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

Town of Norwood
Community Resilience Building Workshop
Municipal Vulnerability Preparedness Program
Summary of Findings

OVERVIEW

Recent years have seen notable weather extremes in Norwood. The winter of 2015 brought record-breaking snow, resulting in delays and shutdowns in MBTA service. The following year, Norwood 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 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 Norwood, 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, Norwood 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 Norwood will be eligible to apply for state and federal grant funds to address identified natural hazards and climate risks.

The Town of Norwood 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. Twenty-eight people representing Norwood town staff, members of Norwood Boards and Commissions, and representatives of Norwood community organizations gathered on April 25 (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 Norwood infrastructure, demographics, and natural resources (see Appendix).

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

Top Hazards and Vulnerable Areas

The Core Planning Team identified the top climate hazards facing Norwood. 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 Norwood. Flooding, drought, and severe storms have all affected Norwood in recent years. Town demographics, and the heat and tree canopy mapping pointed to extreme heat as an additional key concern.

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 from nor'easters are the threat of power outages and, secondarily, difficulty clearing snow. Heavy rains result in flooding when local streams and the Neponset River exceed their banks, as well as numerous locations where stormwater drainage capacity is exceeded. The status and capacity of local dams is a key concern during rain events. The recent drought had negative impacts on the health of the Neponset River and local streams. As these issues are not new, the Town of Norwood 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, particularly public health issues related to high heat.

Areas of Concern

Geographic:
Locations downstream of the Willett Pond Dam and the Hollingsworth & Vose Dam were highlighted. The Willett Pond Dam is on the Walpole/Norwood border and is owned by the Neponset River Watershed Association (NepRWA). Waters from the Willett Pond Dam flow to Ellis Pond and Hawes Brook through central Norwood before reaching the Neponset River. The Hollingsworth & Vose Dam is privately owned and located in Walpole on the Neponset River just upstream of the Norwood town line. Willett Pond is a high hazard dam (defined by the state as: "failure will likely cause loss of life and serious damage to homes(s), industrial or commercial facilities, important public utilities, main highways(s) or railroad(s)"). Hollingsworth & Vose is a significant hazard dam (defined by the state as: "failure may cause loss of life and damage home(s), industrial or commercial facilities, secondary highway(s) or railroad(s)").

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-town 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 Route 1 area along the Auto Mile is the hottest area of Town.

Societal:
Populations identified include: seniors and seniors who live alone, non-English speaking communities, low-income residents, renters, and people with health problems or disabilities. Also noted were populations living in nursing homes, residential facilities, senior housing and public housing. Participants were particularly concerned with barriers to emergency communication, and recognized that some residents have fewer resources to prepare for, endure, and recover from, severe weather events.

Environmental:
Stormwater management to prevent flooding and pollution was a significant concern, particularly in light of the potential for larger rainstorms. High heat areas and a lack of green space and tree canopy were also highlighted. Neponset River issues included invasive plants, stormwater pollution, and low river flow due to droughts.

Infrastructure:
Locations without generators or sufficient backup power were highlighted. Town facilities identified include: high school, senior center, library, and the civic center. Other locations noted were: senior housing, assisted living and other group residential facilities, and gas stations. Flooding concerns include the light department, light substations, and the airport. As noted above, the dams and downstream locations were also a key concern.

Current Strengths and Assets

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

- Reliable water supply provided by the Massachusetts Water Resources Authority
- Norwood Hospital is located in town and is part of the town's Comprehensive Emergency Management Plan
- Norwood has a municipal light department
- Norwood has an airport and three MBTA commuter rail stations
- Norwood has strong public health programs
- The Public Safety building is well-prepared for emergencies
- Cooling stations are available at the Senior Center and the Recreation Center
- Senior Housing tracks residents in need of support.
- Meals on Wheels provides wellness checks.
- Local cable and reverse 911 provide emergency communication
- Taxi vouchers, and reduced cost lunch through the Norwood Food Pantry provide support to low-income residents
- Solar panels are planned for the MBTA commuter lot

- The Conservation Commission utilizes updated (Cornell) precipitation figures for stormwater management requirements
- Ellis Pond Dam has been updated
- A number of recent town efforts will support resilience: wastewater infrastructure upgrades, walkability and green space in new developments, adoption of the Community Preservation Act, new stormwater infrastructure and, on-going GIS mapping of the stormwater system.

Top Recommendations to Improve Resilience

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

Highest Priorities

Dam Management: Focus on the Hollingsworth & Vose and Willett Pond dams. The concern is the potential for flooding and downstream impacts if they fail. A flood communication plan is needed. Cooperation across town lines and ownership will be necessary as the town does not own either dam, and the Hollingsworth & Vose dam is not located in Norwood. The Town should find funding, apply for grants, and engage support from the state for dam safety upgrades. Study Willett Pond to Hawes Brook to identify problem spots, engage NepRWA for assistance.

Stormwater Management: Focus on overall stormwater management and retrofits to address flooding and future higher rain events. Investigate establishing a stormwater utility or regional utility. Set higher standards for stormwater infiltration, review regulations, require replication of storage. Complete GIS mapping.

Emergency Notification: Identify vulnerable populations (seniors, those without landlines, immigrants, people who don't speak English) who may not be receiving emergency notifications. Establish an interagency task force to address emergency outreach and planning. Provide resources to Public Safety and Council on Aging. Foster community and neighbor check-ins.

Tree Planting: Increase tree canopy town wide. Focus on "hot spots" identified in maps. Encourage new businesses to increase green space. Collaborate with the agricultural school to support tree planting.

Improve Shelter Capacity: Upgrade the high school to a full shelter. Address deficiencies in the civic and senior center shelters. Make sure shelters can be prepared for flooding, extreme heat and cold, power outages, and biohazards.

Electric Substations: Ensure that the electric substation on Dean Street can withstand a 500-year flood.

Address traffic light signal issues: Work with the state to find a resolution to traffic signal electrical issues at Route 1 and Morse Street. The lights malfunction during heavy rain and wind, requiring public safety resources.

Solar Energy: Utilize solar energy. Work on making it possible to tie solar in to the current system.

Fuel plan: Ensure that generators are available at key gas stations for access to fuel for the town and the public in the event of a power failure.

High Priorities

- Stormwater and wastewater infrastructure needs upgrades. Consider a stormwater partnership, outreach and education, use of green infrastructure, sump pump management.
- Senior housing does not have generators. Five locations identified. Provide backup power so seniors are not displaced in an emergency.
- Keep the Neponset River clear of downed trees to reduce airport flooding.
- Ensure cable television has backup power, utilize it for emergency notices, public service announcements, and develop the capacity for translation for non-English speaking populations.
- Create a working group for public outreach during storms.
- Prioritize open space acquisition in climate vulnerable locations.
- Provide education on building and health practices to address emerging pathogens (ticks, mosquitoes, Lyme disease). Work with the Neponset River Watershed Association (NepRWA) on these issues.

Medium Priorities

- Continue strong relationship with Massachusetts Water Resources Authority.
- Work with NepRWA on Neponset River low-flow issues related to drought.
- Address heat sinks with green infrastructure, white roofs, landscaping for parking lots and redevelopment, lot leasing bylaw.
- Plant more mature trees to address the preponderance of immature trees in new developments.
- Do regulatory/zoning review to find way to create more green space.
- Create a plan for bike and walking connectivity especially in the vicinity of the Norwood Depot commuter rail station. Consider a bike rental program.
- Make sure there is good communication between the Town, residents, and Norwood Hospital. Have a surge plan for large emergency events..
- Work with the state to assure they are requiring proper climate resilience for nursing homes and residential facilities.
- Do a feasibility study of underground utilities and solar panels at parking lots.
- Have a plan for emergency food and equipment. Work with Shaw's and local contractors.
- Establish an emergency volunteer corps. Work at the church and neighborhood level. Do practice drills. Apply for grants from FEMA and MEMA. Translate communication materials.

- Have a plan for backup power for nursing homes. Upgrade generators. Check on state licensure requirements for emergency power sources.
- Upgrade the medical reserve system. Have a local emergency surge plan.
- Focus on outreach to seniors and seniors who live alone. Do outreach for reverse 911 sign-up, utilize the Senior Center, phone trees, Community Emergency Response Team (CERT), and Town Meeting representatives.
- Do outreach to renters. Improve the Assessors Database for outreach. Do mailings through the Water Department. Gather cell numbers, text information.

Low Priorities

- Work on invasive species removal, public awareness. Work with the Department of Fish and Wildlife.
- Study options to elevate the airport.
- Upgrade the regional emergency plan for regional evacuation routes.
- Do targeted communication to low income housing residents to ensure they are prepared for emergencies.

No priority listed

- Lobby the state to adopt updated precipitation figures (Cornell).
- Buy land for open space; use CPA funding.
- Protect existing open space.
- Provide public education on causes of river pollution and algae blooms.
- Install automated outlet control gate systems for the Ellis Pond and Willet Pond Dams.
- Increase stormwater regulation, require more porous surfaces, install rain gardens, encourage elevation of basement utilities.
- Increase emergency identification of, and communication to, seniors.
- Encourage air conditioning upgrades for low-income residents.

CRB Workshop Invited Participants

* = representative attended
Norwood Airport*
Norwood Animal Control*
Norwood Assessor
Norwood Building*
Norwood Council on Aging*
Norwood Engineering/Public Works*
Norwood Fire*
Norwood Police*
Norwood Town Manager*
Norwood Assistant Town Manager*
Norwood Health*
Norwood Library
Norwood Light
Norwood Conservation*

Norwood Planning*
Norwood Purchasing
Norwood Recreation*
Norwood Schools*
Norwood Accounting*
Norwood Veteran's Services
Norwood Airport Commission*
Norwood Selectmen
Norwood Board of Assessors
Norwood Board of Health*
Norwood Community Preservation*
Norwood Conservation Commission*
Norwood Finance Commission*
Norwood Planning Board*
Norwood Zoning Board of Appeals
Norwood Council on Aging Board
Norwood Cultural Council
Norwood Disability Officer
Norwood Housing Authority
Neponset Valley Chamber of Commerce*
MBTA
Neponset River Watershed Association*
Norfolk County Mosquito Control
Norwood Hospital
Together Yes*
Historic Society
GZA*

CRB Workshop Project Team

Norwood Core Team

Paul Halkiotis	Planning, Project Lead
Christopher Padden	Police
Andrew Murphy	Engineering
Pat Deschenes	Planning
Ron Maggio	Fire
Al Goetz	Conservation
Bernard Cooper	Assistant General Manager and Emergency Management Director
Mark Ryan	DPW Director
Tony Greeley	Fire Chief
Kerri McCarthy	Council on Aging
Sigalle Reiss	Public Health

Facilitation Team

Anne Herbst	Metropolitan Area Planning Council (Lead Facilitator)
Sam Cleaves	Metropolitan Area Planning Council
Elise Harmon	Metropolitan Area Planning Council
Darci Schofield	Metropolitan Area Planning Council

CITATION

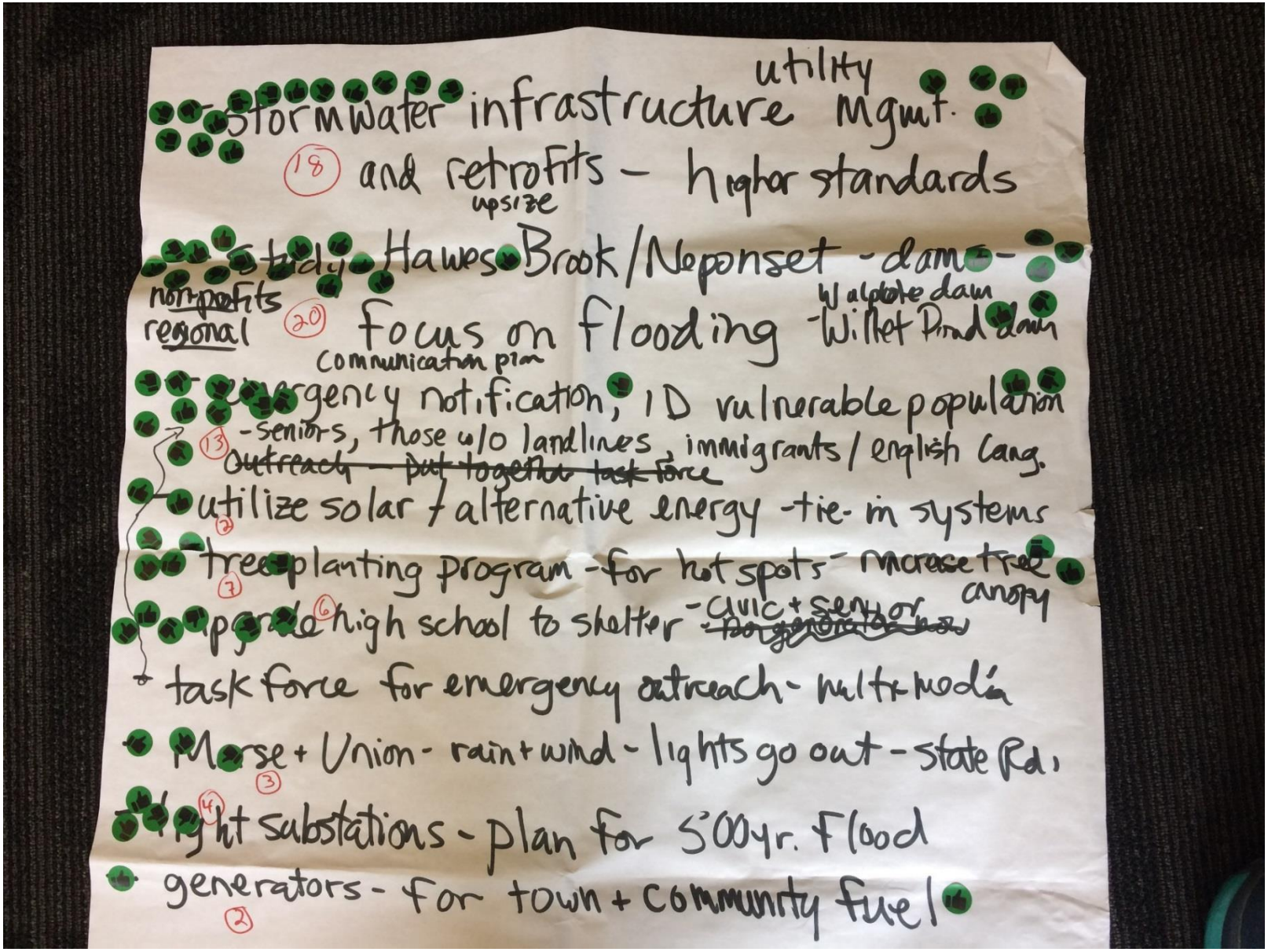
Metropolitan Area Planning Council. 2018. Town of Norwood Municipal Vulnerability Preparedness Program. Community Resilience Building Workshop Summary of Findings. Norwood, Massachusetts

ACKNOWLEDGEMENTS

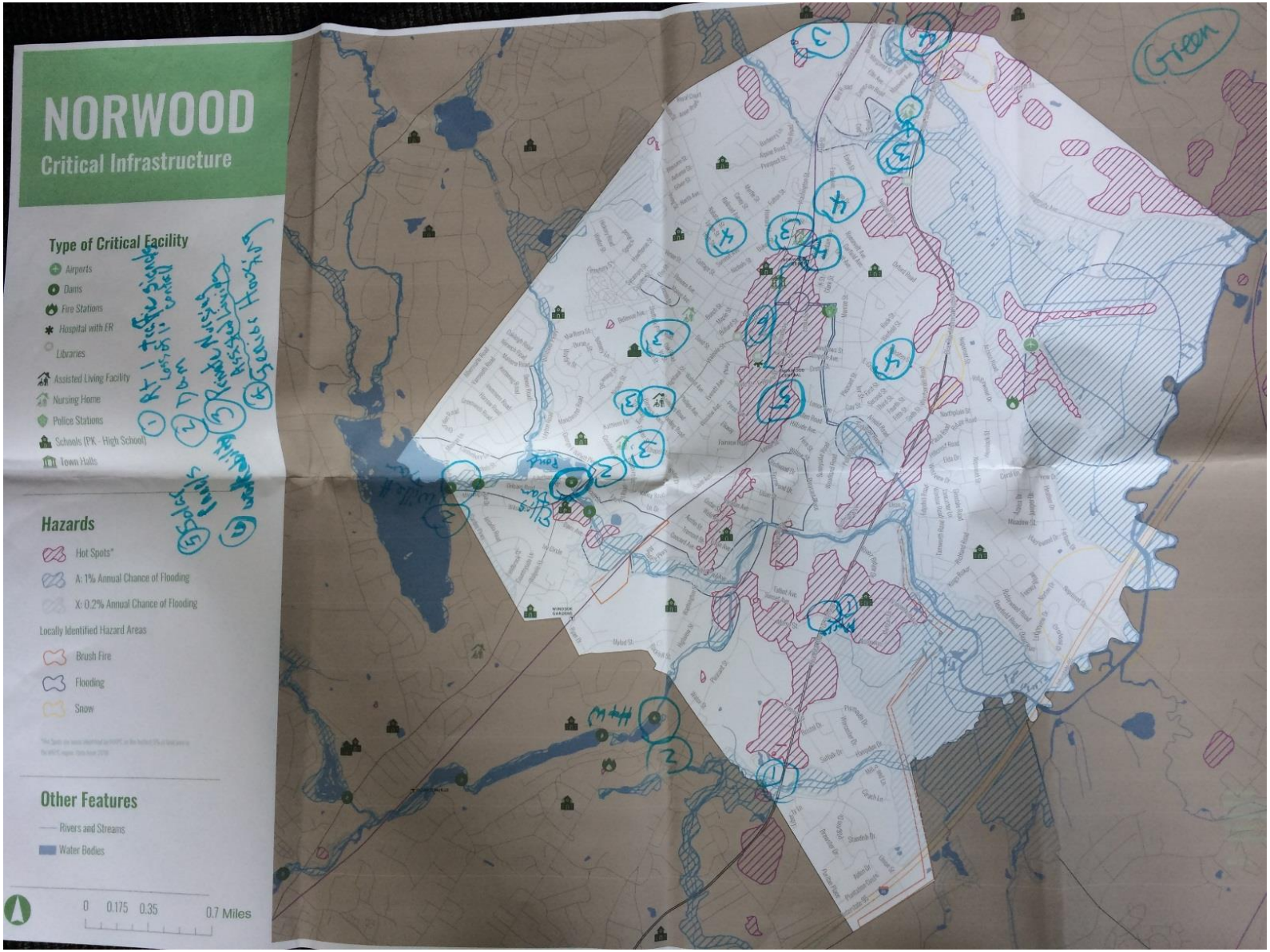
Thanks to the MVP Core Team members, CRB workshop participants, and to Paul Halkiotis, and Pat Deschenes from the Planning Department who served as local Project Coordinators. Thank you to Emergency Management Director and Assistant General Manager Bernard Cooper for addressing the workshop. Funding for the CRB Workshop was provided by the Commonwealth of Massachusetts through a $20,000 grant from the Municipal Vulnerability Preparedness program.

APPENDIX –ACTION PRIORITIZATION, BASE MAP, AND WORKSHOP MATERIALS

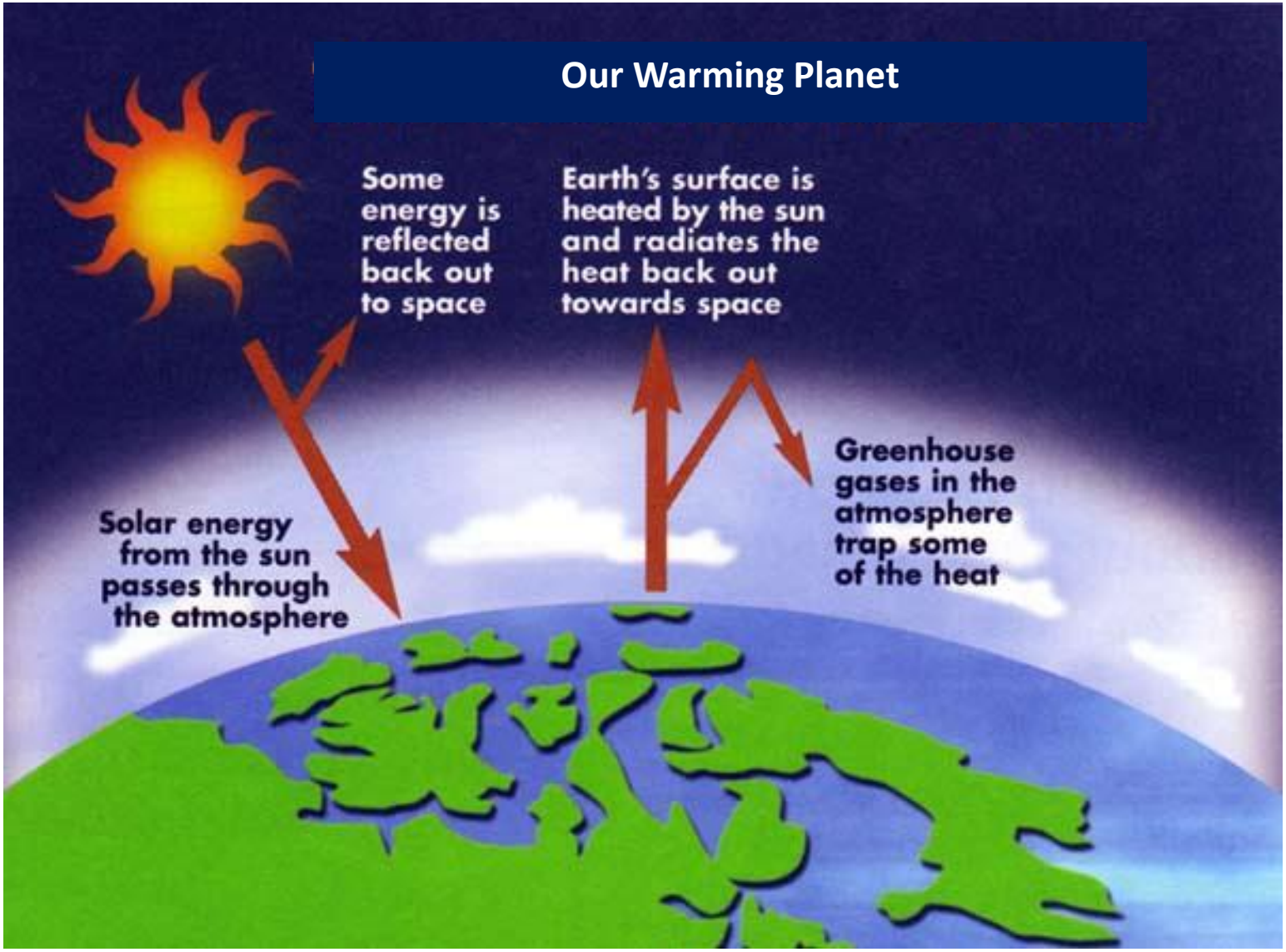
Action Prioritization

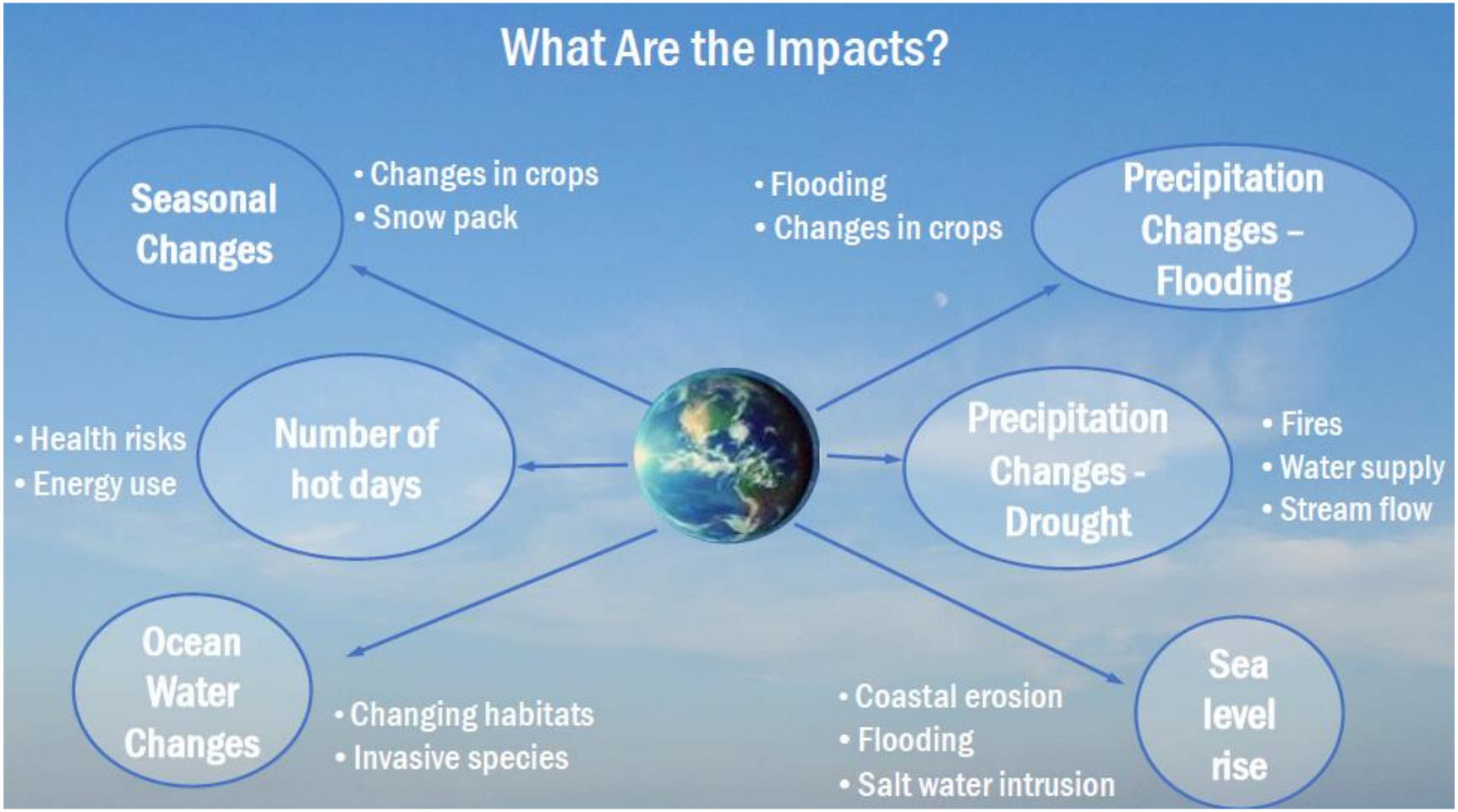


Base Map

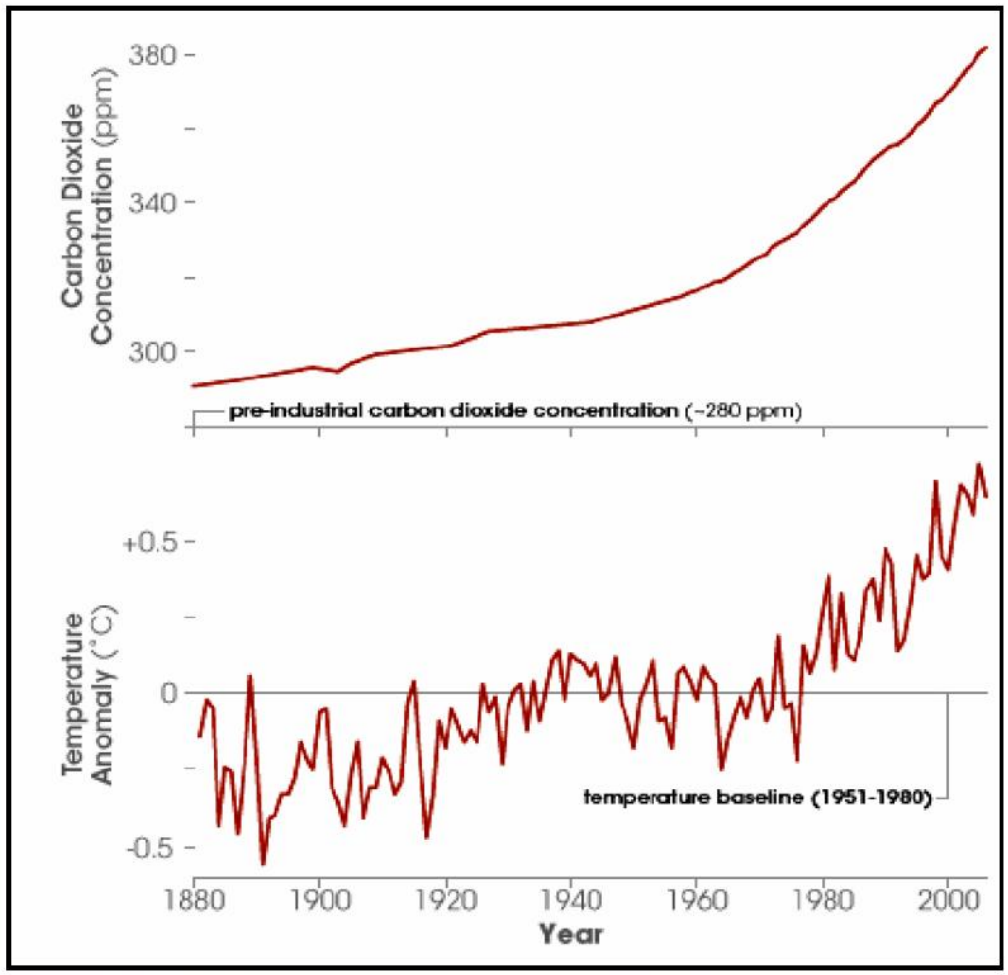

NORWOOD
Critical Infrastructure
Type of Critical Facility
Airports
Dams
Fire Stations
Hospital with ER
Libraries
Assisted Living Facility
Nursing Home
Police Stations
Schools (PK - High School)
Town Halls
Hazards
Hot Spots*
A: 1% Annual Chance of Flooding
X: 0.2% Annual Chance of Flooding
Locally Identified Hazard Areas
Brush Fire
Flooding
Snow
Other Features
Rivers and Streams
Water Bodies
0 0.175 0.35 0.7 Miles

PowerPoint


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

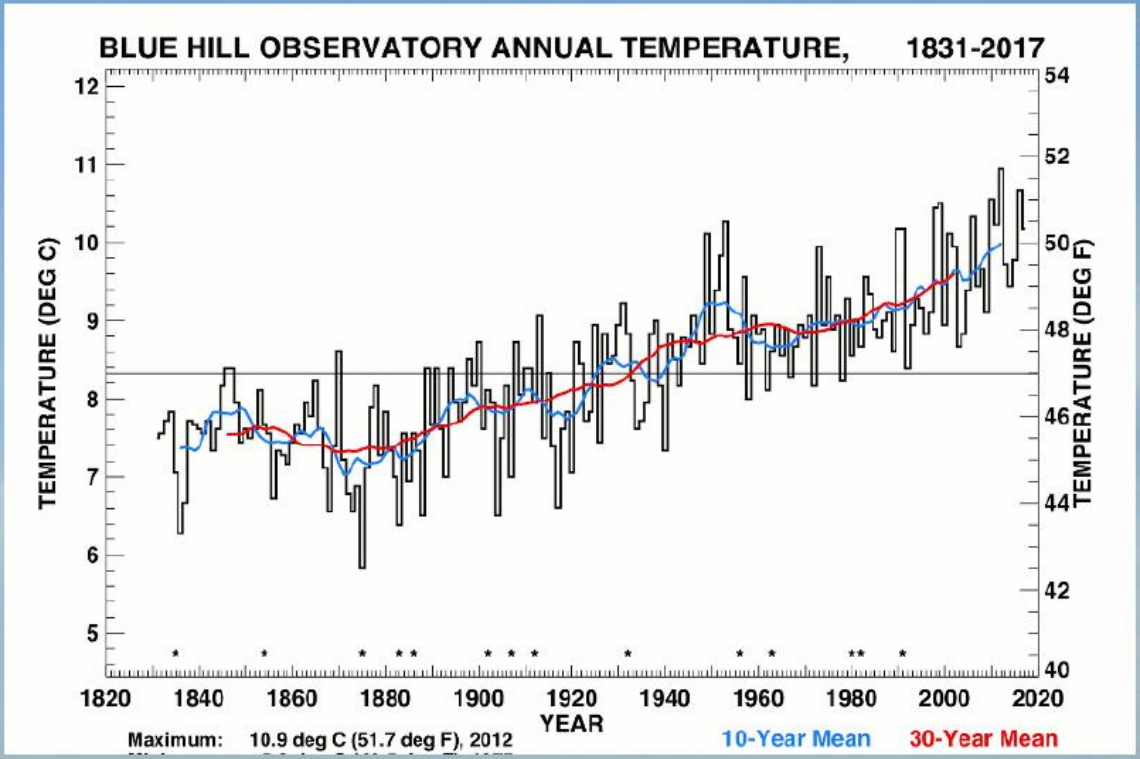

What Are the Impacts?
Seasonal Changes
• Changes in crops
• Snow pack
• Flooding
• Changes in crops
Precipitation Changes – Flooding
• Health risks
• Energy use
Number of hot days
Precipitation Changes - Drought
• Fires
• Water supply
• Stream flow
Ocean Water Changes
• Changing habitats
• Invasive species
• Coastal erosion
• Flooding
• Salt water intrusion
Sea level rise

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)

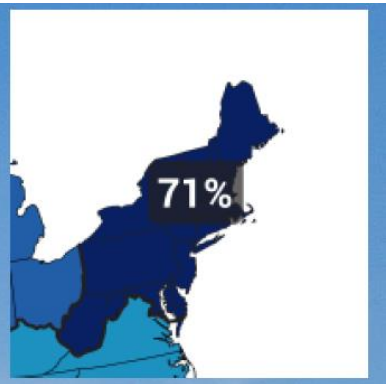


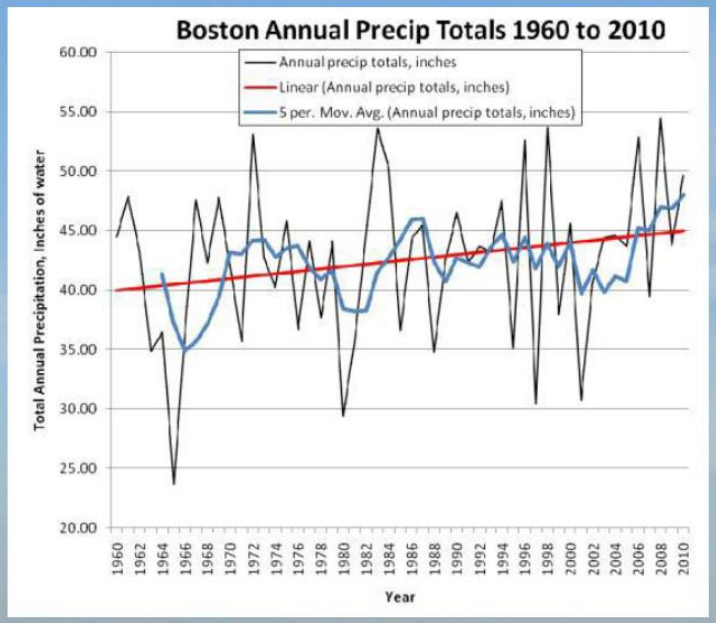
Blue Hill Observatory Annual Temperature, 1831-2017

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



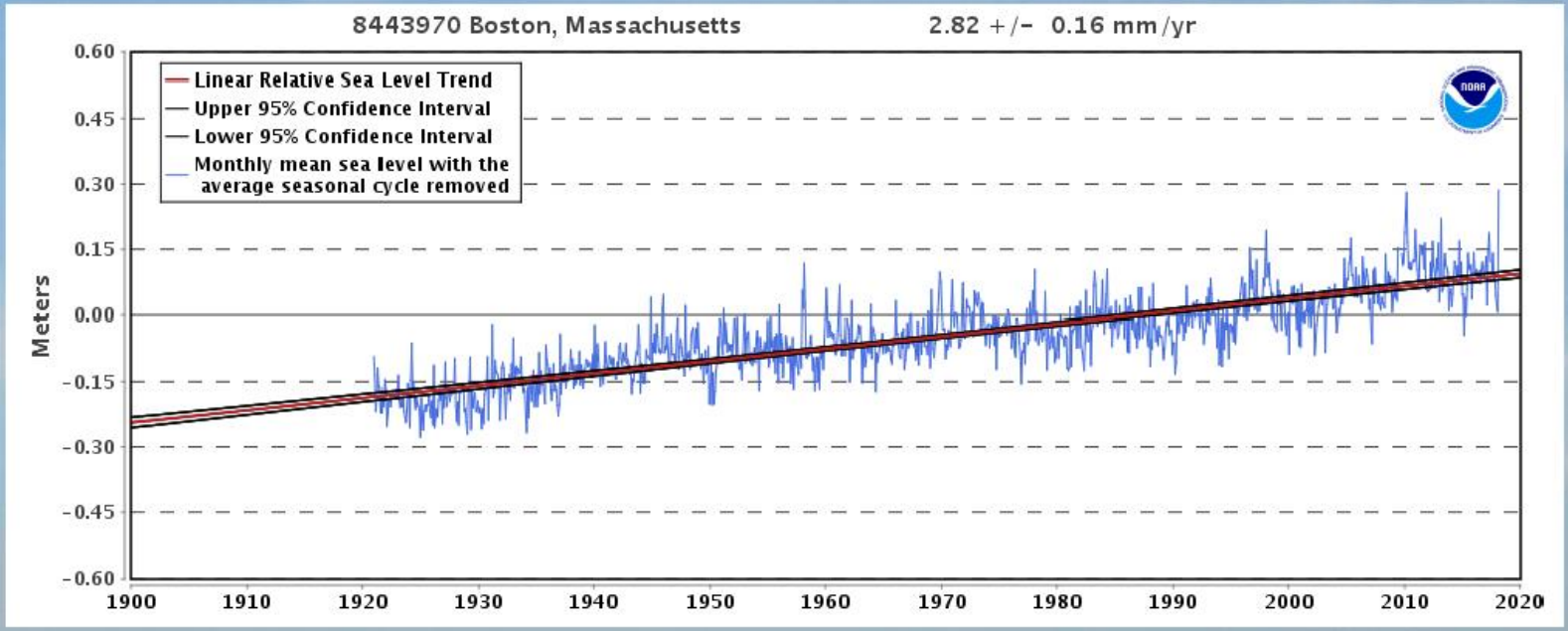


Source: MA Climate Change Adaptation Report 2011

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

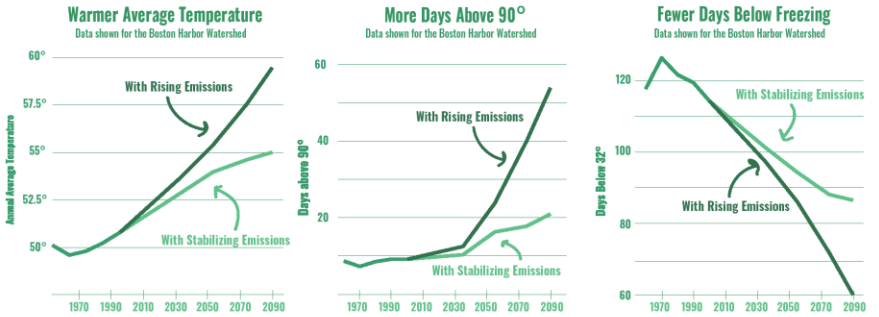


Climate Change

Norwood and the Boston Harbor 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, Norwood can expect...

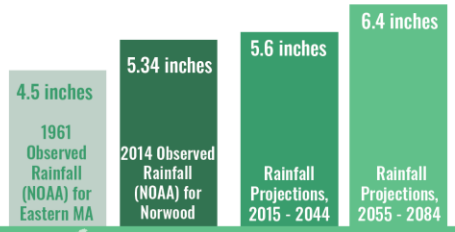
More Large Storm Events

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.

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



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.

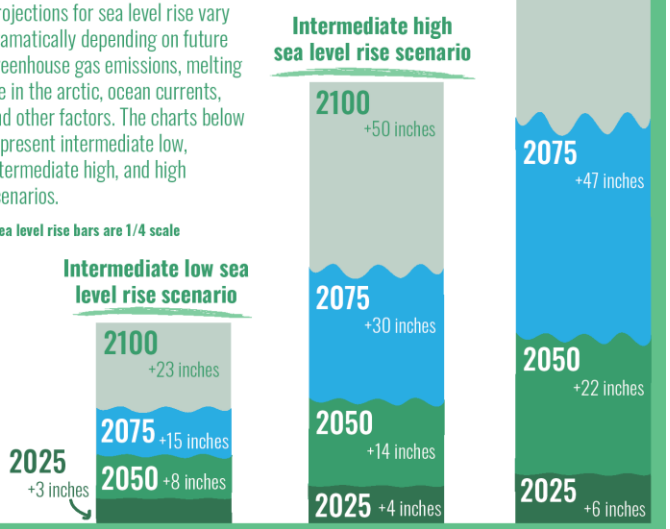
And more frequent droughts...

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

NORWOOD

Critical Infrastructure

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, and do not generally capture stormwater flooding, or flooding that exceeds the capacity of current stormdrains and culverts. 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

- School, Child Care, or Special Needs
- Place of Assembly
- Elder Care
- Grocery, Hardware, or Veterinarian
- Emergency Operations Center
- Public Safety
- Medical Facilities
- Municipal
- Water or Sewer Infrastructure
- Communication Tower
- Dam
- Hazardous Material Site
- Gas Distribution
- Power Substation
- Transportation Facility

Hazards

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

Locally Identified Hazard Areas

- Brush Fire
- Flooding
- Snow

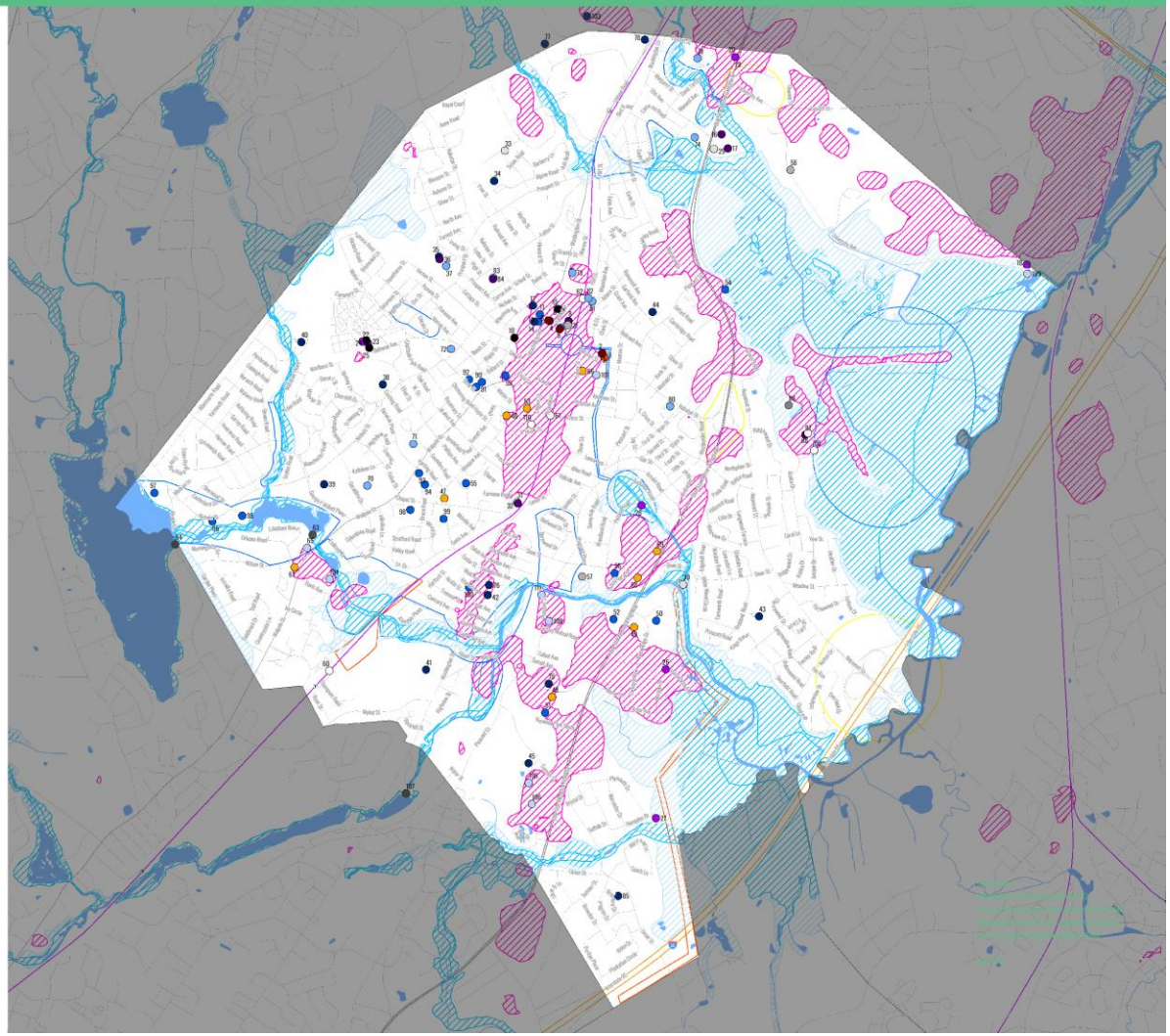
*Hot Spots are areas identified by MAPC as the hottest 5% of land area in the MAPC region. Data from 2016.

Other Features

- Rivers and Streams
- Water Bodies

Label	Facility	Label	Facility	Label	Facility
1	Fire Department	38	Norwood High School	75	SMARTC Lifeworks Workshop
2	Police Department	39	Cleveland Elem School	76	SMARTC Residence
3	Emergency Operations Center	40	Willett School All Day Kindergarten	77	SMARTC Offices/Day Facility
4	Norwood Town Hall	41	Coakley Middle School	78	SMARTC Residences
5	Norwood Civic Center	42	Balch Elem School	79	Housing Authority Brookview
6	ESSC Secondary	43	Prescott Elementary	80	Housing Authority Kalistan Village
7	ESSC Secondary	44	Callahan Elementary School	81	Housing Authority Willow Wood Terrace
8	Department of Public Works	45	Solomon Schecter School	82	Housing Authority Willow Wood Terrace
9	Norwood Electric Light	46	Guild Medical Facility Offices	83	Housing Authority Frank Walsh
10	Verizon Exchange	47	Windsor Medical Facility Offices	84	Norwood Housing Authority Offices
11	Saint Catherine of Siena Church	48	Eastern Massachusetts Surgery Center	85	SMARTC Residences
12	Saint Catherine Parish School	49	Dedham Medical Facility Associates	86	FAA Control Tower
13	United Church of Norwood	50	Courtyard by Marriott	87	Norwood Airport Manager Offices
14	Norwood Christian Pre/School	51	Residence Inn	88	Eastern Air Center
15	Norwood Broadband Div	52	Sheraton Four Points	89	Eastern Air Center Fuel Depot
16	Elks Well Field Pump Station	53	Caritas Norwood Hospital	90	First Congregational Church
17	Norwood Animal Shelter	54	Wyndham Hotel	91	First Baptist Church
18	MWRA Water Connection	55	Elks Lodge	92	First Baptist Church Community Hall
19	MWRA Water Connection	56	VFW Post 2012	93	Trinity Community Church
20	MWRA Water Connection	57	KeySpan Gas Distribution Facility	94	Emmanuel Lutheran Church
21	Fuel Depot Municipal	58	Algonquin Gas Central Facility	95	Temple Shaare Tefilah
22	Water Storage Tank 4mg	59	Morrill Memorial Library	96	Knights of Columbus
23	Water Stand Pipe 1.5mg	60	MBTA Windsor Gardens Station	97	Saint Timothy's Church
24	AT&T Cell Tower	61	MBTA Norwood Central Station	98	Grace Episcopal Church
25	Sprint Cell Tower	62	MBTA Norwood Depot Station	99	Jain Center of Greater Boston
26	Sewer Pump Station	63	Elks Pond Dam	100	Saint George Orthodox Church
27	Sewer Pump Station	64	Willett Pond Dam	101	Stowe Supermarket
28	Sewer Pump Station	65	Norwood Animal Hospital	102	Roche Brothers Supermarket
29	Fire I Substation #4/5	66	CVS Pharmacy	103	Xaverian Brothers High School
30	Dean Street Substation#4/5	67	Rite Aid Pharmacy	104	Hannaford Supermarket
31	Chapel Street Substation#2/3	68	Rite Aid Pharmacy	105	Stop and Shop Supermarket
32	Chapel Street Storage Facility	69	Walgreen Pharmacy	106	Home Depot
33	Pelonial Substation#6/7	70	Cherwell House Nursing Home/Rehab	107	Hollingsworth and Vose Dam
34	Oldham Elem School	71	Sunrise Assisted Living	108	Stock Building Supply
35	Phoenix Alternative High School	72	Victoria Haven Nursing Home	109	Grainger Industrial Supply
36	Norwood Public School Administration	73	Golden Living-Emerald Court Nursing Home	110	Hotspot
37	Norwood Senior Center & CDA Offices	74	Elks Nursing Home	111	Bosse Tool Company

0 0.2 0.4 0.8 Miles



Norwood
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?

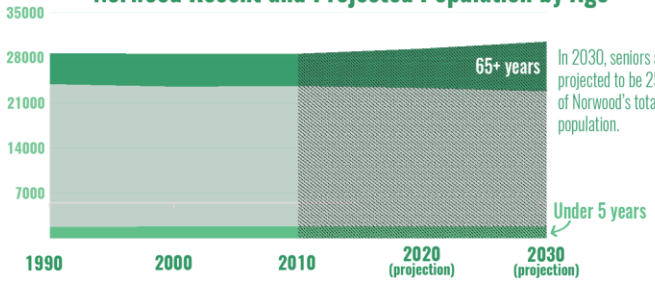
People who may be more susceptible to negative health effects: These can include older adults, young children, pregnant women, people with disabilities, and people with pre-existing health conditions, as they are more likely to be physically vulnerable to the health impacts of extreme heat and poor air 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.

Older Adults and Young Children

Norwood Recent and Projected Population by Age

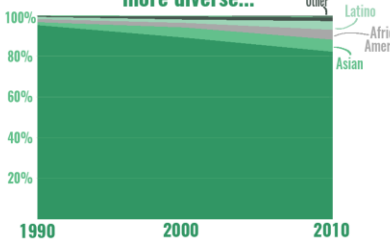


In 2030, seniors are projected to be 25% of Norwood's total population.

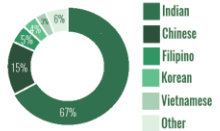
Communities of Color

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

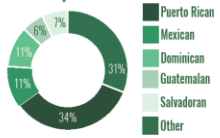
Norwood is becoming more diverse...



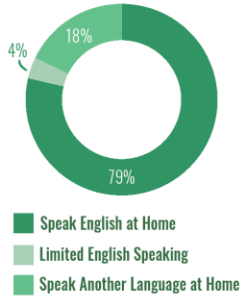
Asian Populations in Norwood



Latino Populations in Norwood



Limited English Speakers



People Living Alone

As of 2010, about 1/5 of Norwood households consisted of someone living alone.

About 40% of people living alone were over 65.

People Who Work Outside

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

Low Income Households

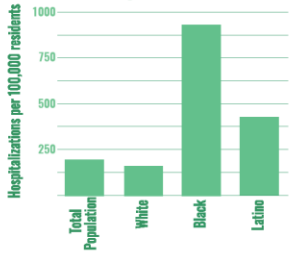
36% ± 3.5% Households in Norwood that are low-income

9% ± 1.8% Households in Norwood 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 with Health Conditions

Norwood Asthma Hospitalizations



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

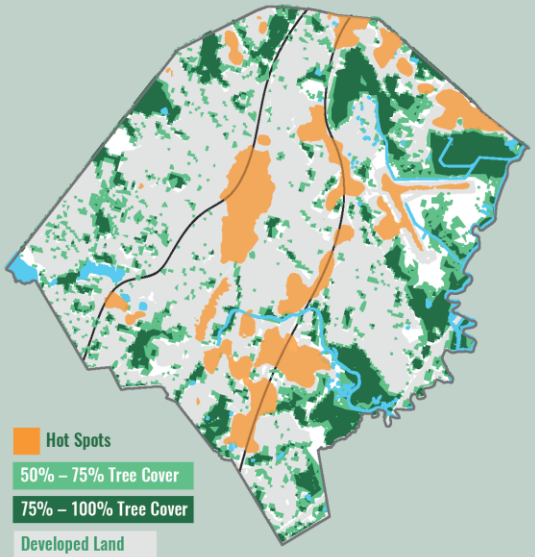
Norwood

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

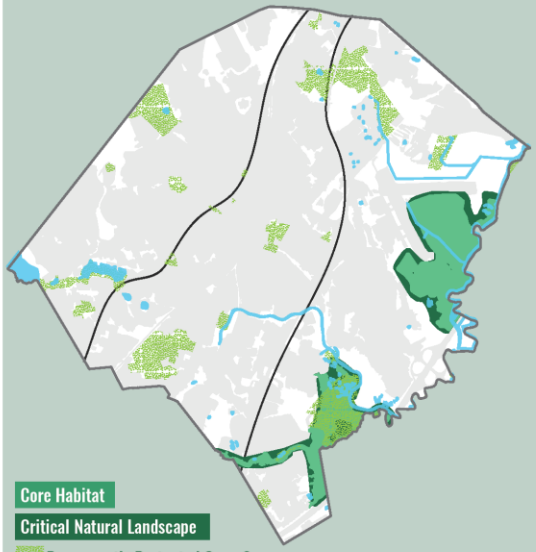
Trees are important in mitigating the impact of heat waves. According to the EPA, suburban areas with mature trees are 4-6 degrees cooler than new suburbs without trees. Shaded surfaces can be 25-40 degrees cooler than the peak temperatures of unshaded surfaces. Trees also absorb remarkable quantities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

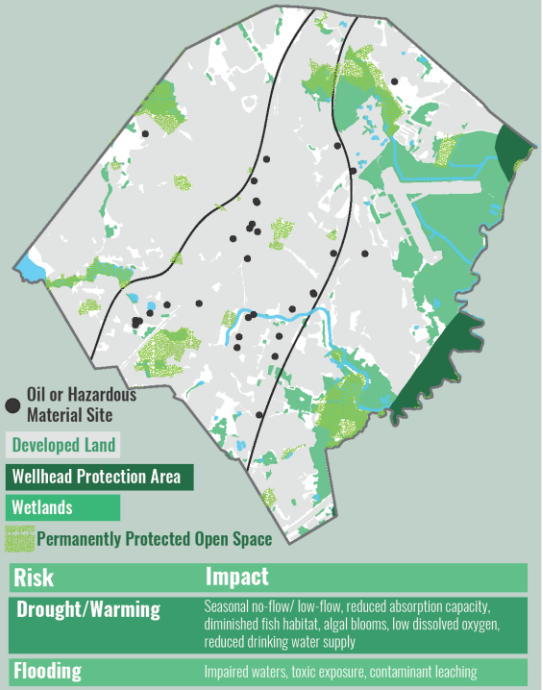
Valuable Habitat

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

Norwood contains, healthy, intact freshwater wetland systems that sustain critical ecosystem functions. These ecological assets protect 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

MAPC METROPOLITAN AREA PLANNING COUNCIL

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)