
- **5.6 inches** — Cambridge Rainfall Projections, 2015 - 2044
- **6.4 inches** — Cambridge Rainfall Projections, 2055 - 2084

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.

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

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.

MAPC

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

HAMILTON

Critical Infrastructure

Infrastructure will be at risk to damage from flooding, and loss of function due to power outages. Increasing large rainfall events may subject roads, bridges, dams and buildings to more frequent or severe flooding. Areas that don't flood today may become vulnerable. FEMA flood zones reflect only current conditions, although the .2% (500-year) flood zones may indicate where future flooding will occur. FEMA flood zones also do not generally capture stormwater flooding. That is, flooding that exceeds the capacity of current stormdrains and culverts. We don't currently have models that project where future flooding from larger rain events will occur. Power outages affecting infrastructure and communications may become more frequent as result of high energy demand during heat waves. Winter outages could be caused by ice storms if warming results in temperatures hovering around freezing. The potential for more intense hurricanes could cause outages due to falling trees. Finally, buildings, roadways, and railways can be stressed by extreme heat. Heat can cause damage to expansion joints on bridges and highways, and may cause roadways to deteriorate more rapidly.

Type of Critical Facility

- Water Infrastructure
- Composting Facility
- Power Substation, Gas Pipeline
- Hazardous Material Site
- Emergency Operations Center
- Public Safety
- Communications
- Federal Office
- Dam, Bridge
- Elder Housing
- Place of Assembly
- Library
- Senior Center
- Schools, Child Care
- Municipal

Other Features

- Rivers and Streams
- Water Bodies

Hazards

- Hot Spots*
- A: 1% Annual Chance of Flooding
- X: 0.2% Annual Chance of Flooding

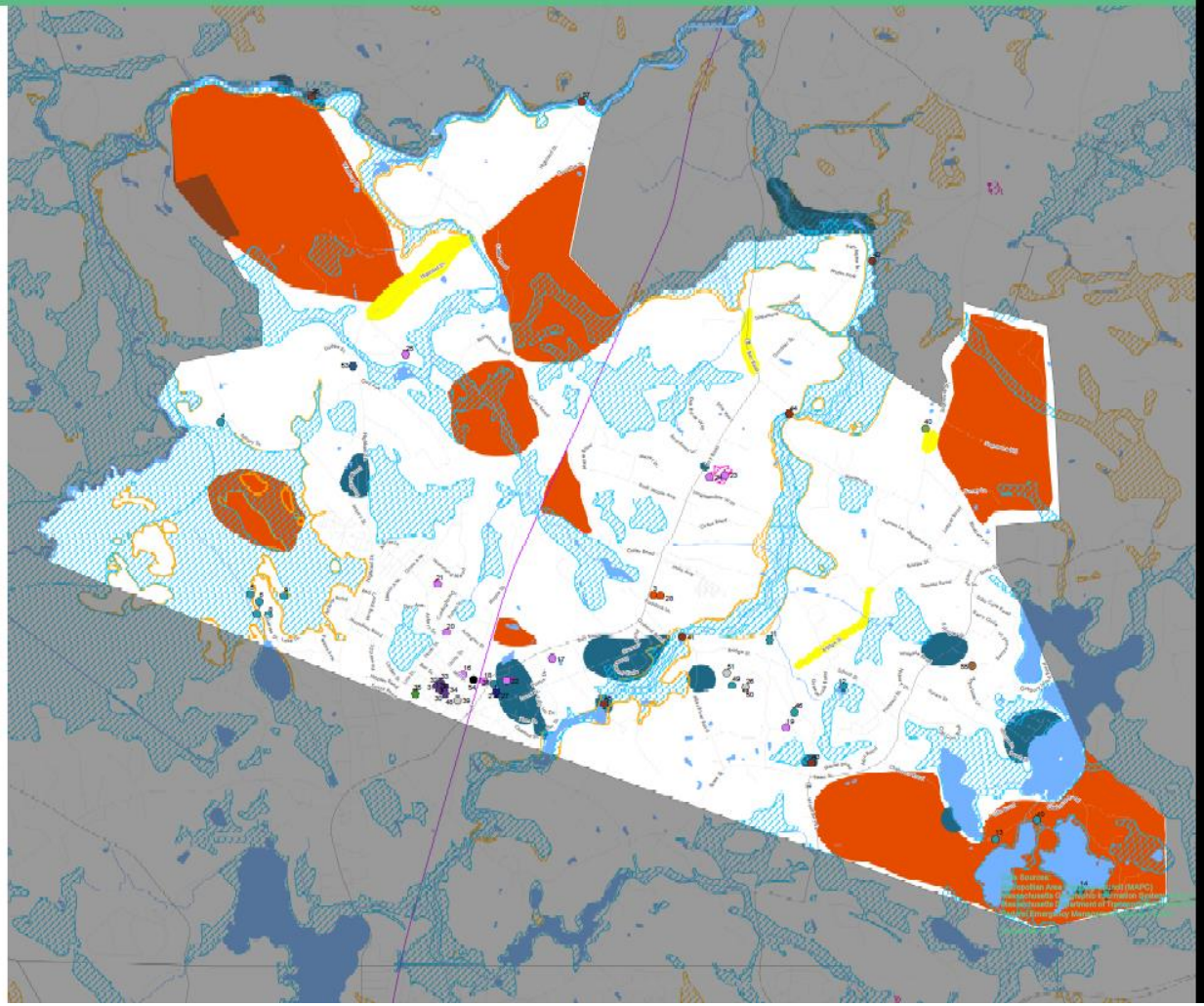
Locally Identified Hazard Areas

- Brush Fire
- Flooding
- Other

*Hot Spots are areas identified by MAPC as the hottest 1% of land area in the MAPC region. Data from 2016.

Label	Name
1	Hamilton Police Department
2	Hamilton Fire Department
3	Town Hall
4	Patton Well
5	Idlewood Well #1
6	Plateau Well
7	Caisson Wells
8	Hamilton Water Treatment Plant
9	Idlewood Well #2
10	Round Pond Well #1
11	Bridge St. Tub Wells (Out of Service)
12	School Well
13	Round Pond Tub Well #2
14	Gravelly Pond
15	Manchester Water Treatment Plant
16	Kids' Connection
17	Children's Development Center
18	Hamilton-Wenham Community House
19	Gordon-Conwell Nursery School
20	Christ Church Parish Day School
21	Cutler Elementary School
22	Winthrop Elementary School
23	Miles River Middle School
24	Hamilton-Wenham Regional High School
25	Pingree School
26	Gordon Conwell Theological School
27	Hamilton-Wenham Communications Ctr.
28	Hamilton Dept. of Public Works
28	Hamilton Dept. of Public Works
29	Brooks House (Hamilton Housing Authority)
30	Hamilton Elderly Housing
31	Lawson Hall (Hamilton Housing Authority)
32	Hamilton Elderly Housing
33	Hamilton Elderly Housing
34	Hamilton Elderly Housing
35	Hamilton-Wenham Library
36	Winthrop St. Bridge (Ipswich River)
37	Highland St. Bridge (Ipswich River)
38	Hamilton Annex (Old Library)
39	Veritas Building
40	Sagamore Hill Solar Observatory (USAF)
41	Bridge St. Bridge (Miles River)
42	Gardner St. Bridge (Miles River)
43	Woodbury St. Bridge
44	Moulton St. Bridge (Miles River)
45	Myopia Dam & Bridge
46	Gordon-Conwell Sewage Treatment Plant
47	Hamilton Elderly Housing
48	Devereux House
49	Subsurface Water Storage Tank (850,000 g)
50	Communication Tower (Commercial)
51	Public Safety Communications
53	Brickland Farms
54	Lawson and Walsh Oil Company
55	TENNECO Gas Pipeline

0 0.25 0.5 1 Miles



Hamilton

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.

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. 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, access sufficient food, 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.

Low Income Households

32% ± 6.2% Households in Hamilton that are low-income

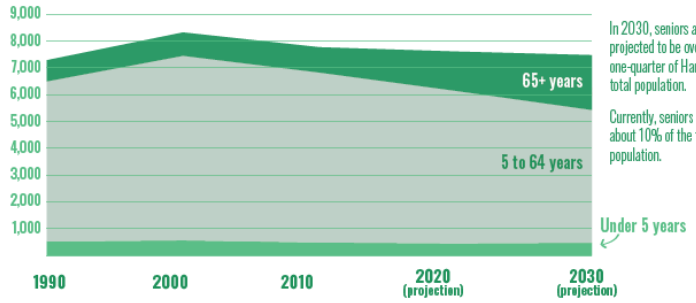
6% ± 2.6% Households in Hamilton that are below poverty level

*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

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.

Hamilton Recent and Projected Population by Age



In 2030, seniors are projected to be over one-quarter of Hamilton's total population.

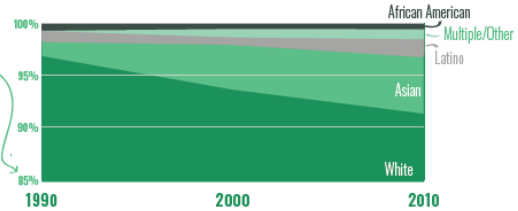
Currently, seniors are about 10% of the total population.

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.

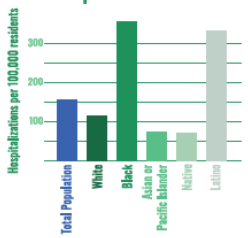
Hamilton is becoming more diverse...

Over 90% if residents are white, but populations of color have increased since 1990.

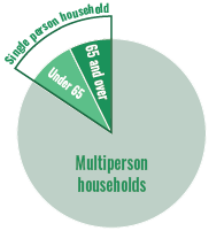


People with Health Conditions

Massachusetts Asthma Hospitalizations



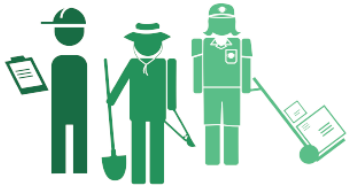
People Living Alone



As of 2010, about 15% of Hamilton households consisted of someone living alone.

About 50% of people living alone were over 65.

People Who Work Outside



People who work outside on the land or on water, including first responders and other town employees, construction workers, or landscapers, may be at added risk from extra exposure to extreme weather and poor air quality.

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

Hamilton

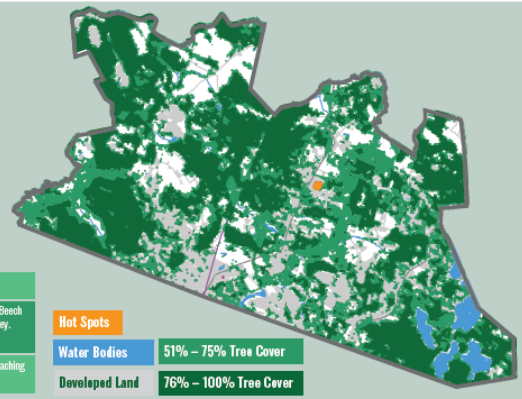
Natural Resources

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

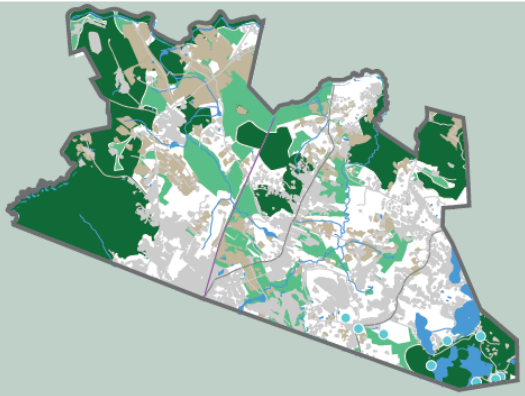
Trees are important in mitigating the impact of heat waves. According to the EPA, suburban areas with mature trees are 4-6 degrees cooler than new suburbs without trees. Shaded surfaces can be 25-40 degrees cooler than the peak temperatures of unshaded surfaces. Trees also absorb remarkable quantities 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. New pests and diseases
Flooding, Drought, Wildfire, Ice Storms	Impaired waters, toxic exposure, contaminant leaching



Critical Habitat

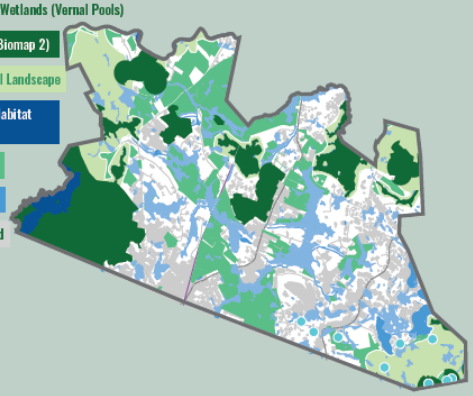
Core Habitat and Critical Natural Landscapes are state-identified intact landscapes, or exemplary natural communities, that are better able to withstand climate stresses, and support the long-term survival of rare species and natural habitats.



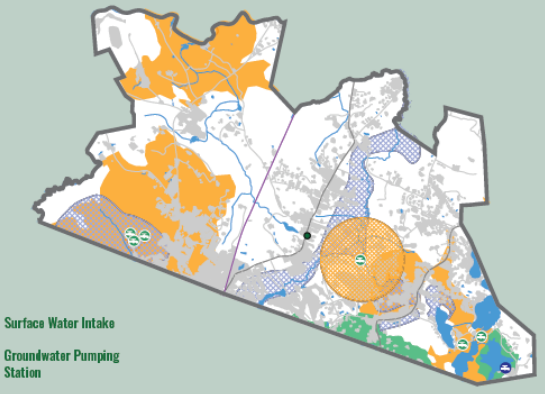
Freshwater Resources

Hamilton contains, healthy, intact freshwater 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



Drinking Water Resources



MAPC

Sources:
MassGIS (Bureau of Geographic Information): BioMap2: Conserving the Biodiversity of Massachusetts in a Changing World; MassGIS (Bureau of Georgraphic Information): National Land Cover Database (NLCD); Massachusetts Department of Fish and Game; Massachusetts Department of Environmental Protection; Massachusetts Department of Transportation (MassDOT); Federal Emergency Management Agency (FEMA); Metropolitan Area Planning Council

APPENDIX B – TABLE MATRIX RESULTS

Participants were divided into small groups identified as Yellows, Blue, Green, or Red. Concerns were categorized as Environmental, Infrastructure, or Societal. Participants identified climate-related strengths and vulnerabilities for Hamilton. Solutions were proposed for the vulnerabilities. Solutions were then prioritized as High, Medium, or Low. Each table was asked to identify their top three priorities. The information was recorded in a matrix for each table and is reproduced in the chart below.

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Green	Society	Senior center program to provide seniors w/ phones	S	Continue to promote & offer services to senior population	L
Green	Society	Senior lockbox program	S	Continue to promote & offer services to senior population	L
Green	Society	Senior center teen vol. program	S	Continue to promote & offer services to senior population	L
Green	Society	Gordon Campus/ Faith based Org.	S/V	Continue task efforts with Gordon Admin	M
Green	Society	Hamilton Housing Auth./ Senior Population	S/V	Improve communication and working relationship with the Housing Authority to better serve the needs of residents.	M
Green	Society	Christ Church- Evac zone United Med Church Community Churches in general	S	Work with faith based organizations to explore joint public/ community facilities	L
Green	Society	The Community House (Community asset & Programming)	S	Continue communication with Community House to explore possible shelter opportunities	L

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Green	Society	4 Daycares in town	S		
Green	Society	Town Social media	S		
Green	Society	Code Red program Calls/ Text/ Email	S		
Green	Society	Town Food Bank Pantry			
Green	Infrastructure	Powerlines & Outdated Infrastructure	V	Directly Sources of power to the town and identify opportunities to incorporate micro grid and other alternatives + tree maintenance	H
Green	Infrastructure	Cell Phone Coverage	V	Development of new cell towers & back up gen to power them	H
Green	Infrastructure	Back up Gens for Senior Centers & PS Building	S		
Green	Infrastructure	No backup generator in High Schools, Town Hall, Library.	V	Identify alt/resilient power sources for power during major storm events	H
Green	Infrastructure	Main Roads are accessible during floods	S	Encourage study & implementation	
Green	Infrastructure	Flood Mitigation	V	Increase Calvert size at 1AB Patton Park to handle future storm events. Flood mitigation study & implementation including Miles River Task force	H

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Green	Infrastructure	Commuter Rail Station	S	Promote commuter rail use and improve communication between the town and MBTA	L
Green	Infrastructure	Water Supply during a drought event	V	Identify alternate drinking water sources	H
Green	Infrastructure	Protecting Groundwater Supply	V	Review ground water by law to determine if more protective measures can be taken to address climate resilience & future water supply	H
Green	Infrastructure	Library has power during storms	S		
Green	Infrastructure	Contracted van services for elders	S/V	Explore options of the town joining CATA to expand transit options	M
Green	Environment	Beaver Dams	V	Study and create a plan for the removal of beaver dams and invasive species	M
Green	Environment	Invasive Plantings	V		
Green	Environment	Miles River Corridor	S/V	Continue work on the Miles River Corridor	H
Green	Environment	DPW Annual Tree Trimming	S		
Green	Environment	Large amount of Open Space	S/V	Explore and implement open space bylaws that ensure future protection of open space wetlands.	M
Green	Environment	Large amount of Wetlands	S/V		

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Green	Environment	Chebacco Rd. Pond & ground/drinking water protection issues Manchester	S/V	Consider eastern portion of town for higher protection of ground water.	H
Green	Environment	Update to the OSRP	S	Finish and adapt plan	M
Green	Environment	Development Pressure surrounding Chebacco Rd.	V		
Green	Environment	Water supply/Wells assessment	V	Continue existing well study to include/address future climate projection	M
Green	Environment	Capped landfill/Solar/Form/Field	S		
Green	Environment	Muni Engineering Efficiency Study	S	Conduct a study of the library, public safety building and water treatment plant	
Red	Infrastructure	Culverts- recently improved	S	Continue to upgrade/improve based on existing inventory in HMP & regil watershed plan	H
Red	Infrastructure	Culverts	V	Keep improving	H

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Red	Infrastructure	Gregory island residences	V	Further elevate the road (already did elevate)	L
Red	Infrastructure	Dirt Rd. Bridge on Winthrop Street	V	Repair/replace bridge	M
Red	Infrastructure	Close proximity to Beverly Hospital but no medical in Town	V/S	S: Fire provides EMS services S: No facility to protect/maintain V: In case of no access to Beverly. Emergency plan for her medical services	H
Red	Infrastructure	Town water reliant on 1 well field	V	Pursue regional alternatives generally-not only emergencies	H
Red	Infrastructure	Generator to provide day shelter & food provided	S	Maintain & continue promotion-most people know it exists	

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Red	Infrastructure	Generators at various locations (housing authority)	S		
Red	Infrastructure	Septic town	S	Diversified system	
Red	Infrastructure	Dam on Ipswich Road. If damaged would flood Winthrop Street	V	Remove dam	M
Red	Infrastructure	MBTA Station & rail access	S	No action	
Red	Infrastructure	Roads that flood even though some have been clear	V	Culvert and stormwater upgrades	H
Red	Infrastructure	Utility lines & power outages	Major V	ID hazards, tree removal included on private property. Strengthen structure/wires	H

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Red	Infrastructure	60% of Town & 2 days of school out	V	Regional reinforcements in case of storm events. Decentralized power supply at Household level. Education	
Red	Infrastructure	Swimming pool at Patton Park provides cooling but sunny	S		H
Red	Infrastructure	Senior Center cooling room w/ generator	S		
Red	Infrastructure	Generators throughout town at individual homes	S		
Red	Infrastructure	New public safety facility	S		
Red	Infrastructure	Lack of affordable housing	V	More affordable housing. Diversify housing supply	

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Red	Society	15% of residents living alone	V	More Town outreach; list with Police safety list	M
Red	Society	Tendency to "age in place" might have community but living alone & isolated	V/S	Promote & encourage people to use existing police checklist. ID households that are vulnerable & haven't opted	H
Red	Society	Active food pantries accord, open door	S		
Red	Society	Gatherings/Communit y spot at senior center	S		
Red	Society	Youth, no generators at School, rec. center	V	Get generators for schools. Factor in co-sharing for regulatory system	M
Red	Society	Seasonal housing but w/ some year-round houses that is "unique"	V/S		

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Red	Society	Opt-in outreach service during storms by Police department	S	Increase & continue to promote	H
Red	Society	Public housing for folks w/ dev. Disability	V/S	Reach out to Department of Mental Health about vulnerability & resiliency action	M
Red	Society	Public housing in Town center near facilities	S		
Red	Society	5 Active churches	S	Reach out to religious centers on role in resiliency	M
Red	Society	Seminary- fairly independent	S		
Red	Society	SeniorCare provide site visits & services	S		

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Red	Society	Low/adequate staffing of police		Increase staffing for shelter staff in case of power outage & emergency (volunteer & paid)	M
Red	Society	Opt-in "code red" town calls resident	S	Promote so more people option	
Red	Society	Social media from Town & Public safety	V/S	Dependent on electricity & service	
Red	Society	Fairly well-integrated across race	V/S		
Red	Society	Most residents are aware of climate change	V/S		
Yellow	Infrastructure	Electrical service to trees/weather	S/V	More tree clearance, communication w/ national grid. Encouraging residents to plan for outages (Back up Generation)	H

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Yellow	Infrastructure	Water supply quality, permitting	V	Need overall water plan	H
Yellow	Infrastructure	Winthrop Bridge potential for blocking	V	Routine inspections Clear blockages Advocate for healthy rivers	L
Yellow	Infrastructure	Trees blockage of road	V/S	Routine assessments More clearance Bucket truck	H
Yellow	Infrastructure	Cell Phone – wireless comm. locking	V	Encourage adaptation cell infrastructure. New tower going up by town hall	H
Yellow	Infrastructure	2-way radio emergency dispatch lack of coverage repeaters lacking	V	Investigate coverage area Capital plan for upgrades Explore regional grant/ procurement opps.	H
Yellow	Infrastructure	No coverage all ind. Septic	V	Legislation to allow communities In area to connect to MRWA system. Funding board of health septic	M

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
				maintenance education/ oven	
Yellow	Infrastructure	No emergency generators in several muni buildings	V	Investigating need, SRES/ Capital planning → grant apps	H
Yellow	Infrastructure	Schools have generators but don't power buildings	V	Capital planning For generators Explore use as shelters (emergency)	H
Yellow	Infrastructure	Have had 1-2 brownouts in last 5 years	V	Solar generation Energy efficiency. Muni buildings Green communities designee	L
Yellow	Infrastructure	Shelter highly limited capacity	V	Needs to be sized appropriately In capacity for seniors, more kitchen amenities + adequate staffing	M
Yellow	Infrastructure	Road flooding less of a concern	S	Explore additional shelter spaces : Schools/Community Houses	

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Yellow	Infrastructure	Code red (not everybody is signed up)	S/V	More public outreach Another sign-up campaign	H
Yellow	Infrastructure	Lack of storage for snow	V	Open convo w/ adjacent Properties + Large property owner Volunteer program	L
Yellow	Infrastructure	Three gas stations, no back up power	V	Policy to allow gas station 24/7 operation w/back up power capacity	M
Yellow	Infrastructure	Water tank capacity don't meet water flows	V	Preferred location: Billy's Hill (Private) Sagamore not preferred based on modeling	H/M
Yellow	Infrastructure	Distribution system imp. To meet fireflow (in progress)	V	Upgrades in progress-continue	M
Yellow	Infrastructure	Lots of private roads - Maintenance, utilities, snow operation	V	Private investment Property owner education Town policy update	M

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Yellow	Society	No back up power in senior housing	V	Encourage to get back-up generators	H
Yellow	Society	Storm related transportation barriers	V	Explore ride share, CATA, ride services	H
Yellow	Society	Limited transportation services for people who can't drive	V	Develop standard operating procedures & participate in MBTA lift program or similar alternatives (Ride hailing)	M
Yellow	Society	COA may have a check-in program but no formal neighbors-neighbor system	S/V	Recruit and train residents to participate in program	L
Yellow	Society	EEE risk/ mosquitos ongoing warning	V	Board of health education maintenance	L
Yellow	Society	Ticks	V	Outreach plan	M

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Yellow	Society	Snow impact on mobility, build up driver society	V	Continue clearance communication w/ public	L
Yellow	Society	COA connecting w/older adult population forced in emergencies	S		
Yellow	Society	Community house – no generator, not active as a shelter	S/V	Addressed in infrastructure page	
Yellow	Society	Town website, local TV, social media, robo calls from schools	S		
Yellow	Society	Communication strongly impacted by power immobility	V	Addressed in Infrastructure page	H
Yellow	Society	Shelter w/ back up power (24/7)	S	More reasonably priced housing	H

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Yellow	Society	Large commuter population (inc. critical staff)	V	More reasonably priced housing	M
Yellow	Society	Lack of proactive coordination w/ health care sector	S/V	Engaging home health agencies in emergency preparedness training opportunities/planning	M
Yellow	Society	Radio communication but some spotty coverage	S/V	Addressed in Infrastructure	
Yellow	Society	Need additional public safety staffing	S/V	Increase budget for additional personnel explore grant opportunities	H
Yellow	Environmental	Water quality impacts from livestock (affluent)	V	Property owner education Board of health oversight Most permit plan implementation	M
Yellow	Environmental	Water quality impacts from septic	V	Addressed in Infra Also in MS4 permit plan	M

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Yellow	Environmental	Extensive beaver populations that create waterway impediments	V	Beaver management Collaboration w/ environment groups + state agencies	M
Yellow	Environmental	Lots of wetlands mosquitos/ticks	V	Addressed in social	
Yellow	Environmental	All well water, no surface	V	Educating public on Imp. Of acquitter explore alt. out of town sources continue water conservation practices	H
Yellow	Environmental	Water withdrawal permits. (Ipswich seems to be taxed)	V	Upgrades + Improvements to sources and rivers	H
Yellow	Environmental	Protected forested areas	S		
Yellow	Environmental	Water conservation practices	S		

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Yellow	Environmental	Restrictive zoning by laws, can't grow the base	S/V	Re-evaluate and adjust accordingly	M
Blue	Infrastructure	Hs/Ms – Hot Spot	V	Vegetative root, solar, cooling, shade structure, HVAC	M
Blue	Infrastructure	Downtown area. Pot Hot Spot	V	Trees, shade benches, water fountains, cooling stations	M
Blue	Infrastructure	Trees- Electrical service	V	Maintenance program, replant, bury lines, solar/geothermal/alte rnate energy	H
Blue	Infrastructure	Elderly housing	V	Building generators, roof solar, buddy or callout system	M
Blue	Infrastructure	Winthrop/Cutler schools no generator	V	Generator	L

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Blue	Infrastructure	Water Supply	V	Shared svc w/ Marlborough, Beverly drill wells	H+M
Blue	Infrastructure	COA-emergency shelter	S/V	Alternate facility, larger space, increase hours/overnight staff amenities	M
Blue	Infrastructure	HS/MS Shelter	S	Dev. Shelter plan for large scale emergency	L
Blue	Infrastructure	Emergency equipment	S	Centrally locate, larger trailer & identify permanent facility or spot	M
Blue	Infrastructure	Library shelter	S	24 hour shelter	H
Blue	Infrastructure	Access to business/groceries	V	PB allows generators	M

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Blue	Society	Senior population growing	V/S	Affordable housing families, seniors, community homes	
Blue	Society	Gordon – high council youth population	V	Checks, map of SVCS + shelters site files w/ medical pets, long. Outreach program tried	M
Blue	Society	Cell/Data coverage	V	Cell towers, booster networks infrastructures, satellite phones	H
Blue	Society	Communications to non- English/ disabled	V	Code red multi. Lang	H
Blue	Society	Group homes	V/S	Van, support staff (shelter)	M
Blue	Society	Civic groups/Shelter team	S/V	Outreach methods, annual meeting to plan/share, recruit young members	L

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Blue	Society	Library - Charge stations	S	Generator, alternative energy, satellite facility	H
Blue	Society	MEP clinics close to hospitals	S	Communicate resource, EAP, points of contact (i.e. NG)	M
Blue	Society	Employees don't live in towns-communities	V/S	Housing, communication, travel	H
Blue	Environment	Tree density	V/S	Tree program, replant, $, lumber + forestry, adopt-a-tree	H
Blue	Environment	Open space ICPC	V/S	Maintain	H
Blue	Environment	Neighborhood/Resource density	V/S	Mixed housing types-multifam, tolerance, rentals, over 55 affordable (mitigation)	L

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Blue	Environment	Water resources	V	Water overlay	H
Blue	Environment	Flooding	V	Stormwater projects, drainage, infiltration of groundwater, vegetated roof, rain gardens	H
Blue	Environment	Miles River- Coastal issues	V	Complete MR Vegetation Management Plan	H
Blue	Environment	Fire breaks @ Bradley Palmer State Forest	S	Maintain	M
Blue	Environment	District forest fire warden based out of Bradley Palmer State Park	S	EAP, communities, utilize	M
Blue	Environment	Water quality	V	Hire water super, better plant storage clean H20, water tower	H

Table	Category	Strengths (S) & Vulnerabilities (V)	V/S	Solutions	Priority
Blue	Environment	Wildlife	V/S	Deer management/ Hunting	
Blue	Environment	Disease (Lyme, EEE, etc.)	V	Vaccine/cure, spray, medical communities/education, reduce standing water	H
Blue	Environment	Work/Rec/ School climate control lakes, oceans	V/S	Cooling station, fountain, pool hours, splash, HVAC	