ARCADIS Design & Consultancy for natural and built assets

Town of Ayer, Massachusetts

COMMUNITY RESILIENCE BUILDING WORKSHOP

Summary of Findings

June 2020

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Summary of Findings

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ACKNOWLEDGEMENTS

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Mark Archambault, Town Planner

The Core Team is grateful to all members of the Ayer community who participated in the MVP planning process.

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ACRONYMS AND ABBREVIATIONS

CRB	Community Resilience Building
DPW	Department of Public Works
EEA	Massachusetts Executive Office of Energy and Environmental Affairs
MBTA	Massachusetts Bay Transportation Authority
MPH	Miles per hour
MRPC	Montachusett Regional Planning Commission
MVP	Municipal Vulnerability Preparedness
NOAA	National Oceanic and Atmospheric Administration
SSO	Sanitary Sewer Overflow

1 INTRODUCTION

Ayer's history dates back to 1667 when the first mill, used to grind corn in the agricultural community, was built. Originally part of the town of Groton, Ayer was incorporated in 1871 and named in honor of Dr. James Cook Ayer, a prominent resident of Lowell who provided the funding for the construction of Town Hall (1873-76). The town's growth was influenced by a period of rapid development of railroad transportation during the mid-19th century. Though only 9.5 square miles in area the town became a major junction for both east-west and north-south rail lines and developed into an important commercial center.

Figure 1. Town of Ayer

During the Civil War an army training camp, Camp Stevens, was located near the Nashua River. Camp Devens, which eventually became Fort Devens, was established in 1917, during World War I. The presence of thousands of military and civilian personnel on the base shifted Ayer's commercial development towards meeting their needs until Fort Devens was closed in 1994.

The town today is a reflection of its history. Within its relatively small area, the town boasts numerous industries, a thriving, historical downtown, unique to the region and modern commuter rail service to Boston.

In 2019, the Town of Ayer (the Town) received a planning grant from the Commonwealth of Massachusetts' Municipal Vulnerability Preparedness (MVP) program and began engaging the public and target stakeholders in a Community Resilience Building (CRB) framework to begin planning for the effects of climate change in the community.

This report provides a summary of the MVP process in Ayer as well as the key outcomes and recommendations of the Community Resilience Building workshops convened by the Town in January 2020.

1.1 Town of Ayer

Ayer is the westernmost community in Middlesex County Massachusetts. The town has a mix of land-uses including a significant amount of permanent open space (13.8%). Other major uses include residential (19.2%), commercial and industrial (17.3%), Town-owned (9.1%), and transportation uses (5.6%). The town also features an interconnected series of natural ponds and man-made impoundments, as well as significant wetland resource areas, that together make up approximately 14% of the town's

land area. [1] According to recent population estimates, the Town is home to approximately 8,000 individuals.[2] Residents are served by a range of Town-led services including fire, police, water, highway, stormwater, and wastewater operations.

1.2 MVP Program Background

The Municipal Vulnerability Preparedness program is led by the Commonwealth of Massachusetts and provides cities and towns with funding and technical assistance for planning and project implementation to advance community climate resilience. The program's foundations lie in Executive Order 569, signed by Governor Charlie Baker in 2016, which instructed State agencies to begin assisting cities and towns in completing local climate vulnerability and resilience plans. The Environmental Bond Bill subsequently signed in 2018 codified EO 569 and provided funding to support climate change adaptation across the Commonwealth.

The MVP program's goals are to help communities:

- Define climate related hazards
- Understand how they may be impacted by climate change utilizing the latest science and data
- Identify existing and future climate vulnerabilities and strengths
- Identify opportunities to take action to reduce risk and build resilience
- Implement priority actions identified through the planning process[3]

Participation in the program involves two steps. First, communities may apply for funding to complete a vulnerability assessment and develop action-oriented resiliency plans driven by a highly participatory community process. Once the community has developed its plan, it is certified as an MVP community by the Commonwealth and is eligible to apply for MVP Action grant funding to help fund implementation of the plan and/or additional studies.

1.3 Community Resilience Building Workshop

The MVP planning process is based in an accessible, community-driven process that seeks to foster partnerships and make more mainstream information and understanding of climate change projections and potential impacts. The process is guided by a core group of stakeholders who help inform and guide the study from the project kick-off to the completion of the work.

To foster and structure community participation in the MVP program, the Town employed a process called Community Resilience Building. The CRB process includes a workshop format that offers a "unique, 'anywhere at any scale"' community-driven process, rich with information, experience, and dialogue, where participants identify top hazards, current strengths, challenges, and priority actions to improve community resilience for all hazards today, and in the future."[4] Additional information about the Community Resilience Building process can be found at www.communityresiliencebuilding.com.

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[1] 2017 Master Plan
[2] 2017 ACS 5-Year Estimate
[3] MVP Program Information: https://www.mass.gov/service-details/mvp-program-information (Accessed February 11, 2020)
[4] https://www.communityresiliencebuilding.com/

The Town held two half-day CRB workshops (part 1 was held on January 9th, 2020 and part 2 on January 16th, 2020). Both sessions were held at the Town of Ayer Department of Public Works offices and were led by Town staff with support from the consulting firm Arcadis (a certified MVP provider). Appendices A, B, and C include the presentation slides and other materials prepared for the workshops.

1.3.1 Pre-Workshop Coordination

Preparation for the CRB workshops began in fall 2020 with coordination led by the Town. A Core Team of stakeholders was convened to kick-off the process in October 2019. The Core Team included representation from a range of Town departments and stakeholders. Members are listed in Table 1 below.

The initial Core Team meeting provided an opportunity to introduce the MVP process to Town departments and to discuss goals and logistics for the CRB workshops. The Team identified key stakeholders to involve in the process and discussed a preliminary list of priority hazards and vulnerabilities. The information was used to inform outreach leading up to the CRB workshops and information gathering to inform the initial hazard assessment provided in the introduction to the workshops. In addition to the Core Team meeting, the primary project manager for the Town, Mark Wetzel, Department of Public Works (DPW) Superintendent, and the MVP provider, Arcadis, were in frequent contact to coordinate and plan for the workshops.

Table 1. Ayer MVP Core Team Members

Name	Town Department	Title
Mark Wetzel	Public Works	Superintendent
Dan Van Schalkwyk	Public Works	Town Engineer
Robert Pedrazzi	Fire	Chief / Emergency Management Director
Brian Gill	Police	Deputy Chief
Carly Antonellis	Town Manager's Office	Assistant Town Manager
Mark Archambault	Planning Board	Town Planner
JoAnne Cristoff	Conservation Commission	Conservation Agent

1.3.2 Preparation and Outreach for the Workshops

1.3.2.1 Data Collection and Literature Review

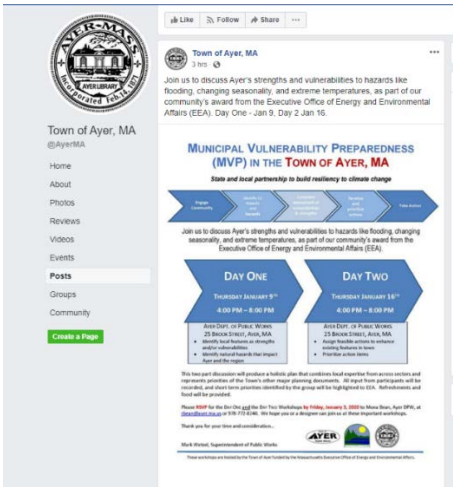
The CRB workshops and Core Team discussions were informed by a review of a range of resources providing information on climate hazards and vulnerabilities in the region. In addition, the process was informed by relevant Town planning documents. These included:

- Montachusett Region Natural Hazard Mitigation Plan (2015 Update)
- Massachusetts Executive Office of Energy and Environmental Affairs Climate Change Projections, produced by Northeast Climate Center at the University of Massachusetts Amherst (2018)
- Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan (2018)
- MVP reports produced for neighboring communities, include Devens, MA (2018) and Littleton, MA (2018)
- Town of Ayer Master Plan (2017)
- Town of Ayer Open Space and Recreation Plan, 2019-2026 Update (2019)

Information on climate projections and hazards collected from these resources informed priority hazard descriptions included in Section 2.

1.3.2.2 Community Outreach and Advertising

A critical component of the MVP process is broad community participation. To foster such participation, a series of outreach strategies were used to advertise the CRB workshops, including placement of flyers at key locations in town, direct email invitations to stakeholders identified by the Core Team, social media posts, and advertisement on the Town calendar and homepage. Figure 2 provides examples of the digital outreach undertaken in advance of the CRB workshops.



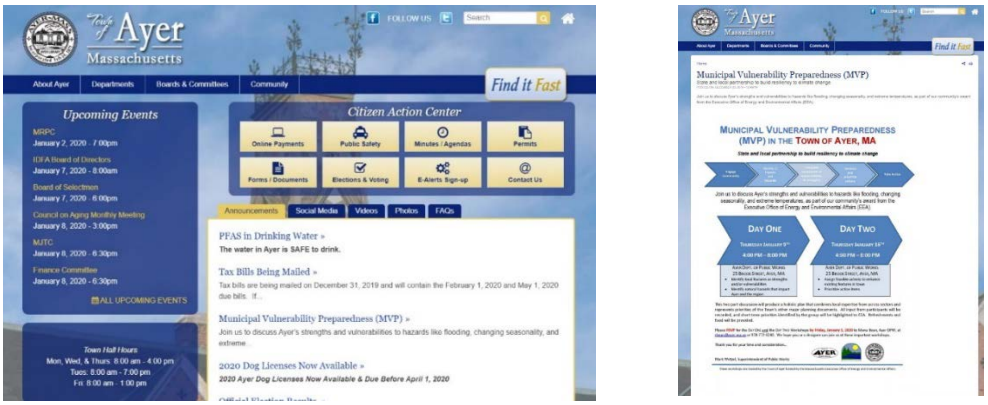


Figure 2. Example digital outreach advertising the Community Building Workshops

1.3.2.3 Community Resilience Building Risk Matrix

The CRB workshop structure and process adhered to the CRB Workshop Guide, including preparation of a CRB Matrix. Completed matrices from the Ayer CRB workshops are included in Appendix C. The matrices provide a format for collaboratively defining priority hazards and community strengths /vulnerabilities, cataloguing site ownership, and identifying and prioritizing actions to address key vulnerabilities while building on existing community strengths. According to the CRB format, strengths and vulnerabilities are divided by participants between three categories: infrastructural, societal, and environmental. Through the Core Team and CRB Workshops process, a set of preliminary vulnerabilities and strengths were identified, as summarized in Table 2. These items were further discussed and refined during the CRB workshops.

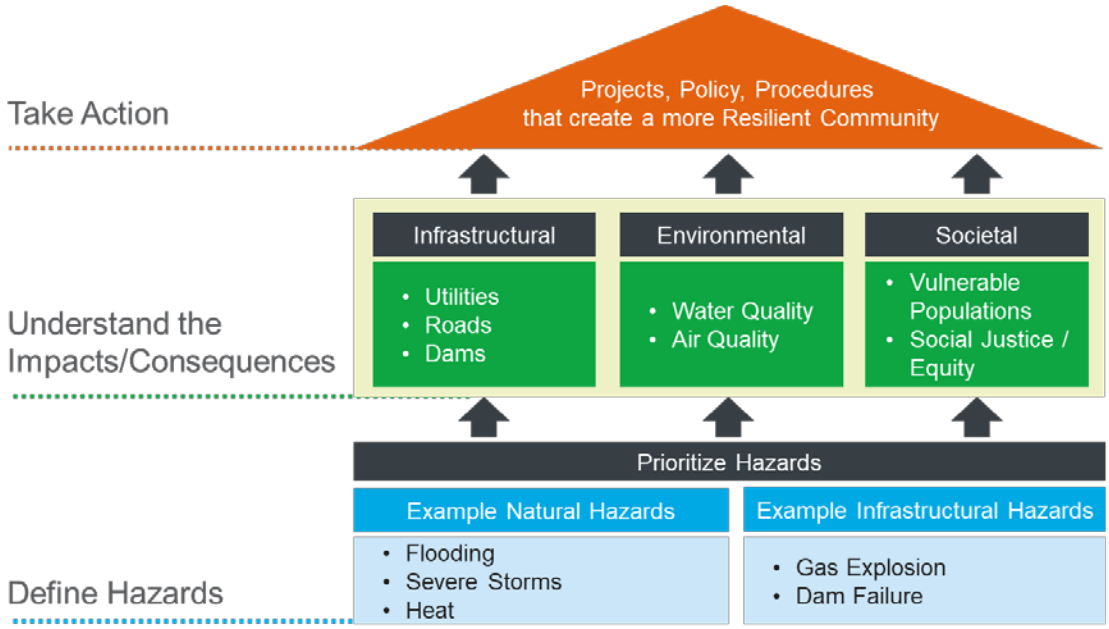


Figure 3. Process Diagram for Building Community Resilience

Table 2. Preliminary list of Vulnerabilities and Strengths for Ayer identified by the Core Team

Infrastructural	Societal	Environmental
Stormwater Culverts	Water Supply	Wetlands
Constructed Dams	Fire Station/Police Station	Beaver Dams
Power Substations / Power Plant / Power System	Medical Facilities	Conservation Land
Road network	Schools (elementary, middle, high)	Grove Pond (arsenic impaired)
Railroads/Trains (commuter rail / freight line)	PACE/Environmental Justice Communities	Waste Management / Transfer Station
Cell Tower / Communications	Public Awareness / evacuation plans/development pressure	Stormwater Management / Treatment & Contamination

2 TOP-PRIORITY HAZARDS AND VULNERABLE AREAS

The effects of climate change will be felt across the Commonwealth of Massachusetts and in many areas already are being felt on a daily basis, whether through increased temperature, severe storms, or heavier than usual precipitation. As documented by the Northeast Climate Center at the University of Massachusetts Amherst and in the Montachusett Region Natural Hazard Mitigation Plan, these effects will only continue to grow over the coming century.

In recognition of this, The Town of Ayer is already taking steps to prepare. To help address flooding hazards, the Town has recently enacted a local wetlands by-law, enforces a floodplain district and Open

Space Residential Development by-law, and maintains stormwater and water control infrastructure (culverts, dams, and dikes). In addition, the Town works to create redundancies in its infrastructure and service capacity in case of outages. Nevertheless, there is widespread recognition that climate change will bring new challenges that will necessitate new approaches and thinking, as well as continued investment in existing Town programs and infrastructure.

During the first CRB workshop on January 9th, 2020, participants discussed and defined four top-priority hazards that participants agreed posed the greatest risk to Ayer, both today and in the future with climate change. The priority hazards were:

- Extreme precipitation and flooding
- Heat and drought
- Extreme storms and wind
- Snow/ice storms

This section describes these top-priority hazards in terms of current and future impacts.

2.1 Precipitation and Flooding

2.1.1 Precipitation and Flooding Hazards

Located in the Nashua Basin, approximately 19% of Ayer is located within the 100-year flood plain according to the *Montachusett Region Natural Hazard Mitigation Plan 2015 Update*. Approximately 82 acres of the floodplain is developed, amounting to 7% of the floodplain. Also located within this 100-year flood zone (1% annual chance floodplain or 1-in-100 chance of flooding in a given year) are a number of critical facilities including public water supplies and the Ayer Fire Station. Projections for future precipitation values vary by season, with summer and fall ranging from decreases to increases in total precipitation while winter and spring are projected to have increases in total precipitation over the coming century. Annual precipitation is projected to increase by as much as six inches at the mid-century mark, and up to eight inches by the end of the century. Projected changes in annual precipitation are summarized in Table 3.

Table 3. Summary of Projected Annual Precipitation Changes for the Nashua Basin

	Observed Baseline 1971-2000	Mid- Century Projection Projected Change in 2050s			End of Century Projection Projected Change in 2090s		
Days with Precipitation over 1” (days)	7	+1	to	+3	+1	to	+4
Days with Precipitation over 2” (days)	1	+<1	to	+ <1	+<1	to	+ <1

Days with Precipitation over 4” (days)	<1	+0	to	+<1	+0	to	+<1
Consecutive Dry Days (Days)	16	-1	to	+2	-1	to	+3
Total Precipitation (inches)	45.9	+1.2	to	+6.3	+1.3	to	+8.4

Source: Northeast Climate Science Center at the University of Massachusetts Amherst

Projections for consecutive dry days, as seen in Table 3, range from decreasing amount of consecutive dry days to increasing from the observed baseline both for the Mid-Century projection and the End of Century Projection.

2.1.2 Vulnerabilities Identified During CRB Workshops

Participants in the CRB workshops identified the following vulnerabilities related to precipitation and flooding in Ayer, as outlined in Table 4.

Table 4. Precipitation and Flooding Related Vulnerabilities

Infrastructural	Societal	Environmental
Undersized stormwater culverts resulting in land and roadway flooding/washouts	Public safety buildings (fire/police) built within or adjacent to flood hazard areas	Beaver damming of culverts and streams, diverting flows and altering water pathways and exacerbating flood hazards
Aging sewer system vulnerable to infiltration and inflow and further pipe degradation	Vulnerable populations residing in current floodplain	Aging sewer system vulnerable to infiltration and inflow and resulting in sanitary sewer overflows (SSOs)
Aging dam infrastructure (private/public) creates potential to increase flood hazards in downstream areas	Emergency shelter capacity may be stressed in event of regional-scale emergency	Stormwater ponding can cause increase in invasive species and insect born illnesses
	Limited roadway access to medical facilities	

2.2 Heat and Drought

2.2.1 Heat and Drought Hazards

Average daily temperatures throughout the Nashua Basin are projected to increase both seasonally and annually through the 21st Century. As a result of increasing temperatures, the number of days annually with a maximum temperature greater than 90°F is projected to increase by as many as 30 days by mid-century and 70 days by end of century. A summary of the projected average temperature increase and resulting effects on maximum and minimum daily temperatures can be found in Table 5.

As well as a projected increase in average temperature, there are projections for more days with a maximum temperature over 90 °F and fewer days with the minimum temperature under 32 °F. These projected changes may bring warmer winters for Ayer, as well as more extreme heat in the summer.

Table 5. Summary of Projected Annual Temperature Changes for the Nashua Basin

	Observed Baseline 1971-2000	Mid- Century Projection Projected Change in 2050s			End of Century Projection Projected Change in 2090s		
Average Temperature (90 °F)	46.8	+3.0	to	+6.4	+3.9	to	+11.0
Days with Maximum Temperature over 90 °F (days)	4	+9	to	+ 30	+13	to	+70
Days with Maximum Temperature over 100 °F (days)	<1	+<1	to	+3	+<1	to	+17
Days with Minimum Temperature under 32 °F (days)	156	-19	to	-38	-23	to	-64
Days with Minimum Temperature under 0 °F (days)	9	-4	to	-7	-4	to	-8

Source: Northeast Climate Science Center at the University of Massachusetts Amherst

2.2.2 Vulnerabilities Identified During CRB Workshops

Participants in the CRB workshops identified the following vulnerabilities related to heat and drought in Ayer, as outlined in Table 6.

Table 6. Heat and Drought Related Vulnerabilities

Infrastructural	Societal	Environmental
Power network stressed by extreme heat and prolonged heatwaves, leading to outages	Vulnerable populations, including the elderly, may not have adequate access to air conditioning and cooling	Water supply and groundwater vulnerability in times of prolonged drought
Other utility networks stressed by extreme heat and prolonged heatwaves, leading to outages	Heatwaves lower air quality, particularly near railways and trucking routes	Large tracts for undeveloped land vulnerable to wildfires in dry months, exacerbated by drought
	Pollution of recreational waterbodies posed public health risk	Changes in habitat can lead to increase in invasive species and insect born illnesses

2.3 Extreme Storms and Wind

2.3.1 Extreme Weather and Wind Hazards

Although the exact number and timing of increase is uncertain, incidence of hurricanes in the North Atlantic is projected to increase in frequency, duration, and intensity with climate change. Along with hurricanes, incidences of other extreme weather such as tornados and thunderstorms are likely to increase over time as well. The *Montachusett Regional Planning Commission* places Ayer in the 90 MPH wind load zone and tracks three tropical storms and a hurricane through the Town between 1858 and 2015. There is also record of a tornado that was tracked through Ayer in 1971. Severe thunderstorms are classified by the National Oceanic and Atmospheric Administration (NOAA) as a thunderstorm containing at least one of the following: hail three quarter inches or greater, wind gusts exceeding 57.5 MPH, or tornados. From 1996 to 2015, there have been 2 instances of high winds and severe thunderstorms in Ayer, with 3 recorded instances of hail (*Montachusett Region Natural Hazard Mitigation Plan 2015 Update*).

2.3.2 Vulnerabilities Identified During CRB Workshops

Participants in the CRB workshops identified the following vulnerabilities related to extreme storms and wind in Ayer, as outlined in Table 7.

Table 7. Extreme Storms and Wind Related Vulnerabilities

Infrastructural	Societal	Environmental
Downed trees can cause utility outages	Emergency shelter capacity may be stressed in event of regional-scale emergency	High wind can damage trees and habitat
Wind and downed trees can damage homes, businesses, and public facilities	Downed trees can limit access to critical facilities, such as Nashoba Valley Medical Center	Downed trees can block trails and access to other public amenities

2.4 Snow and Ice Storm

2.4.1 Impacts from Snow and Ice Storms

Instances of snow and ice storms, along with nor'easters, are likely to increase over time similar to other extreme weather in the area. With severe winter storms come the potential for downed trees and power lines resulting in a loss of electricity for the area. The *Montachusett Region Natural Hazard Mitigation Plan 2015 Update* notes 11 instances from 1996 to 2015 where there was a winter storm related Federally declared disaster in the region. The Montachusett Region has also seen a trend of increasing amounts of snowfall since 1980, according to data from the National Oceanic and Atmospheric Administration.

2.4.2 Vulnerabilities Identified During CRB Workshops

Participants in the CRB workshops identified the following vulnerabilities related to snow and ice in Ayer, as outlined in Table 8.

Table 8. Snow and Ice Related Vulnerabilities

Infrastructural	Societal	Environmental
Heavy snow and ice can lead to downed trees and utility wires	Removal of heavy snow and ice strains Town resources and capacity	Heavy snow and ice resulting in downed trees, impacting habitat and providing fuel for wildfires during hot/dry periods
Spring snow melt can result in flooding	Downed trees and utility wires can limit access to critical facilities, such as Nashoba Valley Medical Center and evacuation center	Pollution of water bodies from run-off during snow melt

Figure 4. Community Resilience Building Workshop

3 CURRENT STRENGTHS AND ASSETS

Ayer's future as a resilient community that provides a high quality of life for all residents, visitors, and business owners can be achieved by drawing on the many strengths and assets already a part of the town's social, physical, and environmental fabric. Participants in the CRB workshops identified a range of town features that will serve as the foundation for future actions to advance community climate resilience. These strengths and assets are summarized in this section.

- **Regional Transportation Link**
  - In addition to a roadway network maintained by the Ayer DPW, the town benefits from being a stop on the Fitchburg Line of the Massachusetts Bay Transportation Authority (MBTA) Commuter Rail line, which provides a direct link to Boston. This connection ensures resident access to jobs and amenities available in the Boston metro area through a sustainable mode of transit, promoting social, economic, and environmental resilience.

- **Existing Emergency Preparedness Programs**
  - The Town implements a robust set of programs and policies to foster emergency preparedness. These include an actively maintained webpage with preparedness resources for residents, reverse 911, emergency sheltering, CodeRed emergency notification systems, and DPW staffing for addressing snow and other storm-borne emergencies. CRB workshop participants suggested steps to maximize the effectiveness of these resources, including ensuring that all new residents were made aware of them.

- **Public Safety Programs and Community Facilities and Institutions**
  - The town offers residents a range of high-quality critical services and amenities, including fire and police. Public schools and other community institutions, such as the public library and senior center, serve as the foundation for community well-being and education and as a source of civic pride. The Nashoba Valley Medical Center, located in Town, is a regional medical facility.

- **Proactive Environmental Policies and Regulations**
  - The Master Plan completed in 2017 addresses the long-term needs of the community in areas such as housing, economic development, transportation, services, and natural resources. The plan recommends a series of steps that will help advance or support climate resilience goals, including smart growth zoning regulations encouraging densification of the downtown district in proximity to the MBTA station; greater protections for sensitive ecological areas such as the Petapawag Area of Critical Environmental Concern; and continued and new actions to conserve natural resources such as wetlands and floodplains. As an up-to-date, comprehensive guiding document, the Master Plan provides Ayer with a roadmap for the Town's future.
  - The Town has recently adopted a local Wetlands Protection By-Law to strengthen controls over development adjacent to wetland resource areas, which preserves habitat,

aids in groundwater recharge, reduces non-point source pollution, and helps mitigate flood risk
    - The Town adopted Open Space Residential Development zoning that requires the provision of open space in new residential subdivisions
    - The Town implements a Floodplain District to regulate development in the floodplain to reduce flood risk to property and preserve the natural risk-reducing function of floodplains
    - Stormwater Bylaw and regulations mandate measures to control stormwater

- **Protected Open Space/Conservation Land**
    - According to the Master Plan, there are approximately 867 acres of protected open space in Ayer. This land provides a range of community benefits, including recreational opportunities, flood protection, ground water recharge, wildlife habitat, and helps buffer developed areas from natural hazards such as wildfire. The town also has a recently adopted *Open Space and Recreation* plan that lays out the community's vision and plans through 2026.

- **Engaged Citizens and Youth**
    - CRB participants identified the community itself as a strength that can built upon to advance resilience. It was noted that the Town's younger demographic, including students, could become active participants and leaders in efforts to achieve the goals laid out through the CRB process.

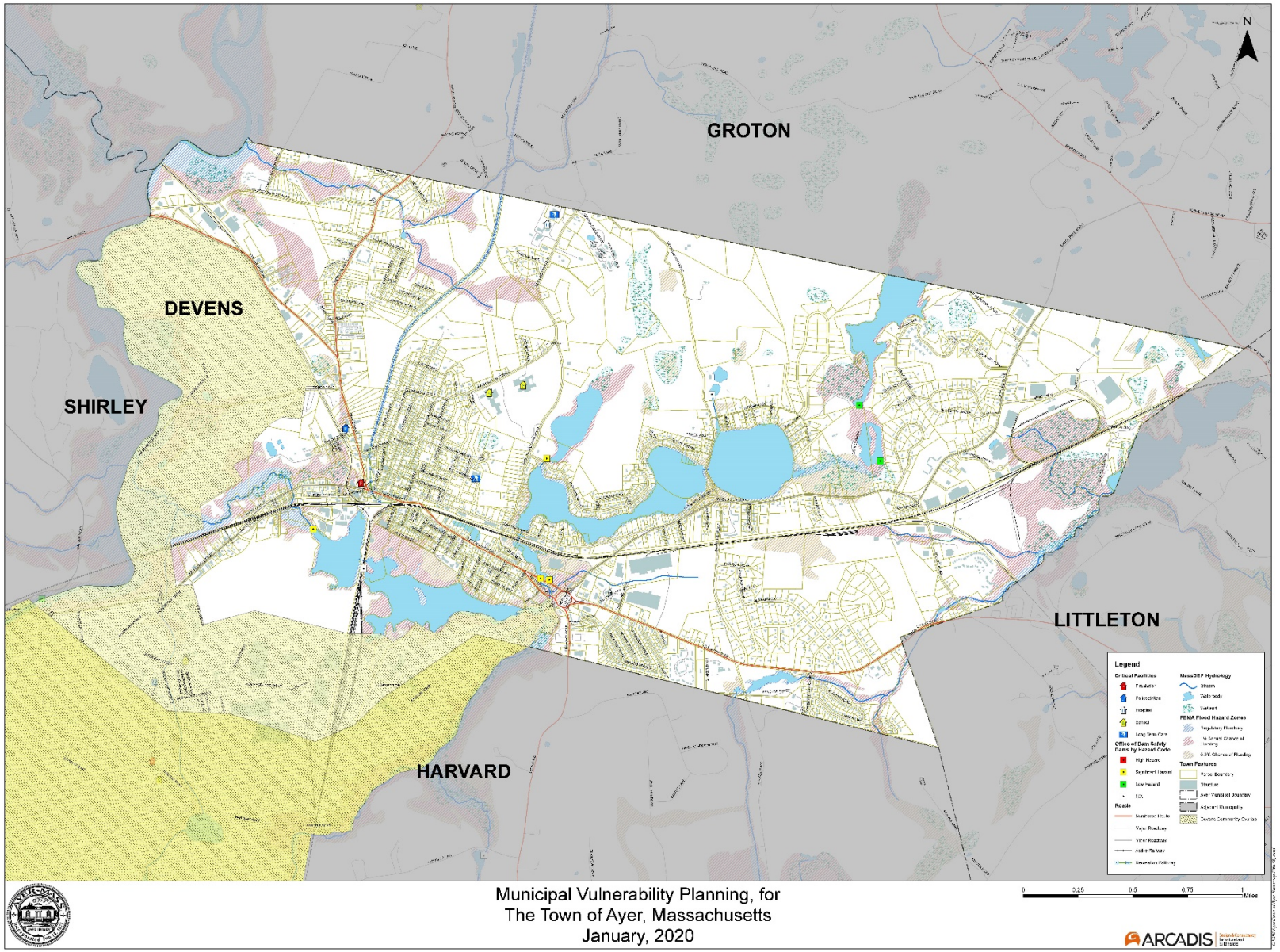


Figure 5. Town of Ayer MVP Base Map

4 TOP RECOMMENDATIONS TO IMPROVE RESILIENCE

After identifying the priority hazards facing Ayer and the primary strengths and vulnerabilities within the community, the next step in the CRB process is to develop a set of actions that participants agree will help foster greater community resilience. Workshop facilitators worked with the Core Team members and other workshop participants to develop a set of actions across the three major categories (infrastructural, societal, environmental) to reduce risks associated with each of the priority hazards. The actions were documented on the CRB Matrix (see Appendix C) and prioritized as high, medium, or low priority. Actions were also classified by the expected timeframe of implementation: short-term, long-term, or ongoing. In determining priority, workshop participants considered factors such as feasibility, funding availability, consequence of associated climate risk, scale of impact, and alignment with existing Town goals and policies.

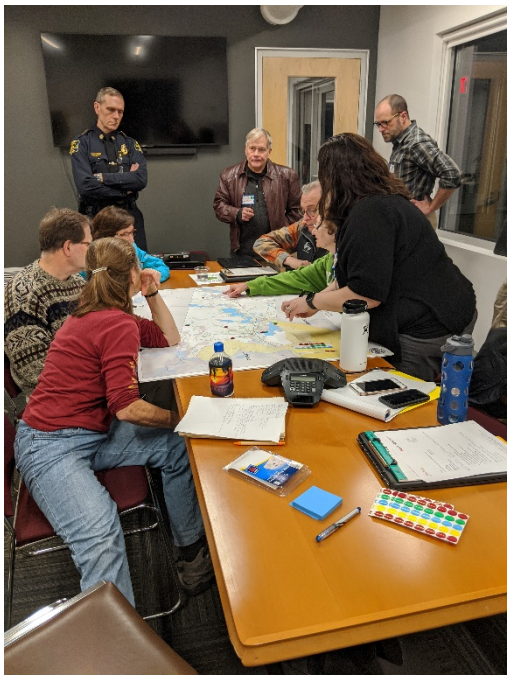


Figure 6. Community Building Workshop

Following group discussions of the actions, each participant was given a set three stickers and asked to vote for the actions they felt were highest priority. This voting exercise was used to identify the consensus view on the three most urgent and impactful actions that the Town can take to advance community resilience. This section summarizes the recommended actions by level of priority.

4.1.1 Top Priority Actions

The following top priority actions received the highest number of votes during the CRB workshop and in follow up survey voting (as described below in Section 4.1.5 and in Appendix D).

- Develop an integrated Stormwater Resilience Master Plan for the town, including a comprehensive flood risk and culvert assessment
- Raise funds and acquire additional permanently protected conservation lands or conservation easements
- Conduct a Climate Vulnerability Study and Resilience Strategy for the Fire Station at 1 West Main Street
- Develop a community engagement plan, as well as tools and programs to encourage ongoing public involvement in the community resilience building process

4.1.2 High Priority Actions

The following actions were deemed high priority during the CRB workshop.

- Develop vulnerability study of Groton Road to assess risks from snow, ice, extreme storms, and flooding (the roadway provides access to Nashoba Valley Medical Center)
- Work closely with Montachusett Regional Planning Commission to develop a framework for regional collaboration on resilience planning
- Conduct study of ponds and other open waterbodies town-wide and develop a level control plan. In relation to this, study public and private dam infrastructure vulnerability and investment needs
- Ensure appropriate updates to and training on State and local wildfire response plans
- Evaluate zoning, floodplain, and aquifer protection By-laws and update as necessary
- Develop beaver management plan
- Conduct air quality monitoring study, particularly in areas with heavy rail and trucking traffic
- Develop Land Use Management Plan for Stony Brook Area in northeast Ayer near Westford Road to address potential conflicts between land use and sensitive ecological areas
- Maintain and improve communication with railroad operators, including Pan Am and the MBTA, to promote health and safety for residents
- Build on existing tree management activities to develop a comprehensive Tree Management Plan
- Develop programs and tools to increase civic engagement by community members
    - Develop a New Resident Orientation program, including information on emergency preparedness
    - Foster formation and engagement with Neighborhood Associations
    - Re-establish the Green Communities Committee or create a new Community Resilience Committee to serve as primary Town committee steering climate resilience objectives

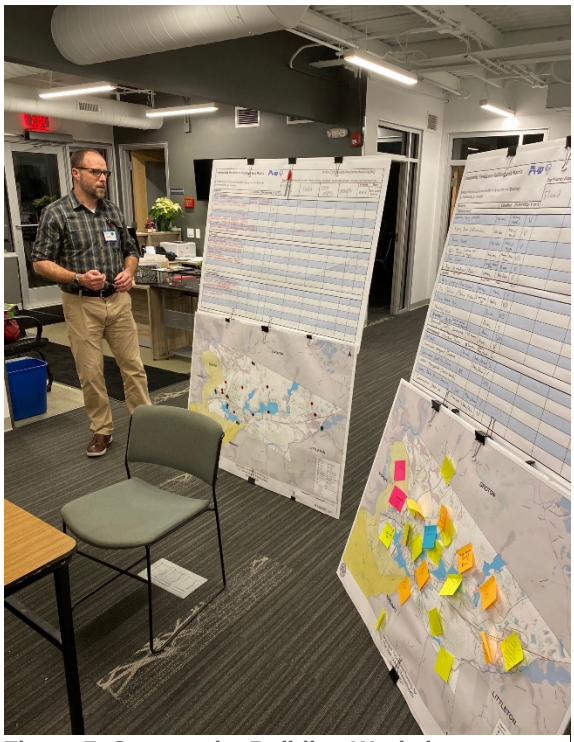


Figure 7. Community Building Workshop

4.1.3 Medium Priority Actions

The following actions were deemed medium priority during the CRB workshop.

- Develop Green Infrastructure Programs and Pilot Projects
    - Seek funding for design and construction of Green Infrastructure Project on Fletcher Street
    - Create incentives/requirements for green infrastructure in private parking lots and other impervious surface areas
    - Create incentives/requirements for rainwater harvesting
- Conduct vulnerability study of critical communications infrastructure

- Strengthen enforcement and implementation of local wetlands By-law
- Develop Managed Water Conservation plan and public education campaign around drinking water supply and conservation best practices
- Study capacity of Emergency Shelters in event of regional emergency and improve community awareness of emergency response procedures
- Ensure alignment between use of funding for downtown streetscape improvement program and goals of a resilient, green community

4.1.4 Low Priority Actions

The following actions were deemed low priority during the CRB workshop.

- Study utility vulnerabilities and improve communications with utilities providers
- Develop Drought Management Plan
- Expand scope of and access to list of town residents who rely on supplemental oxygen
- Improve good housekeeping and develop a Stormwater Pollution Prevention Plan for Waste Transfer Station at 100 Groton Harvard Road[5]
- Study alternatives for spraying to address insect-borne illness, including proactive measures and homeowner education

4.1.5 Web Survey

Following the CRB workshops, the Town hosted a web-based survey to solicit additional feedback on community hazards and vulnerabilities, and on the set of actions recommended during the workshops. The survey received nearly 100 responses with results generally aligning with the recommendations that were generated during the workshops. A notable exception was the addition of pandemic-related vulnerabilities and recommendations, which several survey respondents noted should be incorporated into the Town's climate preparedness planning. Pandemic had not been raised during the CRB workshops but became an important issue as the consequences of the COVID-19 pandemic began to be felt in March 2020. Several potential recommendations for increasing resilience to pandemics were discussed during the virtual Public Listening Session held in May 2020, as described below. The full survey results are presented in Appendix D.

4.2 Public Listening Session

Following the CRB workshops and release of the draft Summary of Findings report in April 2020, the Town hosted a public listening session on May 7, 2020. Due to public health restrictions resulting from the COVID-19 pandemic, the listening session was held virtually using ZOOM. The listening session was advertised in advance via a variety of Town platforms, including social media. The Town DPW Superintendent, Mark Wetzel, led the presentation of the CRB process and priority recommendations.

[5] The Town is in the process of preparing a Stormwater Pollution Prevention Plan in compliance with MS4 permit requirements

The primary focus of discussion was on how the Town could best position itself to begin implementing community resilience projects as recommended by the CRB process. For example, it was noted that the top priority action is the preparation of a community-wide Stormwater Resilience Master Plan and that the Town would consider applying for State Action Grant funding to pursue this work during a future funding cycle. Another potential Action Grant project discussed was implementation of previously studied flood risk mitigation measures for the Ayer Fire Station.

Another topic related to the COVID-19 pandemic and how it exposed certain additional vulnerabilities that had not been previously considered during the CRB planning process. A key theme to emerge from this discussion was the need to foster regional support for critical services, such as medical care. This was a recommendation discussed during the CRB workshops and it has taken on heightened urgency in light of the pandemic. Nevertheless, Town leadership noted that it would be important to maintain momentum on climate adaption initiatives even while the Town responded to the immediate impacts of the pandemic.

A final point of consensus from the listening session was broad agreement on the need to form a Community Resilience Committee that can help lead the Town's climate resilience initiatives beyond the scope of the MVP planning process. The Town expects to being implementing this step immediately.

5 PROJECT TEAM AND WORKSHOP PARTICIPANTS

The Community Building Workshops occurred on January 9th and 16th 2020.

Table 9. Participants in CRB workshop January 9th, 2020

Name	Affiliation
Trevor Johnson	Arcadis, Lead Facilitator
Kate Edwards	Arcadis, Facilitator
Sheila Joyce	Arcadis, Coordinator
Dan VanSchalkwyk	Ayer DPW
Jeanne Bombara	Resident
Jake Bombara	Resident
Carly Antonellis	Ayer Assistant Town Manager
Robert Pedrazzi	Ayer Fire Dept
Jonathan Vos	MRPC
Mark Archambault	Ayer Planning
Laurie Nehring	Ayer People Concerned About the Environment
Jo-Anne Crystoff	Ayer Conservation Commission
Ken Diskin	Ayer Planning Board
Allan Wilson	Resident
Jessi Duston	Resident
Beth Suedmeyer	Ayer People Concerned About the Environment
Mark Wetzel	Ayer DPW
Tim Silva	Ayer Library
Geof Tillotson	Ayer Planning Board
Tim Johnson	Ayer Fire Dept
Irv Rockwood	Sandy Pond School Association
Laurie Sabol	Ayer Recycling Committee
David Bodurtha	Resident
Alicia Hersey	Ayer Community Development
Melissa Fetterhodd	Nashoba Valley Chamber of Commerce
Jessica Strunkin	Devens / MassDevelopment

Table 10. Participants in CRB workshop January 16th, 2020

Name	Affiliation
Trevor Johnson	Arcadis, Lead Facilitator
Seth MacDonald	Arcadis, Facilitator
Sheila Joyce	Arcadis, Coordinator
Dan VanSchalkwyk	Ayer DPW
Alan Mawoian	Town of Ayer
Jeanne Bombara	Resident
Jake Bombara	Resident
Robert Pontbriand	Ayer Town Manager
Robert Pedrazzi	Ayer Fire Dept
Jonathan Vos	MRPC
Mark Archambault	Ayer Planning
Julie Corenzwit	Ayer People Concerned About the Environment
Laurie Nehring	Ayer People Concerned About the Environment
Jo-Anne Crystoff	Ayer Conservation Commission
Ken Diskin	Ayer Planning Board
Jonathan Kranz	Ayer Planning Board
Allan Wilson	Resident
Ruth Maxant-Shultz	Resident
Jessi Duston	Resident
Beth Suedmeyer	Ayer People Concerned About the Environment
Mark Wetzel	Ayer DPW
Tim Silva	Ayer Library
Geof Tillotson	Ayer Planning Board

APPENDIX A

Community Resilience Building Workshop Presentation

MUNICIPAL VULNERABILITY PREPAREDNESS WORKSHOP

DAY 1

January 9, 2020

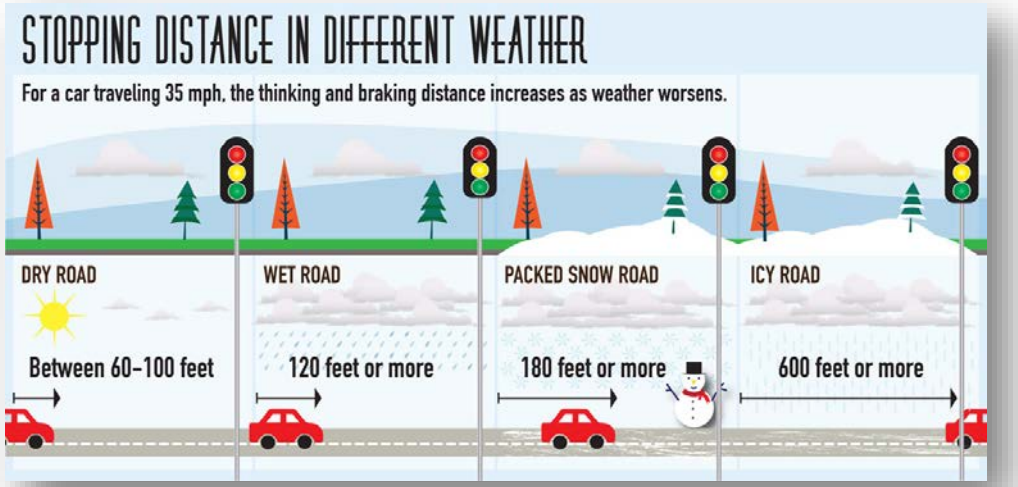
Health and Safety Moment – Winter Driving

Safety

Maintain your car by checking…

- Battery
- Tire tread
- Windshield wipers
- Antifreeze levels

Allow additional travel time and take safer routes, even if they are out of the way



Always have…

- Flashlight
- Jumper cables
- Sand/kitty litter for ice
- Shovel & snowbrush,
- Water/food
- Cellphone

In preparation for an emergency!

Welcome & Introductions

Carly Antonellis - Assistant Town Manager

Mark Wetzel, PE - Town of Ayer, Superintendent, Department of Public Works

Trevor Johnson, AICP - Arcadis, Resilience Planner / Lead Facilitator

Kate Edwards, PE - Arcadis, Senior Engineer

Sheila Joyce – Arcadis, Engineering Intern

Welcome & Introductions

MVP Town of Ayer Core Team Members

Mark Wetzel – Superintendent, Department of Public Works

Dan Van Schalkwyk – Town Engineer

Robert Pedrazzi – Fire Chief / Emergency Management Director

Brian Gill – Deputy Chief of Police

Carly Antonellis – Assistant Town Manager

Mark Archambault – Town Planner

Agenda

- Health & Safety Moment / Welcome, Introductions, and Workshop Overview ~ 4:00 PM / 4:10 PM
- Overview Presentation ~ 4:30 PM
- Small Team Exercise – Hazard, Vulnerability, and Strength Identification ~ 5:00 PM
- Break / Dinner ~ 6:30 PM
- Working Dinner with Report Out ~ 6:45 PM
- Summary Discussion ~ 7:15 PM
- Wrap up and Introduce CRB Workshop #2 ~ 7:45 PM

Workshop Objectives

Understand connections between ongoing issues, hazards, and local planning and actions in Ayer and define the top hazards in the community.

Identify and map vulnerabilities and strengths to develop infrastructure, societal and environmental risk profiles for Ayer.

MA Municipality Vulnerability Preparedness (MVP)

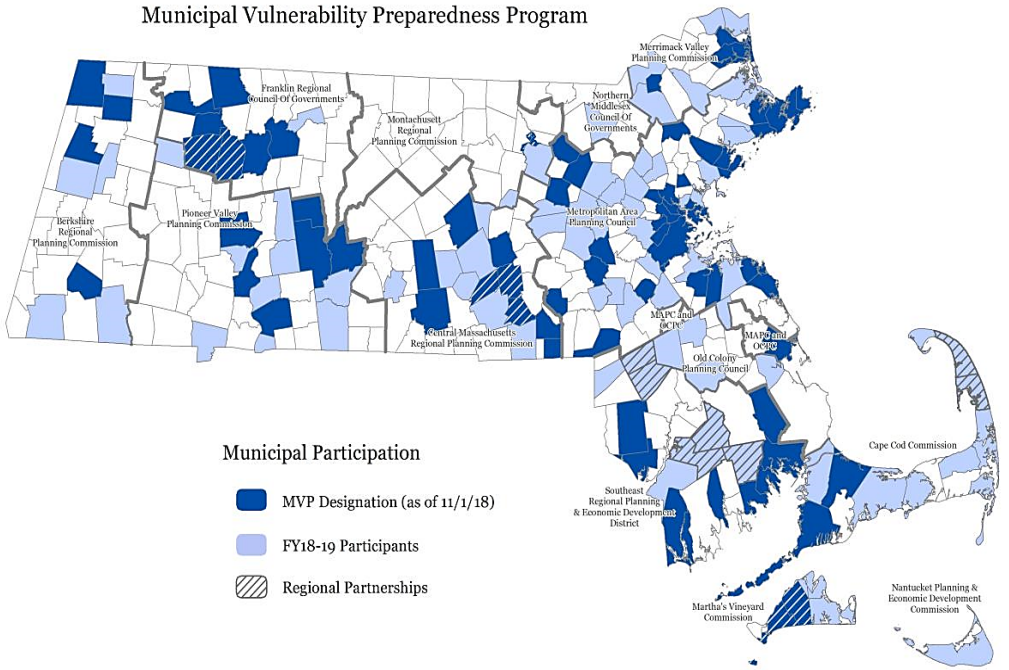
MA Executive Order 569 (September 2016)

Technical Support & funding for MA municipalities

- Vulnerability Assessment
- Community Engagement
- Actionable Resiliency Plans

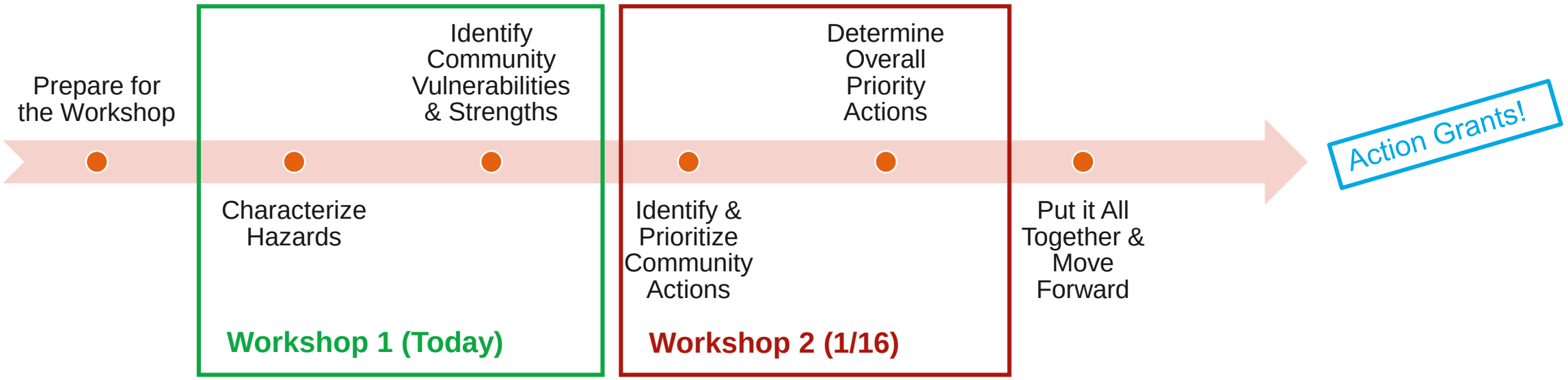
Grant Opportunities

- **MVP Planning Grant:** complete vulnerability assessment, community involvement requirements, final report – receive MVP designation
- **MVP Action Grant:** Must have MVP designation. For communities to implement priority climate adaptation actions identified through MVP process.



Source: Massachusetts Municipal Vulnerability Preparedness (MVP) Program Information Page: https://www.mass.gov/service-details/mvp-program-information

MVP Planning Process



MVP Principles
• **Community-led process** that employs local knowledge & requires local support • **Accessible** • **Utilizes partnerships** and leverages existing efforts • **Mainstreams** climate change • See communities as **local innovators** • Frames **coordinated state efforts**

MA Municipal Vulnerability Preparedness Program

CRB Workshops / Matrix

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

Features	Location	Ownership	V or S	Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)				Priority	Time
								H - M - L	Short Long Ongoing
Infrastructural									
Societal									
Environmental									

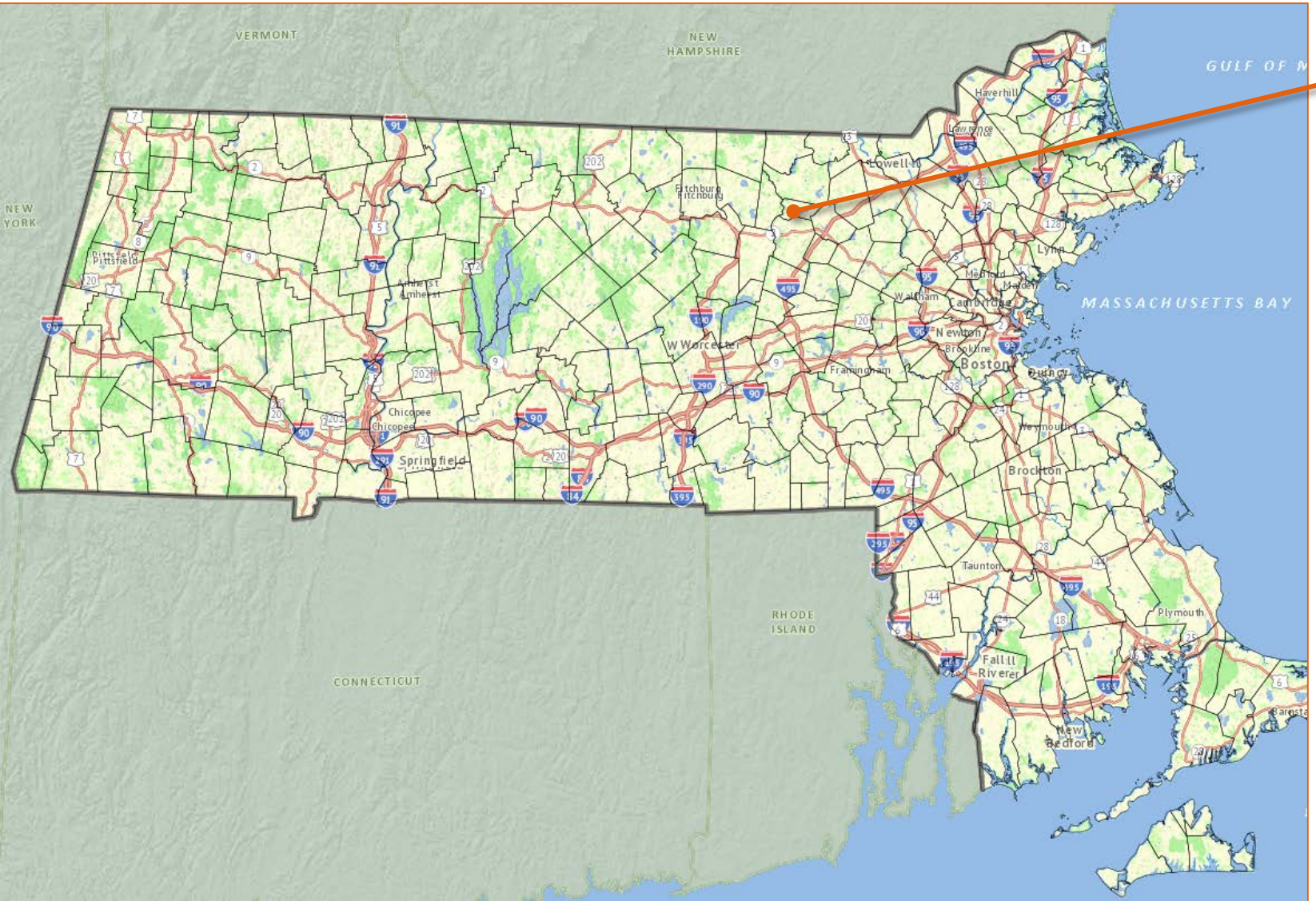
Who are the Stakeholders?

People impacted by hazards in the past & likely to be impacted in the future

People who influence, guide, and/or have the authority to make decisions

Key Community / Business Community Members

Community Overview



Town of Ayer

Location

- Most western town in Middlesex County

Population

- ~8,000 (2017 ACS 5-Year Estimate)

Area

- Total: 9.6 mi^2
- Land: 9.0 mi^2
- Water: 0.6 mi^2 (5.75%)

DPW Operations

- Municipal water, wastewater, highway, stormwater and solid waste operations

Land Use in Ayer

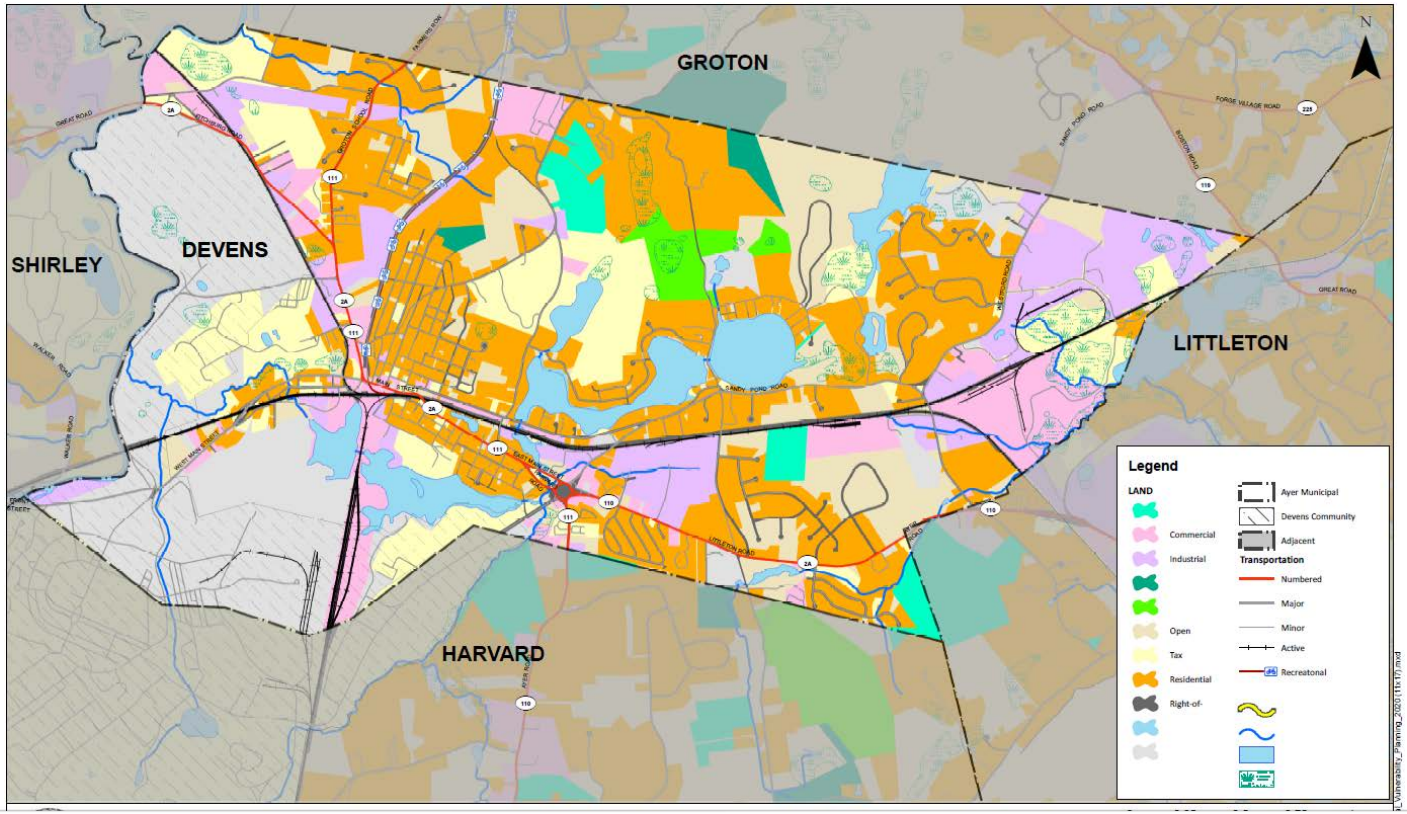
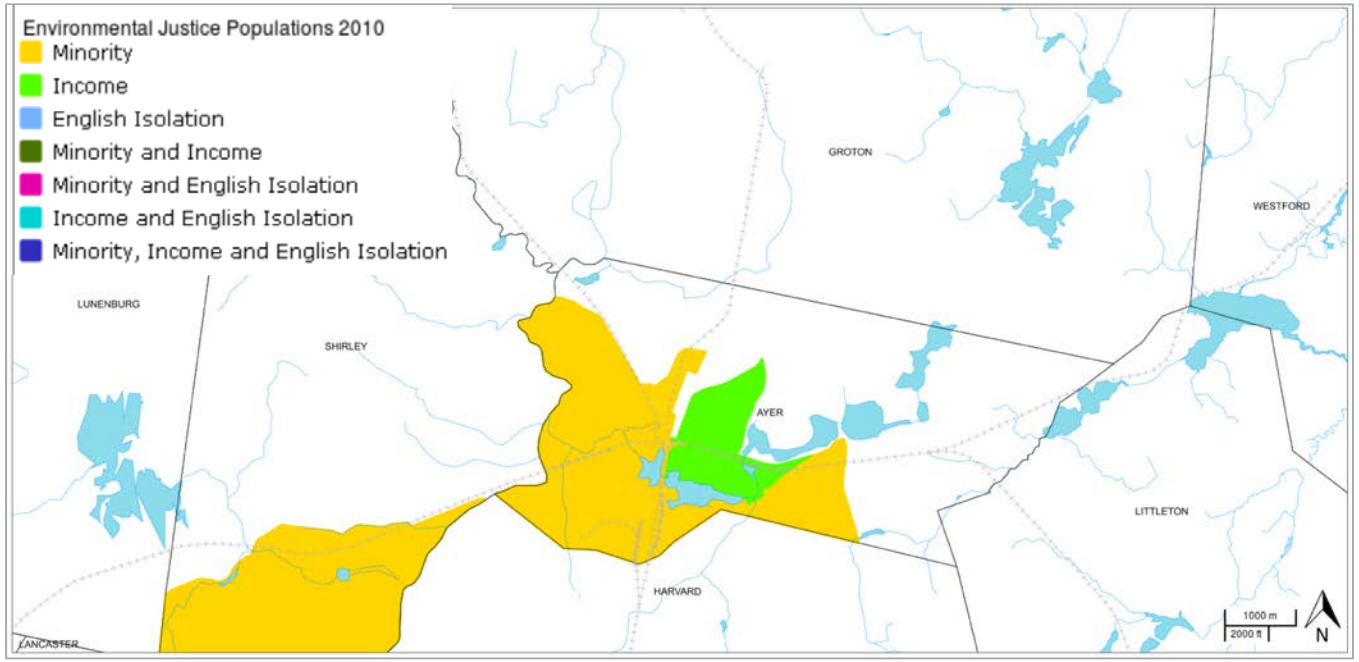


Table 3: Land Use by Community

	Forest		Residential		Commercial &Industrial		Agricultural		Wetlands & Water		Transportation		Other		Total
Community	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres
Ayer	2475	40.70%	846	13.92%	519	8.53%	133	2.18%	349	5.74%	951	15.64%	809	13.29%	6082

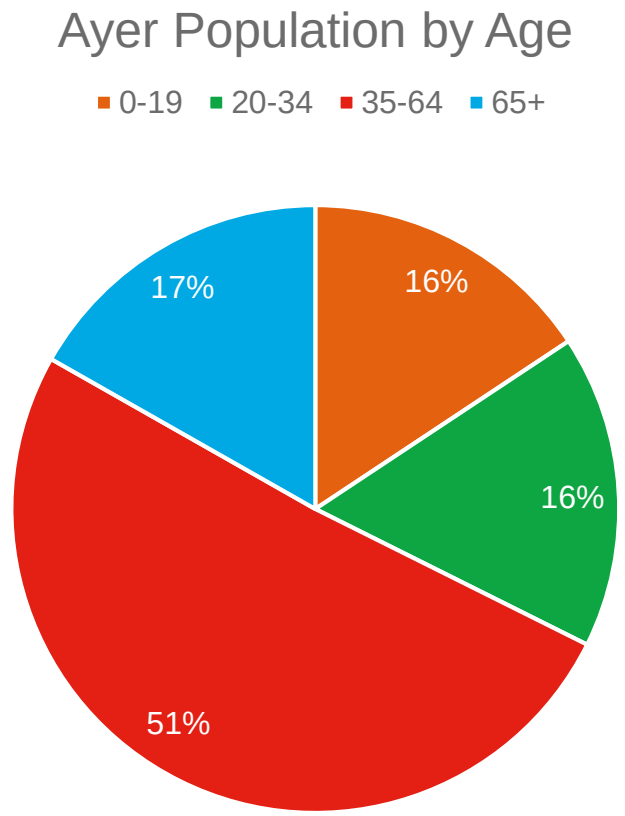
Vulnerable Populations



In Massachusetts a community is identified as an Environmental Justice community if any of the following are true:

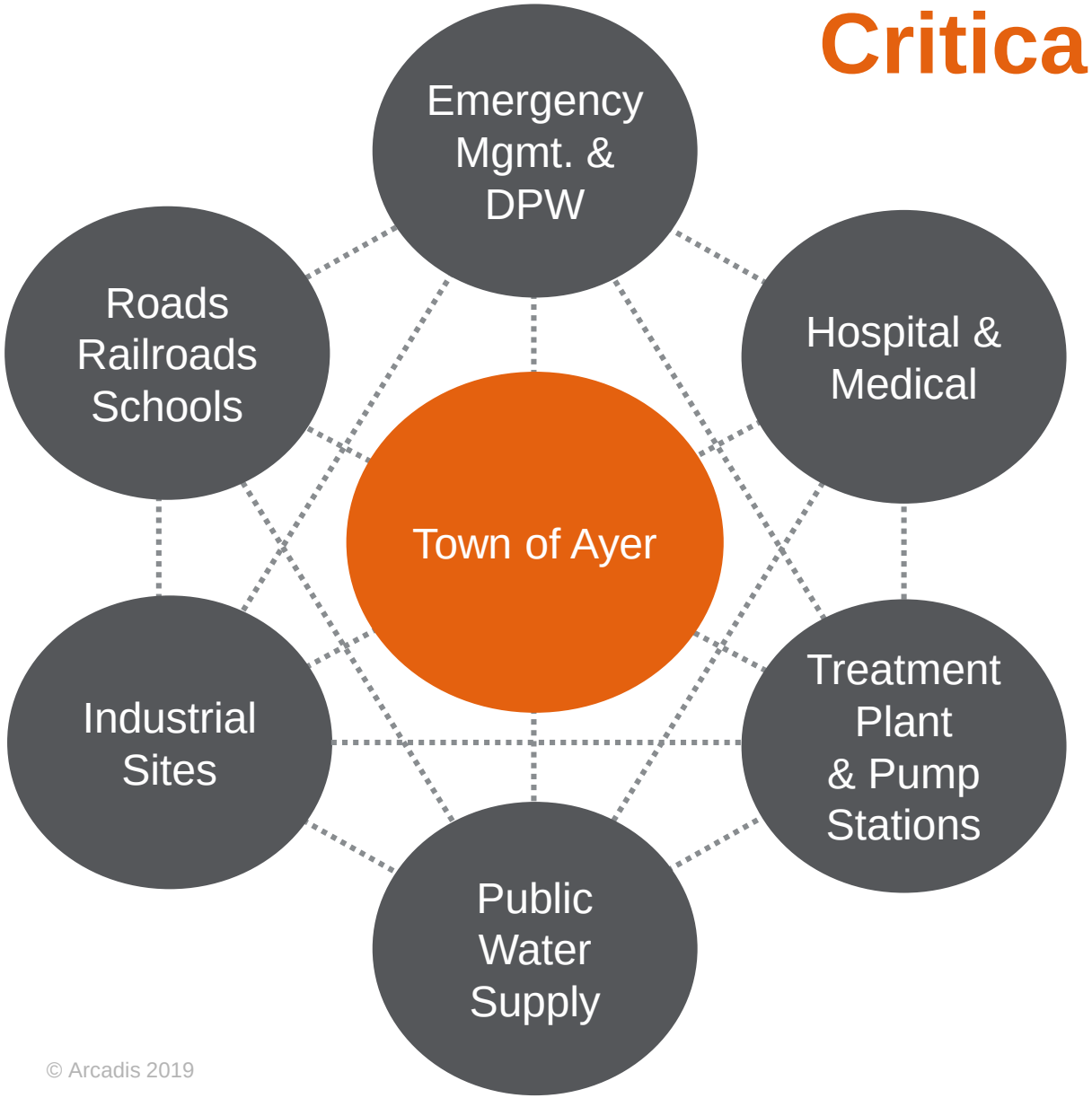
- Median household income at or below 65 percent of the statewide median income
- 25% or more of the residents identify as a race other than white; or
- 25% or more of households have no one over the age of 14 who speaks English only or very well - English Isolation

Source: https://www.mass.gov/info-details/environmental-justice-communities-in-massachusetts



Source: U.S. Census, American Community Survey, 5- year estimates, 2013-2017

Critical Facilities / Infrastructure



Ayer Implements:

Reverse 911

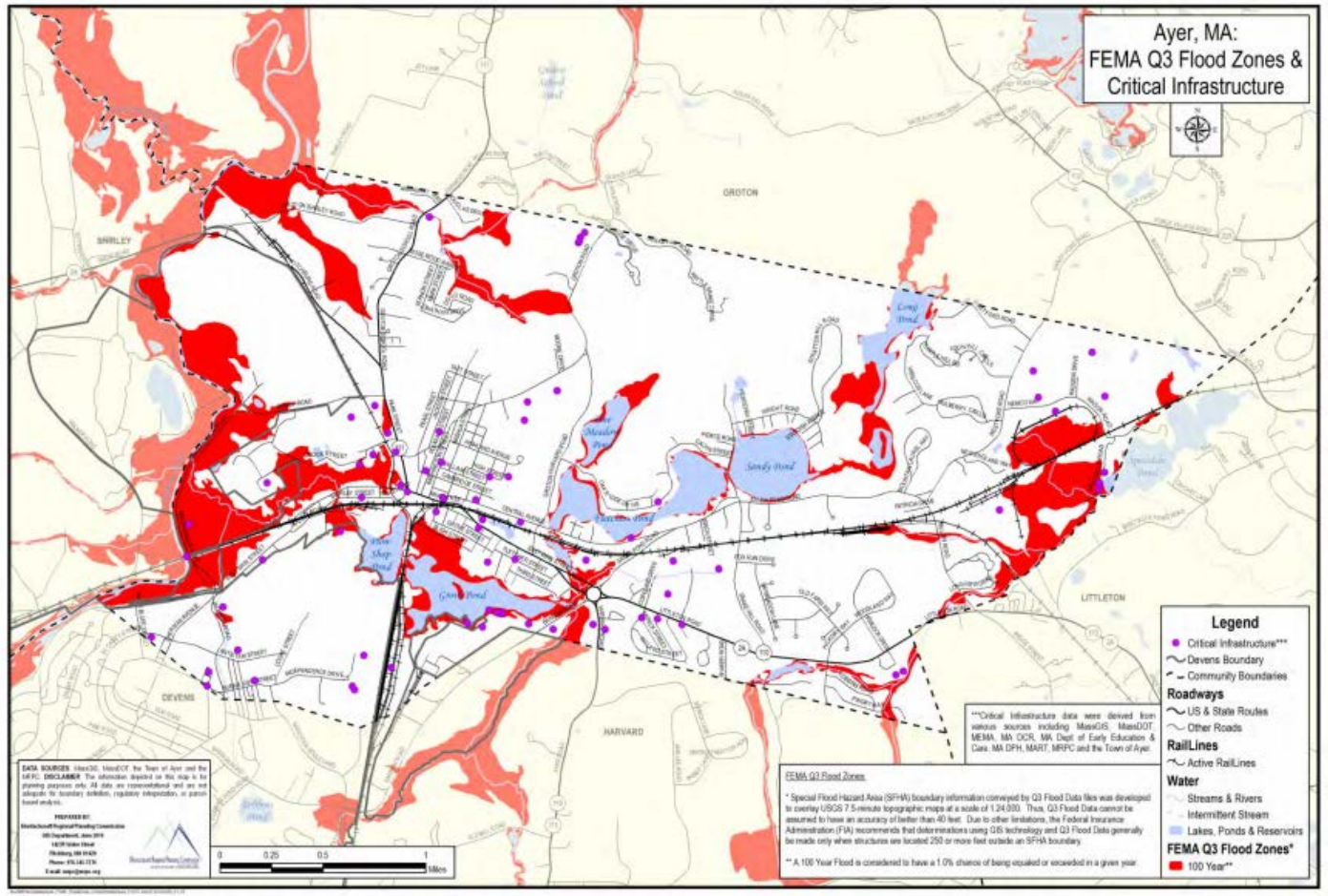
Shelter identification and public notification of locations

Evacuation Routes identified

- Open house at Fire Department
- Emergency Response Team
- Emergency Committee with Regional School District

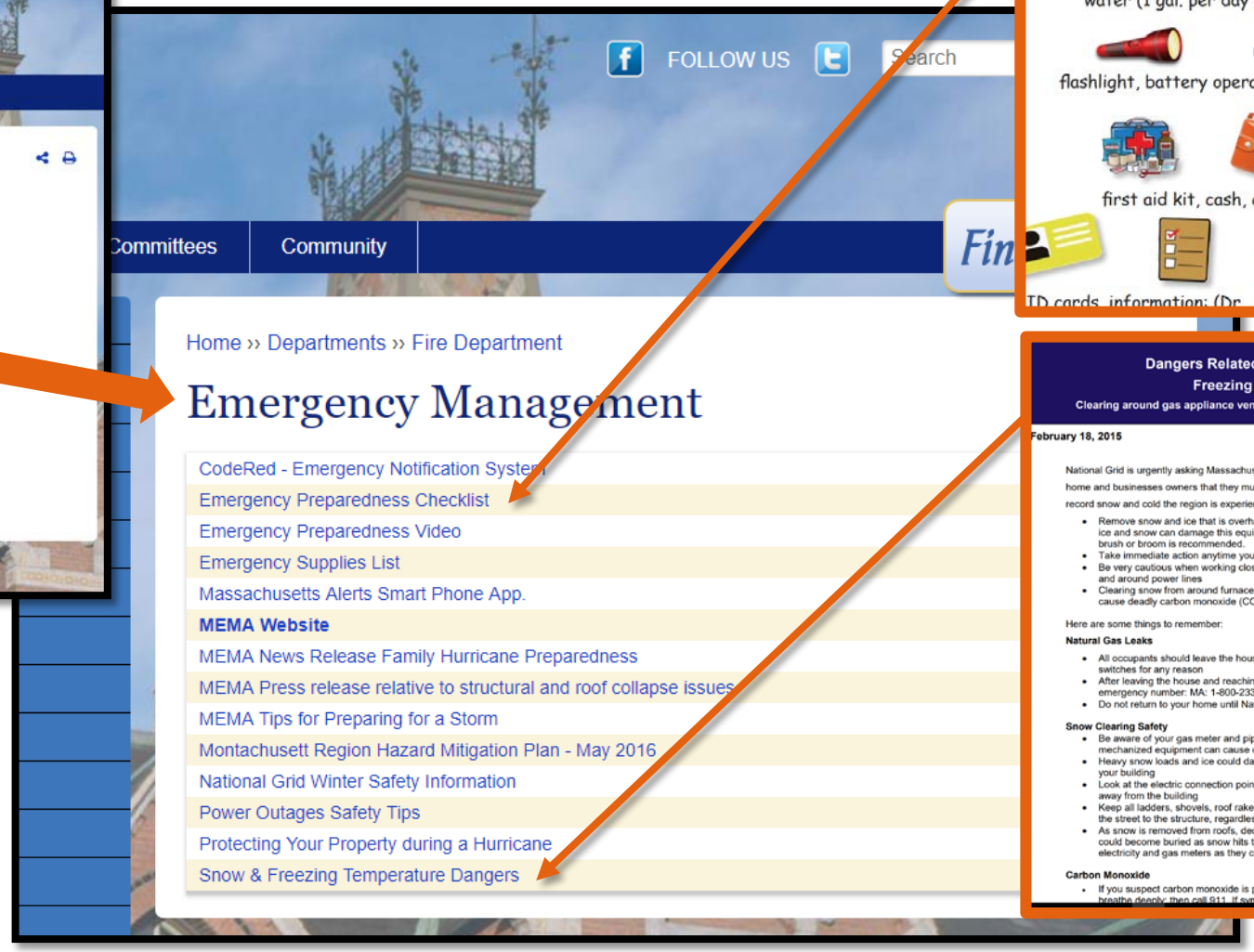
Current Town Planning Efforts

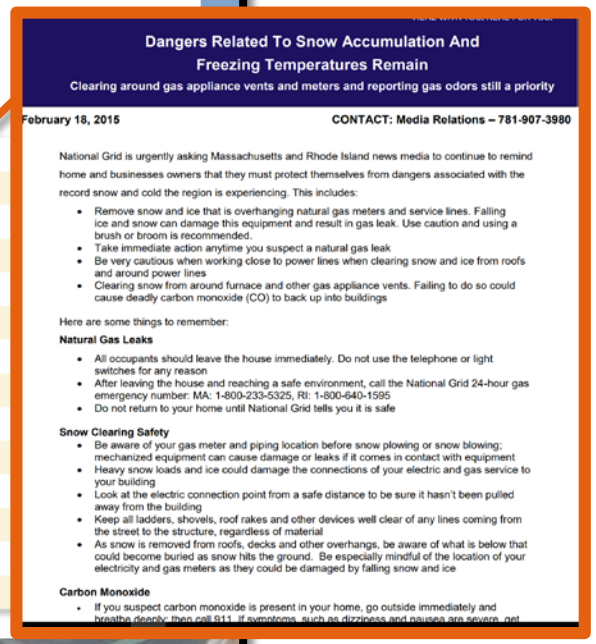
- Hazard Mitigation Plan
- Comprehensive Emergency Management Plan
- Water Supply
- Joint Emergency Preparedness Committee
- Emergency Planning Tools for Residents



Ongoing MA Municipal Vulnerability Preparedness Program

Existing Citizen Action Tools





Why Plan?

re·sil·ience

rəˈzilyəns/

noun

1. the ability of a strained body to recover its size and shape after deformation caused especially by compressive stress
2. an ability to recover from or adjust easily to misfortune or change

Steps to Resilience

A Hazard is like the sun. The Risk from that hazard is sunburn. The Vulnerability includes the length of Exposure of skin to the sun. The Action to reduce risk from the hazard is to apply sunscreen or seek shade.

Resiliency Planning Process

Vulnerability / Risk Assessment

- Natural Hazards
- Technological / Man-made hazards
- Infrastructure concerns

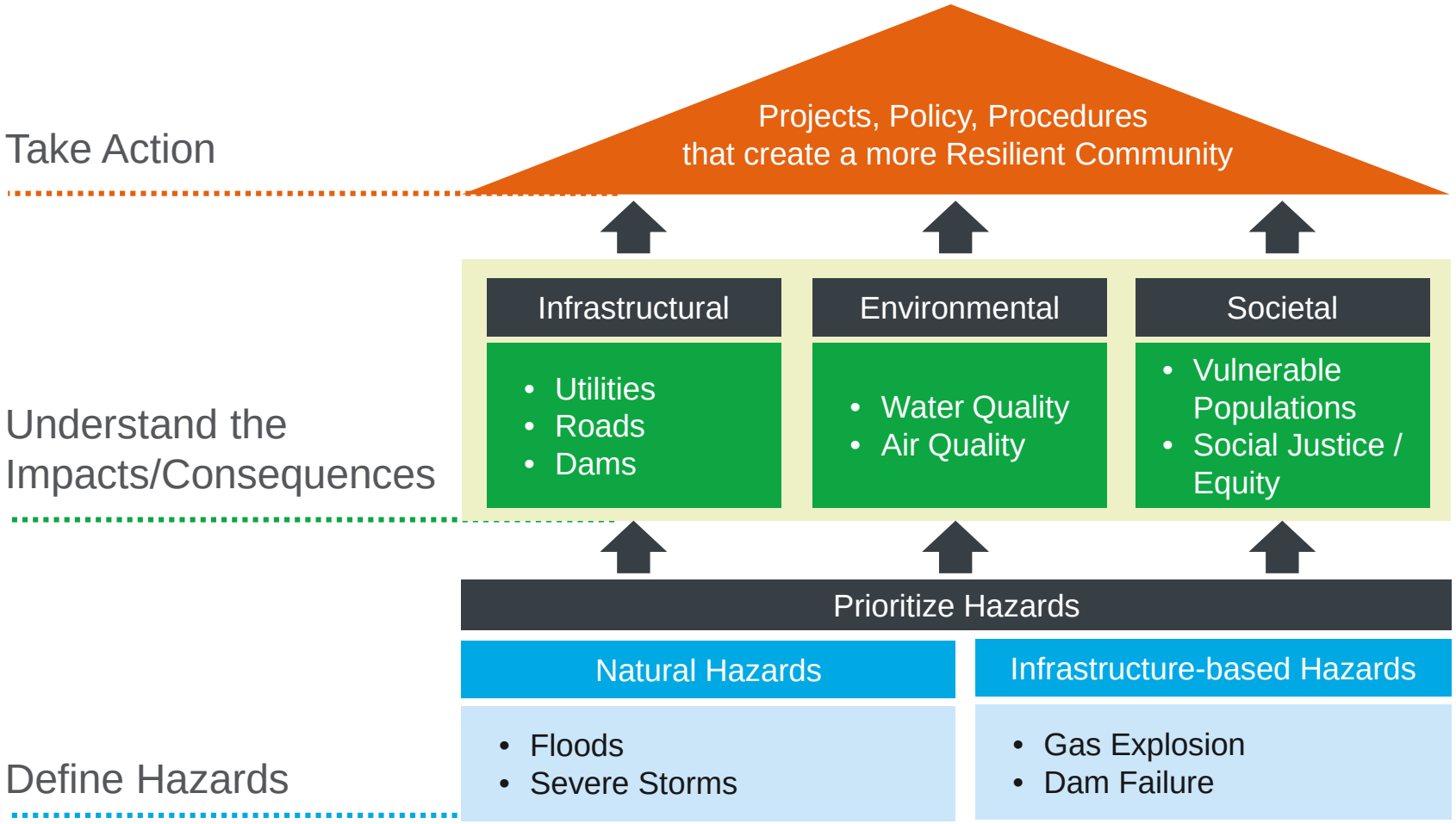
Mitigation Strategy Goals and Objectives

- Action list - based on risks and vulnerabilities
- Prioritization process

Maintenance / Update Procedures

Plan Adoption

Hazard and Impact Types



Natural Hazards

- Flooding
- Hurricanes/Tropical Storms
- Nor'easters
- Severe Winter Storms
- Tornadoes
- Wildfires
- Drought
- Extreme Temperatures
- Earthquakes
- Landslide

Ayer Natural Hazard Matrix

Natural Hazard	Likelihood of Occurrence	Location	Impacts	Hazard Index
Natural Hazard Separated by Flood, Atmospheric Related and Winter Related, Other Natural Hazards, and Geologic Hazards	3 = Highly Likely 2 = Possible 1 = Unlikely	3 = Regional/State 2 = Multi Community/Regional 1 = Local/Town	4 = Catastrophic 3 = Critical 2 = Limited 1 = Negligible	Ranking Determined by Combining the Likelihood, Location and Impacts of a Natural Hazard
Flood-Related Hazards				
• Heavy Rain	2	1	2	5
• Snow Melt	1	1	1	3
• Dam Failure	2	2	3	7
• Ice Jams	1	2	3	6
• Beavers	3	1	2	6
Atmospheric Related and Winter Related Hazards				
• High Winds	2	2	3	7
• Hurricanes	1	3	3	7
• Tornados	1	2	3	6
• Nor'easters	2	3	2	7
• Severe Thunderstorms	2	1	2	5
• Heavy Snow	3	2	3	8
• Ice Storms	2	2	3	7
• Blizzard	1	2	3	6
Other Natural Hazards				
• Major Urban Fires	1	1	3	5
• Wildland Fire	3	1	2	6
• Drought	1	3	2	6
• Extreme Temperatures	1	3	2	6
Geologic Hazards				
• Earthquakes	1	2	2	5
• Landslides	1	1	1	3
• Tsunami	NA	NA	NA	NA

Key

Highly likely:	90 to 100 percent probability of occurrence in the next year or a recurrence interval of less than 1 year.
Possible :	10 to 90 percent probability of occurrence in the next year or a recurrence interval of 1 to 10 years.
Unlikely:	Less than 10 percent probability of occurrence in the next year or a recurrence interval of greater than 11 years.
Catastrophic:	Immediate onset or extended duration of event, resulting in catastrophic damage and uninhabitable conditions.
Critical:	Fast speed of onset or long duration of event resulting in devastating damage and loss of services for weeks or months.
Limited:	Moderate speed of onset or moderate duration of event, resulting in some damage.
Negligible:	Slow speed of onset or short duration of event resulting in little to no damage.

Climate Change Impacts

	Climate Driver	Exposure	Health Outcome	Impact
Extreme Heat	More frequent, severe, prolonged heat events	Elevated temperatures	Heat-related death and illness	Rising temperatures will lead to an increase in heat-related deaths and illnesses
Outdoor Air Quality	Increasing temperatures and changing precipitation patterns	Worsened air quality (ozone, particulate matter, and higher pollen counts)	Premature death, acute and chronic cardiovascular and respiratory illnesses	Rising temperatures and wildfires and decreasing precipitation will lead to increases in ozone and particulate matter, elevating the risks of cardiovascular and respiratory illnesses and death.
Flooding	Rising sea level and more frequent or intense extreme precipitation, hurricanes, and storm surge events	Contaminated water, debris, and disruptions to essential infrastructure	Drowning, injuries, mental health consequences, gastrointestinal and other illness	Increased coastal and inland flooding exposes populations to a range of negative health impacts before, during, and after events
Vector-Borne Infection (Lyme Disease)	Changes in temperature extremes and seasonal weather patterns	Earlier and geographically expanded tick activity	Lyme disease	Ticks will show earlier seasonal activity and a generally northward range expansion, increasing risk of human exposure to Lyme and disease-causing bacteria.
Water-Related Infection (Vibrio vulnificus)	Rising sea surface temperature, changes in precipitation, and runofff affecting coastal salinity	Recreational water or shellfish contaminated with Vibrio vulnificus	Vibrio vulnificus induced diarrhea & intestinal illness, wound and bloodstream infections, death	Increases in water temperatures will alter timing and location of Vibrio vulnificus growth, increasing exposure and risk of water-borne illness.
Food-Related Infection (Salmonella)	Increases in temperature, humidity, and season length	Increased growth of pathogens, seasonal shifts in incidence of Salmonella exposure	Salmonella infection, gastrointestinal outbreaks	Rising temperatures increase Salmonella prevalence in food, longer seasons and warming waters increase risk of exposure and infection.
Mental Health and Well-Being	Climate-change impacts, especially extreme weather	Level of exposure to traumatic events, like disasters	Distress, grief, behavioral health disorders, social impacts, resilience	Changes in exposure to climate- or weather-related disasters cause or exacerbate stress and mental health consequences, with greater risk for certain populations.

Source: US Global Change Research Program, 2016. The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. Crimmins, A., J. Balbus, J.L. Gamble, C.B. Beard, J.E. Bell, D. Dodgen, R.J. Eisen, N. Fann, M.D. Hawkins, S.C. Herring, L. Jantarasami, D.M. Mills, S. Saha, M.C. Sarofim, J. Trtanj, and L. Ziska, Eds. U.S. Global Change Research Program, Washington, DC, 312 pp.

Projected Temperature Changes

Nashua Basin		Observed Baseline 1971-2000 (°F)	Projected Change in 2030s (°F)	Mid-Century Projected Change in 2050s (°F)	Projected Change in 2070s (°F)	End of Century Projected Change in 2090s (°F)
Average Temperature	Annual	46.8	+2.2 to +4.4	+3.0 to +6.4	+3.5 to +9.0	+3.9 to +11.0
	Winter	25.2	+2.2 to +5.1	+2.8 to +7.6	+3.7 to +9.2	+3.9 to +10.6
	Spring	44.9	+1.6 to +3.5	+2.5 to +5.5	+2.7 to +7.7	+3.3 to +9.5
	Summer	67.6	+2.2 to +4.6	+3.1 to +7.0	+3.5 to +10.1	+4.0 to +12.6
	Fall	49.0	+2.2 to +5.1	+3.7 to +6.6	+3.6 to +9.5	+4.1 to +11.8
Maximum Temperature	Annual	57.8	+2.1 to +4.3	+2.7 to +6.5	+3.2 to +9.1	+3.6 to +11.0
	Winter	35.1	+1.8 to +4.6	+2.4 to +7.1	+3.0 to +8.4	+3.4 to +9.6
	Spring	56.2	+1.5 to +3.4	+2.4 to +5.5	+2.7 to +7.9	+3.3 to +9.6
	Summer	79.2	+2.0 to +4.7	+3.0 to +7.2	+3.4 to +10.5	+3.9 to +12.9
	Fall	60.2	+2.3 to +4.9	+3.6 to +7.0	+3.5 to +9.8	+4.0 to +12.3
Minimum Temperature	Annual	35.8	+2.3 to +4.8	+3.3 to +6.5	+3.8 to +8.9	+4.2 to +11.0
	Winter	15.3	+2.5 to +5.6	+3.3 to +8.1	+4.2 to +10.0	+4.4 to +11.4
	Spring	33.7	+1.8 to +3.8	+2.7 to +5.9	+2.8 to +7.5	+3.3 to +9.3
	Summer	56.0	+2.5 to +4.6	+3.2 to +7.2	+3.7 to +9.8	+4.1 to +12.3
	Fall	37.8	+2.0 to +5.2	+3.6 to +6.6	+3.7 to +9.3	+4.1 to +11.6

Nashua Basin		Observed Baseline 1971-2000 (Days)	Projected Change in 2030s (Days)	Mid-Century Projected Change in 2050s (Days)	Projected Change in 2070s (Days)	End of Century Projected Change in 2090s (Days)
Days with Maximum Temperature Over 90°F	Annual	4	+6 to +17	+9 to +30	+10 to +50	+13 to +70
	Winter	0	+0 to +0	+0 to +0	+0 to +0	+0 to +0
	Spring	<1[72]	-0 to +1	+<1[72] to +1	+<1[72] to +3	+<1[72] to +4
	Summer	4	+5 to +15	+8 to +26	+10 to +42	+11 to +56
	Fall	<1[72]	+<1[72] to +1	+<1[72] to +3	+<1[72] to +7	+1 to +10
Days with Maximum Temperature Over 95°F	Annual	<1[72]	+1 to +6	+2 to +13	+3 to +27	+4 to +42
	Winter	0	+0 to +0	+0 to +0	+0 to +0	+0 to +0
	Spring	0	+0 to +<1[72]	+0 to +<1[72]	+0 to +1	+0 to +1
	Summer	<1[72]	+1 to +6	+2 to +12	+2 to +24	+3 to +37
	Fall	<1[72]	+<1[72] to +<1[72]	+<1[72] to +1	+<1[72] to +2	+<1[72] to +3
Days with Maximum Temperature Over 100°F	Annual	<1[72]	+<1[72] to +1	+<1[72] to +3	+<1[72] to +9	+<1[72] to +17
	Winter	0	+0 to +0	+0 to +0	+0 to +0	+0 to +0
	Spring	0	+0 to +<1[72]	+0 to +<1[72]	+0 to +<1[72]	+0 to +<1[72]
	Summer	<1[72]	+<1[72] to +1	+<1[72] to +3	+<1[72] to +8	+<1[72] to +16
	Fall	0	+0 to +<1[72]	+0 to +<1[72]	+0 to +<1[72]	+0 to +1

Source: Northeast Climate Science Center at the University of Massachusetts Amherst

Projected Temperature Changes

The Nashua basin is expected to experience increased average temperatures throughout the 21st century.

Seasonally, maximum summer and fall temperatures are expected to see the highest projected increase

Summer mid-century increase of 3 °F to 7.2 °F (4-9% increase); end of century increase of 3.9 °F to 12.9 °F (5-16% increase).

Fall mid-century increase of 3.6 °F to 7 °F (6-12% increase); end of century increase by and 4 °F to 12.3 °F (7-20% increase).

Annually, the Nashua basin is expected to see days with daily maximum temperatures over 90 °F increase by 9 to 30 more days by mid-century, and 13 to 70 more days by the end of the century.

Seasonally, summer is expected to see an increase of 8 to 26 more days with daily maximums over 90 °F by mid-century. By end of century, the Nashua basin is expected to have 11 to 56 more days.

Projected Precipitation Changes

Nashua Basin		Observed Baseline 1971-2000 (Days)	Projected Change in 2030s (Days)	Mid-Century Projected Change in 2050s (Days)	Projected Change in 2070s (Days)	End of Century Projected Change in 2090s (Days)
Days with Precipitation Over 1"	Annual	7	+<1[74] to +2	+1 to +3	+1 to +3	+1 to +4
	Winter	2	+0 to +1	+<1[74] to +1	+<1[74] to +2	+<1[74] to +2
	Spring	2	+0 to +1	+0 to +1	+0 to +1	+<1[74] to +1
	Summer	2	+0 to +1	+0 to +1	+0 to +1	+0 to +1
	Fall	2	+0 to +1	+0 to +1	+0 to +1	+0 to +1
Days with Precipitation Over 2"	Annual	1	+0 to +<1[74]	+<1[74] to +<1[74]	+<1[74] to +1	+<1[74] to +1
	Winter	<1[74]	+0 to +<1[74]	+0 to +<1[74]	+0 to +<1[74]	+0 to +<1[74]
	Spring	<1[74]	+0 to +<1[74]	+0 to +<1[74]	+<1[74] to +<1[74]	+<1[74] to +<1[74]
	Summer	<1[74]	+0 to +<1[74]	+0 to +<1[74]	+0 to +<1[74]	+0 to +<1[74]
	Fall	<1[74]	+0 to +<1[74]	+0 to +<1[74]	+0 to +<1[74]	+0 to +<1[74]
Days with Precipitation Over 4"	Annual	<1[74]	+0 to +<1[74]	+0 to +<1[74]	+0 to +<1[74]	+0 to +<1[74]
	Winter	0	+0 to +0	+0 to +0	+0 to +0	+0 to +0
	Spring	0	+0 to +<1[74]	+0 to +<1[74]	+0 to +<1[74]	+0 to +<1[74]
	Summer	<1[74]	+0 to +<1[74]	+0 to +<1[74]	+0 to +<1[74]	+0 to +<1[74]
	Fall	0	+0 to +<1[74]	+0 to +<1[74]	+0 to +<1[74]	+0 to +<1[74]

Nashua Basin		Observed Baseline 1971-2000 (Inches)	Projected Change in 2030s (Inches)	Mid-Century Projected Change in 2050s (Inches)	Projected Change in 2070s (Inches)	End of Century Projected Change in 2090s (Inches)
Total Precipitation	Annual	45.9	+0.4 to +4.9	+1.2 to +6.3	+2.3 to +7.9	+1.3 to +8.4
	Winter	11.0	-0.3 to +1.9	+0.2 to +2.5	+0.4 to +3.3	+0.6 to +4.3
	Spring	11.8	-0.0 to +2.2	+0.1 to +2.0	+0.5 to +3.0	+0.1 to +2.9
	Summer	11.3	-0.3 to +1.5	-0.3 to +2.2	-0.6 to +2.2	-1.1 to +2.2
	Fall	11.8	-1.1 to +1.1	-1.2 to +1.8	-1.6 to +1.7	-1.4 to +1.5

Nashua Basin		Observed Baseline 1971-2000 (Days)	Projected Change in 2030s (Days)	Mid-Century Projected Change in 2050s (Days)	Projected Change in 2070s (Days)	End of Century Projected Change in 2090s (Days)
Consecutive Dry Days	Annual	16	-0 to +2	-1 to +2	-1 to +2	-1 to +3
	Winter	11	-1 to +1	-1 to +1	-1 to +1	-1 to +2
	Spring	11	-1 to +1	-1 to +1	-1 to +1	-2 to +1
	Summer	12	-1 to +2	-1 to +2	-1 to +3	-1 to +3
	Fall	12	-0 to +2	-0 to +3	-0 to +3	-0 to +3

Source: Northeast Climate Science Center at the University of Massachusetts Amherst

Projected Precipitation Changes

The projections for expected number of days receiving precipitation over one inch and for total precipitation are variable for the Nashua basin

Seasonally, the winter season is generally expected to see the highest projected increase.

Projections for the summer and fall seasons are more variable and could see either a drop or increase in total precipitation throughout the 21st century.

Annual and seasonal projections for consecutive dry days, or for a given period, are variable throughout the 21st century.

Nashua basin expected to see a slight decrease to an increase in consecutive dry days throughout this century, especially during summer and fall

Flood Hazards

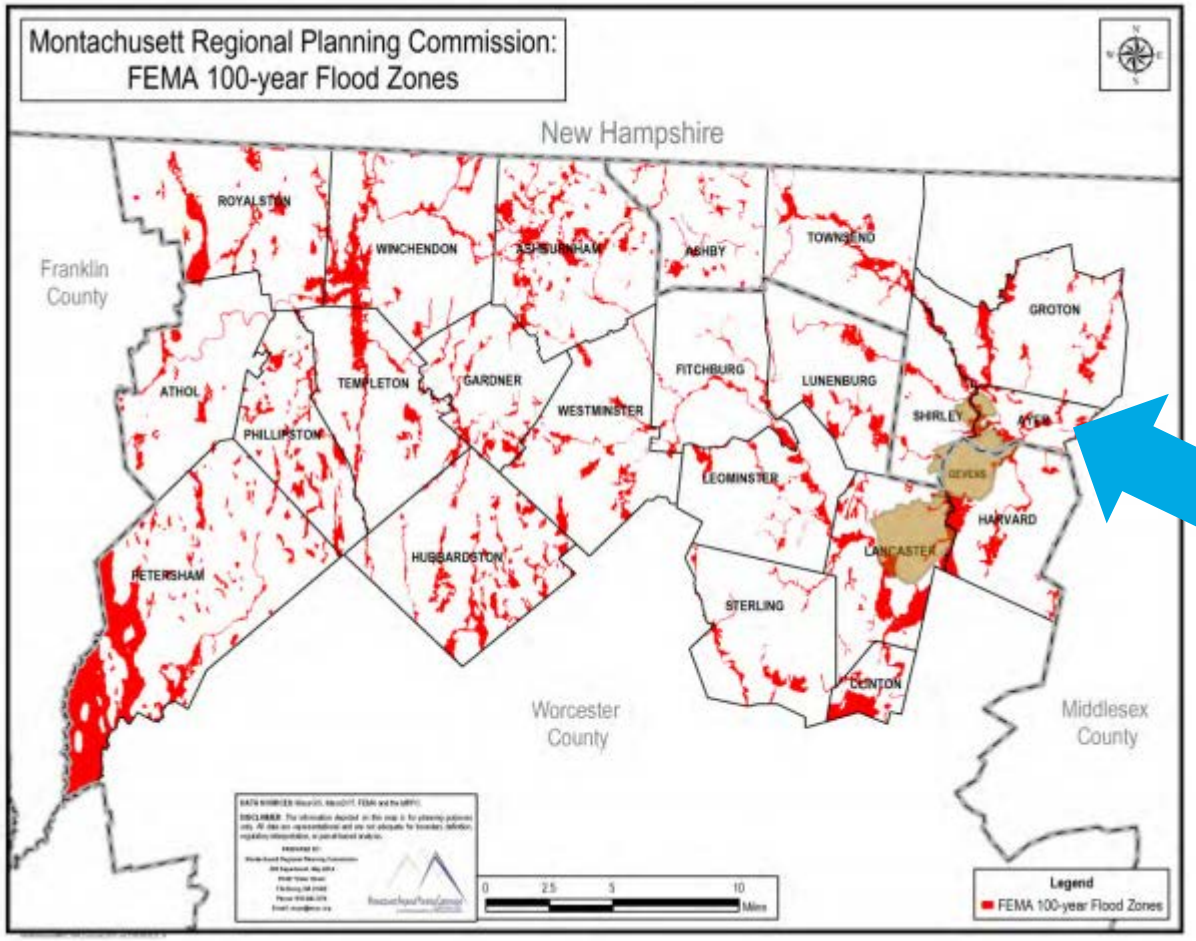


Table 6: Acreage of Community within the 100 year Flood Plan And Flood Plain Development

Community	Acres in Community	Acres in 100-year Floodplain	Percent of Community in 100-year Floodplain	Acres of Floodplain that are developed	Percent of Floodplain Developed
Ashburnham	26,208.81	3434.38	13.10%	65.54	1.91%
Ashby	15,406.70	911.63	5.92%	12.09	1.33%
Athol	21,352.00	1299.58	6.09%	65.77	5.06%
Ayer	6,082.06	1175.61	19.33%	82.32	7.00%
Clinton	4,646.91	1358.09	29.23%	58.93	4.34%
Devens	4,469.63	628.20	14.05%	11.70	1.86%
Fitchburg	17,904.55	876.54	4.87%	244.02	20.25%

Ayer Implements:

- MA Wetlands Protection Act/Town Wetlands Bylaw
- Town Flood Plain District Bylaw
- Maintenance of stormwater system
- Maintenance of dams, dikes, and public waterbodies
- Cluster Development Bylaw (protected open space)
- Beaver diverters and trapping

Flood Hazards

Hurricanes & Tropical Storms

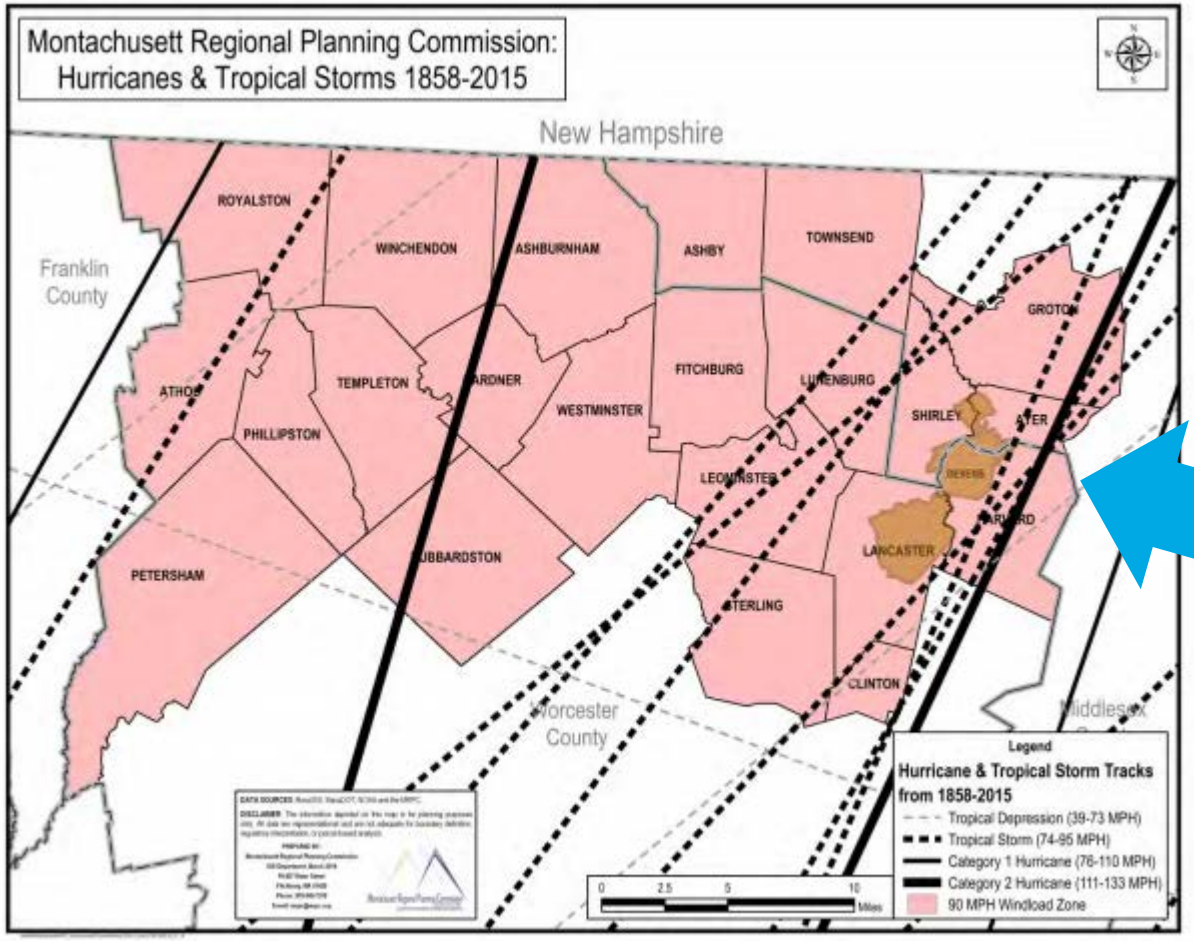


Table 11: Hurricanes and Tropical Storms that passed directly through the Montachusett Region (1858 – 2015)

Date	Type	Name	Wind Speed
9/28/1861	Tropical Storm	Unnamed	50
9/30/1874	Tropical Storm	Unnamed	60
10/10/1894	Tropical Storm	Unnamed	55
9/2/1952	Tropical Depression	Able	30
8/31/1954	Category 2	Carol	85
7/30/1960	Tropical Storm	Brenda	45
9/12/1960	Category 2	Donna	90
9/15/1961	Tropical Storm	Unnamed	35
9/27/1985	Category 1	Gloria	75
9/17/1999	Tropical Storm	Floyd	50
9/17/2004	Tropical Storm	Charley	50

Source: National Oceanic and Atmospheric Administration

Ayer Implements:

State Building Code enforced by Building Inspector

- Regular inspection and tree maintenance (National Grid)
- National Grid Staging Area during major storms

Projections for Extreme Weather

- Incidence of hurricanes in the North Atlantic is projected to increase in frequency, duration, and intensity with climate change. Exact number and timing of increase is uncertain.
- Incidences of other extreme weather events, including tornados, thunderstorms, Nor'easters, are likely to increase over time

Wildfire

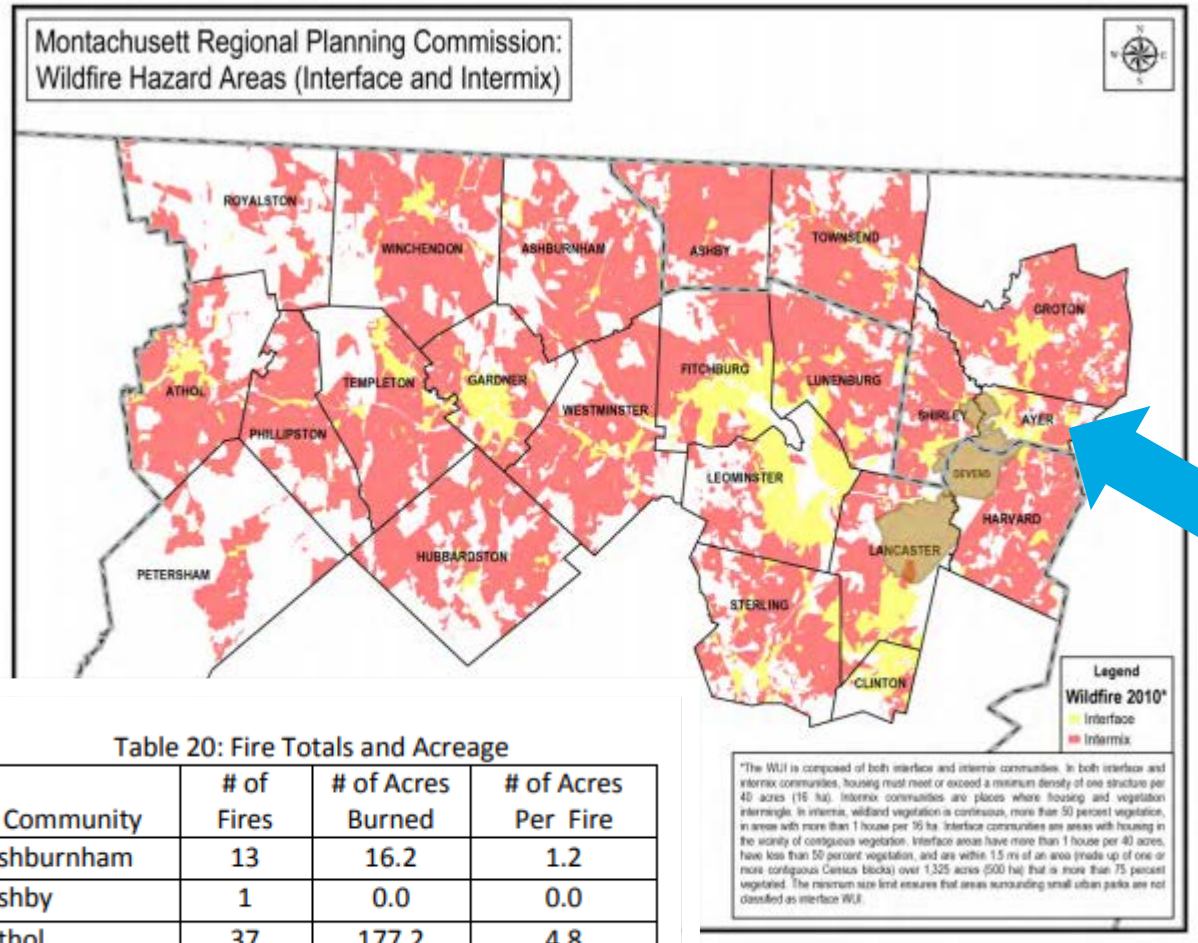


Table 20: Fire Totals and Acreage

Community	# of Fires	# of Acres Burned	# of Acres Per Fire
Ashburnham	13	16.2	1.2
Ashby	1	0.0	0.0
Athol	37	177.2	4.8
Ayer	37	70.4	1.9

Probability of Future Events: HIGHLY LIKELY

Readily Available Fuel

- 2008 ice storm brought down many trees
- Old growth
- Property owners do not clear brush

Weather Conditions

- Recent drought
- High wind
- Lightning strikes

Ability to Respond

- Lack of appropriate equipment
- Lack of personnel

Other Factors

- Trains nearby (sparks, work on tracks)
- Topography

Heavy Snow

Ayer Implements:

Residential Parking Bans

Clearing Snow from Major Arterial Routes

- Regular inspection and tree maintenance (National Grid)
- DPW Staff – (20) and 4 contractors available for storms
- DPW is Staging Area for National Grid Crews

Need Identified: Additional Personnel and Equipment

Infrastructure Concerns

- Dam Failure
- Fire
- Loss of Power
- Gas Explosion
- Water Contamination
- Water Main Break
- Road Washouts & Culverts

Dams

Table 8: Dams in the Monnachusett Region and Hazard Potential

Community	High Hazard	Significant Hazard	Low Hazard	Non-Jurisdictional*	Total # of Dams
Ashburnham	4	4	4	12	24
Ashby	2	0	4	1	7
Athol	2	6	4	8	20
Ayer	0	4	3	2	9
Clinton	2	3	0	1	6
Devens*					0

Actions at DPW Facilities

- Equipment Redundancy
- Back-up Power for all Water / Wastewater Facilities
- Water Supply Interconnections
- Member of MaWARN Mutual Aid Group
- Reverse 911 System (Code Red)
- On-call operators

Group Discussion

- Are there other hazards not discussed above that have impacted your community today and in the past?
- Where, how often, and in what ways?
- In what ways will these hazards affect your community in the future (5, 10, 25 years)?
- What is exposed to hazards and climate threats within your community?

Instructions for Group Exercise

1. Please divide into small groups based on colored dot sticker on your name tag.
2. In small groups, identify past, current, and future hazards in your community.
   - Determine top 3-4 **priority hazards** from the hazards discussed previously and write those in the top row of your **Risk Matrix**.
3. Identify **community vulnerabilities and strengths** and categorize them based on the themes of infrastructure, society, or environment.

Community Resilience Building Risk Matrix www.CommunityResilienceBuilding.org

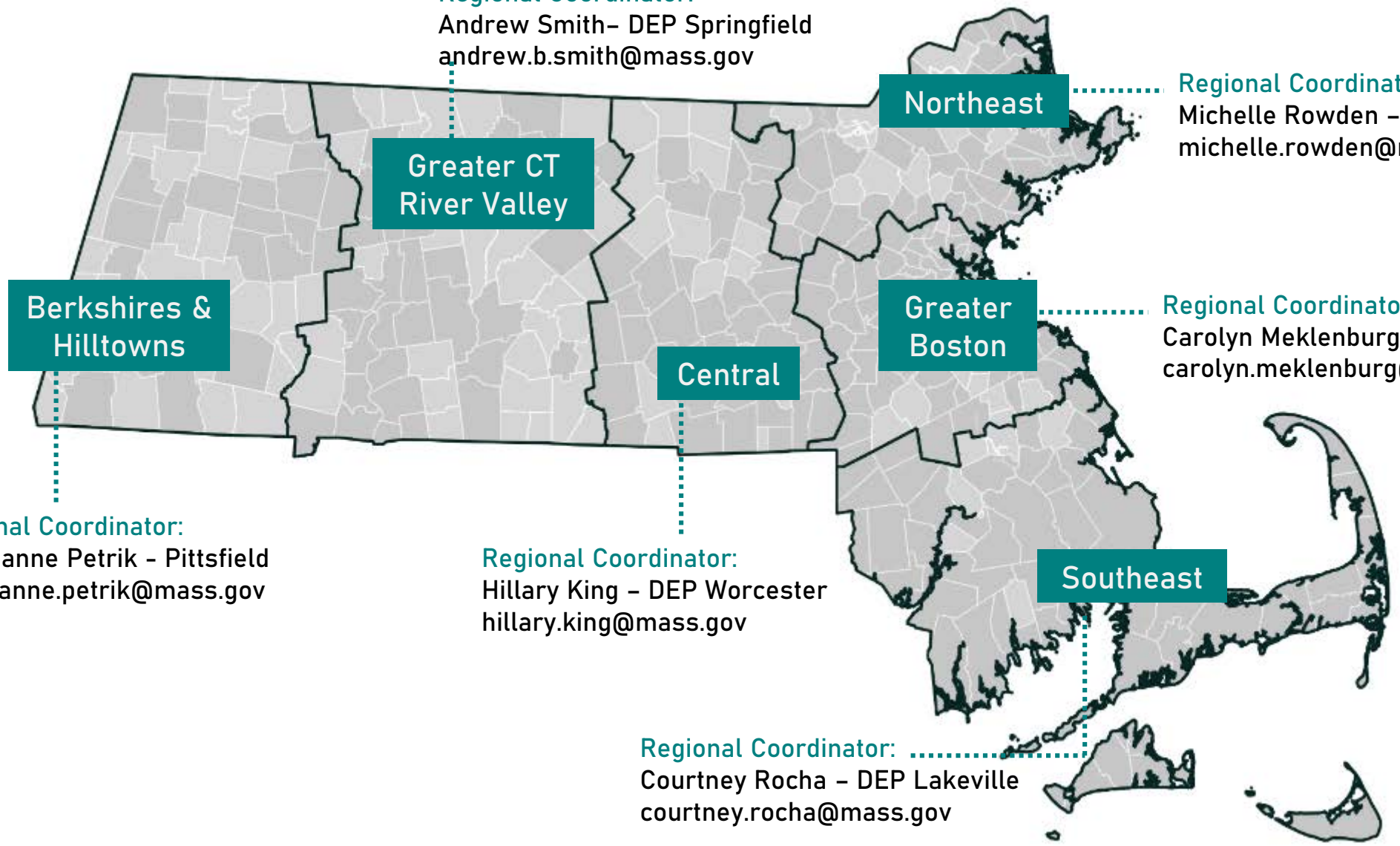
H-**M**-**L** priority for action over the **S**hort or **L**ong term (and **O**ngoing)
V = Vulnerability **S** = Strength

Features	Location	Ownership	V or S	Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)				Priority	Time
								H - M - L	Short Long Ongoing
Infrastructural									
Societal									
Environmental									

Municipal Vulnerability Preparedness Program

Hillary King,
MVP Central Regional Coordinator
MA Executive Office of Energy and Environmental Affairs

MVP Regions & Regional Coordinators



Greater CT River Valley
Regional Coordinator:
Andrew Smith– DEP Springfield
andrew.b.smith@mass.gov

Northeast
Regional Coordinator:
Michelle Rowden – DEP Lawrence
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Berkshires & Hilltowns
Regional Coordinator:
Carrieanne Petrik - Pittsfield
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Central
Regional Coordinator:
Hillary King – DEP Worcester
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Southeast
Regional Coordinator:
Courtney Rocha – DEP Lakeville
courtney.rocha@mass.gov

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

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

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

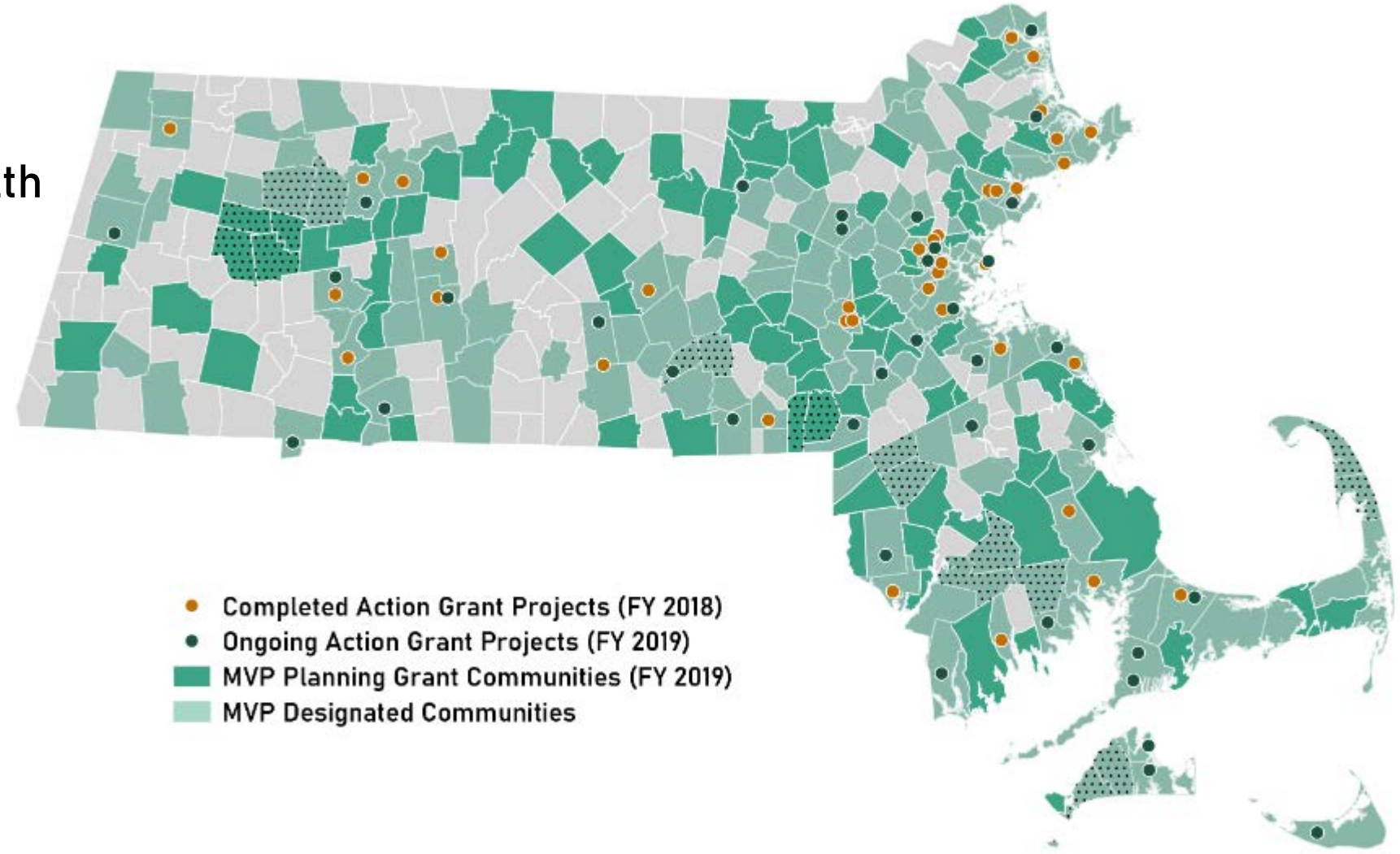
Implement priority adaptation actions identified through planning process

Three Years of MVP

MVP Designations
71% of the Commonwealth
249 communities

Action Grant Projects
FY 18: 37
FY 19: 36

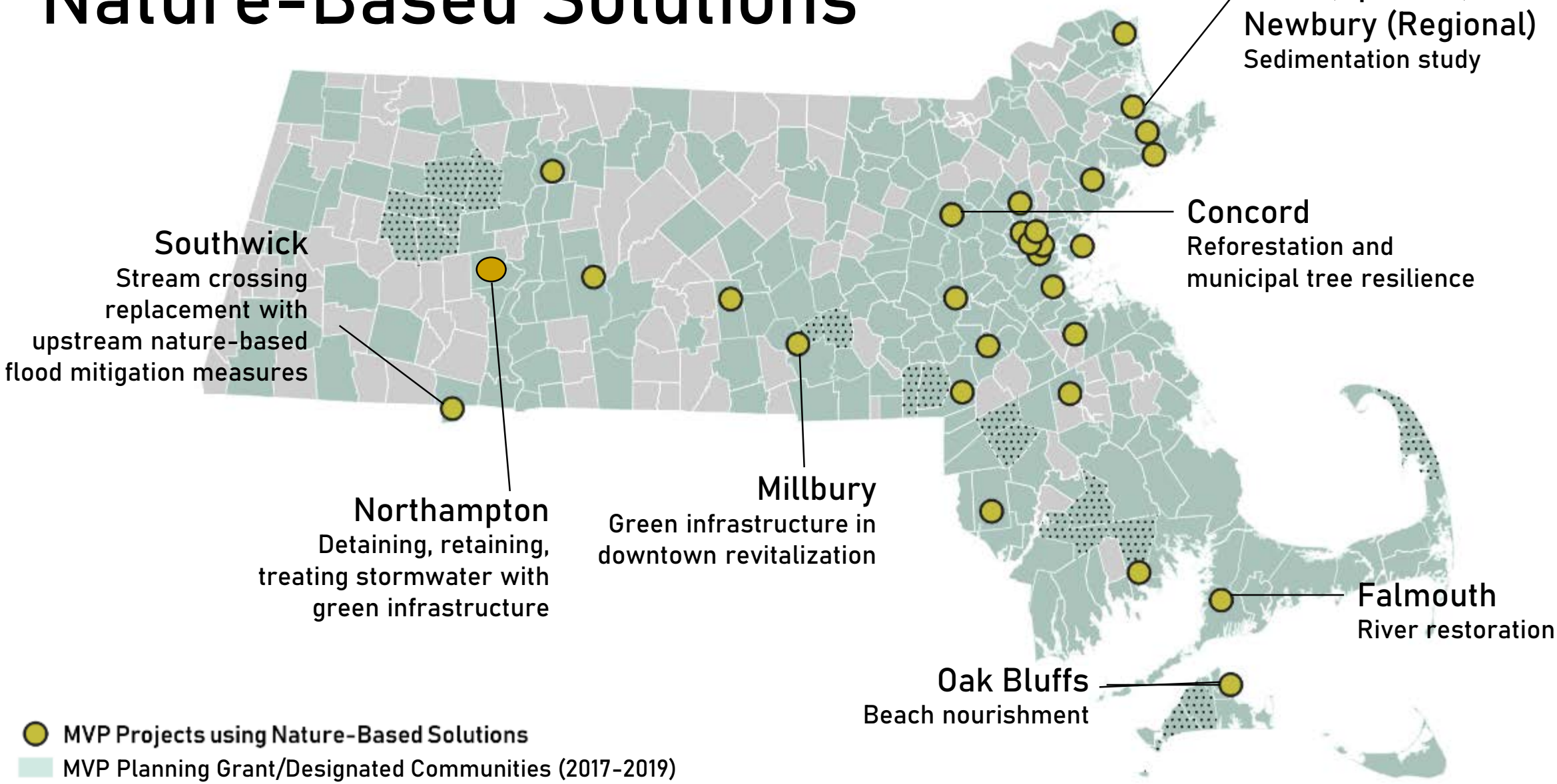
Total Awards
$17M+ in planning and action grants to date



MVP Action Grants: Project Type Examples

- Planning and Studies for:
  - Vulnerability and Risk Assessment
  - Community Outreach and Education
  - Local Bylaws, Ordinances, Plans, and Other Management Measures
- Redesigns and Retrofits for:
  - Energy Resilience
  - Chemical Safety
  - Subsidized Low-Income Housing
- Nature-Based Solutions for:
  - Land Acquisition (e.g. for flood protection/ecological restoration, or park creation)
  - Green Infrastructure(e.g. for water quality and infiltration improvement)
  - Tree Planting, Pavement Removal (e.g. to reduce vulnerability to extreme heat and poor air quality)
  - Ecological Restoration and Habitat Management (e.g. dam removal, controlled burns, soil stabilization)

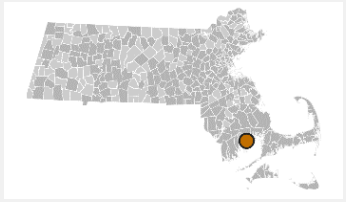
Nature-Based Solutions



Example Action Grant Projects

Land Acquisition for Resilience

Mattapoisett



Purchasing 120 acres of forest, streams, freshwater wetlands and coastal salt marsh as conservation land to prevent development in vulnerable areas

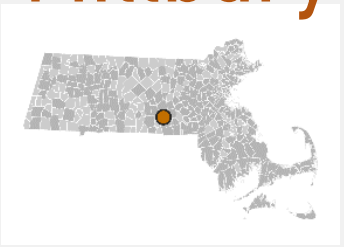
Data utilization

Proactive

Example Action Grant Projects

Nature-Based Flood Protection, Drought Prevention, Water Quality, and Water Infiltration Techniques

Millbury



Utilizing green infrastructure like stormwater planters, bioretention bump outs, rain gardens, and other measures like porous pavers and pervious pavement to reduce heat island effects and stormwater runoff into the Blackstone River.

Nature-based solutions

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.

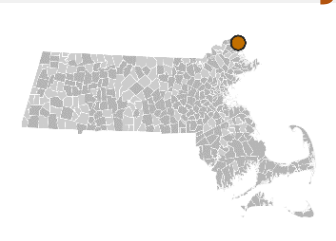
Nature-based solutions

Community co-benefits

Example Action Grant Projects

Redesigns and Retrofits

Salisbury



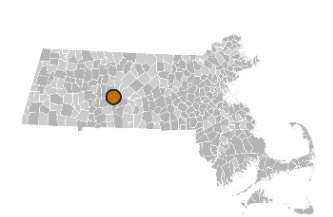
Increasing the resilience of the neighborhood of Ring's Island by raising its access/egress roads and by improving tidal flushing through culvert replacements

Vulnerable communities

Example Action Grant Projects

Nature-Based Flood Protection, Drought Mitigation, Water Quality, and Water Infiltration Techniques

Belchertown



Designing and permitting for a replacement water storage tank that would increase storage capacity and resiliency to drought, and completing a feasibility/ concept design of a rainwater harvesting system at Belchertown High School to irrigate the athletic fields.

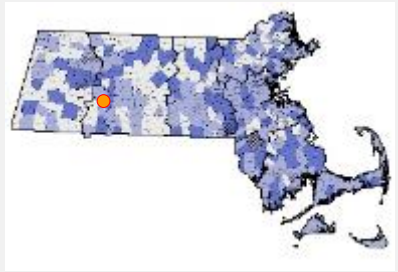
Nature-based solutions

Pilot potential

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

Table 12

How did the Holyoke municipal government respond to your needs? Was the response...	Freq.	Percent
Helpful	26	63.4
I don't know	7	17.1
Neither helpful nor unhelpful	2	4.9
There was no response from this resource	6	14.6
Total	**41**	**100**

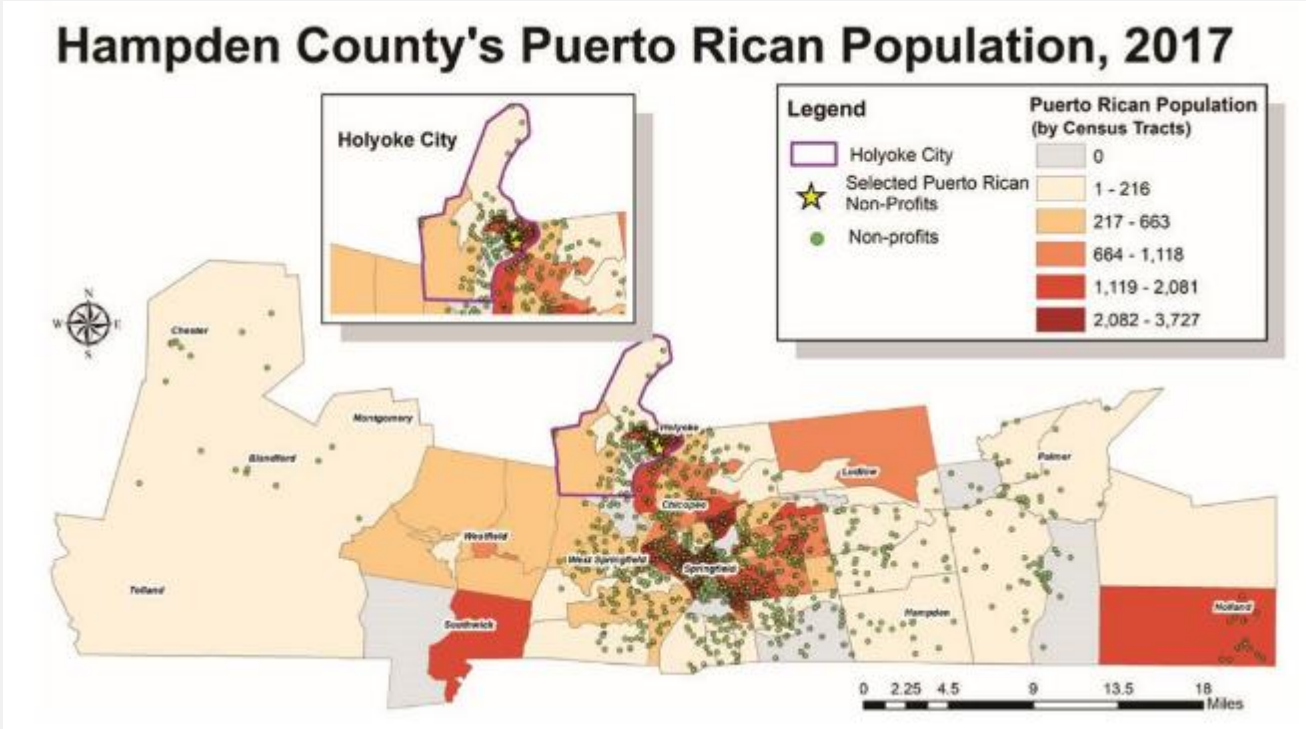
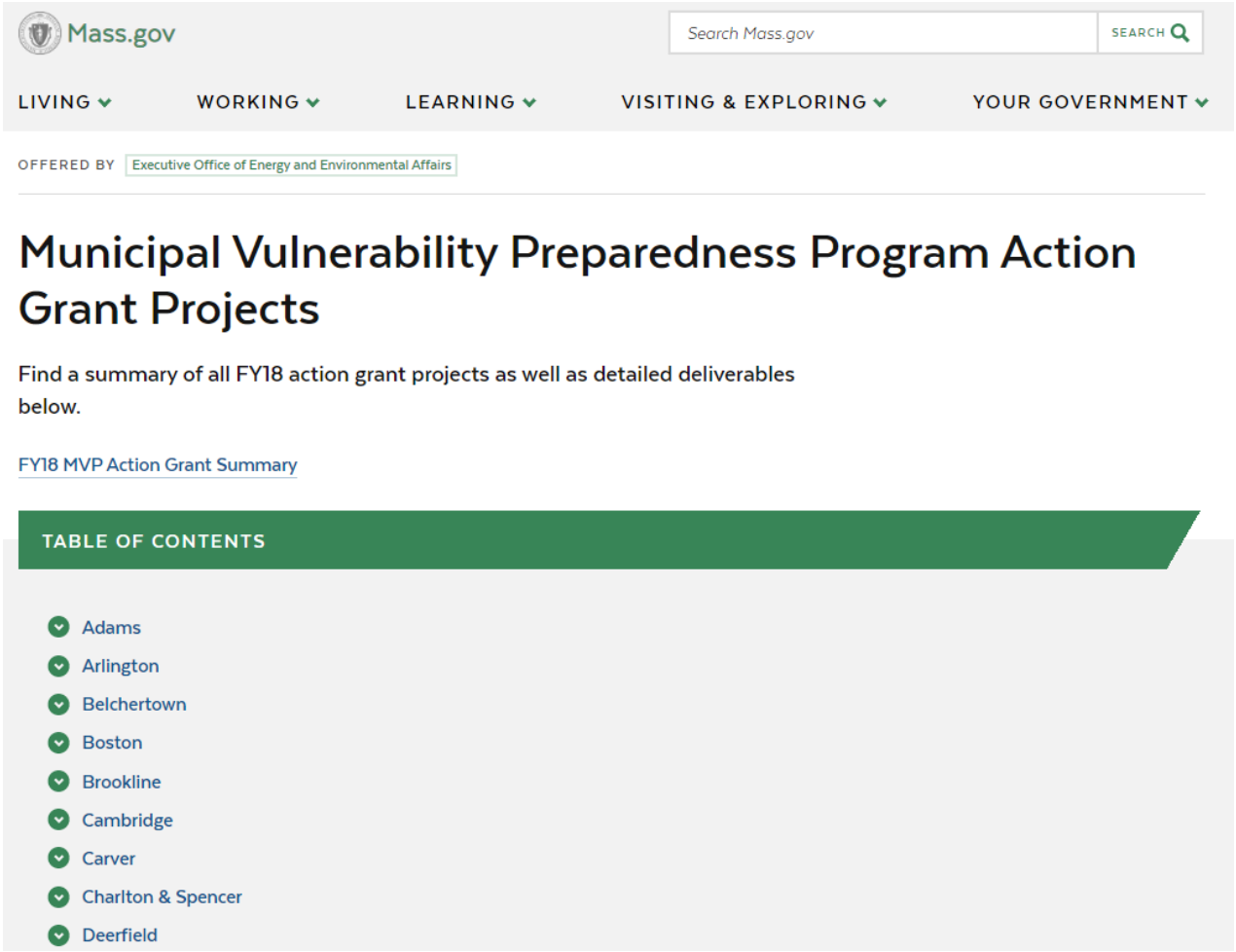


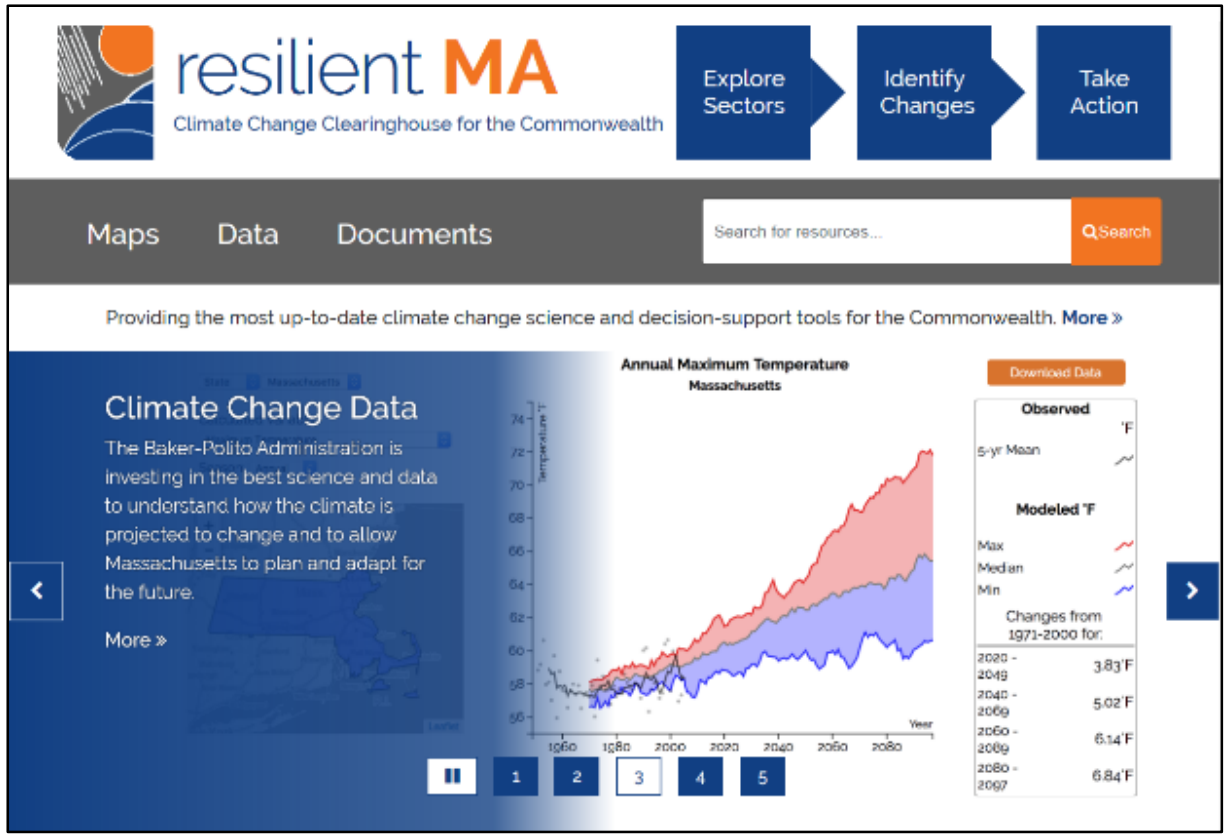
Image credits: Town of Holyoke, Hunter College CUNY, El Instituto UCONN

MVP Resources

mass.gov/municipal-vulnerability-preparedness-program



resilientma.org

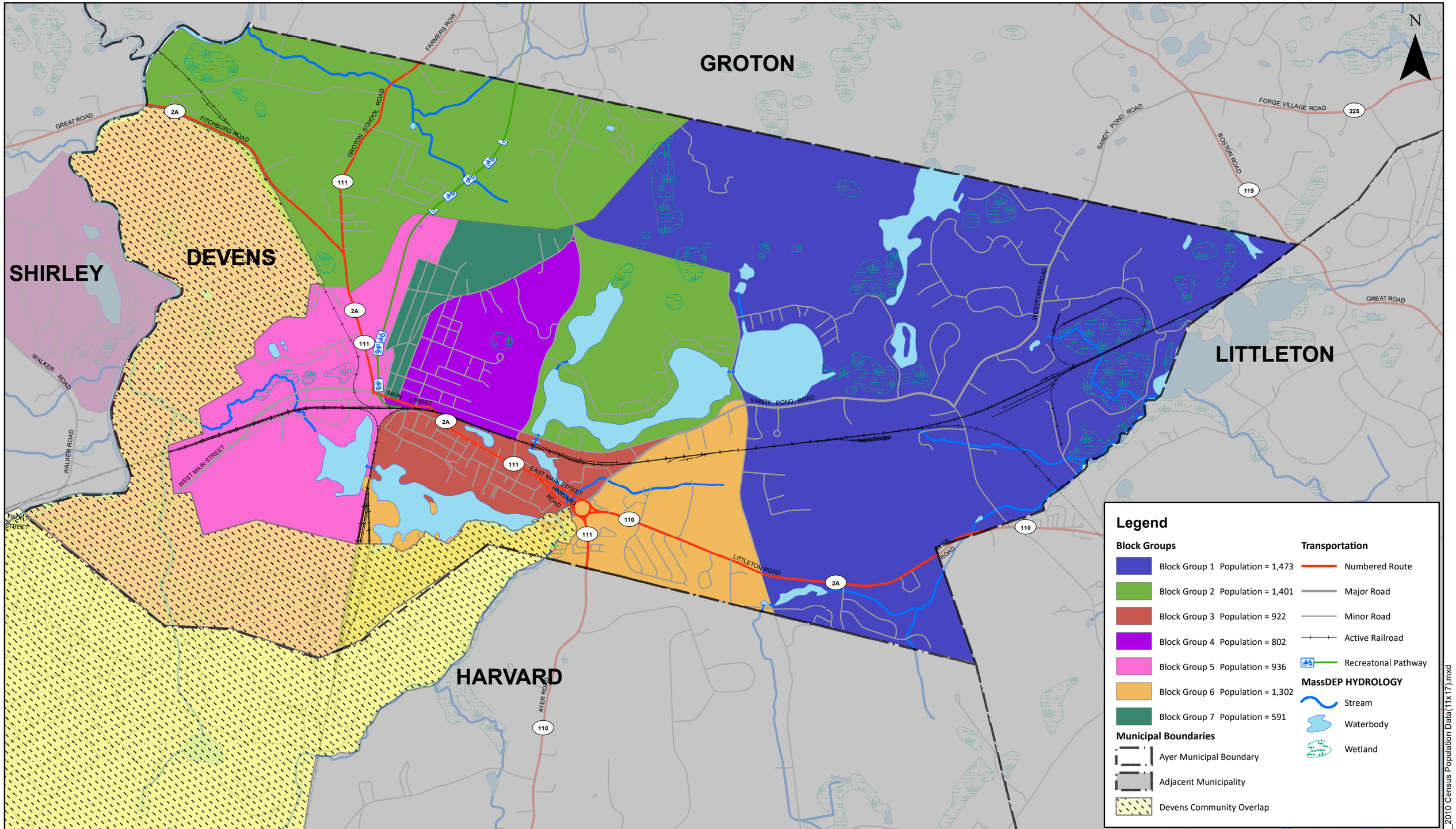


hillary.king@mass.gov

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

APPENDIX B

Workshop Maps



Municipal Vulnerability Planning: 2010 Census Block Group Populations
Town of Ayer, Massachusetts
January, 2020

0 0.25 0.5 0.75 1 Miles

ARCADIS Design & Consultancy for natural and built assets

G:\GIS\Ayer\MVP_2020_2010 Census Population Data(11x17).mxd

GROTON
DEVENS
SHIRLEY
LITTLETON
HARVARD
N
GREAT ROAD
FARMERS ROW
GROTON SCHOOL ROAD
SITKUBU ROAD
FORGE VILLAGE ROAD
SANDY POND ROAD
BOSTON ROAD
WESTFORD ROAD
WALKER ROAD
MAIN STREET
WEST MAIN STREET
EAST MAIN STREET
HARVARD ROAD
AYER ROAD
LITTLETON ROAD
NEW ROAD
FRONT STREET
2A
111
110
119
225

Legend

Land Cover
- Impervious
- Developed Open Space
- Bare Land
- Cultivated Land
- Pasture/Hay
- Grassland
- Scrub/Shrub
- Deciduous Forest
- Evergreen Forest
- Waterbody
- Wetland

Municipal Boundaries
- Ayer Municipal Boundary
- Adjacent Municipality
- Devens Community Overlap

Transportation
- Numbered Route
- Major Road
- Minor Road
- Active Railroad
- Recreatonal Pathway

MassDEP Hydrology
- Stream
- Waterbody
- Wetland

Municipal Vulnerability Planning: Land Cover Map
Town of Ayer, Massachusetts
January, 2020

0 0.25 0.5 0.75 1 Miles

ARCADIS Design & Consultancy for natural and built assets

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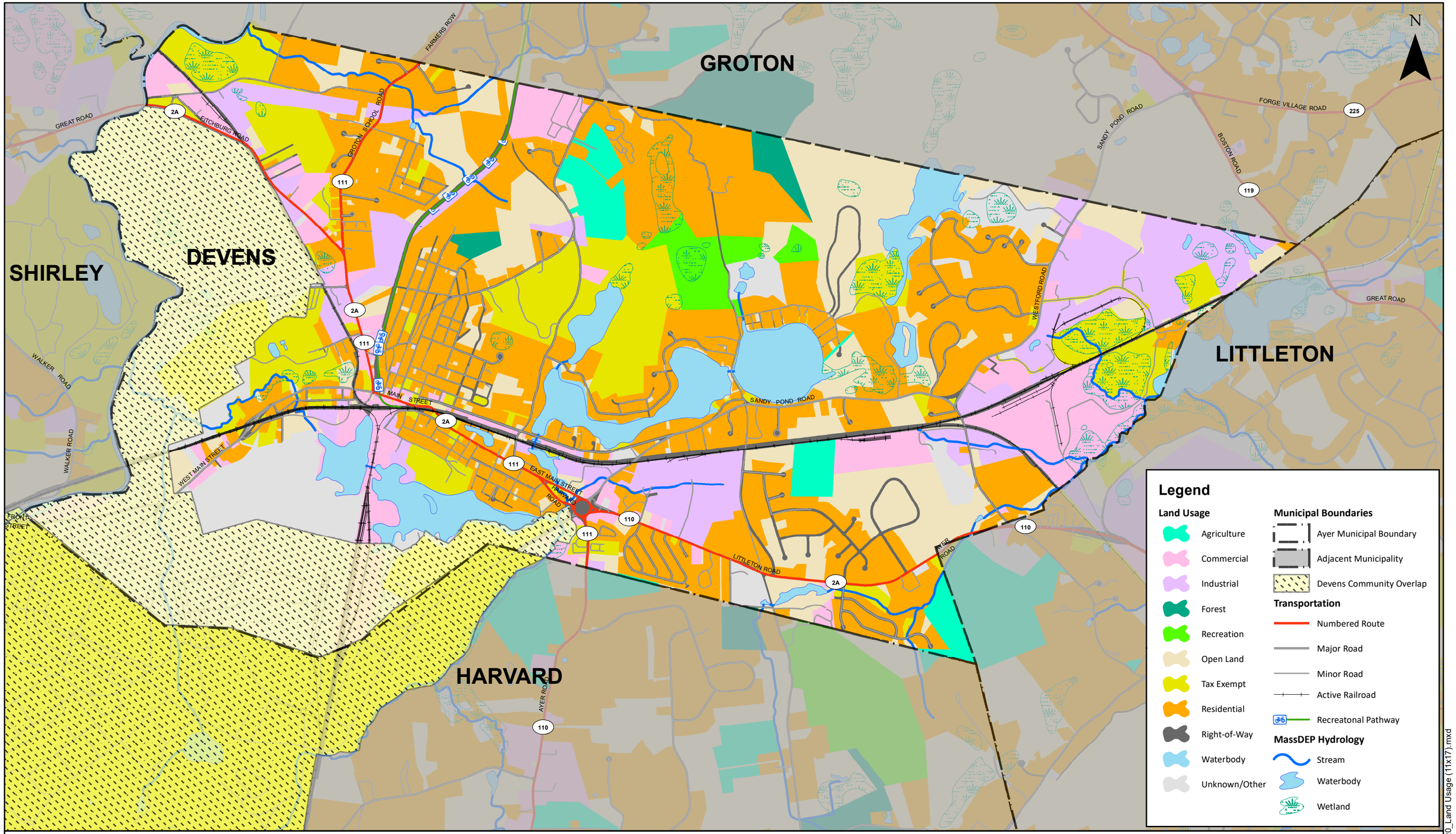

Municipal Vulnerability Planning: Land Usage Map
Town of Ayer, Massachusetts
January, 2020

0 0.25 0.5 0.75 1 Miles

ARCADIS Design & Consultancy for natural and built assets

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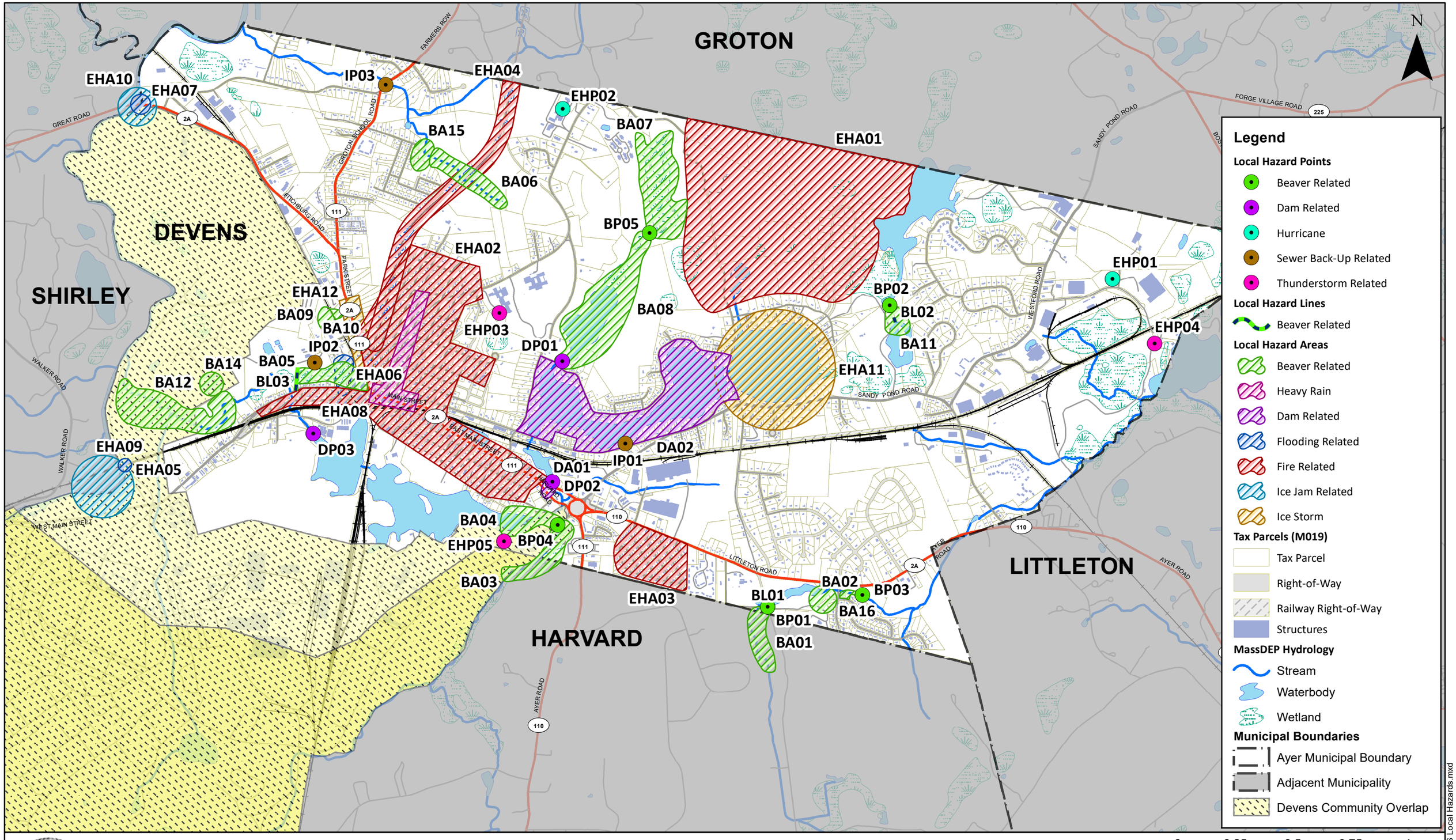

Legend

Local Hazard Points

- Beaver Related
- Dam Related
- Hurricane
- Sewer Back-Up Related
- Thunderstorm Related

Local Hazard Lines

- Beaver Related

Local Hazard Areas

- Beaver Related
- Heavy Rain
- Dam Related
- Flooding Related
- Fire Related
- Ice Jam Related
- Ice Storm

Tax Parcels (M019)

- Tax Parcel
- Right-of-Way
- Railway Right-of-Way
- Structures

MassDEP Hydrology

- Stream
- Waterbody
- Wetland

Municipal Boundaries

- Ayer Municipal Boundary
- Adjacent Municipality
- Devens Community Overlap

Municipal Vulnerability Planning: Local Hazards Map
Town of Ayer, Massachusetts
January, 2020

ARCADIS Design & Consultancy for natural and built assets

G:\GIS\Ayer\Ayer GIS Local Hazards.mxd

ID	HAZARD	DESCRIPTION
BA01	Beaver	Shaker Mill Pond, at Shaker Rd- The culvert between the bodies of water has been increased in recent years. This culvert gets dammed up by beavers and occasionally floods the area to the south.
BA02	Beaver	Bennetts Brook, east of Bennetts Crossing- Beavers have dammed up this brook causing occasional flooding in the area to the west and affecting a couple of the houses.
BA03	Beaver	Cold Spring Brook, south of Barnum Rd- Beavers have dammed up this brook causing swamping/flooding in the area to the south.
BA04	Beaver	Cold Spring Brook, south of Barnum Rd- Beavers have dammed up this brook causing swamping/flooding in the area to the south.
BA05	Beaver	Area in between West Main St & Brook St- A large culvert exists here that is a secondary access road. Beaver activity and damming causes a back-up of water that causes flooding in this area occasionally reaching the fire station.
BA06	Beaver	Stream at the end of Rosewood Avenue- Beaver activity is totally out-of-control in this area. The beaver dams in this area are hard to get to and hard to control.
BA07	Beaver	Beaver Dam, north of Erskine Pond- Beaver activity/damming has significantly enhanced the body of water to the north. A potential breach of this dam would flood into Erskine Pond, flooding over Oak Ridge Drive, and into Upper Flannagan Pond.
BA08	Beaver	Beaver Dam, north of Erskine Pond- Beaver activity/damming has significantly enhanced the body of water to the north. A potential breach of this dam would flood into Erskine Pond, flooding over Oak Ridge Drive, and into Upper Flannagan Pond.
BA09	Beaver	North of Brook St, at the Rail Line- Beaver activity to the left of the rail line is causing flooding to the east, occasionally flooding the parking lot of the credit union.
BA10	Beaver	North of Brook St, at the Rail Line- Beaver activity to the left of the rail line is causing flooding to the east, occasionally flooding the parking lot of the credit union.
BA11	Beaver	South end of Long Pond- A man-made dam exists here and beavers build in front of the dam. If this area is not kept clean of debris the dam increases in height and has the possibility to blow out and flood downstream.

ID	HAZARD	DESCRIPTION
BA12	Beaver	Nonacoicus Brook, east of the Nashua River- Beaver activity damming up this brook and causing flooding to this area. In a worst case scenario it could possibly flood the Wastewater Treatment Facility to the north.
BA14	Beaver	Nonacoicus Brook, east of the Nashua River- Beaver activity damming up this brook and causing flooding to this area. In a worst case scenario it could possibly flood the Wastewater Treatment Facility to the north.
BA15	Beaver	The water from this beaver activity is now encroaching on the properties to the eastern side of Mark Street.
BA16	Beaver	Bennetts Crossing- 2 houses off of Robbins Road that get backed up with water due to beaver dams.
DA01	Dam	Balch Pond Dam- This dam is in poor condition. The dam is part culvert on the ramp (owned by Mass Highway) coming off Barnum Circle. It should be replaced, and is currently on the "to-do" list- to get money to replace.
DA02	Dam	Upper Flannagan Pond Dam- This dam has a fairly low likelihood of breaching, but a breach of this dam would flood half-way between the pond and the road. This has a potential to affect several houses in the area.
EHA01	Fire	Wooded area, north of Wright Rd- This area is prone to brush fires.
EHA02	Fire	Neighborhoods surrounding Ayer Center- This area is highly dense, filled with old wooden frame construction buildings. Fires don't occur here a lot, but they have happened, and the potential to spread exists.
EHA03	Fire	Neighborhood south of Littleton Rd, east of rotary- This area is highly dense, and the potential for fire to spread exists.
EHA04	Fire	Area around Rail Trail- People frequently start brush fires in the area surrounding the rail trail.
EHA05	Flooding	MacPherson Rd, at Rail Line- The water is at road level often and this road floods a lot. This road is gated off (to the south) frequently due to flooding.

ID	HAZARD	DESCRIPTION
EHA06	Flooding	Area west of Rail Line, north & south of West Main St- There is a low spot in the road here at the bridge. Flooding occurs in this area, affecting businesses to the south of West Main St and potentially affecting a home south of Mechanic St Ext.
EHA07	Flooding	Great Rd & Fitchburg Rd- This area typically floods at the same time as MacPherson Rd (noted above). When this happens, access to and from Ayer is significantly blocked off.
EHA08	Heavy Rain	Main Street gets flooded out during heavy rain (which can occur during severe t-storms).
EHA09	Ice Jam	Nashua River, west of MacPherson Rd and north of West Main St- The river bends and narrows, leading to the possibility of ice jamming here.
EHA10	Ice Jam	Nashua River, at Great Rd & Fitchburg Rd- The river bends here and the presence of the bridge leads to the possibility of ice jamming here.
EHA11	Ice Storm	Sandy Pond Area- Lots of pine trees down. The DPW had to assist in clean-up of this area.
EHA12	Ice Storm	Along Route 2A, near DPW, 25 Broos Road.
BL01	Beaver	Shaker Mill Pond, at Shaker Rd- The culvert between the bodies of water has been increased in recent years. This culvert gets dammed up by beavers and occasionally floods the area to the south.
BL02	Beaver	South end of Long Pond- A man-made dam exists here and beavers build in front of the dam. If this area is not kept clean of debris the dam increases in height and has the possibility to blow out and flood downstream.
BL03	Beaver	Area in between West Main St & Brook St- A large culvert exists here that is a secondary access road. Beaver activity and damming causes a back-up of water that causes flooding in this area occasionally reaching the fire station.
BP01	Beaver	Shaker Mill Pond, at Shaker Rd- The culvert between the bodies of water has been increased in recent years. This culvert gets dammed up by beavers and occasionally floods the area to the south.

ID	HAZARD	DESCRIPTION
BP02	Beaver	South end of Long Pond- A man-made dam exists here and beavers build in front of the dam. If this area is not kept clean of debris the dam increases in height and has the possibility to blow out and flood downstream.
BP03	Beaver	Bennetts Brook, east of Bennetts Crossing- Beavers have dammed up this brook causing occasional flooding in the area to the west and affecting a couple of the houses.
BP04	Beaver	Cold Spring Brook, south of Barnum Rd- Beavers have dammed up this brook causing swamping/flooding in the area to the south.
BP05	Beaver	Beaver Dam, north of Erskine Pond- Beaver activity/damming has significantly enhanced the body of water to the north. A potential breach of this dam would flood into Erskine Pond, flooding over Oak Ridge Drive, and into Upper Flannagan Pond.
DP01	Dam	Upper Flannagan Pond Dam- This dam has a fairly low likelihood of breaching, but a breach of this dam would flood half-way between the pond and the road. This has a potential to affect several houses in the area.
DP02	Dam	Balch Pond Dam- This dam is in poor condition. The dam is part culvert on the ramp (owned by Mass Highway) coming off Barnum Circle. It should be replaced, and is currently on the “to-do” list- to get money to replace.
DP03	Dam	Plow Shop Dam- Concern over condition related to dam and dike.
EHP01	Hurricane	Power Station off Radison Dr- This power station houses six huge transformers and comes from big hydro power in Canada. It supplies 10% of the power to the northeast area (greater than the New England area).
EHP02	Hurricane	Nashoba Valley Medical Center- This hospital is a major part of its’ regional towns’ emergency plans. It is located on top of a hill and could be affected in the event of a hurricane.
IP01	Sewer Back-up	Central Ave Sewage Pump Station- This station covers the eastern part of town. If a sewer back-up of consequence were to occur it would most likely occur here, though it is not likely to happen.
IP02	Sewer Back-up	Main Sewage Pump Station- This station covers, and would affect, a significant area if a sewage back-up were to occur, though it is not likely to happen.

ID	HAZARD	DESCRIPTION
IP03	Sewer Back-up	James Brook Sewage Pump Station- This station covers, and would affect, a significant area if a sewage back-up were to occur, though it is not likely to happen.
EHP03	Thunderstorm	Water Tank off Washington St- SCADA System on the water tank gets hit by lightning on average once per year. When this happens the service of operations is interrupted.
EHP04	Thunderstorm	Spectacle Pond Wells & Water Filtration Plant- This location gets hit occasionally. As a result the boards get fried from the power surge occasionally.
EHP05	Thunderstorm	Grove Pond Wells & Water Filtration Plant- This location gets hit occasionally, though it is not common.

GROTON

SHIRLEY

DEVENS

LITTLETON

HARVARD

N

GREAT ROAD
FITCHBURG ROAD
FARMERS ROW
GROTON SCHOOL ROAD
SANDY POND ROAD
FORGE VILLAGE ROAD
BOSTON ROAD
WESTFORD ROAD
WALKER ROAD
WEST MAIN STREET
EAST MAIN STREET
FRONT STREET
LITTLETON ROAD
AYER ROAD
2A
111
110
119
225
PS

Legend

Sewer System
- Sewer Manhole
- Sewer Cleanout
- Sewer Other
- Pump Station
- Sewer Gravity Pipe
- Sewer Force Main
- Sewer Low Pressure Pipe

Stormwater System
- Stormwater Manhole
- Stormwater Gravity Pipe

Municipal Boundaries
- Ayer Municipal Boundary
- Adjacent Municipality
- Devens Community Overlap

Transportation
- Numbered Route
- Major Road
- Minor Road
- Active Railroad
- Recreatonal Pathway

MassDEP Hydrology
- Stream
- Waterbody
- Wetland

Municipal Vulnerability Planning: Sewer and Stormwater Infrastructure
Town of Ayer, Massachusetts
January, 2020

0 0.25 0.5 0.75 1 Miles

AYER-MASS AYER LIBRARY Incorporated Feb. 21, 1871

ARCADIS Design & Consultancy for natural and built assets

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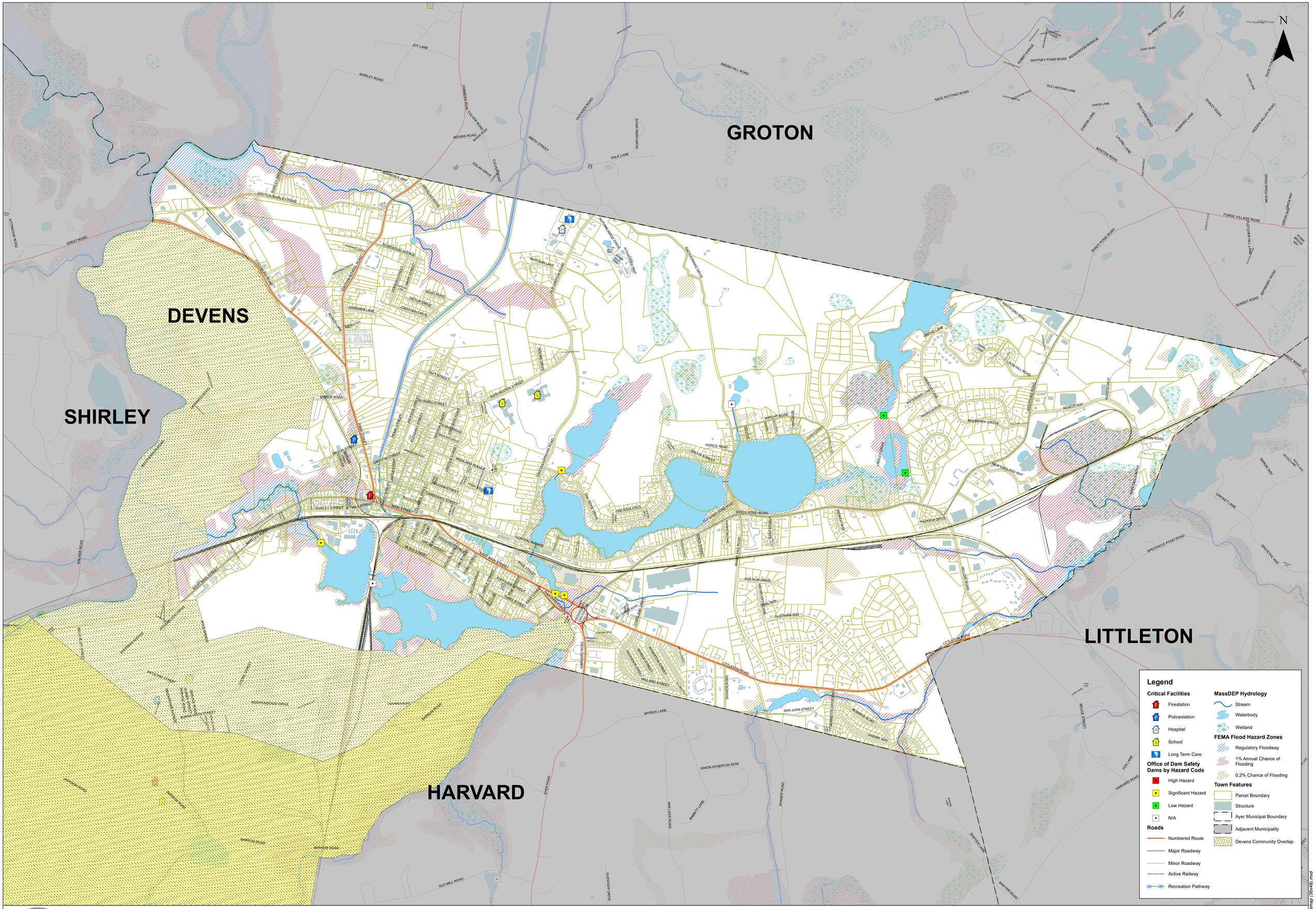

Municipal Vulnerability Planning, for The Town of Ayer, Massachusetts
January, 2020

0 0.25 0.5 0.75 1 Miles

AYER-MASS
AYER LIBRARY
Incorporated Feb.14, 1871

ARCADIS Design & Consultancy for natural and built assets

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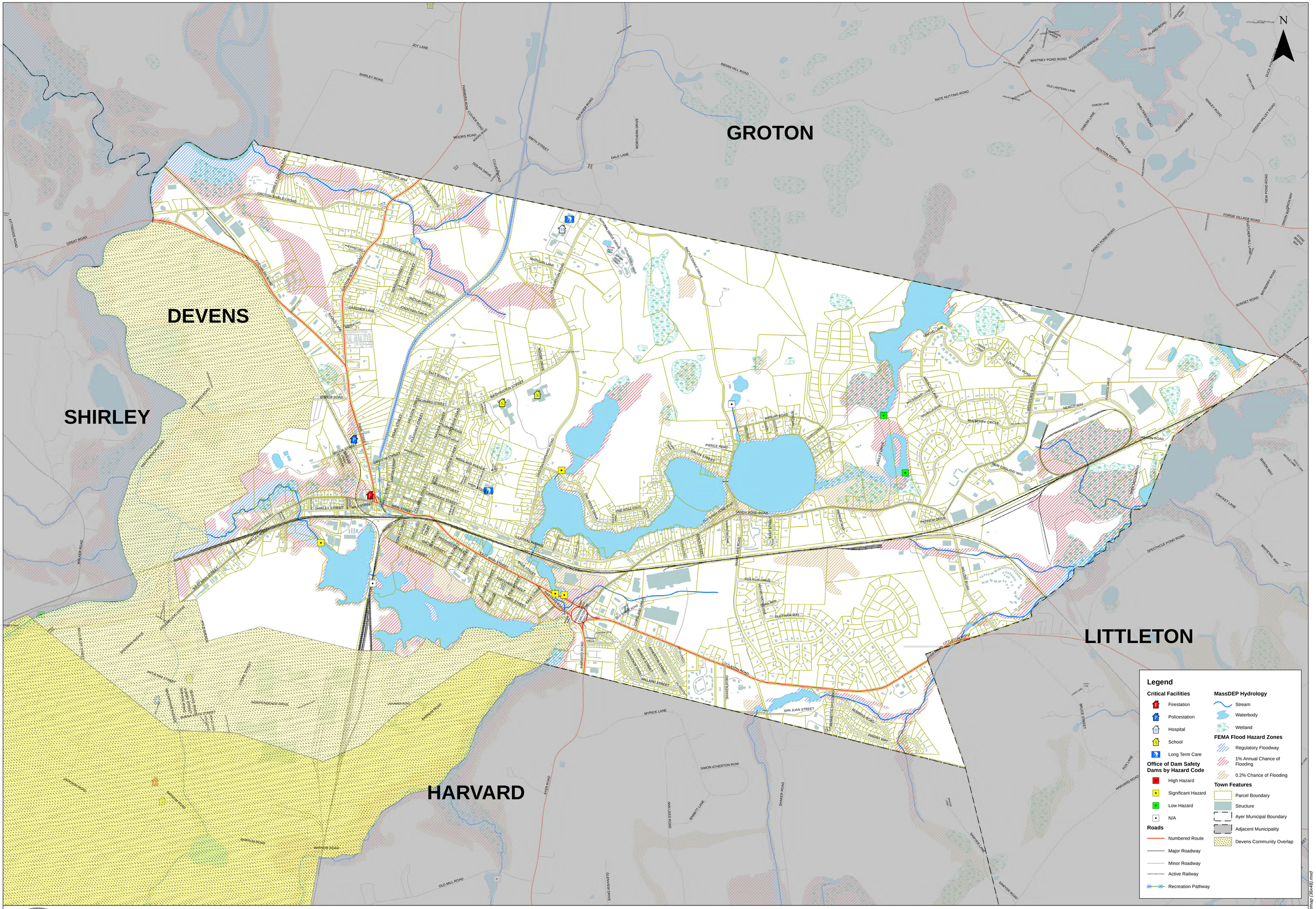

Municipal Vulnerability Planning, for The Town of Ayer, Massachusetts January, 2020

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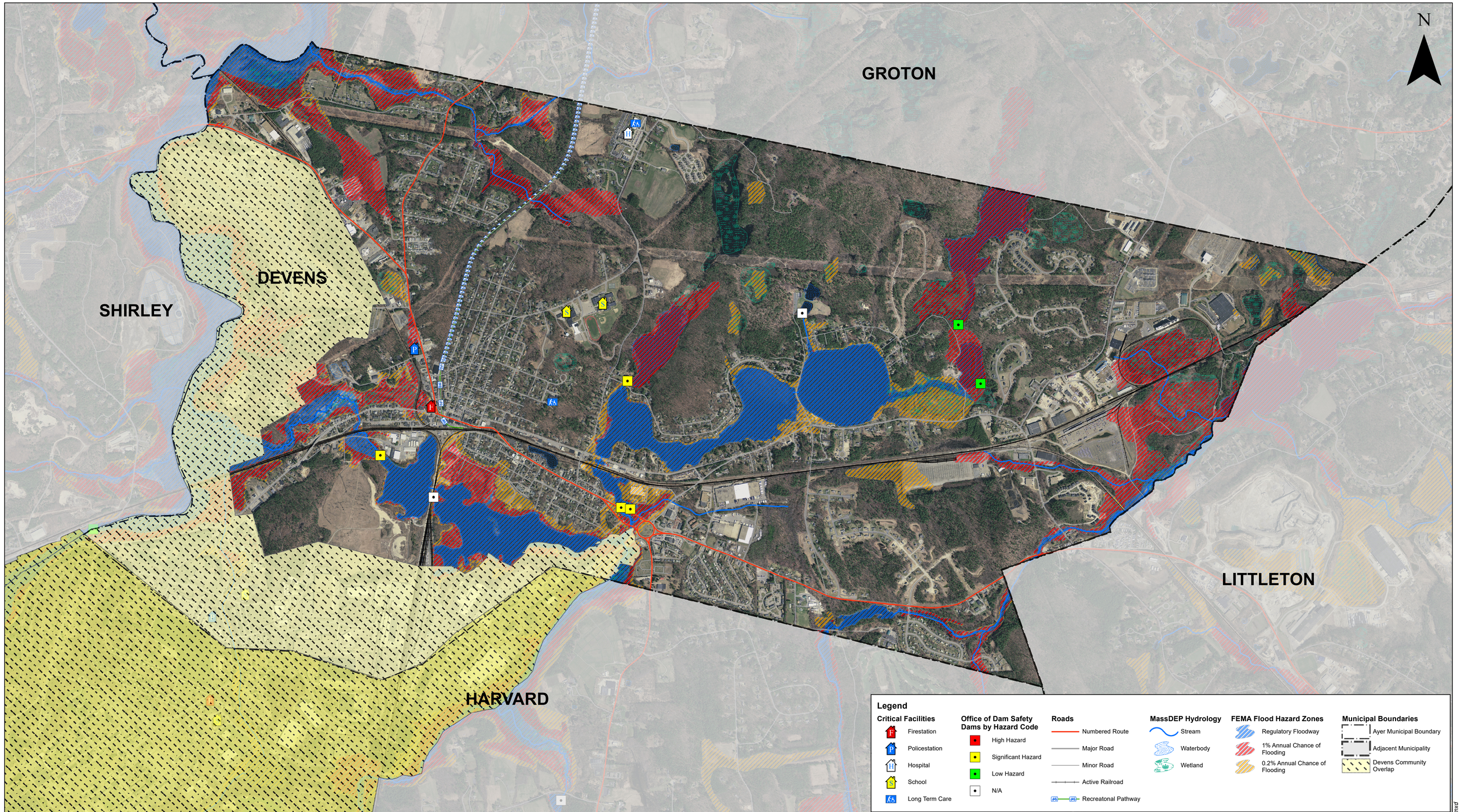

Municipal Vulnerability Planning: Orthophoto Map
Town of Ayer, Massachusetts
January, 2020

0 0.25 0.5 0.75 1 Miles

ARCADIS Design & Consultancy for natural and built assets

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APPENDIX C

Community Resilience Building Matrices

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	Snow/ice	Flooding	Heat waves	Drought/Fire	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Power Stations (1&2)	Raddison Rd/ Bishop Rd	Private	V	Cut branches/Improve relations with National Grid for all 4 hazards/Underground powerlines?	Berms/levees or potential relocation	Harden transmission lines		L	O
Page Hilltop Elementary School (3)	115 Washington St	Public	V	Green infrasturure solution for parking lot and roofs	Community rain garden/green roof - involve children in green infrastructure	Reduce heat island effect	Rainwater harvesting and plantings (drought-resistant vegetation)	M	S-O
Nashoba Valley Medical Center (4)	200 Groton Rd	Private	V/S	Old Groton Road Vulnerability Study (trees, snow, flooding)			Study	H	L
Railroad - commuter/freight line (5)	Variable	Public/Private	V/S	Communication between town and railways (MBTA, Pan Am, etc.)	Industrial Park/Study Central Ave culverts/Rail clean-up		Drought plan	L	O
Aging water(6)/sewer(7&8) infrastructure/pump stations (9 &10)	Spectacle & Grove Pond	Public/Private	V/S	Improve access	Berms/Raise elevations/Engineering controls/Flood Risk Study systemwide		Water bans - interconnections/infra structure (talk to Epic)	H	S-L-O
Fire Station (11)	1 W Main St	Public	V/S	Ice Storm Action Plan	Design-in-Process/Flood Preparation Plan/Annex Plan			H	O
Societal									
Emergency Shelter (Ayer Shirley Middle School) ~ outreach/AC/enough space?	Shirley	Public	V/S	Transportation/Community Outreach - Shelter Relocation Study/Supplemental Shelter				L	S-O
List of elderly/residents who rely on oxygen at fire station (voluntary program)	Variable (list at F.S.)	Public	S	Expansion to other conditions/provide Town Hall with access to list?				L	S-O
Cell phone tower resilience/communication & outreach (12)	Variable	Private	V	Communication Study - Vulnerabilities				M	L-O
Red Cross presence in Ayer	Variable	Public	S						
Robust reverse 911 service/CERT	Fire Station	Public	S						
PACE/Regional Coordinator/environmental justice community	Variable	Public	S						
Environmental									
Nonacocious Brook/land development	Floodplain	Public	V/S		Land acquisition/Reevaluate floodplain regulations zoning			M	O
Town pond system-Sandy Pond Beach (14) & Pirone Park (13)	Please see # on map	Public	V	Long-term pond assesment study (Nature/man-made developments /vectors)			Wells - Study for droughts	H	S-L-O
Petapawag Conservation forest (15)	Please see # on map	Public	V		Zoning/Floodplains Conservation		Wildfire Plan	H	S-O
Aquifer-industrial park built over it (16) - water contamination	Please see # on map	Public	V		Revisit aquifer bylaw			M	O
Beaver dams	Townwide	Public/Private	V		Beaver Management Plan			H	S-L-O
Waste management (transfer station)	95 Groton-Harvard Rd	Public	V		Good Housekeeping/SWPPP/ Emergency Plan			L	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	Heat/Drought	Extreme Weather/Wind	Snow/Ice Storm	Priority H - M - L	Time Short Long Ongoing
Infrastructural									
Undersized/aging culverts	Variable	Mostly Public	V	Stormwater Management Plan/Culvert assessments ecological & physical				H	S
Aging dam infrastructure	Variable	Public/Private	V	Planning for level control of ponds					
Railroad/trains (commuter rail/ freight line) & Trucking (all public health hazards)	Everywhere	Public/Private	V/S	Signage for getting around train to hospital	Study air quality issues from trucks/trains [H] (youth engagement?)	Strengthen monitoring at off load sites (meetings/inspections)	Maintain communication with train operators (speed)	H	
Power	Across Town	Private	V			Implement Tree Management for power outage			
Power substations/plant (Stoney Brook Area)	Variable	National Grid	V	Land use management plan for Stoney Brook Area				H	S
Cell tower resiliency - communication/availability of back up power	Variable	Private	V/S						
Societal									
Water supply (dam-related)	Variable	Public	V						
Fire Station/Police Station (CERT/reverse 911 service)	1 W Main St	Public	V/S						
Hospital (Nashoba Valley Medical Center)	200 Groton Rd	Private	V/S						
Schools (elementary, middle, & high)	Ayer/Shirley	Public	V/S						
PACE/environmental justice communities	EJ Committee	Public	V/S						
Public awareness/evacuation plans	Everywhere	Public/Private	V/S	Implement New Resident Orientation Program/	Neighborhood Association formation/	Reactivate Green Communities Committee		H	O
Environmental									
Wetlands	Variable	Public/Private	S	Strengthen regulations so "no means no"					
Storm water management/treatment/infrastructure & contamination (PFAS, etc.)	Townwide	Public/Private	V	Pilot green infrastructure project (Fletcher Street) design & construction					
Conservation land (fire/buffer)	NE	Public	V/S	Purchase more conservation land				H	S-O
Waste management (transfer station)	95 Groton-Harvard Rd	Public	V						
Grove Pond (arsenic impairment)	SW	Public/Private	V						
Beaver dams	Townwide	Public/Private	V						

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

Features	Location	Ownership	V or S	Flooding	Heat/Drought	Extreme Weather/Wind	Snow/Ice Storm	Priority H - M - L	Time S Short L Long O Ongoing
Infrastructural									
Roads/bridges - especially when Nashua River floods over its banks	Townwide	Public/Private	V						
Ayer Public library (has AC; could be emergency shelter during heat event)	26 E Main St	Public	S						
Water Supply Quantity			V		Managed Water Conservation Plan (grants)/Public education and outreach (smart water)	Look at inter-regional agreements/redundancies			
Fire Station/Police Station			V						
Hospital			V	Ran barrels/Green infrastructure at Town properties					
Water Supply Quality			V	Town aquifer protection bylaw (review and strengthen)/Slopes, trees, vegetation protection				H	O
Societal									
Fitchburg State University students	Fitchburg	Public University	S						
Utilizing APAC television, Council on Aging, other NGOs	Townwide	Public/Private	S						
"Regionalization"/regional planning with MRPC	Regional	Public	V/S	Work with MRPC to develop framework for regional collaboration				H	S
Enthusiastic & motivated students/youth of community	Townwide	Public	S	Identify opportunities for youth involvement across the board				H	
Emergency Shelters	Townwide			Study capacity of emergency shelters					
Insect-borne Illness	Townwide			Study alternatives to spraying/proactive measures/homeowner education					
Environmental									
Downtown Heat Island Effect	Downtown	Public/Private	V	Ensure "TIP" money is used in keeping with goals of a green community					
Tree Management				Tree Management Plan - building on DPW				H	O

APPENDIX D

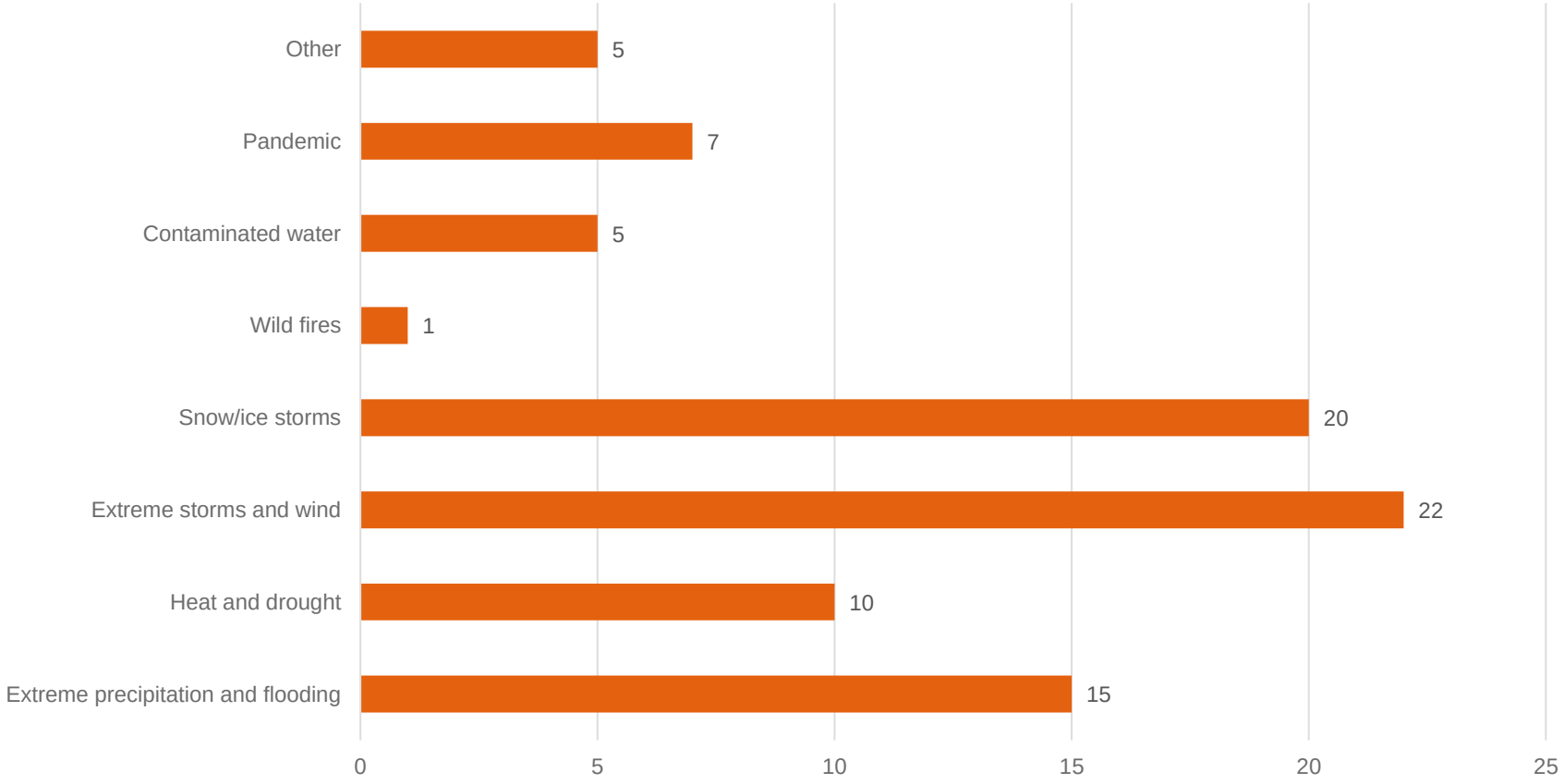
Community Resilience Building Web Survey Results

Post Workshop Web-Survey:

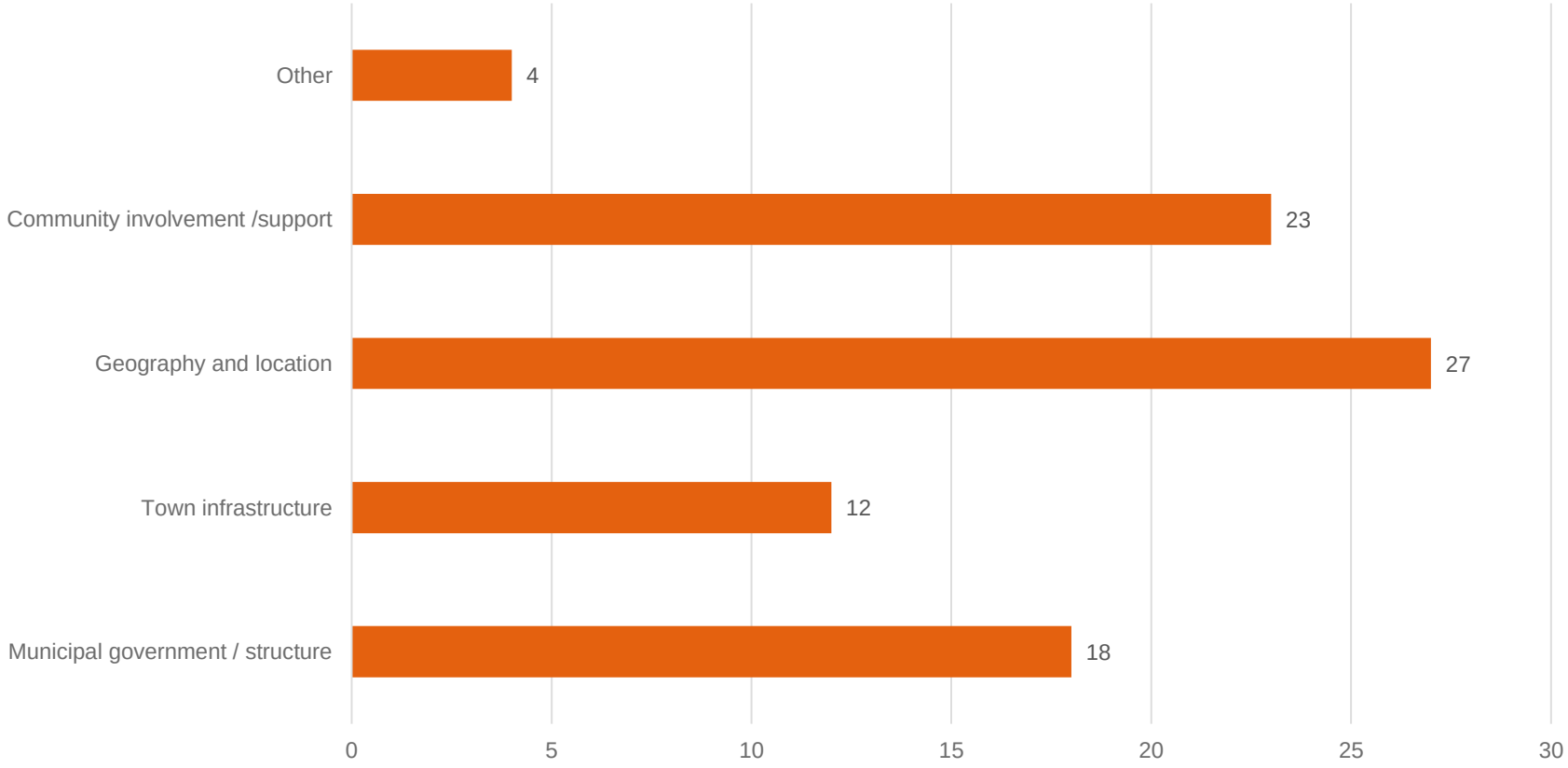
Town website

Twitter post

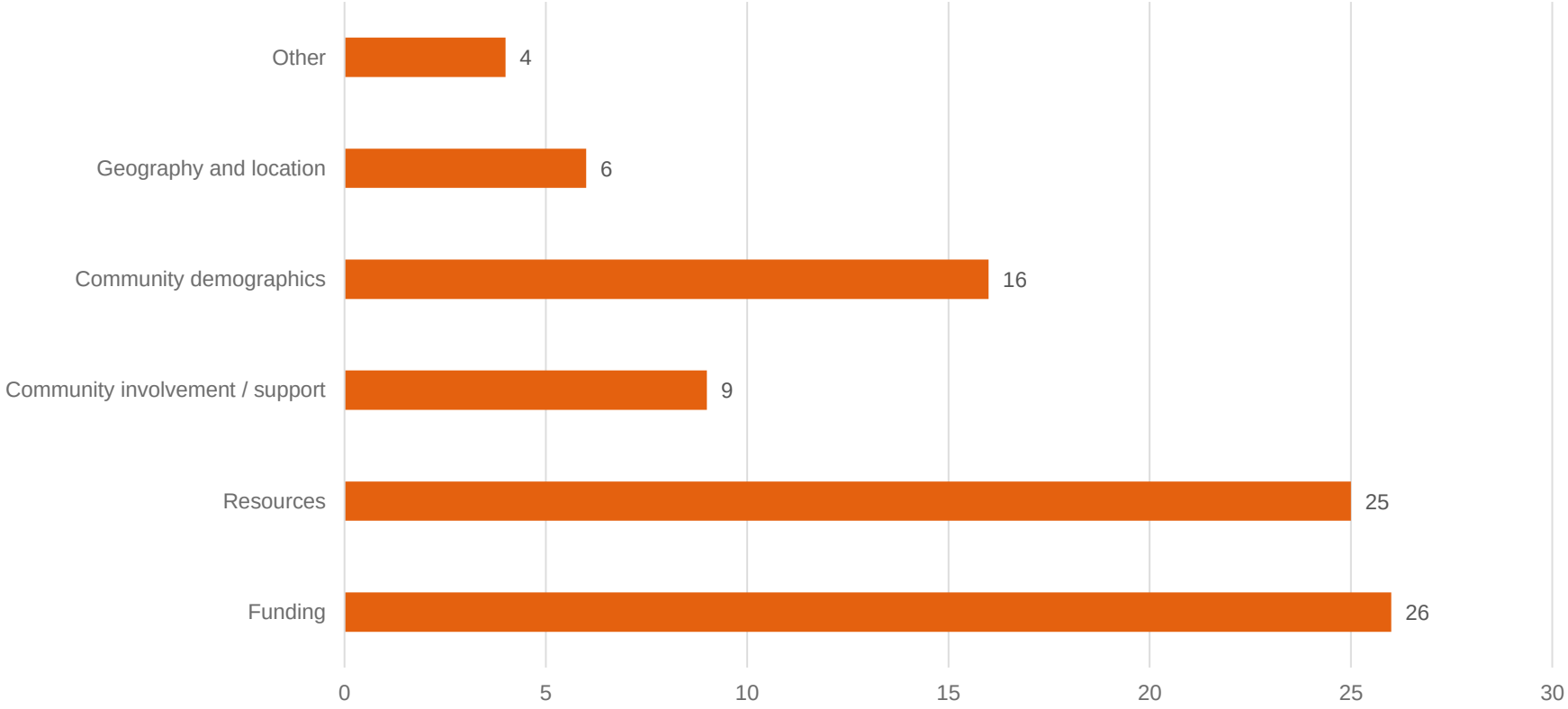
Which of the following hazards pose the greatest threat to Ayer?



What do you consider Ayer's greatest strengths as a community in combating the effects of natural hazards and climate change?



What do you consider Ayer's greatest vulnerabilities or challenges as a community related to the effects of natural hazards and climate change?



Highest priority actions *(respondents selected up to 3)*

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