Community Resilience Building Workshop – Summary of Findings

April 2020

Weston & Sampson

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1.0 INTRODUCTION

The Town of Winchester pursued the Municipal Vulnerability Preparedness (MVP) Planning Grant to identify priority action items that build upon the planning initiatives and projects that Winchester has completed to-date and to address new and intensified impacts due to climate change. The Town has focused their efforts on resolving flooding, and dealing with the impacts from extreme temperatures, extreme storms, and drought, which were also identified as top hazards during the MVP planning process. The Town also used the MVP Planning Grant process as an opportunity to coordinate with on-going updates of the Town's Climate Action Plan and Master Plan.

MVP Objectives in Winchester

Increase resilience of community

Raise awareness of climate threats

Identify priority actions to move forward

Create implementation pathways

1.1 Background on Current Resiliency Efforts

The Town of Winchester has worked diligently over the last decade to improve their resilience to flooding along the Aberjona River and its tributaries through the implementation of a Flood Mitigation Program. The Town and/or outside partners have completed all but two of the original 12 flood mitigation projects. Project 8 – Swanton Street bridge improvements is fully design and waiting for final permitting from the state; the project is expected to be constructed in late 2020/early 2021. The final projects – improvements to the existing culvert at the railroad bridge near the Muraco School is still in preliminary design. The Town is anticipating that these measures will provide a significant level of protection against future storm events in the near term but was interested in discussing areas that may be at higher risk in the future. The Town has also taken steps to reduce stormwater flooding through a variety of projects. One of the most notable is the on-going construction of a large-scale stormwater retention/infiltration system below the playing fields West Side Field, providing150,000 cubic feet of underground storage.

The Town recognizes the direct relationship between riverine and urban flooding, and development projects within the watershed, which may result in increased impervious surfaces and stormwater runoff. In Winchester, 68% of the total land of 4,062 acres is developed.[1] Natural land consists of forest, wetland, and water and comprises approximately 27% of Winchester. Open land consists or agricultural areas, bare soil, or low vegetation and accounts for 5% of the land use in Winchester.

Natural and open land within Winchester are key assets and are maintained by the Town, the state, and private entities. The Middlesex Fells and other natural areas in the Town were identified by numerous participants in the MVP planning process as key assets. Natural and open areas reduce the Town's vulnerability to urban heat and in some cases flood storage amount several additional co-benefits. The Town also works with Eversource to maintain as much tree canopy as possible while reducing the risk to power outages during intense storms and high winds.

[1] Mass Audubon. 2013. Losing Ground. 5th Edition Statistics: Town of Winchester. https://www.massaudubon.org/our-conservation-work/advocacy/shaping-the-future-of-your-community/publications-community-resources/losing-ground-report/losing-ground-fifth-edition-statistics/(areaid)/343

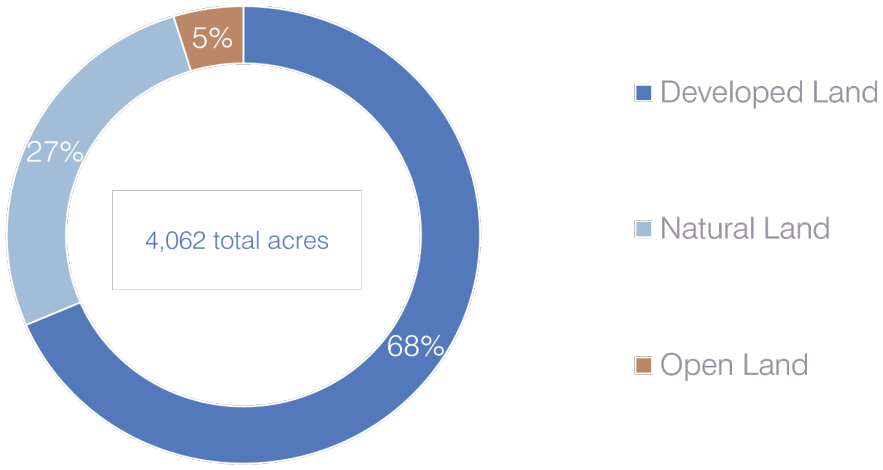

Figure 1. Land Use in Winchester (Mass Audubon, 2013)

To address extreme temperatures, the Town currently utilizes the Jenks Senior Center and Public Library as cooling stations. Seniors and youth are the most vulnerable to heat-related illnesses. Eighteen percent of Winchester's population are over 65, which is comparable to Massachusetts overall. However, Winchester has a much higher percentage youth population compared to the whole state. Twenty-eight percent of Winchester residents are under 18. Winchester is also home to a significant number of people that speak a language other than English at home. Winchester is increasingly using translation services to reach residents where English is not their native language.

Table 1. Vulnerable Populations (US Census, 2010 and US Census American Community Survey 2014-2018)

Population	Winchester	Massachusetts
2010	21,393 residents	6,547,790
2018	22,851 residents	6,902,149
Age		
Under 18 years:	28%	20%
65+ years:	18%	17%
Additional Information		
Median household income:	$152,196	$74,167
Persons in poverty:	2.3%	10.5%
With a disability:	2.3%	7.9%
Language other than English spoken at home:	19.3%	23.1%

Depending on the season, the Town of Winchester supplies between one-third and two-thirds of the community with drinking water from its municipally owned reservoirs, and therefore, takes special precautions to protect its water supply. The most concerning threats to the water supply are drought and dam failure. The Town of Winchester is currently working on a project to improve the North Reservoir Dam that is in poor condition. The Town has a water conservation program. The remainder of the Town's water is supplied through an agreement with the Massachusetts Water Resources Authority (MWRA). In case of emergency, the Town has the ability to supply 100% of the community with drinking water from the MWRA.

2.0 PROCESS AND TIMELINE

The MVP planning process engaged municipal leaders, key stakeholders and the general public to inform the Summary of Findings Report.

2.1 Core Team Meetings

The Town of Winchester convened a Core Team of municipal staff to guide the MVP planning process. Members of the Core Team are listed in Section 7. Core Team members provided local expertise and feedback to ensure the Community Resilience Building (CRB) Process considered the uniqueness of Winchester. The Core Team met on October 3, 2019 to discuss the MVP process, to provide information about past hazard events, and other pertinent information related to natural hazards and climate change impacts in Winchester. The Core Team developed the invitation list for the CRB Workshop described below and reviewed the final priority action items to ensure local priorities were captured.

Figure 2. Winchester CRB Workshop (W&S, 2019)

2.2 Community Resilience Building Workshop

Municipal staff, town boards and committees, local organization, regional partners, state agencies, and adjacent towns were invited to participate in the CRB Workshop held on November 20, 2019. Over 30 participants were able to join throughout the day. The CRB workshop utilized a Risk Matrix to complete the objectives of the day in small groups. The CRB 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.

The completed matrices are available in Appendix C. The Town is concurrently updating its Master Plan and developing a separate Climate Action Plan. Coordination between the three processes was of the utmost importance. Representatives from these groups participated in the CRB Workshop and were consulted prior to the public listening session. A list of Workshop participants is included in Section 7.1 of this report.

Figure 3. Winchester Community Resilience Building Workshop (W&S, 2019)

2.3 Public Input

As part of the CRB process, the Town convened a public listening session on the evening of January 21, 2020 in partnership with the Climate Action Plan Update Committee and with input from the Town Planner. Twenty-three people attended. To promote the event, the CRB workshop invitee list was also invited to the public listen session and were asked to promote the listening session through their own networks. Additional promotional materials were sent to Town Meeting members, members of the Master Plan Steering Committee and Climate Action Plan Update Committee, and posted on the Town's webpage. The listening session consisted of a brief presentation and open house format with posters that participants could provide feedback on. The presentation gave an overview of the ongoing planning processes, their overlap, and about climate impacts in Winchester. The outcomes of the CRB process were presented and were also available on poster boards throughout the room. Participants were able to ask questions and provide input on the priorities for the plan. The listening session was shown live on WinCam and posted online. The draft plan was also posted online for a public comment period of two weeks. The materials for the event and summary of the input is available in Appendix D.

Figure 4. Winchester Listening Session

3.0 TOP HAZARDS

During the CRB Workshop, participants discussed the Town's greatest threats under climate change in a large group format.

3.1 Top Hazards

Flooding, drought, nor'easters, and extreme heat rose to the top as areas of concern during the CRB Workshop.

Flooding | Drought | Nor'easters (Wind & Precipitation) | Heavy | Extreme Heat

3.2 Current Concerns and Future Challenges

3.2.1 Flooding

Across the northeast, precipitation during heavy events increased by more than 70% between 1958 and 2010.[2] This change in precipitation patterns brings about additional concerns regarding riverine and stormwater flooding in Winchester. The intensity and severity of extreme precipitation events in

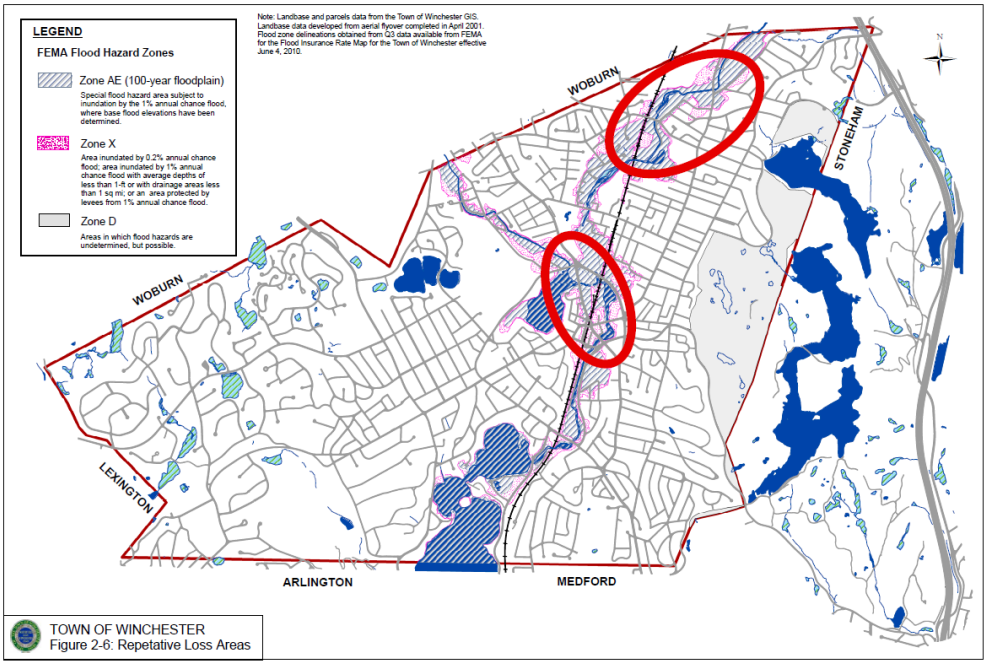

Figure 5. FEMA Flood Zones and Areas of Repetitive Loss Sites (Winchester All Hazards Mitigation Plan, 2016)

[2] Massachusetts Executive Office of Environmental Affairs. 2019. "Extreme Precipitation." Massachusetts Climate Change Clearing House. Resilientma.org

the northeast is expected to increase in the future under various climate change scenarios. Currently, there are 30 repetitive flood loss structures in Winchester as defined by the National Flood Insurance Program (an insured structure that has had at least two paid flood losses of more than $1,000 each in any 10-year period since 1978[3]). The repetitive loss structures are primarily located in the northeast section of Town along the Aberjona River and in the Town Center.[4] The Town also experiences flooding in the following areas of town:

- Winchester Center
- Cross Street
- Main Street
- Skillings Road
- Lake Street
- Lowell Ave
- Brookside Avenue
- Tufts Road/Nathaniel Road
- Area near Winchester High School and its associated playing fields
- Bridges along Canal Street and Sylvester Avenue

Over the past several decades, the Town of Winchester has experienced devastating flooding along the Aberjona River and its tributaries, which has imperiled public safety, disrupted businesses and schools, and led to significant economic losses totaling more than $25million. However, the Town recognizes that the we have not yet seen the impact from a 100-year event as defined in the effective Flood Insurance Rate Maps (FIRMs) published FEMA maps issued in 2010. The highest streamflow at the USGS Streamflow Gage on the Aberjona River in Winchester was recorded in March 2001, and only correlates to a 75-year streamflow event. The USGS gage has been in continuous operation since April 1939. Future precipitation scenarios under climate change will likely cause events such as this to occur more frequently. Flooding during hurricane activity is also projected to be more likely in the future (see below). Stormwater flooding due to poor drainage, increased impervious surfaces, and undersized infrastructure is a growing concern. Glen Road and the rear of the Winchester High School are two areas that currently experience stormwater flooding. Sea level rise is predicted to have little impact on Winchester directly, but will likely impact downstream communities in the Mystic River watershed.

3.2.2 Drought

Episodic droughts, or droughts lasting one to three months, are predicted to occur more frequently in the late summer and early fall as a result of climate change. Under a high emissions scenario, episodic droughts frequency could increase as much as 75%.[5] Droughts in Winchester have previously impacted the Town's water supply. Fortunately, the Town has an existing connection with the Massachusetts Water Resource Authority (MWRA), which supplies between one and two-thirds of the Town's drinking water, depending on the season. Under emergency

Figure 6. South Reservoir (Weston & Sampson)

[3] Federal Emergency Management Agency (FEMA). 2019. "Definitions." Accessed August 29, 2019. Fema.gov/national-flood-insurance-program/definitions#

[4] Winchester All Hazards Mitigation Plan, 2016, pg. 2-12.

[5] Massachusetts Executive Office of Energy and Environmental Affairs. 2011. Massachusetts Climate Adaptation Report. Ch. 2. https://www.mass.gov/files/documents/2017/11/29/ch%202.pdf

conditions, the Town has the ability to supply 100% of the community with drinking water from the MWRA. However, water rates through the MWRA connection are very high, so such a scenario would have a negative impact on the Town's finances and water/sewer rates. Droughts can also negatively impact the other natural resources that rely on water including weaken root systems and the dry ponds and wetlands. Droughts also increase wildfire vulnerability, which is primary concern in Middlesex Fells and surrounding area.

3.2.3 Nor'easters

Nor'easters along the Atlantic coast are increasing in frequency and intensity and there has been an upward trend in North Atlantic hurricane activity since 1970.[6] Figure 7 shows the anticipated flood impact of four different levels of hurricane activity. Downed trees, road closures, and the increased risk of flooding are concerns for the Town.

Figure 8. Fallen Trees (Town of Winchester Facebook)

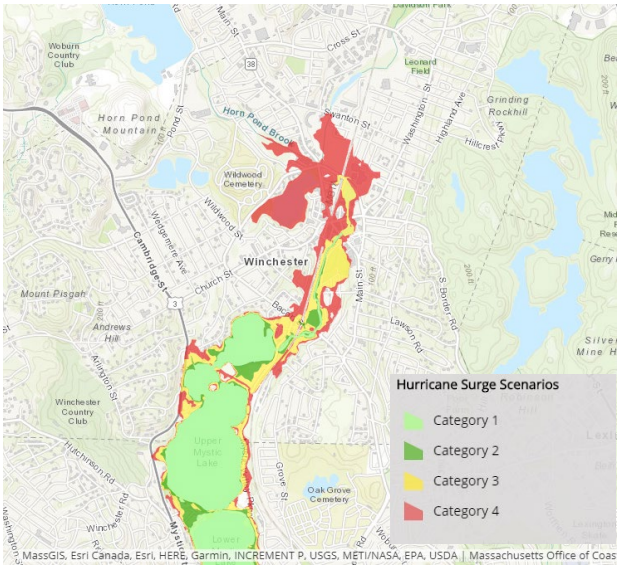

Figure 7. Hurricane Surge Scenarios (Mass EOEEA)

3.2.4 Extreme Heat

Massachusetts has experienced an increase in the annual air temperature. Since 1970, the annual air temperature as increase 0.5° F per decade and the winter temperatures have increased 1.3° F per decade.[7] Rising annual temperatures corresponds to more days where the temperature will rise above 90° F and less days that will drop below freezing. The observed annual average of days over 90° F in Massachusetts was approximately six. By midcentury, 24 days over 90° F are expected on annually on average. The risk of heat to the Town's most vulnerable populations and emerging vector borne diseases is a major concern. The workshop participants also discussed how changing temperatures may impact stormwater flooding. Winchester anticipates seeing more heavy rainfall events in the warmer months, rather than snow while the ground is still frozen.

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[6] Source: Climate Science Special Report, Fourth National Climate Assessment (NCA4), Volume prepared by the U.S. Global Change Research Program (USGCRP)

[7] Massachusetts Executive Office of Environmental Affairs. 2019. "Rising Temperatures." Massachusetts Climate Change Clearing House. Resilientma.org

4.0 VULNERABILITIES

The participants' major area of concern was ensuring public health and safety in Winchester. The need for infrastructure upgrades, improved communications to vulnerable populations, and protecting our environmental assets were highlighted during the discussion. The specific examples of areas of concern were grouped within the following three categories: infrastructure, societal, and environmental. Many of the identified vulnerabilities were also categorized as strengths.

Figure 9. Fire Department (Town of Winchester)

4.1 Infrastructure

Workshop participants identified the following key infrastructural features in Winchester that are most vulnerable to natural hazards and climate change impacts or may be so in the future:

- Municipal buildings
- Municipally owned and Other Public Utilities
  - Power lines
  - Water and sewer
  - Stormwater system
  - Gas lines
- Roads and bridges
- Winchester Hospital
- Jenks Senior Center
- Dams
- Reservoirs
- MBTA and railroad
- Schools
- Residences
- Transfer Station

4.2 Societal

Workshop participants discussed the impact of climate change to vulnerable populations and essential services, which included:

- Environmental justice communities (non-native English speakers)
- Healthcare
- Seniors and Jenks Center
- Youth
- Emergency response and Department of Public Works personnel
- Downtown businesses
- Housing Authority properties and other affordable units
- Faith communities
- After school and enrichment programs
- Hospitals
- Commuters
- Food supply

4.3 Environmental

Workshop participants identified the following key environmental features in Winchester that are most vulnerable to natural hazards and climate change impacts:

- Waterways
  - Aberjona River
  - Horn Pond Brook
- Sandy Beach at Upper Mystic Lake and Borggaard Beach on Wedge Pond
- Wetlands
- Open Space and Recreation Land
- Environmentally contaminated sites
- Kraft Property
- Wildlife and fisheries
- Street trees
- Whipple Hill
- Community Gardens
- Wright-Locke Farm
- Electric vehicle charging stations
- Bike path
- Vector borne diseases
- Drinking water reservoirs
- Cyanobacteria or algal blooms
- Middlesex Fells

Figure 10. Town Hall (Town of Winchester)

5.0 CURRENT STRENGTHS AND ASSETS

Many workshop participants felt Winchester's greatest assets were the residents, volunteers, and staff that advance the Town's priorities and build the community's resilience. Winchester's infrastructure and environmental assets also contribute to the Town's ability to successfully weather shocks to the day to day system, like extreme weather.

5.1 Infrastructure

Workshop participants identified the following key infrastructure features in Winchester that provide strength against natural hazards and climate change impacts:

- Municipal buildings
- Municipally owned and Other Public Utilities
  - Power lines
  - Water and sewer
  - Stormwater
  - Gas lines
- Roads and bridges
- Winchester Hospital
- Jenks Senior Center
- Dams
- Reservoirs
- MBTA and railroad
- Schools
- Transfer Station
- Public Safety
  - Communications
  - Emergency Shelters
  - Gear and supplies

5.2 Societal

Workshop participants identified the following key societal aspects of Winchester that provide strength against natural hazards and climate change impacts:

- Environmental justice communities (non-native English speakers)
- Healthcare
- Seniors and Jenks Center
- Youth
- Emergency response and Department of Public Works personnel
- Downtown businesses
- Housing Authority properties and other affordable units
- Faith communities
- After school and enrichment programs
- Hospitals
- Food supply

Figure 11. Winchester Police Car (Town of Winchester)

5.3 Environmental

Workshop participants identified the following key environmental features in Winchester that provide strength against natural hazards and climate change impacts:

- Waterways: Aberjona River and Horn Pond Brook
- Beaches
- Wetlands
- Open Space and Recreation Land
- Wildlife and fisheries
- Wright Locke Farm
- Street trees
- Wright-Locke Farm
- Whipple Hill
- Community Gardens
- Environmental advocacy groups
- Electric vehicle charging stations
- Bike path
- Drinking water reservoirs
- Middlesex Fells

Figure 12. North Reservoir (Deanna Lambert, 2019)

6.0 TOP RECOMMENDATIONS TO IMPROVE RESILIENCE

After listing vulnerabilities, hazards, and possible actions in the Risk Matrix, participants ranked their recommendations from high to low priority. Each group underwent an additional prioritization to develop a smaller list of the groups "highest high" priorities and reported the top three to the larger group. Several of the highest high priorities overlapped between the groups or were discussed amongst the other groups. The priorities presented here primarily focus on resiliency efforts the Town can implement and are eligible for MVP Action Grant funds. The priorities also incorporate ideas from the public listening session. Coordination and input from the Town's Climate Action Plan (CAP) Update Committee and Master Planning effort were also considered. The CAP Update Committee is a group of town volunteers working for the past year to develop a comprehensive plan to meet Winchester's climate mitigation goals (an 80% reduction by 2050) and to expand resiliency efforts. The CAP identifies actions for individuals, organizations, and local government to take across several topics, including buildings, transportation, solid waste, energy and resiliency.

6.1 Highest High Priorities

- Create a comprehensive extreme heat strategy identifying urban heat islands, mitigation measures, and a response plan.
- Evaluate the stormwater system on Nelson Street and Glen Road to reduce flooding.
- Conduct a study to determine the best areas to install green infrastructure throughout the Town to maximize infiltration and reduce flooding and encourage Low Impact Development (LID) techniques in new development.
- Study open space potential for flood storage and areas to conserve or construct wetlands.
- Create a robust community engagement plan that would include, but not be limited to information about:
    - Clearing private property sidewalks, especially around schools and intersections;
    - Demonstration about green infrastructure improvements and how to make small improvements at home;
    - Tours of, giving awards for, or showcasing examples of resiliency;
    - Water conservation during droughts;
    - Announcements in real time about hazards (including water quality);
    - Neighborhood or precinct communication networks or hubs;
    - Messages targeted to vulnerable populations (non-native English speakers, youth, seniors); and
    - Available resources during extreme heat conditions (i.e. cooling centers) and the importance of wellness checks.
- Regularly review and update bylaws, regulations, and other planning documents to incorporate climate change and the latest developments, including but not limited to the: All Hazards Mitigation Plan; Comprehensive Emergency Management Plan; and Winchester's Zoning Bylaw, including the floodplain overlay district.
- Integrate incentives or requirements for green infrastructure into the Town bylaws, regulations, and site plan review.
- Improve landscape management around the reservoir and work with DCR to develop a coordinated forest management plan.
- Develop a water conservation program or policy.
- Improve capacity to provide public health services and shelters by creating more spaces to stay warm, cool down, and get resources.

6.2 High Priorities

6.2.1 Multi-hazard

- Support ongoing climate adaptation and hazard mitigation improvements, such as
  - Glen Road and High School drainage studies
  - Stormwater projects and flood mitigation efforts
  - Tree maintenance and plantings
  - Snow removal
  - Low level outlet or alternative considerations as part of the rehabilitation at North Reservoir Dam
  - Amelia Earhart Dam improvements (regional project)
- Use solar energy and storage to improve resiliency at critical facilities such as Vinson-Owen school and municipal buildings.
- Establish a memorandum of understanding with Stop and Shop to supply food and water during emergencies.
- Improve resilience of properties owned and managed by the Winchester Housing Authority by installing air conditioning, protecting the single property within the floodplain, creating and practicing evacuation plans, retrofitting buildings with water conservation technology.
- Identify multiple funding sources that could be used as a match, such as the Cummings Foundation or other federal grants.

6.2.2 Stormwater/Flooding

- Identify priority culvert replacements and use rainfall projections under climate change scenarios to evaluate the design in areas with frequent flooding.
- Consider stormwater recapture or nature-based systems prior to grey infrastructure.
- Identify and apply to funding sources for green infrastructure improvements in parks, green spaces, and parking lots.
- Incorporate green infrastructure and permeable pavement into affordable housing parcels, school and municipal grounds.
- Model future flood zones for the Aberjona River and Horn Pond Brook.
- Complete Project 10 of the Town's flood mitigation program to expand the culvert at the railroad bridge near the Muraco School.
- Work regionally with Woburn, other surrounding communities, and developers to implement projects upstream for flood storage, stormwater management, and smart redevelopment on priorities like the former Kraft Foods property.
- Rehabilitation of the Town-owned North Reservoir Dam.
- Work with the developers of four mixed use developments that are currently in conceptual design in Town Center or near Town Center to pilot energy resilience and sustainability projects.

6.2.3 Drought

- Update safe yield analysis for the Town's reservoir system during drought.
- Investigate non-municipal water supplies for irrigation.
- Retrofit municipal buildings, schools, and affordable housing with water conservation technology.
- Maintain integrity of reservoirs through dam rehabilitation projects.

6.2.4 Heat

- Develop strategies to reduce the heat island effect of the turf fields.
- Protect and maintain mature trees by updating the town bylaws and completing a tree survey.
- Evaluate heating and cooling alternatives, such as Passive House techniques.
- Conduct a needs assessment for cooling centers and additional emergency shelters, Lynch Elementary and the Jenks Center might be possible candidates for capacity expansion.
- Retrofit schools and other gathering places with climate adaptation in mind.
- Conserve open space and prioritize areas that may be of importance to regional bird migration.

6.3 Moderate Priorities

- Load shedding and clean energy incentives.
- Assess dredging Judkins Pond and Davidson Park.
- Maintain higher base flow in the Aberjona River to reduce exposure to contaminated soils.
- Life cycle assessment for curbside vs drop off solid waste management.
- Build shelters at the bus stops, possibly with solar panels. Identify other areas, such as parking lots where energy could be captured.
- Coordinate with Winchester Hospital to conduct outreach on emerging public health risks related to climate change.
- Update emergency shelter supplies.
- Conduct a study and implement recommended actions for building in redundancy within the communication system.
- Provide personal protective equipment to town employees and encourage private businesses to do the same.
- Develop a protocol for protecting workers during hazard events, including extreme heat, and encourage private business to do the same.
- Conduct a microgrid study.
- Bury power lines.
- Develop a vulnerable population database.
- Secure technical assistance grants for environmental advocacy groups.
- Study the impact of increased water temperatures on river herring habitat and migration.
- Study nutrient loading as it relates to climate change.
- Develop an alternative transportation study to identify projects where multiple co-benefits are possible, such as transportation corridors with nature-based stormwater features.
- Develop a fertilizer and pesticide ban.
- Long term water rationing.
- Research on how to support better wildlife passage in and throughout town.

6.4 Other Priorities

- Use Wright Locke Farm as an emergency shelter.
- Install renewable energy in the community, one possible location could be Wright Locke Farm.
- Find a sustainable solution to heating the Wright Locke Farm greenhouses.
- Install green infrastructure at Winchester Hospital.
- Increase education and outreach about rain barrels.
- Provide real-time information on nutrient loads.
- Preserve the water quality of the Town-owned reservoirs in Middlesex Fells through a campaign to reduce trash and dog waste.

7.0 ADDITIONAL INFORMATION

7.1 CRB Workshop Participants

The CRB Workshop participants represented the Core Team, Town Staff, Boards and Committees, Local Organizations, Adjacent Communities, and Regional and State Agencies.

7.1.1 Core Team

Name	Affiliation	Attendance
Beth Rudolph	Town Engineer	✓
Lisa Wong	Town Manager	✓
Phillip Beltz	Director, Council on Aging	✓
Bryan Carignan	Assistant Town Engineer	✓
Peter MacDonnell	Police Chief	✓
Brian Szekely	Town Planner	✓
James Gibbons	Water & Sewer Operations Manager	✓
James Gill	Director, Department of Public Works	✓
Margaret White	Special Projects Manager, Engineering Department	✓
Susan McPhee	Energy Management Committee	✓
Elaine Vreeland	Conservation Agent	✓
Rick Tustin	Fire Chief (Current)	
Jennifer Murphy	Director, Health Department	
Sgt. Frank Batchelor	Safety Officer, Police Department	
John Nash	Fire Chief (Retired)	
Mark Twogood	Assistant Town Manager	

7.1.2 Additional Town Staff

Matthew Griffin	Information Technology Director	✓
Peter Lawson	Facilities Manager	
Al Wile	Building Commissioner & Veterans Affairs Agent	
Ann Wirtanen	Director, Winchester Public Library	
Chris Nelson	Director, Recreation Department	
Ellen Knight	Archival Center	
Judith Evans	Superintendent, Winchester Public Schools	
Michelle Tassi	Human Resources Director	

7.1.3 Board and Committees

Name	*Affiliation*	*Attendance*
Laura Turenne	Energy Management Committee	✓
Fritzie Nace	Energy Management Committee	✓

Name	*Affiliation*	*Attendance*
Jack Hurd	Winchester Housing Authority	✓
Lisa Matrundola	Disability Access Committee	✓
Michelle Bergstrom	School Committee	✓
Ruth Trimarchi	Climate Action Advisory Committee	✓
Zeke Nims	Conservation Commission	✓
Anne Lieby	Climate Action Advisory Committee	✓
Eileen Casciari	Design Review Committee	✓
Tom Howley	Council on Aging	✓
Heather Von Mering	Planning Board	
Cathy Donaghey	Board of Health	
Aaron Kutylo	Finance Committee	
Bob Deering	Educational Facilities Planning & Building Committee	
Helen Philliou	Capital Planning Committee	
Jack LeMenager	Historical Commission	
Karl Rexer	Energy Management Committee	
Kerry Bartlett	Board of Health	
Mariano Goluboff	Chair, Select Board	

7.1.4 Local Organizations

Name	*Affiliation*	*Attendance*
Liora Norwich	Winchester Multicultural Network	✓
Reverend Dr. Jessica McArdle		✓
Archie McIntyre	Wright-Locke Farm	✓
Dot Butler	Winchester Coalition for a Safer Community	
Steve Shea	Winchester Hospital	
Carolyn Starrett	Sustainable Winchester	
Cathy Alexander	Winchester Chamber of Commerce	
Marylou Hardy	Winchester Hospital	
Reverend William Burhans	First Congregational Church of Winchester	
Wei Han	Winchester School of Chinese Culture	
	Family Action Network	
	Cool Winchester	

7.1.5 Adjacent Communities

Name	*Affiliation*	*Attendance*
Jay Corey/Matthew Barrett	Woburn	✓
Erin Wortman	Stoneham	
Ken Pruitt	Arlington	

7.1.6 Regional and State Agencies

Name	*Affiliation*	*Attendance*
Senator Jason Lewis	Massachusetts Senate	
Representative Katherine Clark	US House of Representatives	
Mark Voorhees	U.S. Environmental Protection Agency	
Martin Pillsbury	MAPC	
Matt Hartman	Chief of Staff, Senator Jehlen	
Rep. Michael Day	Massachusetts House of Representatives	
Senator Patricia Jehlen	Massachusetts Senate	
Patrick Herron	Director, Mystic River Watershed Association	
Priscilla Geigis or Dan Driscoll	DCR	
Terrence W. Kennedy	MA Governor's Council	
Zachary Crowley	Chief of Staff, Senator Lewis	
	Eversource - Electric	
	National Grid - Natural Gas	
Amber Christofferson	Mystic River Watershed Association	✓
Emily Granoff	Senator Lewis's Office	
Ryan McGeown-Conron	Rep. Day's Office	✓
Jeff Zukowski	MEMA	
Suzanne Warner	EPA	
Elise Simons	Environmental Protection Specialist	
Eric Worrall	Northeast Regional Director	
Priscilla Geigis or Dan Driscoll	Deputy Commissioner for Conservation and Resource Stewardship	

7.2 Citation

Town of Winchester. (2020). Community Resilience Building Workshop Summary of Findings. Prepared by Weston & Sampson.

7.3 CRB Workshop Project Team

Key Staff:

- Beth Rudolph, Project Manager, Town of Winchester
- Core Team Members as noted above

Facilitators from Weston & Sampson:

- Amanda Kohn
- Steve Roy
- Lydia Kifner
- Deanna Lambert
- Lindsey Adams

7.4 Acknowledgements

We'd like to recognize the Core Team members and the Town Manager, Lisa Wong, for leading by example throughout the MVP planning process. A special thanks to the Massachusetts Executive Office of Energy and Environmental Affairs for providing the grant funding to conduct the MVP process and to the Nature Conservancy for providing the Community Resilience Building Guidebook. Additional thanks to all the participants and to the Workshop Project Team for a successful event and to the Public Library for generously providing the space.

APPENDIX A
Core Team Meeting Materials

Municipal Vulnerability Preparedness Planning Grant

Core Team Meeting
Waterfield Room, Lower Level Town Hall
Thursday, October 3rd, 2019
10:00 am – 11:30 am

Introductions — 5 minutes

Project Overview — 15 minutes

1. MVP Program Overview
    a. MVP Planning Process
    b. MVP Action Grants
2. Core Team Role
    a. Develop/approve list of stakeholders
    b. Active participants in the Community Resilience Building Workshop
    c. Promote the listening session/attend listening session
    d. Inform community priorities/Determine how decisions from Workshop will be used
3. Introduction to Climate Change in Winchester
    a. Local hazards/experiences to highlight? - previous flood events, issue areas

Community Resilience Building Workshop and Review of Materials — 45 minutes

1. MVP Risk Matrix
    a. Discuss hazards and key features (infrastructure, society, environment)
2. Review map of key resources/assets
3. Prioritization Process MVP Key Actions
4. Workshop Schedule
    b. One 8-hour or two 4-hour meetings
    c. Weekday or weekend
    d. Day or evening
5. Presentation Feedback

W&S Action Item: Finalize Workshop materials based on Core Team input
Winchester Action Item: Help to fill mapping and PowerPoint gaps

Data Sources — 5 minutes

1. Interviews with municipal officials
2. Applicable reports and materials
    a. Hazard Mitigation Plan Update (2016)
    b. Open Space and Recreation (2009)
    c. Master Plan (2004, being updated now)
    d. Critical assets and infrastructure
    e. Demographics
3. Ask:
    a. Other ongoing efforts?

W&S Action Item: Review materials and incorporate into Workshop and Report(s)
Winchester Action Item: Identify and provide any additional resources

Workshop Participants — 15 minutes

1. Respond to a list of workshop invitees

W&S Action Item: Draft invitation to stakeholders
Winchester Action Item: Finalize list of invitees; send invitation and track RSVPs, assign participants to tables

Wrap Up and Next Steps — 5 minutes

The Town Of WINCHESTER MASSACHUSETTS

Municipal Vulnerability Preparedness Planning Grant Project
Thursday, October 10, 2019 10:00 pm – 11:30 pm

Name	Present
Lisa Wong	
Mark Twogood	
Elaine Vreeland	✓
Phillip Beltz	✓
Susan McPhee	✓
Bryan Carignan	✓
Beth Rudolph	
Margaret White	✓
John Nash	
Rick Tustin	
Jennifer Murphy	✓
Brian Szekely	✓
Peter MacDonnell	✓
Frank Batchelor	✓
James Gill	
James Gibbons	
David Elmer	X
Amanda Kahn	✓
Steve Ray	✓

Town of Winchester
Municipal Vulnerability Preparedness (MVP) Grant Project
Core Team Meeting Notes
Thursday, October 3, 2019
10:00 am – 12:00 pm

Attendance

Winchester

Weston & Sampson
Amanda Kohn, Project Manager
Steve Roy, Technical Lead
David Elmer, Wastewater Director

Discussion

Introductions of all in Attendance

Review of MVP Planning Process and Materials

- Amanda Kohn opened the meeting with a summary of the MVP Planning process and expectations for the Core Team Involvement and she also outlines the Stakeholder Workshop
- Amanda used a draft PowerPoint presentation to review climate impacts, risks, and vulnerabilities. The Weston & Sampson Team requested corrections on the data presented concerning Winchester and to send the team any local photos that could be used during the Workshop
- The Jenks Center and Library could be assessed for an energy load shed.
- Existing Town Plans were identified as resources and several additional plans were suggested as background materials
    - Masterplan – undergoing an update
    - Open Space recreation Master Plan - undergoing an update
    - Fields Master Plan
    - Tri-Community Bike Plan
- It was noted that MAPC has recently updated data for the community on census and land use.
- A discussion on flooding in Winchester was held and several comments were provided on upstream community impacts to flooding in Winchester. Need for regional assessment and projects were discussed.
    - Flood was identified as a major hazard in Town, both riverine and stormwater. Stormwater impacts are felt from development upstream. There is a large development going in.
    - Riverine flooding is felt near the center of town. Improvement to the high school has reduced vulnerability. Main Street floods. Some people experience basement flooding. Police are very active when it floods, checking on residents and making sure people in cars are safe near Cross Bridge. There is a lot of critical infrastructure along Horn Pond Brook. They implemented a flood mitigation program (17 out of about 20 actions) which as helped.
    - Heat was an issue last summer. The Town wanted to use the Jenks Center, which is not open on weekends. Need to spread awareness on the protocols/establish a protocol.
-

- The Core team reviewed the invitation list for the Stakeholder Workshop. Several suggestions were made. Beth Rudolph will make revisions to the invitation list and provide to WSE.
- Vulnerability and hazards map for Winchester was reviewed at the end of the meeting. Due to time constraints, Beth will collect all suggested revisions to the map and scan and forward to WSE.

Existing Mitigation Measures in Winchester

- Green communities
    - Heat smart
- Fields Master Plan (utilization and schedule for maintenance)
- Stormwater Utility
- Flood Control Program
- Community Choice Aggregation – residential outreach
- MassSAVE Audits – SolarMass Pilot
- 15 passengers to Jenks Center (Dec)
- Re-doing master plan → Sus. And CR throughout
- OSRP → new one started → focus on regional connections
- Orgs: sustainability, Cool, 350
- Actions: Wedge Pond and bacteria (swimmable)

Next Steps

- WSE will revise Workshop materials for final review by the Core Team prior to the Stakeholder Workshop.
- A date will be set for November for the workshop

APPENDIX B

Workshop Materials

Agenda
Attendance
Presentation
Base Map
Critical Facilities List

TOWN OF WINCHESTER

Municipal Vulnerability Preparedness Planning Grant Project

Community Resilience Building Workshop

Winchester Public Library, Large Meeting Room, 80 Washington Street
Wednesday, November 20, 2019
8:30 am – 4:30 pm

8:30 am – 8:45 am	**Registration and Refreshments**
8:45 am – 9:00 am	**Welcome and Introductions**
9:00 am – 9:15 am	**MVP Workshop Purpose and Overview** • MVP Program Background • Purpose, Desired Outcomes, Objectives, Expectations • Review Agenda • Logistics

9:15 am – 10:00 am	**Data Resources and Overview of Science**
	• Hazards
	• Existing Climate Change
	• Projected Climate Change
	• Recent Planning Efforts
	• Overview of Data and Maps Being Used During Workshop
	Risk Matrix
	• Hazards
	• Features
	  • Infrastructure, Societal, Environmental
	  • Vulnerability or Strength
	  • Location
	  • Ownership
	• Actions

10:00 am – 10:15 am	**Large Group Exercise #1** • Identify Major Hazards in Community • Prioritize Top Four Hazards
10:15 am – 10:30 am	**BREAK**
10:30 am – 10:50 am	**Small Group Exercise #1** • Infrastructure and Buildings Features: Vulnerability or Strength, Location, Ownership
10:50 am – 11:10 am	**Small Group Exercise #2** • Societal Features: Vulnerability or Strength, Location, Ownership
11:10 am – 11:30 am	**Small Group Exercise #3** • Environmental Features: Vulnerability or Strength, Location, Ownership

TOWN OF WINCHESTER

Municipal Vulnerability Preparedness Planning Grant Project

Community Resilience Building Workshop

Winchester Public Library, Large Meeting Room, 80 Washington Street
Wednesday, November 20, 2019
8:30 am – 4:30 pm

11:30 am – 12:00 pm	**MVP Community Actions** • Infrastructure • Nature-Based Solutions
12:00 pm – 1:00 pm	**Lunch**
1:00 pm – 1:45 pm	**Small Group Exercise #4** • Infrastructure and Buildings Features • Define MVP Community Actions
1:45 pm – 2:30 pm	**Small Group Exercise #5** • Societal Features • Define MVP Community Actions
2:30 pm – 3:00 pm	**Small Group Exercise #6** • Environmental Features, • Define MVP Community Actions
3:00 pm – 3:15 pm	**BREAK**
3:15 pm – 4:15 pm	**Large Group Exercise #2** • Identify MVP Priority Actions
4:15 pm – 4:30 pm	**Wrap-up and Closing Remarks**

The Town Of WINCHESTER MASSACHUSETTS

Municipal Vulnerability Preparedness Planning Grant Project
Wednesday, November 20, 2019 8:30 am – 4:30 pm

Table Number	Name	Sign
1	Amber Christofferson	
1	Beth Rudolph	
1	Emily Granoff	
1	Laura Turenne	
1	Liora Norwich	
1	Lisa Wong	
1	Matthew Griffin	
1	Phillip Beltz	
2	Bryan Carignan	
2	Fritzie Nace	
2	Heather Von Mering	
2	Jack Hurd	N/A
2	Lisa Matrundola	
2	Peter Lawson	
2	Peter MacDonnell	
2	Ryan McGeown-Conron	
3	Brian Szekely	Partial
3	Cathy Donaghey	N/A

Weston & Sampson

The Town Of WINCHESTER MASSACHUSETTS

Municipal Vulnerability Preparedness Planning Grant Project
Wednesday, November 20, 2019 8:30 am – 4:30 pm

Table Number	Name	Sign
3	James Gibbons	
3	Jeff Zukowski	
3	Michelle Bergstrom	
3	Reverend Dr. Jessica McArdle	
3	Rick Tuston	
3	Ruth Trimarchi	
3	Zeke Nims	
4	Anne Lieby	
4	Archie McIntyre	
4	Eileen Casciari	
4	James Gill	
4	Jennifer Murphy	
4	Margaret White	
4	Steve Shea	
4	Suzanne Warner	
4	Tom Howley	
2	MATTHEW BARRETT	
	Carolyn Mecklenburg	

Weston & Sampson

The Town Of WINCHESTER MASSACHUSETTS

Municipal Vulnerability Preparedness Planning Grant Project
Wednesday, November 20, 2019 8:30 am – 4:30 pm

Table Number	Name	Sign
	Susan McPhee	
	Elaine Vreeland	Elaine Vreeland

Weston & Sampson

TOWN OF WINCHESTER

COMMUNITY RESILIENCE BUILDING WORKSHOP

Wednesday, November 20th, 2019

Photo: Wedge Pond in Winchester, MA. Photo by Mingwei Li, Youtube, 2015.

1

WELCOME FROM W&S

Amanda Kohn
Steve Roy
Lindsey Adams
Deanna Lambert
Adria Boynton

Photo: Winchester Public Library. Photo from Winchester town website.

2

Municipal Vulnerability Preparedness Program

Carolyn Meklenburg
MVP Regional Coordinator for Greater Boston
MA Executive Office of Energy and Environmental Affairs

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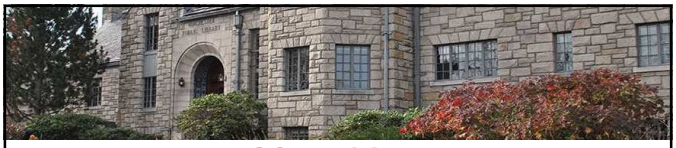

WELCOME CORE TEAM

Frank Batchelor	Susan McPhee	Brian Szekely
Phillip Beltz	Jennifer Murphy	Elaine Vreeland
Bryan Carignan	Rick Tustin	Margaret White
James Gibbons	Beth Rudolph	Lisa Wong
James Gill	Mark Twogood	
Peter MacDonnell	Rick Tustin	

Photo: Winchester Public Library. Photo from Winchester town website.

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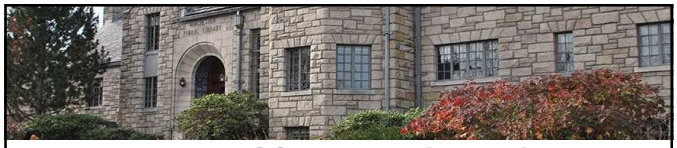

WELCOME PARTICIPANTS

Your name
Organization/Relationship to Winchester
Favorite thing about Winchester

Photo: Aqueduct Bridge. Photo by Winter Wind Photography.

5

WORKSHOP OUTLINE

PRESENTATION:
- Overview of MVP Program and Climate Science
- Characterization of Hazards

- BREAK -

INDIVIDUAL TABLES:
- Identify Community Features

- LUNCH -

INDIVIDUAL TABLES:
- Identify and Prioritize Actions

- BREAK -

LARGE GROUP DISCUSSION:
- Determine Overall Priority Actions

Photo: Winchester Town Hall. Photo from Ashley Myers, The Odyssey Online, 2017.

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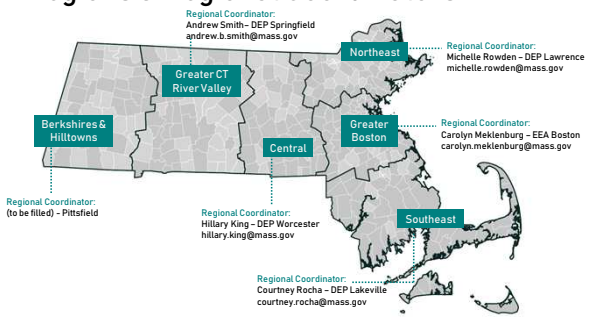
MVP Regions & Regional Coordinators



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Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) – September 2018

- Acknowledges that climate change is already worsening natural hazards, integrating information and planning elements for 14 natural hazards that affect the Commonwealth
- Uses best scientific data and projections to assess risk and vulnerability
- Evaluates the Commonwealth's existing capabilities to implement agency-specific and statewide activities to reduce risk and increase resilience

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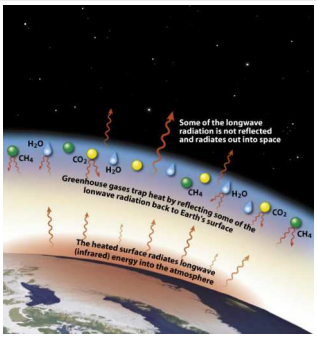
GREENHOUSE GASES (GHG)

- Naturally occurring
- Act as a blanket
- Examples: carbon dioxide and methane

Climate mitigation ensures there is less to adapt to and is a key component of our community's resilience



Smithsonian Environmental Research Center. "Too Much of a Good Thing."
http://forces.si.edu/atmosphere/02_04_07.html

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MASSACHUSETTS GHG GOALS

- Established by the Global Warming Solutions Act (GWSA) of 2008
- 25% reduction in GHG emissions by 2020
- 80% reduction in GHG emissions by 2050
- 1990 is the baseline year

Weston & Sampson Source: Commonwealth of Massachusetts. 2019. "Global Warming Solutions Act 10-year Progress Report," 10.

10

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FIGURE 3 | TRENDS OF GROWTH IN GSP, VMT, AND POPULATION WHILE GHG EMISSIONS ARE DECREASING AND ENERGY USE HAS BEEN STABLE

Weston & Sampson Source: Commonwealth of Massachusetts. 2019. "Global Warming Solutions Act 10-year Progress Report," 10.

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MA 2050 Decarbonization Plan

EEA is conducting an **80x50 Study** to identify the strategies, policies, and implementation pathways for MA to achieve at least 80% Greenhouse Gas reductions by 2050.

The results of that research will be published in a **2050 Roadmap report** and will inform the setting of a **2030 GHG emissions limit** and the development of the **Clean Energy and Climate Plan for 2030**.

More information and opportunities to get involved:
www.mass.gov/2050Roadmap

Massachusetts Global Warming Solutions

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Next Steps: Climate Change & the Commonwealth

Bill S.10:

An Act for Climate Change Adaptation Infrastructure Investments in the Commonwealth

- Building on success of existing programs like MVP: Proposed new source of revenue for loans, grants, and technical assistance to municipalities and regional partnerships for priority adaptation projects
  - Proposed deeds excise increase → est. $137M annually ($1B in ten years)
  - Recurring, long-term revenue stream for multi-year project feasibility

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MVP Principles

A community-led, accessible process that

- Employs local knowledge and buy-in
- Utilizes partnerships and leverages existing efforts
- Is based in best available climate projections and data
- Incorporates principles of nature-based solutions
- Demonstrates pilot potential and is proactive
- Reaches and responds to risks faced by EJ communities and vulnerable populations

Why nature-based?

Where appropriate, nature-based solutions can be more cost-effective, protect water quality and quantity, sustain lands that provide food and recreation opportunities, reduce erosion, and minimize temperature increases associated with developed areas and climate change.

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MVP Process/ Grant Types

COMMUNITY RESILIENCE BUILDING WORKSHOP(S)

- Define and characterize hazards using latest science and data
- Identify existing and future community vulnerabilities and strengths
- Develop and prioritize community adaptation actions
- Determine overall priority actions
- Receive MVP designation

MVP Planning Grant

MVP Action Grant

Implement priority adaptation actions identified through planning process

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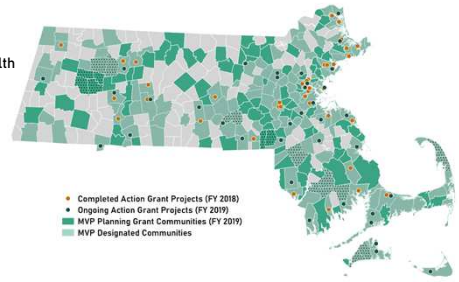
Three Years of MVP

MVP Designations
71% of the Commonwealth
249 communities

Action Grant Projects
FY 18: 37
FY 19: 36

Total Awards
$17M+ in planning and action grants to date



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MVP Action Grants: Project Types

- Detailed Vulnerability and Risk Assessment*
- Community Outreach and Education
- Local Bylaws, Ordinances, Plans, and Other Management Measures
- Redesigns and Retrofits***
- Nature-Based Flood Protection, Drought Mitigation, Water Quality, and Water Infiltration Techniques**
- Nature-Based, Infrastructure and Technology Solutions to Reduce Vulnerability to Extreme Heat and Poor Air Quality

* Most common project type
** Second-most common project type
***Third-most common project type

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MVP Action Grants: Project Types (cont.)

- Nature-Based Solutions to Reduce Vulnerability to other Climate Change Impacts
- Ecological Restoration and Habitat Management to Increase Resiliency

NEW IN 2019

- Energy Resilience
- Chemical Safety
- Land Acquisition for Resilience
- Subsidized Low-Income Housing Resilience Strategies
- Mosquito Control Districts

\+ Expanded eligibility of project location

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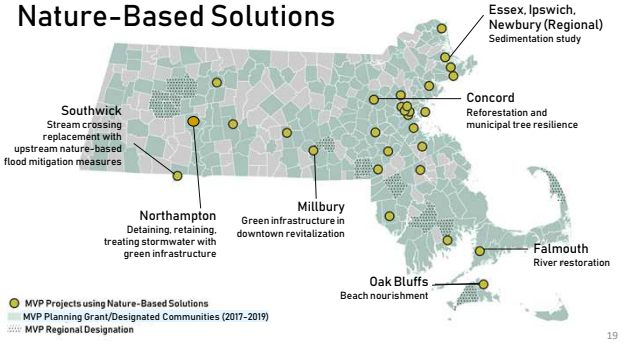
Nature-Based Solutions



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Example Action Grant Projects

Nature-Based Flood Protection, Drought Prevention, Water Quality and Water Infiltration
Community Outreach and Education
Ecological Restoration and Habitat Management

Arlington

Building a green infrastructure demonstration project along Mill Brook to reduce flooding, incorporating informational signage to educate residents about the benefits of green infrastructure

Nature-based solutions

Community education

© Photos by David Mussina 2019

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Example Action Grant Projects

Local Bylaws, Ordinances, Plans, and Other Management Measures
Redesigns and Retrofits

Boston

Developing its first ever resilient building code so that development in the future floodplain is prepared for at least three feet of sea level rise, the likely scenario by late century.

Proactive

Pilot potential

Retrofitting a major waterfront park into a legacy park that uses nature-based solutions to address climate vulnerabilities while providing important access to recreation for residents.

Nature-based solutions

Community co-benefits

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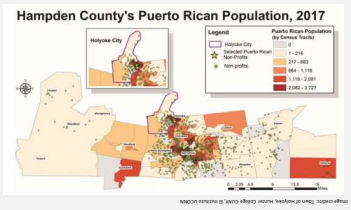
FY18 Action Grant Projects

Detailed Vulnerability and Risk Assessment, Further Planning

Holyoke

Conducted a detailed demographic analysis of individuals who arrived in Holyoke from Puerto Rico as a result of Hurricane Maria and develop recommendations for planning for future climate change migrants in Holyoke

Informational graphics from Holyoke's final report



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carolyn.meklenburg@mass.gov
https://www.mass.gov/municipal-vulnerability-preparedness-program

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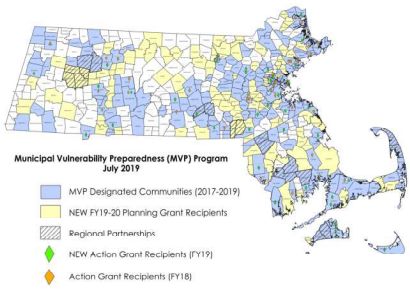
MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM (MVP)



Weston & Sampson

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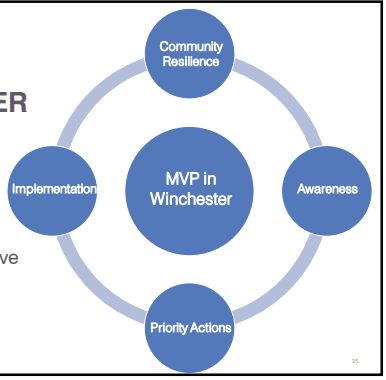
MVP IN WINCHESTER

- Increase resilience of community
- Raise awareness of climate threats
- Identify priority actions to move forward
- Create implementation pathways



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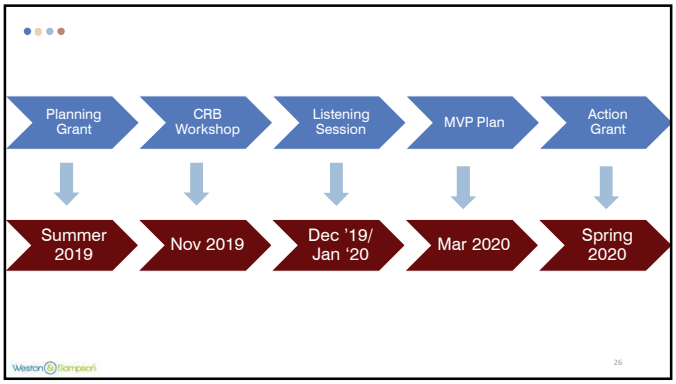

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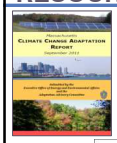
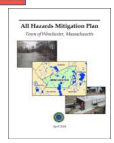
DATA RESOURCES





Within Winchester and Throughout Massachusetts

- Massachusetts Climate Change Projections, 2018)
- Massachusetts State Hazard and Climate Adaptation Plan, 2018
- Massachusetts Climate Change Adaptation Report, 2011
- All Hazards Mitigation Plan, Winchester, 2016
- US Census, American Community Survey, 2013-2017

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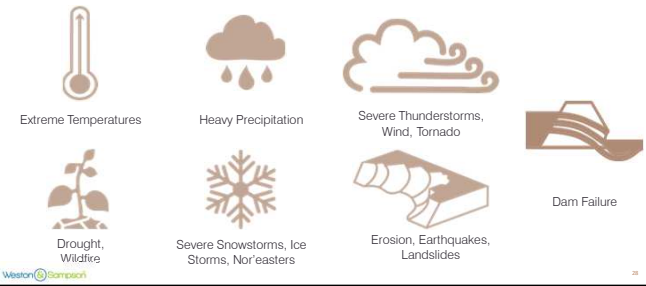
HAZARDS IN WINCHESTER



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Hazards in Winchester

Hazard	Frequency (In Winchester)	Severity (In Winchester)
Flooding	High	Extensive
Dam Failures	Very Low	Extensive
Snow Storms	High	Minor
Ice Storms	Medium	Moderate
Hurricanes	Medium	Moderate
Nor'easters	High	Moderate
Thunderstorms	High	Minor
Wildfires	Medium	Minor
Earthquakes	Low	Extensive
Landslides	Very Low	Moderate
Extreme Temperatures	Low	Minor
Drought	Low	Minor

Source: Winchester All Hazards Mitigation Plan, 2016, pg 3-4

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EXTREME TEMPERATURES

WARMER ANNUAL AIR TEMPERATURES
UP 0.5°F PER DECADE SINCE 1970, ON AVERAGE

WARMER WINTERS
UP 1.3°F PER DECADE SINCE 1970, ON AVERAGE

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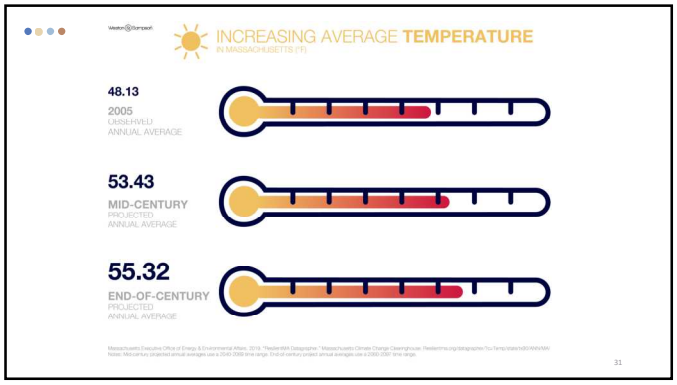

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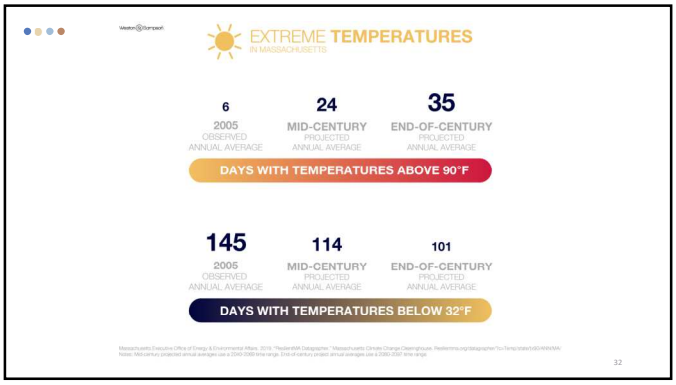

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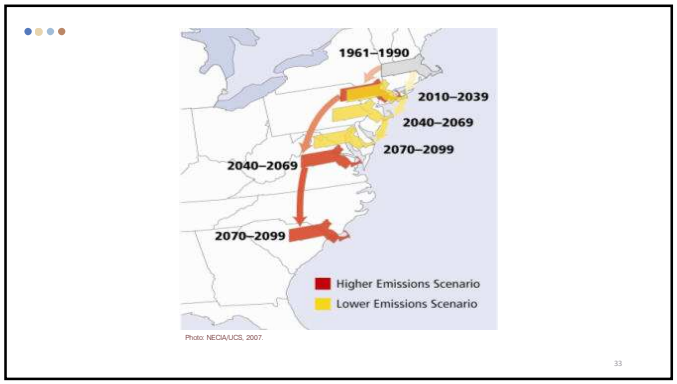

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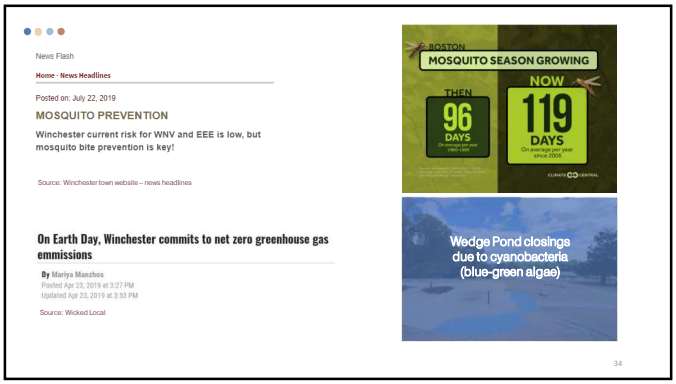

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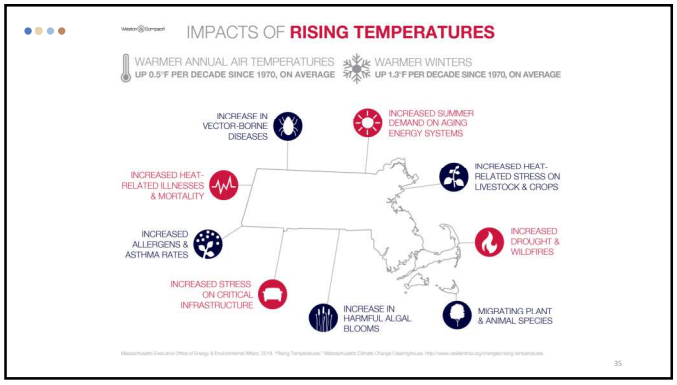

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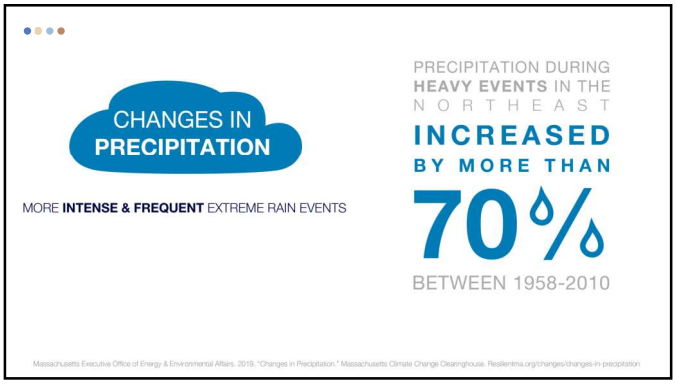

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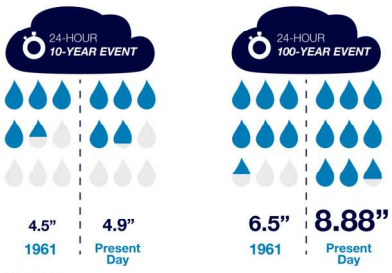
CHANGES IN PRECIPITATION



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EXTREME PRECIPITATION

8%

Increase in extreme precipitation events by midcentury

13%

Increase in extreme precipitation events by 2100

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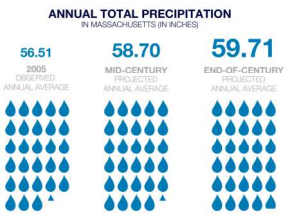
PROJECTED CHANGES IN PRECIPITATION

ANNUAL TOTAL PRECIPITATION
IN MASSACHUSETTS (IN INCHES)



EXTREME RAIN EVENTS WITH MORE THAN 2" OF RAIN PER DAY IN MASSACHUSETTS

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FLOODING

ZONE	ANNUAL CHANCE	FLOODPLAIN
A, AE, A1-A30	1% ANNUAL CHANCE	100-YEAR FLOODPLAIN
X	0.2% ANNUAL CHANCE	500-YEAR FLOODPLAIN

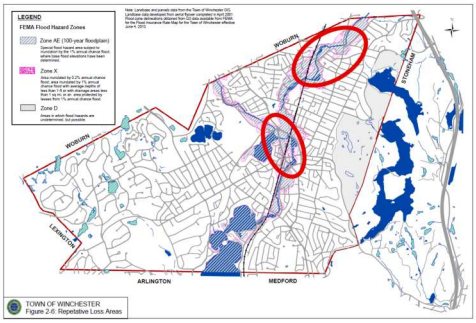
"By 2050, Boston could experience the current 100- year riverine flood every two to three years on average"

40

30

REPETITIVE FLOOD LOSS STRUCTURES

Defined as an NFIP-insured structure that has had at least 2 paid flood losses of more than $1,000 each in any 10-year period since 1978 [1]



1. Federal Emergency Management Agency (FEMA). 2019. "Definitions." Accessed August 29, 2019. Fema.gov/national-flood-insurance-program/definitions#R
2. Winchester All Hazards Mitigation Plan, 2016, pg 2-12.

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FLOODING

Vulnerable Areas

- Poor drainage
- High amounts of impervious surface
- Undersized culverts

"The average annual streamflow at this gage is approximately 25 cfs"

Streamflows during Stormwater Flooding Events

at the USGS Gage in Winchester

Date	Recurrence Interval	Peak Streamflow (cfs)
October 21, 1996	25-year event	1150
June 14, 1998	20-year event	1070
March 22, 2001	60-year event	1590*
April 1, 2004	15-year event	990
May 15, 2006	30-year event	1270
March 14, 2010	50-year event	1450
March 30, 2010	25-year event	1100

*Highest streamflow recorded at this location.

Source: Winchester All Hazards Mitigation Plan, 2016, pg 3-6.

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AREAS PRONE TO FLOODING

Stormwater Flood Prone Areas

Wildwood Street/New Meadows Road Neighborhood

Glen Road

Grove Place

Riverine Flood Prone Areas

Winchester Center

Vicinity to Horn Pond Brook

Vicinity to Aberjona River

Cross Street

Main Street

Skillings Road

Lake Street

Lowell Ave

Houses in the Brookside Avenue and Tufts Road/Nathaniel Road neighborhoods

Area around Winchester High School and its associated playing fields

Bridges along Canal Street and Sylvester Avenue

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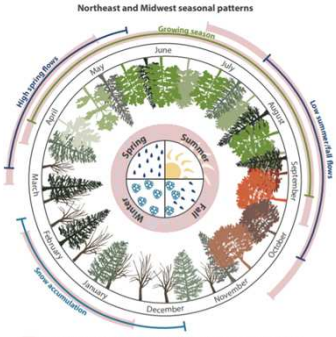

The most notable recent drought event was in

2016

The occurrence of droughts **lasting 1 to 3 months** could go up by as much as **75% over existing conditions** by the end of the century, under the high emissions scenario

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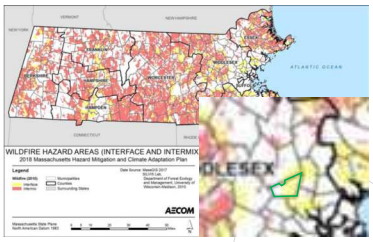
WILDFIRE



Middlesex Fells Reservation

is the most common location of wildfires

3 water-supply reservoirs and the water treatment facility

are located in the Fells

South Border Road

North Border Road

Hillcrest Parkway

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WINTER STORMS

The blizzard of 2013 left nearly **400,000 Massachusetts residents without power**

"Heavy blizzards are among the **most costly and disruptive** weather events for Massachusetts communities."

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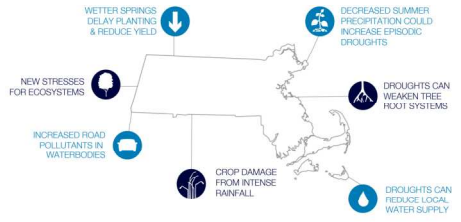
IMPACTS OF CHANGING PRECIPITATION

HIGHER AVERAGE ANNUAL PRECIPITATION
INCREASED BY ABOUT 10% IN THE NORTHEAST INTHE LAST 50 YEARS



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EROSION

- Caused by riverine flow & stormwater[1]
- Increased precipitation, including winter rains, could increase erosion[1]
- Drier soils will reduce resistance to erosion

1. Executive Office of Energy and Environmental Affairs, Adaptation Advisory Committee. 2011. "Massachusetts Climate Change Adaptation Report." 42.

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HURRICANES AND EARTHQUAKES

HURRICANE
Sandy
and nor'easters
cause downed trees and power lines

Upward trend in North Atlantic hurricane activity since 1970

Nor'easters along the Atlantic coast are increasing in frequency and intensity

EARTHQUAKE
30-40
Earthquakes occur in New England each year, although most are not felt.

Source: Climate Science Special Report, Fourth National Climate Assessment (NCA4), Volume prepared by the U.S. Global Change Research Program (USGCRP)

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IMPACTS OF EXTREME WEATHER

STORMS ARE BECOMING MORE INTENSE AND DAMAGING

Massachusetts Executive Office of Energy & Environmental Affairs. 2015. "Extreme Weather." Massachusetts Climate Change Clearinghouse. http://www.resilientma.org/changes/extreme-weather

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HAZARD POTENTIAL OF DAMS

Hazard Classification of Jurisdictional Dams Owned by Winchester

Dam Name	Impoundment Name	Hazard Class	Condition Rating	Ownership	Last Inspection Date	Next Inspection Due
Dams in Winchester						
Wedge Pond Dam	Wedge Pond	Low	Fair	Town of Winchester	10/8/2010	10/8/2020
North Reservoir Dam	North Reservoir	High	Poor	Town of Winchester	7/24/2019	7/24/2021
Dams in Medford						
South Reservoir East Dike	South Reservoir	High	Satisfactory	Town of Winchester	7/24/2019	7/24/2021
South Reservoir Dam	South Reservoir	High	Fair	Town of Winchester	8/15/2018	8/15/2020
Middle Reservoir Dike	Middle Reservoir	Significant	Fair	Town of Winchester	8/5/2019	8/5/2024
South Reservoir West Dike	South Reservoir	Low	Poor	Town of Winchester,	8/5/2019	8/5/2029

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HAZARD POTENTIAL OF DAMS

Hazard Classification of Jurisdictional Dams Impacting Winchester

Dam Name	Impoundment Name	Hazard Class	Condition Rating	Ownership	Last Inspection Date	Next Inspection Due
Dams in Woburn						
Horn Pond Dam/Scalley Pond Dam	Horn Pond	Significant	Fair	City of Woburn	1/28/2016	1/28/2021
Dams in Arlington						
Upper Mystic Lake Dam	Upper Mystic Lake	Significant	Poor (5/27/2006)	MA DCR	3/1/2017	3/1/2022
Dams in Sommerville						
Amelia Earhart Dam	Mystic River	Low	Satisfactory (5/26/2006)	MA DCR	3/7/2017	3/7/2027

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HAZARD POTENTIAL OF DAMS

Non-Jurisdictional Dams Impacting Winchester

Dam Name	Impoundment Name	Hazard Class	Condition Rating	Ownership	Last Inspection Date	Next Inspection Due
Dams in Winchester						
Mill Pond Dam	Mill Pond	Non-Jurisdictional	None	Unknown	None	None

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DAMS, DROUGHTS, AND DRINKING WATER

- Dam vulnerability is critical
- Dams are used to create the drinking water reservoirs
- Droughts have impacted the drinking water supply previously
- Reservoirs supply between 1/3 and 2/3 of Winchester with drinking water
- Remainder of drinking water is purchased from MWRA

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As an FYI: Boston Sea Level Rise Projections (ft)

Increased coastal flooding

Permanently inundated low-lying coastal areas

Increased shoreline erosion

Emission Scenario	2030	2050	2070	2100
Intermediate	0.7	1.4	2.3	4.0
Intermediate-High	0.8	1.7	2.9	5.0
High	1.2	2.4	4.2	7.6
Extreme	1.4	3.1	5.4	10.2

(Source: Northeast Climate Adaption Science Center)

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RISK MATRIX

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RISK MATRIX

Community Resilience Building Risk Matrix — www.CommunityResilienceBuilding.com

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership: Y or N	Priority	Time
Infrastructural				
Societal				
Environmental				

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RISK MATRIX: HAZARDS

Community Resilience Building Risk Matrix — www.CommunityResilienceBuilding.com

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership: Y or	Priority	Time
Infrastructural				
Societal				
Environmental				

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IDENTIFY HAZARDS

Photo: Aberjona River. Photo by Melissa Russell, Wicked Local, 2016.

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HAZARDS IN WINCHESTER

CHOOSE 4 FOR THE MVP ACTION PLAN

Extreme Temperatures

Heavy Precipitation

Severe Thunderstorms, Wind, Tornado

Dam Failure

Drought, Wildfire

Severe Snowstorms, Ice Storms, Nor'easters

Erosion, Earthquakes, Landslides

Weston & Sampson

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RISK MATRIX: HAZARDS

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)				Priority	Time
				H - M - L	Short Long Ongoing

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15 MINUTE BREAK!

Photo: Winchester Sign. Winchester town website.

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RISK MATRIX: FEATURES

Community Resilience Building Risk Matrix — www.CommunityResilienceBuilding.com

H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	Priority	Time
Infrastructural					
Societal					
Environmental					

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RISK MATRIX: FEATURES

H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Features	Location	Ownership	V or S
Infrastructural			
Societal			
Environmental			

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FEATURES IN WINCHESTER

Photo: Winchester Hospital. Photo by The Winchester Star, Twitter, 2016.

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INFRASTRUCTURAL FEATURES

Police Department
Photo by the Winchester Police Department

Fire Department
Google Maps (2017)

Wastewater Treatment & Collection

Dams
South Reservoir. Photo by Weston & Sampson.

Roadways
Photo by WBZ-TV

Water Supply

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INFRASTRUCTURAL FEATURES
CRITICAL FACILITIES

Category	Type of Facility	Site	Address
1	Town Offices	Department of Public Works	15 Lake Street
		Public Safety Building	30 Mount Vernon Street
		West Side Fire Station	45 Lockeland Road
		Winchester Town Hall	71 Mount Vernon Street
	Hospital	Winchester Hospital	41 Highland Avenue
2	Town Facilities	Water Treatment Facility	
		Winchester Public Library	80 Washington Street
	Schools	Ambrose School[1]	15 High Street
		Lincoln School[1]	161 Mystic Valley Prkwy
		Lynch School	10 Brantwood Road
		McCall Middle School[1]	452 Main Street
		Muarco School	33 Bates Road
		Winchester High School[1]	80 Skillings Road
		Vinson Owen School	75 Johnson Road
	Nursing Homes	Aberjona Nursing Center	184 Swanton Street
		Mt. Vernon House	110 Mt. Vernon Street
		The Gables	299 Cambridge Street
		Winchester Nursing Center	223 Swanton Street

Source: All Hazards Mitigation Plan. 2016. 2-6.

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INFRASTRUCTURAL FEATURES
CRITICAL FACILITIES Cont.

Category	Type of Facility	Site	Address
	Churches	Crawford Memorial United Memorial Church	34 Dix Street
		First Church Christ Scientist	114 Church Street
		First Congregational Church	21 Church Street
		First Baptist Church	90 Mount Vernon Street
		Hope Christian Church	58 Mt. Vernon Street
		Parish of the Epiphany	70 Church Street
		Second Congregational Church	485 Washington Street
		St. Eulalia's Church	50 Ridge Street
		St. Mary's Church	160 Washington Street
		Temple Shir Tikva	34 Vine Street
		Unitarian Universalist Church	478 Main Street
	Day Care Facilities	Children's Own School	86 Main Street
		Creative Corner	12 Sheridan Circle
		Family Tree Childcare	39 Holton Street
		Kid Connection/WRAP	263 Main Street
		Kids Corner After School Program	263 Main Street
		Neighborhood Cooperative Nursery School	21 Church Street
		Private Day Care Facilities (list maintained by state)	
		United Methodist Nursery School	34 Dix Street
		Winchester Child Development Center	259 Swanton Street
		Winchester Cooperative Nursery	478 Main Street
		Winchester School of Chinese Culture After School Program	478 Main Street
	Miscellaneous	Bridges & Evacuation Routes	
3		Stop and Shop	695 Main Street

Source: All Hazards Mitigation Plan. 2016. 2-6.

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SOCIETAL FEATURES

Population	Winchester	Massachusetts
2010	21,393 residents	6,547,790
2018	22,851 residents	6,902,149
Age		
Under 18 years:	28%	20%
65+ years:	18%	17%
Education		
Bachelor's degree or higher:	75.5%	42.1%
Additional Information		
Median household income:	$152,196	$74,167
Persons in poverty:	2.3%	10.5%
With a disability:	2.3%	7.9%
Language other than English spoken at home:	19.3%	23.1%

Source: U.S. Census Bureau, 2013-2017 ACS Estimates

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ENVIRONMENTAL FEATURES

Reservoirs

Trails

Photo 1: North Reservoir. Photo by Deanna Lambert, July 2019.
Photo 2: Middlesex Falls Reservation. Photo by KC Landry, Google, March 2019.

Winchester's Open Space

- 20% of the town is open space
- Open spaces include:
  - Middlesex Fells Reservation
  - Borggaard Beach Park

Horn Brook Pond

Aberjona River

Source: Winchester Master Plan Phase I, 2010.

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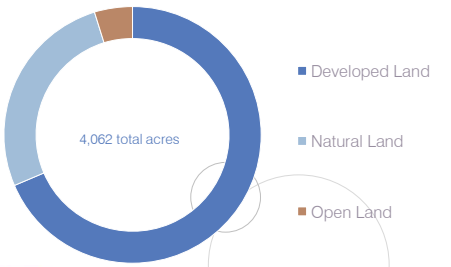
WINCHESTER'S LAND USE



Source: Mass Audubon. "Losing Ground Fifth Edition Statistics for the Town of Winchester." Nonprofit. Our Conservation Work, 2019.

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RISK MATRIX: FEATURES

FEATURES	LOCATION	OWNERSHIP	VULNERABILITY OR STRENGTH
Infrastructural	Town wide	State	Vulnerability
Societal	Multi- vs. Single-neighborhood	Town	Strength
Environmental	Specific location	Private	Both
		Shared	

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LUNCH

Photo: Sanborn House. Photo by Cydney Ambrose, Winchester Historical Society

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ADAPTATION STRATEGIES

Photo: Conditions during a January 2018 snowstorm. Posted by The Winchester Star. Photo by Summer Marion, Twitter, 2018.

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EXISTING HAZARD PROTECTION

- Participation in the National Flood Insurance Program (NFIP);
- Policy-related strategies targeting new and redevelopment projects;
- Local drainage improvement and maintenance activities;
- Emergency response planning;
- EPA Phase II Stormwater permit requirements; and
- Public education
- Dam Emergency Action Plans
- Cooperation with local utility companies to perform annual tree maintenance around utility lines
- Placement of power lines underground for new construction to avoid storm related damage.

Weston & Sampson Source: All Hazards Mitigation Plan, 2016, Town of Winchester. 75

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CLIMATE RESILIENCE ACTIONS

- EV Charging Stations
- Green Communities Participant
  - HEAT SMART Program
- Ongoing Initiative for a Stormwater Enterprise Fund
- Flood Mitigation Program
- Community Choice Aggregation
- MassSave Audits
- Community Outreach on Programs
- Updating Master Plan with Climate Resilience/Sustainability
- Open Space Plan is being updated with Regional Focus

Weston & Sampson Source: All Hazards Mitigation Plan, 2016, Town of Winchester. 76

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CLIMATE ACTION PLAN (CAP)

- CAP, charged by Town Manager in 3/19 with writing a Climate Action Plan, has been working to identify the current status of all climate change impacts for Winchester
- CAP is bringing you the climate vulnerability concerns of a large number of Winchester residents:
  - Our 17-member Committee has extremely broad representation both in its membership and in our very extensive outreach over the past several months, with written responses of various sorts now approaching 1000 residents and verbal interaction with many more.
- Climate concerns and proposed solutions are currently being finalized for both Mitigation and Resiliency. CAP is very pleased to be hearing the MVP team identify vulnerabilities and concerns that we will weigh for inclusion in the final CAP recommendations.
- Here's a sense of some action items we will be including in the CAP …

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CAP Preliminary Resiliency Recommendations

- Who We Have Talked To:
  - Town Departments (but not all)
  - Community/Business Groups
  - Held Resiliency Roundtable (September 29, 2019)
  - CAP Committee Retreat
  - Town Manager/Select Board
- Initial Recommendations:
  - Hire a Sustainability Director
  - Develop Strategies to Address Climate-Related Health Impacts:
    - Severe Weather Response Strategy (e.g., Heat Response Plan)
    - Develop a Comprehensive Climate Communications and Technical Assistance Strategy (including outreach tools such as interactive website, workshops, etc.)

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CAP Preliminary Resiliency Recommendations

- Promote Greater Use of Green Infrastructure/Nature-Based Solutions:
  - Conduct a hydrogeology study of existing and future conditions
  - Develop Green Infrastructure Strategy for small-scale projects on municipal and residential properties
  - Incentivize infiltration practices as part of stormwater utility credit system
  - Implement a Town-Wide Tree Protection and Replacement By-Law
  - Implement a Town-Wide Infiltration By-law
- Incorporate Climate Preparedness into Emergency Response Planning
  - How can CAP help with that?

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COMMUNITY ACTIONS

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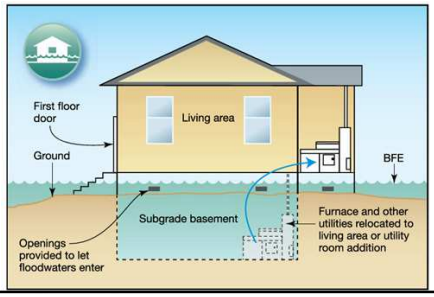
WET FLOODPROOFING



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RAISED BUILDINGS

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PREVENTING SEWER BACKFLOW

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83

MULTI-PURPOSE FLOOD STORAGE

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84

LOW IMPACT DEVELOPMENT (LID)

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85

POROUS ASPHALT & PERMEABLE PAVERS

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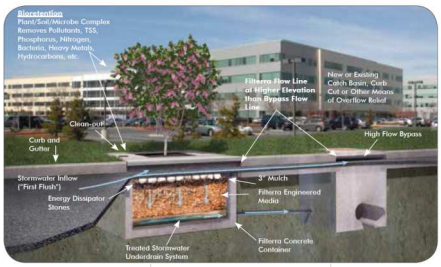
STREET TREES & TREE BOX FILTERS



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STREET TREES & TREE BOX FILTERS

Rain Garden in a median strip of a townhouse project. Please note the depressed curb and grate inlet structure

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STORMWATER DETENTION & RETENTION

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CULVERT WIDENING TO IMPROVE HABITAT & FLOW

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CLOUDBURST STREETS

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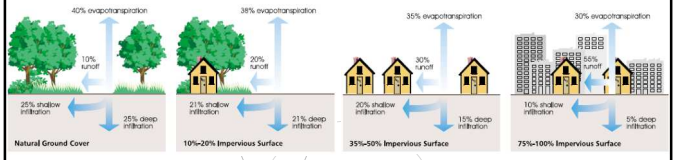
REDUCE IMPERVIOUS AREAS



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GREEN ROOFS

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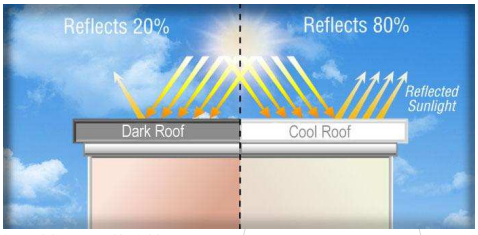
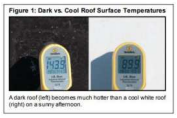
COOL ROOFS



Source: Heat Island Group at Lawrence Berkeley National Laboratory



Source: U.S. Department of Energy
Guidelines for Selecting Cool Roofs

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COOLING CENTERS

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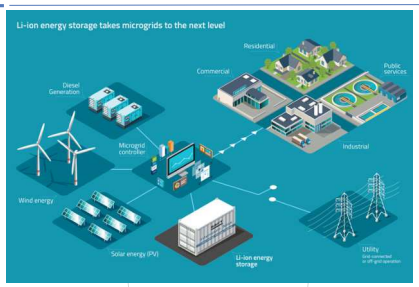
RENEWABLE MICRO-GRIDS



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LANDSCAPE DESIGN TO ACCOMMODATE WATER

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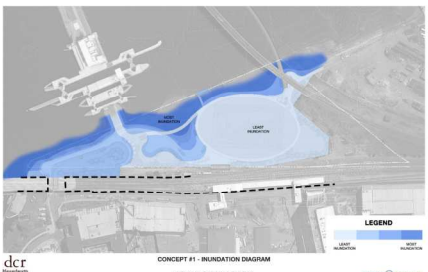
LANDSCAPE DESIGN TO ACCOMMODATE WATER



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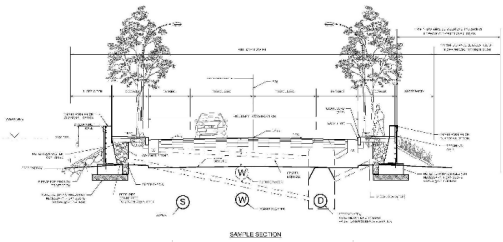
RAISED ROADWAYS



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RETROFITTED FLOODPROOF DOORWAYS

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RE-EVALUATE LOCAL REGULATIONS & POLICIES

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DEFINE COMMUNITY ACTIONS

Photo: Aberjona River. Photo by Mark Wilson, The Boston Globe, 2011.

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15 MINUTE BREAK!

Photo: Chefalo Park. Photo by William Fleming Associates Incorporated.

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IDENTIFY PRIORITY ACTIONS

Photo: South Border Road. Photo by Mariya Manzhos, Wicked Local, 2018.

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WRAP-UP & CLOSING REMARKS

Photo: Flooding on Cross Street on March 15, 2010. Photo by Erik Jacobs, Sirius Mug, 2010.

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Legend

- City/Town Offices/Utilities/Services
- Day Care
- Emergency Shelter
- Fire Station
- Food/Grocery/Supply Store
- Hazardous Material Site
- Hospital
- Housing Authority Unit
- Library
- Nursing Home
- Place of Worship
- Police Department
- Rail Station
- Sewage Pumping Station
- School
- Underground Storage Tank
- Water Treatment Facility
- Railroad
- Evacuation Route
- Landfill
- Conservation/Protected Land and Open Space
- Bridge

Dams

- High Hazard
- Significant Hazard
- Low Hazard

Census Blocks with Vulnerable Populations

- >25% of residents are people of color (EJ 2010 Populations)
- 25% of population <18
- 25% of population > 65

Waterways

- Rivers, Streams, and Brooks
- Marsh/Bog/Wooded Marsh
- Lakes, Ponds, Reservoirs

FEMA National Flood Hazard Layer

- 1% Annual Chance of Flooding (Zones A, AE, AH, AO)
- 0.2% Annual Chance of Flooding (Zone X)
- Possible But Undetermined Hazard (Zone D)

WOBURN
STONEHAM
LEXINGTON
ARLINGTON
MEDFORD
N
0 0.25 0.5 Miles

FIGURE 1

TOWN OF WINCHESTER, MASSACHUSETTS

MUNICIPAL VULNERABILITY PREPARDNESS HAZARD AND FEATURE MAP

NOVEMBER 2019 SCALE: NOTED

Weston & Sampson

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

H-**M**-**L** priority for action over the **S**hort or **L**ong term (and **O**ngoing)
V = Vulnerability **S** = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	HEAT	FLOODING (Stormwater & Riverine)	NOR'EASTERS (Wind & Heavy Precip)	DROUGHT	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Municipal Buildings	Town Center/ Town wide	Town	V/S	Health, Town Hall Cooling, Cooling Centers, Clean H&C	Public safety, schools update bylaws for buildings in floodplains. Adopt floodplain policies for municipal buildings Permeable pavement in parking lots	backup energy resilience on municipal buildings (generator, solar) backup power for maintaining heating during outages	retrofit buildings with water conservation infrastructure	H	S/L/O
Public Utilities	Town wide	Town & Private	V	evaluate options for renewable power backup for municipal buildings (brownouts during summer)	Lynn Road and High School studies (ongoing) Stormwater retrofits	Renewable energy backup undergrounding utilities	Up to date safe yields analysis for water supply	H	S/L
Roads & Bridges	Town wide	Town /State	V/S		Swan Street bridge expansion (occurring) Ongoing SW studies & projects	snow removal		H	O
Support Facilities (hospital, senior center, etc.)	East Town wide	Private	V/S	retrofitting for schools and senior center for AC, kitchen space	620 Washington Street in floodplain Swan Street facilities in flood	Senior center has limited generator, needs backup power, surrounded by high	long term water rationing	M	O
Dams	specific location and outside town	Town, Woburn, DCR	V/S		Low level outlook at North Reservoir Dam - ongoing Regionally - Amelia Earhart Dam			H	O
Railroads	N -> S across town	multiple	V/S	Communication improvements	RR crossing at school, expand opening	Communication improvements		H	L/O
Societal									
EJ/Non-English speaking community	EJ zone (see map)		V/S	outreach and coordination create a communication plan integrate with CAP				H	O/S
Healthcare	northeast town	private	V/S		Confirm CEM Plan up to date and understood in issues like evacuation emergencies			M	O
Senior	Town wide		V	Education and outreach on cooling center wellness checks				M	O
Youth	Town wide		V	outreach, school-age				M	O
Emergency Response/DPW	Town and outside		V/S		management plan for workers that cant get to work in events of natural hazards Plan to support working during extended storm events			H	S
Housing authority	Town wide	Town	V	look into getting air conditioning education and outreach	One property in floodplain, make sure there's an evacuation plan		retrofitting building with low flow infrastructure	H	S
Environmental									
Waterways/Wetlands	Town wide & Fells	Town/DCR/ Private	V/S	improve infiltration I in areas to keep baseflow as high as possible	stormwater retrofit			H	S/L/O
Open/Recreation space	Town wide	public and other	V/S	turf fields	a lot of fields in flood plain many fields have built in infiltration already	study to look at using these spaces for flood storage invoice DCR with forest	investigate non-municipal water supplies for irrigation	H	S/L/O
Environmental contamination	Woburn & Town	public and private	V		Assess dredging Judkins pond and Davidson park (ongoing)		contaminated soil exposed wen water level is low. Maintain base flow	M	L
Wright Locke Farm		Town & Private	S			long term possibility as use of shelter, installing 100% renewable energy	maintain baseflow	L	O
Wildlife/Fisheries	Town wide	Town & DCR	V/S	studying impact of water temp on herring	nutrient loading MS4 plan			M	O
Kraft Property		Woburn, Winchester	V		conservation restriction on wetlands in Winchester regional collaboration			H	O

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

H-**M**-**L** priority for action over the **S**hort or **L**ong term (and **O**ngoing)
V = Vulnerability **S** = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	FLOODING (Stormwater & Riverine)	HEAT	DROUGHT	NOR'EASTERS (Wind & Heavy Precip)	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Dams/Reservoirs	Winchester/ Stoneham/ Medford	Town	V/S	Dam Rehab		Water Conservation Policy	Landscape Management around Reservoir	H	O/S
Roadways/Bridges/MBTA (Trains)		Town/MBTA	V/S	Culvert/Retrofit Green Infrastructure	Heat Island Study Heat Island Mitigation Alternate Transportation		Bus Shelters Solar covered shelters for MBTA	H	S/L
Schools/Municipal Buildings		Town	V/S	Incorporate GI/LID Flood Resiliency Study	Evaluate heating and cooling alternatives Passive heat elimination heat response plan Cooling center evaluation		alternate snowmelt feasibility study Geothermal feasibility study	H	S/L
Power Lines		Private	V/S	Microgrid study	load shedding EP Camp Clean energy incentives		Bury power lines Tree maintenance	M	S
Water/Sewer		Town	V/S			Rain barrels outreach/education		L	S
Gas Lines		Private	V/S						
Societal									
Affordable Housing		Town/Private	V/S	Green Infrastructure	Evaluate heat island evaluate heat & cooling green space access			H/M	O/L
Jenks Center	Town Center	Town/Private	V/S	Green Infrastructure				H	O/S
Faith Communities/Neighborhoods		Private	V/S				Develop a vulnerable population database	M	S/L
First Responders/DPW Personnel/IMT		Town	V/S		Fund a study for a Heat Response Plan		Neighborhood res. Hub planning tool	H	S/L
After School/ Enrichment Programs		Private	V/S	Climate Communication Strategy (Across all societal features and priority hazards)				H	S/L
Hospitals		Private	V/S	Green Infrastructure				M/L	S/L
Environmental									
Waterways/Beaches		Town/State	V/S		Water Quality Alert System			H	S
Greenspace/Parks/Fields		Town/State	V/S	Fund GI Projects		Comprehensive Review of town Bylaws for Climate Considerations		H	S
WLF/Whipple Hill/Community Garden		Town/State	V/S						
Street Trees		Town/State	V/S	Tree Box Study	Street Tree Planting and Maintenance Program Complete bylaw			M	L
Environmental Advocacy		Town/Private	S	Tech Assistance Grant	LCA for Curbside vs. Dropoff Solid Waste Management			M	S/L
EV Charging		Town	V/S						
Bike Path		Town	V/S						

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

H-**M**-**L** priority for action over the **S**hort or **L**ong term (and **O**ngoing)
V = Vulnerability **S** = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	FLOODING (Stormwater & Riverine)	NOR'EASTERS (Wind & Heavy Precip)	HEAT	DROUGHT	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Residences and infrastructure along Horn Pond Brook	Horn Pond Brook Floodplain	Town/Private	V	Complete two culverts (in progress)	sidewalk clearing (esp. around schools and intersections)	Community Engagement (across all categories): green infrastructure demonstrations and tours info on wildlife passage	drought education	H	O
Stormwater System	Town	Town	V/S	evaluate nelson street, glen green, palmer. Integrated green infrastructure. Bylaw review and site plan review.			stormwater recapture natural biological system retention	H	S/O
Power Lines/Gas Lines	Town wide/Residences	Utility Companies/Tow	V/S		underground lines for new subdivisions/bylaw review	solar generators at school battery VO school		H	S/O
Transportation	Town	Town/MBTA	V/S	Shuttle system (coordinate with hospital and school bus companies)				H	S/O
Public Safety		Town	S	Update emergency shelter supplies	backup communication systems (redundancy study/implementation)	provide gear for town workers		M	O
Transfer Station	Specific		V/S					L	
Societal									
Vulnerable populations - elderly (Jenks center), children	Town		V	communication by precinct. Real time public edication on hazards. Comprehensive extreme heat/weather strategy				H	S/O
Commuters	businesses, roads/ transportation		V		shelters at train station (happening now)			M	S
Food Supply			V/S	Food and water relationship with stop & shop during hazard				H	O
Youth/Schools			V/S		clear sidewalks shoveling bylaw	cooling in schools contract with bus company		H	O
Downtown Businesses (Economic/Services)	downtown	Private	V/S			work condition limits		H	S/O
Hospital	specific	Private	V/S	community engagement outreach utilize hospital vans during hazards				M	O
Environmental									
Abeona River/Horn Pond Brook	Town		V/S	model future conditions				H	S/O
Open Space (including trees, wildlife, vector born diseases)	Road/forest/ open space		V/S	(across all): Tree planting outreach regional bird plan/flyways for birds over borders/conservation	protection of mature trees, bylaw updates	fertilizer and pesticide ban	Tree survey	H	S/L/O
Reservoirs (drinking water)		Town	V/S					H	O
Algae Blooms			V			pesticide and fertilizer bank real time information - posted in public places		L	
Fells		Town/State	V/S			clean up trash & poop		L	O
Wright Locke Farm		Private/Town	S		sustainable solution to heating greenhouses			L	S/O

Winchester CRB Workshop Notes
November 20, 2019

What do you like about Winchester?

- Aberjona Waterway, Reservoir and Fells
- Town employees (including volunteers) – orgs and commissions
- Conservation, wildlife and lakes
- Open space – farms
- Engaged community – welcoming and caring
- Downtown area – buildings and architecture
- Schools
- Fair

Town information

- Winchester is not in a mosquito control district – look into this more.
- Past 20 years, big upgrades on stormwater infrastructure. Working with Woburn and Medford
- Two priority culver replacements left
- Washington street SW improvements
- Big project in Wildwood park with a detention basin and stormwater infrastructure, 150,000 ft3 of detention storage
- Flash flooding still a huge problem
- There is a river flood mitigation program
- Design for dam updates is in progress
- Local flooding areas (circled on group 4 map):
    - Horn Pond Brook floodplain – including forest street, brookside – 30 houses, lowell ave, sunset
- Mystic Lake → water storage. Water level is lowered before a storm
- Town has "Climate Change Week"
- YEP – youth engagement planning
- CAP – buildings, energy, transportation, solid waste
- Have tree trimming program with Eversource
- Plowing priorities: primary and secondary plow routes. Primary includes evacuation routes, road leading to hospital, emergency response locations
- Winchester has a water conservation tier system
- Shut down public building (lights, computers) during extreme heat wave
- Kraft foods development project

Top Hazards in Winchester

- Flooding – Stormwater and Riverine
- Nor'easters, including snow and wind
- Heat
- Drought

Infrastructure

- Transfer station – former landfill. Playfields
- Tanneries
- Sunset Road
- Kraft Property – development will impact Winchester
- Industra-plex – Woburn – Superfund site
- Recreation facilities
    - Parks
    - Beaches
    - Trails
- DPW
- Emergency response buildings
    - WS Fire Station (Fire Dept is prepared during large storms)
- Town Hall
- Designated cool spaces
    - Library
    - Jenks
- Schools (not air conditioned)
    - High school – renovations spec for flooding
    - Morroco School
    - Lynch School
- Emergency shelters – most go to hotels
- Dams
- Bridges
- Railroads
- Winchester hospital
- Public utilities – water, sewer, gas, electric, telecom
- Stop & Shop – food distribution
- Road network
- Pump stations – stormwater and water
- MWRA infrastructure

Societal

- Seniors
- Jenks Center
- EJ Community (including non-english speaking: mandarin, multigenerational families)
- Children
- Religions
- Hospitals
- 620 Center
- Nursing/Rehab
- Emergency response/DPW

- Housing authority
- Chinese culture center
- Human assets

Environmental

- Waterways:
    - Lakes
    - Rivers
    - Reservoirs
- Open space – town owned
- Fells – DCR
- WLF
- Golf course/country club
- wetlands

Potential Action Items

- Site Plan Review update
- Bylaw updates:
    - Over 90° Town workers come inside
    - Greenways
    - Site development limitation
    - Incorporate predicted future rainfall info
- Green infrastructure
    - Demonstrations through town
    - Robust website
- Survey where people get their information so that public outreach can reach as many people as possible
- Create flyways/greenways → nature conservancy, site development goals
- Pathways, flyways, waterways group
- Stormwater utility → residents, businesses, town
- Update stormwater models (hydro study)
- Verify plan for chemical spill on trains
- Update communication system so it is no longer on power lines – possible satellite, microwave, radio
- Public education and outreach
    - different segment every quarter
    - "landscape tour" of residential green infrastructure
    - Demonstration of green infrastructure in public area so that people can view and learn about it
- Cooling center, cooling public resources, ID vulnerable populations and outreach.
- Increase tree canopy
- Incorporate Jenks Center into ERP – cooling station

APPENDIX C

Annotated Maps and Matrices from Participants

#1

Legend

- City/Town Offices/Utilities/Services
- Day Care
- Emergency Shelter
- Fire Station
- Food/Grocery/Supply Store
- Hazardous Material Site
- Hospital
- Housing Authority Unit
- Library
- Nursing Home
- Place of Worship
- Police Department
- Rail Station
- Sewage Pumping Station
- School
- Underground Storage Tank
- Water Treatment Facility
- Railroad
- Evacuation Route
- Landfill
- Conservation/Protected Land and Open Space
- Bridge

Dams

- High Hazard
- Significant Hazard
- Low Hazard

Census Blocks with Vulnerable Populations

- >25% of residents are people of color (EJ 2010 Populations)
- 25% of population <18
- 25% of population > 65

Waterways

- Rivers, Streams, and Brooks
- Marsh/Bog/Wooded Marsh
- Lakes, Ponds, Reservoirs

FEMA National Flood Hazard Layer

- 1% Annual Chance of Flooding (Zones A, AE, AH, AO)
- 0.2% Annual Chance of Flooding (Zone X)
- Possible But Undetermined Hazard (Zone D)

KRAFT

N

WOBURN

STONEHAM

LEXINGTON

ARLINGTON

MEDFORD

North Reservoir Dam

North Reservoir

Middle Reservoir

Middle Reservoir Dike

Spot Pond Dike #5

Spot Pond Dike #4

South Reservoir

South Reservoir East Dike

South Reservoir Dam

South Reservoir West Dike

Wedge Pond Dam

Winter Pond

Wedge Pond

Upper Mystic Lake

Aberjona River

Mystic Valley Parkway

Muraco Elementary

Lynch Elementary

Ambrose Elementary

Vinson-Owen Elementary

Acera School

St Mary Elementary

Winchester High School

Lincoln Elementary

McCall Middle School

Winchester Hospital

Winchester Hospital Cancer Care Center

Winchester Transfer Station

Department of Public Works

Jenks Center for Public Safety Building

Winchester Town Hall

Winchester Public Library

Wildwood Cemetery

Town Forest

Wright-Locke Farm

Water Treatment Facility

Winchester Center Commuter Rail

Wedgemere Commuter Rail Station

0 0.25 0.5 Miles

FIGURE 1

TOWN OF WINCHESTER, MASSACHUSETTS

MUNICIPAL VULNERABILITY PREPARDNESS HAZARD AND FEATURE MAP

NOVEMBER 2019 SCALE: NOTED

Weston & Sampson

#4

FIGURE 1

TOWN OF WINCHESTER, MASSACHUSETTS

MUNICIPAL VULNERABILITY PREPARDNESS HAZARD AND FEATURE MAP

NOVEMBER 2019 SCALE: NOTED

Weston & Sampson

#2

Legend

- City/Town Offices/Utilities/Services
- Day Care
- Emergency Shelter
- Fire Station
- Food/Grocery/Supply Store
- Hazardous Material Site
- Hospital
- Housing Authority Unit
- Library
- Nursing Home
- Place of Worship
- Police Department
- Rail Station
- Sewage Pumping Station
- School
- Underground Storage Tank
- Water Treatment Facility
- Railroad
- Evacuation Route
- Landfill
- Conservation/Protected Land and Open Space
- Bridge

Dams

- High Hazard
- Significant Hazard
- Low Hazard

Census Blocks with Vulnerable Populations

- >25% of residents are people of color (EJ 2010 Populations)
- 25% of population <18
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Waterways

- Rivers, Streams, and Brooks
- Marsh/Bog/Wooded Marsh
- Lakes, Ponds, Reservoirs

FEMA National Flood Hazard Layer

- 1% Annual Chance of Flooding (Zones A, AE, AH, AO)
- 0.2% Annual Chance of Flooding (Zone X)
- Possible But Undetermined Hazard (Zone D)

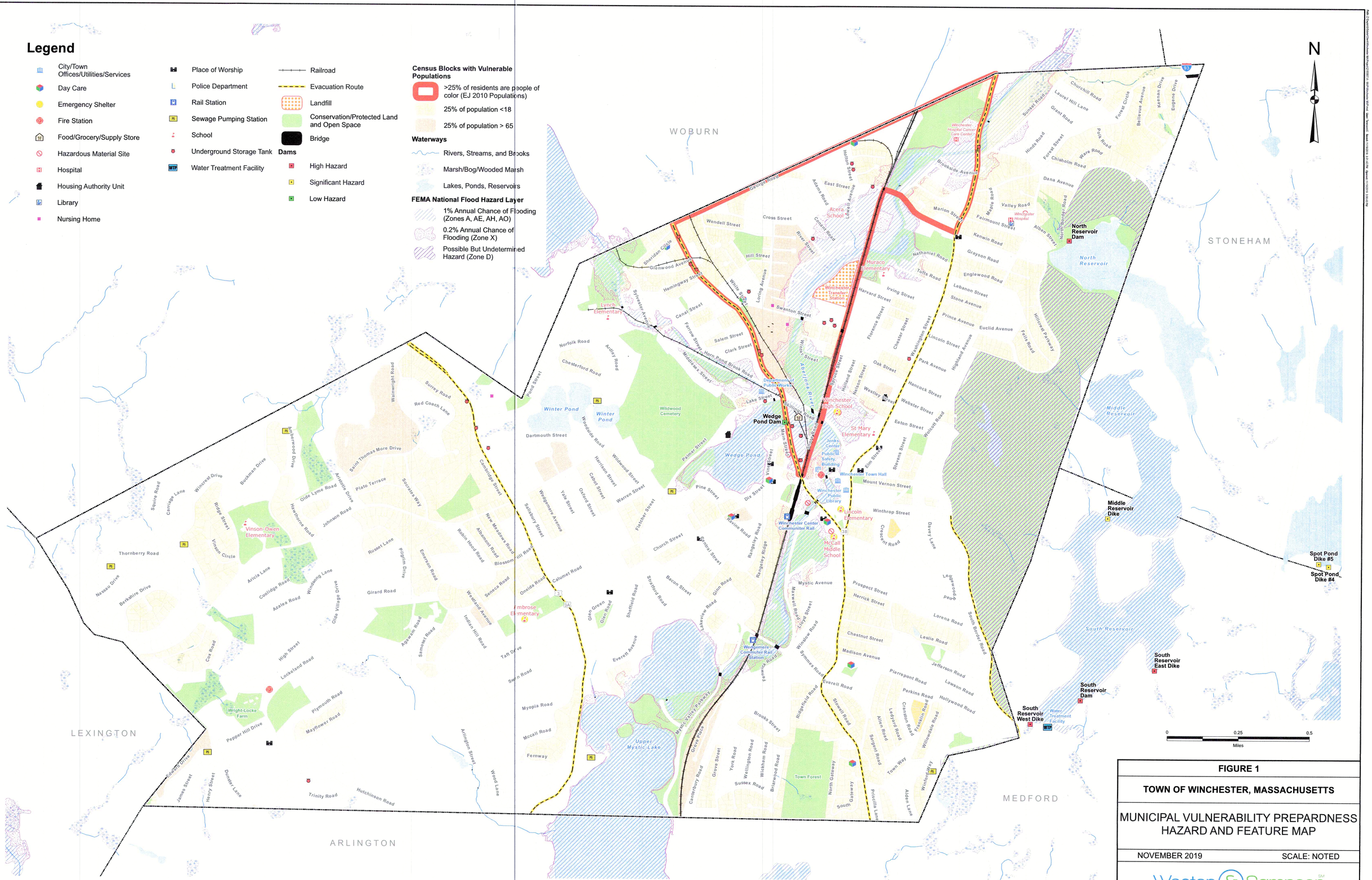


FIGURE 1

TOWN OF WINCHESTER, MASSACHUSETTS

MUNICIPAL VULNERABILITY PREPARDNESS HAZARD AND FEATURE MAP

NOVEMBER 2019 SCALE: NOTED

Weston & Sampson

TABLE #1

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

H-**M**-**L** priority for action over the **S**hort or **L**ong term (and **O**ngoing)
V = Vulnerability **S** = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	HEAT (Health, Town Hall Comm)	FLOODING SW & Riverine	Nor Easters WIND HEAVY PRECIP.	DROUGHT		Priority H-M-L	Time S L O
Infrastructural										
Municipal buildings	town center townwide	Town	B	Cooling centers CLEAN H&C	Public safety, Sidewalks update bylaws for build ings in floodplain. Adopt floodplain policies for municipal buildings	Increase energy resilience on municipal buildings (generator, solar) backup power for maintaining healthy drinking supplies	Retrofit buildings with water conserving infrastructure	Permeable pavement in parking lots	H	S/L/O
Public utilities	townwide	Town + Private	V	Evaluate options for stormwater pretreatment backup for municipal build ings (wastewater during summer)	Lynn RR + High school studies (ongoing) stormwater retrofits	Renewable energy backup units for utilities	up to date Safe yield analysis for water supply Back up supply already in place	gas leaks	H	S/L
roads + bridges	Townwide	Town ~~Mass~~ State	B		Swan St bridge expansion (underway) ~~RR~~ Hwy ongoing SW studies & projects	Snow removal			H	O
support facilites (hospital, senior center etc)	east Townwide	Private	B	retrofitting for schools + senior center for AC, kitchen space	620 Washington St in flood plain Swan St facilities in flood plain	Senior center has limited generator, need backup power, surrounded by high trees	long term water reliability		M	O
Dams	specific loc + outside Town	Town Woburn, DCR	B		Low level outlook @ N. Reservoir Dam - ongoing Regionally - Aberjona Watershed Dam improvements - ongoing				H	O
Railroad	N→S across town	MBTA UNK ~~Amtrak~~ Multiple	B	communication improvements	RR xing at Salem, expand opening				H	L/O
~~Environ~~ Societal										
EJ / non-english speaking comm	EJ (see map) Zone		B	outreach + coordination create a communication plan integrate with CAP					H	O/S
healthcare	northeast town	private	B			confirm EOM Plan up to date understood in issues like evacuation emergencies			M	O
Seniors	townwide		V	ED vication + outreach on cooling centers Wellness checks					M	O
Youth	townwide		V	outreach school - age					M	O
Emergency response / DPW	townwid + outside		B		Management plan for workers that cant get to work in event of natural hazards	Plan to support workers during extended storm events			MH	S
Housing authority	townwide	Town	V	look into getting air conditioning education + outreach	one property in flood plain, make sure tenants on evacuation plan		retrofitting buildings with low flow infrastructure		H	S
~~Environmental~~										
waterways / wetlands	Townwide	Town/DCR private	B	improve infiltration in area to keep baseflow as high as possible	stormwater retrofits				H	S/L/O
open / recreational space	Townwide + Fells	Public + other govt. entities	B	turf fields	a lot of fields in flood plain, many fields have built in infiltration already	~~should~~ to look at using them as spaces for flow storage INVOLVE DCR with forest management plans in the Fells	investigate non-municipal water supplies for irrigation		H	S/O
Environmental Contamination	Woburn + Town	Public + private	V		Assess dredging Judkins Pond and Davidson Park (ongoing)		contaminated soil exposed when water level is low. maintain baseflow		M	L
Wright Locke Farm	Town / Private	specific	S			long term possibility as use of shelter, installing 100% renewable energy			L	O
Wildlife / Fisheries	Townwide	Town + DCR	B	studing impact of water temp on herring	nutrient loading ~~on~~ MS4 plan				M	O
Kraft Property	Woburn specific ~~Winchester~~	Private	V		conservation restriction on wetlands Private in waterbody regional collaboration				H	O

TRANSFER STATION
~~PUBLIC SAFETY BUILDING~~ TOWN V/S
TRANSFER
EVACUATION ROUTES

Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.org

H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	FLOODING & HEAVY PRECIP.	WINTER STORMS & NOREASTERS	HEAT	DROUGHT		Priority H-M-L	Time S L O
Infrastructural										
SUNSET ST BROOKSIDE RESIDENCES	ABERJONA FLOODRAIN	TOWN/ PRIVATE	V	IN PROGRESS COMPLETE TWO CULVERTS			drought education		H	
NATHANIEL RESIDENCES LOWELL AVE	"		V	green Swan: COMMUNITY ENGAGEMENT stormwater utility demonstration projects + tours clearing sidewalks - INFO ON WILDLIFE PATHWAYS					H	O
STORMWATER SYSTEM (Nelson St)	TOWN	TOWN	V/S	evaluate Nelson St., glen green integrated green inf. palmer by law review → site plan review			stormwater capture natural biolog. syst. retention		H	S/O
POWER LINES/GAS LINES	TOWN/RES. UTIL.	UTIL./ TOWN	V/S	↑	underground lines for new subdivisions by law	solar generator at school battery VO school			H	S/O
~~SCHOOLS~~ JENKS CENTER TRANSPORTATION	TOWN	TOWN/ TRAN	V/S	flooded roads update emergency shelter supplies	shuttle system				H	S/O
~~HOSPITAL~~ PUB. SAFETY	T	TOWN	S		backup communication system redundancy study/implementation		provide gear for town workers		EM	O
SOCIETAL				real time public education on hazards						
ELDERLY/CHILDREN (VULNERABLE POPS)	TOWN		V	communication by precinct		comprehensive extreme heat/ strategy	weating		H	S/O
COMMUTERS	BUSIN. ROADS/TRANS		V	~~TRAIN SIDE~~ (happening now) Shelters at train station					M	S
FOOD SUPPLY			V/S	food and water relationship w/ Stop + Shop during hazard					H	O
Youth - Schools			V/S		Clear sidewalks shovelling bylaws	cooling in schools CONTRACT W/ BUS COMPANY			H	O
DOWNTOWN BUSINESSES (ECON./ SERVICE)		PRIVATE	V/S		~~CLEAR SIDEWALKS~~	working condition limits			H	S/O
HOSPITAL			V/S	COMMUNITY ENGAGEMENT OUTREACH UTILIZE HOSPITAL VANS DURING HAZARDS					M	O
ENVIRONMENTAL										
ABERJONA RIVER ~~FLOODPLAIN~~	TOWN		V/S	MODEL FUTURE CONDITIONS					H	S/O
TREES	ROAD/FOREST		V/S	TREE PLANTING OUTREACH	PROTECTION OF MATURE TREES BYLAW UPDATES	CONTINUED TREE PLANTING	TREE SURVEY		H	S/O/L
WILDLIFE/OPENSPACE/ (vector borne diseases)			V	REGIONAL BIRD PLAN/FLYWAYS FOR BIRDS		fertilizer + pesticide ban vector borne diseases	OVER BORDERS + CONSERVATION		H	O
RESERVOIRS (DRINKING WATER)		TOWN	V/S						L	
ALGAE BLOOMS			V			fertilizer + pesticide ban real time infor. post infor.			H	S/O
FELLS		TOWN/ STATE	V/S			clean up trash/poop			L	O
WRIGHT LOCKE FARM		PRIVATE/ TOWN	S	$	sustainable solution to heating greenhouse					

Jenks Center

VULNERABLE POPS

Table #3

Community Resilience Building Risk Matrix www.CommunityResilienceBuilding.org

H-**M**-**L** priority for action over the **S**hort or **L**ong term (and **O**ngoing)
V = Vulnerability **S** = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	Flooding + Heavy Precip.	Heat	Drought	Winter Storms / Nor'easters / Wind		Priority H-M-L	Time Short Long Ongoing
Infrastructural										
DAMS / RESERVOIRS	WINCHESTER/ STONEHAM/ MEDFORD	TOWN	BOTH	DAM REHAB		WATER CONS. POLICY	LANDSCAPE MANAGEMENT AROUND RES		H	O, S
ROADWAYS / BRIDGES / MBTA (TRAINS)		TOWN / MBTA		CULVERT / RETROFIT GI	HEAT ISLAND STUDY HEAT ISLAND MIT. ALT. TRANSP. STUDY		BUS SHELTERS SOLAR COVERED SHELTERS FOR MBTA		H	S, L
SCHOOLS / MUNICIPAL BUILDINGS		TOWN		INCORPORATE GI/LID FLOOD RESILIENCE STUDY	Evaluate heating & cooling alternatives - Passive heat elimination	HEAT RESPONSE PLAN COOLING CENT. EVAL	INFRAST. STUDY ALT. SNOWMELT FEAS STUDY	GEOTHERMAL FEAS. STUDY	H	S, L
POWER LINES		PRIVATE		MICRO GRID STUDY	LOAD SHEDDING ED. CAMP. CLEAN ENERGY INCENT.		Bury Power lines Tree maintenance		M	S
WATER / SEWER		TOWN				RAIN BARRELS OUTDOOR EDUCATION			L	S
GAS LINES		PRIVATE							N/A	
SOCIETAL										
AFFORDABLE HOUSING		TOWN / PRIVATE	BOTH	G.I.	EVAL HEAT I.S. & EVAL HEAT & COOLING GREEN SPACE ACCESS				H/M	O, L
JENKS CENTER	TOWN CENTER	TOWN / PRIVATE	BOTH	G.I.			DEVELOP A VULNERABLE POP. DATABASE		H	O, S
FAITH / NEIGHBORHOOD COMMUNITIES		PRIVATE	BOTH				NEIGHBORHOOD RES. HUB PLANNING TOOL		M	S, L
FIRST RESPONDERS / DPW PERSONEL / IMT		TOWN	BOTH		FUND A STUDY FOR A HEAT RESPONSE PLAN				H	S, L
AFTER SCHOOL / ENRICHMENT PROGRAMS		PRIVATE	BOTH		CLIMATE	COMMUNICATIONS STRATEGY			H	S, L
HOSPITALS		PRIVATE	BOTH	G.I.					M/L	S, L
WATERWAYS / BEACHES		TOWN / STATE	BOTH		WATER QUALITY ALERT SYSTEM				H	S
GREEN SPACE / PARKS / FIELDS		TOWN / STATE	BOTH	FUND GI. PROJECTS PREVIOUSLY IDENTIFIED		COMPREHENSIVE REVIEW OF TOWN BYLAWS FOR CLIMATE CONSIDERATIONS			H	S
WLF / WHIPPLE HILL / COMMUNITY GARDEN		TOWN / PRIVATE	BOTH							
STREET TREES		TOWN	BOTH	TREE BOX STUDY	STREET TREE PLANTING & MAINTENANCE PRG. + COMPLETE BY-LAW				M	L
ENVIRONMENTAL ADVOCACY		TOWN / PRIVATE	S	TECH. ASSISTANCE GRANT		LCA FOR CURBSIDE VS. DROP OFF SOLID WASTE MAN.			M	S, L
EV CHARGING / BIKE PATH		TOWN	BOTH							

APPENDIX D
Listening Session

Winchester Listening Session Results

Question and Answer during the Presentation

- Advocate for an update to the Massachusetts Building Code to allow or require more resilient homes. Alternatively, provide guidance to developers on how they can go above the building code.
- Work regionally with Woburn to implement projects upstream for flood storage and stormwater management.
- Four mixed use development process are in conceptual design in Town center or near town center and one or two could be used as a pilot project for energy resilience and sustainability.
- Identify multiple funding sources that could be used as a match, such as the Cummings Foundation or other federal grants.
- Identify projects were multiple co-benefits are possible. Transportation corridors with nature-based stormwater features would be one example.
- Update regulations that control development to account for climate change.

Extreme Heat and Drought Poster Comments

- Need to utilize communications through the Council of Aging and explore what other forms of communications could be used
- Retrofit schools to adapt
- Initiate more tree planting projects in parks and school grounds
- Subsidize solar installations
- Expand or incentivize ground cover
- Explore solutions that don't necessarily require AC, which adds to emissions
- Preserve open space with more residential support
- Explore tree bylaw
- Have more events and awareness materials to promote hiking and use of parks and open spaces
- Buddy system of neighbors for vulnerable populations
- Design Lynch elementary school renovation to include heating and cooling shelter

Intense Storms and Wind Poster Comments

- Support for the presented high priorities:
    - Community engagement
    - Solar generators at schools and municipal buildings
- Solar energy and storage for resiliency, profit, and covered parking at grocery stores, schools, and emergency shelters
- Sawmill Brook Road improvements
- Be prepared for the impacts of upstream development (such as the Kraft Property) during extreme events
- Nature-based solutions to mitigate stormwater flooding
- Improve the Town's bylaw for tree protection and tree planting
- Retrofit town parking lots with nature-based stormwater controls
- Look at permeable paving for parking lots and paths. Budget and plan for regular vaccumming to stay porous.

Flooding and Extreme Precipitation Poster Comments

- Experienced Flooding
    - Residents have experienced basement flooding
    - Flooding on Cross St
    - At the end of Highland Ave by Sawmill Brook Road
- Steps taken
    - Installed French drains
    - Less aggressive pruning and more ground cover
- Actions
    - Increase public education about the need for stormwater utility and flood mitigation
    - Identify or build model projects or "how to" materials for rain gardens or retention structures on private land for homeowners
    - More mini green spaces in residential areas
    - Planning
    - Change nature of parking lot asphalt to more permeable materials
    - Drainage bylaw to discourage impermeable and encourage permeable
    - Cross coordination with planning of local MVP towns that touch Winchester's boundary

Comments Received Via Email

- That water in flood plain areas be redirected, collected, and /or stored for irrigating dry areas & during periods of drought for trees, plants, gardens, etc., for town beautification and promoting green environment.
- Additionally conserve water by decreasing/eliminating hard surfaces to allow surface water to penetrate the soil i.e.:
    - construct multi-story parking areas for schools, public buildings, living complexes, downtown merchants, commuter rail, etc. to decrease hard surface parking areas & promote use public transportation & business and allow for more green space
    - regulate landscaping for all building/remodeling to promote water conservation by requiring driveway, parking areas to be permeable surfaces [provide incentives to increase such landscaping];
- Allow present residential homes & require any remodels & all new construction, public & private organizations' buildings and houses of worship to divert grey water to garden, grassy areas, or holding tanks, cisterns to be collected and used during periods of drought. An incentive be provided i.e., decrease the sewer cost proportionate with grey water use
- Secure a grant could be used to plant trees on public property or within 10' of the public way, including sidewalks
- The impact of climate change is so globally vast and Winchester is such a tiny speck within the global system that to focus on the direct influences on our area will be omitting climate changes' impact on other parts of the globe that will have repercussions on Winchester.
    - ISO New England has a complex, resilient, redundant system to maintain continuous supply. But what happens if the system is shut down a la California?
    - What happens if the transportation system gets damaged a la Hurricane Irene and Vermont? What happens to the goods and services being transported to Winchester? Stop & Shop only has supplies for a day or two.

- What happens if a major food producing area like the Central Valley in California fails which may have happened if the drought there had continued for a few more years?
- The Northeast US may not have the lack of water issues that other regions have. What happens if those regions have severe prolonged droughts like Oklahoma and the Dust Bowl? How do we handle climate refugees? Winchester already has had 3 major renovations/additions to the McCall Middle School in the last twenty years.
- The costs of insurance and construction will surely be going up.
- Locally, millions of dollars are being put into the strategy of moving more water downstream faster. In a future Hurricane Sandy at high tide with sea level rise the flood waters from the ocean will overflow the Amelia Earhart Dam and the waters in Winchester will have nowhere to go.
- The fires in Australia prevented the hospitals from using their equipment like MRIs because of smoke and dust particles. Will there be protective measures?
- Winchester may never have to face an extreme situation like several places in the world are beginning to. But these extreme situations will become more frequent and more distributed.

TOWN OF WINCHESTER

CLIMATE RESILIENCE PUBLIC LISTENING SESSION

Workshop Findings, Priority Recommendations, and

Review of Draft Municipal Vulnerability Preparedness Plan

Weston & Sampson℠

Photo: Wedge Pond in Winchester, MA. Photo by Mingwei Li, Youtube, 2015.

WELCOME

Members of the public

Members of the Climate Action Committee

Municipal Leadership

- Beth Rudolph
- Bryan Carignan
- Brian Szekely

Core Team Members

- Lisa Wong
- Mark Twogood
- Margaret White
- James Gill
- James Gibbons
- Peter MacDonnell
- Frank Batchelor
- John Nash
- Rick Tustin
- Jennifer Murphy
- Elaine Vreeland
- Phillip Beltz
- Susan McPhee

Photo: Winchester Public Library. Photo from Winchester town website.

AGENDA

PRESENTATION:

- Climate change in Winchester
- Current Planning Initiatives
- Climate Action Plan
- Municipal Vulnerability Preparedness (MVP) Planning Process
- Introduction to Open House Stations

OPEN HOUSE STATIONS

- Climate Hazards
- Greenhouse Gases

Photo: Winchester Town Hall. Photo from Ashley Myers, The Odyssey Online, 2017.

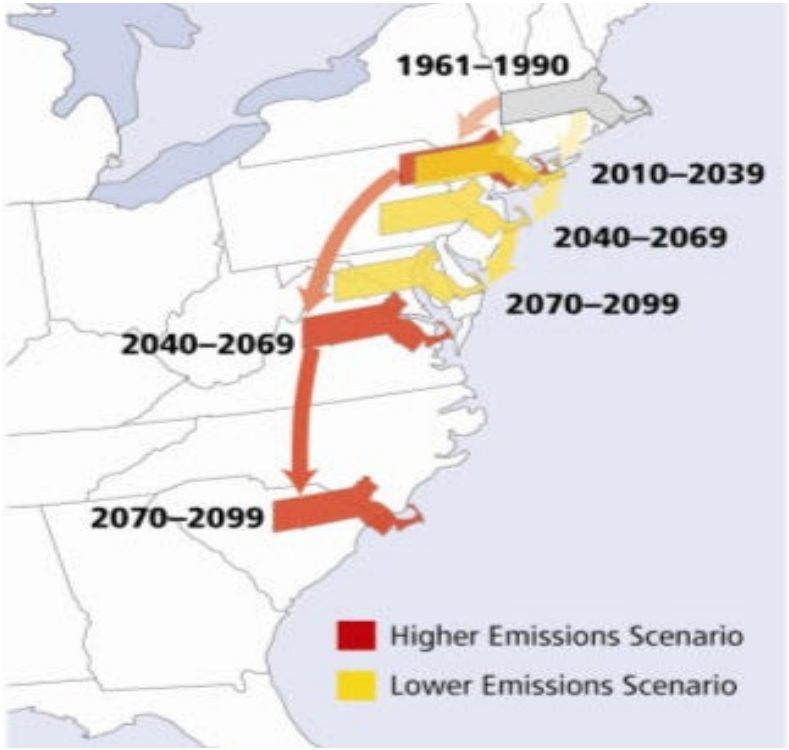
EXTREME TEMPERATURES
IN MASSACHUSETTS

DAYS WITH TEMPERATURES ABOVE 90°F

2005 OBSERVED ANNUAL AVERAGE	MID-CENTURY PROJECTED ANNUAL AVERAGE	END-OF-CENTURY PROJECTED ANNUAL AVERAGE
6	24	35

DAYS WITH TEMPERATURES BELOW 32°F

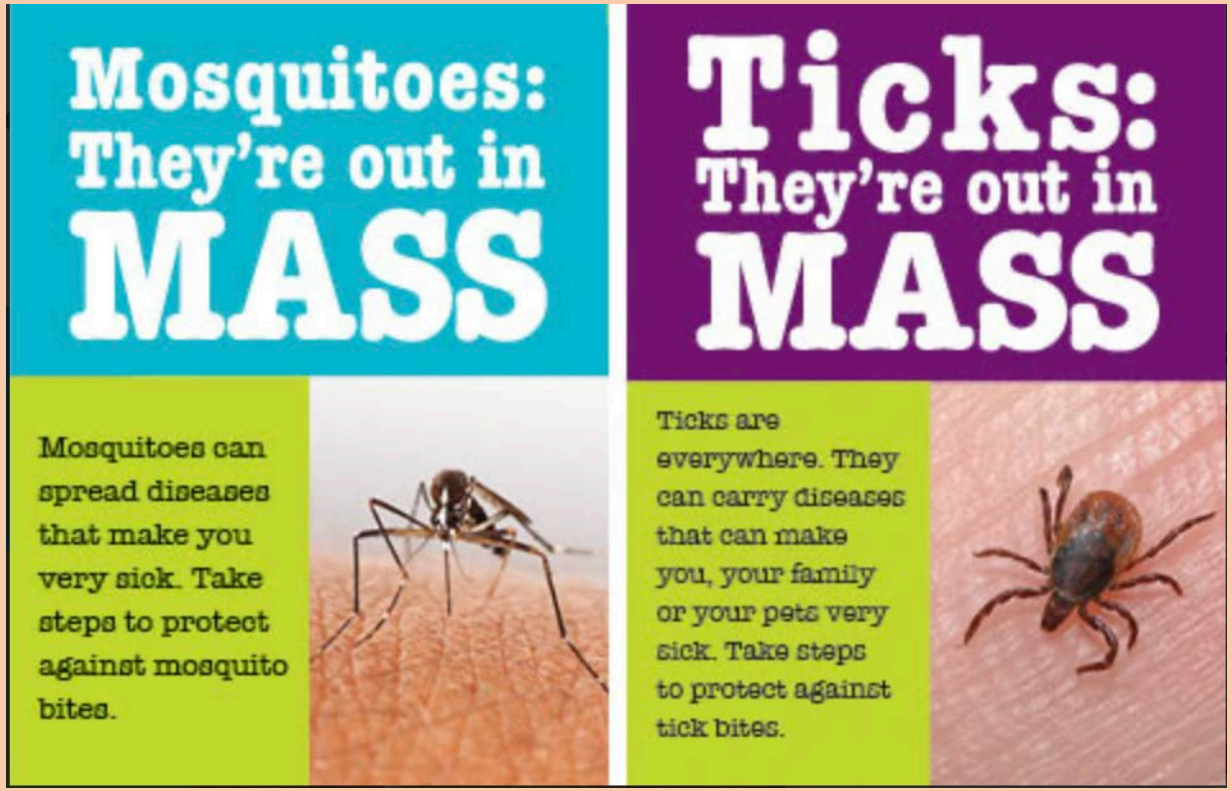
2005 OBSERVED ANNUAL AVERAGE	MID-CENTURY PROJECTED ANNUAL AVERAGE	END-OF-CENTURY PROJECTED ANNUAL AVERAGE
145	114	101



Massachusetts Executive Office of Energy & Environmental Affairs. 2019. "ResilientMA Datagrapher." Massachusetts Climate Change Clearinghouse. Resilientma.org/datagrapher/?c=Temp/state/tx90/ANN/MA/
Notes: Mid-century projected annual averages use a 2040-2069 time range. End-of-century project annual averages use a 2080-2097 time range.

Map Image: NECIA/UCS, 2007.

Vector-borne Diseases and Water Contamination



PRECIPITATION DURING
HEAVY EVENTS IN THE
NORTHEAST

INCREASED

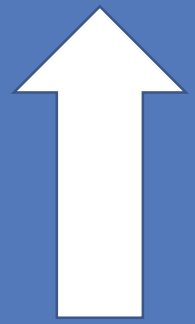
BY MORE THAN

70%

BETWEEN 1958-2010

13%

Increase in extreme precipitation events by 2100



Flooding
Erosion

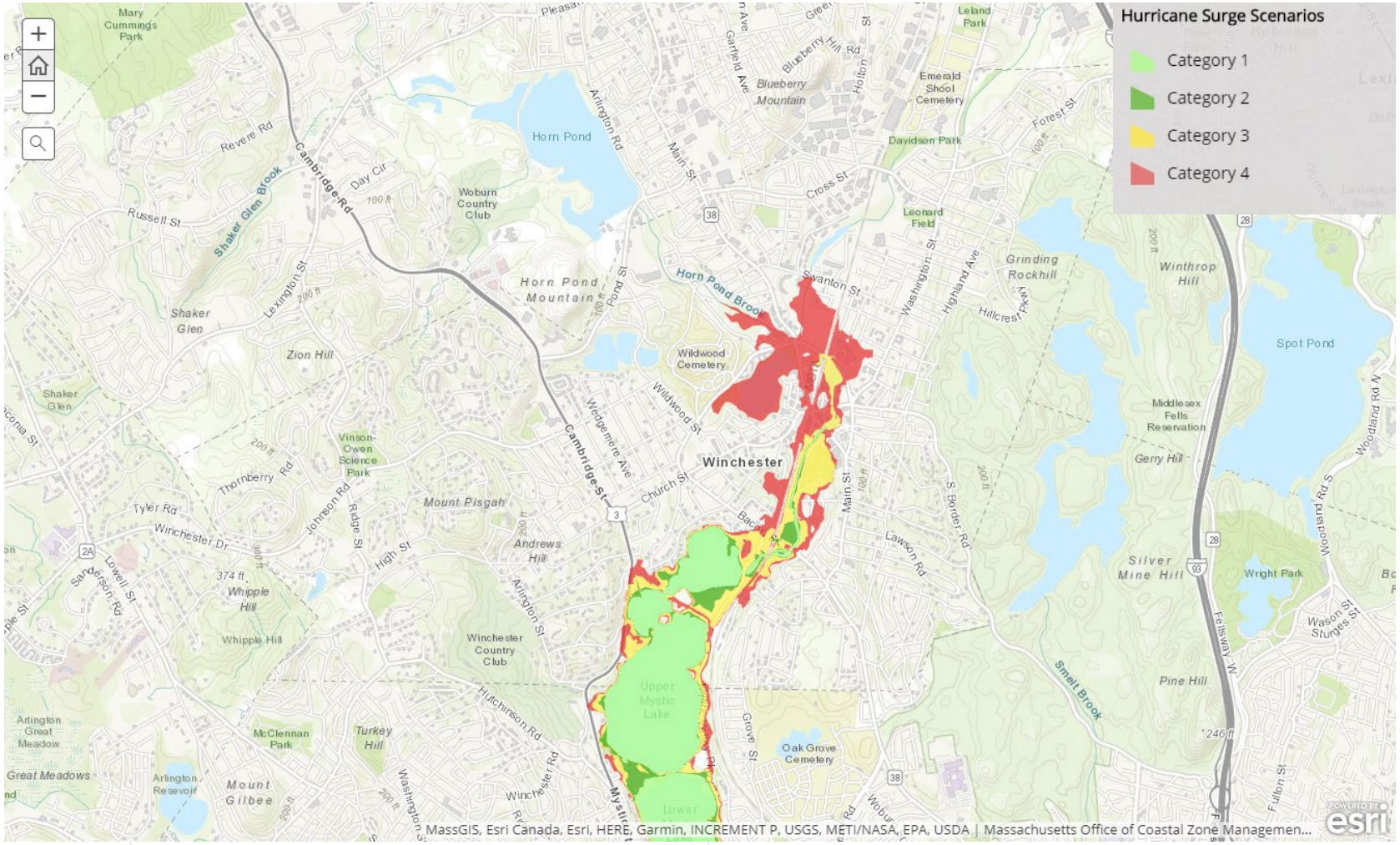
More intense and frequent downpours caused over $9.1M damages/year (2007 - 2014)

Massachusetts Executive Office of Energy & Environmental Affairs. 2019. “Changes in Precipitation.” Massachusetts Climate Change Clearinghouse. Resilientma.org/changes/changes-in-precipitation

HURRICANES

Upward trend in North Atlantic hurricane activity since 1970

Nor'easters along the Atlantic coast are increasing in frequency and intensity



Source: Climate Science Special Report, Fourth National Climate Assessment (NCA4), Volume prepared by the U.S. Global Change Research Program (USGCRP)

Map: MASS EOEEA, https://mass-eoeea.maps.arcgis.com/apps/MapSeries/index.html?appid=6f2797652f8f48eaa09759ea6b2c4a95

Intensity of Winter Storms and Thunder/Severe Storms

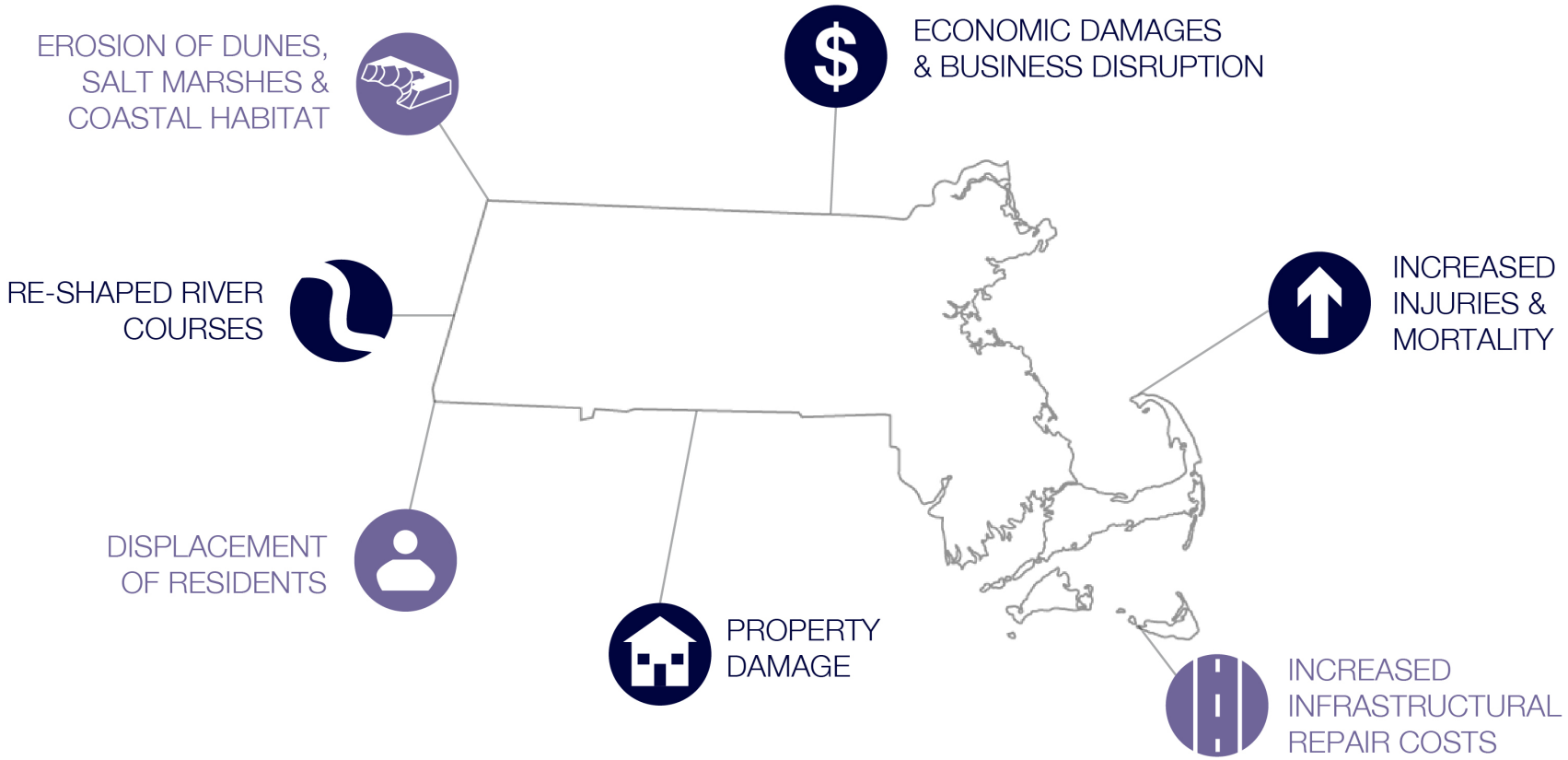
Flash or Episodic Droughts

Vulnerability to Wildfire

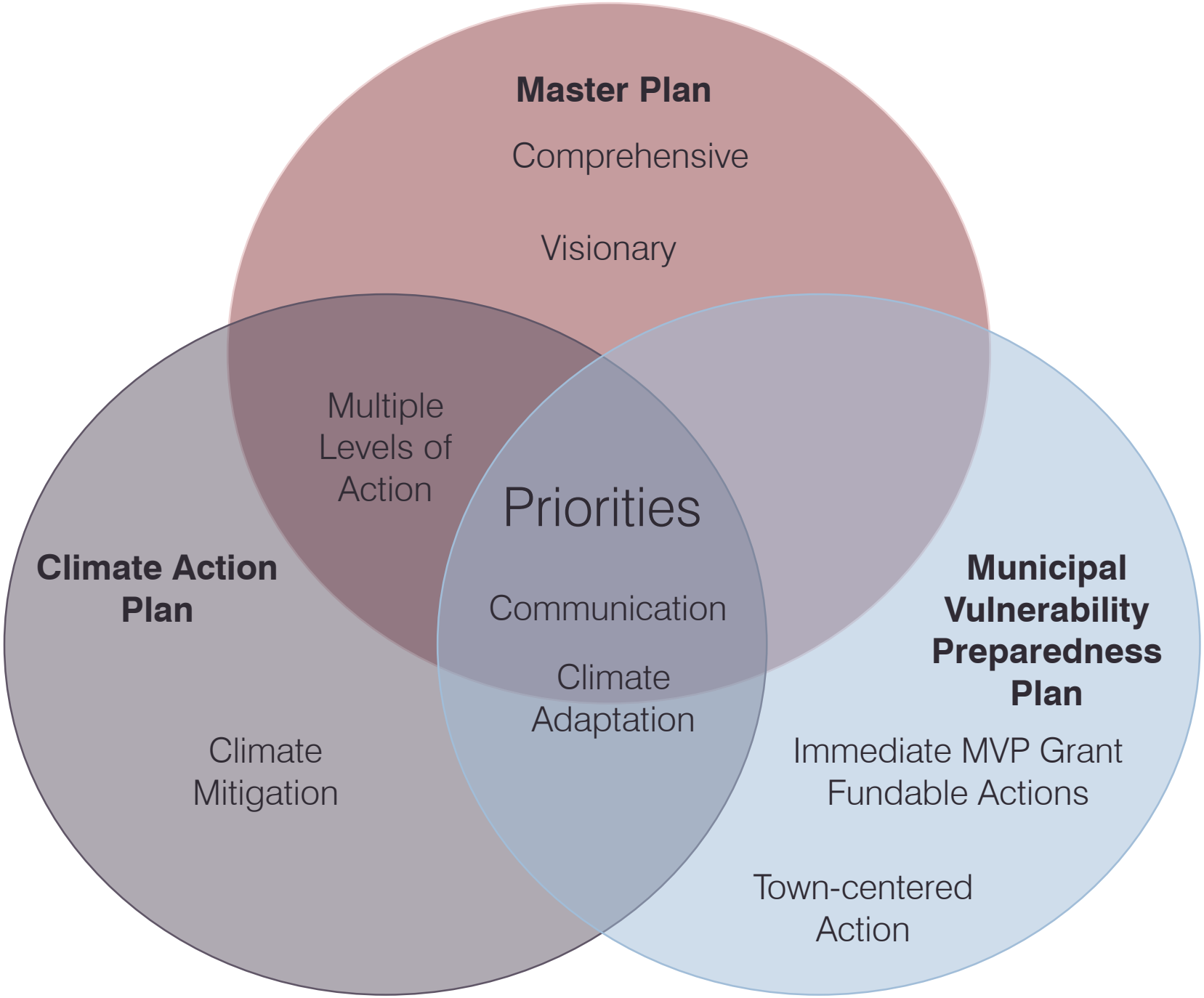
Sea Level Rise

IMPACTS OF **EXTREME WEATHER**

STORMS ARE BECOMING MORE INTENSE AND DAMAGING

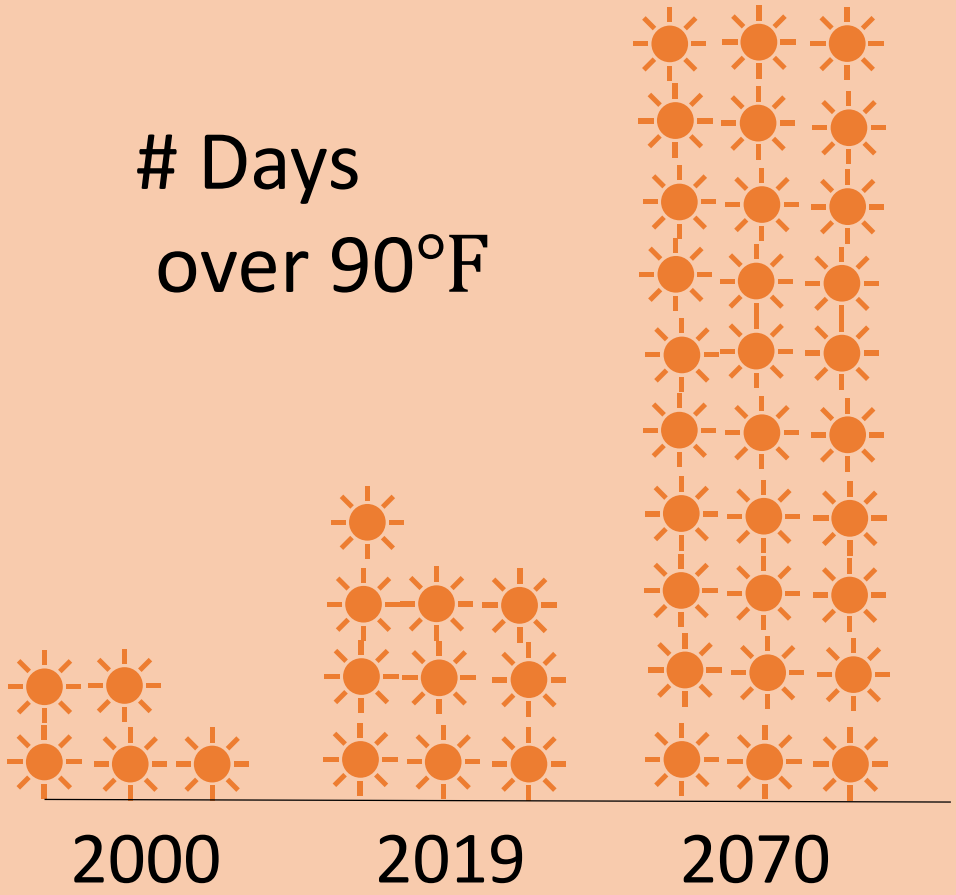


Massachusetts Executive Office of Energy & Environmental Affairs. 2019. "Extreme Weather." Massachusetts Climate Change Clearinghouse. http://www.resilientma.org/changes/extreme-weather


Master Plan
Comprehensive
Visionary
Multiple Levels of Action
Priorities
Communication
Climate Adaptation
Climate Action Plan
Climate Mitigation
Municipal Vulnerability Preparedness Plan
Immediate MVP Grant Fundable Actions
Town-centered Action

How Hot Is It in Boston? The Hottest July Ever Recorded

This swampy, warm, cursed month is about to break a record.



Impacts:

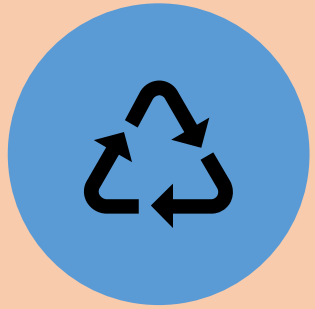
- ✓Cost of cooling homes
- ✓Heat-related illnesses and deaths
- ✓Outdoor recreational activities
- ✓ Construction and other outdoor workers

Source: 2018 Massachusetts State Hazard Mitigation and Adaptation Plan

A HEALTH ISSUE

A TRAFFIC CONGESTION AND COMMUTING ISSUE

AN ENERGY HEATING/COOLING ISSUE



A WASTE DISPOSAL ISSUE

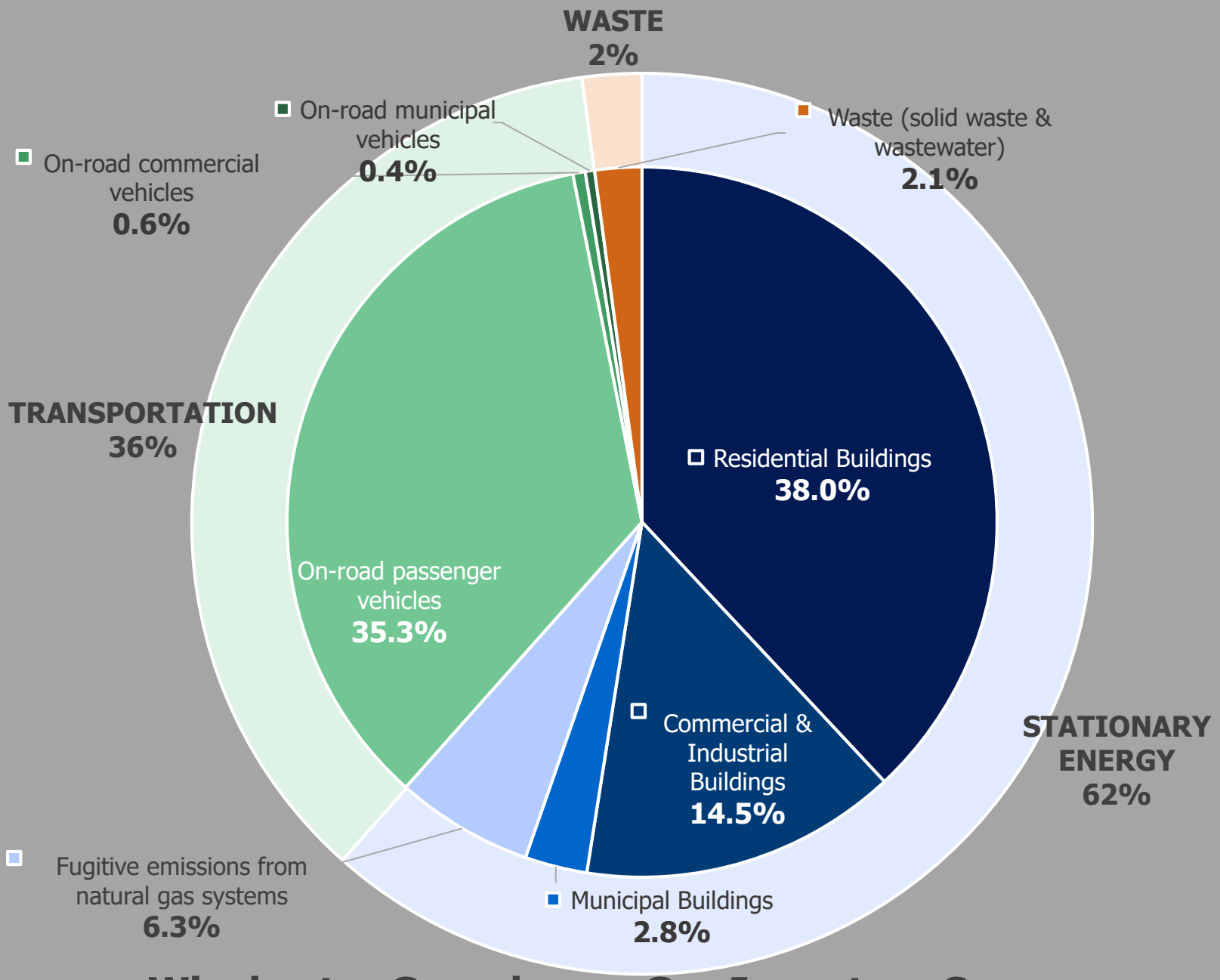
A SUSTAINABLE DEVELOPMENT ISSUE

AN ECONOMIC ISSUE

THE ISSUE OF OUR TIME

What will Winchester's roadmap to address climate change look like?

REDUCE GHGs (carbon emissions)	INCREASE RESILIENCY
• Buildings • Energy • Solid Waste • Transportation	• Preparing for extreme heat and cold, snow, ice, wind • Reducing flooding risks, especially utilizing green infrastructure options • Increasing awareness of health risks from new vector-borne diseases, heat etc • Increase public communications for all climate impacts



Winchester Greenhouse Gas Inventory Summary

How will we measure resiliency progress?

GREEN INFRASTRUCTURE PROJECTS

CLIMATE COMMUNICATIONS /EDUCATION IMPROVEMENTS

COOLING AND WARMING CENTERS

% STREETS BIKING AND WALKING FRIENDLY

MVP Process/ Grant Types

COMMUNITY RESILIENCE BUILDING WORKSHOP(S)

- Define and characterize hazards using latest science and data
- Identify existing and future community vulnerabilities and strengths
- Develop and prioritize community adaptation actions
- Determine overall priority actions
- Receive MVP designation

MVP Planning Grant

MVP Action Grant

Implement priority adaptation actions identified through planning process

Community Resilience Building Workshop

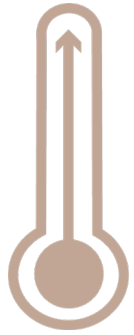
- Defined natural hazards
- Identified key features
- Determined vulnerabilities and strengths
- Developed and prioritized actions

What's the next step?

Implement actions

Top Hazards Identified at the Workshop

Flooding (Stormwater & Riverine)



Heat

Nor'easters (Wind & Heavy Precipitation)

Drought

INFRASTRUCTURAL

Strengths	Vulnerabilities	Both
Public safety (communications, emergency shelters, gear & supplies)	Residences and infrastructure along Horn Pond Brook	Municipal buildings
		Public utilities (power lines, water and sewer, gas lines)
		Roads and bridges
		Hospital
		Jenks Senior Center
		Dams
		Reservoirs
		MBTA and railroad
		Schools
		Stormwater system
		Transfer station

South Reservoir. Photo by Weston & Sampson.

Photo by WBZ-TV

SOCIETAL

Vulnerabilities	Both
Commuters	Environmental justice communities (non-native English speakers)
	Healthcare
	Seniors and Jenks Center
	Youth
	Emergency response and Department of Public Works personnel
	Downtown businesses
	Housing Authority properties and other affordable units
	Faith communities
	After school and enrichment programs
	Hospitals
	Food supply

Google Maps (2017)

Photo by the Winchester Police Department

ENVIRONMENTAL

Strengths	Vulnerabilities	Both
Environmental advocacy groups	Contaminated sites	Waterways (Aberjona River, Horn Pond Brook)
Wright Locke Farm	Kraft Property	Beaches
	Vector borne diseases	Wetlands
	Cyanobacterial or algal blooms	Open space and recreation land
		Wildlife/fisheries
		Street trees
		Whipple Hill
		Community gardens
		Electric vehicle charging stations
		Bike path
		Drinking water reservoirs
		Middlesex Fells

North Reservoir. Photo by Deanna Lambert, July 2019

Middlesex Fells Reservation. Photo by KC Laxon, 2019

HIGHEST HIGH PRIORITY ACTION ITEMS

- **Heat:** identify urban heat islands, mitigation measures, response plan
- **Stormwater:** evaluate system on Nelson Street and Glen Green
- **Green infrastructure:** identify ideal locations for green infrastructure to reduce flooding
- **Open space:** identify areas for potential flood storage and conserved or constructed wetlands
- **Community engagement:** strategize public education related to climate hazards and resiliency strategies
- **Bylaws:** regularly review and update regulations incorporate climate considerations
- **Dams:** retrofit existing dams for fish passage
- **Water conservation:** develop a program or policy
- **Public health:** improve services and shelters related to heating, cooling, and resources
- **Flooding:** upsize the culvert near the Muraco school to reduce flooding

HIGH PRIORITY ACTION ITEMS

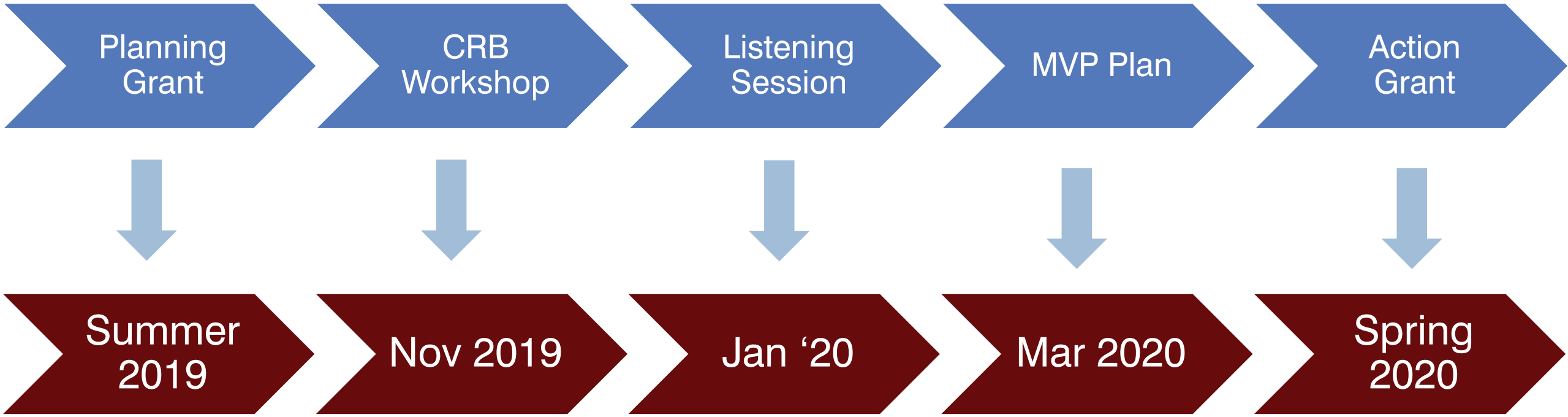
- **Water supply:** update safe yields analysis for water supply during drought
- **Dam rehabilitation:** maintain reservoir integrity
- **Community engagement:** public education related to wildlife passage
- **Regional collaboration:** on how new development will have downstream impacts (Kraft Property)
- **Climate adaptation:** support ongoing resiliency projects
- **Solar generators:** provide backup energy at schools and municipal buildings
- **Memorandum of Understanding (MOU):** develop an MOU with Stop & Shop to supply food and drinking water during emergencies
- **Housing Authority properties:** increase resilience through retrofits and evacuation plans
- **Stormwater flooding:** prioritize culvert replacements, increase green infrastructure, model future flood zones
- **Drought:** identify new irrigation supply, increase use of water conservation technology
- **Wind:** require underground power lines for new subdivisions
- **Heat:** reduce heat island effect, protect mature trees and open space, identify needs for cooling centers

INTRODUCTION TO OPEN HOUSE STATIONS

- 3 Posters on Hazards and Priority Action Items
- 1 Poster on Greenhouse Gas Emissions
- 1 Poster on Climate Action Plan
- Use sticky notes to provide input and capture ideas
- Come and go as you please

MVP Action Grants: Project Types

- Vulnerability and Risk Assessment
- Community Outreach and Education
- Local Bylaws, Ordinances, Plans, and Other Management Measures
- Redesigns and Retrofits
- Nature-Based Flood Protection, Drought Mitigation, Water Quality, and Water Infiltration Techniques
- Nature-Based, Infrastructure and Technology Solutions to Reduce Vulnerability to Extreme Heat and Poor Air Quality
- Nature-Based Solutions to Reduce Vulnerability to other Climate Change Impacts
- Ecological Restoration and Habitat Management to Increase Resiliency
- Energy Resilience
- Chemical Safety
- Land Acquisition for Resilience
- Subsidized Low-Income Housing Resilience Strategies
- Mosquito Control Districts


Planning Grant
CRB Workshop
Listening Session
MVP Plan
Action Grant
Summer 2019
Nov 2019
Jan ‘20
Mar 2020
Spring 2020

WINCHESTER VULNERABILITY PREPAREDNESS PLANNING GRANT

Community Resilience Open House

Extreme Heat & Drought

HAZARD IMPACT

Historic Climate Change

WARMER ANNUAL AIR TEMPERATURES
UP 0.5°F PER DECADE SINCE 1970, ON AVERAGE

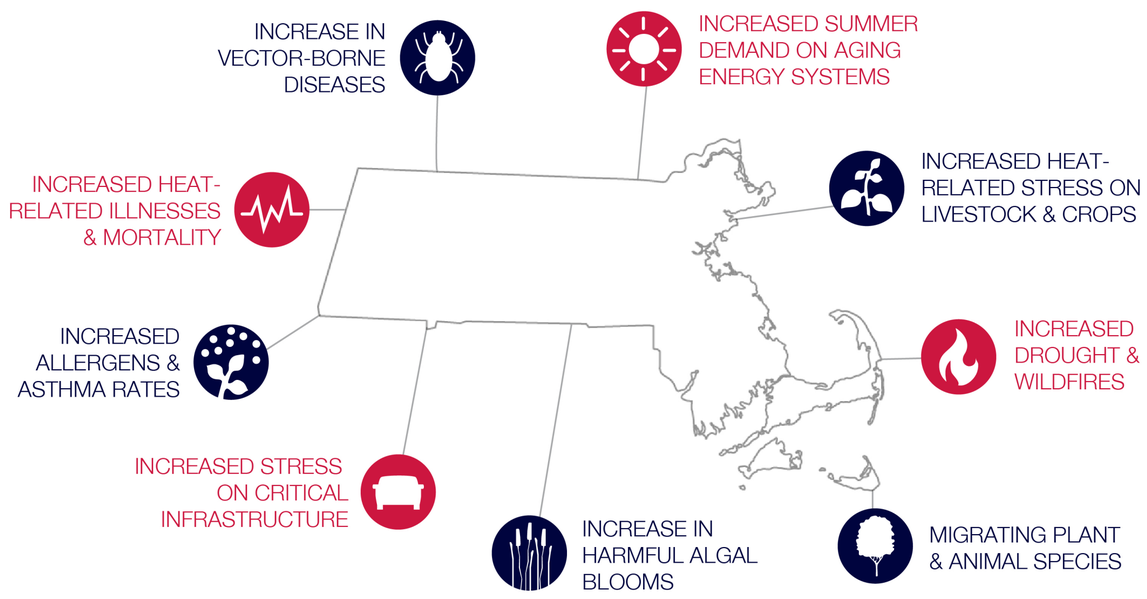
WARMER WINTERS
UP 1.3°F PER DECADE SINCE 1970, ON AVERAGE

Future Climate Change

48.13
2005
OBSERVED
ANNUAL AVERAGE

55.32
END-OF-CENTURY
PROJECTED
ANNUAL AVERAGE

Impacts of Rising Temperatures



Massachusetts Executive Office of Energy & Environmental Affairs. 2019. "Rising Temperatures." Massachusetts Climate Change Clearinghouse. http://www.resilientma.org/changes/rising-temperatures

ACTIONS

Highest High Priority

- **Heat:** identify urban heat islands, mitigation measures, response plan
- **Community engagement:** strategize public education related to climate hazards and resiliency strategies
- **Bylaws:** regularly review and update regulations incorporate climate considerations
- **Water conservation:** develop a program or policy
- **Public health:** improve services and shelters related to heating, cooling, and resources

High Priority

- **Water supply:** update safe yields analysis for water supply during drought
- **Climate adaptation:** support ongoing resiliency projects
- **Memorandum of Understanding (MOU):** establish a MOU with Stop & Shop to supply food and bottled water during emergencies
- **Housing Authority properties:** increase resilience through retrofits and evacuation plans
- **Drought:** identify new irrigation supply, increase use of water conservation technology
- **Heat:** reduce heat island effect, protect mature trees and open space, identify needs for cooling centers

Moderate Priority

- **Transit:** build sheltered areas with solar panels at bus stops and commuter rail stations
- **Community outreach:** collaborate with the hospital to share climate-related public health hazards, and increase public education and outreach to youth
- **Shelters:** update emergency supplies
- **Communications:** study the existing system and increase redundancy
- **Advocacy:** develop a database of vulnerable populations and secure grants for environmental advocacy groups
- **Ecosystems:** study impact of water temperatures on river herring, study nutrient loading
- **Water:** assess long-term water rationing

Low Priority

- **Hospital:** install green infrastructure
- **Community outreach:** increase education related to rain barrels

WE WANT TO HEAR FROM YOU!

How have you experienced extreme heat and drought in Winchester?

How have you prepared for extreme heat and drought in Winchester under changing climate conditions?

What resources do you need to be more prepared?

How could the town become more resilient to extreme heat and drought?

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WINCHESTER VULNERABILITY PREPAREDNESS PLANNING GRANT

Community Resilience Open House

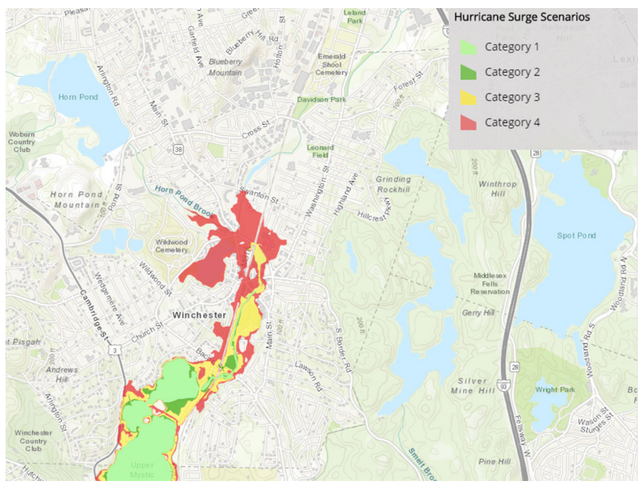
Intense Storms & Wind

HAZARD IMPACT

Historic & Future Climate Change

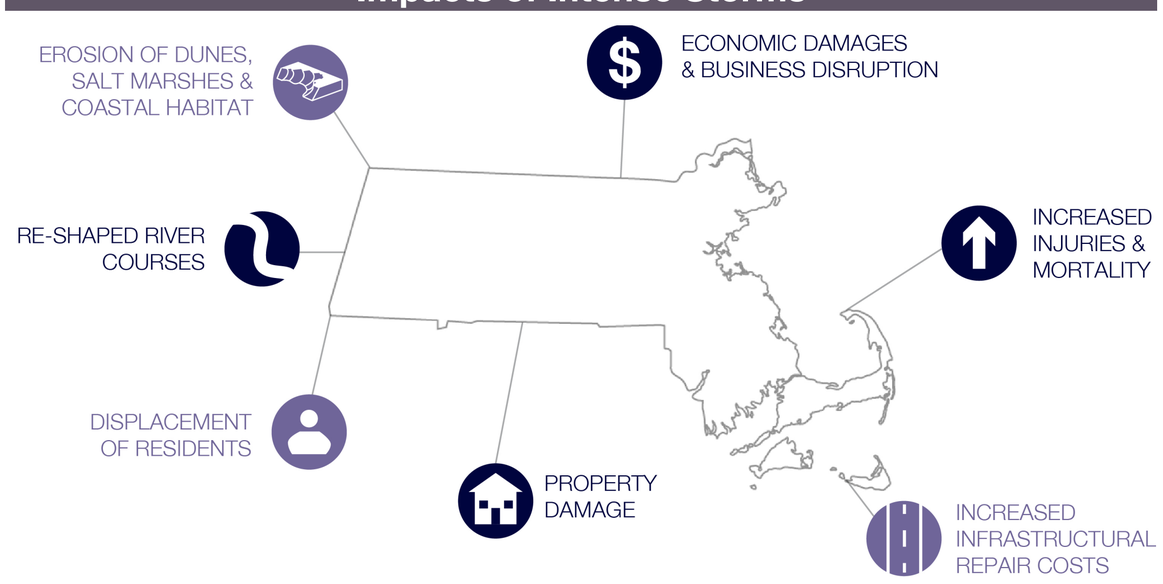
⇧ There has been an upward trend in North Atlantic hurricane activity since 1970

⇧ Nor'easters along the Atlantic coast are increasing in frequency and intensity



Map Source: Climate Science Special Report, Fourth National Climate Assessment (NCA4)

Impacts of Intense Storms



Massachusetts Executive Office of Energy & Environmental Affairs. 2019. "Extreme Weather." Massachusetts Climate Change Clearinghouse. http://www.resilientma.org/changes/extreme-weather

ACTIONS

Highest High Priority

- **Community engagement:** strategize public education related to climate hazards and resiliency strategies
- **Bylaws:** regularly review and update regulations incorporate climate considerations
- **Public health:** improve services and shelters related to heating, cooling, and resources

High Priority

- **Community engagement:** public education related to wildlife passage
- **Climate adaptation:** support ongoing resiliency projects
- **Solar generators:** provide backup energy at schools and municipal buildings
- **Memorandum of Understanding (MOU):** establish a MOU with Stop & Shop to supply food and bottled water during emergencies
- **Housing Authority properties:** increase resilience through retrofits and evacuation plans
- **Wind:** require underground power lines for new subdivisions

Moderate Priority

- **Power:** bury power lines, increase clean energy incentives, conduct a microgrid study
- **Shuttle system:** coordinate with the hospital and school bus company to plan for emergencies
- **Shelters:** update emergency supplies
- **Communications:** study the existing system and increase redundancy
- **Safety:** protect workers during extreme events, including providing protective equipment
- **Advocacy:** develop a database of vulnerable populations and secure grants for environmental advocacy groups

Low Priority

- **Wright Locke Farm:** use as an emergency shelter
- **Renewable energy:** increase use, possibly at Wright Locke Farm

WE WANT TO HEAR FROM YOU!

How have you experienced intense storms and wind in Winchester?

How have you prepared for intense storms and wind in Winchester under changing climate conditions?

What resources do you need to be more prepared?

How could the town become more resilient to intense storms and wind?

The Town Of WINCHESTER MASSACHUSETTS

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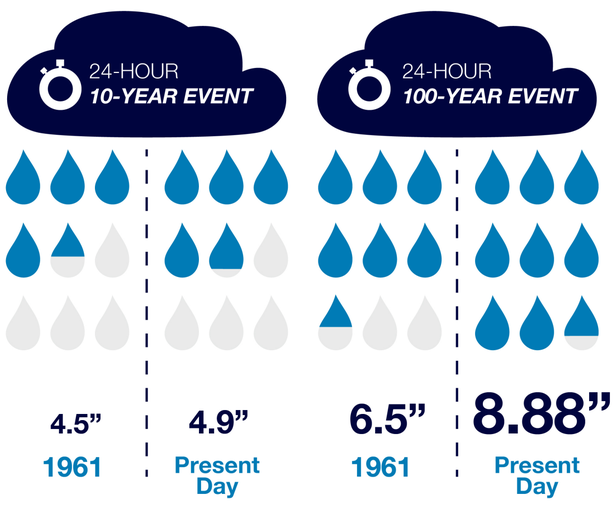
WINCHESTER VULNERABILITY PREPAREDNESS PLANNING GRANT

Community Resilience Open House

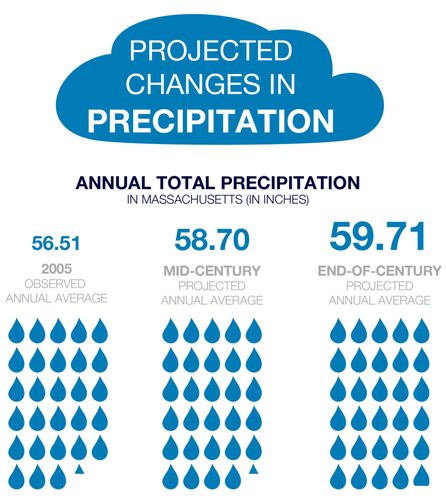
Flooding

HAZARD IMPACT

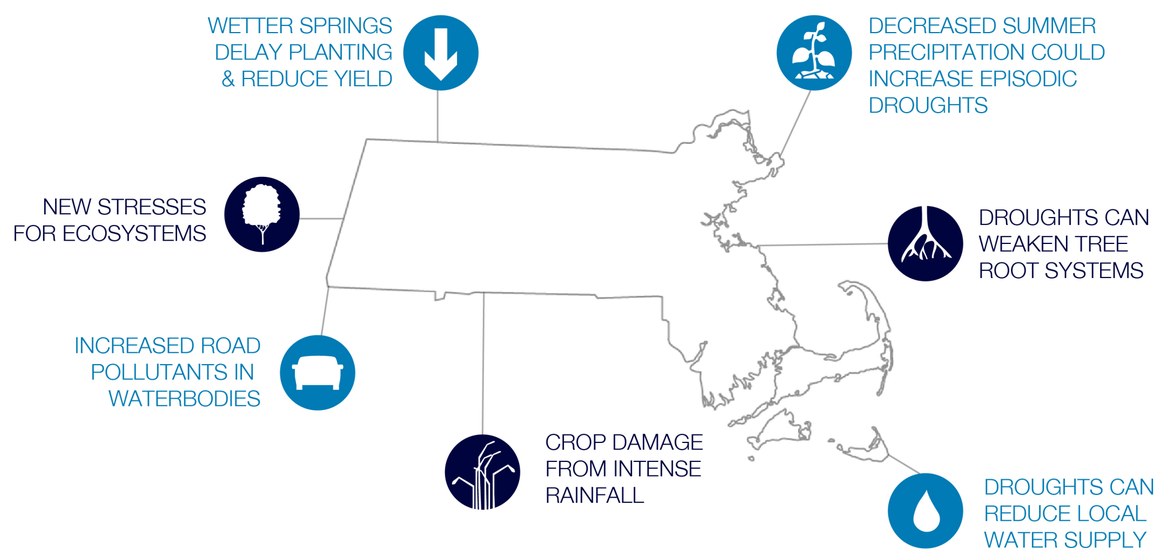
Historic Climate Change



Future Climate Change



Impacts of Changing Precipitation



ACTIONS

Highest High Priority

- **Stormwater:** evaluate system on Nelson Street and Glen Green
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- **Flooding:** upsize the culvert near the Muraco School to reduce flooding

High Priority

- **Dam rehabilitation:** maintain reservoir integrity
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- **Climate adaptation:** support ongoing resiliency projects
- **Memorandum of Understanding (MOU):** establish a MOU with Stop & Shop to supply food and bottled water during emergencies
- **Stormwater flooding:** prioritize culvert replacements, increase green infrastructure, model future flood zones

Moderate Priority

- **Judkins Pond:** assess options to reduce contamination at Davidson Park
- **Contamination:** reduce exposure to contaminated soils
- **Water:** address localized flood risk and assess long-term water rationing

Low Priority

- **Wright Locke Farm:** use as an emergency shelter
- **Hospital:** install green infrastructure
- **Community outreach:** increase public education related to rain barrels
- **Nutrient loads:** provide real-time information, reduce nutrient loading in the reservoir at Middlesex Fells by reducing trash and dog waste

WE WANT TO HEAR FROM YOU!

How have you experienced flooding in Winchester?

How have you prepared for flooding in Winchester under changing climate conditions?

What resources do you need to be more prepared?

How could the town become more resilient to flooding?

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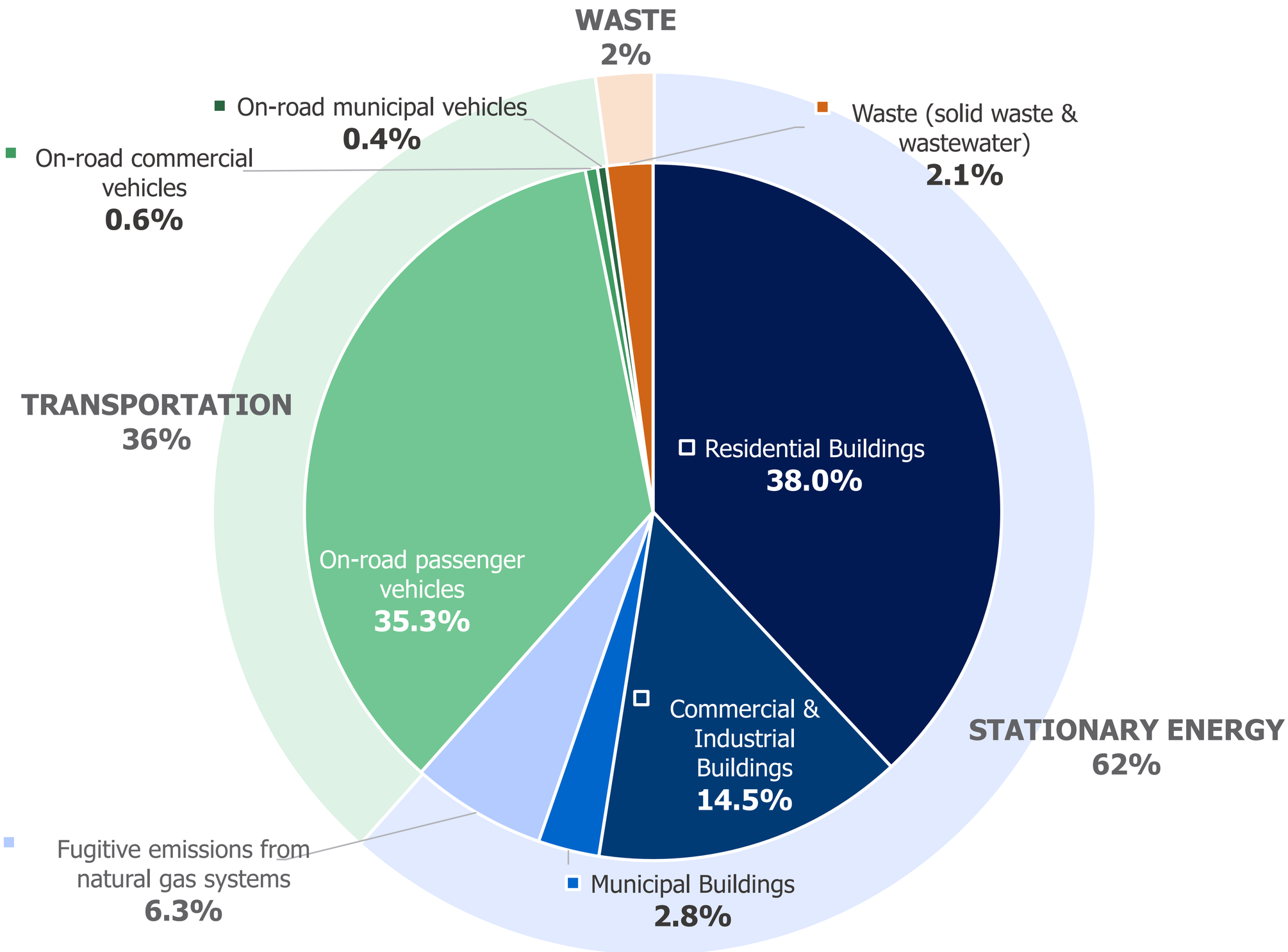
WINCHESTER VULNERABILITY PREPAREDNESS PLANNING GRANT

Community Resilience Open House

Greenhouse Gas Inventory



WE WANT TO HEAR FROM YOU!

Does it surprise you that most (98%) of the carbon emissions in Winchester are due to **Buildings** (Stationary Energy) plus **Transportation**? Why or why not?

Does it surprise you that most (73.3%) of the carbon emissions in Winchester occur in the **Residential** sector? Why or why not?

Since the residents of Winchester are responsible for the lion's share of carbon emissions, what suggestions can you offer for how we can **reduce carbon emissions due to our homes and our travel needs?**

The Town Of WINCHESTER MASSACHUSETTS

Weston & Sampson℠ transform your environment

WINCHESTER VULNERABILITY PREPAREDNESS PLANNING GRANT

Community Resilience Open House

Climate Change in Winchester

What does *CLIMATE CHANGE* look like in *WINCHESTER?*

- **A HEALTH ISSUE**
- **A TRAFFIC CONGESTION AND COMMUTING ISSUE**
- **AN ENERGY HEATING AND COOLING ISSUE**
- **A WASTE DISPOSAL ISSUE**
- **A SUSTAINABLE DEVELOPMENT ISSUE**
- **THE ISSUE OF OUR TIME**

WE WANT TO HEAR FROM YOU!

What are some of the **health issues** that climate change is causing in Winchester? What can the Town and residents do about these?

How will **relieving traffic congestion and improving transportation** have a positive impact on climate change?

How can the Town and residents become more ready for **extreme temperatures** (heat and cold) and more **extreme storms**?

The Town Of WINCHESTER MASSACHUSETTS

Weston & Sampson℠ transform your environment

The Town Of WINCHESTER MASSACHUSETTS

Municipal Vulnerability Preparedness Planning Grant Project Listening Session
Tuesday, January 21st, 2020 7:00 pm – 8:30 pm

Name	Affiliation	Email Address
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Weston & Sampson

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Name	Affiliation	Email Address
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Name	Affiliation	Email Address
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