Harvard Municipal Vulnerability Preparedness

Workshop 1

April 11, 2019

HARRIMAN

Workshop Agenda

6:00 Welcome and Introductions

6:10 MVP Overview, Workshop Process, Overview of Climate Change

6:40 Hazard Characterization

6:50 Small Group Discussion

- Introductions within the group, identify people for scribe and report out
- Identify Harvard's vulnerabilities and strengths for Infrastructure, Societal, and Environmental Profiles

7:30 Break

7:45 Continue Small Group Discussion

8:15 Small Group: Report Outs

8:30 Wrap up and Introduce Workshop #2

Introductions

- MVP Core Group
  - Christopher Ryan, Director of Community and Economic Development
  - Liz Allard, Land Use Administrator
  - Kara Minar, Select Board
  - Sharon McCarthy, Board of Health
  - Eric Broadbent, Harvard Energy Advisory Committee
  - Kerri Green, Agricultural Advisory Commission
  - Justin Brown, Planning Board
  - Jarrett Rushmore, Planning Board

- Harriman – MVP Facilitators
  - Emily Keys Innes, Director of Planning and Senior Planner
  - Katie Moore, Planner

Overview of the Municipal Vulnerability Preparedness (MVP) Program

What is the MVP Program?

- A component of MA Executive Order 569 (2016)
- Grant funding for technical support to
  - Complete vulnerability assessments
  - Develop action-oriented resiliency plans

Why is the Town Participating?

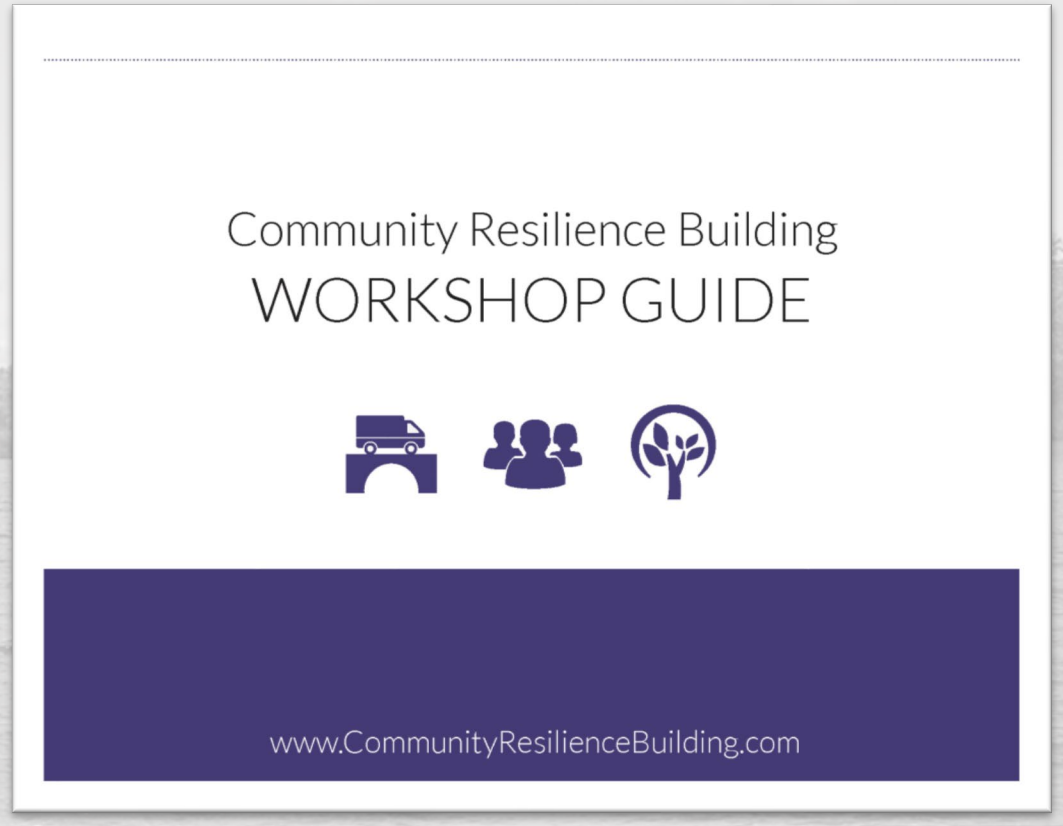
- Increasingly more unpredictable and severe weather is occurring
- Agriculture is a significant part of the town's composition and identity; Dedicated MVP component focusing on agriculture
- Completion qualifies Harvard for access to further grant funding

MVP Plan must follow the Community Resilience Building (CRB) Framework

- Developed by The Nature Conservancy (www.CommunityResilienceBuilding.com)
- Develop core team, community-driven workshops to identify hazards, current challenges, strengths, and priority actions

Workshop Process

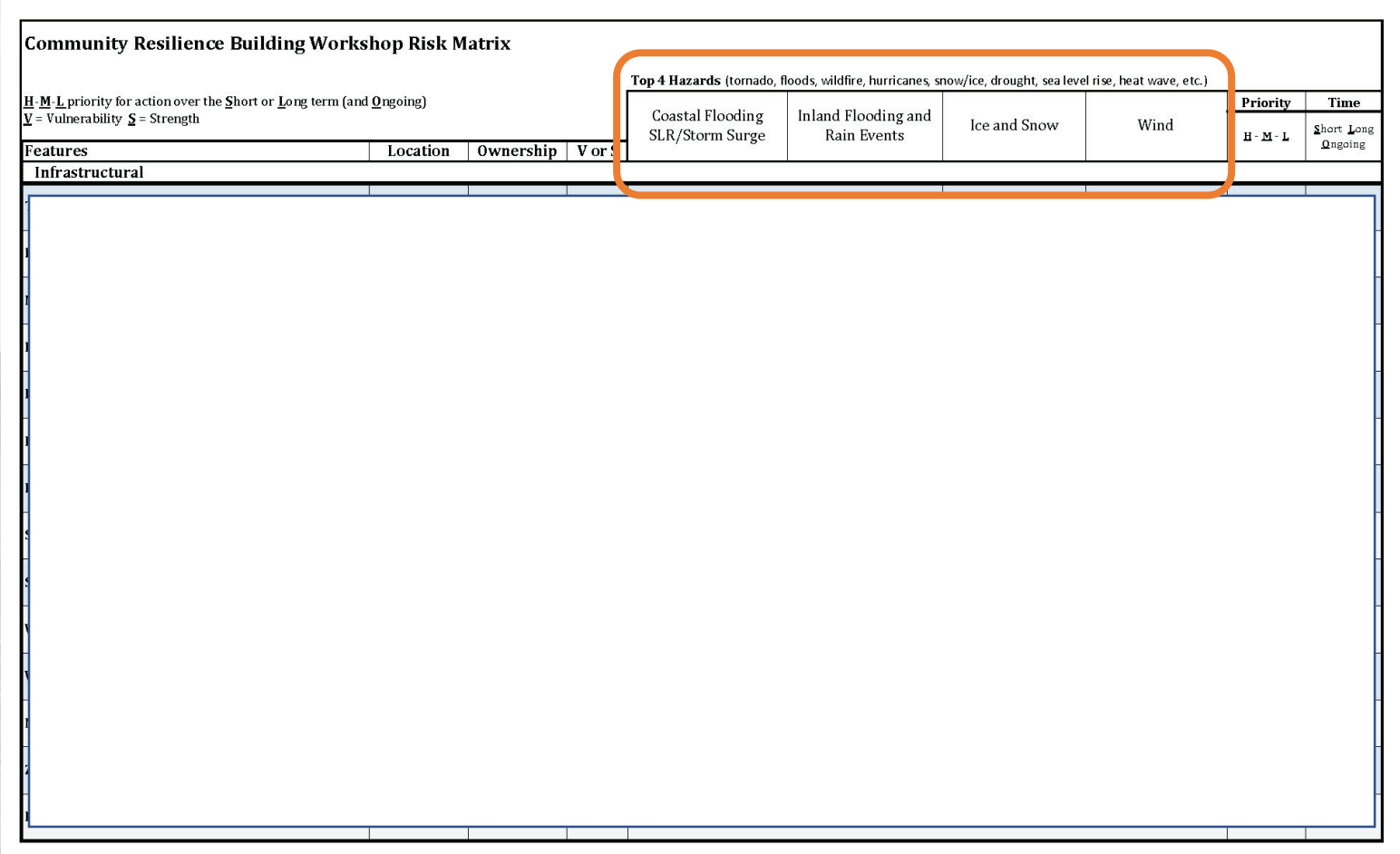
A. Prepare for the Workshop
B. Characterize Hazards
C. Identify Community Vulnerabilities and Strengths
D. Identify and Prioritize Community Actions
E. Determine the Overall Priority Actions
F. Put it All Together
G. Move Forward



Characterize Hazards

- Identify past, current, and future hazards
- Determine top-priority hazards (large group)

(Workshop 1)



Community Resilience Building Workshop Risk Matrix

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

Top 4 Hazards (tornado, floods, wildfire, hurricanes, snow/ice, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	Coastal Flooding SLR/Storm Surge	Inland Flooding and Rain Events	Ice and Snow	Wind	Priority H - M - L	Time Short Long Ongoing
Infrastructural									

Identify Community Vulnerabilities and Strengths

- Infrastructural
- Societal (People)
- Environmental

(Workshop 1)

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Infrastructural									
Town Campus	Specific	Town	V						
Evacuation Routes - Roads	Town-wide	Town/State	V						
Nursing Homes/Elderly Care Facilities	Multiple	Private	V						
Homeowners Associations/Neighborhoods	Town-wide	Town/Private	V						
Electrical Distribution System	Multiple	CL&P/Town	V						
Dams (inland and coastal)	Multiple	Private	V						
Railway and State Bridges	Multiple	Amtrak/State	V						
Septic Systems	Town-wide	Private	V						
State Roads/Intersections	Town-wide	State/Town	V						
Wharves and Shore Infrastructure	Shore	Town-State-Private	V						
Waste Water Treatment Facility	Specific	Town	V						
New Ambulance Center	Specific	Town	S						
Zoning Regulations (maintain large lot size)	Multiple	Town	S						
Business District (power generators)	Specific	Town/Private	s						

Identify and Prioritize Community Actions

- Actions and Next Steps
- Prioritization
- Timeframe for Action

(Workshop 2)

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Infrastructural									
Town Campus	Specific	Town	V	Verify risk from flooding events; Identify alternative locations during peak flooding; Verify maintenance plan annually				H	S
Evacuation Routes - Roads	Town-wide	Town/State	V	Install highly visible signage for evacuation routes; Develop and implement communication program				H	S
Nursing Homes/Elderly Care Facilities	Multiple	Private	V	Improve power generation; Review building codes and zoning for existing and future facilities				H	S
Homeowners Associations/Neighborhoods	Town-wide	Town/Private	V	Engage Neighborhood Associations and develop cooperative response plan with Town: Advance "Neighbor helping Neighbor" Program; Develop comprehensive neighborhood-based emergency plans				H	S
Electrical Distribution System	Multiple	CL&P/Town	V	Within floodplain area, establish plan to address protection and long-term relocation of equipment	Upgrade transformers; Maintain power line protection zone (tree trimming)			H	O-L
Dams (inland and coastal)	Multiple	Private	V	Prevent possibility of catastrophic dam failure; Identify and remove dams to minimize downstream flooding due to failure				H	L
Railway and State Bridges	Multiple	Amtrak/State	V	Improve communications between parties; Expand green/gray infrastructure and improve bridge structures; Assess vulnerability and prioritize infrastructure improvement list				M	S
Septic Systems	Town-wide	Private	V	Assess opportunities for community systems or alternative treatment technology; Upgrade regulations to reduce contamination in water ways				M	L
State Roads/Intersections	Town-wide	State/Town	V	Coordinate with DOT, volunteers, public works to improve response; Need signage to warn of flooding risk in critical intersections				M	L
Wharves and Shore Infrastructure	Shore	Town-State-Private	V	Establish community dialogue regarding retaining/relocating infrastructure; Advance comprehensive shoreline management plan				L	S
Waste Water Treatment Facility	Specific	Town	V	Conduct alternative siting feasibility study; Relocate to low risk area within next 25 years.				L	L
New Ambulance Center	Specific	Town	S	Continue to support services in budget; Add additional staff and vehicle in next annual cycle					Ongoing
Zoning Regulations (maintain large lot size)	Multiple	Town	S	Current building codes control development in risky areas; Consider additional zoning incentives (TDRs) to reduce risk to residential units					Ongoing
Business District (power generators)	Specific	Town/Private	S	Downtown business district with power generators in place; Prioritize pharmacy and gas stations					Ongoing

Climate Change

- “It's pretty clear that climate change is starting to have a very significant impact on our communities, on our infrastructure, on personal property, on real property and on community property.”
  - Charlie Baker, Governor of Massachusetts

- “Every company, investor, and bank that screens new and existing investments for climate risk is simply being pragmatic.”
  - Jim Yong Kim, Former President of the World Bank

- “Climate change is a key problem facing people.”
  - David Malpass, Current President of the World Bank

- “The effects of a changing climate are a national security issue with potential impacts to Department of Defense (DoD) missions, operational plans, and installations. … To achieve these goals, DoD must be able to adapt current and future operations to address the impacts of a variety of threats and conditions, including those from weather and natural events. To that end, DoD factors in the effects of the environment into its mission planning and execution to build resilience.”
  - *Report on Effects of a Changing Climate to the Department of Defense*, January 2019

Overview of Climate Change

- Climate change
  - A change in the state of the climate … whether due to natural variability or as a result of human activity
- Natural hazard
  - Natural events that threaten lives, property, and other assets
  - Often can be predicted; they tend to occur repeatedly in the same geographic locations because they are related to weather patterns or physical characteristics of an area
- Risk
  - The potential for an unwanted outcome resulting from a hazard event
- Vulnerability
  - The propensity or predisposition to be adversely affected
  - A function of exposure, sensitivity, and adaptive capacity

Definitions from the *Massachusetts State Hazard Mitigation and Climate Adaptation Plan*, 2018

A *hazard* is the sun.

The *risk* is sunburn.

The *vulnerability* includes the length of *exposure* to the sun, how *sensitive* the skin is to it.

Risk/Risk Management

- Defining risk, understanding risk, and managing risk
  - Rational actor paradigm: making the optimal choice based on an understanding of maximizing the benefit and minimizing the losses
  - Behavioral economics: studies why people don't always make the rational choice

- Define your risk by understanding where/how you are vulnerable
- Understand the strategies that can reduce your vulnerability
- Identify the cost of implementing the strategy vs. the cost of doing nothing
- **Know that you will never have perfect information, and that reducing vulnerability/risk is a series of actions over time, not a single decision**

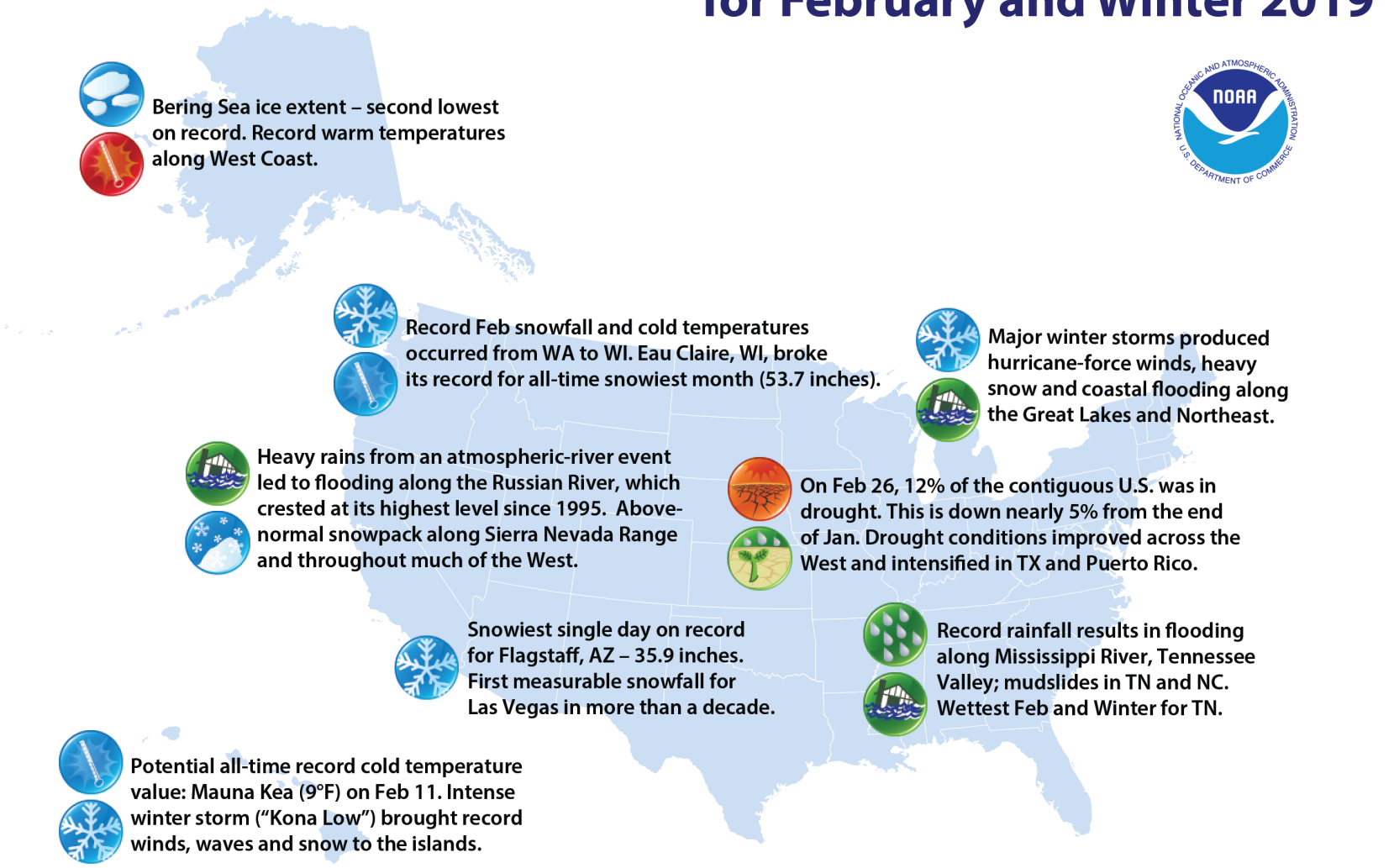
Resources

- **Risk, Uncertainty and Rational Action**; Carlo C. Jaeger, Thomas Webler, Eugene A. Rosa, Ortwin Renn
- **The Resilience Dividend: Being Strong in a World Where Things Go Wrong**, Judith Rodin
- **Antifragile: Things that Gain from Disorder**, Nassim Nicholas Taleb

Overview of Climate Change - US

- For the ninth consecutive month, the Northeast was wetter than normal.
- Precipitation was 114% of normal in Massachusetts

U.S. Selected Significant Climate Anomalies and Events for February and Winter 2019



The average U.S. temperature for February was 32.0°F, 1.8°F below average, ranking in the coldest third of the 125-year record. The U.S. precipitation average for February was 3.22 inches, 1.09 inches above average, ranking second wettest on record. The winter average U.S. temperature was 33.4°F, 1.2°F above average. The winter precipitation total was 9.01 inches, 2.22 inch above average — wettest on record.

Moderate drought expands, covering nearly 33% of Puerto Rico.

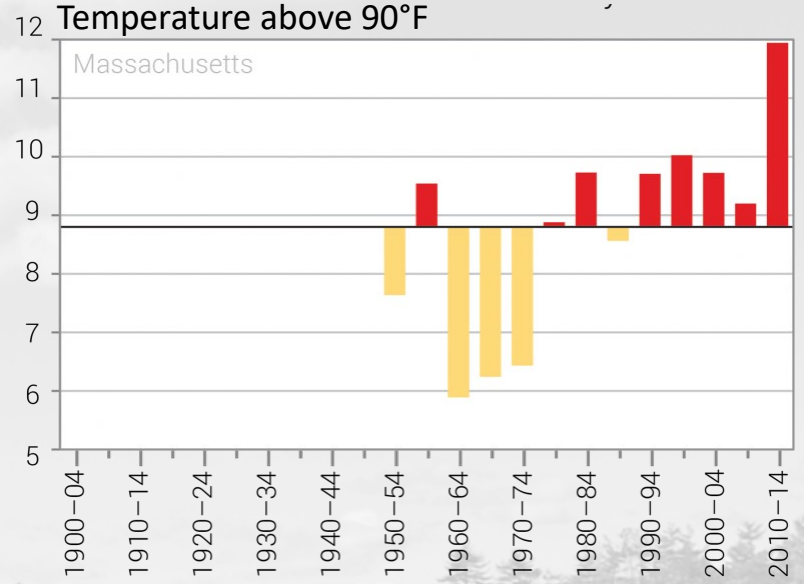
Please Note: Material provided in this map was compiled from NOAA's State of the Climate Reports. For more information please visit: http://www.ncdc.noaa.gov/sotc

Overview of Climate Change - MA

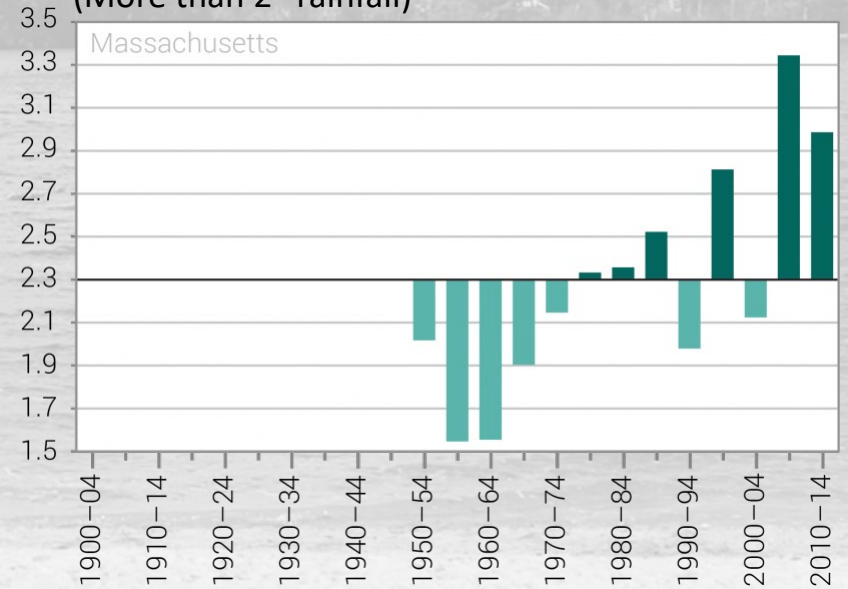
- Average annual temperatures increased almost 3°F between 1900-2014
- Number of days maximum temperature was above 90°F has been consistently above average since the 1990s
- All precipitation metrics have been highest during the most recent decade of data (2005–2014)

Source: *NOAA Technical Report NESDIS 149-MA*, 2017

Observed Days Maximum Temperature above 90°F



Observed Extreme Precipitation Events (More than 2" rainfall)



Overview of Climate Change - MA

MA Executive Office of Energy and Environmental Affairs created a clearinghouse of climate science maps, data, documents (resilientMA.org)

Projections from Northeast Climate Adaptation Science Center (e.g., temperature, precipitation)

- "Downscaled" to major watershed basin (Harvard is in the Merrimack, Nashua, and Sudbury-Assabet-Concord (SuAsCo) Basins)
- Temperature projections are more certain than precipitation

Trail along Bare Hill Wildlife Sanctuary – December 2008 ice storm

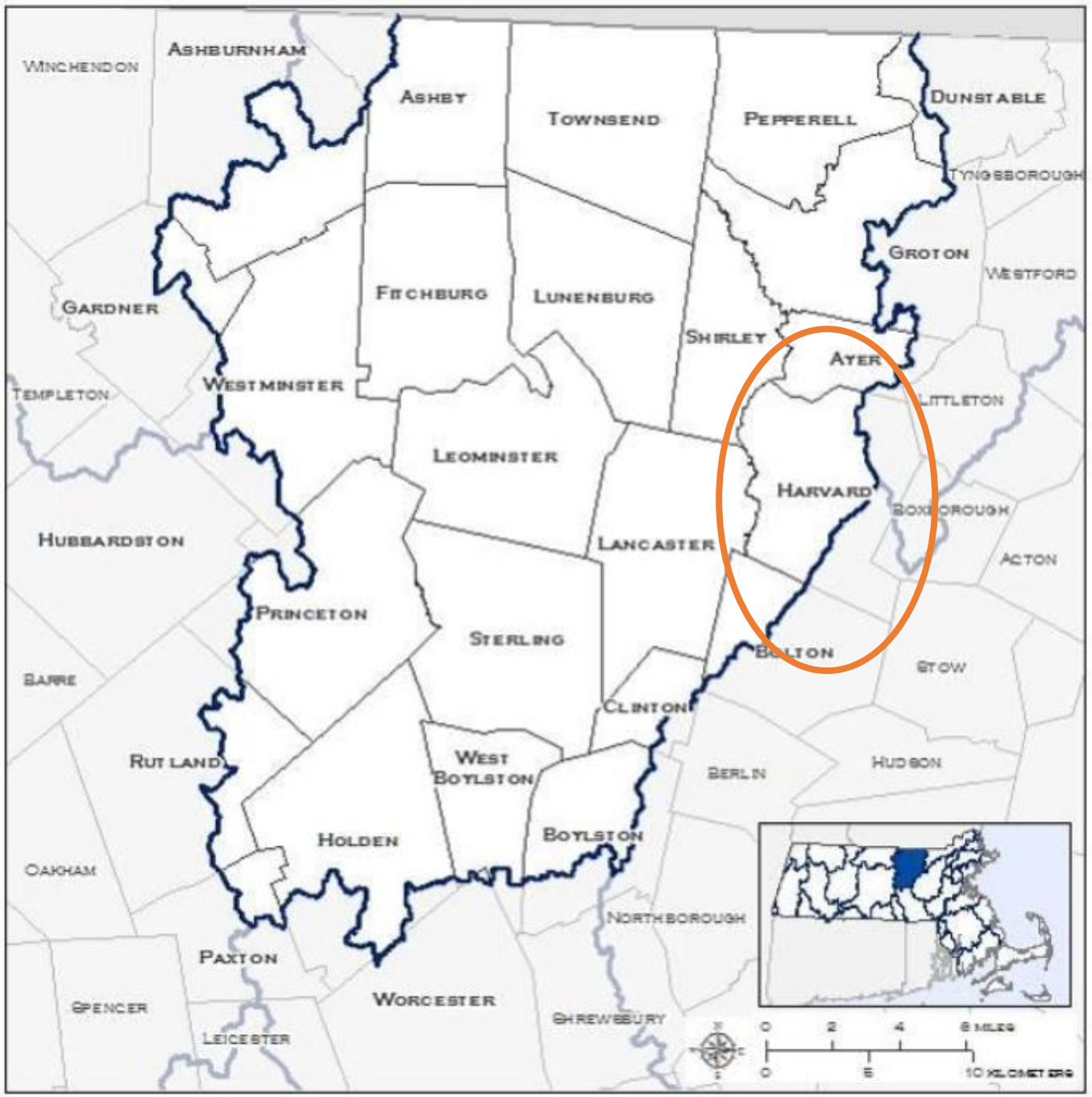
Bower's Brook along Cruft Lane – July 2016 drought

Trail along the Powell-Abbot-Reed land – December 2008 ice storm

Ice storm 2008
Source: Rochelle Greayer

William's Pond Stow Road – July 2016 drought

Overview of Climate Change - Nashua Basin



Overview of Climate Change - Nashua Basin

- Increased average, maximum, and minimum temperatures
  - Increased seasonal temperatures; winter is expected to see greater increases
- More days with extreme heat (daily maximum temperatures over 90°F)
- Fewer days with daily minimum temperatures below 32°F

	Baseline (1971-2000)	Mid-century (2050s)	End of Century (2090s)
Average annual temperature (°F)	46.8°F	+ 3.0 to 6.4°F	+ 3.9 to 11.0°F
Annual days max temperature >90°F	4 days	9 to 30 more days	13 to 70 more days
Annual days min temperature <32°F	156 days	19 to 38 fewer days	23 to 64 fewer days

Source: resilient MA, 2018

Overview of Climate Change - Nashua Basin

- Number of days receiving over 1” precipitation are variable; winter is expected to see the highest increase
- Winter is expected to see the greatest change in precipitation (increase 2-22% by 2050s, increase 6-39% by 2090s)
- Fall and summer are expected to continue to have the most consecutive dry days

Climate-related Hazard Characterizations

Town of Harvard's hazards as identified in the *Montachusett Region Natural Hazard Mitigation Plan 2015 Update*

- High risk: Heavy rain, Snow melt, High winds, Nor'easters, Heavy snow, Wildland fire
- Moderate risk: Hurricanes, Tornados, Severe thunderstorms, Ice storms, Blizzard, Drought, Extreme temperatures

Agriculture Workshop

- Temperature (high and low temperatures), Precipitation (too much, too little, frequency)

Pre-workshop Survey (http://tinyurl.com/harvardclimatesurvey)

- High temperatures and heat waves, Temperature fluctuations, Drought, High winds, Soil and water contamination by salts and other contaminants

Hazards in Harvard

- What hazards have impacted Harvard in the past/currently/future?
  - How? Where? Frequency?
- Other concerns or considerations?

Top 4 Hazards in Harvard

- Temperature
  (Agriculture Workshop)
- Precipitation
  (Agriculture Workshop)
- _____
- _____

Small Groups

1. Group introductions: Name, organization/department

2. Identify a spokesperson and a scribe (not the facilitator)

3. Focus on identifying:
   - Strengths and vulnerabilities (what is the strength or vulnerability? Is it both?
   - Location (where is the strength or the vulnerability?)
   - Ownership (who owns or who is responsible?)

4. Choose 1 strength and 1 vulnerability from each section (infrastructure, societal, environment) to report back to the group

Report Out from Small Groups

- 1 strength and 1 vulnerability from each section
  - Infrastructure
  - Societal
  - Environment

Next Steps

Workshop #2

April 25, 6-9pm

Town Hall

- Develop and prioritize actions and clearly delineated next steps
- Identify opportunities to advance actions that further reduce the impact of hazards and increase resilience across and within Harvard