



Town of Lynnfield
Municipal Vulnerability Preparedness Program
Community Resiliency Building Workshop



Welcome!

➤ Opening Remarks

- Charlie Richter, Town Engineer
- Bob Hartzel, CEI



Introductions

- Name
- Organization



Workshop Overview



MVP Program Overview

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

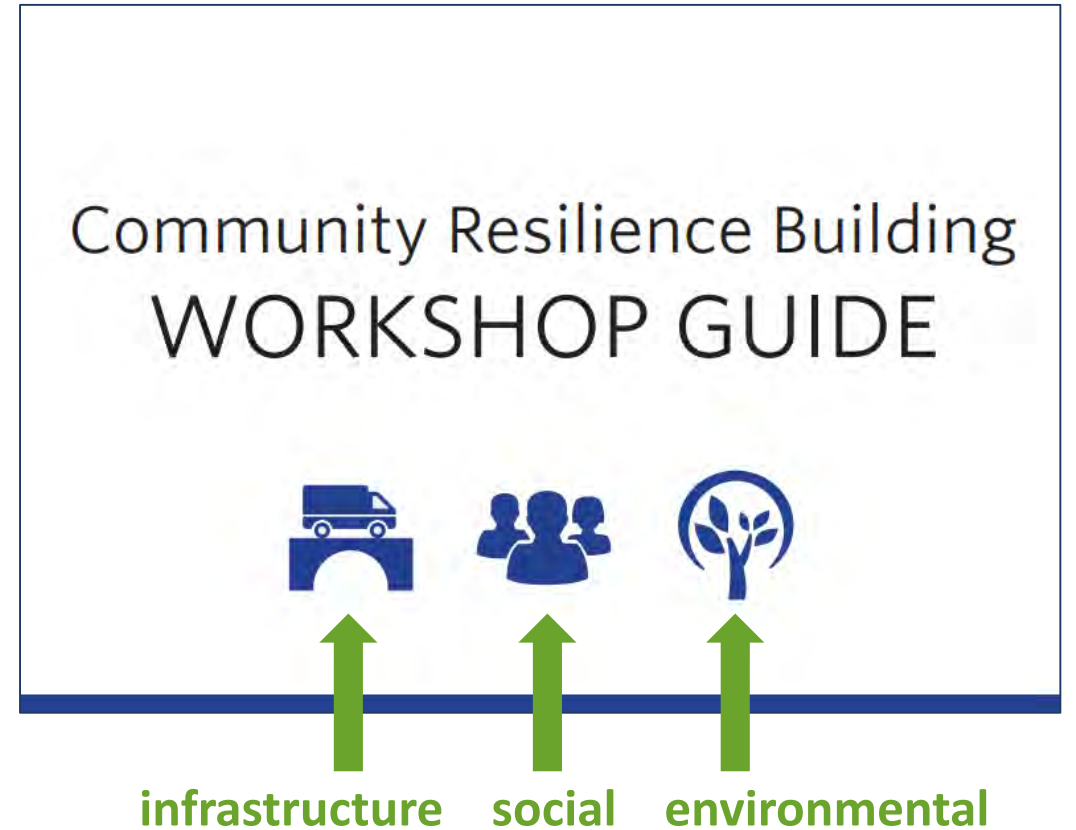


- \$2.4 billion bond bill with focus on climate change resiliency
- Over \$200 million authorized for climate change adaptation
- **Codifies EO 569, including the MVP Program**

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



Action Categories:

Hypothetical Example:

Fire Department floods during extreme storm events



Resiliency	Mitigation	Adaptation
<ul style="list-style-type: none">• Improve floodplain function:<ul style="list-style-type: none">➤ riparian land conservation➤ green stormwater infrastructure	<ul style="list-style-type: none">• Flood-proof building	<ul style="list-style-type: none">• Relocate facility outside of 500-yr floodplain

Community Resilience Building Process

A: Prepare for Workshop

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graph TD; A[A: Prepare for Workshop] --> B[B: Characterize Hazards]; B --> C[C: Identify Community Vulnerabilities and Strengths]; C --> D[D: Identify and Prioritize Community Actions]; D --> E[E: Determine the Overall Priority Actions];
```


B: Characterize Hazards

C: Identify Community Vulnerabilities and Strengths

D: Identify and Prioritize Community Actions

E: Determine the Overall Priority Actions

Workshop Agenda

- Workshop Overview 
- Overview Presentations on Science and Resources
- Group Exercises
 - Identify Top Hazards
 - Identify Vulnerabilities and Strengths
 - Identify Actions to Reduce Vulnerabilities and Strengths
 - Identify Top Actions

Overview Presentations and Resources

Hazard Mitigation Plan and Emergency Preparedness Overview

Glenn Davis

Fire Chief / Emergency Management Director



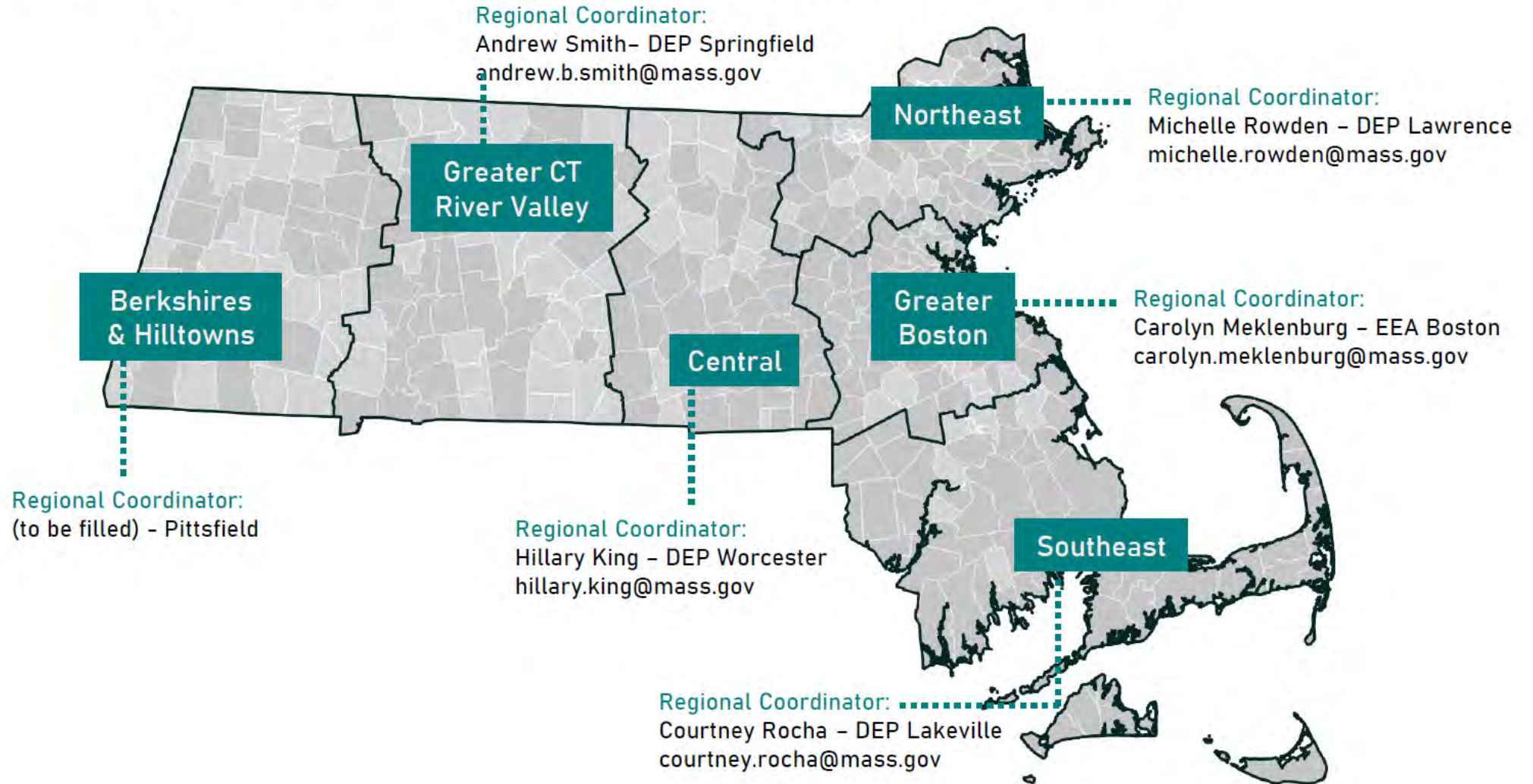
MVP Regional Coordinator Overview

Michelle Rowden

EOEEA MVP Regional Coordinator



MVP Regions & Regional Coordinators



MVP Principles

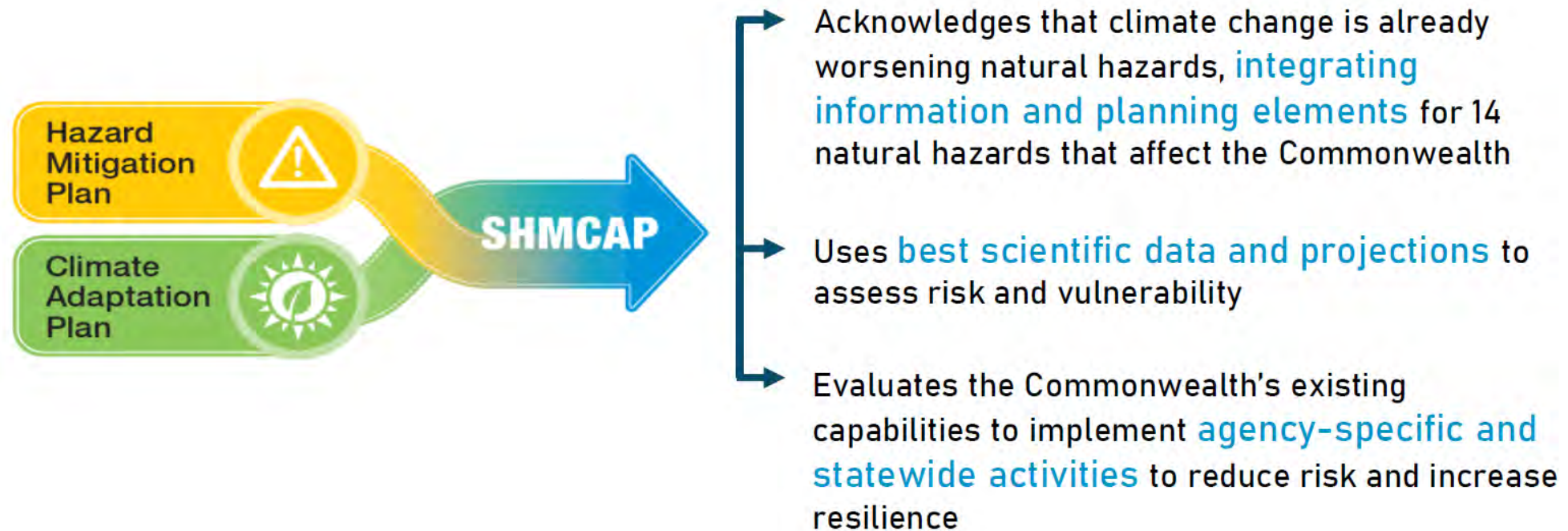
A community-led, accessible process that

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

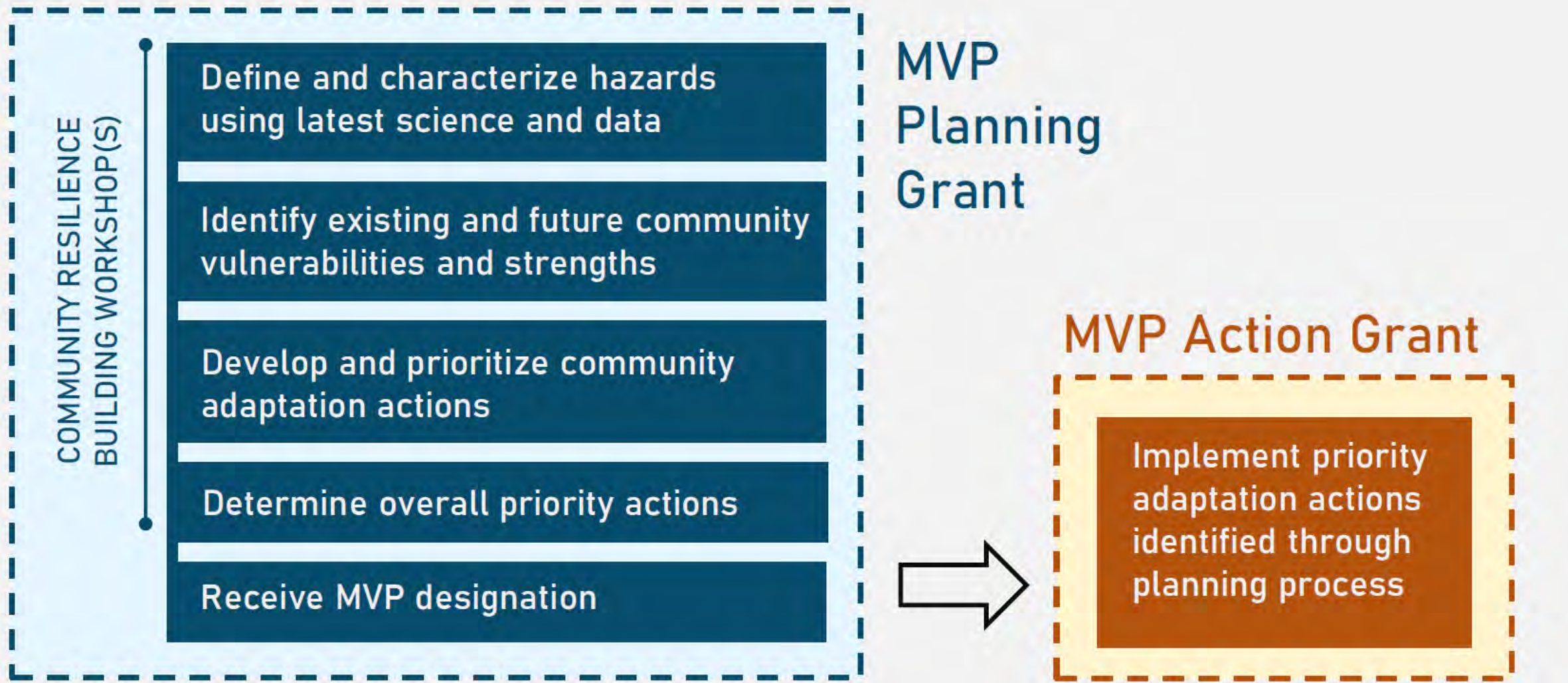
Why nature-based?

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

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



MVP Process/ Grant Types



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.)

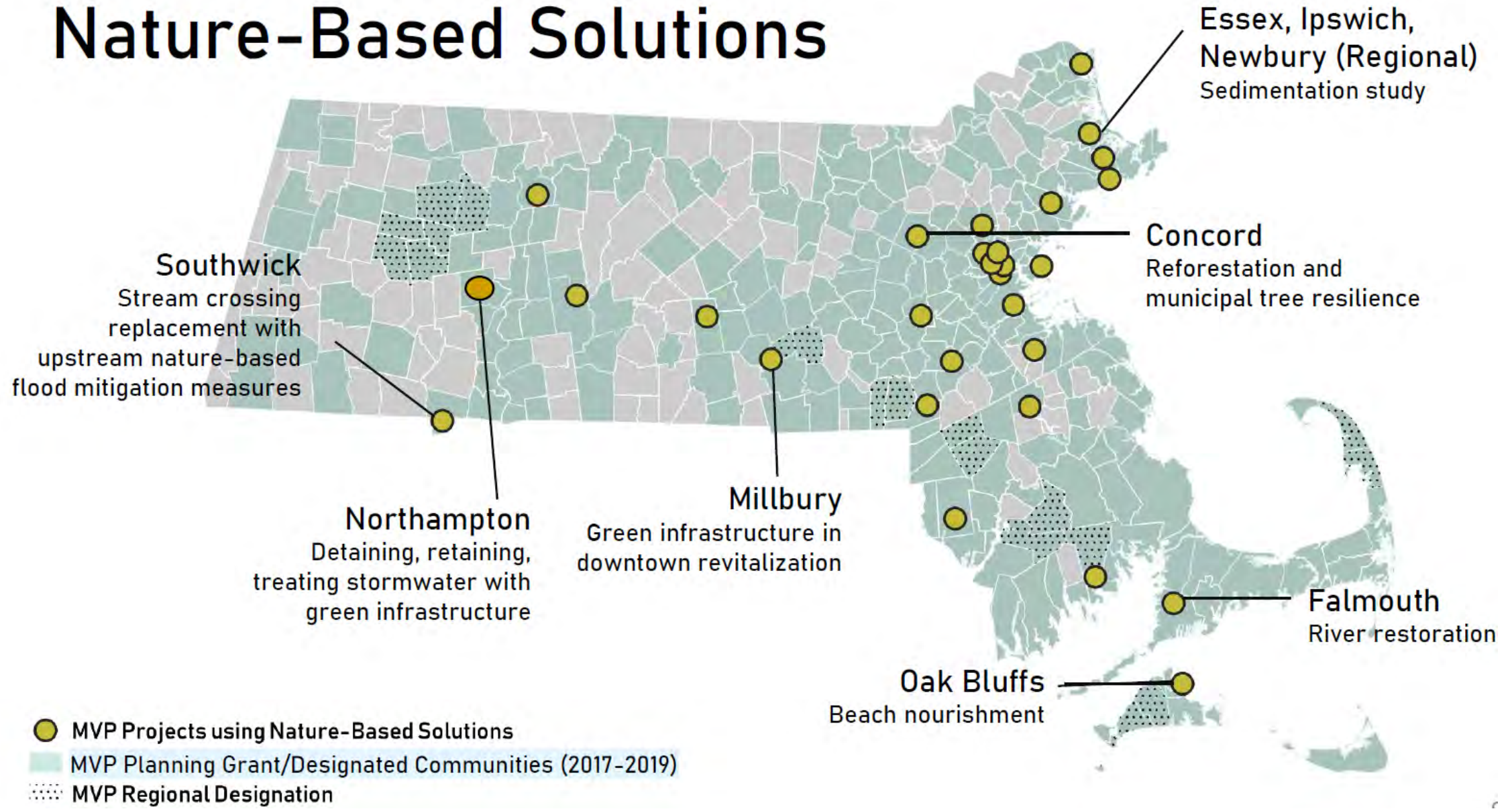


- Nature-Based Solutions to Reduce Vulnerability to other Climate Change Impacts
- Ecological Restoration and Habitat Management to Increase Resiliency

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

Nature-Based Solutions



- MVP Projects using Nature-Based Solutions
- MVP Planning Grant/Designated Communities (2017-2019)
- ⋯ MVP Regional Designation

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

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

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

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

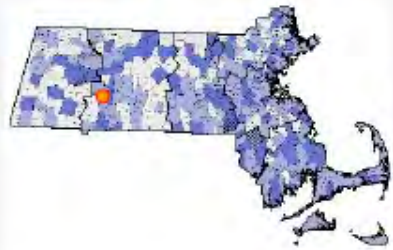


Vulnerable communities

FY18 Action Grant Projects

Detailed Vulnerability and Risk Assessment, Further Planning

Holyoke



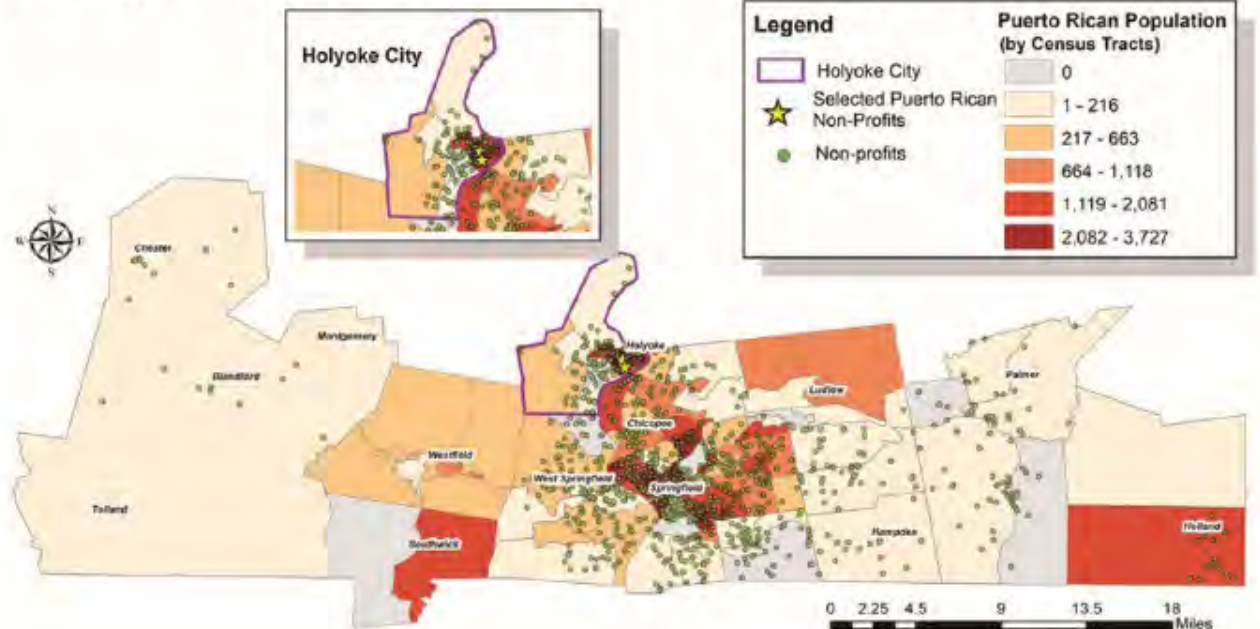
Conducted a detailed demographic analysis of individuals who arrived in Holyoke from Puerto Rico as a result of Hurricane Maria and develop recommendations for planning for future climate change migrants in Holyoke

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

Hampden County's Puerto Rican Population, 2017



Next Steps: Climate Change & the Commonwealth

Bill S.10:

An Act for Climate Change Adaptation Infrastructure Investments in the Commonwealth

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



Climate Change 101





WEATHER vs CLIMATE

Atmospheric observations down to the minute

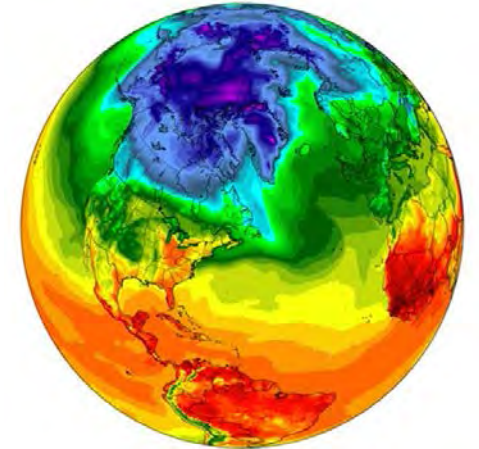
Weather statistics over a period of time (30 years)

Weather is what you get

Climate is what you expect

EX: Nor'easter, hurricane, heat wave

EX: Average high and low temperatures



https://www.youtube.com/watch?v=cBdxDFpDp_k

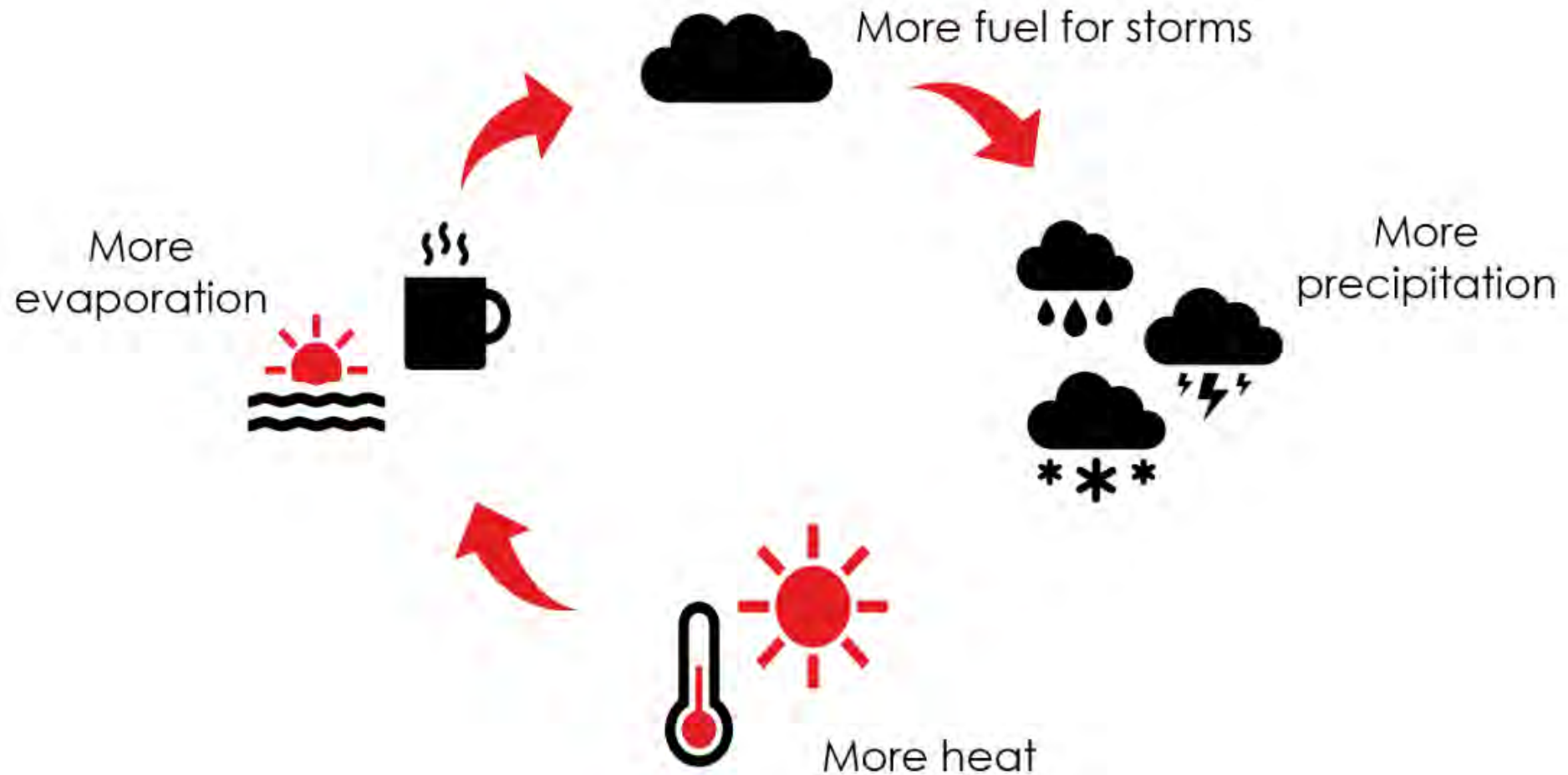
How Does Climate Change Work?

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.

Rising Temperatures Cause More Precipitation Events



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

Consequences



Changes in precipitation

- Inland flooding
- Drought



Rising Temperatures

- Wildfires
- Invasive species/pests



Extreme Weather

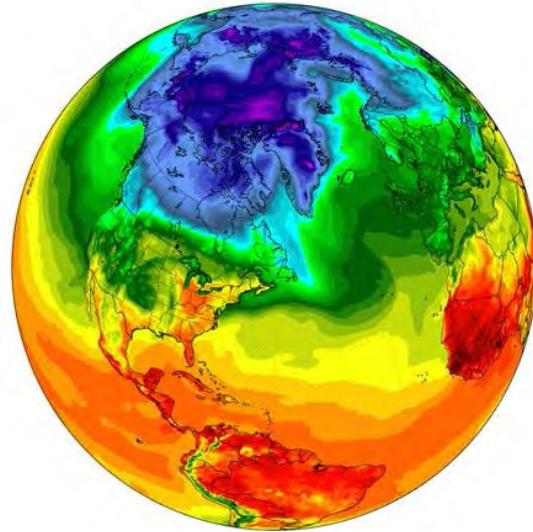
- Hurricanes/tornadoes
- Severe winter storms



Human-induced hazards

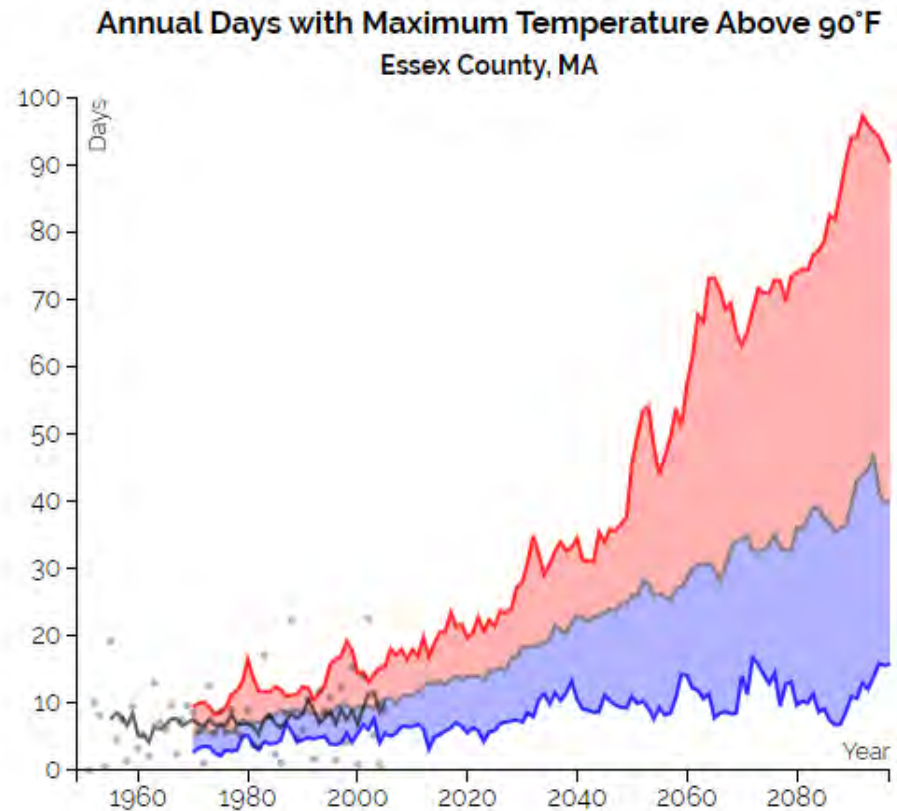
- Loss of habitat/floodplains
- Overuse of fertilizers/pesticides

Lynnfield Climate Projections



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

TEMPERATURE



[Download Data](#)

Observed	
5-yr Mean	days

Modeled days	
Max	days
Median	days
Min	days

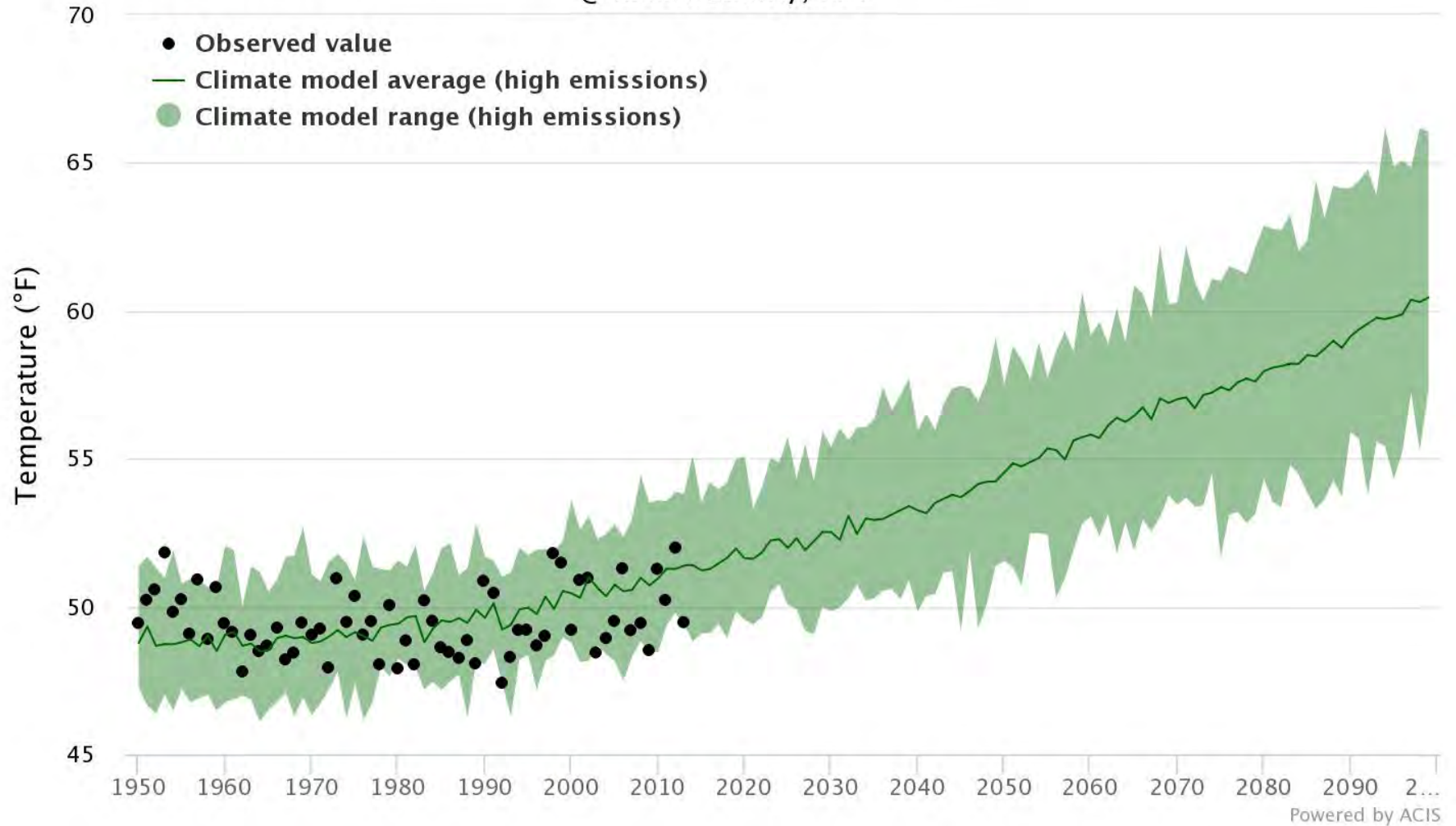
Changes from 1971-2000 for:	
2020 -	13.21
2049	days
2040 -	20.17
2069	days
2060 -	27.33
2089	days
2080 -	33.10
2097	days

[About the Source Data](#)

Hotter...average annual temperature steadily increasing

Annual Average Temperature (°F)

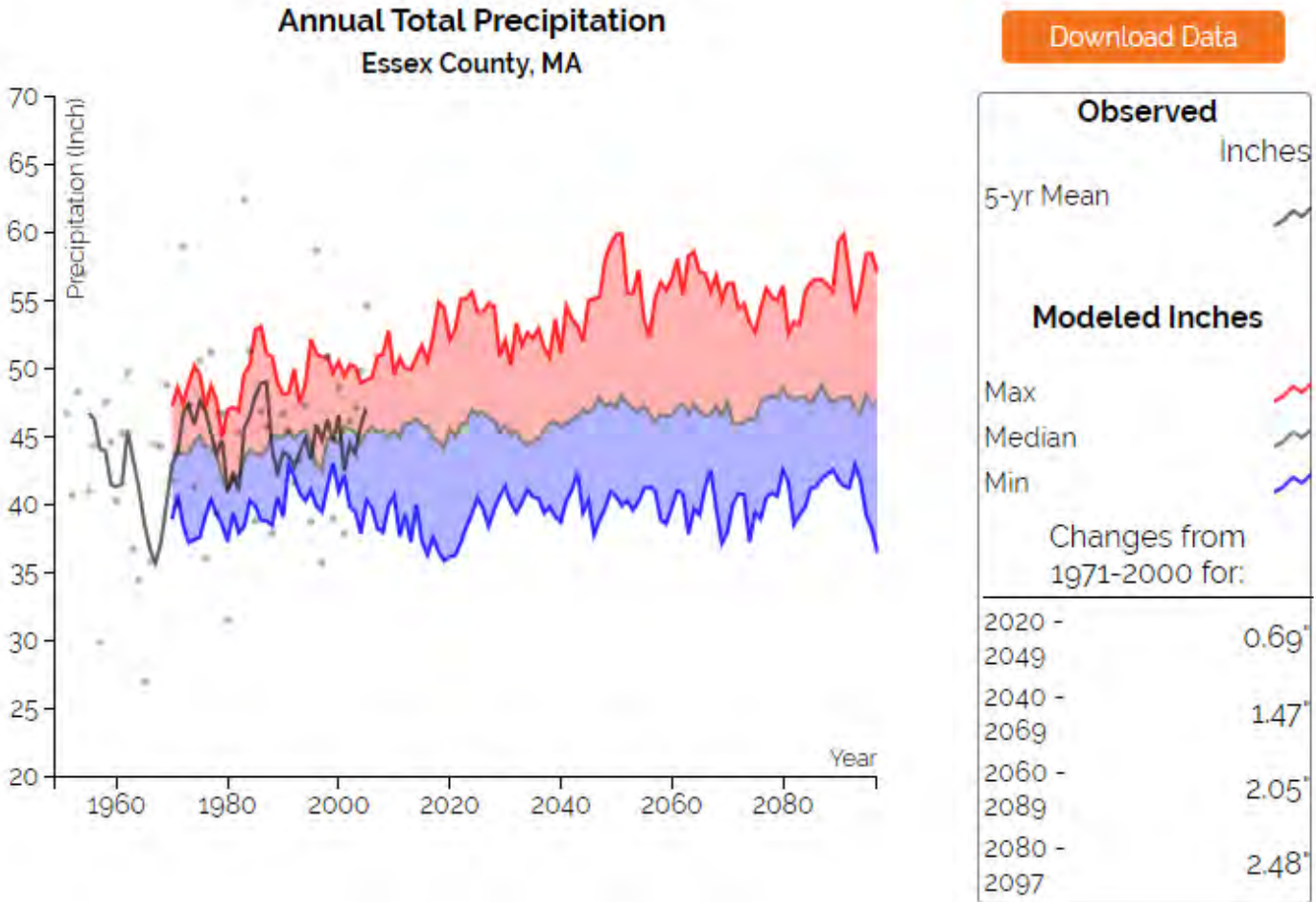
@ Essex County, MA



TEMPERATURE

Wetter...more frequent intense precipitation events

PRECIPITATION

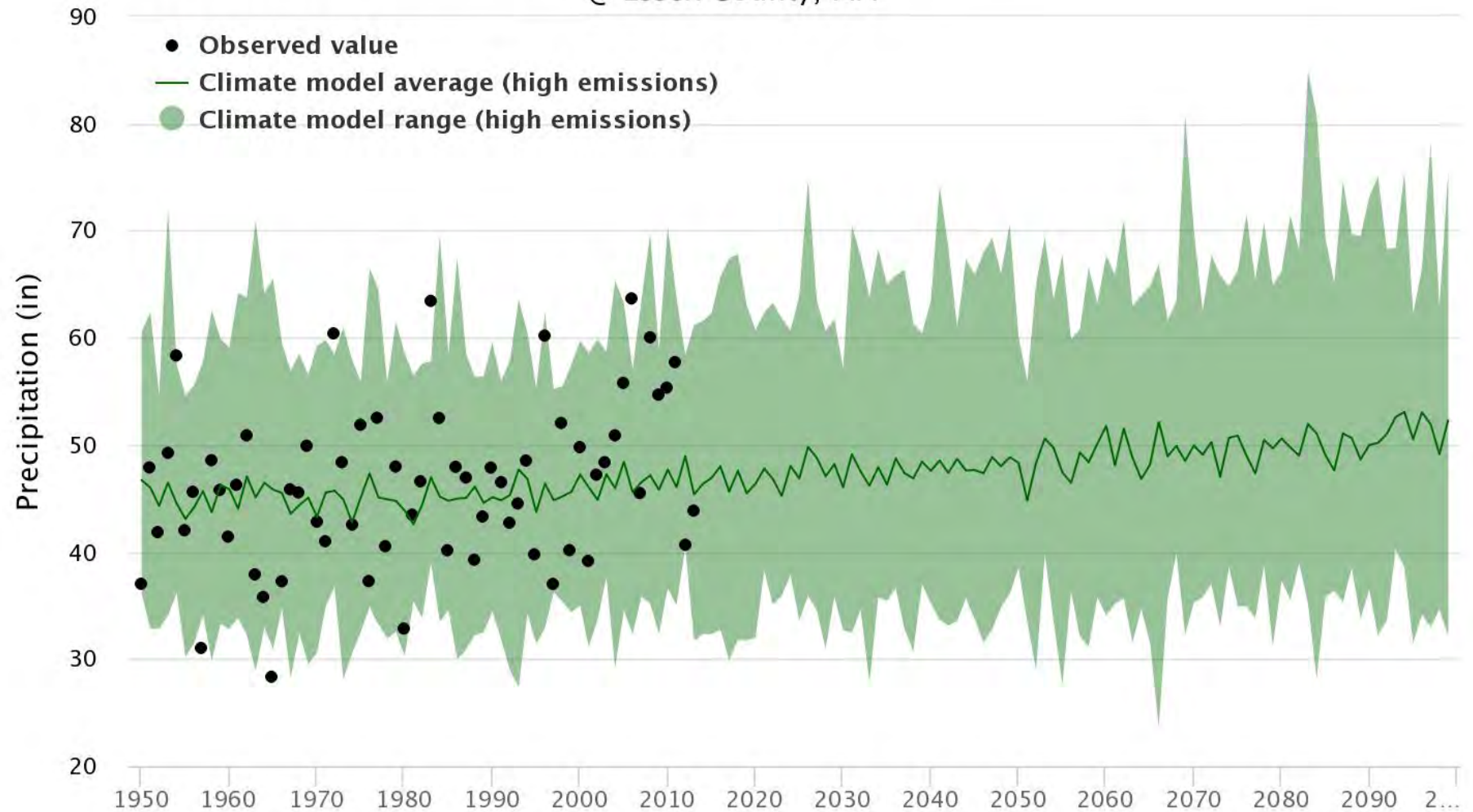


About the Source
Data

Wetter...increasing average annual rainfall

Total Annual Precipitation (inches)

@ Essex County, MA

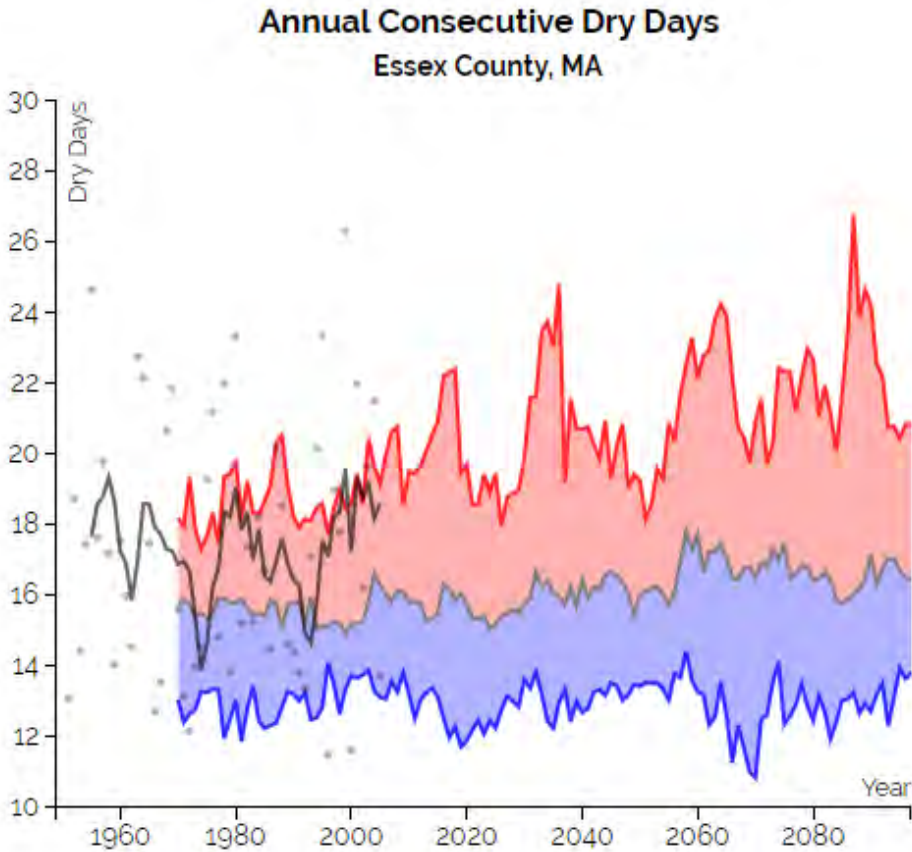


Powered by ACIS

PRECIPITATION

More frequent droughts

DROUGHT



[Download Data](#)

Observed days

5-yr Mean

Modeled days

Max

Median

Min

Changes from 1971-2000 for:

2020 -	-0.03days
2049	
2040 -	0.50days
2069	
2060 -	0.68days
2089	
2080 -	0.50days
2097	

[About the Source Data](#)



resilient MA

Climate Change Clearinghouse for the Commonwealth

<http://resilientma.org/>

Maps

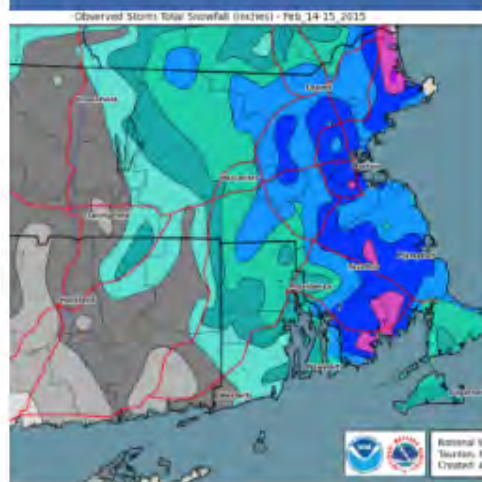
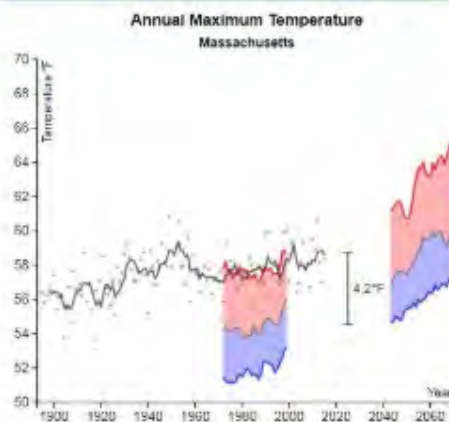


Photo: National Weather Service

Use maps to identify climate change impacts and assess vulnerabilities in Massachusetts.

[More »](#)

Data



Explore Massachusetts climate science and data through interactive charts.

[More »](#)

Documents



Discover reports, articles, plans, and other climate-related resources relevant to Massachusetts.

[More »](#)

Nature Based Green Infrastructure



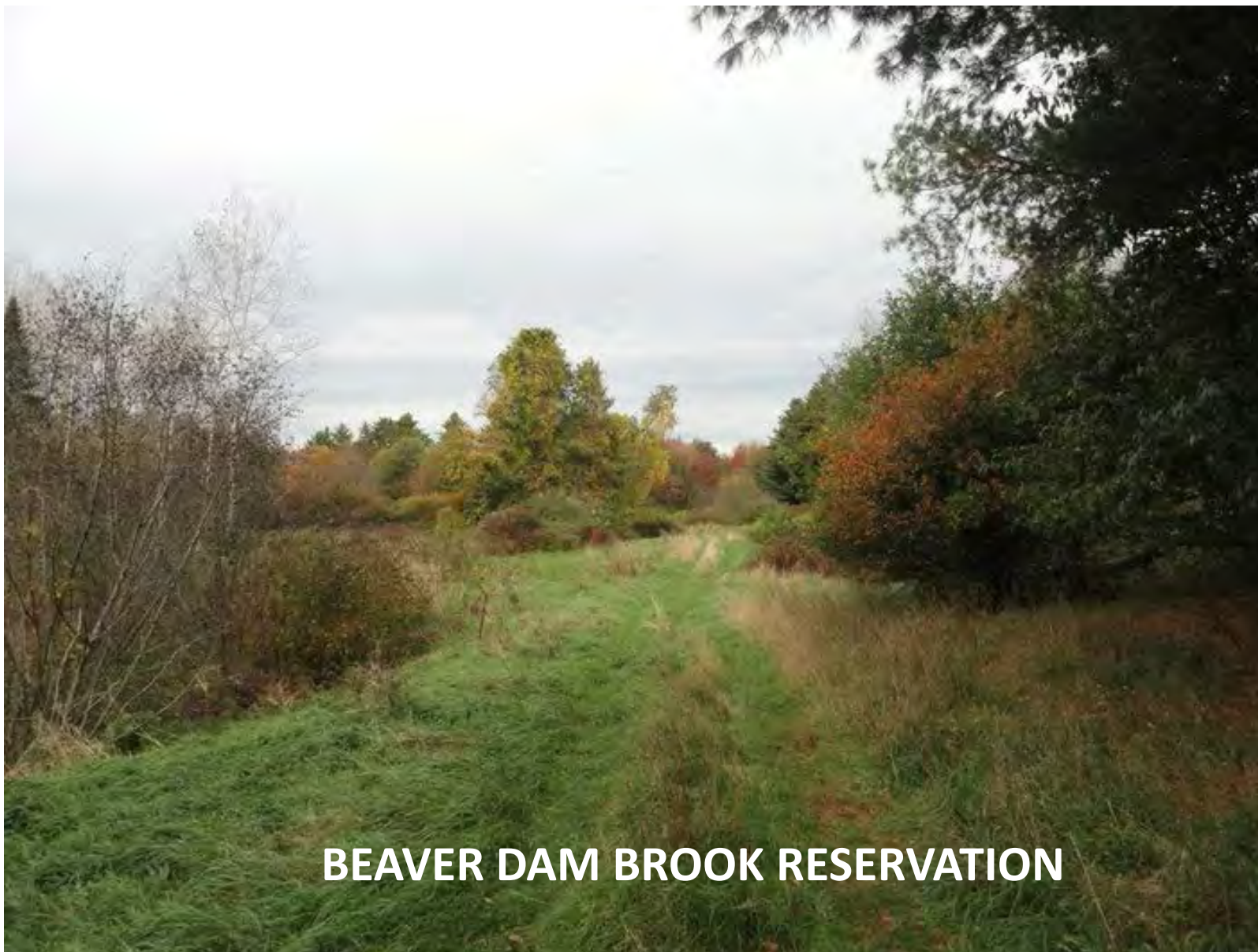
Vegetated Buffers

(Reforestation, bank restoration, etc.)

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



Land Protection (acquisition, conservation easements, etc.)



BEAVER DAM BROOK RESERVATION

Improved Stream Crossings

- Flood flow passage
- Streambank stability
- Wildlife passage



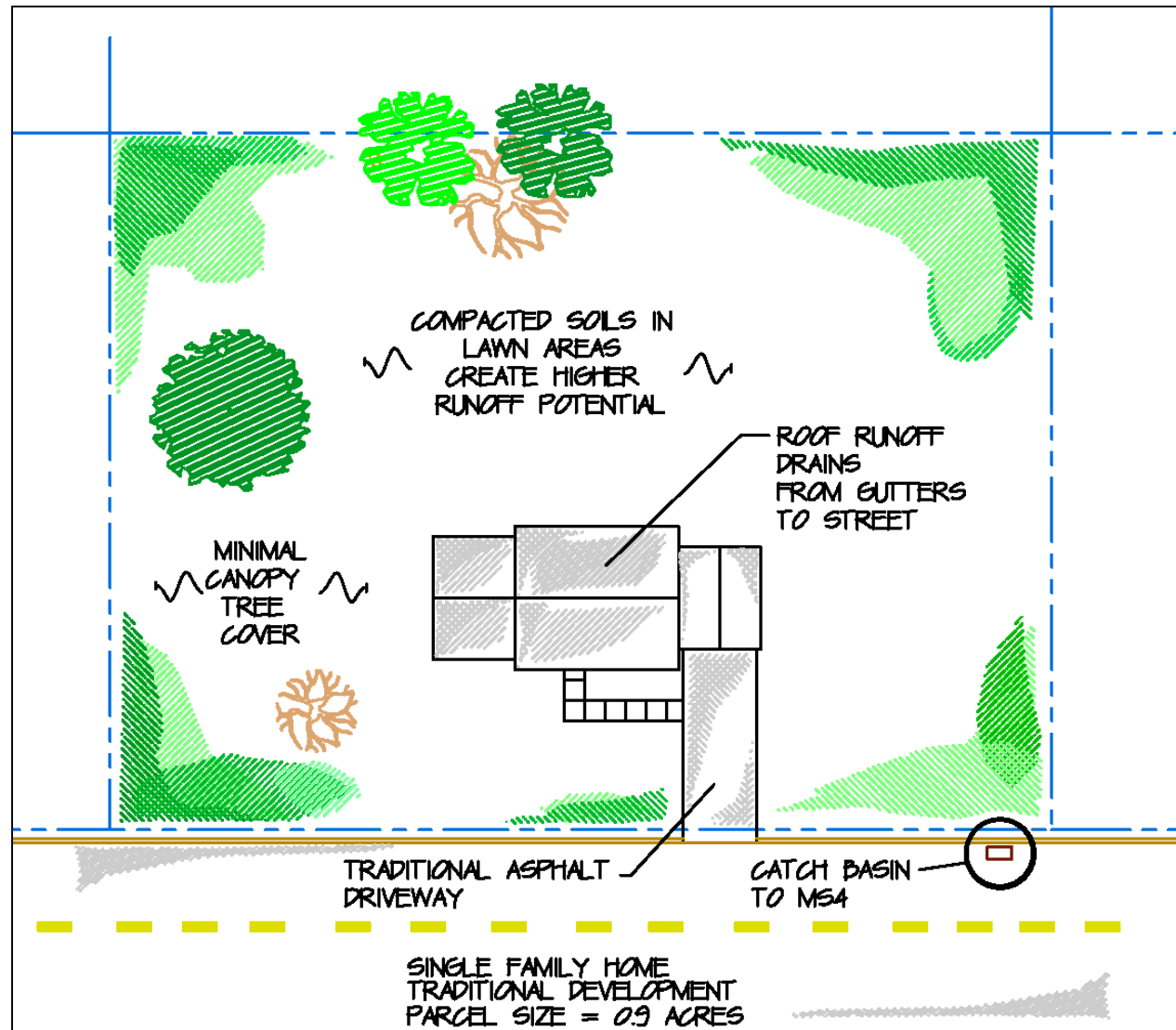
Low Impact Development (LID)

An ecosystem-based approach to land development and stormwater management

Mimic pre-development site hydrology!

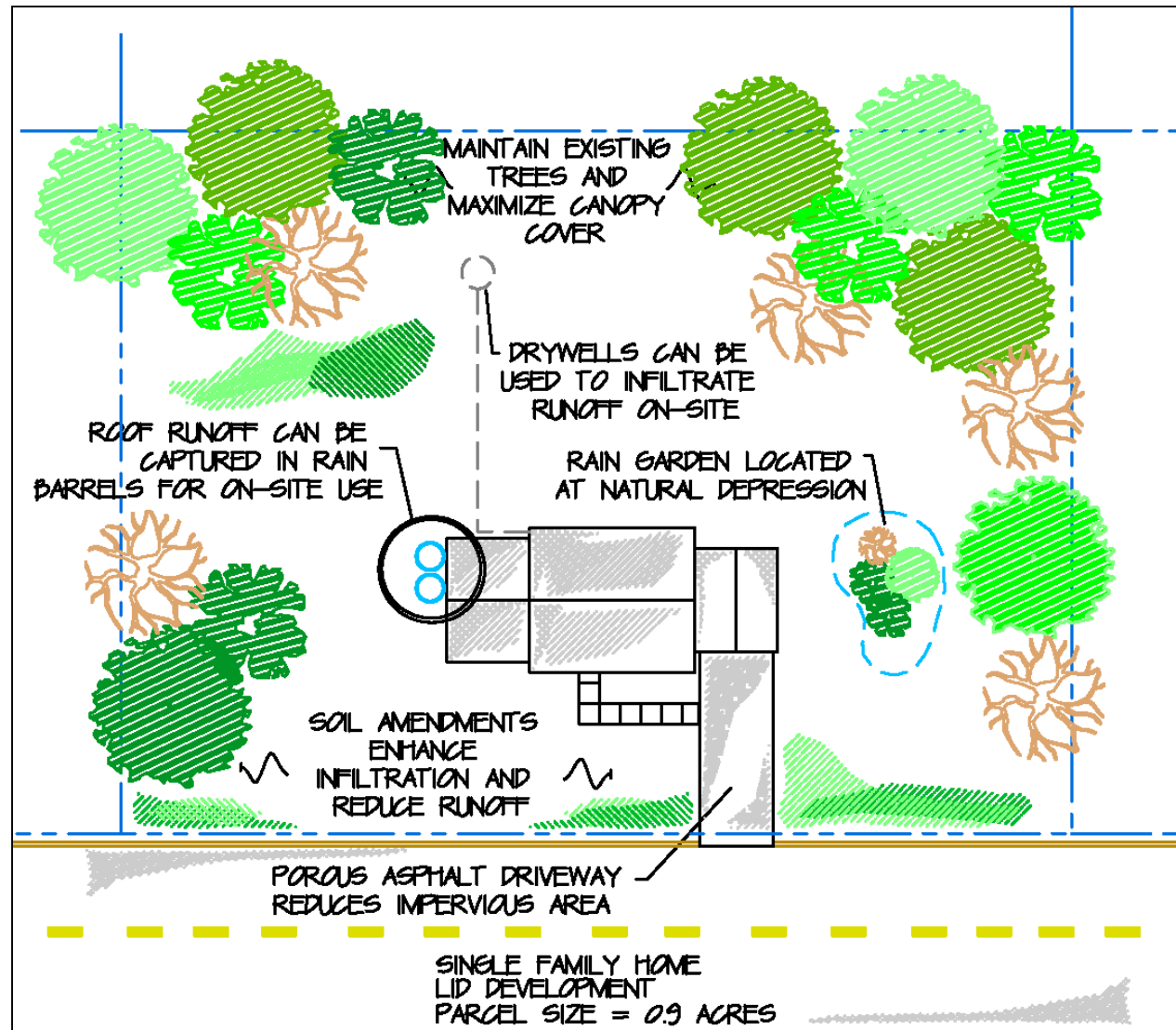


Conventional Single Family Lot



- Runoff: 8.9 in/yr
- Infiltration: 28.1 in/yr
- TSS: 213 lb/ac/yr
- TP: 0.72 lb/ac/yr

LID Single Family Lot



- **Runoff: 1.9 in/yr**
- **Infiltration: 35.2 in/yr**
- **TSS: 68 lb/ac/yr**
- **TP: 0.27 lb/ac/yr**



Runoff: -7.0 in/yr



Infiltration: +7.1 in/yr



TSS: -145 lb/ac/yr (-68%)



TP: -0.44 lb/ac/yr (-63%)

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)



Infiltrating Planter Box for Roof Runoff (Plymouth, MA)



Rain Barrels

- For capture/re-use of roof runoff
- Most barrels average 60 gallons and cost \$75 - \$125
- Cisterns are much larger systems, often involving pumps and drywell structures.

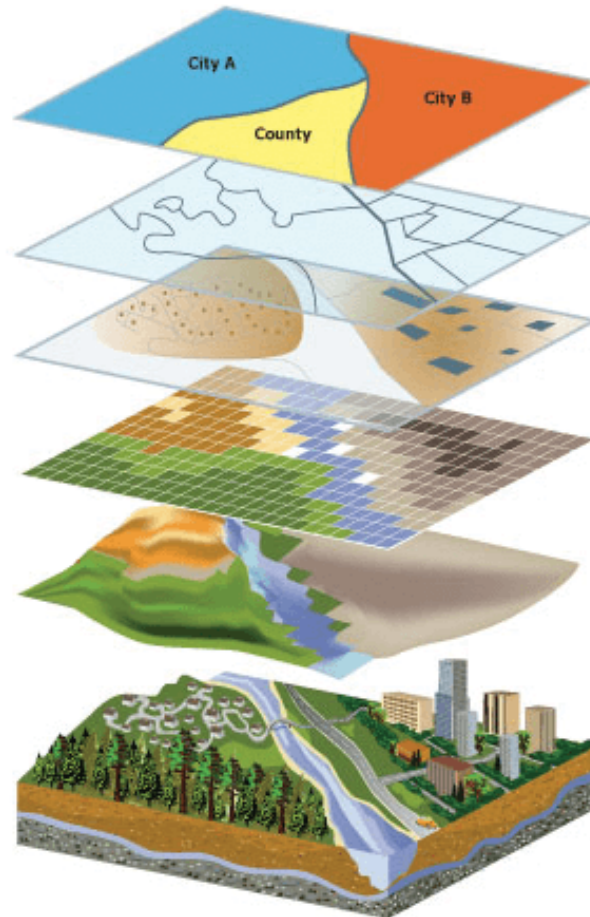


Porous Pavements (Wilmington MA)

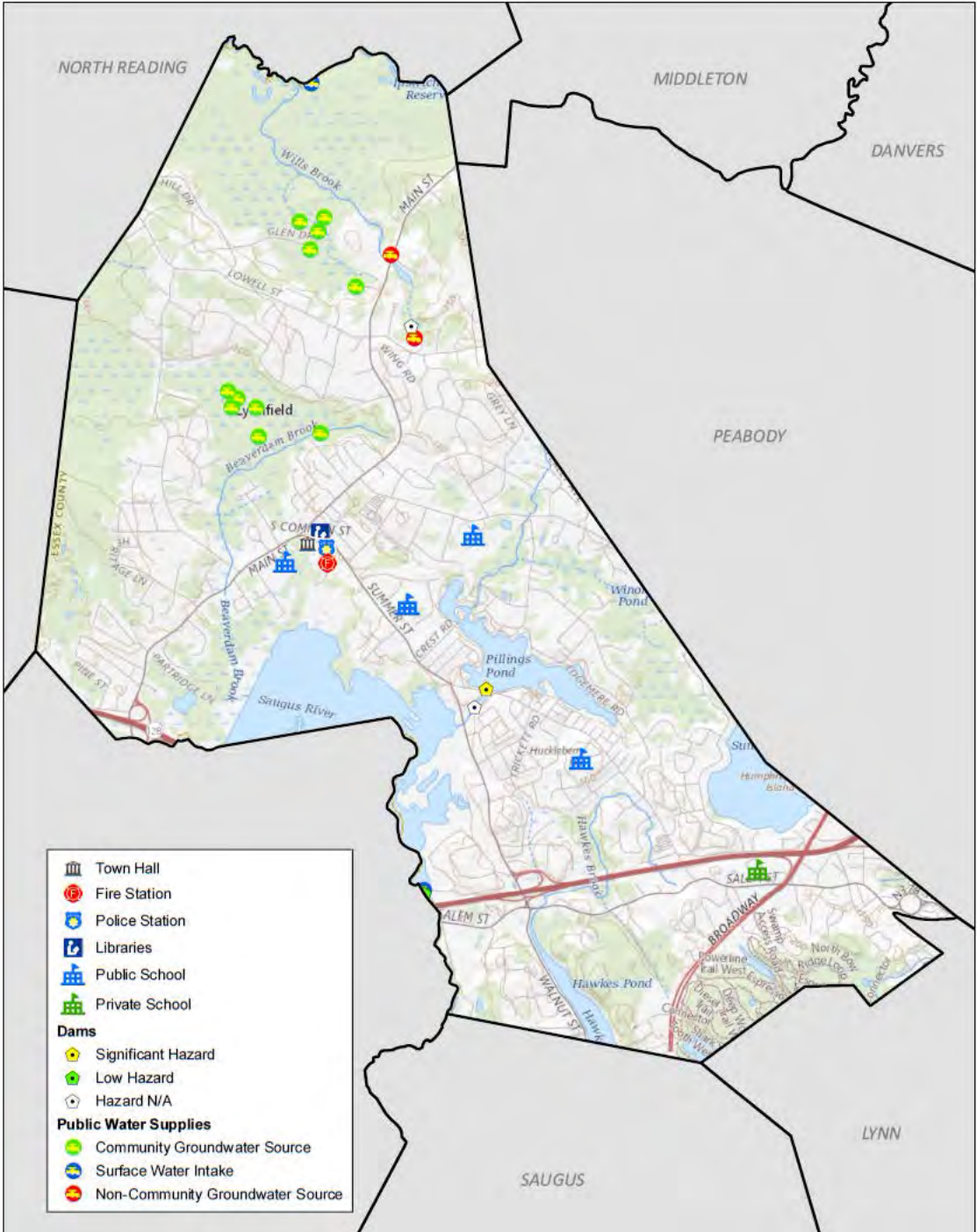
- Interlocking Concrete Pavers
- Porous Asphalt / Concrete
- Flexipave



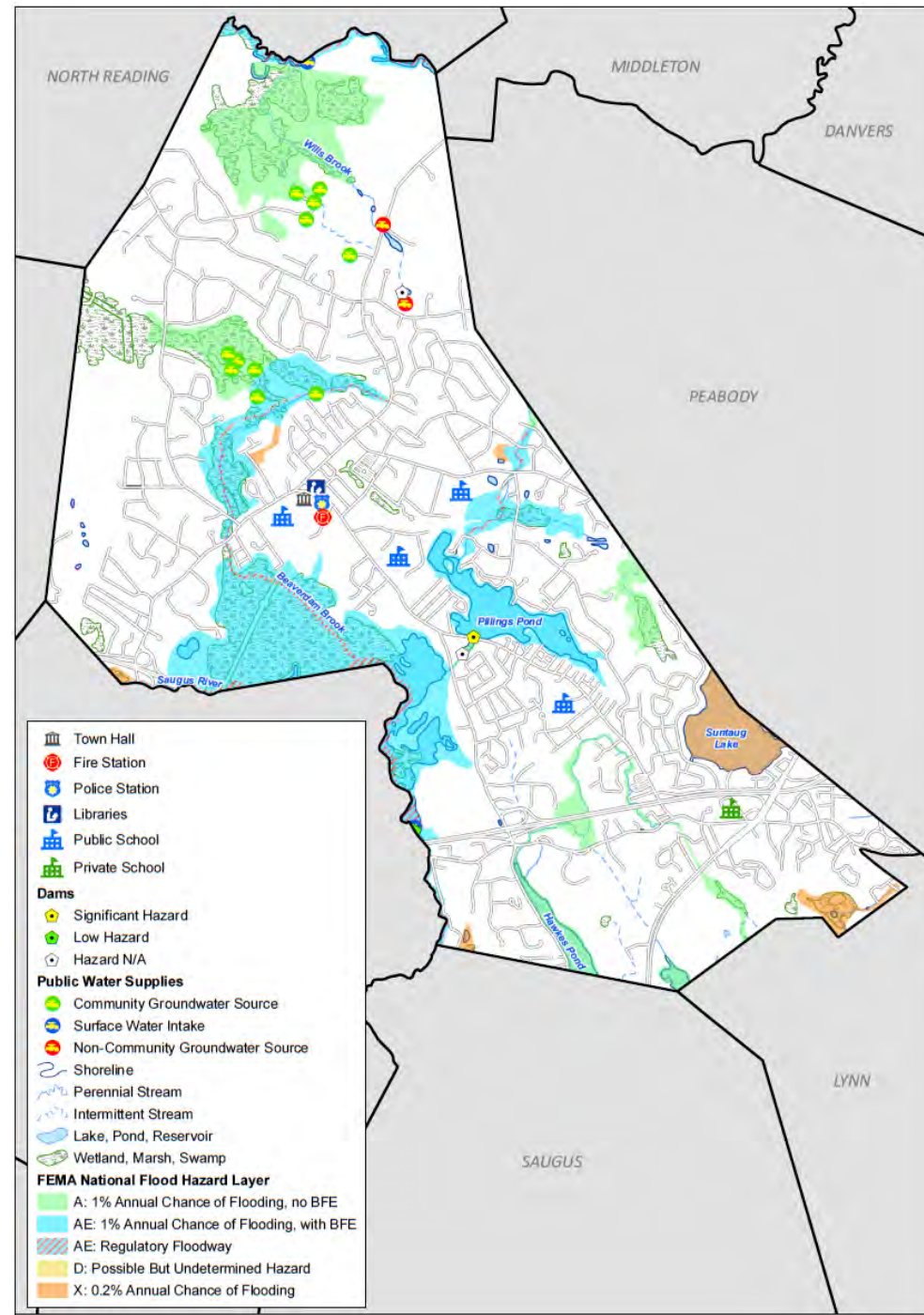
Workshop Map Resources



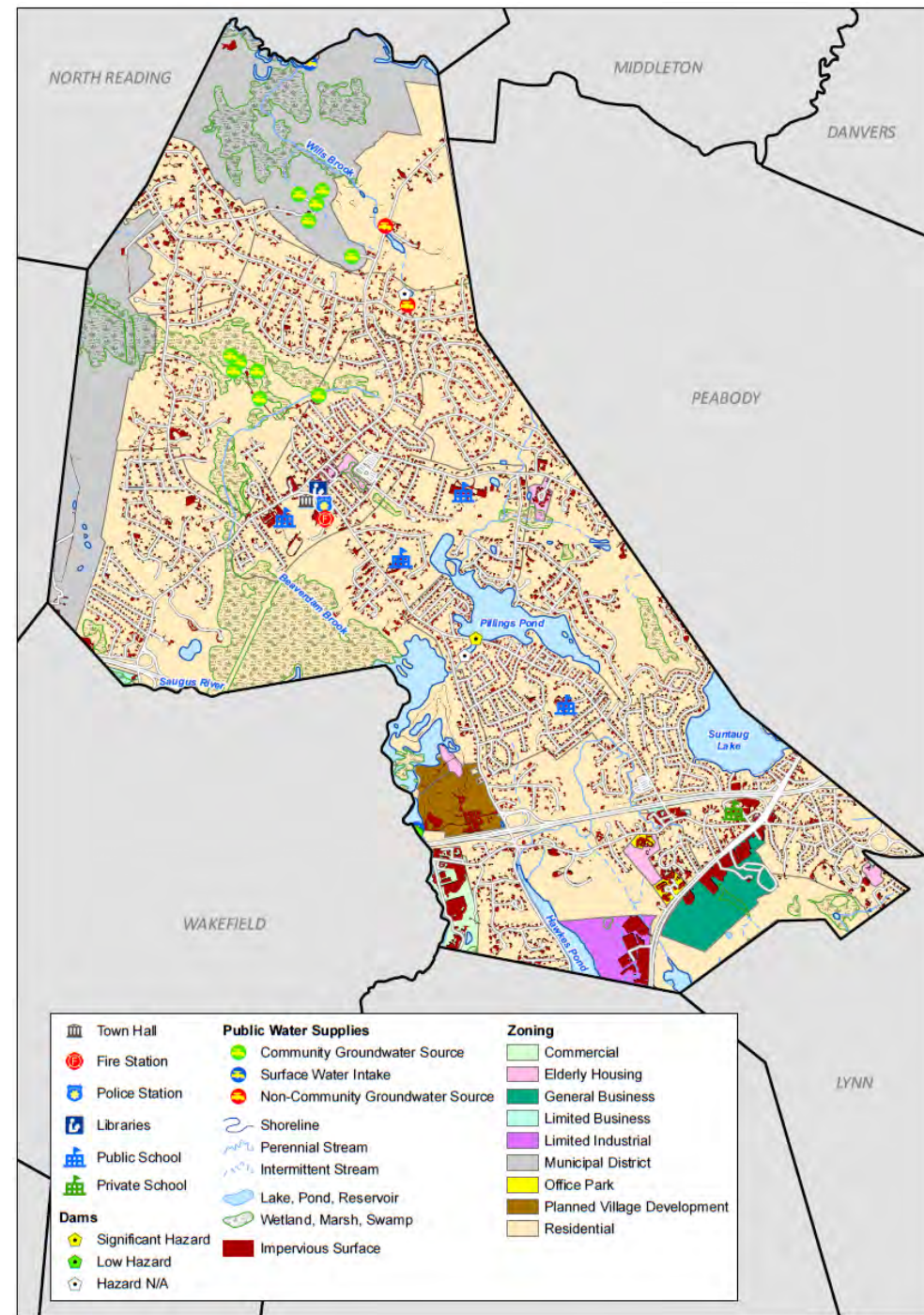
Basemap



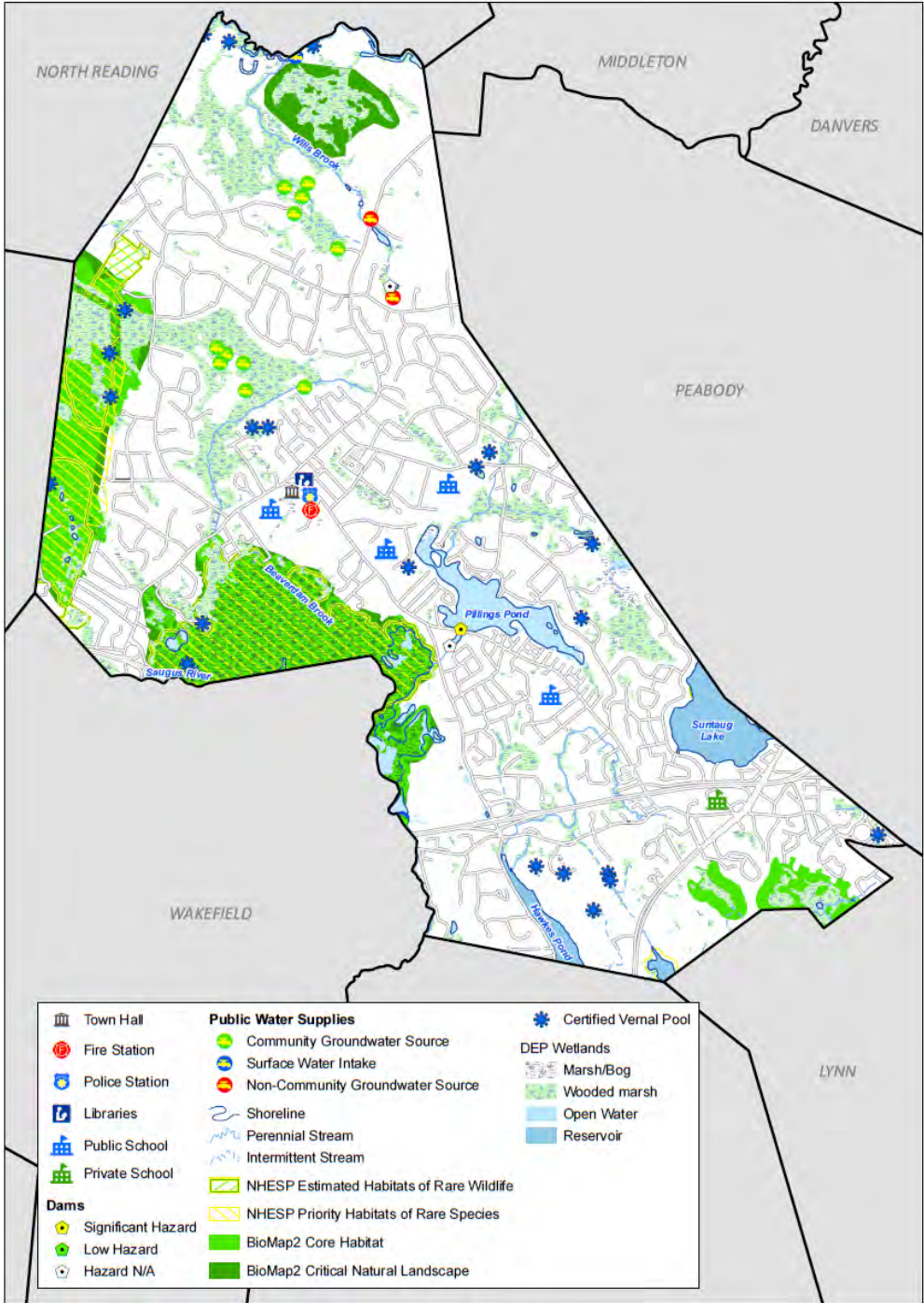
FEMA Flood Zones



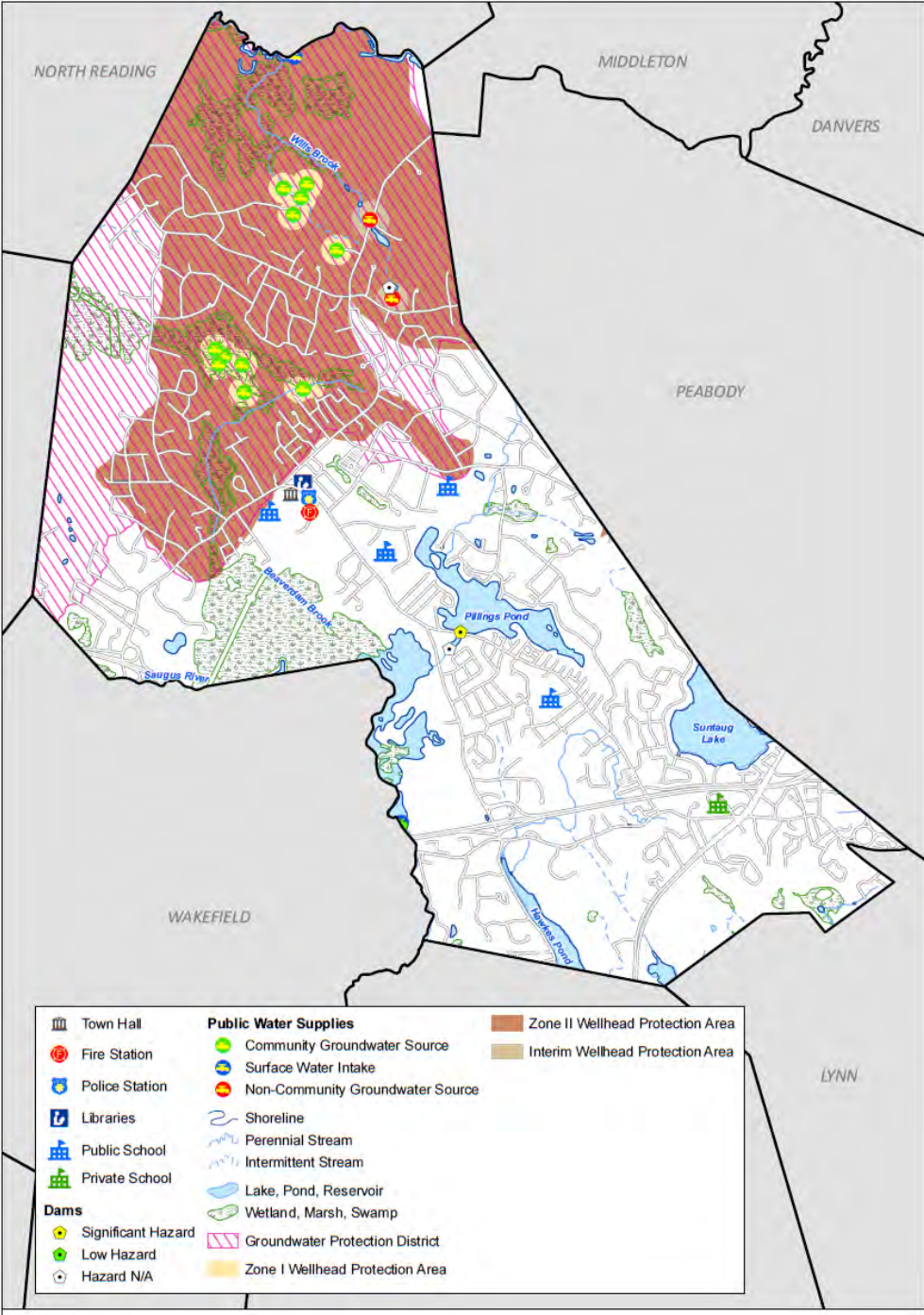
Impervious Surface & Zoning



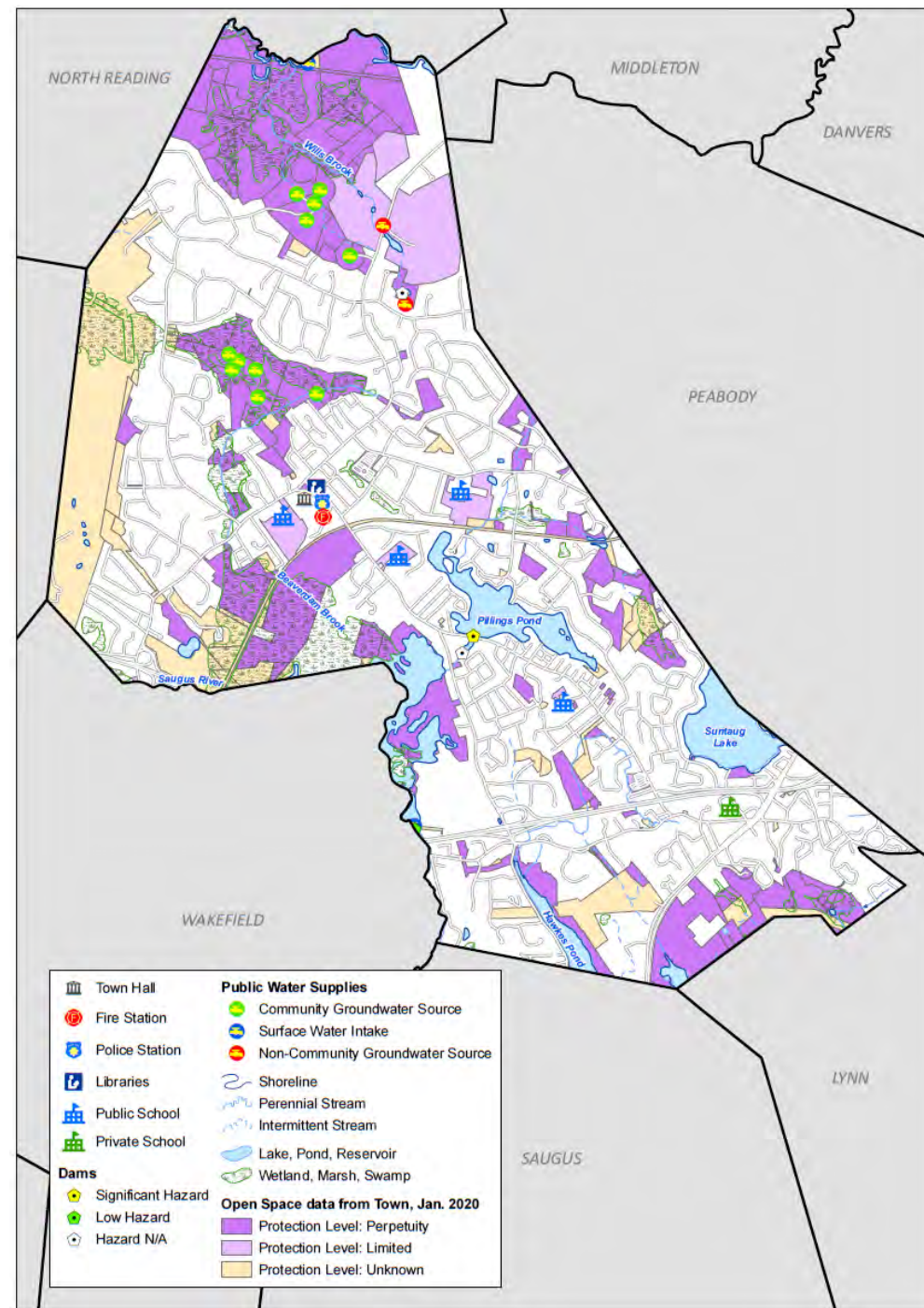
Wetlands, Critical Habitat, Rare Species



Public Water Supplies



Protected Open and Recreational Space



Stakeholder Interview Results



Stakeholder Interview Results



VULNERABILITIES

Business/Economic Disruption

- Emergency road closures
- Cooperation between public and private entities

Infrastructure

- Culvert failure
- Roadway hazards due to storms

Environmental Damage

- Development in critical areas
- Loss of floodplains/in-town flooding

*Primary concern: **Flooding***

Stakeholder Interview Results



STRENGTHS

Emergency Management Department

- Work together well and meet regularly

Ongoing Regulatory Management

- Created bylaws to strengthen stormwater controls related to development

Group Exercises

B: Characterize Hazards

C: Identify Community Vulnerabilities and Strengths

D: Identify and Prioritize Community Actions

E: Determine the Overall Priority Actions

Table Facilitators:

- Bob Hartzel, CEI
- David Roman, CEI
- Elisha Musgraves, CEI

Ground Rules

- Contribute
- Let everyone participate
- Listen with an open mind
- Stay on point and on time
- Attack the problem, not the person!



Ground Rules

Great ideas!



Stay focused!
...or that grant \$\$\$ is going to Peabody!

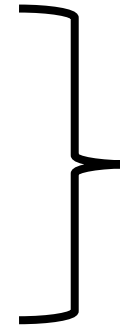
Group Exercise #1: Characterize Hazards

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

1. Table introductions, identify team spokesperson, review Risk Matrix and maps
2. Identify Top 3 Hazards (*10-15 mins*)
3. Report out to large group (*10-15 mins*)



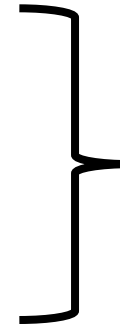
Hazard:
ultraviolet radiation



- Extreme precipitation
- Drought
- Sea level rise
- Extreme temps.



Vulnerability: exposed skin

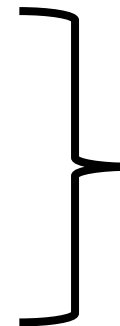


- Undersized culverts
- Crop failure
- Low-lying properties
- Vulnerable population health



Actions:

- apply sunscreen
- seek shade



- Upgrade culverts
- Irrigation improvements
- Floodproofing
- Cooling stations

Group Exercise #2: Identify Community Vulnerabilities and Strengths

Objective: Develop a **profile** of Lynnfield'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
4. Report out to large group

Time: Appx. 60-90 Minutes

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



Lunch!



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
<ul style="list-style-type: none">• Improve floodplain function:<ul style="list-style-type: none">➤ riparian land conservation➤ green stormwater infrastructure	<ul style="list-style-type: none">• Flood-proof building	<ul style="list-style-type: none">• 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

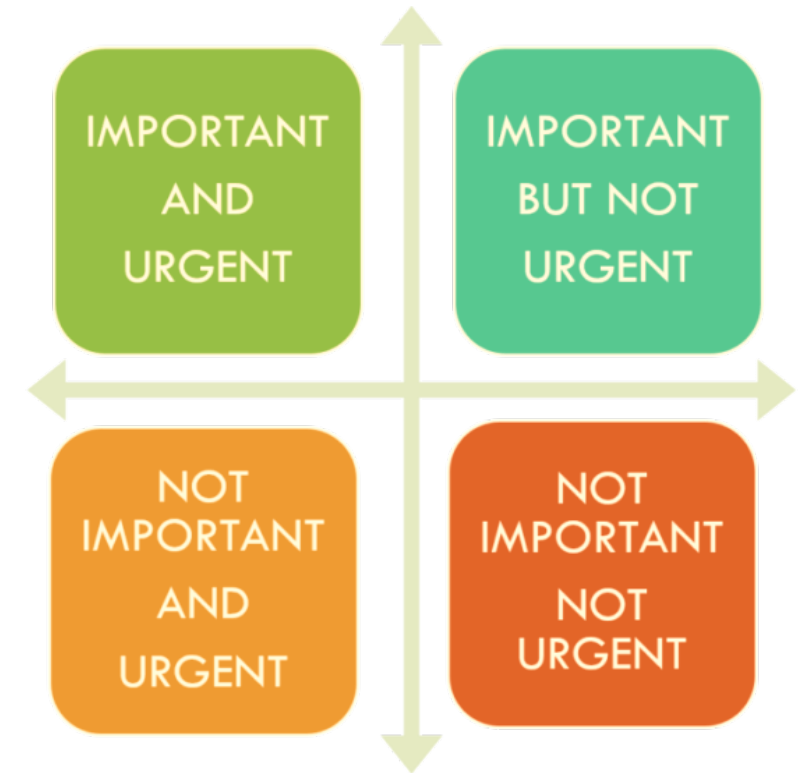
Prioritization Factors

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!



Thank you for your time!

