March 2021

TOWN OF BOXBOROUGH

COMMUNITY RESILIENCE BUILDING WORKSHOP SUMMARY OF FINDINGS

Prepared for:

Town of Boxborough
29 Middle Road
Boxborough, MA 01719

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Appendices

Note: *This report has been prepared in accordance with the Community Resilience Building (CRB) Guide and Municipal Vulnerability Program (MVP) "Summary of Findings Template Guidance" provided by the Massachusetts Executive Office of Energy and Environmental Affairs (MA EEA).*

1. Background Information

1.1 MVP Program Overview

In 2016, Massachusetts Governor Charles Baker issued Executive Order 569 to establish a comprehensive statewide approach to reduce greenhouse gas emissions and prepare for the impacts of climate change. As part of this initiative, the Massachusetts Executive Office of Energy and Environmental Affairs administers the Municipal Vulnerability Preparedness (MVP) Program. The MVP Program provides communities with funding to identify vulnerabilities and develop plans to increase climate change resilience. In 2018, a $2.4 billion Environmental Bond Bill authorized over $200 million to fund climate change adaptation, including both planning and implementation aspects of the MVP Program.

To date, 285 of the Commonwealth's 351 municipalities (81%) have participated in the MVP Program. This has resulted in more than $17 million dollars in Planning Grants and Action Grants to implement high priority actions identified during the planning process. Projects funded through Action Grants are wide ranging, including the following priority project categories:

- More detailed vulnerability and risk assessments;
- Community outreach and education projects;
- Local bylaw updates;
- Redesign and retrofits of infrastructure;
- Nature-based solutions for flood protection, drought mitigation, and water quality improvements;
- Nature-based infrastructure and technology solutions for extreme heat and poor air quality.

1.2 Community Resilience Building Workshop

The Town of Boxborough (Town) received funding through an MVP Planning Grant to compile data for and conduct a Community Resiliency Building (CRB) workshop. The goal of the CRB workshop was to have community stakeholders work collaboratively to complete a climate change and natural hazard vulnerability assessment and develop prioritized actions to address vulnerabilities and improve strengths. Upon completion of the CRB workshop process, Boxborough will become an "MVP Community" and will be eligible to apply for MVP Action Grant funding from the Commonwealth.

An interdisciplinary team of Town staff (i.e., "Core Team") worked to implement the CRB process with consulting support from Comprehensive Environmental, Inc. (CEI), a certified MVP provider. The Town's MVP Core Team included the following:

Town of Boxborough – MVP Core Team
Simon Corson, Town Planner
Bentley Herget, Building Commissioner and Zoning Enforcement Officer
Ed Kukkula, Department of Public Works Director
Paul Fillebrown, Fire Chief and Emergency Management Director
Dennis Reip, Conservation Commission Chair and Community Preservation Committee Chair
Francie Nolde, Sustainability Committee Chair

1.3 Workshop Preparation

The following tasks were performed to prepare for the CRB workshop:

- The Core Team and CEI held a kickoff meeting and preliminary MVP planning session on July 16, 2020 to prepare for the workshop.
- CEI worked with Core Team members to identify potential areas of concern, strengths, and vulnerabilities with regard to climate change.
- CEI prepared presentation materials and a set of maps to guide the workshop (Appendix A).
- The Core Team scheduled the workshop, invited stakeholders, and handled logistics.

1.4 Workshop Process

The MVP Planning Workshop was conducted as a web-based virtual meeting on November 5, 2020 due to COVID-19 limitations in accordance with guidance from EOEEA. The workshop session followed the format as presented in the CRB guidance[1]. The workshop participants are listed below.

Name	Department/Committee
Simon Corson	Planning Board
Cindy Markowitz	Planning Board
Bentley Herget	Building Department
Ed Kukkula	Department of Public Works
Paul Fillebrown	Fire Department
Dennis Reip	Conservation Commission
Francie Nolde	Sustainability Committee
Barbara Salzman	Sustainability Committee
Warren O'Brien	Police Department
Les Fox	Select Board
Jon Markiewicz	Select Board
Ron Sisco	Boxborough Reserve Corps
Ralph Murphy	Housing Board
Bryan Lynch	Board of Health
Lisa Stamand	Boxborough Conservation Trust
George Krusen	Resident
Michelle Rowden	Regional MVP Coordinator
Kelly Brown	Regional MVP Coordinator
Bob Hartzel	CEI
Emily DiFranco	CEI

[1] CRB Guidance: www.communityresiliencebuilding.com

As listed below, the exercises solicit and organize input from workshop participants through use of the Risk Matrix presented in Appendix B. To help generate ideas and discussion during the planning exercises, workshop attendees were provided with a series of maps (Appendix A) with information such as FEMA flood hazard areas, critical habitat areas, and conservation land within Boxborough. This information was emailed to the group before the webinars.

Introductory information included:

- Description of the MVP program and CRB process.
- Introduction to climate change, including climate change projections for Massachusetts and Middlesex County[2;]
- Introduction to nature-based solutions (i.e., green infrastructure).

Upon completion of the workshop, an email was sent to the group with the vulnerabilities and actions identified as high priority. The workshop attendees responded by email to prioritize the proposed actions for Boxborough. The votes were then tallied to determine the Town's three top priority climate resiliency actions as presented in Section 5.1 of this report.

This report provides an overview of workshop findings, including a summary of the Town's top hazards related to climate change, current climate resiliency strengths and vulnerabilities, and potential actions to improve the community's resilience to natural and climate-related hazards. The summary of findings described in this report are compiled from feedback from the workshop participants.

Workshop Exercises

Exercise 1: Identify the Town's top local natural and climate-related hazards of concern.

Exercise 2: Identify the Town's strengths and vulnerabilities relative to top hazards.

Exercise 3: Identify and prioritize actions to reduce vulnerabilities or improve strengths.

Exercise 4: Determine the Town's overall top priority actions.

[2] Climate Projections obtained from: www.resilientma.org

2. Top Hazards and Vulnerable Areas

2.1 Summary of Top Hazards

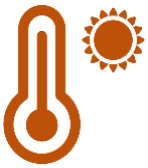
During the Core Team Kickoff Meeting, the Core Team discussed Boxborough's top natural hazards and areas of concern. The group then reached consensus on these topics.

The following three hazards were identified as presenting the highest direct and indirect risks to the infrastructure, societal, and environmental resources of Boxborough:

Boxborough Town Hall

1. **Flooding:** Flooding was a hazard of concern to Boxborough. There are multiple areas in town that have experienced historical flooding and others that are expected to flood under future climate change projections.

2. **Strong Storms:** Extreme weather events, including strong winter storms, heavy rainfall with high winds, and ice storms were a top concern due to their potential for damage to infrastructure and other physical, social, and environmental consequences.



3. **Drought and Extreme Temperatures:** As global temperatures continue along a long-term warming trend, local occurrences of drought and extreme temperature (i.e., days greater than 90º F) are predicted to increase. Drought conditions have the potential to limit water supply availability, increase wildfire risk, and impact agriculture in Boxborough. Extreme temperatures have the potential to impact vulnerable populations without access to air conditioning.

2.2 Areas of Concern

Key stakeholders developed a preliminary list of Boxborough's primary climate resiliency vulnerabilities and strengths. These stakeholders were primarily concerned with vulnerabilities relative to flooding and storm-induced hazards. Vulnerabilities of concern included potential culvert failures, road flooding, water supply infrastructure, and greenhouse gas emission from town-owned vehicles and facilities.

The table below lists areas of concern that were identified based on stakeholder feedback. Subsequent sections of this report provide more details on strengths and vulnerabilities (and potential solutions to increase resilience) relative to these areas of concern.

Category	Areas of Concern
 **Infrastructure**	• Stormwater management system (town-wide) • Municipal buildings (old DPW facility, fire station) • Private water supply
 **Societal**	• Public alert system • Vulnerable populations • Critical town facilities with no generator • Increase in insect-borne diseases and respiratory illnesses
 **Environmental**	• Invasive species (town-wide) • Prioritizing land for conservation (town-wide) • Barriers to aquatic connectivity (culverts at Beaver Brook Road, Hill Road, and Route 111 at Beaver Brook) • Greenhouse gas emission from town vehicles and buildings

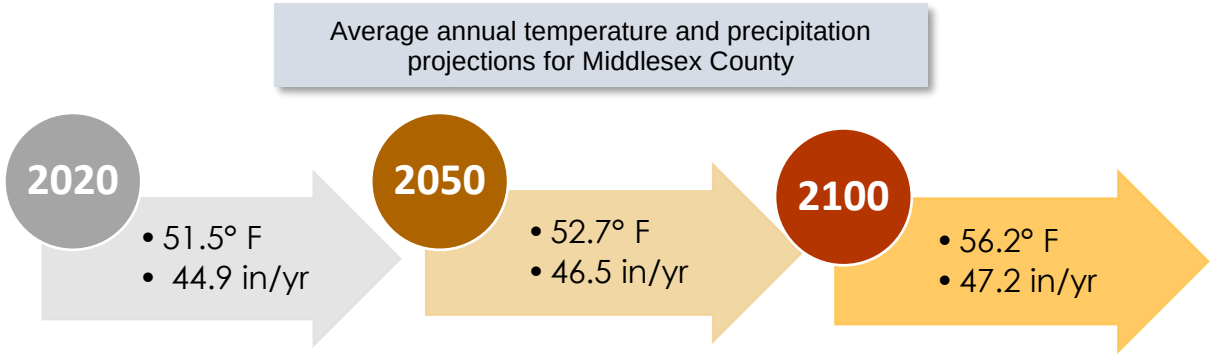
3. Current Concerns and Challenges Presented by Hazards

Boxborough faces multiple challenges related to potential impacts from natural hazards. In recent years, the Town has experienced multiple disruptive and damaging weather events, including Tropical Storm Irene (August 2011), Tropical Storm Sandy (October 2012), winter Nor'easter Nemo (February 2013), winter Nor'easter Quinn (March 2018), and Hurricane Barry (August 2019). These storms brought heavy rain-induced inland flooding, wind damage to trees, and snow that caused widespread damage to Boxborough and many other Massachusetts communities.

The intensity and frequency of extreme weather events has increased awareness of Boxborough's natural hazards and risks associated with climate change, while motivating communities throughout Massachusetts to comprehensively assess and improve resilience at the local level.

The following is a summary of climate change projections for Middlesex County, Massachusetts from the Climate Change Clearinghouse (CCC) for the Commonwealth (www.resilientma.org):

Note: Climate change projections below are based on median modeled results – some models predict higher and lower outcomes.



3.1 Categories of Concerns and Challenges

During the guided exercises, workshop participants identified Boxborough's vulnerabilities and strengths to natural hazards. As in any community, Boxborough is not uniformly vulnerable to potential hazards and climate change impacts – certain locations, resources, and populations will be affected to a greater degree than others. Workshop participants identified the following as key areas of concern across three categories – infrastructure, societal, and environmental.

3.1.1 Infrastructure Concerns

- **Road Flooding**: Workshop participants expressed concerns about localized flooding due to low spots in the road. Specific areas of concern included:
  - Littlefield Road near Central Street;
  - Depot Road near Wildlife Management Area and intersection with Liberty Square Road;
  - Davidson Road;
  - Burroughs Road near Wolf Swamp;
  - Sargent Road
  - Near intersection of Hill Road and Cunningham Road;

- Route 111 crossing of Elizabeth Brook;
- Near intersection of Hill Road and Barteau Lane;
- Northern end of land near Cisco campus, near border with Harvard Sportsman's Club;
- State-owned road Route 111 historically floods due to low spots in road. MassDOT and the Town are improving sections of the road and installing a sidewalk. Once work is complete, an additional assessment of other low spots should be conducted.
- Road flooding may limit access to the transfer station on Codman Hill Road as there is only one access road.

- **Municipal Buildings**: Workshop participants expressed concerns about multiple town-owned buildings location in the flood plain. Specific buildings include the following:
  - **Fire Station**: A study has been conducted to develop a new Public Safety and Health Building, including the potential relocation of the facility.
  - **Old DPW Facility:** A new DPW building has recently been constructed. The old facility is located adjacent to wetlands.
- **Private Water Supply**: Workshop participants expressed concerns about the water quality and quantity of drinking water in private wells as many residents rely on private wells as their primary water source.

3.1.2 Societal Concerns

- **Vulnerable Populations**: Multiple climate-vulnerable populations may be impacted by extreme heat and impacts from power outages due to strong storms. Specific concerns related to population include:
  - Many key town facilities do not have generators and cannot be used as cooling/warming stations.
  - Boxborough currently has town programs to assist vulnerable populations (e.g., Boxborough Rental Assistance Program (BRAP), but these programs are not currently used for climate-related needs such as air conditioning/heating.
- **Emergency Alert System**: Workshop participants expressed concern that the current emergency alert system is not adequate for all residents, as it does not work for mobile devices.
- **Insect-Related Illnesses**: Workshop participants expressed concern about climate-related increases in mosquito breeding areas due to increased temperatures and longer periods of standing water due increased precipitation.
- **Respiratory-Related Illnesses**: Workshop participants expressed concern about increases in respiratory illnesses related to impacts to air quality associated with climate change.

3.1.3 Environmental Concerns

- **Invasive Species:** Workshop participants expressed concern about an increase in invasive species throughout the town. Invasive species of concern include garlic mustard, purple loosestrife, Japanese knotweed, bittersweet, and other species.
- **Aquatic Connectivity:** Workshop participants expressed concern about multiple culverts that

have been identified as barriers to aquatic connectivity. An initial culvert assessment has been conducted by the North Atlantic Aquatic Connectivity Collaborative.

- **Greenhouse Gas Emission:** Workshop participants expressed concern about the need to reduce greenhouse gas emissions from town-owned vehicles and facilities. Multiple energy audits of town buildings have been conducted.

4. Current Strengths and Assets

Workshop participants identified the following as Boxborough's key climate change resiliency strengths:

- **Land Protection Opportunities**: Workshop participants indicated that there are multiple opportunities for land conservation and for the installation of nature-based solutions throughout the town.
- **Energy Audits:** The Town has conducted three energy audits of town-owned buildings.
- **Alternative Energy Sources:** The Town is planning to install an electric charging station at the Sargent Memorial Library and has allowed for the installation of a solar site on a commercial property (Cisco).

Meadow/grassland habitat at the Cisco property is only partially protected and could be an important area for future conservation efforts and nature-based solutions for climate resiliency.

5. Recommendations to Improve Resilience

As summarized below, the final step of the workshop was to develop recommended actions to address identified vulnerabilities and to build upon strengths.

- The workshop participants identified potential actions and assigned each action a priority (i.e., high, medium, low), then differentiated them as short-term, long-term, or ongoing efforts.
- After the workshop, the list of the actions identified at the workshop were sent by email to the workshop participants. The workshop participants then ranked the actions as "High," "Medium," or "Low." The rankings were then tallied to determine the Town's three top priority climate resiliency actions as presented in Section 5.1.

5.1 Top Three Recommendations

1. Road Flooding Study

Many of Boxborough's roads flood due to low spots and/or proximity to surface waters, wetlands, and floodplains. This flooding is expected to increase with climate change. Many problem areas have already been identified by the town including a key transportation corridor, Route 111, a state-owned road managed by MassDOT.

While a study is currently underway to assess and prioritize culverts for retrofits, it is recommended that the Town conduct a town-wide stormwater study to assess and further prioritize areas for re-design and retrofit to minimize flooding. The study should build off the current culvert assessment and include areas of flooding due to low spots in the road. A focus should be placed on major egress and collector roads including Route 111. Given ongoing efforts, it is recommended that the following phases within this plan be performed concurrently:

- Assess: Expand the culvert assessment currently being conducted in to include additional information related to climate resiliency. This could include additional engineering assessments and flood modeling relative to potential future higher intensity storms, and prioritized recommendations for repairs. Expand existing studies to include low spots in the road.
- Repair: Repair roadways and culverts based on recommendations from the assessment. Repair steps would include: engineering feasibility analysis (i.e., modeling, conceptual design), permitting, engineering design, and repair.

The Town is currently building a sidewalk along Route 111 from the public library to Liberty Square Road. This project has included coordinating with MassDOT to improve drainage on sections of the road. It is recommended that this coordination continue after the sidewalk project is complete to identify other areas for flooding improvement along Route 111.

2. Identify Alternative Drinking Water Sources

Many residents in the Town of Boxborough rely on private wells for drinking water. Particularly in the western portion of Town, the water quality and water quantity of these wells are vulnerable to drought and flood impacts (e.g., potential flood impacts from the MassDOT salt storage area on Swanson Road).

Boxborough's Water Resources Committee is currently reviewing alternative sources for wells in the western portion of Town. Based on the results of the Committee's work, explore options for supplemental funding sources to acquire identified land. Funding sources may include an MVP Action Grant or other funding sources identified in Section 6.

3. Conversion of Town-Owned Vehicles to Electric or Hybrid

In an effort to reduce greenhouse gas emissions from town-owned vehicles, convert select town vehicles to electric or hybrid vehicles where appropriate. Though large DPW vehicles such as plow trucks would not be appropriate to convert, smaller vehicles, such as police vehicles, Building Inspector, Planning, etc. may be appropriate for conversion. In addition, an electric charging station is currently slated to be installed at the Sargent Memorial Library. Consider other locations in town to install electric charging station such as the Town Hall. Funding sources may include an MVP Action Grant or other funding sources identified in Section 6.

5.2 Other Prioritized Recommendations

Higher Priority

- Review the list of conservation priorities in the OSRP and develop a list of additional priorities which reflect climate change resiliency goals. This effort could include additional flood modeling relative to potential future higher intensity storms associated with climate change or a review of vegetation that may be at risk due to increased temperatures.
- Identify “climate-resilient” tasks that would be included in the development of the new Public Safety and Health Building (Police and Fire Departments).
- Identify key parcels for future water supply climate resiliency in regards to water level and water quality. Drinking water impacts in private wells, particularly in the western portion of town may be at risk due to climate change.

Moderate Priority

- Conduct a study to determine the feasibility of relocating the DPW yard or installing stormwater BMPs and secondary containment for material storage at the facility to decrease flood risk. The DPW yard is located adjacent to wetlands and houses DPW stockpiles, the town salt shed, and a fueling station. It is also the location for household hazardous waste collection. Flooding of this facility due to climate change could result in the discharge of hazardous materials to adjacent wetlands.
- Determine the feasibility of retrofitting existing buildings to support solar arrays and develop a program to encourage solar on residential properties.
- Review recently-conducted energy audits of town-owned buildings to determine locations that may be appropriate for solar installation and to update town facilities as recommended in the audits to reduce greenhouse gas emissions.

Lower Priority

- Conduct a study to determine alternative options for accessing the transfer station, as road flooding may limit access to the facility.
- To limit wind damage to municipal utility infrastructure, review options to strengthen town regulations by increasing the size of vegetation buffers required for new developments and redevelopment.
- Explore adding mobile devices to the current public alert system as it may not be available to all populations (e.g., renters, people without landlines).

- Assess potential for library to be used as a cooling/warming station if it had a backup generator/solar battery.
- Continue to provide for mosquito control as needed in response to potential increased mosquito activity due to a warming climate. Provide additional clinics at the new Public Health and Safety Building to address increased health needs associated with climate change (e.g., mosquito-borne diseases, respiratory illnesses).
- Assess possibility of expanding Boxborough Rental Assistance Program (BRAP) to assist vulnerable populations in climate change-related needs such as air conditioning and heating. Consult with town counsel to determine if the "No Aid" amendment would limit funds for private residents.
- Review the initial culvert assessment conducted by the North Atlantic Aquatic Connectivity Collaborative and conduct engineering and design as needed to retrofit the top three priority culverts identified as barriers to aquatic connectivity (Beaver Brook Road (just north of Fifer's Field), Hill Road/Barteau Lane, and Rt.111 crossing at Beaver Brook).
- Develop a town-wide management plan for invasive species and develop a public education program to inform the public about invasive species.
- Work with the USDA-NRCS to assess climate resiliency needs for at-risk farmers in Boxborough. Identify funding options available.
- Assess opportunities for tree planning, buffer zone improvements, reforestation, etc. to provide natural air quality protection.
- Assess town facilities to install electric charging stations.

As previously discussed, this list of prioritized recommendations was developed by workshop participants based on identified vulnerabilities.

- It is recommended that the Town create a committee or working group to implement recommendations from this plan. Specifically, the committee or working group would develop an anticipated timeline, determine potential funding requirements, then apply for local, state or federal grant funding to implement prioritized recommendations.
- It is also recommended that this report be reviewed and updated annually as actions are completed and/or new needs are identified.

6. Funding Source Assessment

A summary of potential funding sources for climate resiliency projects is provided below.

Climate Resiliency Programs

Municipal Vulnerability Preparedness (MVP) Grant Program
Agency: Massachusetts Executive Office of Energy and Environmental Affairs (EEA)

The MVP grant program provides support for cities and towns in Massachusetts to being the process of planning for climate change resiliency and implementing priority projects. The state awards communities with funding to complete vulnerability assessments and develop action-oriented resiliency plans. Communities who complete an MVP planning grant become certified as an MVP community and are eligible for MVP Action Grant funding and other opportunities. Link to MVP Grant Program

Planning and Implementation Programs

604b Water Quality Management Planning Grant Program
Agency: Massachusetts Department of Environmental Protection (MassDEP)

The 604b grant program provides funds for water quality assessment and management planning. In cases where water body data is limited or does not exist, information collected through these grant projects (e.g., water quality monitoring) can provide the foundation to support 319 grant projects. ***No local match is required for these grants***. Link to MassDEP 604b Program

319 Nonpoint Source Grant Program
Agency: Massachusetts Department of Environmental Protection (MassDEP)

The 319-grant program provides funds to control nonpoint source pollution. These grants can be used for projects to help restore impaired water bodies and to protect high quality water bodies. ***A minimum of 40% non-federal match is required for these grants***. Link to MassDEP 319 Program

Habitat Improvement Programs

Massachusetts Division of Ecological Restoration (DER) Grant Programs
Agency: Massachusetts Department of Fish and Game

- The **Culvert Replacement Municipal Assistance Grant Program** is for municipalities interested in replacing an undersized, perched, and/or degraded culvert located in an area of high ecological value. This funding is to encourage municipalities to replace aging culverts with better designed crossings that meet improved structural and environmental design standards and flood resiliency criteria. Link to DER Culvert Replacement Assistance Grant Program
- The **Restoration and Revitalization Priority Projects Program** selects projects that restore and protect Massachusetts rivers, wetlands, and watersheds for the benefit of people and the environment. The Priority Projects Program selects ecological and urban stream revitalization projects that present significant benefits to Massachusetts. Eligible applicants include restoration project site landowners, non-profit and/or non-governmental organizations, regional planning organizations, municipalities, and state and federal agencies. Current project focus is on cranberry bog wetland restoration, stream restoration, and urban stream and river revitalization. Link to DER Priority Project Program

Agricultural Programs

Natural Resources Conservation Service (NRCS) Financial Assistance Programs

Agency: United States Department of Agriculture

- **Environmental Quality Incentives Program (EQIP)** provides financial and technical assistance to agricultural producers to address natural resources concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, reduced soil erosion, and improved wildlife habitat. Link to EQIP Program
- **Conservation Stewardship Program (CSP)** is the largest conservation program in the United States with a goal of enhancing natural resources and improving agricultural operations. The program helps agricultural operations build on existing conservation efforts while strengthening their operations. The program focuses on improving grazing conditions, increasing crop yields, developing wildlife habitat, and increasing resilience to weather extremes. Link to CSP Program

Climate Smart Agriculture Program (CSAP) Grants
Agency: Massachusetts Department of Agricultural Resources

MDAR offers various grants and funding programs for agricultural projects. The CSAP program links MDAR's water, energy, and climate grants together into one application. This program implements projects that help the agricultural sector adapt to climate change, mitigate climate change, reduce or prevent impacts to natural resources that may result from agricultural practices, and that improve energy efficiency and facilitate adoption of alternative clean energy technologies. Link to the CSAP Program.

Other Programs

State Revolving Fund (SRF) Clean Water Program
Agency: Massachusetts Department of Environmental Protection (MassDEP)

The SRF Clean Water program provides a low-cost financing method to help communities meet water quality standards. The program addresses issues such as watershed management priorities, stormwater management, and green infrastructure. SRF also supplies financial assistance to address communities with septic systems. Link to SRF Program

Summaries of other grant programs can be found at:

https://www.mass.gov/files/documents/2016/08/vg/grants-directory.pdf

7. Public Listening Session

Workshop findings were presented to the general public during a listening session held during a meeting of the Boxborough Board of Selectmen on March 1, 2021. No questions or other feedback on the listening session were received during the session or via the feedback request. Information about the listening session was advertised as follows:

- Included on the publicly noticed Board of Selectmen agenda and posted on the Town website;
- Posted in hard copy within the Town Hall building;
- Posted on the Town's Facebook and Twitter pages;
- The listening session PowerPoint slides and contact information to provide feedback were posted to the Town website.
- In addition to the public listening session, all materials from the MVP Planning Grant project have been made available on the Town of Boxborough website.

8. Report Citation

Comprehensive Environmental, Inc. (2021). Community Resiliency Building Workshop Summary of Findings. Town of Boxborough, Massachusetts.

Appendix A: Introductory Presentation Materials and Base Maps

TOWN OF BOXBOROUGH
MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM

Climate Change and Natural Hazard Vulnerability Assessment

WORKSHOP MAP PACKAGE – MARCH 2020

List of Maps:

- Town Base Map 24x36
- Town Base Map 11x17
- FEMA National Flood Hazard
- Impervious Surfaces and Zoning
- Wetlands and Critical Habitats
- Public Water Supplies and Wellhead Protection Areas

Map Layer:	**Source:**
Town Hall	MassGIS
Fire Stations	MassGIS
Police Stations	MassGIS
Library	MassGIS
Schools	MassGIS
Dams	MassGIS
Public Water Supplies	MassGIS
Certified Vernal Pools	MassGIS
FEMA National Flood Hazard	MassGIS
DEP Wetlands	MassGIS
NHESP Estimated Habitats of Rare Wildlife	MassGIS
NHESP Priority Habitats of Rare Species	MassGIS
BioMap2 Core Habitat	MassGIS
BioMap2 Critical Natural Landscape	MassGIS
Zone I Wellhead Protection Areas	MassGIS
Zone II Wellhead Protection Areas	MassGIS
Interim Wellhead Protection Areas	MassGIS
Impervious Surfaces	MassGIS
Hydrography	MassGIS
Roads	MassGIS
Zoning	Town of Boxborough

LITTLETON

HARVARD

ACTON

STOW

BOLTON

USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

Figure 1
Town Base Map

Municipal Vulnerability Preparedness Program
Boxborough, MA

Comprehensive Environmental Incorporated

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Miles

Data Source: MassGIS

- Town Hall
- Local Police
- Fire Stations
- Libraries
- Public School

Public Water Supplies

- Community Groundwater Source
- Non-Community Groundwater Source

3/3/2020

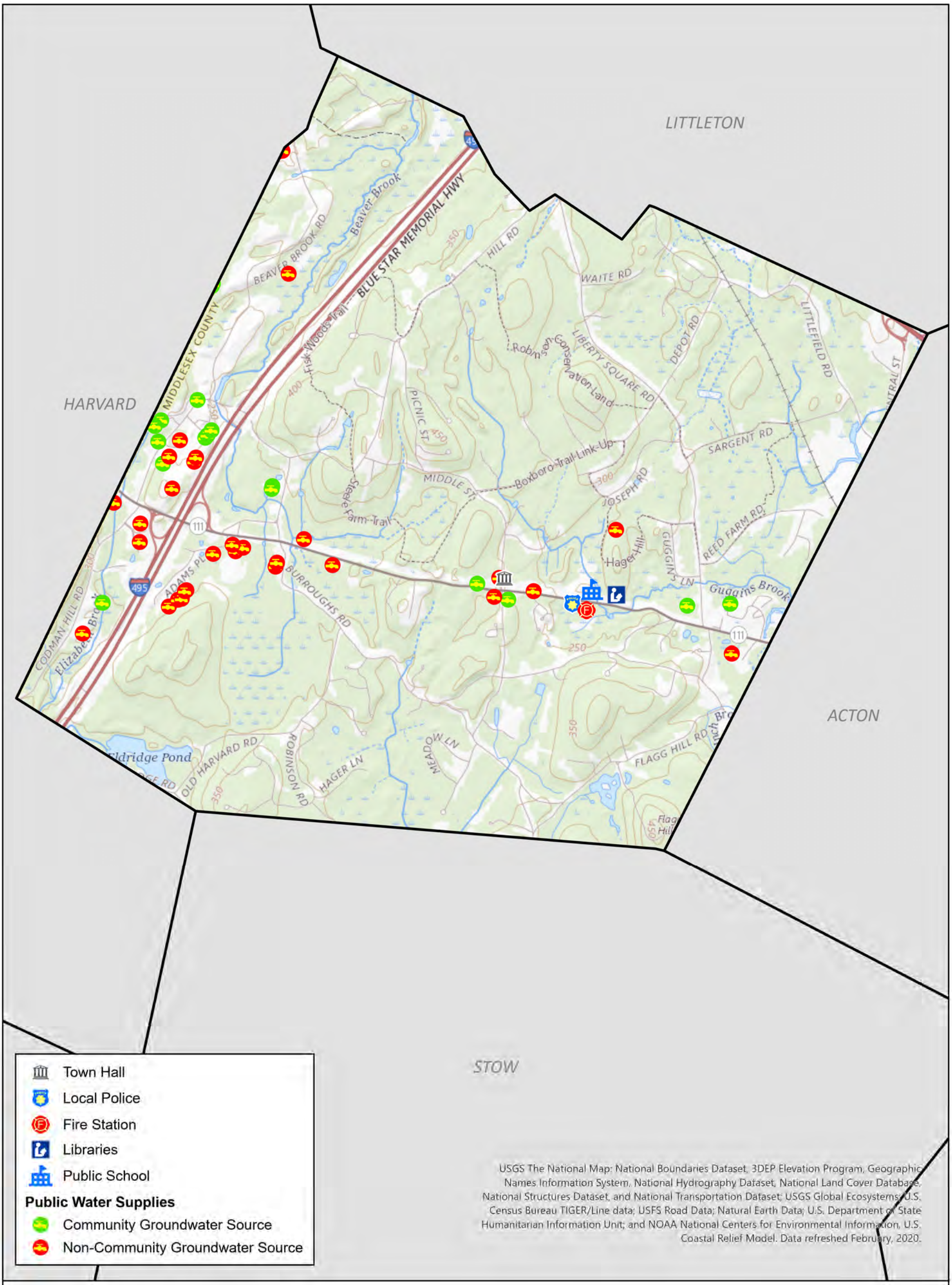

Figure 1
Town Base Map

Municipal Vulnerability Preparedness Program
Boxborough, MA

Comprehensive Environmental Incorporated

Data Source: MassGIS

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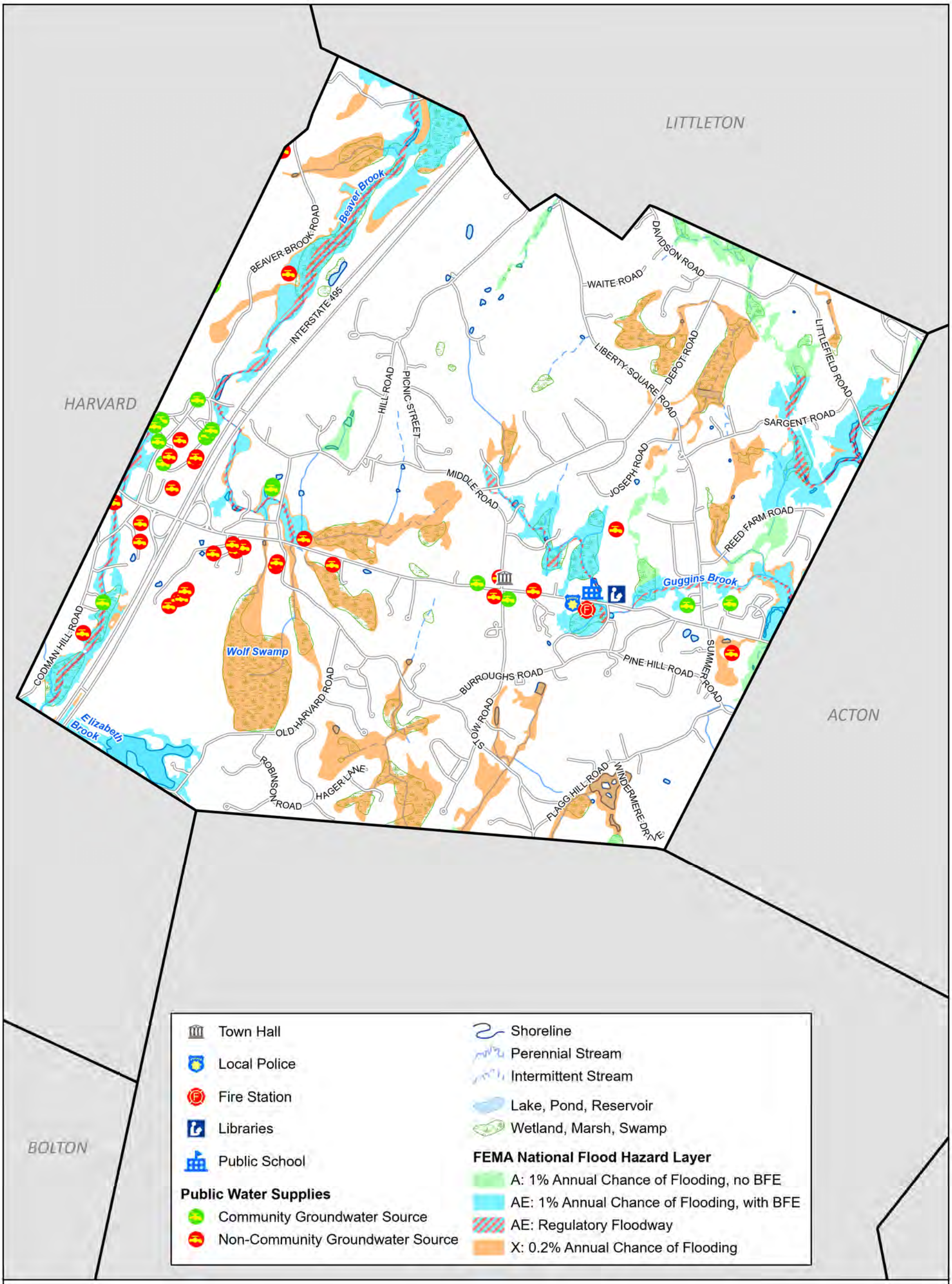

Figure 2
FEMA National Flood Hazard

Municipal Vulnerability Preparedness Program
Boxborough, MA

Comprehensive Environmental Incorporated

Data Source: MassGIS

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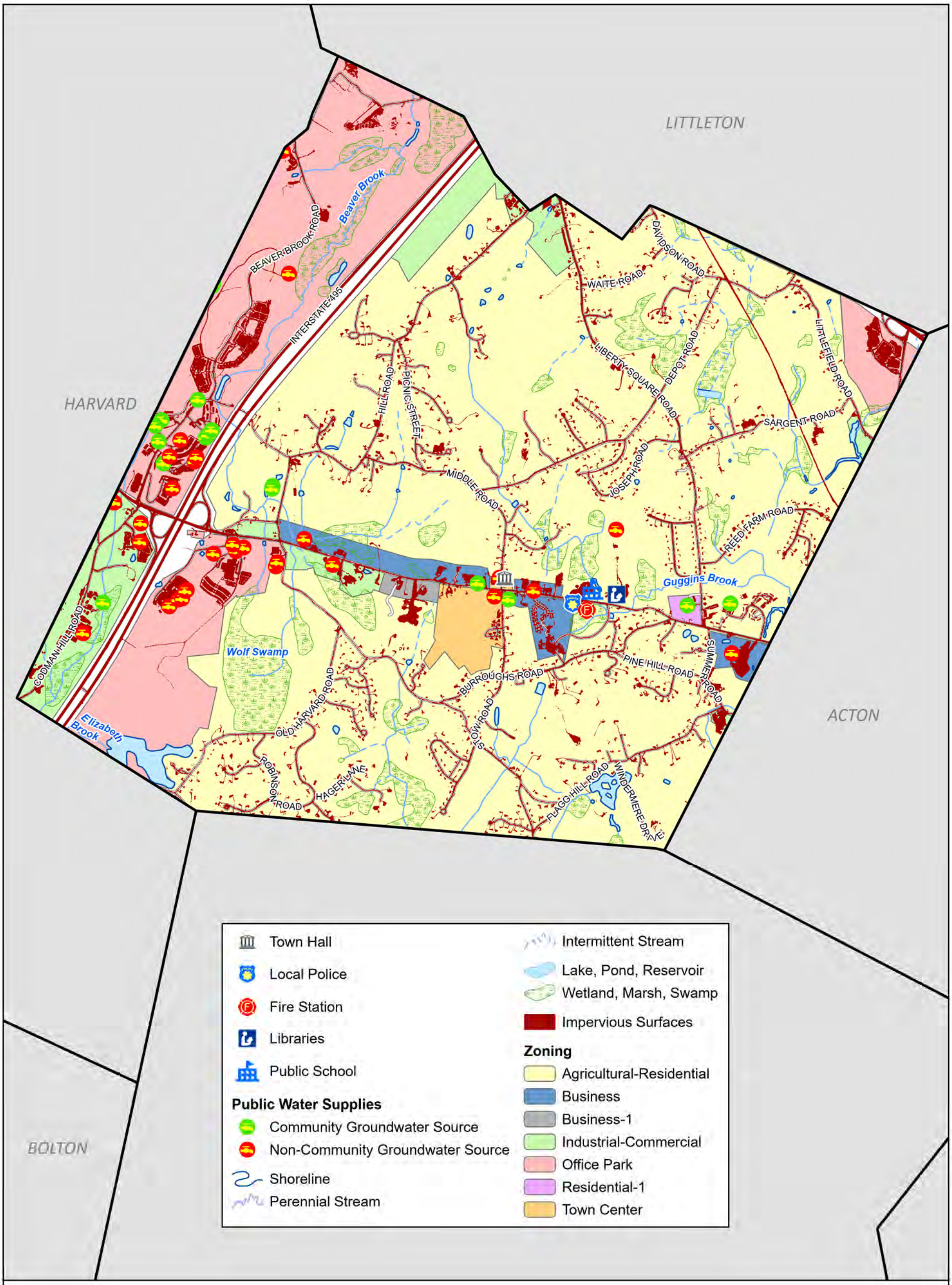

Figure 3
Impervious Surfaces and Zoning

Municipal Vulnerability Preparedness Program
Boxborough, MA

Comprehensive Environmental Incorporated

Data Source: MassGIS, Town of Boxborough

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3/3/2020

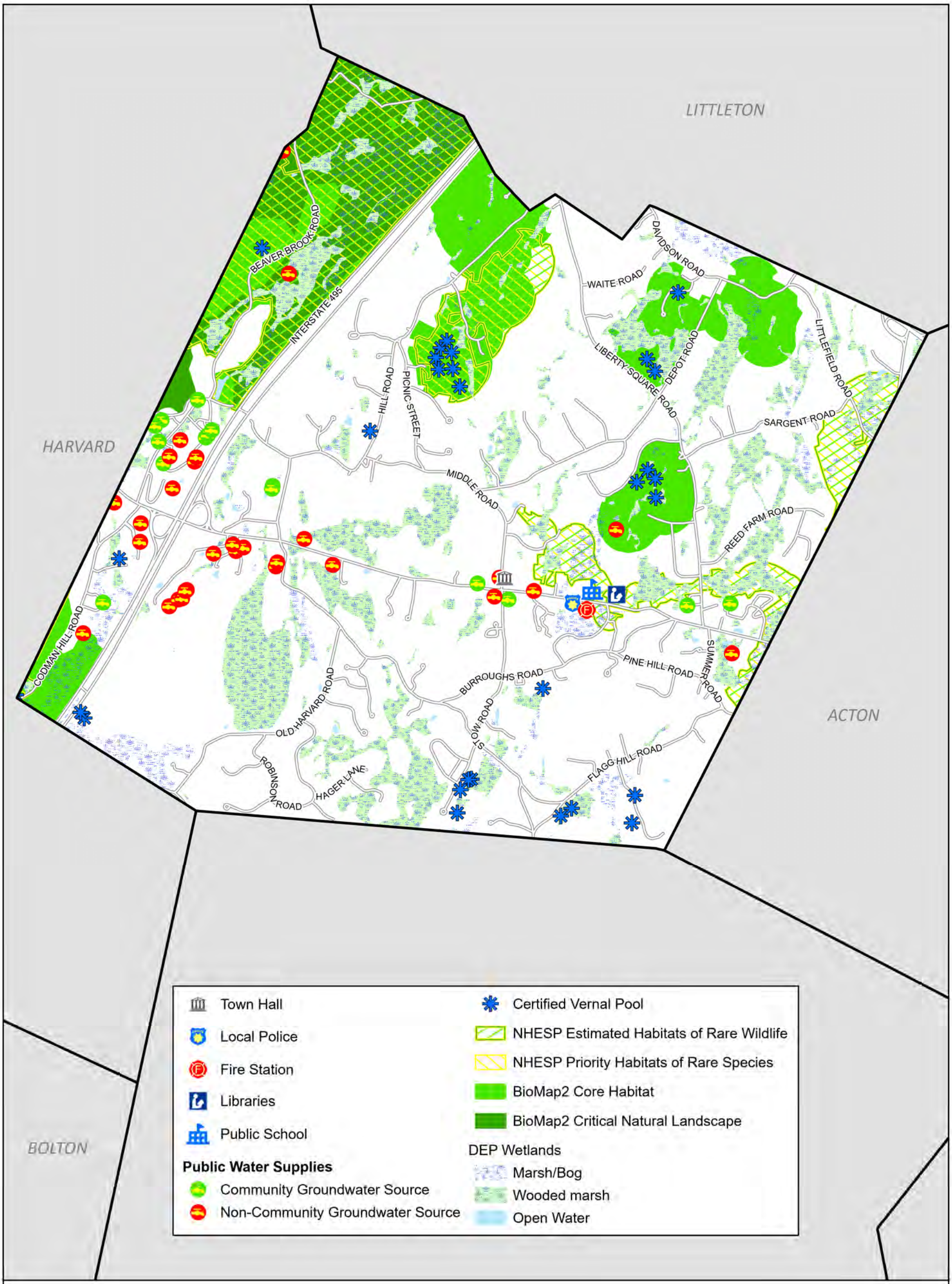

Figure 4
Wetlands, Rare Species, and Critical Habitat Areas

Municipal Vulnerability Preparedness Program
Boxborough, MA

Comprehensive Environmental Incorporated

Data Source: MassGIS

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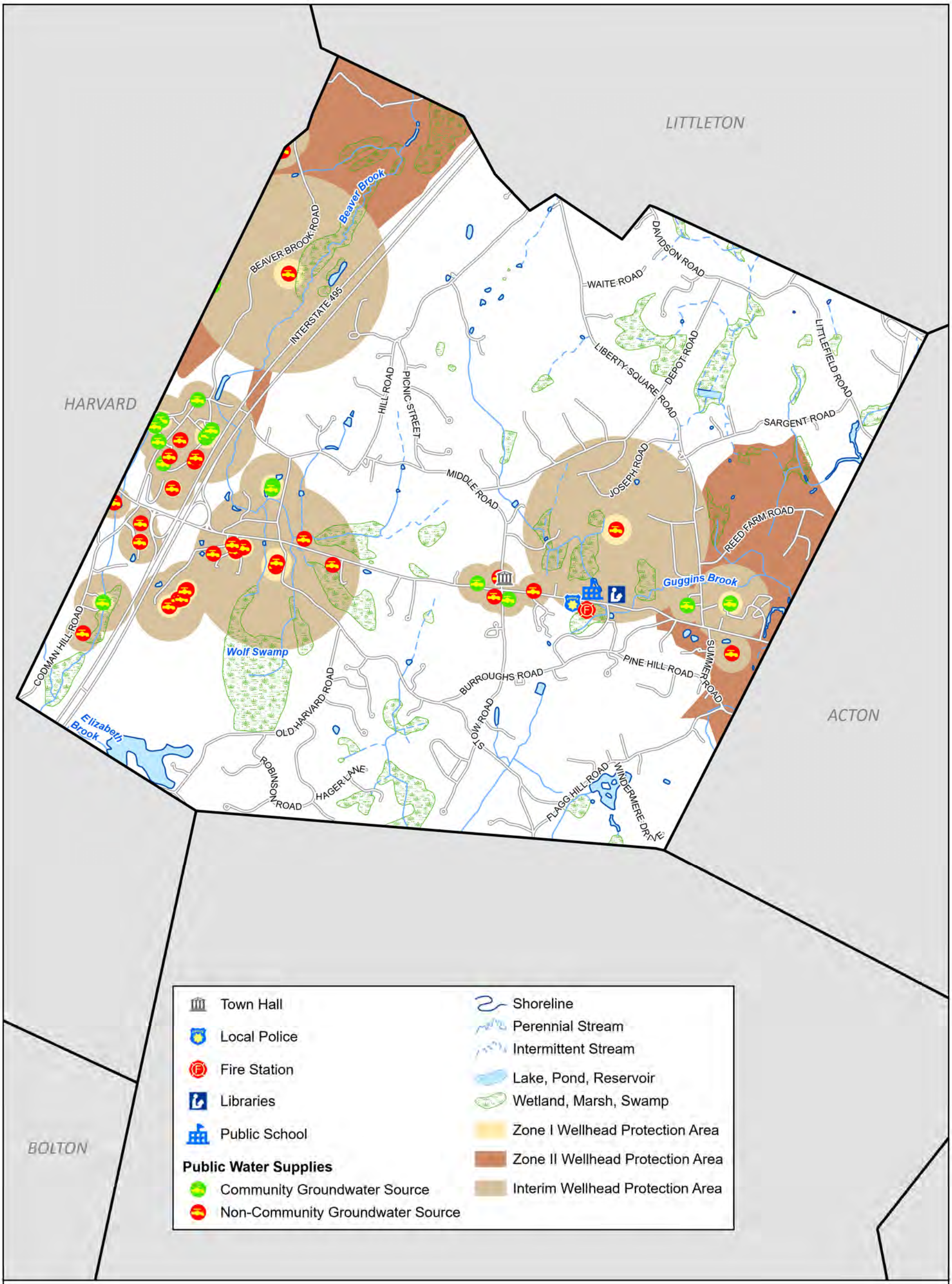

Figure 5
Public Water Supplies and Wellhead Protection Areas

Municipal Vulnerability Preparedness Program
Boxborough, MA

Comprehensive Environmental Incorporated

Data Source: MassGIS

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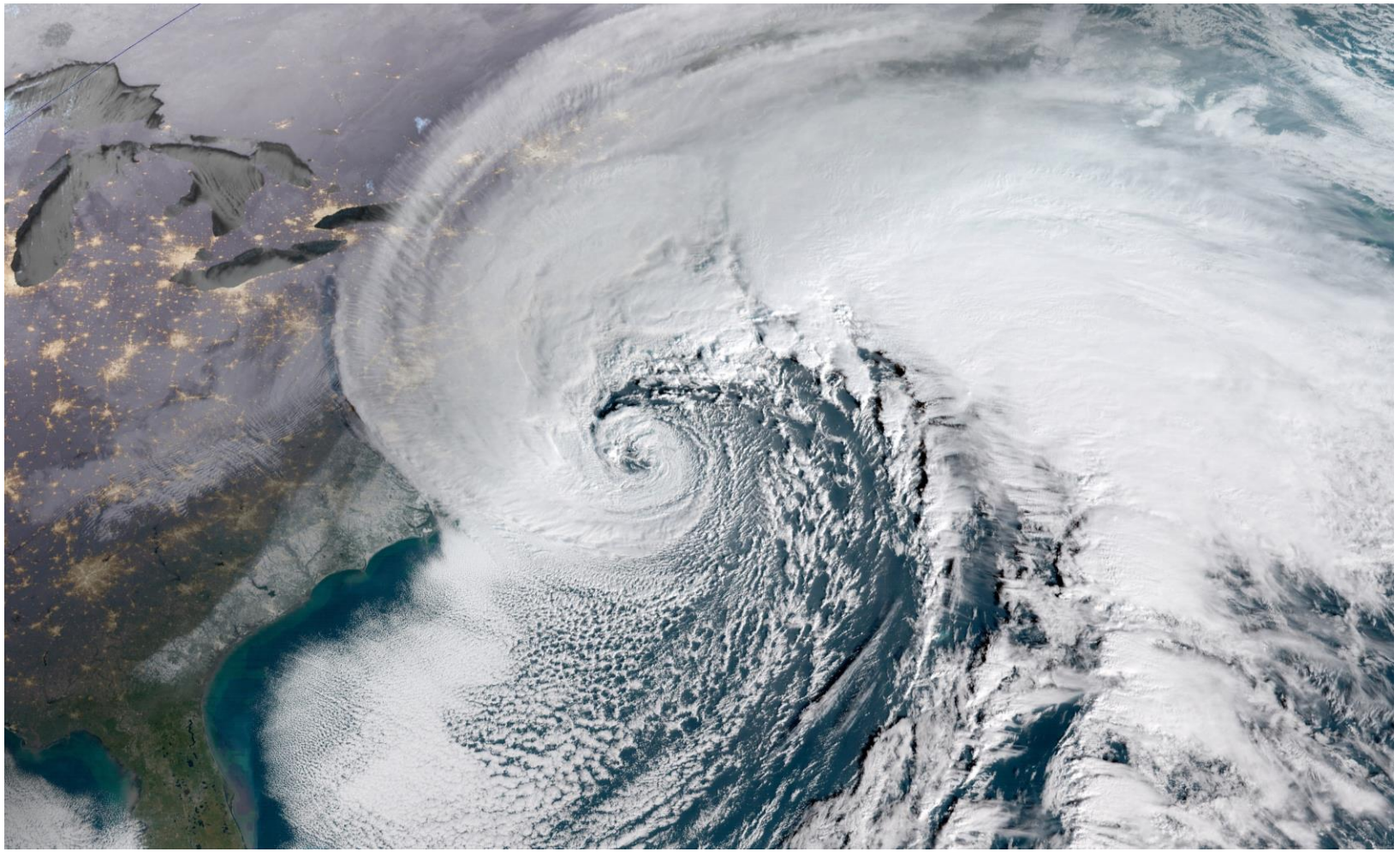
Miles

3/3/2020

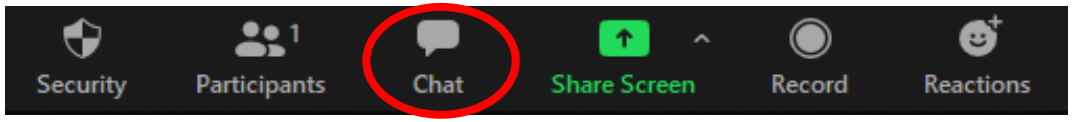
Town of Boxborough

Municipal Vulnerability Preparedness Program
Community Resiliency Building Workshop

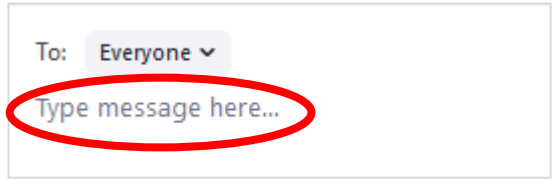


Introductions

1. **Click "Chat" on banner at bottom screen**



2. **Type name and organization** (chat box at lower right corner of screen)



3. **Use chat to ask questions during intro presentation…group discussion at end of presentation**

In case of Zoom problems: edifranco@ceiengineers.com or 603-343-6311

Workshop Agenda

Part 1:
July 15, 2020

- **Introductory Presentations**
- **Group Exercises**

1: Identify Top Hazards

2: Identify Vulnerabilities and Strengths

Part 2:
Date, 2020

3: Identify Actions to Reduce Vulnerabilities

4: Prioritize Top Actions

Workshop Overview

MVP Program Summary

EXECUTIVE ORDER 569 2016

- Reducing greenhouse gas emissions to combat climate change
- Preparing for the impacts of climate change
  - State Adaptation Plan
  - Climate Coordinators
  - Agency Vulnerability Assessments
  - Municipal Support

ENVIRONMENTAL BOND 2018

- $2.4 billion bond bill with focus on climate change resiliency
- Over $200 million authorized for climate change adaptation
- **Codifies EO 569, including the MVP Program**

Source: https://www.mass.gov/files/documents/2019/07/16/mvp-grant-program-overview-2019-mvp-vendor-training.pdf

MVP Process

Obtain Planning Grant

Complete Workshop

- Identify Actions to Address Vulnerabilities
- Write Report

Become Certified MVP Community

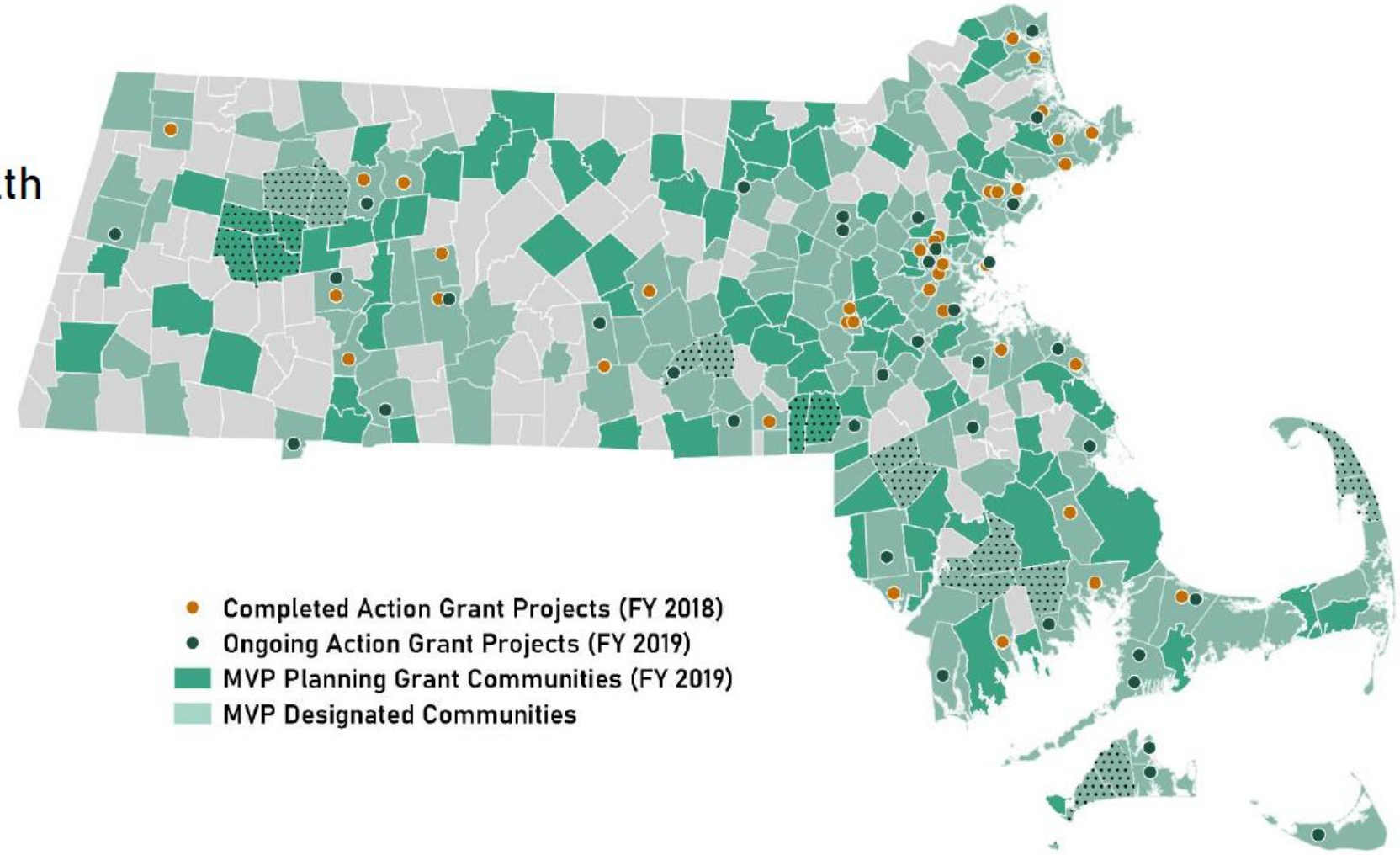
- Eligible for Grant Funding to Implement Actions

Three Years of MVP

MVP Designations
71% of the Commonwealth
249 communities

Action Grant Projects
FY 18: 37
FY 19: 36

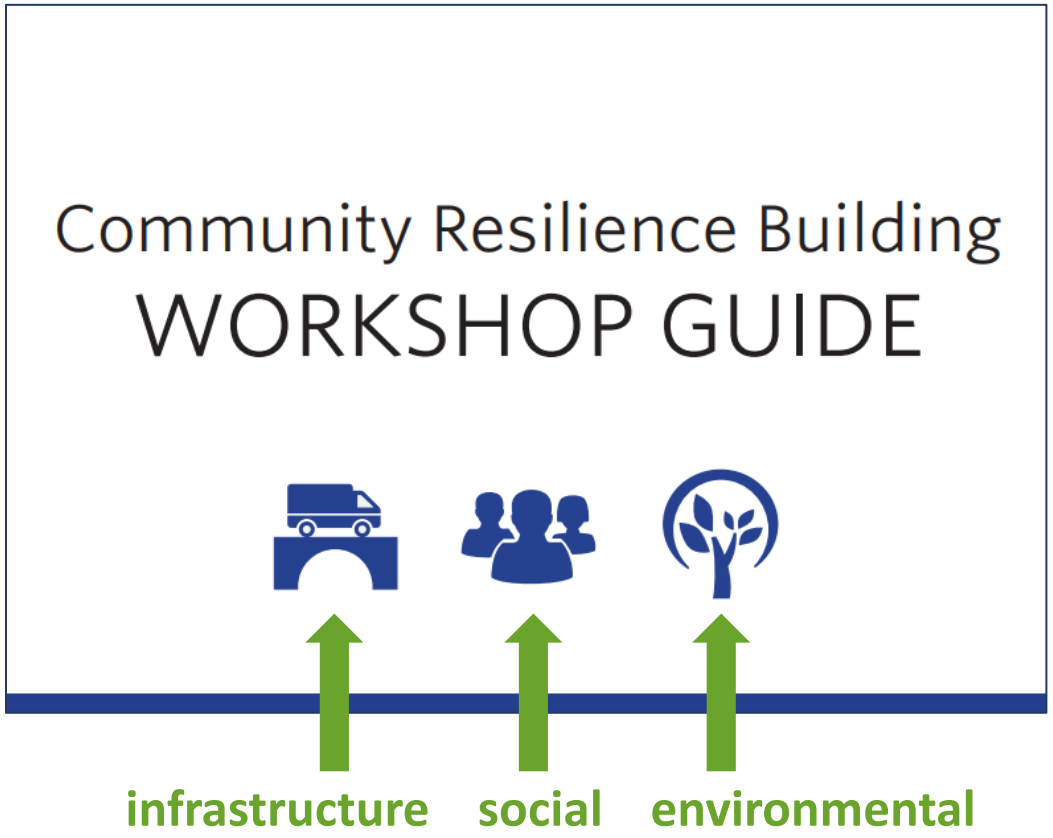
Total Awards
$17M+ in planning and action grants to date



Workshop Purpose

Use Community Resilience Building Workshop Guide to:

- Complete **baseline assessment** of climate change and natural hazard vulnerability
- Develop **specific actions** to address priority hazards/vulnerabilities



MVP Action Grants: Project Types

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

* Most common project type

** Second-most common project type

***Third-most common project type

MVP Action Grants: Project Types (cont.)

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

NEW IN 2019

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

\+ Expanded eligibility of project location

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

Redesigns and Retrofits

Salisbury

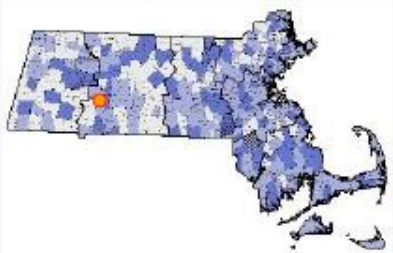
Increasing the resilience of the neighborhood of Ring's Island by raising its access/egress roads and by improving tidal flushing through culvert replacements

Vulnerable communities

FY18 Action Grant Projects

Detailed Vulnerability and Risk Assessment, Further Planning

Holyoke

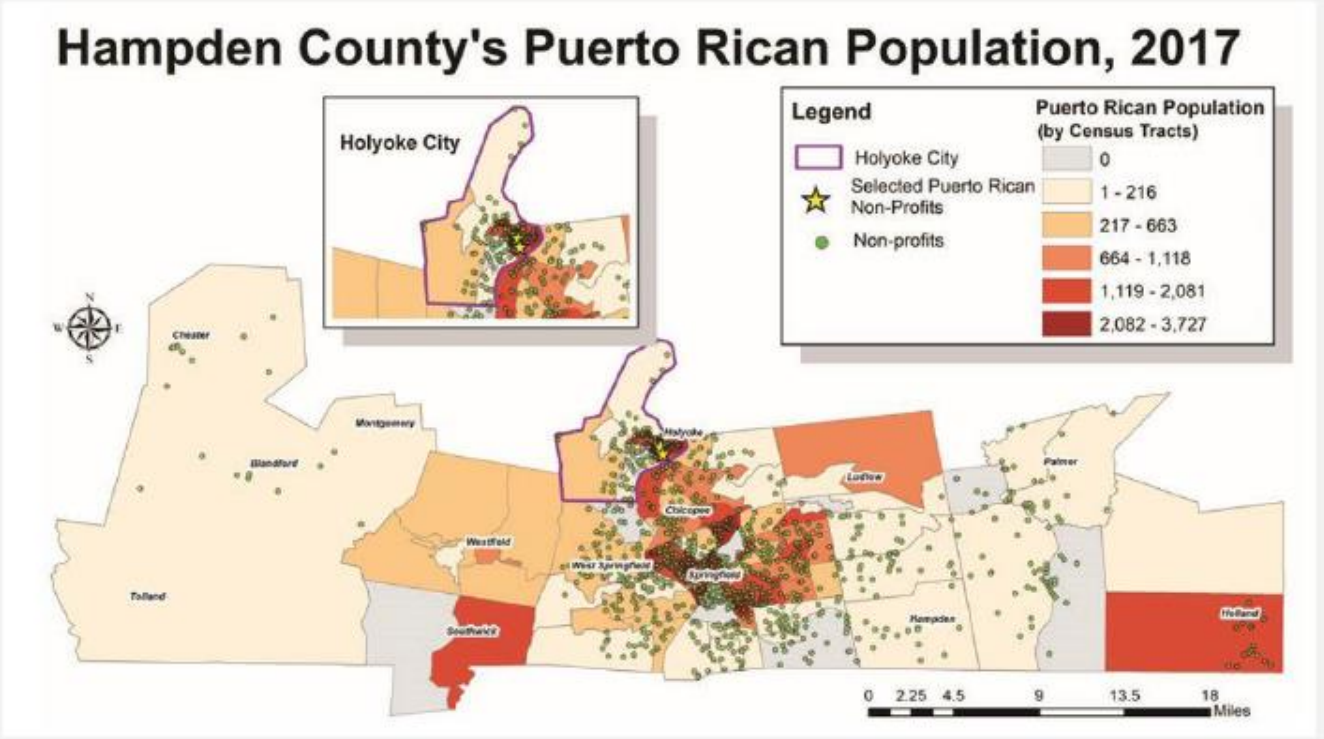


Conducted a detailed demographic analysis of individuals who arrived in Holyoke from Puerto Rico as a result of Hurricane Maria and develop recommendations for planning for future climate change migrants in Holyoke

Informational graphics from Holyoke's final report

Table 12

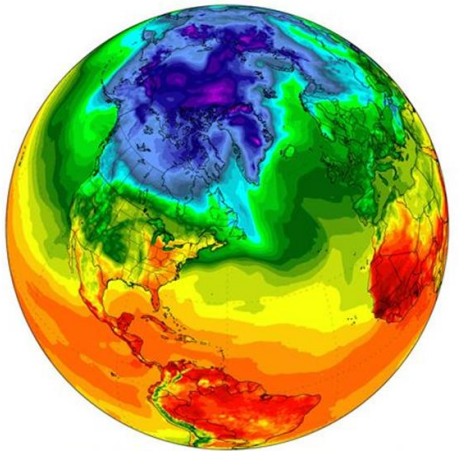
How did the Holyoke municipal government respond to your needs? Was the response...	Freq.	Percent
Helpful	26	63.4
I don't know	7	17.1
Neither helpful nor unhelpful	2	4.9
There was no response from this resource	6	14.6
Total	**41**	**100**



Climate Change 101

WEATHER vs CLIMATE

Atmospheric observations down to the minute	Weather statistics over a period of time (30 years)
Weather is what you get	Climate is what you expect
EX: Nor'easter, hurricane, heat wave	EX: Average high and low temperatures



How Does Climate Change Work?

The heat-trapping blanket metaphor

- The atmosphere is like a blanket that surrounds the earth.
- Burning fossil fuels adds more carbon dioxide to the atmosphere and makes the blanket thicker.
- The blanket has become too thick. It's trapping in too much heat, and the planet is warming up too fast.

Massachusetts
Observed Climate Changes

Temperature: **2.9°F**

Since 1895 (Statewide)

Growing Season: **15 Days**

Since 1950

Sea Level Rise: **11 inches**

Since 1922 (Boston)

Heavy Precipitation: **55%**

Since 1958

Source: Climate Science Special Report, 2017; NOAA NCEI nClimDiv; NOAA Ocean Service

Consequences

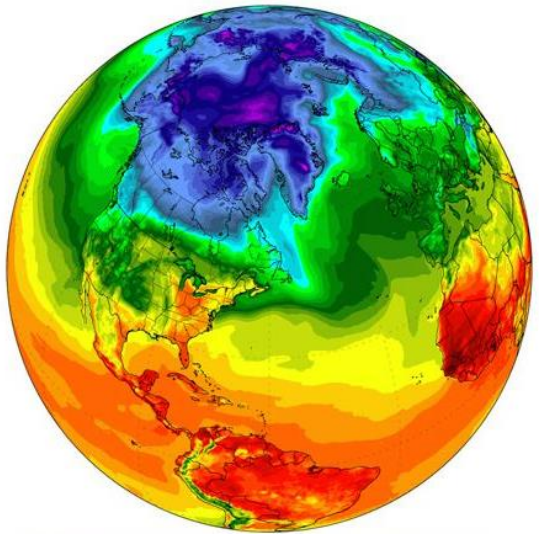
Changes in precipitation
- Inland flooding
- Drought

Rising Temperatures
- Wildfires
- Invasive species/pests

Extreme Weather
- Hurricanes/tornadoes
- Severe winter storms

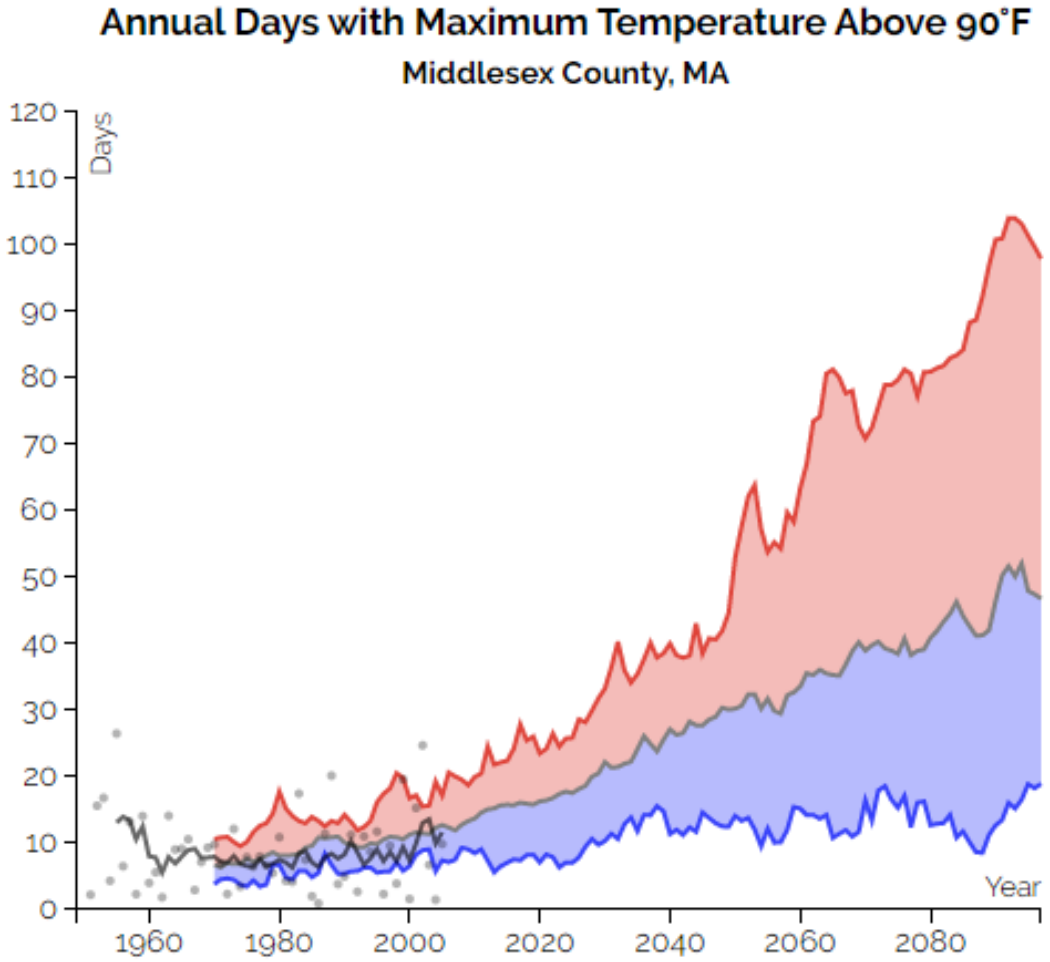
Human-induced hazards
- Loss of habitat/floodplains
- Overuse of fertilizers/pesticides

Boxborough
Climate Projections



Hotter…by 2040, days per year over 90 F will almost double

TEMPERATURE



Download Data

Observed

days

5-yr Mean

Modeled days

Max

Median

Min

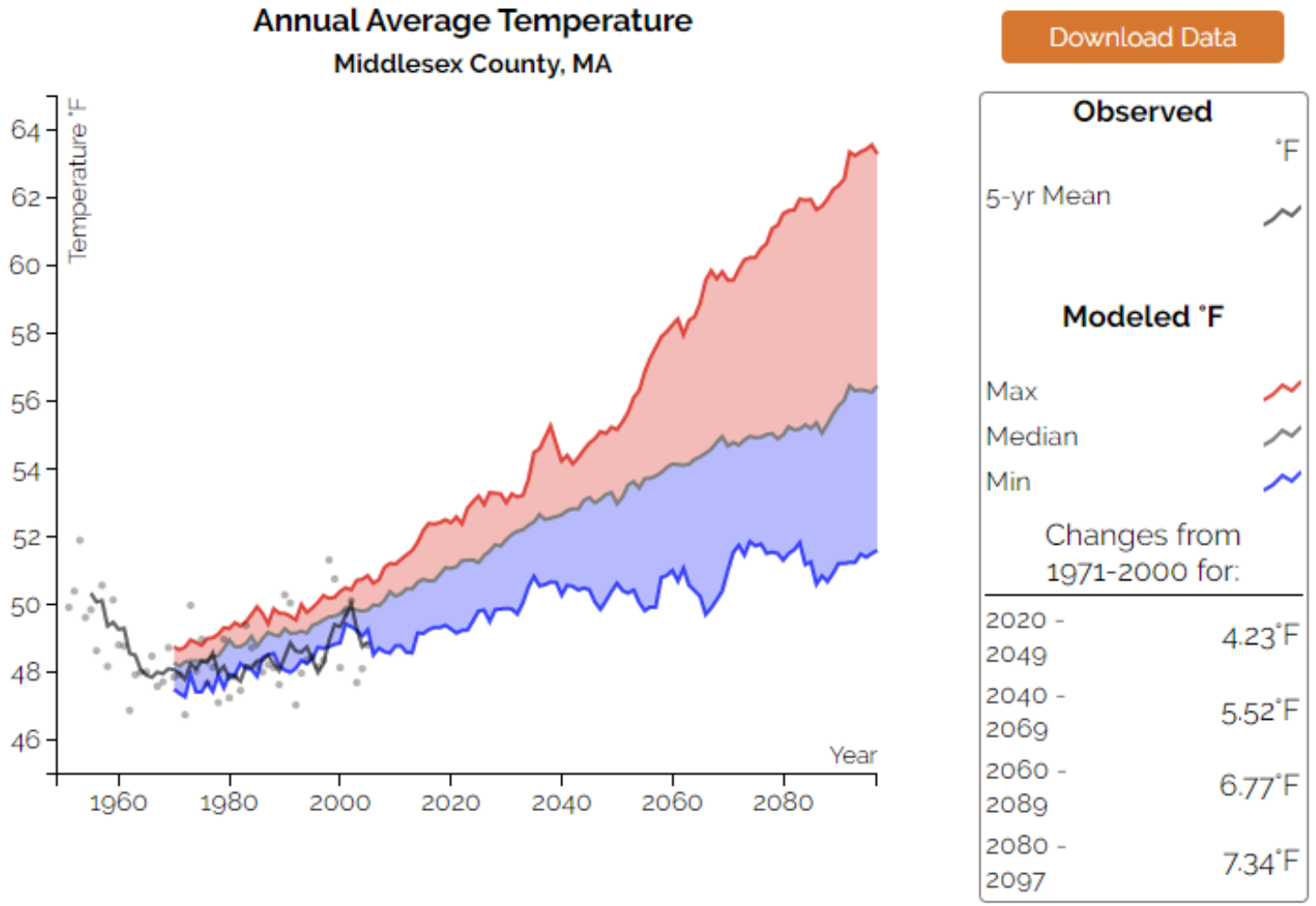
Changes from 1971-2000 for:

2020 - 2049	16.30 days
2040 - 2069	24.47 days
2060 - 2089	32.49 days
2080 - 2097	38.67 days

http://resilientma.org

Hotter…average annual temperature steadily increasing

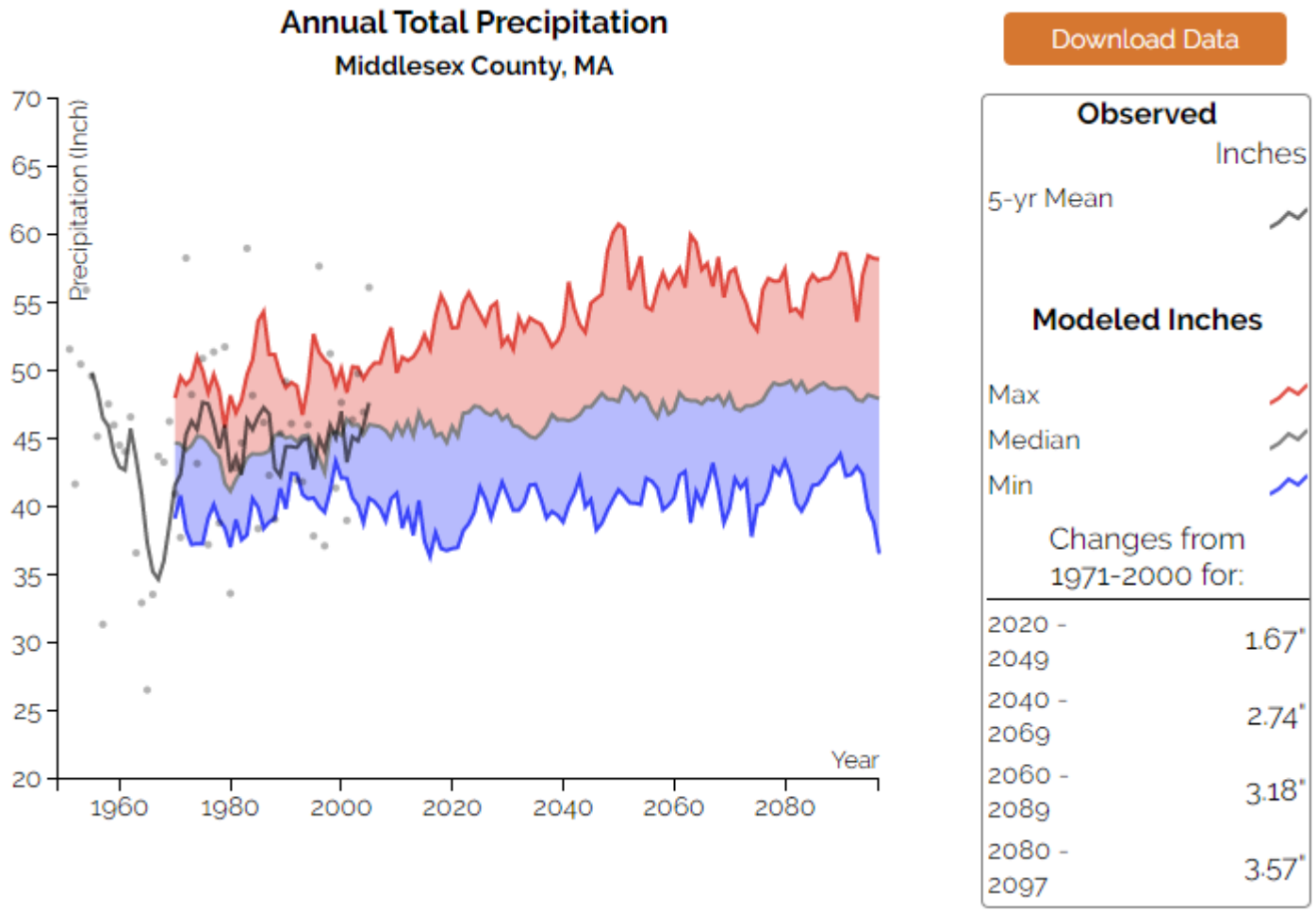
TEMPERATURE



http://resilientma.org

Wetter…increasing average annual rainfall

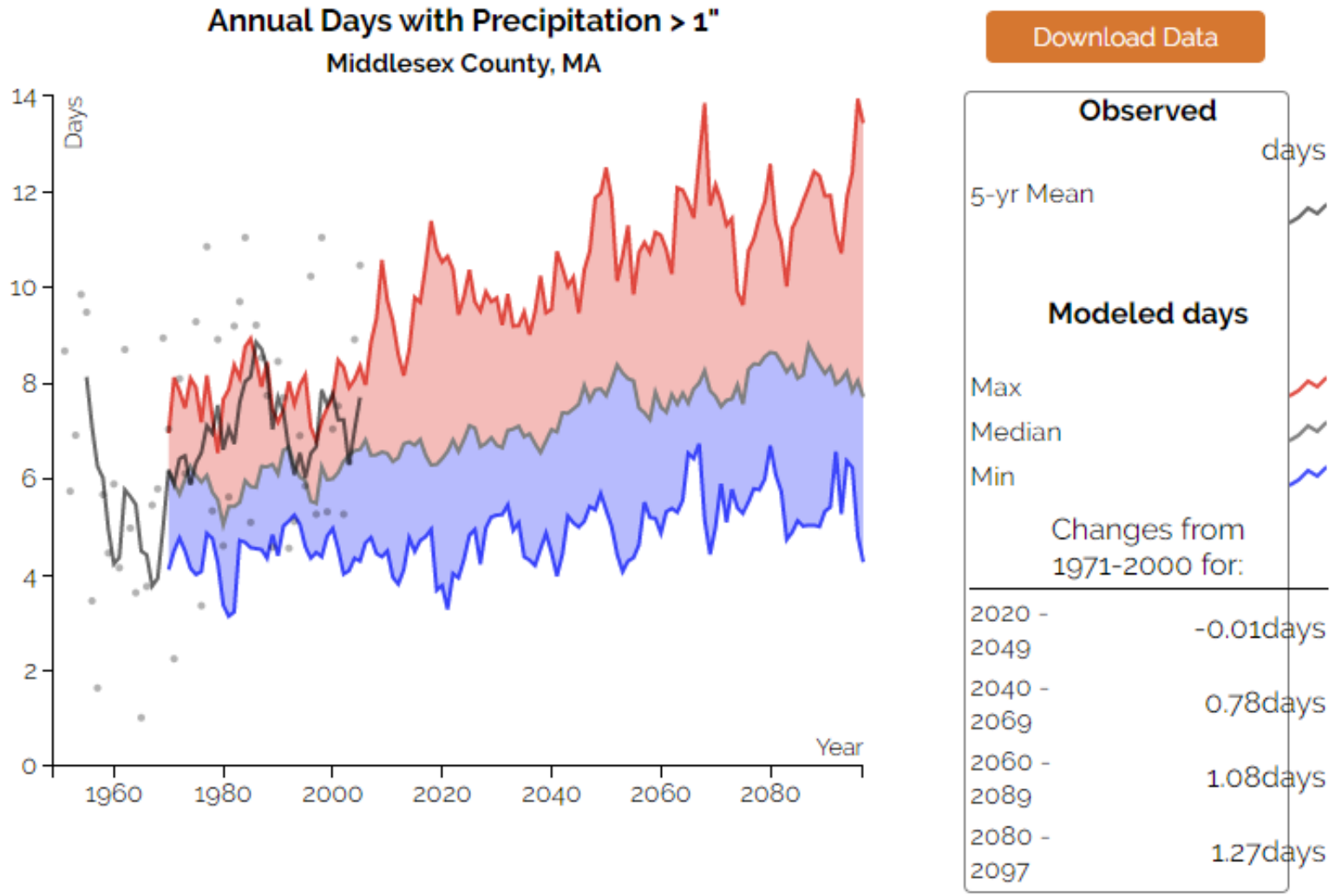
PRECIPITATION



http://resilientma.org

Wetter…more frequent intense precipitation events

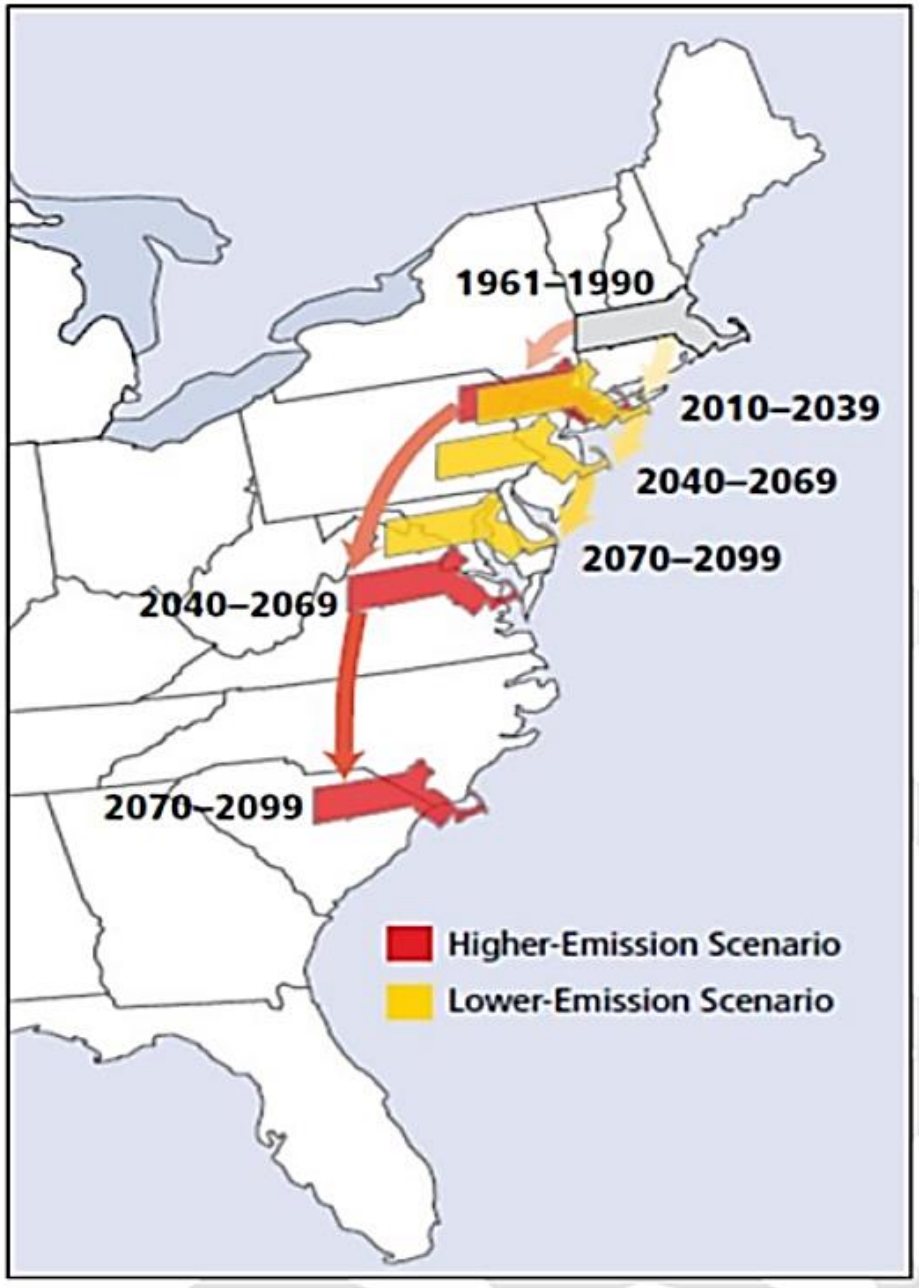
PRECIPITATION



http://resilientma.org

What do these Projections Mean?

(relative to temperature)



Source: https://www.yarmouth.ma.us/DocumentCenter/View/11769/MVP-Listening-Session-Presentation?bidId=

Nature Based Green Infrastructure

Vegetated Buffers
(Reforestation, bank restoration, etc.)

- Pollutant Uptake /Filtering
- Habitat / Wildlife Food Source
- Shading
- Aesthetics
- Flood attenuation

Land Protection

(acquisition, conservation restrictions, etc.)

Steele Farm (conservation restriction)

Improved Stream Crossings

- Flood flow passage
- Streambank stability
- Wildlife passage

Low Impact Development (LID)

An ecosystem-based approach to land development and stormwater management

Mimic pre-development site hydrology!





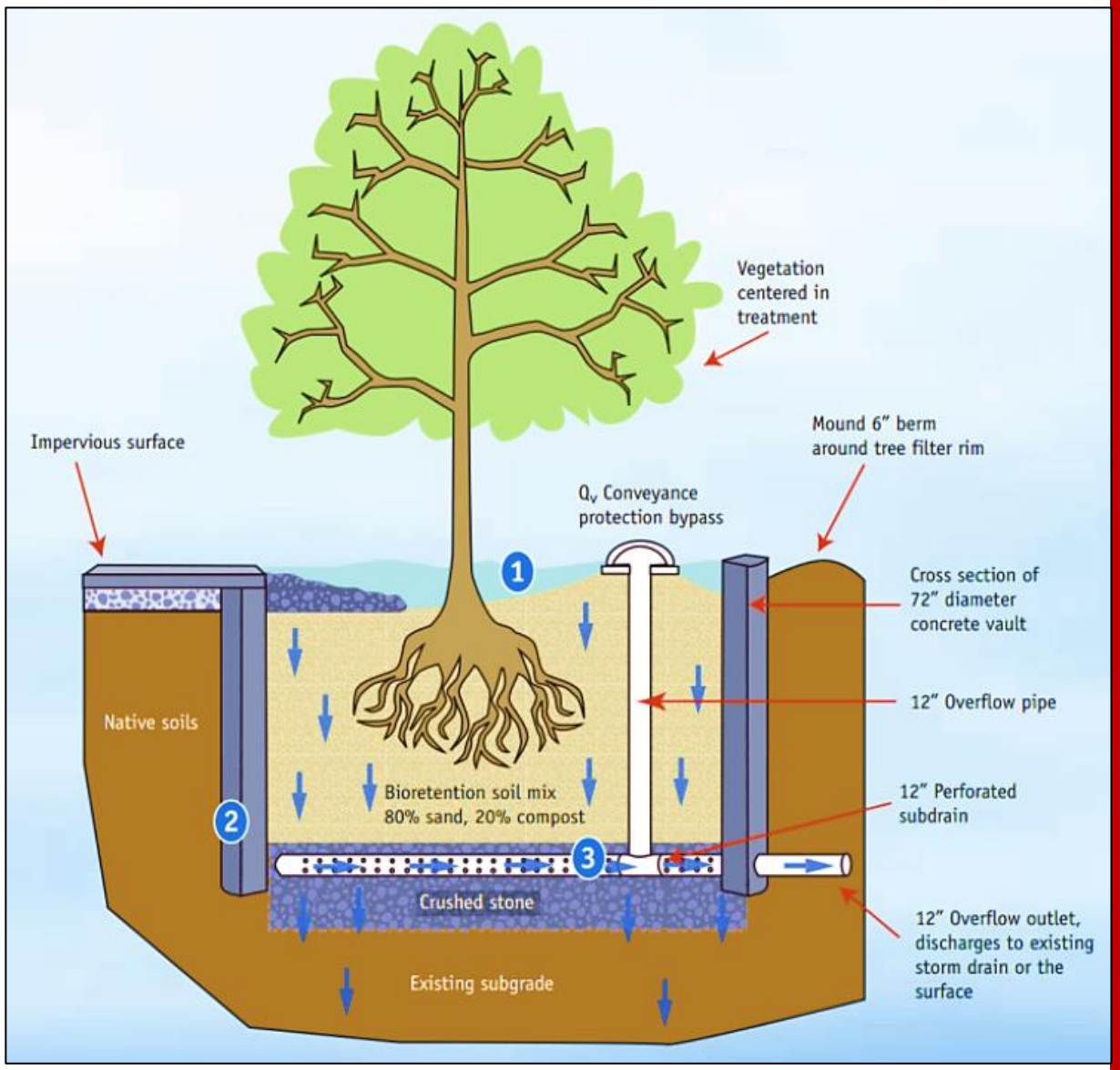

Example
LID Practices

Raingardens / Bioretention Areas

A bowl-shaped garden designed to capture and absorb stormwater.


Lake Shirley Bioretention Cell
Lesson: *Small is beautiful!*

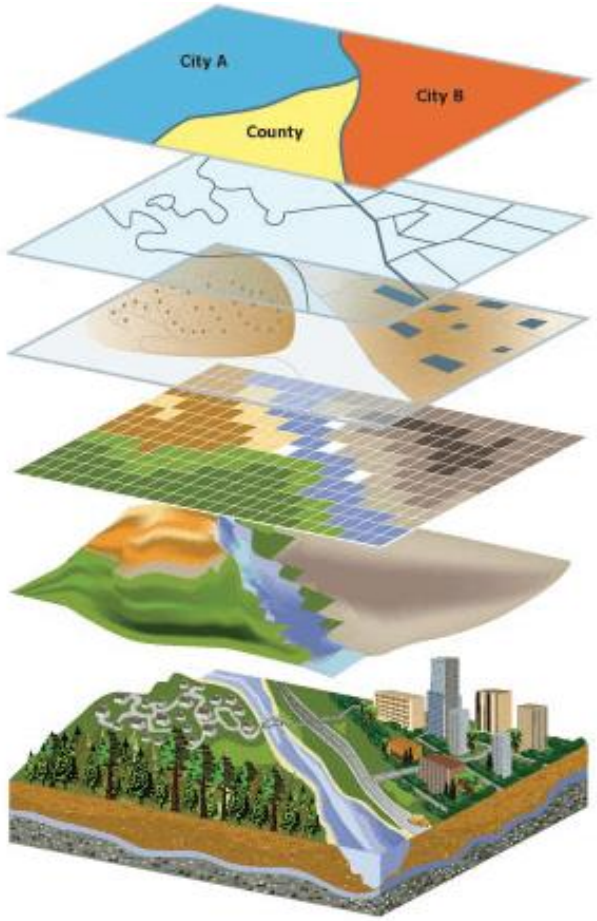
Tree Box Filter (bioretention)



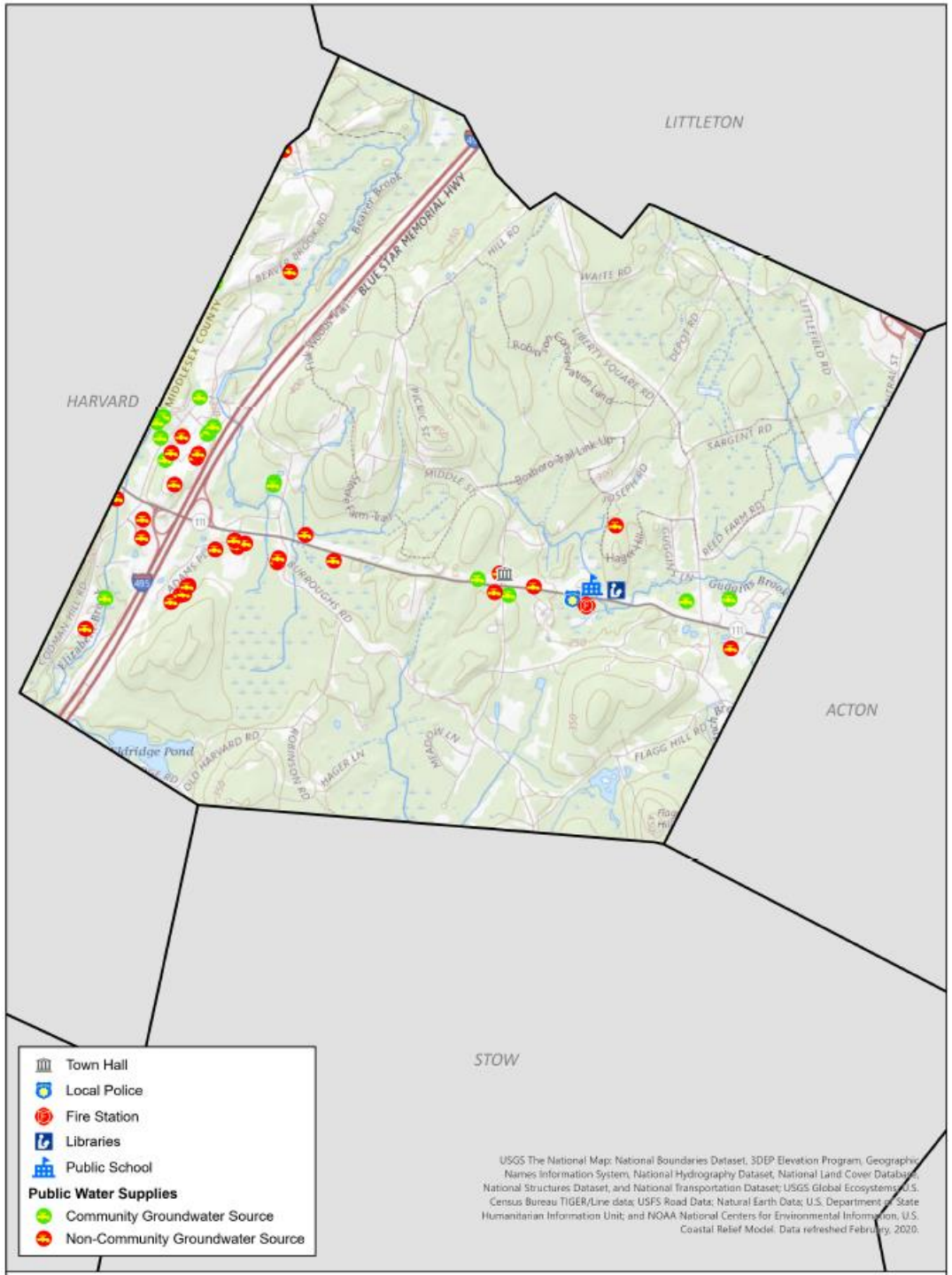
Porous Pavements (Wilmington MA)

- Interlocking Concrete Pavers
- Porous Asphalt / Concrete
- Flexipave

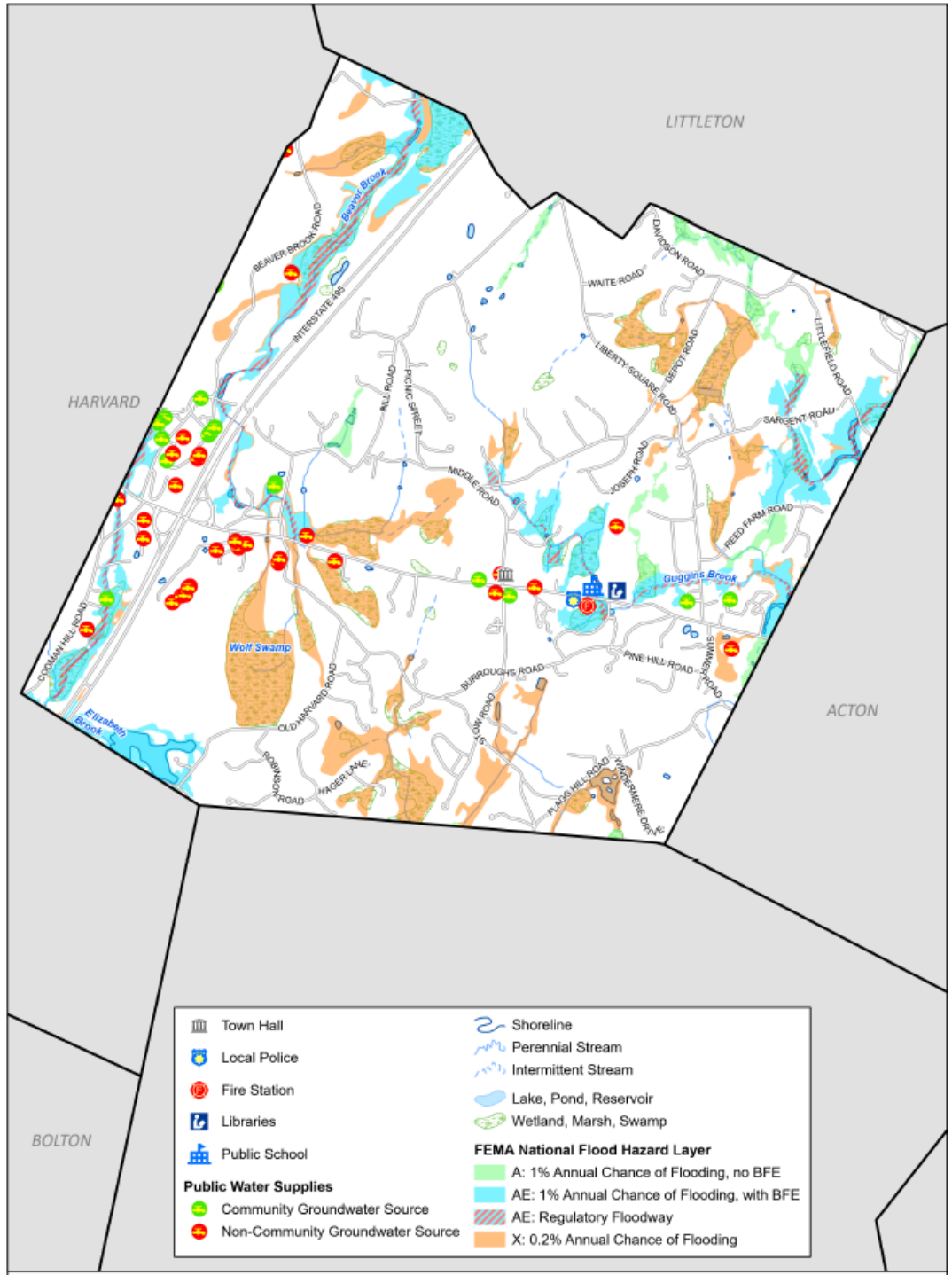
Workshop Map Resources



Base Map


LITTLETON
HARVARD
ACTON
STOW
BLUE STAR MEMORIAL HWY
Town Hall
Local Police
Fire Station
Libraries
Public School
Public Water Supplies
Community Groundwater Source
Non-Community Groundwater Source
USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.

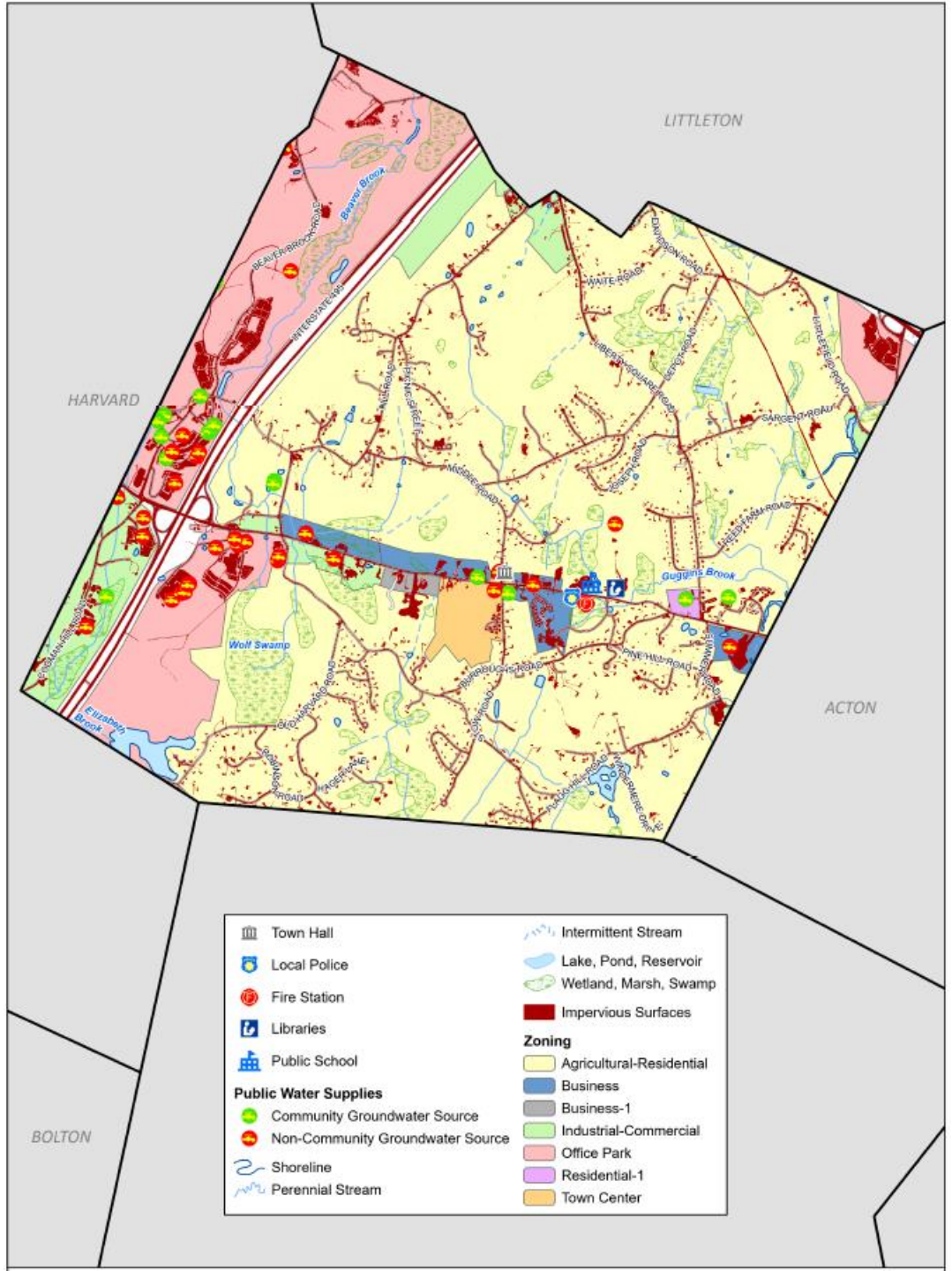
FEMA Flood Zones



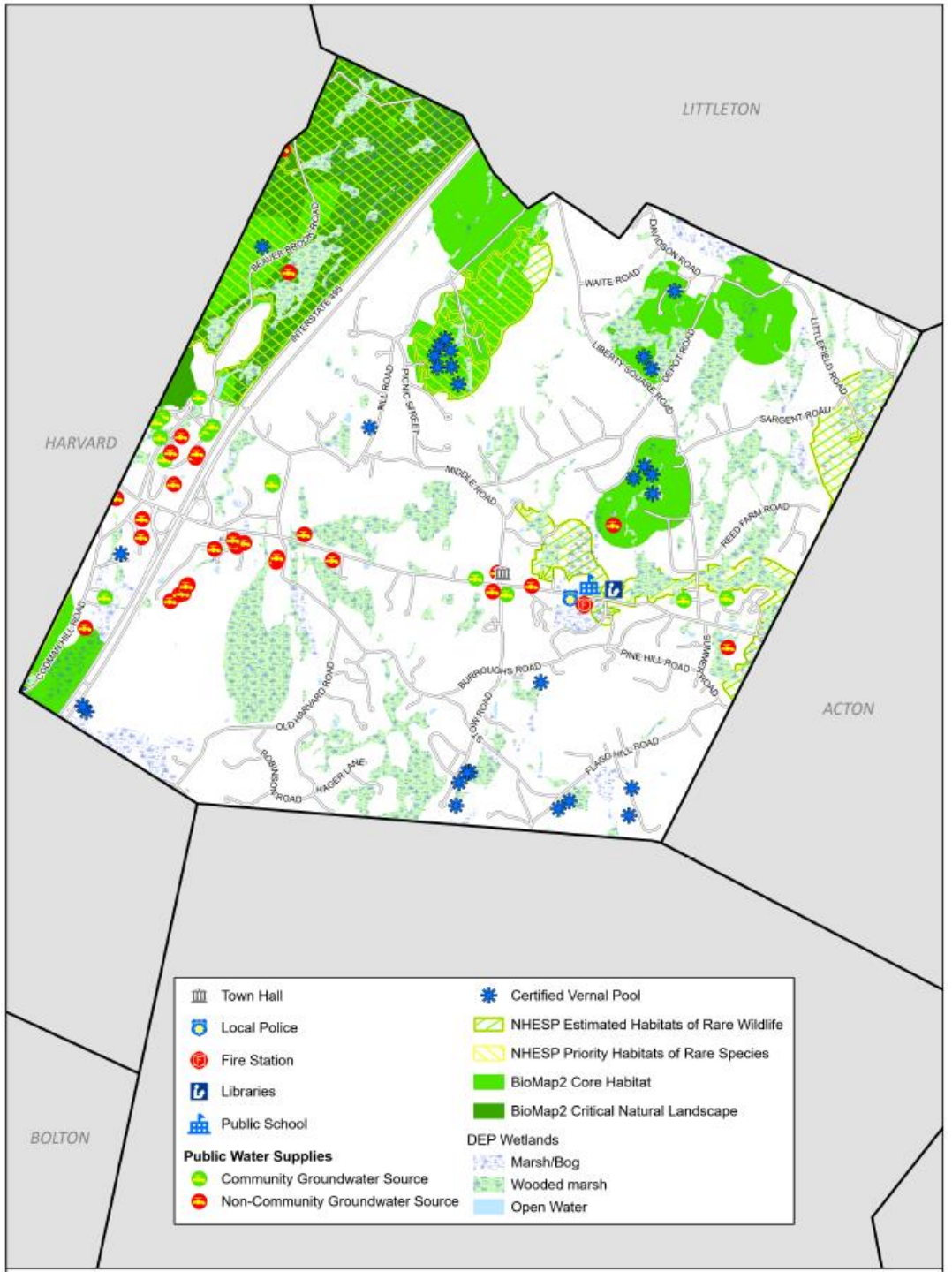
Impervious Surfaces

and

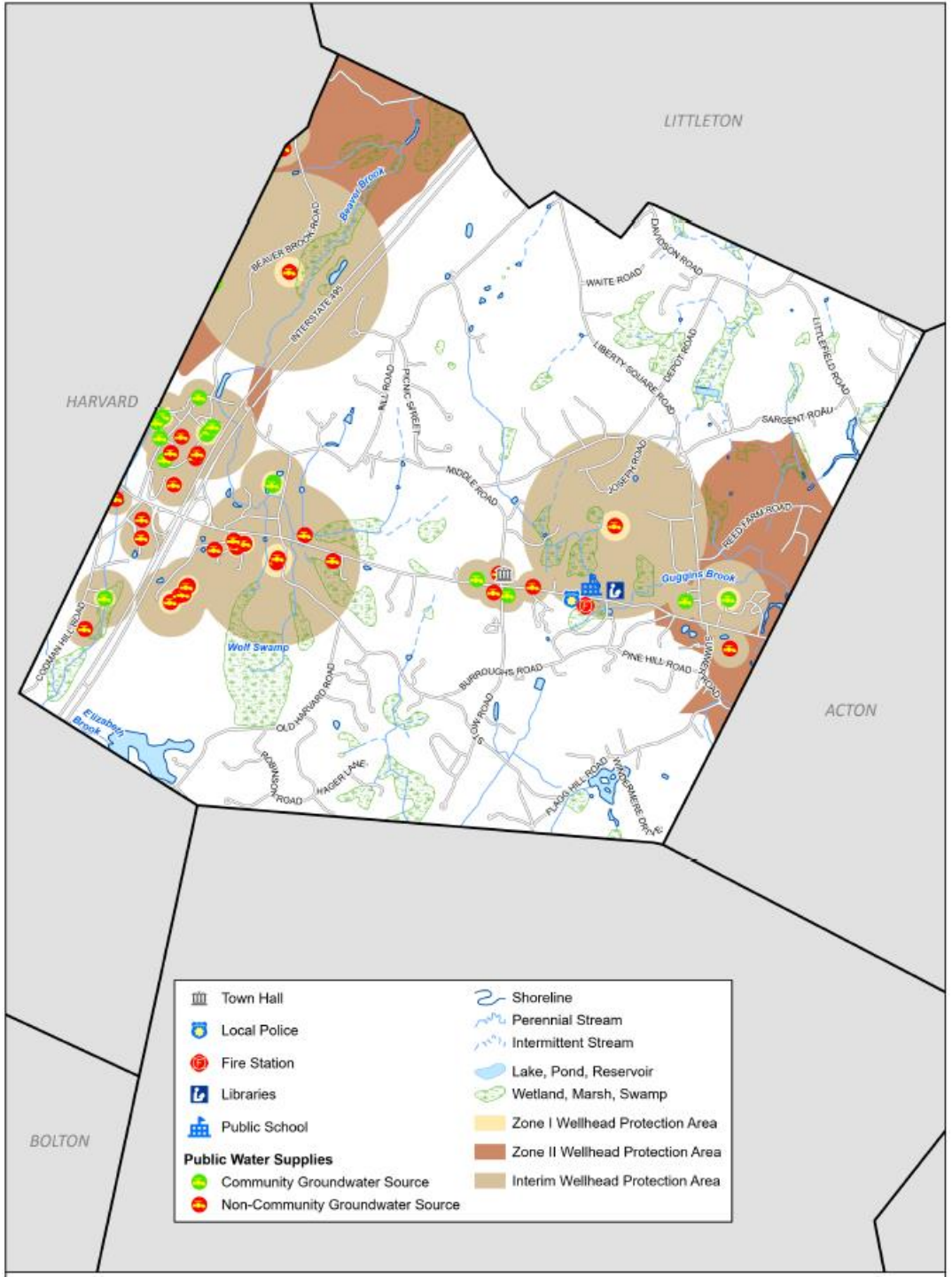
Zoning



Wetlands, Rare Species, and Critical Habitat



Public Water Supplies



Group Exercises

1: Characterize Hazards

2: Identify Community Vulnerabilities and Strengths

3: Identify and Prioritize Community Actions

4: Determine the Overall Priority Actions

Group Exercise #1: Characterize Hazards

Objective: Develop **top 3 Hazards** for facilitated discussions on vulnerabilities and strengths of Boxborough (infrastructure, natural resources, people, supply chain, etc.)

Hazard:
ultraviolet radiation

- Strong Storms
- Flooding
- Drought
- Sea level rise
- Extreme temps

Vulnerability: exposed skin

- Undersized culverts
- Crop failure
- Low-lying properties
- Vulnerable population health

Actions:

- apply sunscreen
- seek shade

- Upgrade culverts
- Irrigation improvements
- Floodproofing
- Cooling stations

Action Categories:

Hypothetical Example:
Fire Department floods during extreme storm events

Resiliency	Mitigation	Adaptation
• **Improve floodplain function**: ➢ riparian land conservation ➢ green stormwater infrastructure	• **Actions to reduce GHG** ➢ convert to electric municipal vehicles ➢ install solar panels on municipal buildings	• Flood-proof building • Relocate facility outside of 500-yr floodplain

Potential Natural Hazards

- Strong Storms
  - Hurricanes
  - Nor'Easters
  - Ice Storms
- Flooding
  - Inland
  - Storm Surge
- Extreme Temperatures/Drought
  - Wildfires
  - Heat Waves
- 
  - Water Table Rise
- Other Hazards
  - Tornadoes
  - Geologic

Group Exercise #2:
Identify Community Vulnerabilities and Strengths

Objective: Develop a **profile** of Boxborough's infrastructural, societal, and environmental components **that are impacted by the Top 3 Hazards.**

1. Begin in first column of the matrix and identify vulnerabilities (V) and strengths (S).
2. Determine location of V/S and list it on the Risk Matrix and mark it on the Base Map
3. Identify ownership of issue/asset/location

Example Vulnerabilities:

- Main road floods, blocking emergency response
- Power outage during heat waves lead to health concerns
- Wildfire and high winds cause supply chain interruptions
- Sewer pump stations become inoperable
- Compromised rail system due to heat-related track warping

Example Strengths:

- Main road elevated and passable by emergency vehicles
- Hurricane roof installed at school – improved sheltering capacity
- Hardened utility lines reduce ice storm outages
- Undersized culver replaced – reduces flooding at key intersection
- Improvement to communications system during extreme weather

Community Resilience Building Risk Matrix

Boxborough, Massachusetts

www.CommunityResilienceBuilding.org

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

Features	Location	Ownership	V or S	Top Priority Hazards: Strong Storms — Proposed Actions	Top Priority Hazards: Flooding — Proposed Actions	Top Priority Hazards: Extreme Temperatures / Drought — Proposed Actions	Priority H - M - L	Time Short Long Ongoing
INFRASTRUCTURE								
SOCIETAL								
ENVIRONMENTAL								

Thank you for your time!

WORKSHOP PART 2:
Date, Time

- **CEI will send draft matrix to group by Date**
- **Please review and start thinking about actions**

Group Exercise #3:
Identify and Prioritize Community Actions

Objective: Identify and prioritize **actions** to help reduce vulnerability or reinforce strengths for each of the Top 3 Hazards

1. Begin on right side of the Matrix – "Actions"
2. Under the "Hazards" column, identify the actions needed to reduce V or reinforce S represented by each feature/asset
3. After completing "Hazards" column, consider Priority (High, Medium, Low) and Urgency (Ongoing, Short-term, Long-term) of each action
4. Identify 3-4 Priority Actions per team

Action Categories:

Hypothetical Example:
Fire Department floods during extreme storm events

Resiliency	Mitigation	Adaptation
• **Improve floodplain function**: ➢ riparian land conservation ➢ green stormwater infrastructure	• **Actions to reduce GHG** ➢ convert to electric municipal vehicles ➢ install solar panels on municipal buildings	• **Flood-proof building** • **Relocate facility outside of 500-yr floodplain**

Example Actions:

- Improved access to high-risk locations
- Reduce housing stock in vulnerable areas
- Prioritize development in low-risk areas
- Integrate future risks in capital improvement plans
- Flood-proof manhole covers
- Secure new generators for critical facilities

MVP Action Grants: Project Types

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

* Most common project type

** Second-most common project type

***Third-most common project type

Group Exercise #4:
Determine the Overall Priority Actions

Objective: Present the findings of each group and collectively discuss identified opportunities to reduce current and future hazard risks and improve resilience

1. Spokesperson from each team presents findings to Large Group
2. Spokesperson presents 3-4 priority action cards to Lead Facilitator
3. Large Group Discussion to further define Highest Priority action list:
    i. **Top 3-5 actions** to implement for Town of Lynnfield

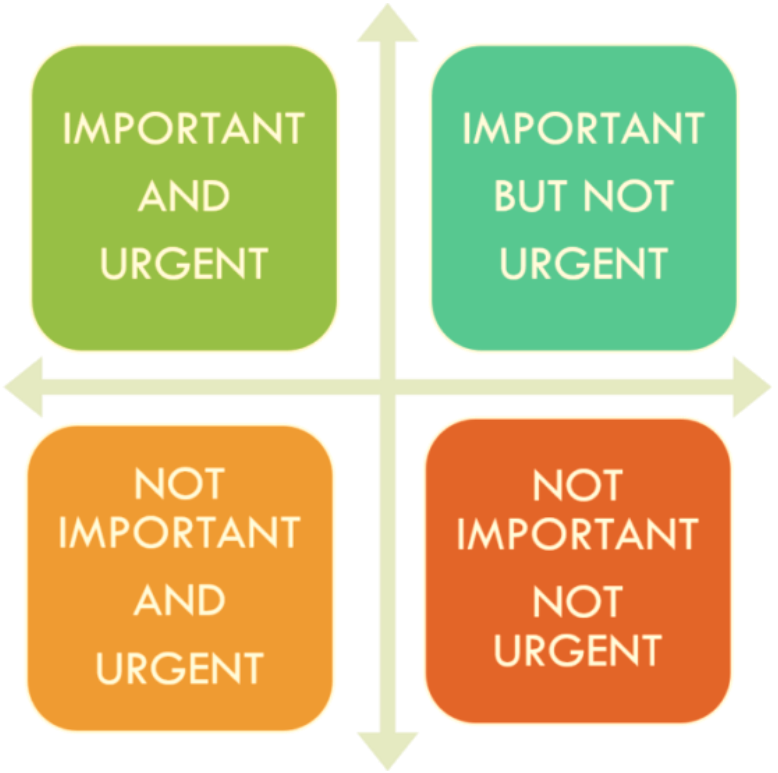
Prioritization Factors

Consider factors such as:

- Funding availability / terms
- Agreement on outstanding impacts from recent hazard
- Necessity for advancing long-term outcomes
- Contribution to meeting existing local /regional planning objectives

Examples of urgency:

- Current project to install hurricane-proof roof on school is ongoing **(O)** action.
- Ensuring evacuation procedures are updated annually is considered a short-term **(S)** action.
- Reducing housing stock in high-risk areas, elevating a road, or replacing a bridge are long-term **(L)** actions.



Wrap-Up

Next Steps:

- Develop Report
- Hold Listening Session
- Become MVP Community

Apply for Action Grant Funding!

Appendix B: Completed Risk Matrix

Community Resilience Building Risk Matrix

Boxborough, Massachusetts

www.CommunityResilienceBuilding.org

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

				Top Priority Hazards			
				Strong Storms	Flooding	Extreme Temperatures / Drought	Priority
Features	Location	Owner	V or S	Proposed Actions			Mark priority as H (high), M (medium), L (low)
INFRASTRUCTURE							
	Route 111 (key transportation corridor)	State	V	Rt. 111 is a state-owned road managed by MassDOT. Town is building a sidewalk (public library to Liberty Square Road) on RT. 111 and is working with MassDOT to improve sections of the road. Once the sidewalk project is complete, work with MassDOT to conduct a study of Route 111 to determine other areas for improvement.			M
	Littlefield Rd. near Central St.	Town	V	Conduct town-wide stormwater study to assess/prioritize areas for re-design and retrofit to mitigate flooding. Major egress/collector roads should be priortizied for mitigation.			H
	Depot Rd. near Wildlife Management Area	Town	V				
	Depot Rd. near Liberty Square Rd.	Town	V				
Road flooding due to low-point in road, proximity to surface waters/wetlands/floodplain, or beaver activity in wetlands. *(Note: Study is currently underway to assess and prioritize catch basins for retrofits - recommendations from this report will likely includes some of the infrastructure at the flooding sites listed here)*	Davidson Rd .	Town	V				
	Burroughs Rd. near Wolf Swamp	Town	V				
	Sargent Rd.	Town	V				
	Hill Rd. and Cunningham Rd.	Town	V				
	Route 111 (crossing of Elizabeth Brook)	Town	V				
	Hill and Barteau Lane	Town	V				
	End of land near Cisco campus near border with Harvard	Town	V				
Fire station in floodplain and has potential to flood.	Fire Station, Rt. 111	Town	V	A study has been conducted to develop a new Public Safety and Health Building (police and fire departments) , including the potential of relocation ($24 million, $15 million for fire station alone). Identify "climate-resilient" tasks that would be included in building relocation, as these are potentially fundable through an MVP Action Grant.			H
Road flooding may limit access to waste disposal facilities (one access road).	Transfer station	Town	V	Conduct study to determine alternative options for accessing the transfer station. Alternatives may include: raising road elevation to minimize access problems during flooding; develop mutual aid agreement with adjacent towns to allow waste disposal during flooding; use old DPW site as a backup when road to transfer station is flooded.			L
Water level and water quality (iron; Swanson Rd. salt storage impacts) of drinking water in private wells - significant area is on private wells and vulnerable to drought/ flood impacts.	Town-wide	Private	V	Water Resources committee is looking at alternative water sources for wells in western portion of Boxborough. Based on the results of the committee's work, explore options for supplmental funding sources including MVP to acquire identified land. MassDOT may contirbute funds through their Salt Remediation Program.			H
	Town-wide	Town	V	Identify key parcels for future water supply climate resiliency including those prioritized in the 2030 Master Plan.			H
Old DPW facility is located adjacent to wetlands/waterbody. DPW stockpiles, salt shed, fuel station, household hazardous waste collection, etc. are located at this facility.	DPW	Town	V	Conduct a study to determine feasibility of relocating DPW yard or installing stormwater BMPs and secondary containment at facility to decrease flood risk.			M
Sustainable power source located on commercial site in town.	Cisco	Private	V/S	Determine the economic benefit to the town of installing other solar sites on commercial properties. Conduct a town-wide assessment for additional sites available to install solar panels including commerical sites similar to the Cisco property.			M
Municipal utility maintains infrastructure for wind damage.	Town-wide		S	Review town regulations to determine the need to strengthen regulations to increase the size of vegetative buffers required for site clearing for new and redevelopment.			L
SOCIETAL							
Public alert system is updated and works well but may not be available to all populations (e.g., renters, people without landlines)	Town-wide	Town	V/S	Explore adding mobile devices to the public alert system in the future.			L
Lack of generator at key town facilities.	Town Hall, Sargent Memorial Library, DPW	Town	V	Assess potential for library to be used as cooling/warming station if it had a backup generator/solar battery.			L
Increase in ice storms may lead to decline in personal safety (e.g., driving, walking)	Town-wide	Town	V	*No actions identified*			
Warmer climate and increased rainfall will increase mosquito breeding, length of mosquito season, and associated human health impacts. Increases in other insect-related issues such as illness from ticks.	Town-wide	Town	V	Town will continue to provide for mosquito control as needed. Board of Health is looking conducting additional clinics at new Public Health and Safety building.			L
Warmer climate and subsequent decline in air quality may impact residents with respiratory illnesses.	Town-wide	Town	V	Town is working to provide more clinics to residents including space in a new Public Health and Safety building to address health and respiratory illnesses.			L
Climate vulnerable populations throughout town.	Town-wide	Town	V	Assess possibility of expanding Boxborough Rental Assistance Program (BRAP) to assist vulnerable populations in climate change-related needs such as adequate air conditioning and heating. Consult with town counsel to determine if the "No Aid" amendment would limit funds for private residents.			L
ENVIRONMENTAL							
Multiple culverts have been identified as barriers to aquatic connectivity by North Atlantic Aquatic Connectivity Collaboration.	Beaver Brook Road Hill Road Route 111 Crossing at Elizatbeth Brook	Town/ Private	V	An initial culvert assessment has been conducted by the North Atlantic Aquatic Connectivity Collaborative - conduct engineering/design as needed to retrofit top 3 priority culvert barriers.			L
Reduction of greenhouse gas emission from town-owned vehicles.	Town-wide	Town	V/S	Convert town-owned vehicles to electric or hybrid vehicles where appropriate (e.g., school buses, police vehicles, Building Inspector, Planning, some DPW vehicles).			H
Reduction of greenhouse gas emissions from town-owned facilities.	Town-wide	Town/ Private	V	Use audits to determine locations that may be appropriate for solar; update town facilities in accordance with energy audits; Review potential for retrofitting existing buildings with solar; develop a residential solar education program.			H
Increase in invasive species (e.g., garlic mustard, purple loosestrife, Japanese knotweed, bittersweet, and additional species).	Town-wide	Town	V	Develop a town-wide management plan for invasive species; Develop public education program to make public aware of problem and what they can do on their property to identify and control invasives.			L
Agriculture in Town at risk due to increase in extreme weather and drought.	Town-wide	Private	V	Work with USDA NRCS to assess climate resiliency needs for at-risk farmers in Boxborough and and identify funding options.			L
Multiple opportunities for conservation and for the installation of nature-based solutions (e.g. Harvard Sportsmen's Club, Cisco property); Key undeveloped lands (e.g., Hager Land drumlin, upland sites, future wellhead sites) located throughout town.	Town-wide	Town/ Private	S	Identify future land protection/land acquisition priorities to incorporate climate change resiliency (e.g., conservation area between Sargent Rd./Depot Rd. helps to naturally mitigate floods); Cisco/Harvard Sportsman Club has ony partial protection and opportunities for increaed protection, including unique grasslands habitat at heightened risk of impacts related to drought/extreme temperatures. Conservation Commission has a list of priortized parcels for conservation. Work with the Conservation Commission to review and update this list for conservation priorities that are specific to climate resiliency.			H
Three energy audits have been conducted for town buildings.	Town-wide	Town	S	Use audits to determine locations that may be appropriate for solar; update town facilities in accordance with energy audits.			M
Forests in Town provide natural air quality protection.	Town-wide	Town	S	Assess opportunities for additional tree planting, buffer zone improvements, reforestation, etc.			L
Electric charging station to be installed at town building.	Sargent Memorial Library	Town	S	Assess other town facilities to install electric charging stations; convert select town vehicles (non-emergency response vehicles) to electric.			L