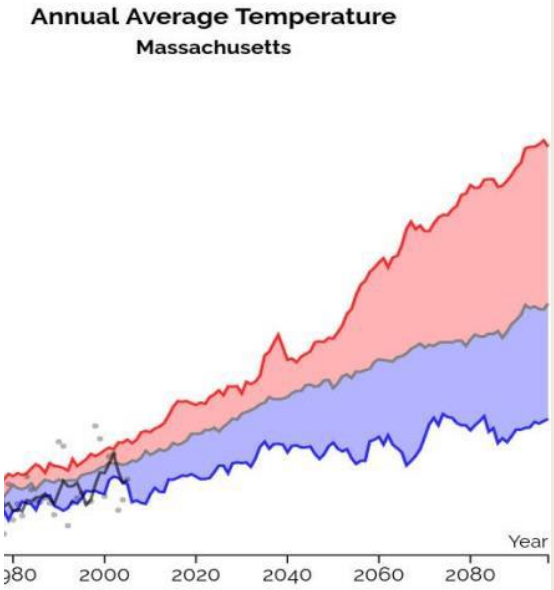
Climate Change in Massachusetts

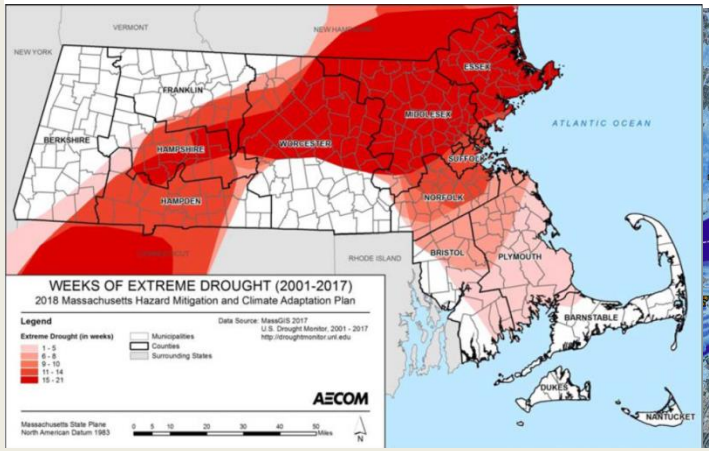
Rising Temperatures

Changes in Precipitation

Extreme Weather

Sea Level Rise





Executive Office of Energy and Environmental Affairs

Toxics Use Reduction Planner Continuing Education Conference, November 13, 2018

Weather vs Climate

"If you don't like the weather in New England, just wait a few minutes." - *Mark Twain*

Weather refers to atmospheric conditions that occur locally over short periods of time—from minutes to hours or days. Weather is **local and short-term.**

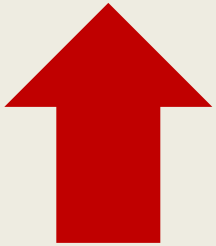
Climate refers to the **long-term regional or even global average** of temperature, humidity and rainfall patterns over seasons, years or decades. Climate is global and long-term.

Global Warming vs Climate Change

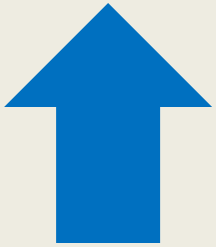
Global warming refers to the **upward temperature trend** across the entire Earth since the early 20th century, due to the increase in fossil fuel emissions since the industrial revolution.

Climate change refers to a **broad range of global phenomena** created predominantly by burning fossil fuels, which add heat-trapping gases to Earth's atmosphere. These phenomena include the increased temperature trends described by global warming, but also encompass changes such as **sea level rise; ice mass** loss in Greenland, Antarctica, the Arctic and mountain glaciers worldwide; **shifts in flower/plant blooming; and extreme weather events**.

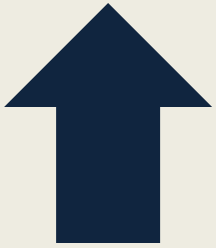
Massachusetts Observed Climate Changes

Temperature: 

2.9°F
Since 1895 (Statewide)

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

Climate Change Projections for Massachusetts

CLIMATE CHANGES	RELATED NATURAL HAZARDS	PROJECTIONS BY THE END OF THIS CENTURY
Changes in precipitation 	– Inland flooding – Drought – Landslide	– Annual precipitation: Increase up to 16% (+7.3 inches) – Days with rainfall accumulation 1+ inch: Increase up to 57% (+4 days) – Consecutive dry days: Increase 18% (+3 days) – Summer precipitation: Decrease
Sea level rise 	– Coastal flooding – Coastal erosion – Tsunami	– Sea level: Increase 4.0 to 10.5 feet along the Massachusetts coast
Rising temperatures 	– Average/extreme temperatures – Wildfires – Invasive species	– Average annual temperature: Increase up to 23% (+10.8 degrees Fahrenheit) – Days/year with daily minimum temperatures below freezing: Decrease up to 42% (-62 days) – Winter temperatures: Increase at a greater rate than spring, summer, or fall – Long-term average minimum winter temperature: Increase up to 66% (+11.4 degrees Fahrenheit) – Days/year with daily maximum temperatures over 90 degrees Fahrenheit: Increase by up to 1,280% (+64 days) – Growing degree days: Increase by 23% to 52%
Extreme weather 	– Hurricanes/tropical storms – Severe winter storms/nor'easters – Tornadoes – Other severe weather	– Frequency and magnitude: Increase

Executive Summary, State Hazard Mitigation & Climate Adaptation Plan, 2018

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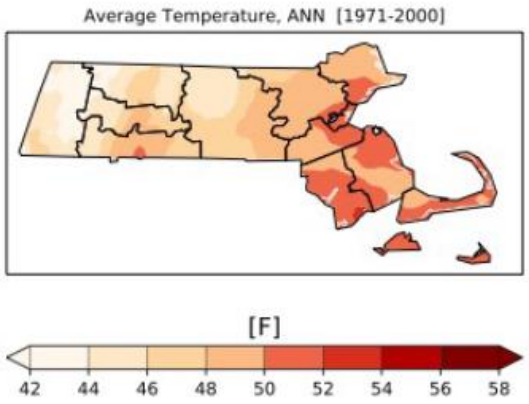
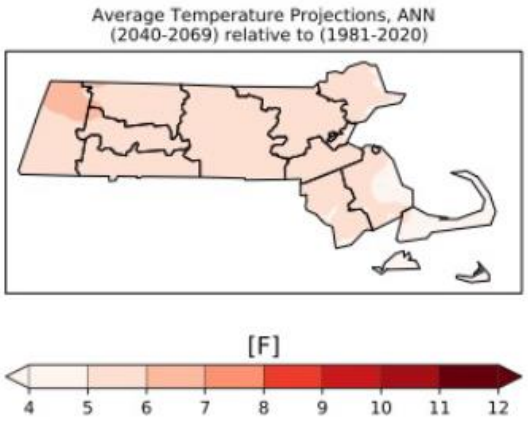
Average Annual Temperature Projections

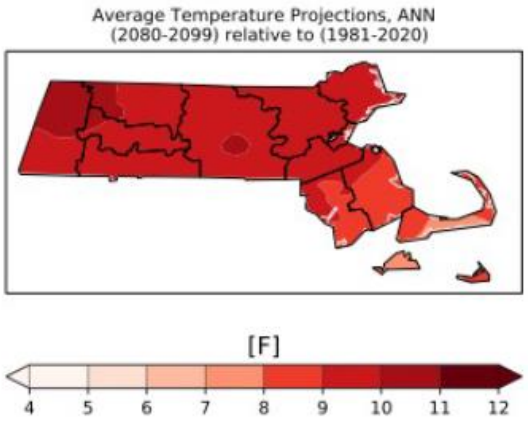
Climatology 1971-2000



Projections 2050s



Projections 2090s



NECASC Northeast Climate Adaptation Science Center

Climate Change Projections for Massachusetts

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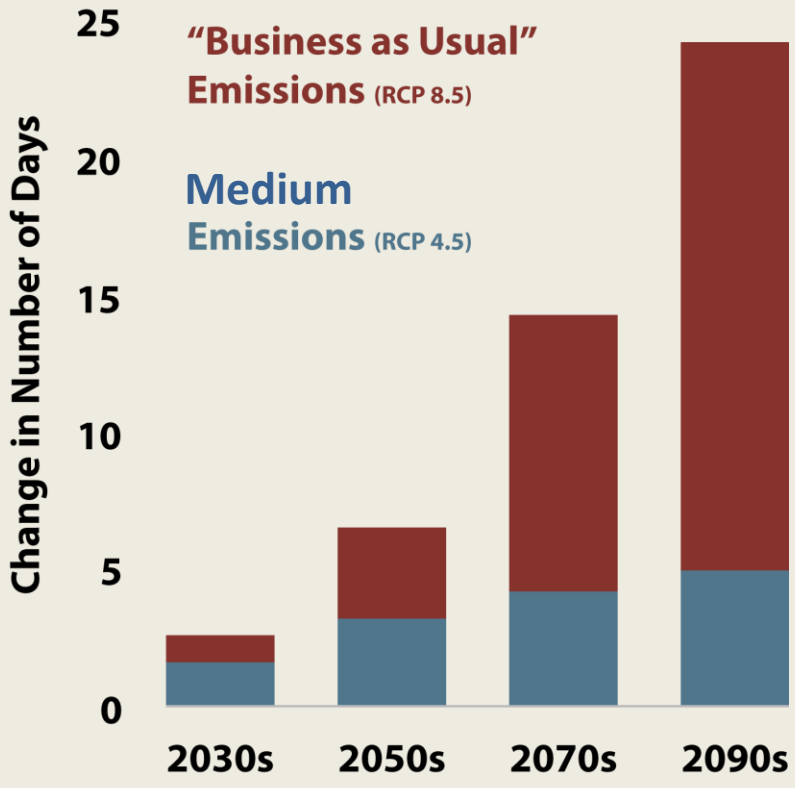
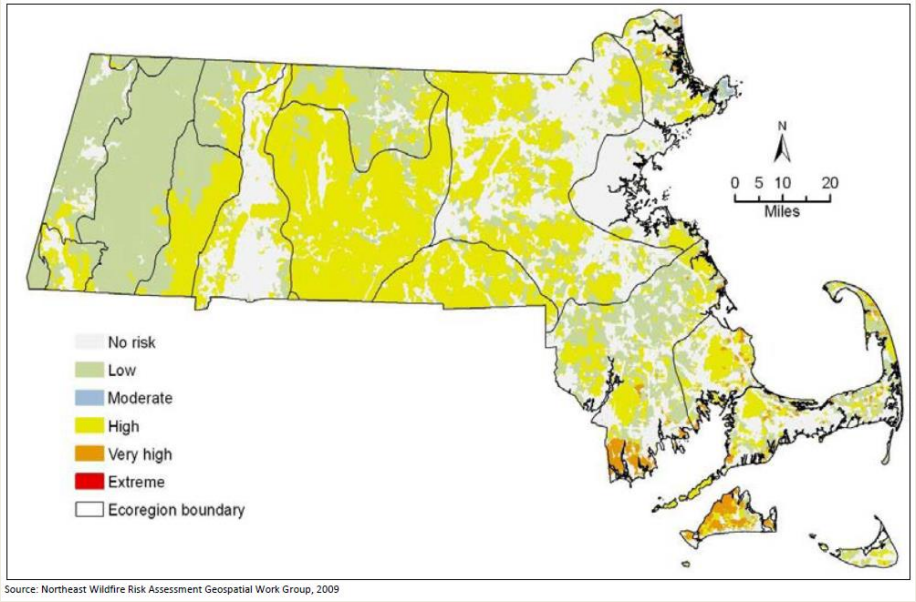
Summer Days Over 95°F

Massachusetts

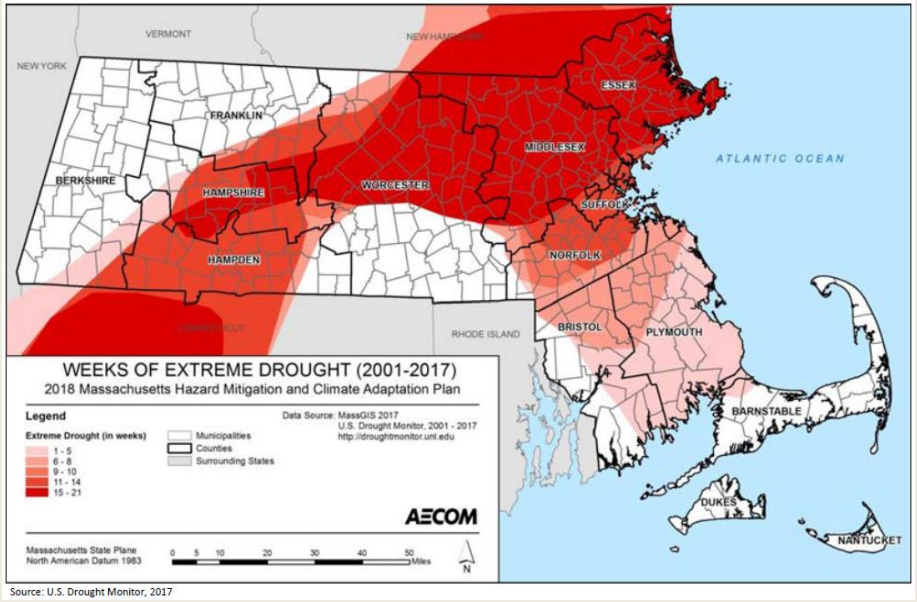


Data courtesy A. Karmalkar, Northeast Climate Adaptation Science Center. Figure by D. Brown

Impacts from Increasing Temperatures



Wildfire Risk Areas for the Commonwealth



Weeks of Extreme Drought (2001-2017)

Climate Change Projections for Massachusetts

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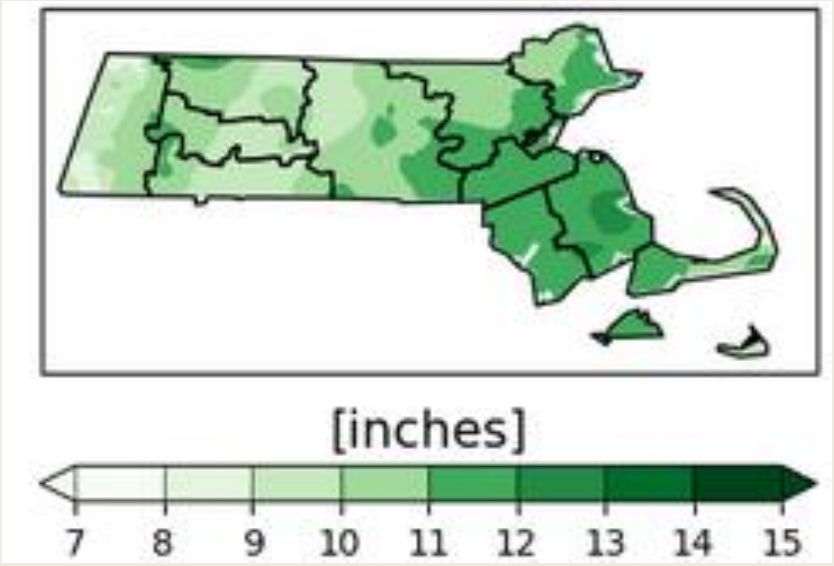
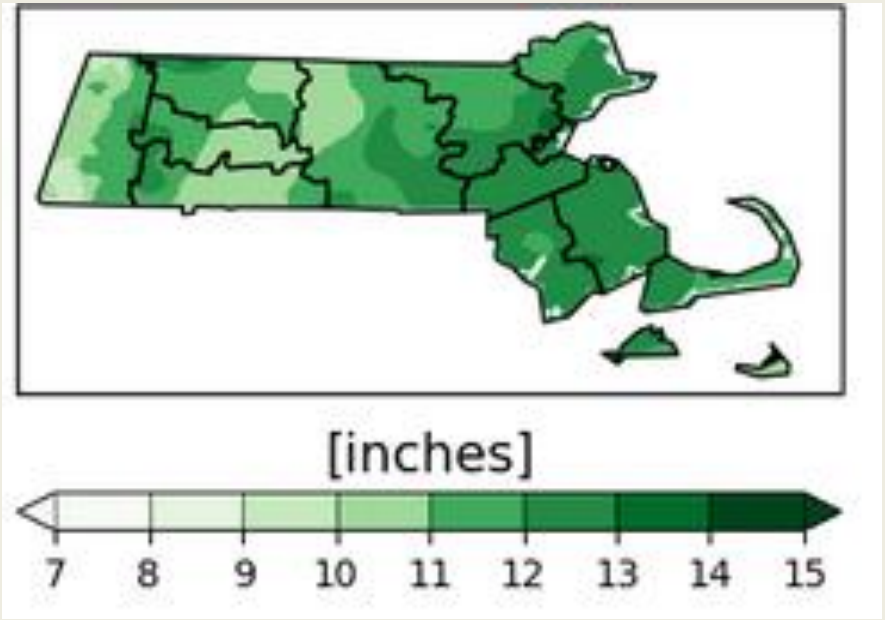
Winter Precipitation



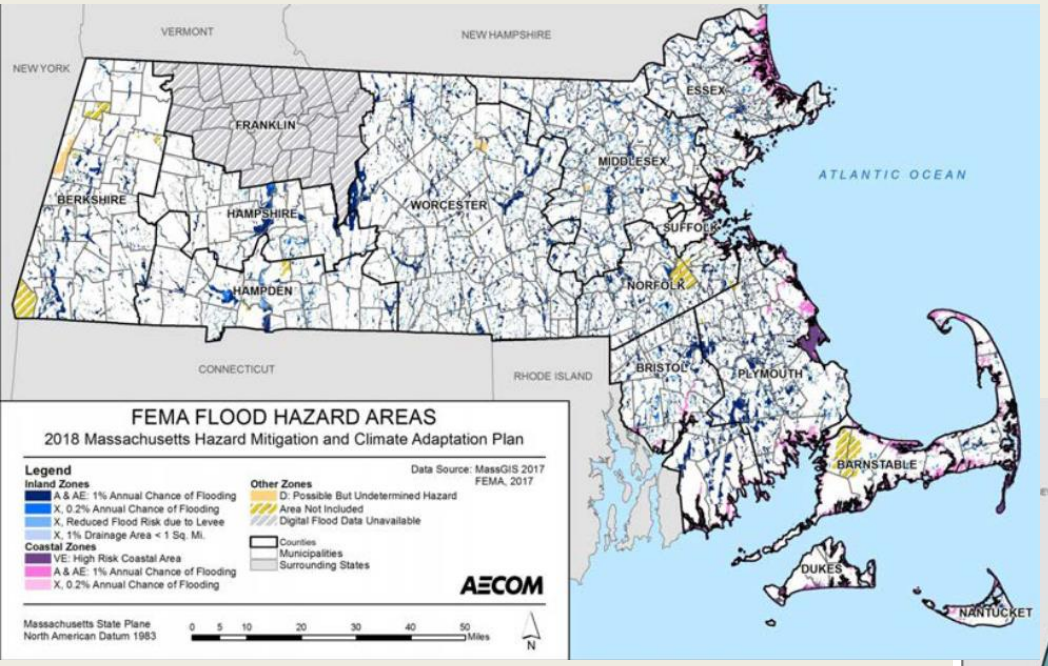
Baseline (1971-2000)

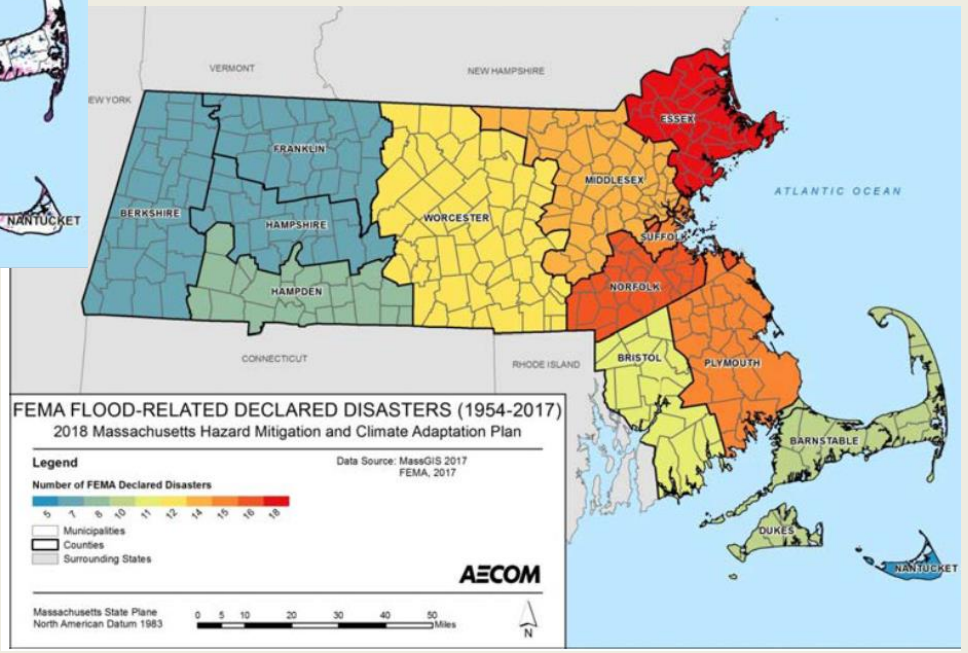


2050s (30-yr projections centered on 2050s relative to baseline)

NECASC Northeast Climate Adaptation Science Center

Impacts from Changing Precipitation Conditions





State Hazard Mitigation & Climate Adaptation Plan, 2018

Climate Change Projections for Massachusetts

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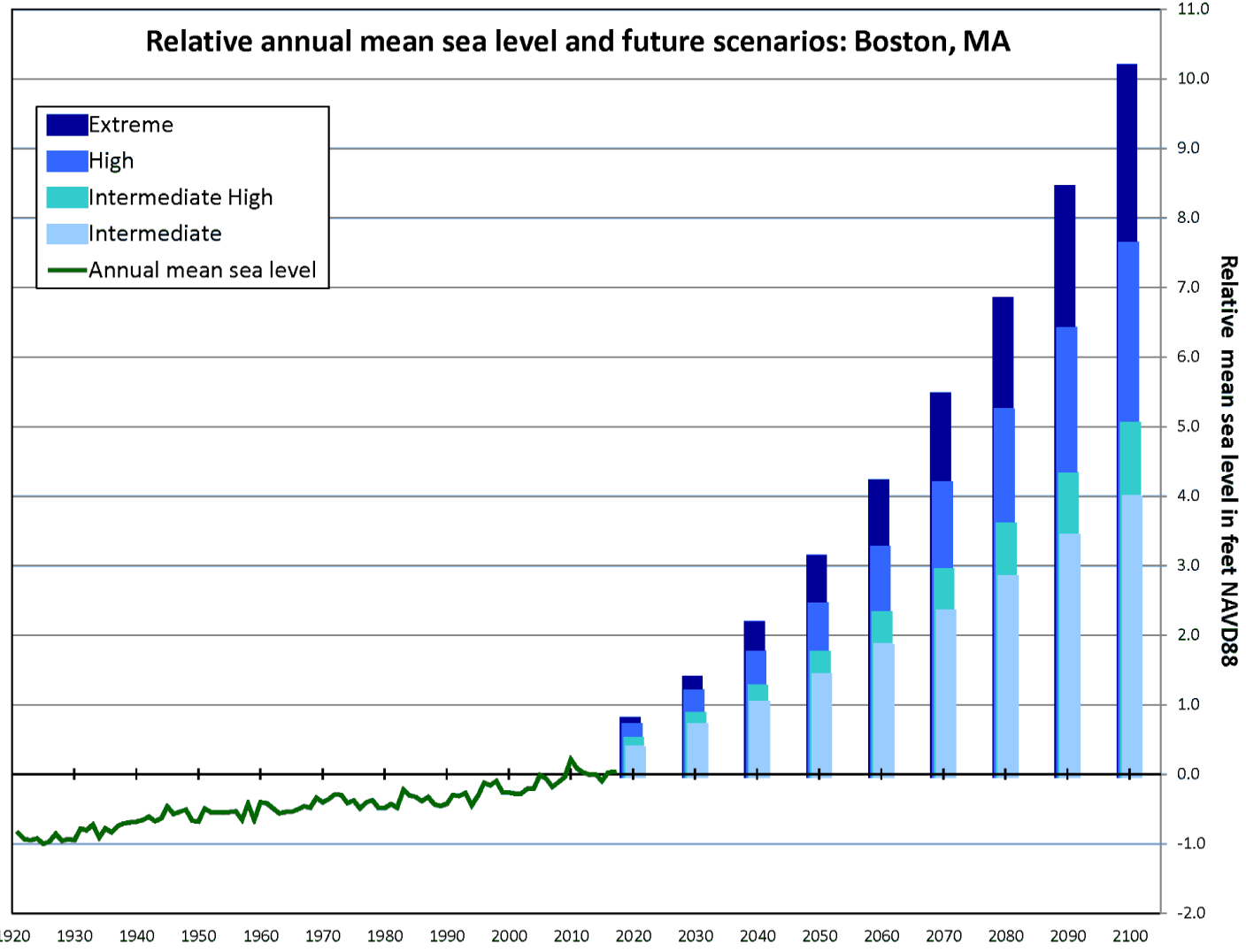

Data courtesy Northeast Climate Adaptation Science Center

Impacts from Sea Level Rise

Boston 6 feet of Sea Level Rise

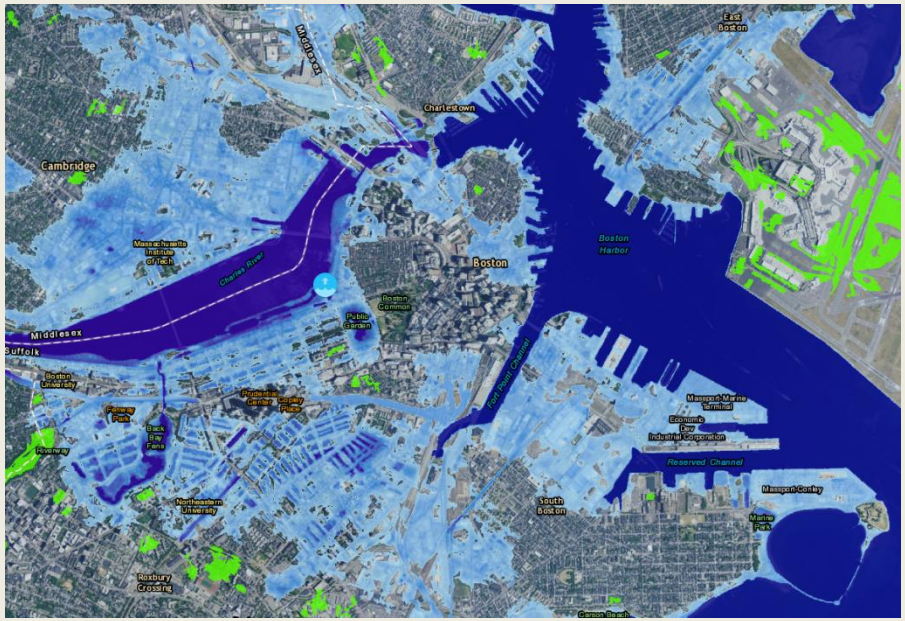

Image and data courtesy NOAA Sea Level Rise Viewer

Boston Harbor Flood Risk Model

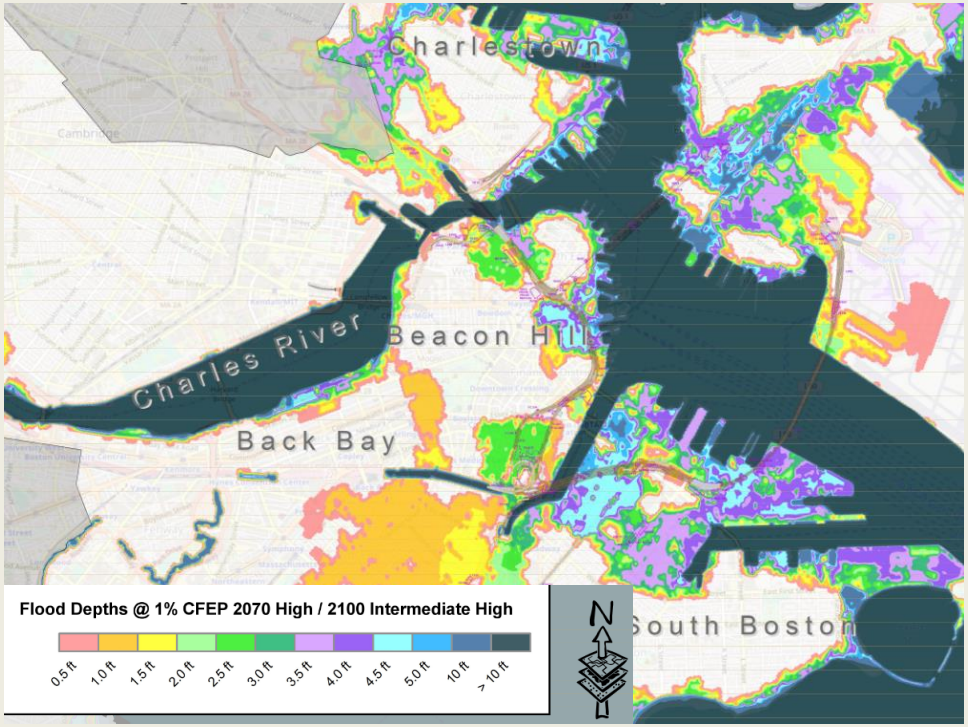

Image and data courtesy MassDOT, Woods Hole Group, UMass Boston, MassGIS, ESRI

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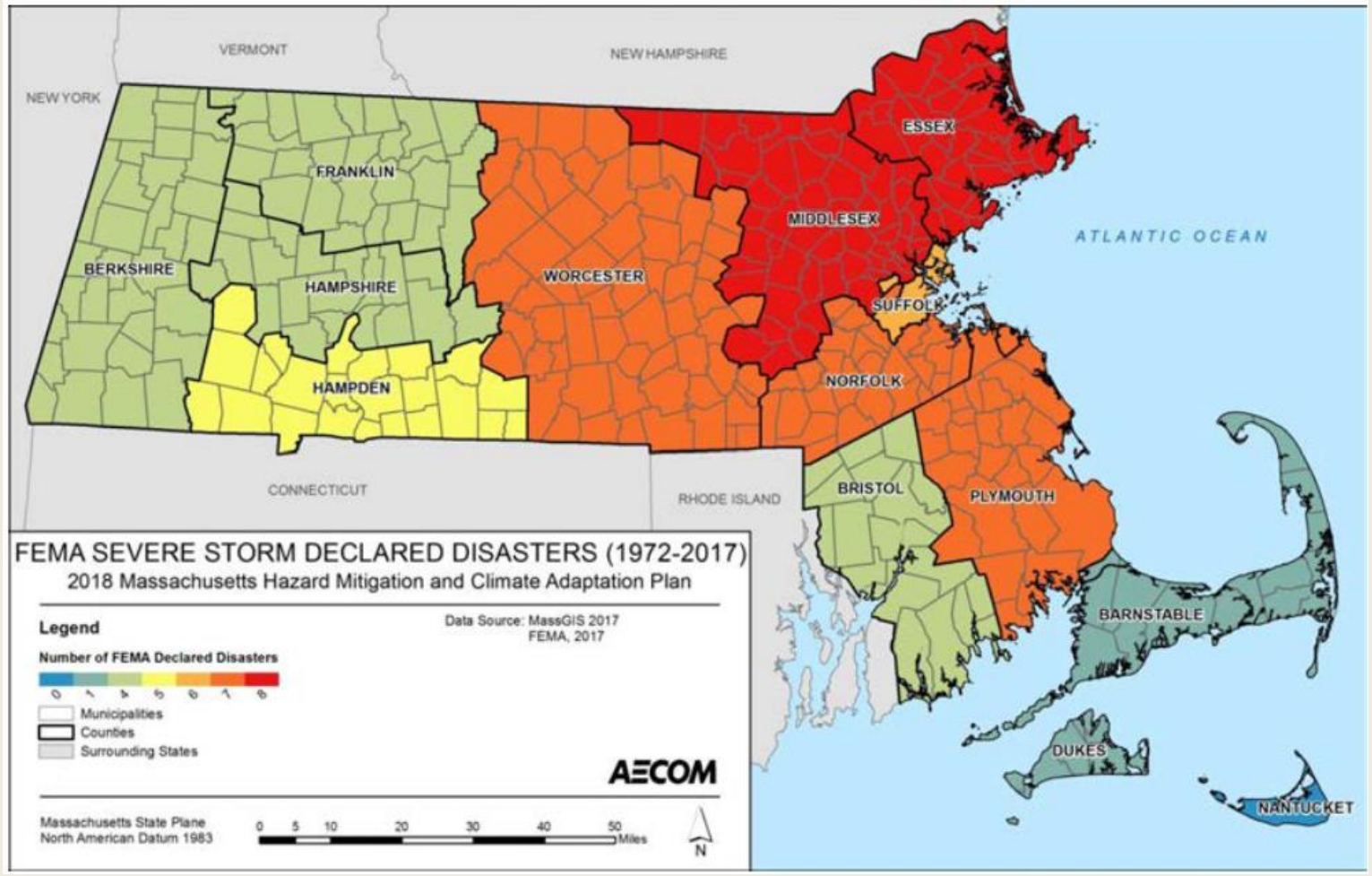


More Tools & Resources

resilient MA

Climate Change Clearinghouse for the Commonwealth

Explore Sectors → Identify Changes → Take Action

Maps | Data | Documents

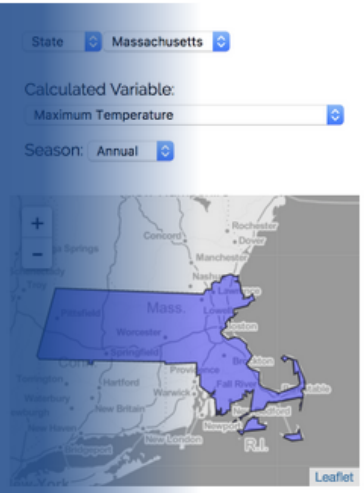
Search for resources... Search

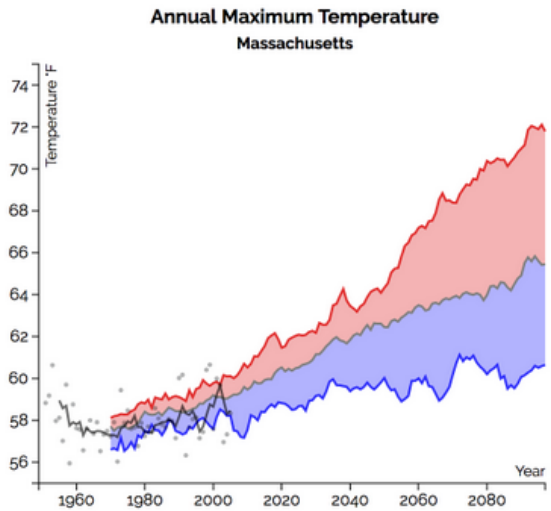
Providing the most up-to-date climate change science and decision-support tools for the Commonwealth. More »

Climate Change Data

The Baker-Polito Administration is investing in the best science and data to understand how the climate is projected to change and to allow Massachusetts to plan and adapt for the future.

More »





Download Data

Observed °F

5-yr Mean

Modeled °F

Max

Median

Min

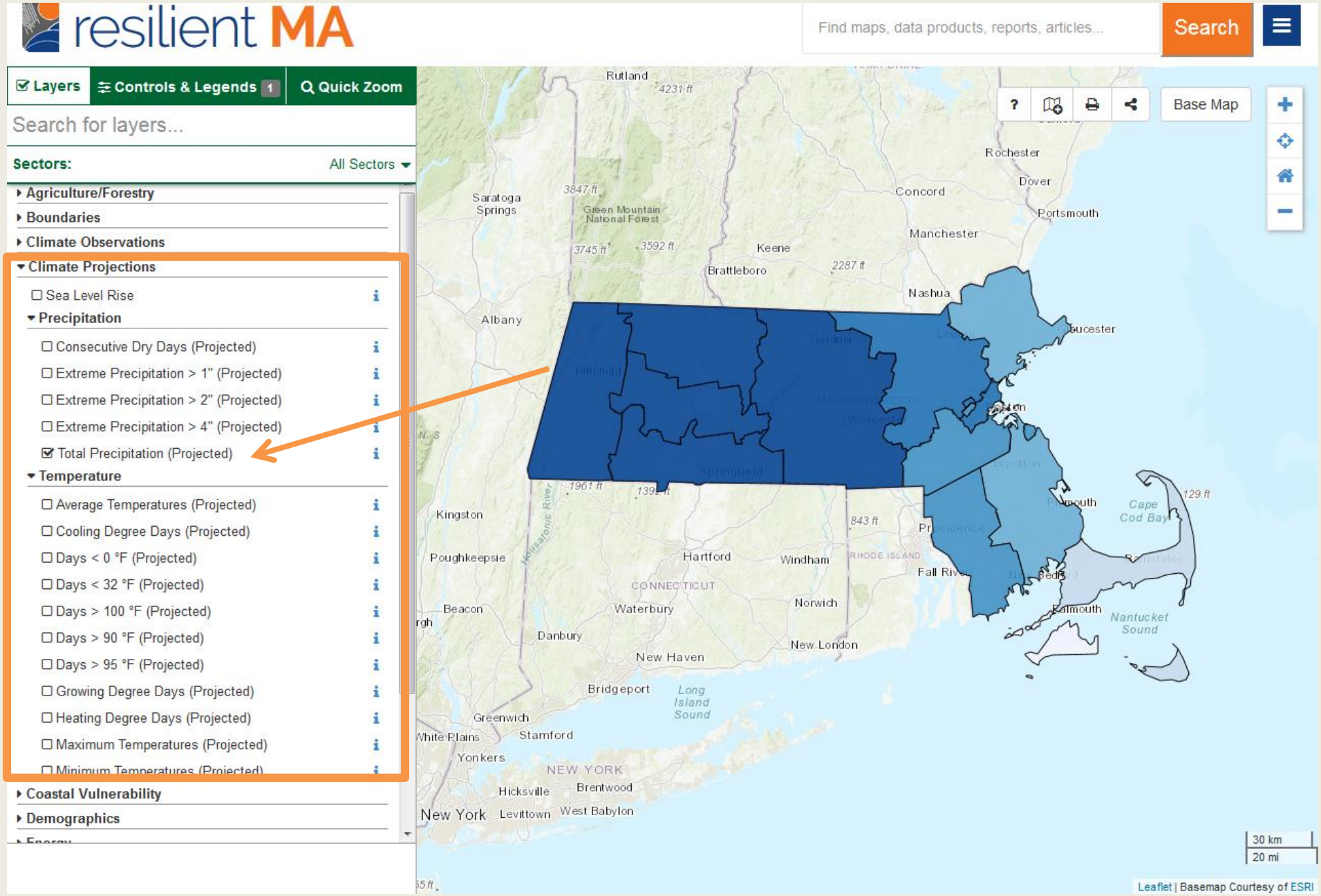
Changes from 1971-2000 for:

2020 - 2049	3.83°F
2040 - 2069	5.02°F
2060 - 2089	6.14°F
2080 - 2097	6.84°F

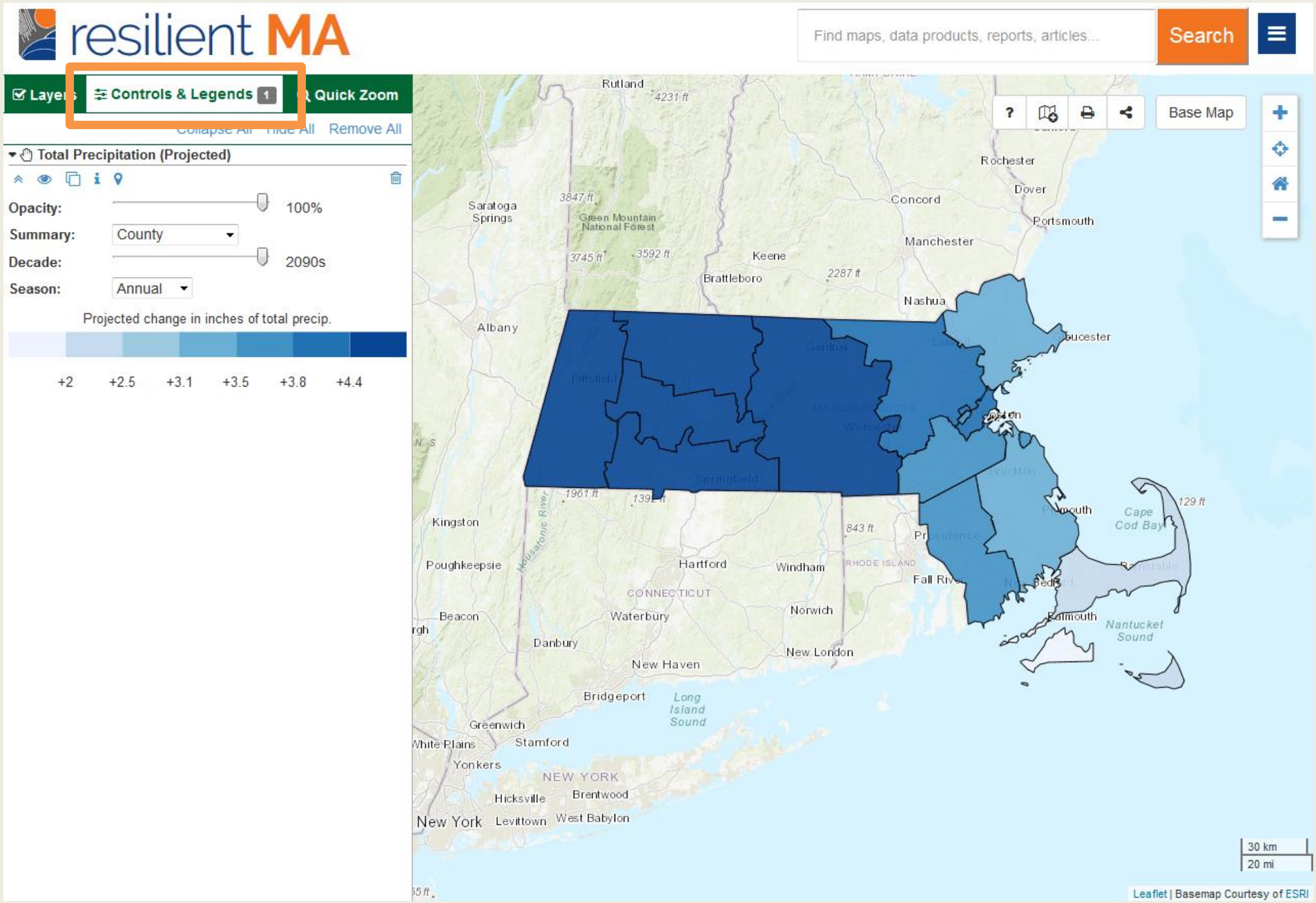
1 2 3 4 5

Executive Office of Energy and Environmental Affairs

www.resilientma.org



www.resilientma.org/map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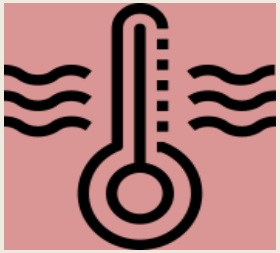
Collapse All
Hide All
Remove All
Total Precipitation (Projected)
Opacity:
100%
Summary:
County
Decade:
2090s
Season:
Annual
Projected change in inches of total precip.
+2
+2.5
+3.1
+3.5
+3.8
+4.4
Base Map
Rutland
Saratoga Springs
Green Mountain National Forest
Albany
Rochester
Concord
Dover
Portsmouth
Manchester
Keene
Brattleboro
Nashua
Kingston
Poughkeepsie
Hartford
Windham
Fall River
CONNECTICUT
RHODE ISLAND
Waterbury
Norwich
Danbury
New London
New Haven
Bridgeport
Long Island Sound
Greenwich
Stamford
White Plains
Yonkers
NEW YORK
Hicksville
Brentwood
New York
Levittown
West Babylon
Cape Cod Bay
Nantucket Sound
30 km
20 mi
Leaflet | Basemap Courtesy of ESRI

What can businesses do to prepare?



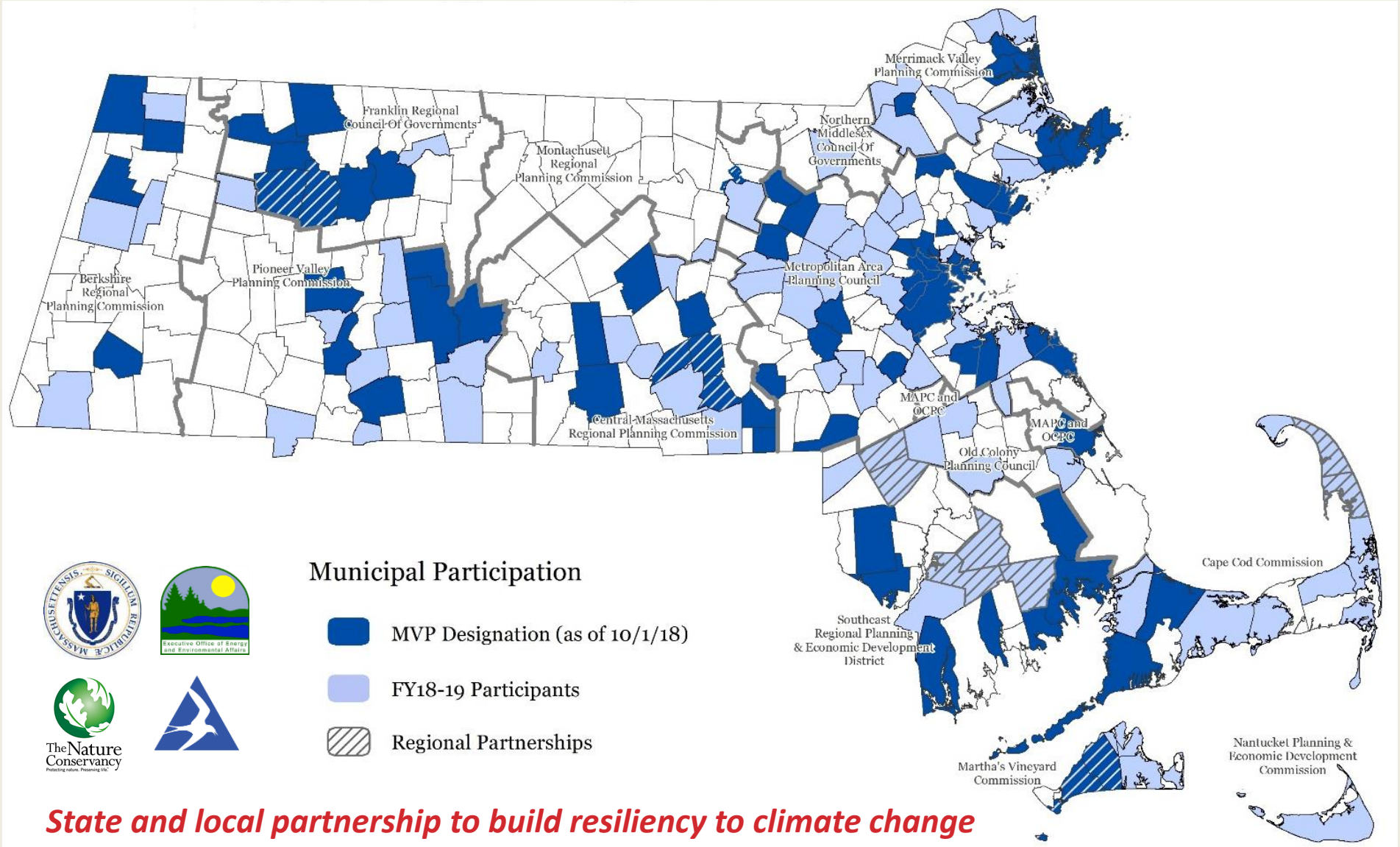

Weatherization

Flood proof

Work with OTA

Join MVP! …

Municipal Vulnerability Preparedness (MVP) Program



State and local partnership to build resiliency to climate change

1. Engage Community
2. Identify CC impacts and hazards
3. Complete assessment of vulnerabilities & strengths
4. Develop and prioritize actions
5. Take Action

Overview of the Process (Steps & Tasks)

DURING WORKSHOP

A Prepare for the Workshop
1. Establish a core team with goals.
2. Engage stakeholders.
3. Prepare materials for workshop.
4. Decide on participant arrangements.

B Characterize Hazards
1. Identify past, current, and future impacts.
2. Determine the highest-priority hazards.

C Identify Community Vulnerabilities and Strengths
1. Identify infrastructural vulnerabilities and strengths.
2. Identify societal vulnerabilities and strengths.
3. Identify environmental vulnerabilities and strengths.

D Identify and Prioritize Community Actions
1. Identify and prioritize infrastructural actions.
2. Identify and prioritize societal actions.
3. Identify and prioritize environmental actions.

E Determine the Overall Priority Actions
1. Identify highest-priority actions.
2. Further define urgency and timing.

F Put It All Together
1. Generate final workshop products.

G Move Forward
1. Continue community outreach and engagement.
2. Secure additional data and information.
3. Inform existing planning and project activities.

Community Components


Infrastructural


Societal


Environmental

Must complete 1-2 workshops to cover this process

Focus on vulnerabilities and strengths

Produce final report with clearly prioritized actions

There's a place for you in this process!

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Vallery.Cardoso@mass.gov

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