



# **MVP Winter Webinar Series 2024**

## **#2**

### **How to Effectively Use ResilientMass Tools: Key Tips from the Office of Climate Science**

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**MVP**

Municipal Vulnerability  
Preparedness



# Webinar Information

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- **Housekeeping**
  - Please remain on mute unless called upon to allow for presenters to speak without interruption.
  - This meeting will be recorded and posted on the EEA's YouTube page.
  - Please Introduce yourself in the chat!
- **Q&A**
  - Please feel free to ask any questions you have in the Q&A Box
- **Additional Questions after the webinar**
  - Contact [Patrick.Forde@mass.gov](mailto:Patrick.Forde@mass.gov)



# MVP Winter Webinar Series 2024

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- **Winter Webinar Series**

- **Webinar #2: February 21st, 2024, 10am-12pm**
  - Topic: Effectively Using ResilientMass Data and Project Tools: Key Tips from the Office of Climate Science
- **Webinar #3: February 28th, 2024, 10am-12pm**
  - Topic: Natural and Working Lands: Natural Climate Solutions and Municipal Opportunities

- **EEA Climate Newsletter**

- [Stay up to date!](#)



# Agenda

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- **Introductions and Housekeeping**
- **Office of Climate Science**
- **Climate Resilience Design Standards Tool**
- **Climate Change Projections Dashboard**
- **MVP Guides for Equitable and Actionable Resilience (GEAR) and ResilientMass Climate & Hazards Viewer**
- **MVP Case Study**
- **Q&A**





# Office of Climate Science (OCS)

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2023 ResilientMass Plan + Recommendations of the Climate Chief Report:

## ***Launch an Office of Climate Science***

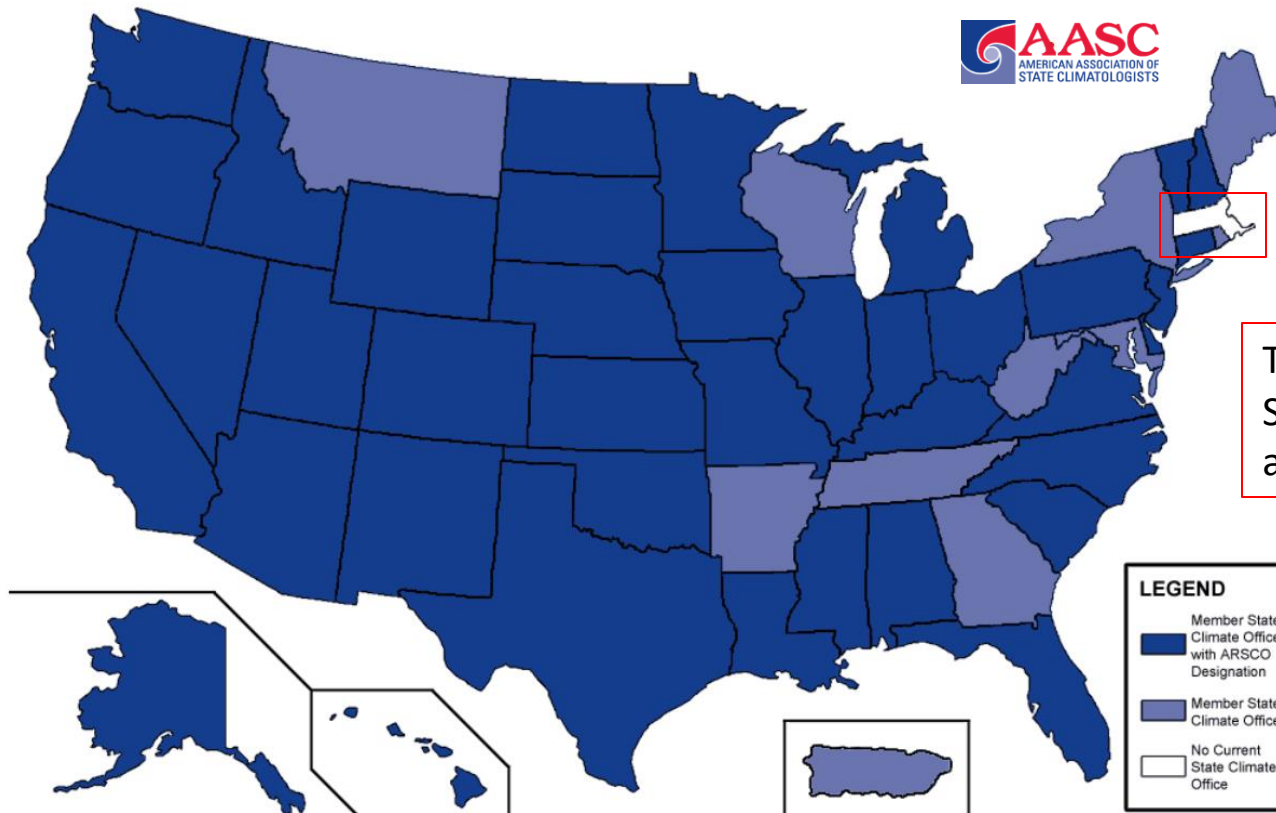
Serve as an authoritative resource, and provide subject matter expertise on statewide climate data and models, and support consistent application across agencies. Convene the academic climate science community and identify opportunities to partner with universities on climate science needs and next steps.

*Focus: provide guidance and interpretation on MA climate hazards & impacts data for policy/implementation purposes*

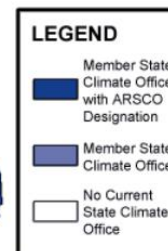




# Office of Climate Science in the National Context



The Office of Climate Science is filling the gap for a MA State Climate Office





# Office of Climate Science Personnel

## Edwin Sumargo

*Climate Scientist (EEA)*

### Expertise:

- Hydroclimatology
- Model validation
- Monitoring network design and data analysis

### Most recent past role:

- Hydrometeorology researcher (Scripps Institution of Oceanography)

## Margot Mansfield

*Coastal Hazards Specialist (EEA/CZM)*

### Expertise:

- Coastal climate hazards
- Data collection and tool development
- Adaptation strategies (living shorelines)

### Most recent past role:

- Coastal hazards & climate specialist (EEA/CZM)

## Caitlin Spence

*Hydroclimatologist (EEA/WRC)*

### Expertise:

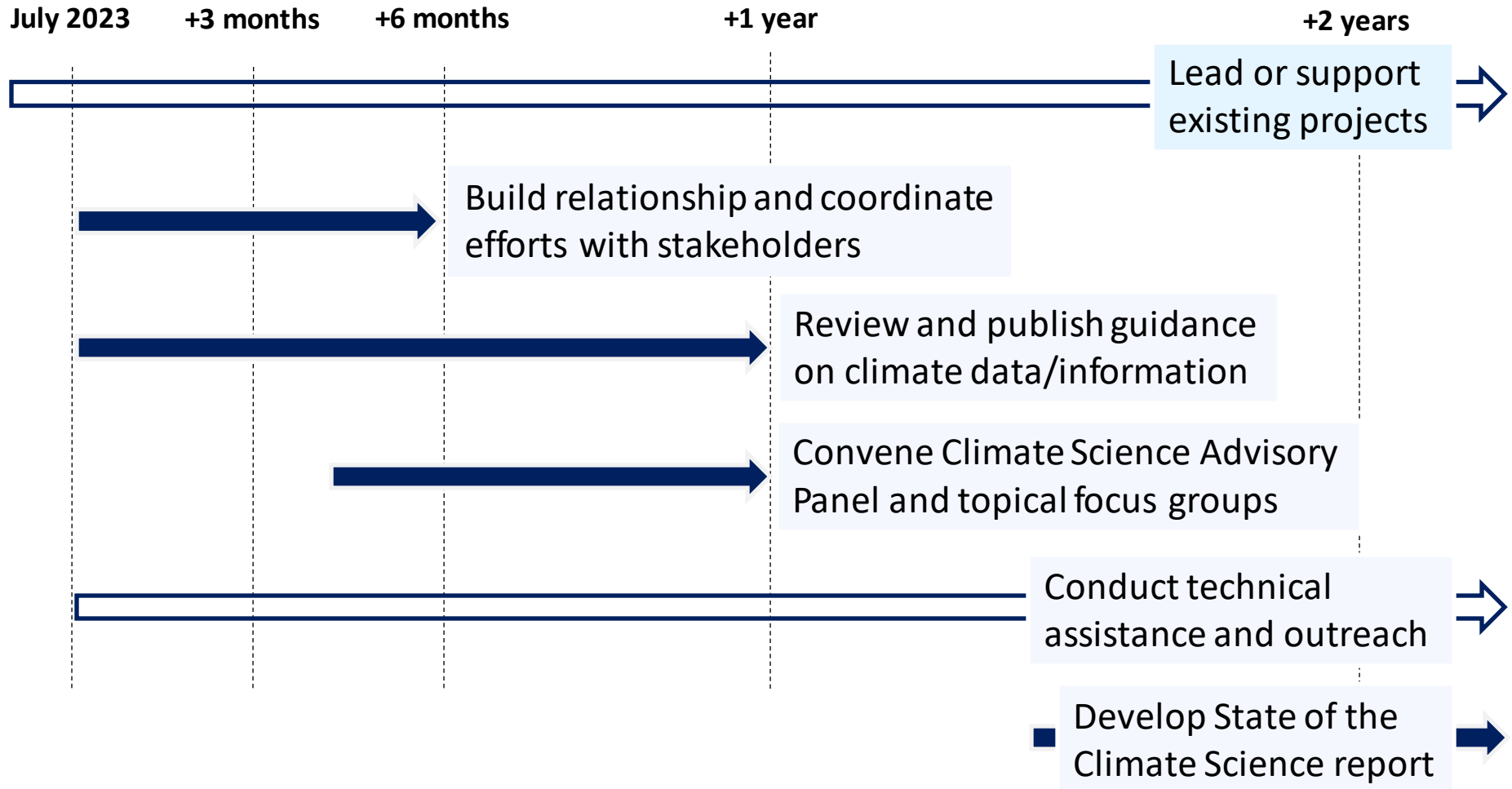
- Inland climate hazards
- Data science, dataset publication, & decision support
- Stakeholder engagement

### Most recent past roles:

- Climate resilience engineer & data scientist (Kleinfelder)
- Climate data specialist (MAPC)
- Climate risks researcher (Penn State Earth & Environmental Systems Institute)



# Key Agenda and Timeline





# Climate Science Advisory Panel

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To provide expertise on climate projection, hazards, and development methods and to inform applications, particularly impacts on EJ and other priority populations

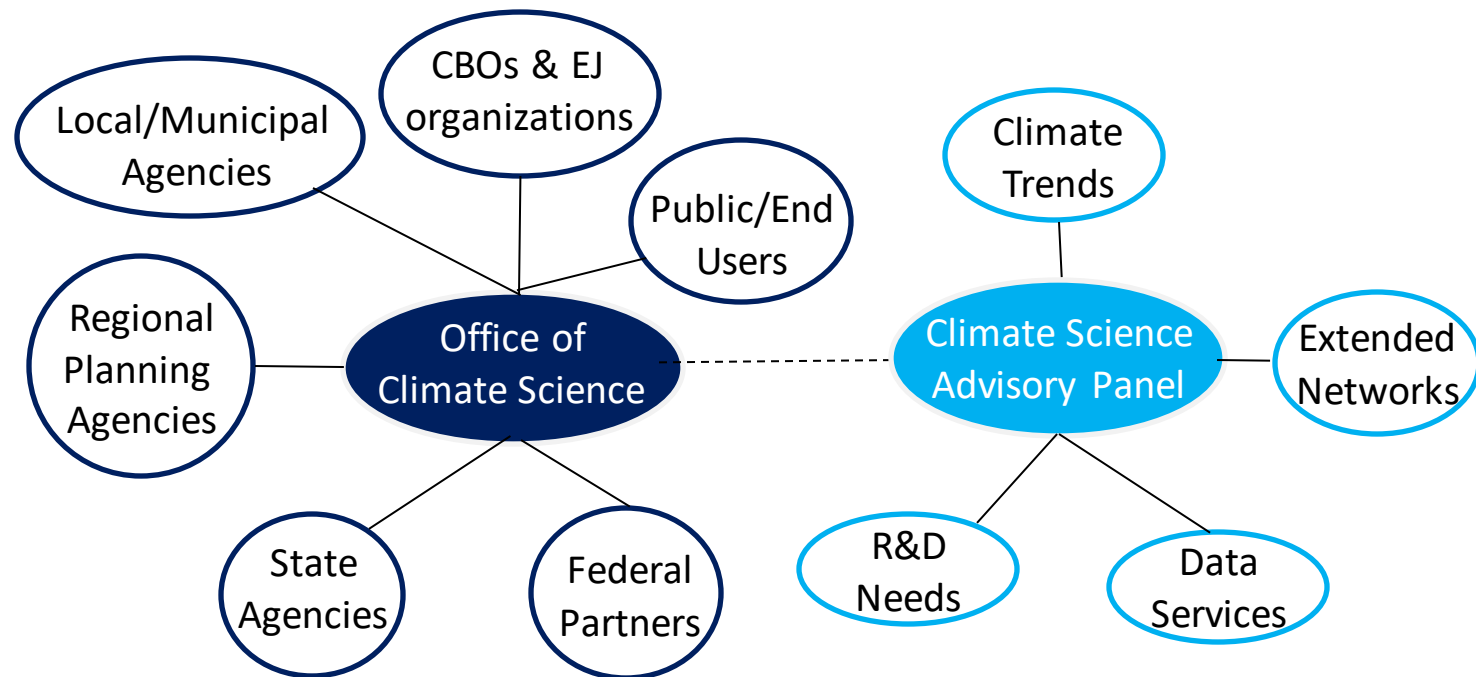
## **Guide the Office of Climate Science on:**

- Convening topical focus groups
- Recent advances in climate science, trends, projection development methods, and data
  - Applying downscaled projections in local plannings and implementations
  - Climate change communications in state and local applications
- Identifying climate data gaps and procurement needs
- Nominating additional areas of expertise and experts
- Preparing the State of Climate Science report



# Climate Science Advisory Panel

To provide expertise on climate projection, hazards, and development methods and to inform applications, particularly impacts on EJ and other priority populations



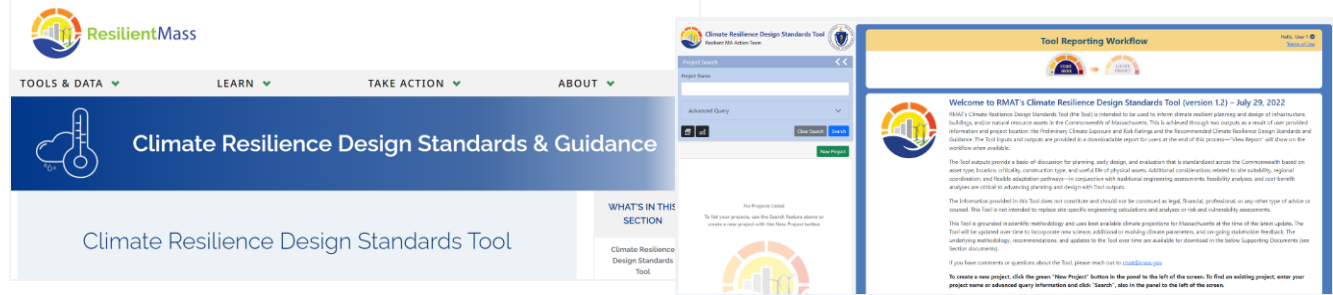


# Examples of OCS-led Projects

With support from EEA's Municipal Vulnerability Preparedness (MVP) Program:

## ResilientMass Action Team's (RMAT's) Climate Resilience Design Standards Tool

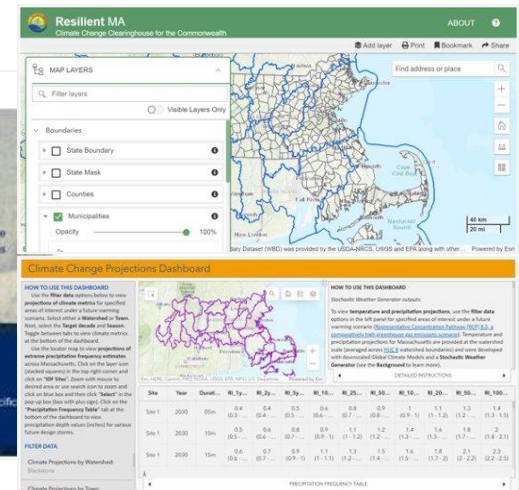
**\*IN-PROGRESS\*** Data updates, revision of guidance



## ResilientMass Maps and Data Center

**Key components:** Climate & Hazards Viewer, Climate Change Projections Dashboard, Map & Data Gallery

**\*IN-PROGRESS\*** Additional guidance for existing tools





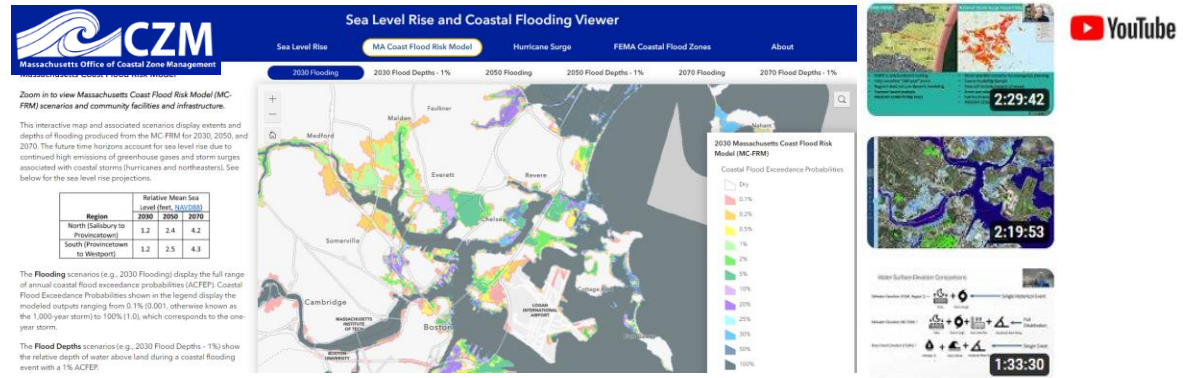
# Examples of OCS-supported Projects

## Massachusetts Coast Flood Risk Model (MC-FRM) - Updates

**\*NEW\*** Recorded MC-FRM Training Series on EEA's YouTube Channel; data download page; updated CZM viewer

**\*IN-PROGRESS\*** Development of model technical documentation; additional data development

CZM as Lead

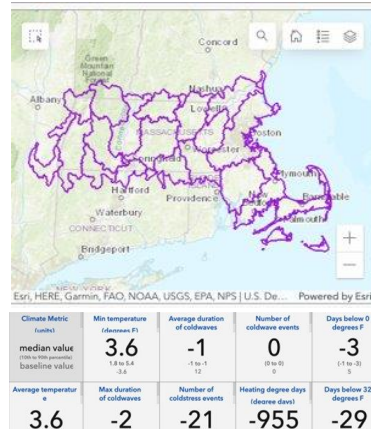


## MA Climate and Hydrologic Risk Project (Phase 2)

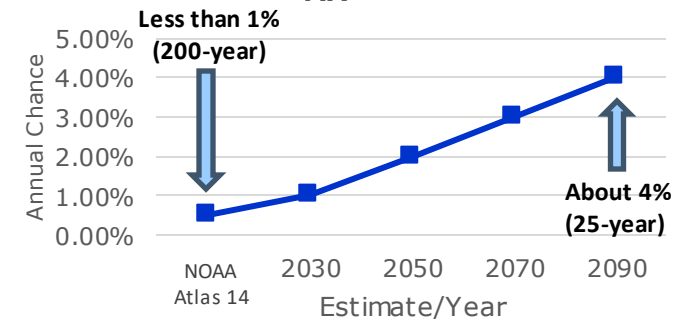
**\*NEW\*** Climate statistics on Climate Change Projections Dashboard

**\*IN-PROGRESS\*** Weather regime and streamflow projections statistics

EEA Water Policy as Lead



Estimated Annual Chance of 9.5" Precipitation in 48 hours, **Leominster MA**







## Learn More

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### Upcoming virtual (Zoom), first-come-first-serve office hours:

- 2/27 at 10-11 am
- 2/29 at 2-3 pm
- 3/4 at 10-11 am
- 3/7 at 1-2 pm
- 3/11 at 10-11 am

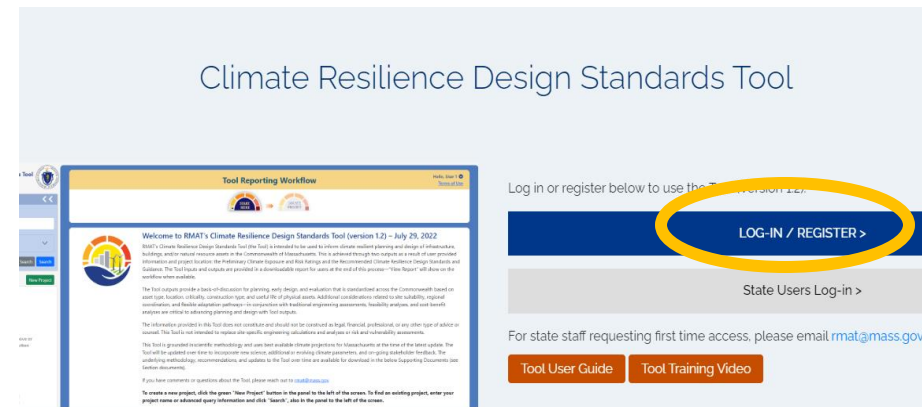
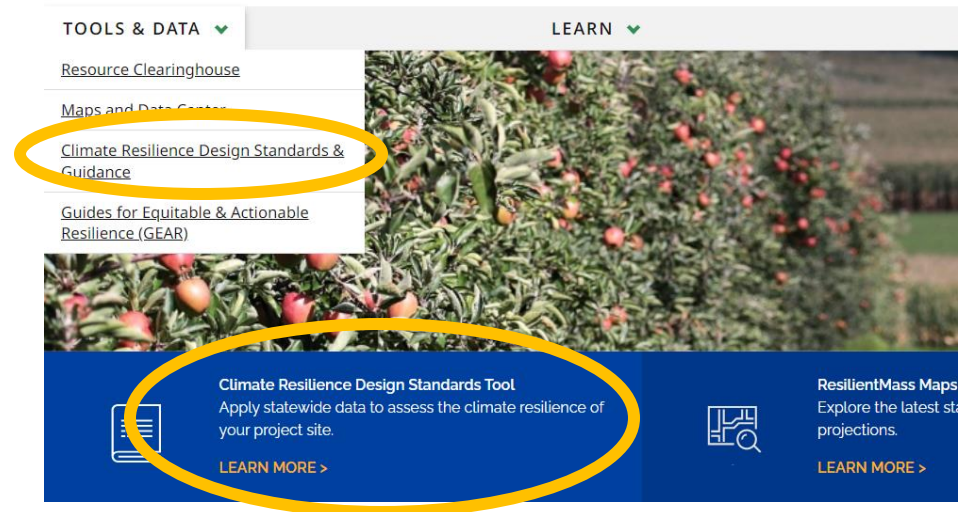




# Climate Resilience Design Standards Tool - Overview

## Goals:

- Make preliminary climate resilience analysis **more broadly accessible**
- Inform "**climate smart**" capital planning and procurement
- Provide recommendations based on **consistent use** of state's climate data
- Provide a unified planning and design **support tool** that state agencies can use to administer grant programs
- Provide **consistent information** to **municipalities** hosted on **resilient.mass.gov**





# Climate Resilience Design Standards Tool - Overview

## When to use this tool:

- Improving a state grant application
- Project siting
- Project planning and design/procurement

The screenshot displays the web interface of the Climate Resilience Design Standards Tool. At the top, the title "Climate Resilience Design Standards Tool" is centered. Below it, a "Tool Reporting Workflow" section shows a progress bar with three steps: "1. Project Information", "2. Design Standards", and "3. Reporting". The main content area is titled "Welcome to RMA's Climate Resilience Design Standards Tool (version 1.2) - July 29, 2022". It includes a brief description of the tool's purpose, a list of tool outputs, and a disclaimer. On the right side, there is a login/register section with a "LOG-IN / REGISTER >" button and a "State Users Log-in >" link. Below this, a note states: "For state staff requesting first time access, please email [rmat@mass.gov](mailto:rmat@mass.gov)". At the bottom right, there are two buttons: "Tool User Guide" and "Tool Training Video".



# Climate Resilience Design Standards Tool - Overview

## Key available resources:

### Guidance and Best Practices

The Climate Resilience Design Guidance provides general design guidance to consider while implementing resilience principles that are not specific to project type or climate hazards, and are illustrated through exam the Guidance considerations and document decision making throughout the planning process.

[Guidance and Best Practices PDF](#)

Additional forms include:

- [Site Suitability](#)
- [Regional Coordination](#)
- [Flexible Adaptation Pathways](#)

**Table 1.1. Climate Resilience Design Guidance Best Practices**

Considerations	Best Practice
Site Suitability (SS)	1. Reduce exposure to climate hazards 2. Mitigate adverse climate impacts and provide benefits 3. Protect, conserve, and restore critical natural resources on-site and off-site
Regional Coordination (RC)	1. Assess regional context of vulnerability 2. Evaluate impacts beyond site-specific design 3. Optimize capital investment opportunities 4. Prioritize services and assets that serve vulnerable populations
Flexible Adaptation Pathways (AP)	1. Embed future capacity and design for uncertainty 2. Design for incremental change 3. Encourage climate mitigation and other co-benefits 4. Prioritize nature-based solutions 5. Prepare for current and future operational and maintenance needs

### *Climate resilience design guidance and best practices*

### *Documentation and training for technical data inputs*

- [Massachusetts Coast Flood Risk Model \(MC-FRM\) FAQ](#) (April 6, 2022)
- [Massachusetts Coast Flood Riks Model \(MC-FRM\) Online Trainings](#) (April-May 2023)
- [EEA's Climate and Hydrologic Risk Project - Weather Generator Technical Document](#) (April, 2022)
- [EEA's Climate and Hydrologic Risk Project - IDF Curves Technical Document](#) (December, 2021)

[https://resilient.mass.gov/rmat\\_home/designstandards/](https://resilient.mass.gov/rmat_home/designstandards/)

Log in or register below to use the Tool (Version 1.2).

[LOG-IN / REGISTER >](#)

[State Users Log-in >](#)

For state users requesting assistance, please email [rmat@mass.gov](mailto:rmat@mass.gov)

[Tool User Guide](#) [Tool Training Video](#)

Climate Resilience Design Standards Tool  
Version 1.2, July 2022

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Tool (V1.2) Training Video - February, 2023



# Climate Resilience Design Standards Tool – Project Inputs

## Tool Reporting Workflow



*Draw project footprint*

The screenshot shows the 'Draw Project Area' instructions on the left and a map view on the right. The instructions are as follows:

- Draw Project Area**  
You must draw a polygon on the map representing the project area.
- 1. Find the project location using the map zoom/pan and/or the address search bar in the upper right area of the map.
- 2. Draw the polygon using the drawing tools under the search bar.
- 3. Click the icon when you are satisfied with the polygon.

The map view shows a street map of South Salem, Massachusetts, with a polygon drawn around a green area labeled 'Palmer Cove Park & Playground'. The map includes a search bar, a toolbar with various icons, and a list of 'Additional Documents and Resources'.



# Climate Resilience Design Standards Tool – Project Inputs

## Tool Reporting Workflow



Map View	Project Inputs	Project Outputs	Additional Documents and Resources
Step 1	Core Project Information	(Click each question to answer and save. All questions in red are required)	
Step 2	Project Ecosystem Services Benefit	(Please identify whether the project provides the following ecosystem services benefits to the project site or surrounding area)	
Step 3	Project Climate Exposure	(Click each question to answer and save. All questions in red are required)	
Step 4	Project Assets		





# Climate Resilience Design Standards Tool – Project Inputs

## Tool Reporting Workflow



### Step 2 Project Ecosystem Services Benefit

- ☐ Provides flood protection through green infrastructure or nature-based solutions No
- ☐ Provides storm damage mitigation No
- ☐ Provides groundwater recharge No
  - ☐ Protects public water supply No
  - ☐ Filters stormwater No
  - ☐ Improves water quality No
  - ☐ Promotes decarbonization Yes
- ☐ Enables carbon sequestration Yes
- ☐ Provides oxygen production No
  - ☐ Improves air quality No
  - ☐ Prevents pollution Yes
- ☐ Remediates existing sources of pollution No
- ☐ Protects fisheries, wildlife, and plant habitat No
  - ☐ Protects land containing shellfish No
  - ☐ Provides pollination No
  - ☐ Provides recreation No

### Step 3 Project Climate Exposure

- ☐ Does the project site have a history of coastal flooding? Yes
- ☐ Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)? No
- ☐ Does the project result in a net increase in impervious area of the site? No
- ☐ Does the project site have a history of riverine flooding? No
- Are existing trees being removed as part of the proposed project? No

### Step 4 Project Assets

Building/Facility	Add
UserGuide Building	
Infrastructure	Add
N/A	
Natural Resources	Add
N/A	

<b>Selected Asset:</b>	UserGuide Building
<b>Asset Type:</b>	Typically Occupied
<b>Asset Sub-Type:</b>	Residential building - Public Housing
<b>Construction Type:</b>	Maintenance (critical repair)
<b>Construction Year:</b>	2025
<b>Useful Life:</b>	15

- Identify the length of time the asset can be inaccessible/inoperable without significant consequences. Building must be accessible/operable at all times, even during natural hazard event
- Identify the geographic area directly affected by permanent loss or significant inoperability of the building/facility. Impacts would be limited to local area and/or municipality
- Identify the population directly served that would be affected by the permanent loss of use or inoperability of the building/facility. Less than 1,000 people



# Climate Resilience Design Standards Tool – Outputs: Project Level Scores

Project Status: 🌱 Scored - Not Submitted

START HERE → LOCATE PROJECT → PROJECT INPUTS → PROJECT OUTPUT → VIEW REPORT → SUBMIT PROJECT

**Project Located** **Inputs Complete**

### Environmental Justice

In Massachusetts, an Environmental Justice (EJ) neighborhood (census block group) is defined as meeting one or more criteria linked to the size of a census block group's minority populations, median household income, and language isolation. EJ neighborhoods typically include climate vulnerable populations, who may have lower adaptive capacity or higher exposure and sensitivity to climate change impacts.

Does this project fall within mapped Environmental Justice neighborhoods? ☐ Yes

### Ecosystem Benefits

The purpose of this output is to provide an overall indication of the Ecosystem Service Benefits (ESB) provided by a project, through protection of natural resources and implementation of nature-based solutions. Natural systems and ecosystem services provide great economic value and social benefit, often untapped in non-resilient projects. Nature-based solutions may cost less than

Ecosystem Benefits Scores Moderate

### Preliminary Climate Exposure Score

The purpose of the Exposure Score output is to provide a preliminary assessment of whether the overall project site and subsequent assets are exposed to impacts of natural hazard events and/or future impacts of climate change. For each climate parameter, the Tool will calculate one of the following exposure ratings: Not Exposed, Low Exposure, Moderate Exposure, or High Exposure. Click on the question mark to identify why your project location is receiving the exposure rating.

Sea Level Rise/Storm Surge <span>High</span>	Extreme Precipitation - Urban Flooding <span>Moderate</span>
Extreme Precipitation - Riverine Flooding <span>Not Exposed</span>	Extreme Heat <span>High</span>





# Climate Resilience Design Standards Tool – Outputs: Project Level Scores

Project Status: 🌈 Scored - Not Submitted



Project Located

Inputs Complete

## Additional Details Provided

Primary factors influencing **High Exposure** Sea Level Rise/Storm Surge score

Exposed to the 1% annual coastal flood event as early as 2030

Historic coastal flooding at project site

Located within the 0.1% annual coastal flood event within the project's useful life

## Preliminary Climate Exposure Score

The purpose of the Exposure Score output is to provide a preliminary assessment of whether the overall project site and subsequent assets are exposed to impacts of natural hazard events and/or future impacts of climate change. For each climate parameter, the Tool will calculate one of the following exposure ratings: Not Exposed, Low Exposure, Moderate Exposure, or High Exposure. Click on the question mark to identify why your project location is receiving the exposure rating.



Sea Level Rise/Storm Surge



Extreme Precipitation - Urban Flooding



Extreme Precipitation - Riverine Flooding



Extreme Heat





# Climate Resilience Design Standards Tool – Outputs: Asset Climate Risk Rating



## Preliminary Asset Climate Risk Ratings and Recommended Design Standards Output

Select Asset (3 total)



### Corridor Revitalization

Infrastructure - Transportation  
Estimated lifespan: 40



### Green Infrastructure Improvements

Infrastructure - Green Infrastructure  
Estimated lifespan: 20



### Flood Barrier

Infrastructure - Dams and Flood Control Structures  
Estimated lifespan: 50

## Preliminary Climate Risk Ratings for Corridor Revitalization



### Sea Level Rise/Storm Surge



### Extreme Precipitation - Urban Flooding



### Extreme Precipitation - Riverine Flooding



### Extreme Heat



*Tool projects can  
accommodate  
multiple assets*

*Will receive  
climate risk rating  
for each asset  
entered*

While it is possible to get a “no exposure” **project** score for “Sea Level Rise/Storm Surge” or “Extreme Precipitation – Riverine Flooding” because geographically dependent, the tool will still give an **asset risk score** (low).



# Climate Resilience Design Standards Tool – Outputs: Standards/Design Criteria for Temperature

Recommended Design Standards for test

Climate Resilience Design Standards are recommended for each asset and climate parameter. Tiered methodologies, or methodologies to calculate design criteria values, are intended for projects that will be designed for today's climate and plan for the future. The three tiers represent various recommended levels of effort for determining design criteria values, dependent upon the consequences of failure of an asset as a function of scope, time, and severity.

Sea Level Rise/Storm Surge

Extreme Precipitation

Extreme Heat

Target Planning Horizon: 2030

Percentile: 50th Percentile

Design Criteria Applicable for test

✓ Projected Annual/Summer/Winter Average Temperatures

Definition

Average Temperatures represent the daily average temperature over a period of time: Annual represents January through December, Summer represents June through August, and Winter represents December through February. Annual Temperatures are anticipated to increase with climate change, but the rate of change varies depending upon the season.\*

How to Estimate Projected Annual/Summer/Winter Average Temperatures Values

Asset Name	Recommended Planning Horizon	Recommended Percentile	Tiered Methodology	Step-by-Step Methodology
test	2030	50th	Tier 1	<a href="#">Downloadable Methodology PDF</a>

\*Note: Projected Annual/Summer/Winter Average Temperatures are not currently available through this Tool. Users should follow the step-by-step instructions outlined in the downloadable methodology PDF to estimate the projected Annual/Summer/Winter Average Temperatures based on the recommended planning horizon, percentile, and tiered methodology. The three tiers represent various anticipated levels of effort for calculating design criteria values, dependent upon the consequences of failure of an asset as a function of scope, time, and severity and useful life of the asset.

How Annual/Summer/Winter Average Temperatures may inform Planning

How Annual/Summer/Winter Average Temperatures may inform Early Design

How Annual/Summer/Winter Average Temperatures may inform Project Evaluation

*Will receive recommended standards and design criteria for each asset entered*

*Updates planned for 2024*

*Guidance for how to consider outputs*

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# Climate Resilience Design Standards Tool – Outputs: Standards/Design Criteria for Precipitation

Sea Level Rise/Storm Surge

Extreme Precipitation

Extreme Heat

Target Planning Horizon: 2050

Return Period: 100-yr (1%)

Design Criteria Applicable for Test2050

✓ Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms

Definition

Total Precipitation Depth for 24-hour Design Storms is the total amount of rain in inches that falls over a period of 24-hours. It can be any 24-hour period, not just a traditional calendar day. This is given for a specific design storm (return period) such as the 100-year or 10-year storm (1% or 10%). Peak Intensity is the maximum rate of rainfall in inches per hour of a 24-hour design storm\*.

Projected Total Precipitation Depth and Peak Intensity values can be used to assess potential flooding impacts and inform design of green and grey infrastructure solutions to mitigate flooding and manage stormwater.

Projected Total Precipitation Depth Values and Peak Intensity Methodology

The Tool uses climate projections developed by Cornell University as part of the EEA's Massachusetts Climate and Hydrologic Risk Project. Assets receive a projected value for the 24-hour Total Precipitation Depth associated with a recommended return period (design storm) and planning horizon.

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Test2050	2050	100-Year (1%)	9.9	<a href="#">Downloadable Methodology PDF</a>

**ATTENTION: This is a Tier 1, Dam & Flood Control Structures project.** Due to the criticality and useful life of this project, it is recommended that NCHRP15-61 methodology be used to calculate total precipitation depth for 24-hour design storms, and those results be compared to the provided total storm depth output: [Tier 3 methodology PDF](#).

How Total Precipitation Depth may inform Planning

How Total Precipitation Depth may inform Early Design

How Total Precipitation Depth may inform Project Evaluation


Limitations for Projected Total Precipitation Depth & Peak Intensity, Standards, and Guidance


*Will receive recommended standards and design criteria for each asset entered*


*Explore additional design storm precipitation values on external dashboard*



# Climate Resilience Design Standards Tool – Outputs: Standards/Design Criteria for Coastal Flooding

 Sea Level Rise/Storm Surge

 Extreme Precipitation

 Extreme Heat

Design Standards

Projected Water Surface Elevation Maps

Target Planning Horizon: 2070

Intermediate Planning Horizon: 2050

Return Period: 1000-yr (0.1%)

Design Criteria Applicable for Bridge St Bridge

✓ Projected Tidal Datums

✓ Projected Water Surface Elevation

✓ Projected Wave Action Water Elevation

✓ Projected Wave Heights

✓ Projected Duration of Flooding

✓ Projected Design Flood Velocity

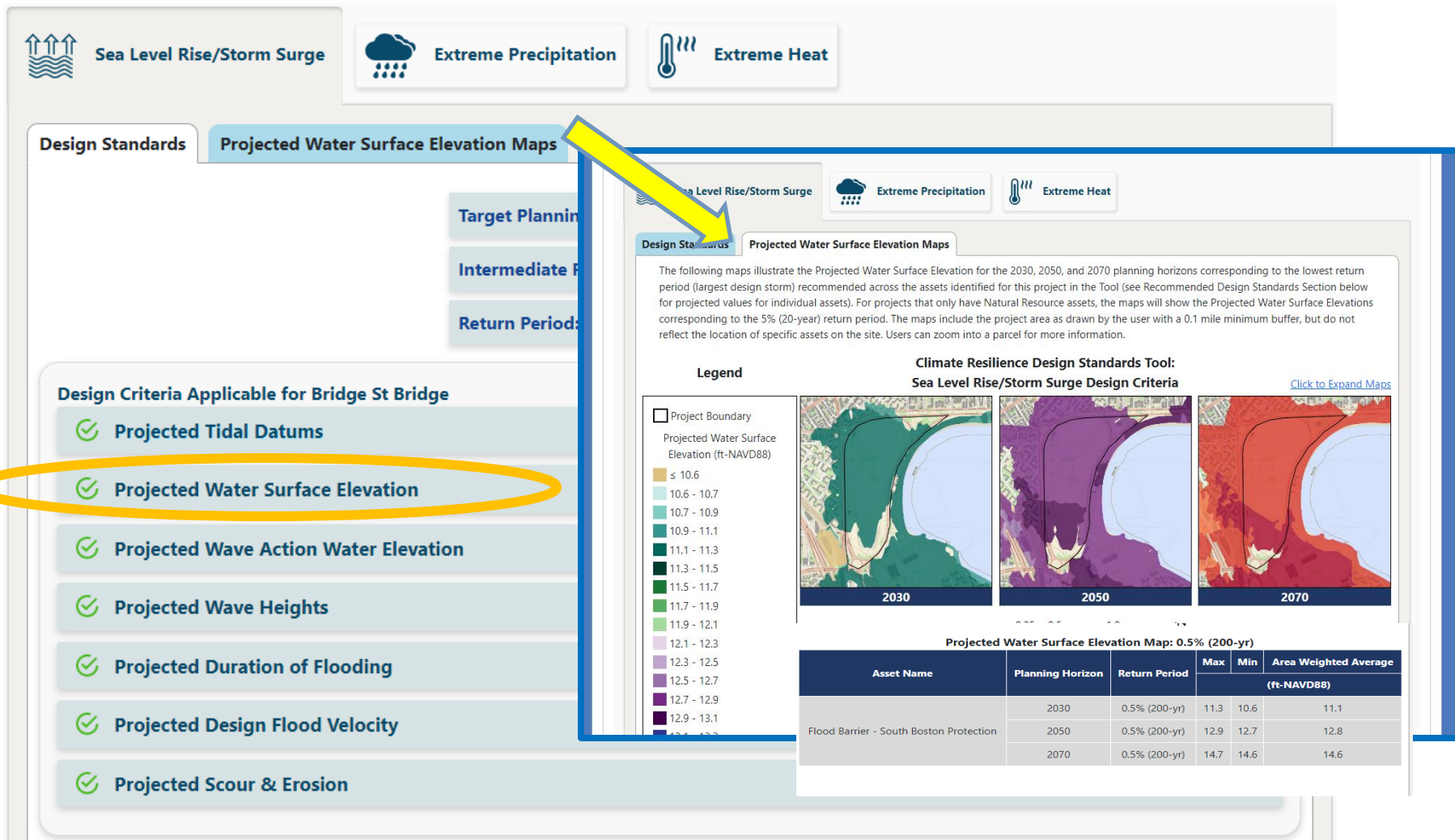
✓ Projected Scour & Erosion

MC-FRM OUTPUTS

Most of the coastal design criteria projected values are sourced from the **Massachusetts Coast Flood Risk Model (MC-FRM)**



# Climate Resilience Design Standards Tool – Outputs: Standards/Design Criteria for Coastal Flooding



Most of the coastal design criteria projected values are sourced from the **Massachusetts Coast Flood Risk Model (MC-FRM)**

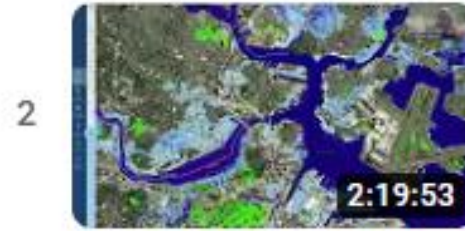


# Coastal Flooding: Massachusetts Coast Flood Risk Model (MC-FRM)



## Key available resources:

### Training Videos



### Data Download Page

MC-FRM DATA

### DOWNLOAD DATA NOW

Get access to the MC-FRM Level 1 and Level 2 data by filling out this form. Once complete you will have access to a data

WOODS HOLE GROUP  
A C.L.S. COMPANY

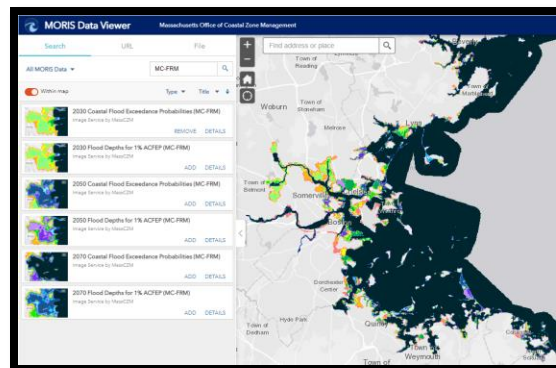
Your Email Address\*

Your Name\*

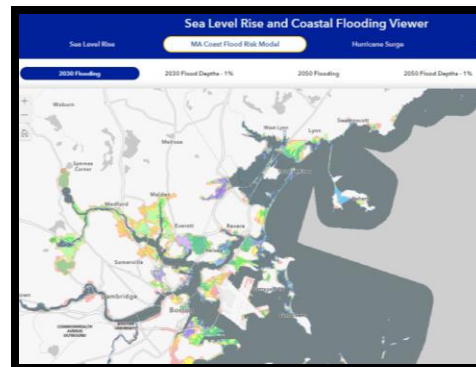
Your Company/Organization\*

Your Purpose of Data Use\*

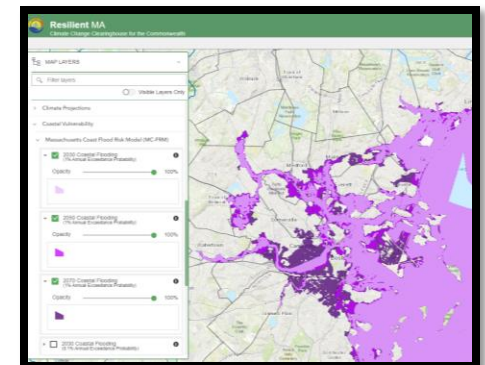
### State Data Viewers



CZM's MORIS Data Viewer



CZM's Sea Level Rise and Coastal Flooding Viewer



ResilientMass Climate & Hazards Viewer

# Coastal Flooding: Massachusetts Coast Flood Risk Model (MC-FRM)



## Sea Level Rise and Coastal Flooding Viewer

Introduction

Sea Level Rise

MA Coast Flood Risk Model

Hurricane Surge

FEMA Coastal Flood Zones

About



*Support the assessment of coastal flooding vulnerability for community facilities and infrastructure*



### Sea Level Rise

Areas of potential inundation under Mean Higher High Water and various sea level rise scenarios



### MA Coast Flood Risk Model

Dynamic future storm surge with sea level rise



### Hurricane Surge

Current worst-case hurricane surge

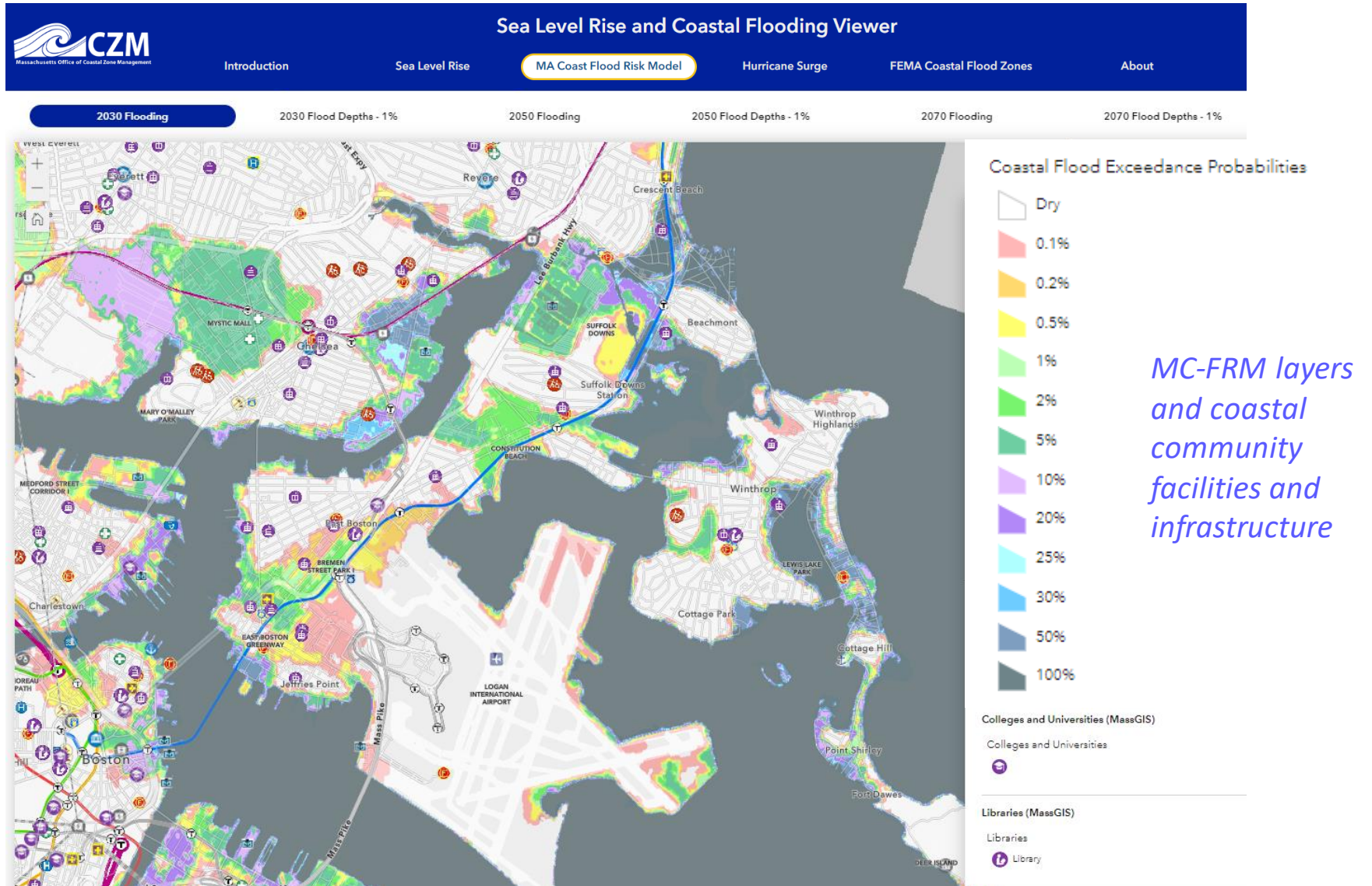


### FEMA Coastal Flood Zones

Areas within the Federal Emergency Management Agency (FEMA) coastal flood zones



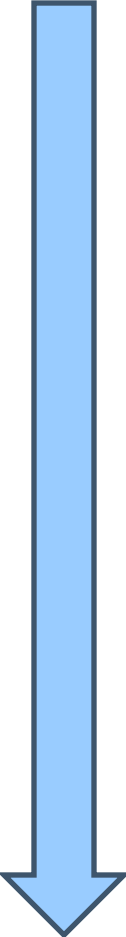
# Coastal Flooding: Massachusetts Coast Flood Risk Model (MC-FRM)





# Climate Resilience Design Standards Tool – Version history

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## Beta Tool (April 2021)

- MVP and Massworks requested Tool reports in grant applications

## Version 1.0 (February 2022)

- Climate exposure updates
- Ecosystem service benefits updates
- Additional in-tool guidance

## Version 1.1 (April 2022)

- **MC-FRM Level 2 outputs** (dynamic tables for applicable coastal design criteria)
- MA Climate Hydrologic Risk Project outputs (dynamic tables for applicable extreme precipitation design criteria)

## Version 1.2 (July 2022)

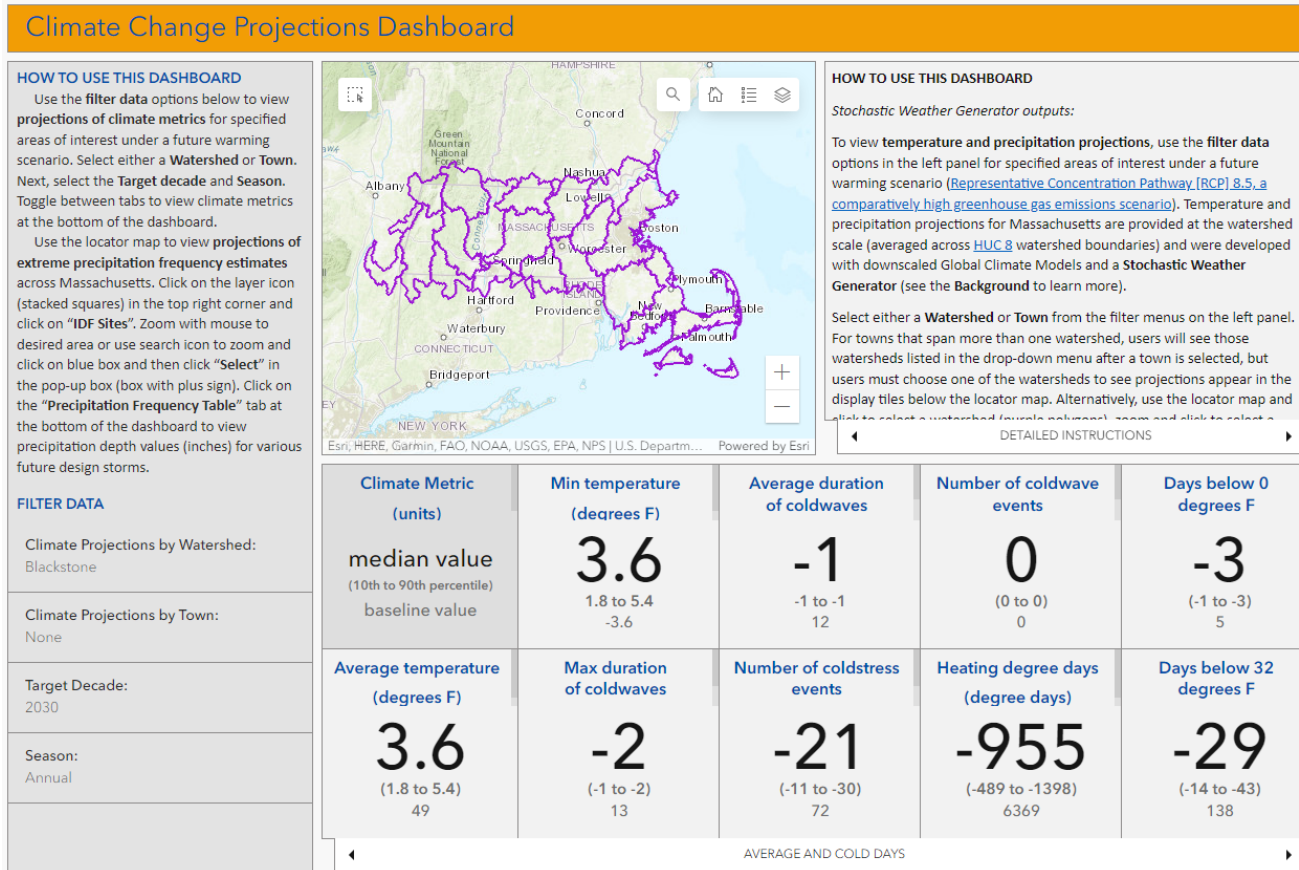
- **MC-FRM Projected Water Surface Elevation Maps** (interactive in-tool interface and printed maps in project report)

## Version 1.3 (2024) – In progress

- Updates to temperature design standards
- Additional MC-FRM maps
- Bug fixes



# Climate Change Projections Dashboard



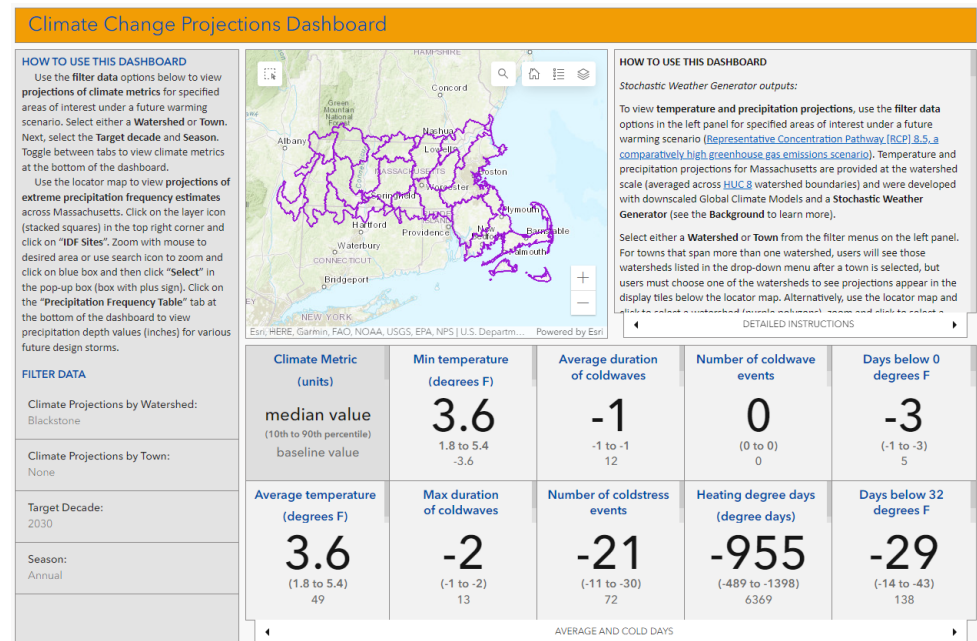
- One-stop shop for temperature and precipitation projections
- Hot & cold days
- Changes in average precipitation and temperature
- Days with high precipitation
- Climate-informed design precipitation



# Climate Change Projections Dashboard

## When to use the dashboard?

- Exploring future climate hazards for adaptation planning
- Designing stormwater infrastructure to last
- Screening for ecosystem/habitat risks
- And more!



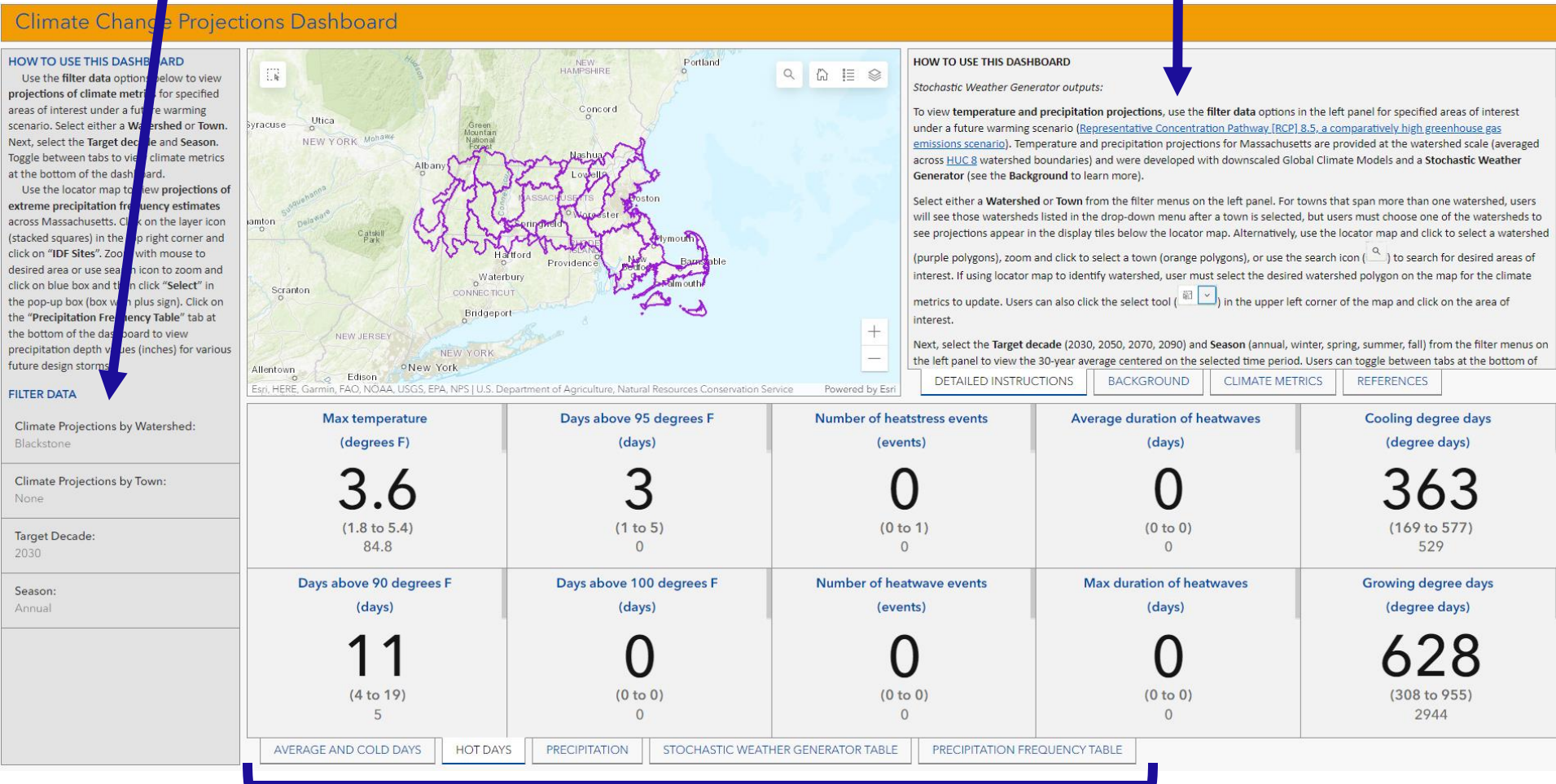




# Climate Change Projections Dashboard

Get projections by location

Read about how metrics were made



See projected metrics of interest



# Climate Change Projections Dashboard

Select either watershed  
OR town

## Climate Change Projections Dashboard

### HOW TO USE THIS DASHBOARD

Use the **filter data** options below to view **projections of climate metrics** for specified areas of interest under a future warming scenario. Select either a **Watershed** or **Town**. Next, select the **Target decade** and **Season**. Toggle between tabs to view climate metrics at the bottom of the dashboard.

Use the locator map to view **projections of extreme precipitation frequency estimates** across Massachusetts. Click on the layer icon (stacked squares) in the top right corner and click on "IDF Sites". Zoom with mouse to desired area or use search icon to zoom and click on blue box and then click "Select" in the pop-up box (box with plus sign). Click on the "Precipitation Frequency Table" tab at the bottom of the dashboard to view precipitation depth values (inches) for various future design storms.

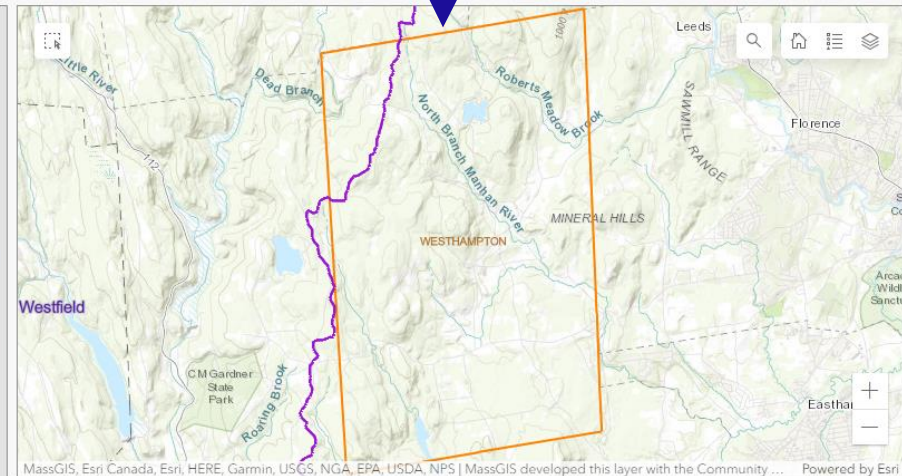
### FILTER DATA

Climate Projections by Watershed:  
Middle Connecticut

Climate Projections by Town:  
WESTHAMPTON

Target Decade:  
2030

Season:  
Annual



Max temperature  
(degrees F)

3.6

(2.7 to 5.4)  
82.8

Days above 95 degrees F  
(days)

2

(2 to 5)  
0

Number of heat  
(even

0

(0 to 0)  
0

Days above 90 degrees F  
(days)

11

(7 to 20)  
5

Days above 100 degrees F  
(days)

0

(0 to 0)  
0

Number of heat  
(even

0

(0 to 0)  
0

Values update in panel



# Climate Change Projections Dashboard

## Climate Change Projections Dashboard

### HOW TO USE THIS DASHBOARD

Use the filter data options below to view projections of climate metrics for specified areas of interest under a future warming scenario. Select either a Watershed or Town. Next, select the Target decade and Season. Toggle between tabs to view climate metrics at the bottom of the dashboard.

Use the locator map to view projections of extreme precipitation frequency estimates across Massachusetts. Click on the layer icon (stacked squares) in the top right corner and click on "IDF Sites". Zoom with mouse to desired area or use search icon to zoom and click on blue box and then click "Select" in the pop-up box (box with plus sign). Click on the "Precipitation Frequency Table" tab at the bottom of the dashboard to view precipitation depth values (inches) for various future design storms.

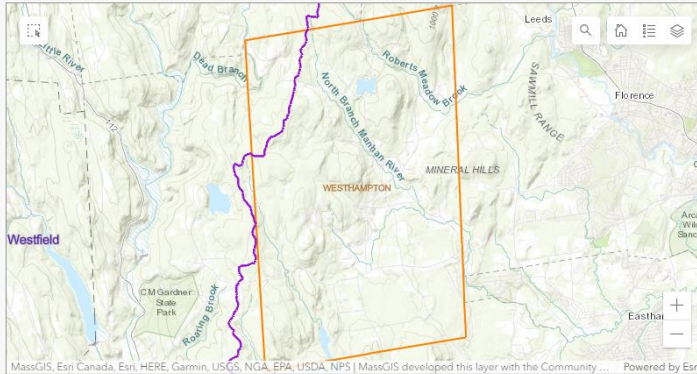
### FILTER DATA

Climate Projections by Watershed:  
Middle Connecticut

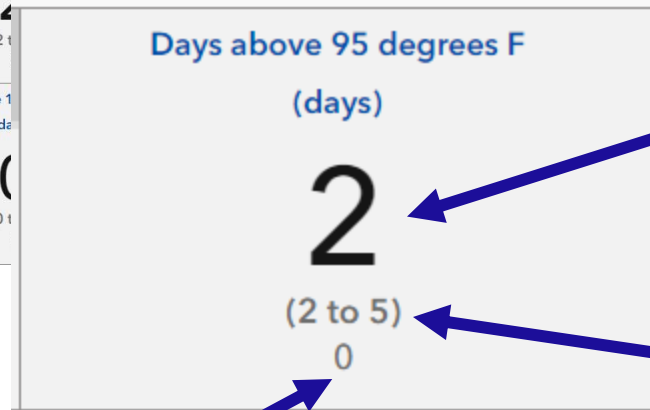
Climate Projections by Town:  
WESTHAMPTON

Target Decade:  
2030

Season:  
Annual



<b>Max temperature</b> (degrees F) <b>3.6</b> (2.7 to 5.4) 82.8	<b>Days above 95 degrees F</b> (days) <b>2</b> (2 to 5) 0	<b>Number of heat</b> (evening) <b>0</b> (0 to 1) 0
<b>Days above 90 degrees F</b> (days) <b>11</b> (7 to 20) 5	<b>Days above 1</b> (days) <b>0</b> (0 to 1) 0	



**Median projection:**  
Two more days over  
95F than we've  
typically seen in the  
past (so... two)

**90% of climate models say**  
more than 2 more days per  
year. 10% of models say 5  
or more additional days  
per year.

**What we've seen in the past:**  
Typically 0 days over 95F each year





# Climate Change Projections Dashboard

## What you can find

Site	Year	Season	90th percentile (percent change)	99th percentile (percent change)	Consecutive dry days (days)	Consecutive wet days (days)	Cooling degree days (degree days)	Days above 1 inch (days)
Middle Connecticut	2030	Annual	0.7 (0.6 - 0.7) 0.4	6.7 (4.4 - 8.8) 1	0 (0 - 1) 31	0 (0 - 0) 45	308 (222 - 498) 382	1 (1 - 1) 4
Middle Connecticut	2030	Fall	0.9 (0.7 - 1.3) 0.4	5.6 (4.5 - 8.4) 1.1	0 (0 - 0) 8	0 (0 - 0) 11	48 (33 - 82) 42	0 (0 - 0) 1
Middle Connecticut	2030	Spring	0.5 (0.5 - 0.7) 0.4	6.7 (2.7 - 9.6) 1	0 (0 - 0) 7	0 (0 - 0) 11	24 (10 - 42) 18	0 (0 - 0) 1
Middle Connecticut	2030	Summer	0 (0 - 0) 0.3	4.7 (2.6 - 6.1) 1	0 (0 - 0) 8	0 (0 - 0) 11	22 (11 - 34) 17	0 (0 - 0) 1
Middle Connecticut	2030	Winter	1.2 (0.7 - 1) 0.4	7.8 (4.5 - 11.6) 0.0	0 (0 - 0) 7	0 (0 - 0) 11	0 (1 - 4) 0	0 (0 - 0) 1

Downloadable table containing all metrics for location

- Precipitation depth by storm return period (chance of depth being equaled or exceeded in a given year)
- 5-, 10-, 15-, 60-minute storms
- 2-, 3-, 6-, 12-, 24-, and 48-hour storms
- 1-, 2-, 5-, 10-, 25-, 50-, 100-, 200-, 500-, and 1000-year storms
  - 100-year storm: 1% chance of equal or bigger storm occurring in a given year

### AVERAGE AND COLD DAYS

- Lowest one-day temperature
- Average temperature
- Number of cold stress events
- Number of cold waves
- Maximum cold wave duration
- Number of days below 0F
- Number of days below 32F
- Heating degree days

### HOT DAYS

- Number of heat stress events
- Number of heat waves
- Average heat wave duration
- Maximum heat wave duration
- Number of days above 90F
- Number of days above 95F
- Number of days above 100F
- Growing degree days
- Cooling degree days

### PRECIPITATION

- Total precipitation
- Highest one-day precipitation
- Number of days with >1", 2", 4" precipitation
- Average consecutive number of dry days
- Average consecutive number of wet days
- 90th, 99th percentile storm (out of all days in a year with measurable precipitation)

### STOCHASTIC WEATHER GENERATOR TABLE

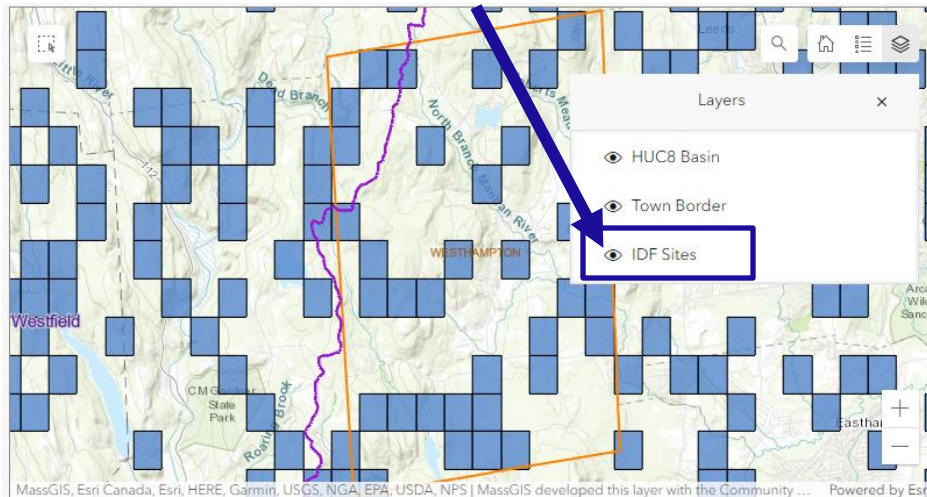
### PRECIPITATION FREQUENCY TABLE





# Climate Change Projections Dashboard

In map, turn on "IDF sites" layer



## HOW TO USE THIS DASHBOARD

### Stochastic Weather Generator outputs:

To view **temperature and precipitation projections**, use the **filter data** options in the left panel for specified areas of interest under a future warming scenario ([Representative Concentration Pathway \(RCP\) 8.5, a comparatively high greenhouse gas emissions scenario](#)). Temperature and precipitation projections for Massachusetts are provided at the watershed scale (averaged across [HUC 8](#) watershed boundaries) and were developed with downscaled Global Climate Models and a **Stochastic Weather Generator** (see the **Background** to learn more).

Select either a **Watershed** or **Town** from the filter menus on the left panel. For towns that span more than one watershed, users will see those watersheds listed in the drop-down menu after a town is selected, but users must choose one of the watersheds to see projections appear in the display tiles below the locator map. Alternatively, use the locator map and click to select a watershed (purple polygons), zoom and click to select a town (orange polygons), or use the search icon (🔍) to search for desired areas of interest. If using locator map to identify watershed, user must select the desired watershed polygon on the map for the climate metrics to update. Users can also click the select tool (📐) in the upper left corner of the map and click on the area of interest.

Next, select the **Target decade** (2030, 2050, 2070, 2090) and **Season** (annual, winter, spring, summer, fall) from the filter menus on the left panel to view the 30-year average centered on the selected time period. Users can toggle between tabs at the bottom of

DETAILED INSTRUCTIONS

BACKGROUND

CLIMATE METRICS

REFERENCES

Site	Year	Duration	RI_1yr_50th	RI_2yr_50th	RI_5yr_50th	RI_10yr_50th	RI_25yr_50th	RI_50yr_50th	RI_100yr_50th	RI_200yr_50th	RI_500yr_50th	RI_1000yr_50th
Site 1	2030	05m	0.4 (0.3 - 0.4)	0.4 (0.4 - 0.5)	0.5 (0.5 - 0.6)	0.6 (0.6 - 0.7)	0.8 (0.7 - 0.8)	0.9 (0.8 - 0.9)	1 (0.9 - 1)	1.1 (1 - 1.2)	1.3 (1.2 - 1.4)	1.4 (1.3 - 1.5)
Site 1	2030	10m	0.5 (0.5 - 0.5)	0.6 (0.6 - 0.7)	0.8 (0.7 - 0.8)	0.9 (0.9 - 1)	1.1 (1 - 1.2)	1.2 (1.2 - 1.3)	1.4 (1.3 - 1.5)	1.6 (1.5 - 1.7)	1.8 (1.7 - 1.9)	2 (1.8 - 2.1)
Site 1	2030	15m	0.6 (0.6 - 0.6)	0.7 (0.7 - 0.8)	0.9 (0.9 - 1)	1.1 (1 - 1.1)	1.3 (1.2 - 1.4)	1.5 (1.4 - 1.6)	1.6 (1.5 - 1.7)	1.8 (1.7 - 2)	2.1 (2 - 2.2)	2.3 (2.2 - 2.5)
Site 1	2030	60m	1 (1 - 1.1)	1.3 (1.2 - 1.3)	1.6 (1.5 - 1.7)	1.9 (1.7 - 2)	2.3 (2.1 - 2.4)	2.5 (2.4 - 2.7)	2.9 (2.7 - 3.1)	3.2 (3 - 3.4)	3.7 (3.4 - 3.9)	4.1 (3.8 - 4.3)
Site 1	2030	02h	1.4 (1.3 - 1.5)	1.7 (1.5 - 1.8)	2.1 (2 - 2.3)	2.5 (2.3 - 2.7)	3 (2.8 - 3.2)	3.4 (3.2 - 3.6)	3.8 (3.6 - 4.1)	4.3 (4 - 4.6)	5.1 (4.7 - 5.4)	5.7 (5.3 - 6.1)
Site 1	2030	03h	1.6 (1.5 - 1.7)	1.9 (1.8 - 2.1)	2.5 (2.3 - 2.7)	2.9 (2.7 - 3.1)	3.6 (3.3 - 3.8)	4 (3.8 - 4.3)	4.5 (4.2 - 4.8)	5.1 (4.8 - 5.5)	6.1 (5.7 - 6.5)	6.8 (6.4 - 7.3)
Site 1	2030	04h	2.1	2.5	3.3	3.9	4.7	5.3	6	6.8	8.1	9.1

AVERAGE AND COLD DAYS

HOT DAYS

PRECIPITATION

STOCHASTIC WEATHER GENERATOR TABLE

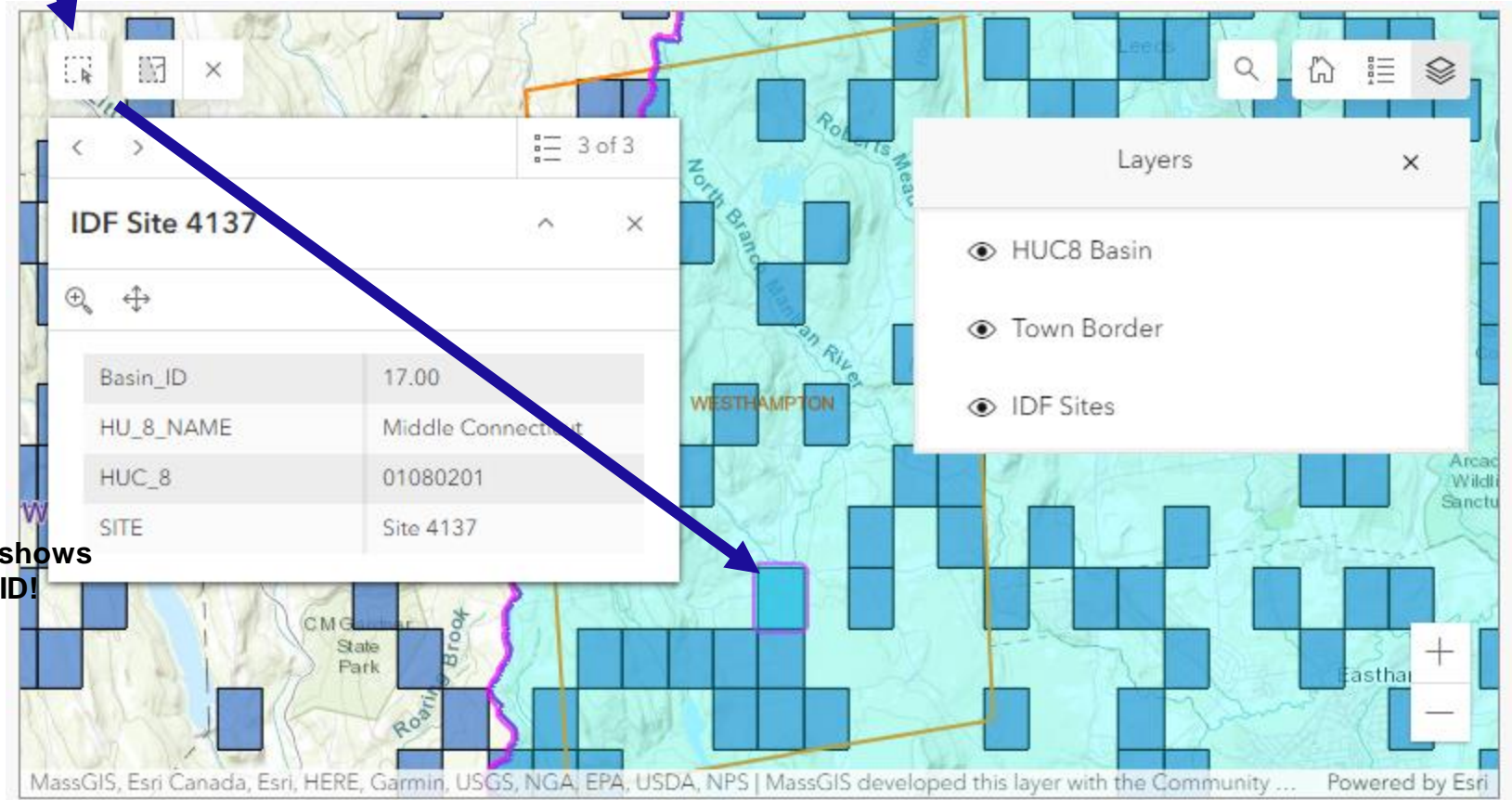
PRECIPITATION FREQUENCY TABLE

Show "Precipitation Frequency Table" tab



# Climate Change Projections Dashboard

Use selection tool to highlight one of the sites  
close to your point of interest

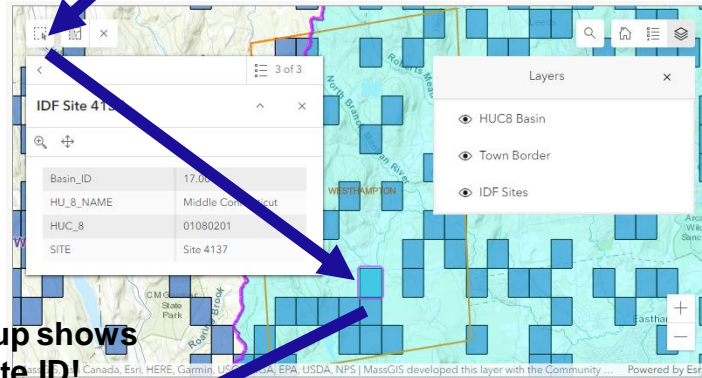


Popup shows  
site ID!



# Climate Change Projections Dashboard

Use selection tool to highlight one of the sites close to your point of interest



Popup shows site ID!

Table updates to show ONLY selected site ID(s)

Site	Year	Duration	RI_1yr_50th	RI_2yr_50th	RI_5yr_50th	RI_10yr_50th	RI_25yr_50th	RI_50yr_50th	RI_100yr_50th	RI_200yr_50th	RI_500yr_50th	RI_1000yr_50th
Site 4137	2030	05m	0.4 (0.4 - 0.4)	0.4 (0.4 - 0.5)	0.6 (0.5 - 0.6)	0.6 (0.6 - 0.7)	0.8 (0.7 - 0.8)	0.9 (0.8 - 0.9)	1 (0.9 - 1)	1.1 (1 - 1.1)	1.2 (1.2 - 1.3)	1.3 (1.3 - 1.4)
Site 4137	2030	10m	0.5 (0.5 - 0.6)	0.6 (0.6 - 0.7)	0.8 (0.8 - 0.8)	0.9 (0.9 - 1)	1.1 (1.1 - 1.2)	1.2 (1.2 - 1.3)	1.4 (1.3 - 1.5)	1.5 (1.5 - 1.6)	1.7 (1.7 - 1.8)	1.9 (1.8 - 2)
Site 4137	2030	15m	0.6 (0.6 - 0.7)	0.7 (0.7 - 0.8)	0.9 (0.9 - 1)	1.1 (1 - 1.1)	1.3 (1.2 - 1.4)	1.4 (1.4 - 1.5)	1.6 (1.5 - 1.7)	1.8 (1.7 - 1.9)	2 (2 - 2.2)	2.2 (2.1 - 2.4)
Site 4137	2030	60m	1.1 (1.1 - 1.2)	1.3 (1.3 - 1.4)	1.6 (1.6 - 1.8)	1.9 (1.9 - 2.1)	2.3 (2.2 - 2.5)	2.6 (2.5 - 2.8)	2.9 (2.8 - 3.1)	3.2 (3.1 - 3.4)	3.6 (3.5 - 3.9)	4 (3.8 - 4.2)
Site 4137	2030	02h	1.4 (1.4 - 1.5)	1.7 (1.6 - 1.8)	2.1 (2 - 2.3)	2.5 (2.4 - 2.6)	2.9 (2.8 - 3.1)	3.3 (3.2 - 3.5)	3.7 (3.6 - 3.9)	4.1 (4 - 4.4)	4.8 (4.6 - 5.1)	5.3 (5.1 - 5.7)
Site 4137	2030	03h	1.6 (1.6 - 1.7)	1.9 (1.9 - 2.1)	2.4 (2.4 - 2.6)	2.8 (2.8 - 3)	3.4 (3.3 - 3.7)	3.8 (3.7 - 4.1)	4.3 (4.1 - 4.6)	4.8 (4.7 - 5.2)	5.6 (5.5 - 6)	6.3 (6.1 - 6.8)
Site 4137	2030	01h	2 (2 - 2)	2.4 (2.4 - 2.4)	3.1 (3.1 - 3.1)	3.7 (3.7 - 3.7)	4.5 (4.5 - 4.5)	5.1 (5.1 - 5.1)	5.7 (5.7 - 5.7)	6.5 (6.5 - 6.5)	7.7 (7.7 - 7.7)	8.7 (8.7 - 8.7)



# Climate Change Projections Dashboard

Find storm return period, e.g. 10-year storm

Site	Year	Duration	RI_1yr_50th	RI_2yr_50th	RI_5yr_50th	RI_10yr_50th	RI_25yr_50th	RI_50yr_50th	RI_100yr_50th	RI_200yr_50th	RI_500yr_50th	RI_1000yr_50th
Site 4137	2050	02h	(1.4 - 1.7)	(1.7 - 2)	(2.1 - 2.5)	(2.5 - 3.0)	(2.9 - 3.5)	(3.3 - 3.9)	(3.7 - 4.4)	(4.1 - 4.9)	(4.8 - 5.6)	(5.3 - 6.3)
Site 4137	2050	03h	1.8 (1.6 - 1.9)	2.1 (1.9 - 2.3)	2.7 (2.4 - 2.9)	3.2 (2.8 - 3.4)	3.8 (3.4 - 4)	4.2 (3.8 - 4.5)	4.7 (4.3 - 5.1)	5.3 (4.8 - 5.7)	6.2 (5.6 - 6.7)	7 (6.3 - 7.5)
Site 4137	2050	06h	2.2 (2 - 2.4)	2.7 (2.4 - 2.9)	3.5 (3.1 - 3.7)	4.1 (3.7 - 4.4)	5 (4.5 - 5.3)	5.6 (5.1 - 6)	6.3 (5.7 - 6.7)	7.1 (6.5 - 7.6)	8.5 (7.7 - 9.1)	9.7 (8.7 - 10.3)
Site 4137	2050	12h	2.7 (2.5 - 2.9)	3.4 (3.1 - 3.6)	4.4 (4 - 4.7)	5.3 (4.8 - 5.7)	6.5 (5.9 - 7)	7.4 (6.7 - 7.9)	8.3 (7.5 - 8.9)	9.6 (8.6 - 10.2)	11.5 (10.4 - 12.3)	13.2 (12 - 14.2)
Site 4137	2050	24h	3.2 (2.9 - 3.5)	4.1 (3.7 - 4.4)	5.4 (4.9 - 5.8)	6.6 (5.9 - 7)	8.1 (7.3 - 8.7)	9.2 (8.4 - 9.9)	10.5 (9.5 - 11.2)	12.1 (11 - 13)	14.8 (13.4 - 15.8)	17.1 (15.5 - 18.3)
Site 4137	2050	48h	3.7 (3.4 - 4)	4.7 (4.3 - 5)	6.3 (5.7 - 6.8)	7.7 (7 - 8.2)	9.6 (8.6 - 10.2)	10.9 (9.9 - 11.7)	12.4 (11.2 - 13.3)	14.5 (13.1 - 15.5)	17.8 (16.1 - 19.1)	20.8 (18.8 - 22.3)
Site 4137	2070	05m	0.5 (0.4 - 0.5)	0.5 (0.5 - 0.6)	0.7 (0.6 - 0.7)	0.8 (0.7 - 0.9)	0.9 (0.9 - 1)	1.1 (1 - 1.2)	1.2 (1.1 - 1.3)	1.3 (1.2 - 1.4)	1.5 (1.3 - 1.6)	1.6 (1.5 - 1.8)

↓

AVERAGE AND COLD DAYS

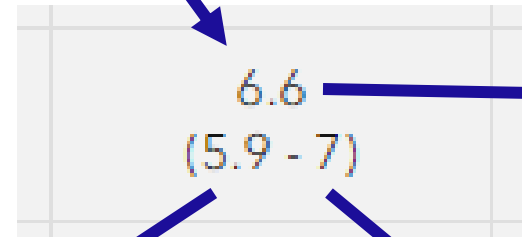
HOT DAYS

PRECIPITATION

STOCHASTIC WEATHER GENERATOR TABLE

PRECIPITATION FREQUENCY TABLE

Scroll to decade & storm duration of interest, e.g. 2050 24-hour storm



Base projection: 6.6" in 24 hours

90% of models higher:  
5.9" in 24 hours

10% of models higher:  
7" in 24 hours



# ResilientMass Climate & Hazards Viewer

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View data and create maps of climate projections

Technical/specific scenarios at multiple time intervals

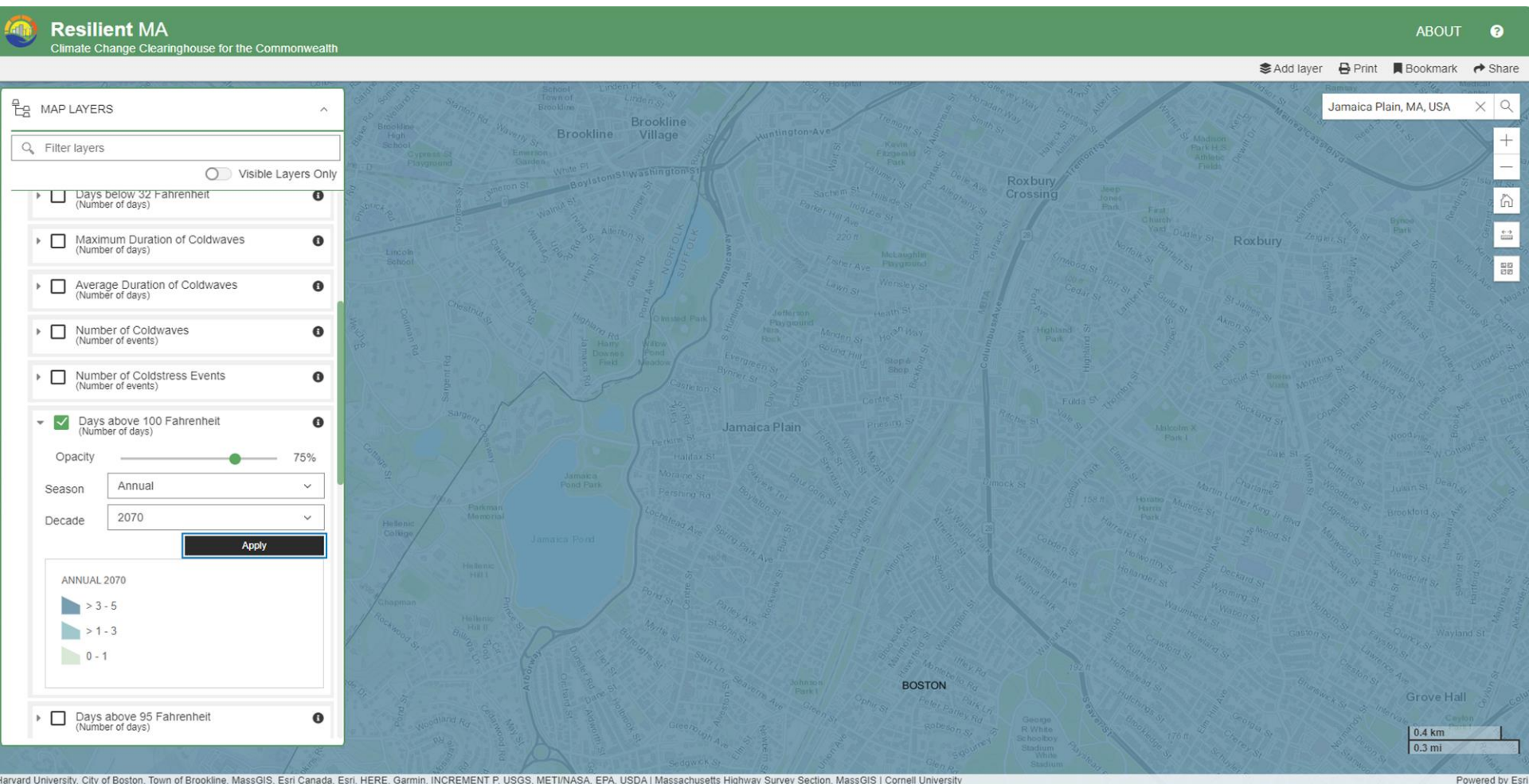
- Precipitation, Temperature, and Sea Level Rise scenarios
- 2030, 2050, 2070, and 2090 projections
- Limited demographic & land use data

All included data is available for download from the ResilientMass Maps & Data Center page





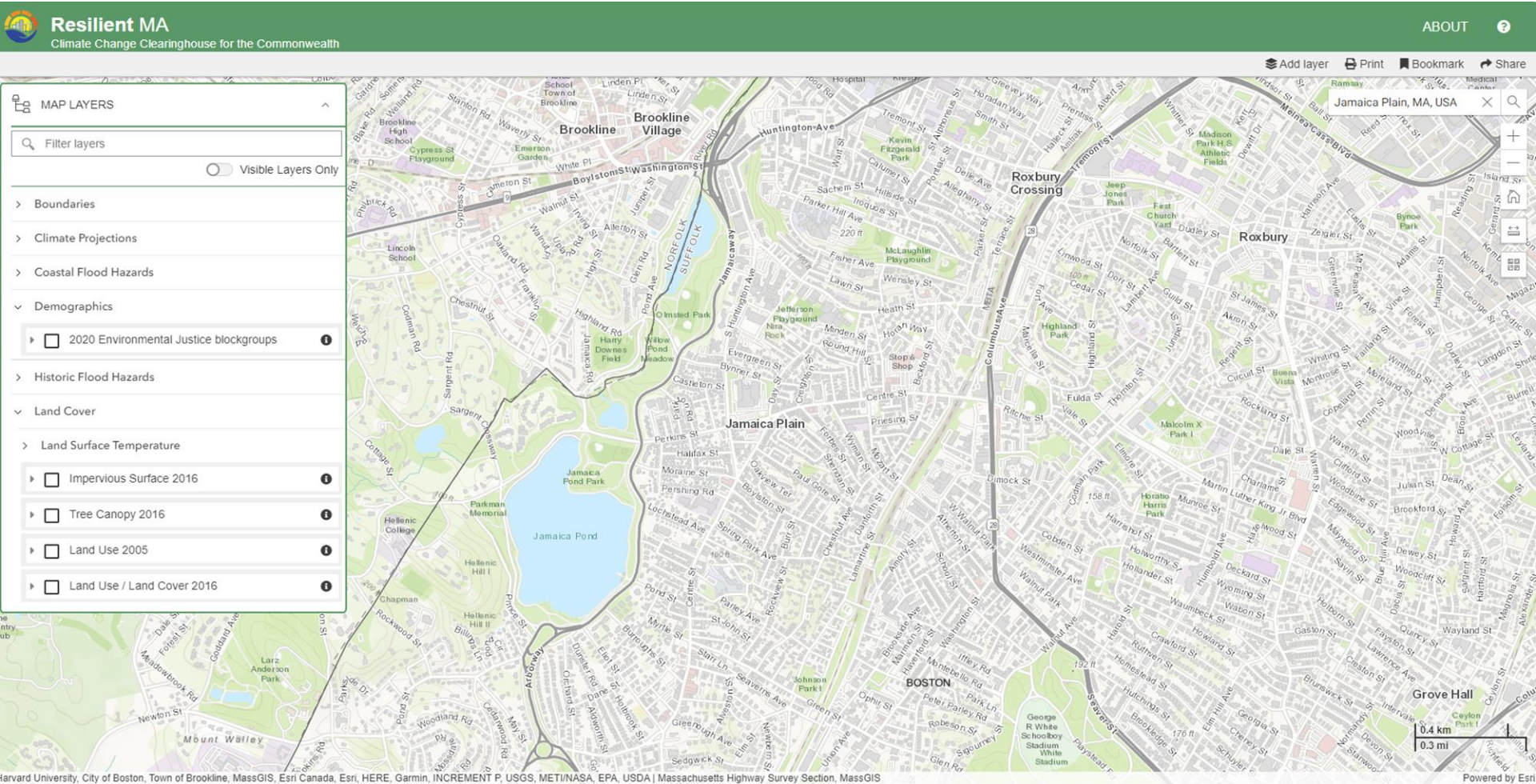
# ResilientMass Climate & Hazards Viewer







# ResilientMass Climate & Hazards Viewer





# MVP GEAR Tool

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## Guides for Equitable and Actionable Resilience

Created for the MVP 2.0 planning process

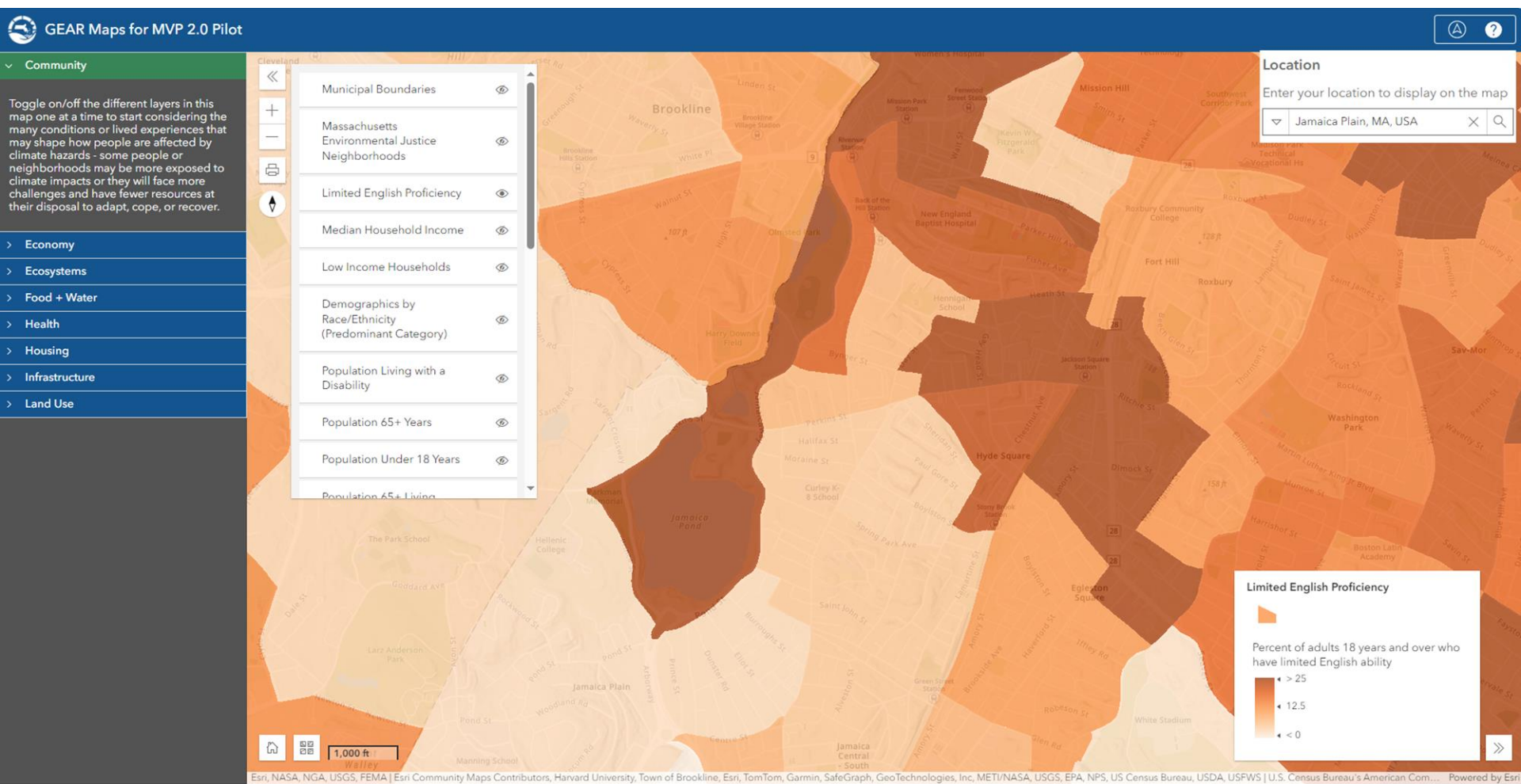
Allows users to evaluate the intersections of

- Social Components
- Climate Hazard Components
- Industry/Sector Components

Uses generalized/aggregated climate hazard areas instead of specific projection scenarios



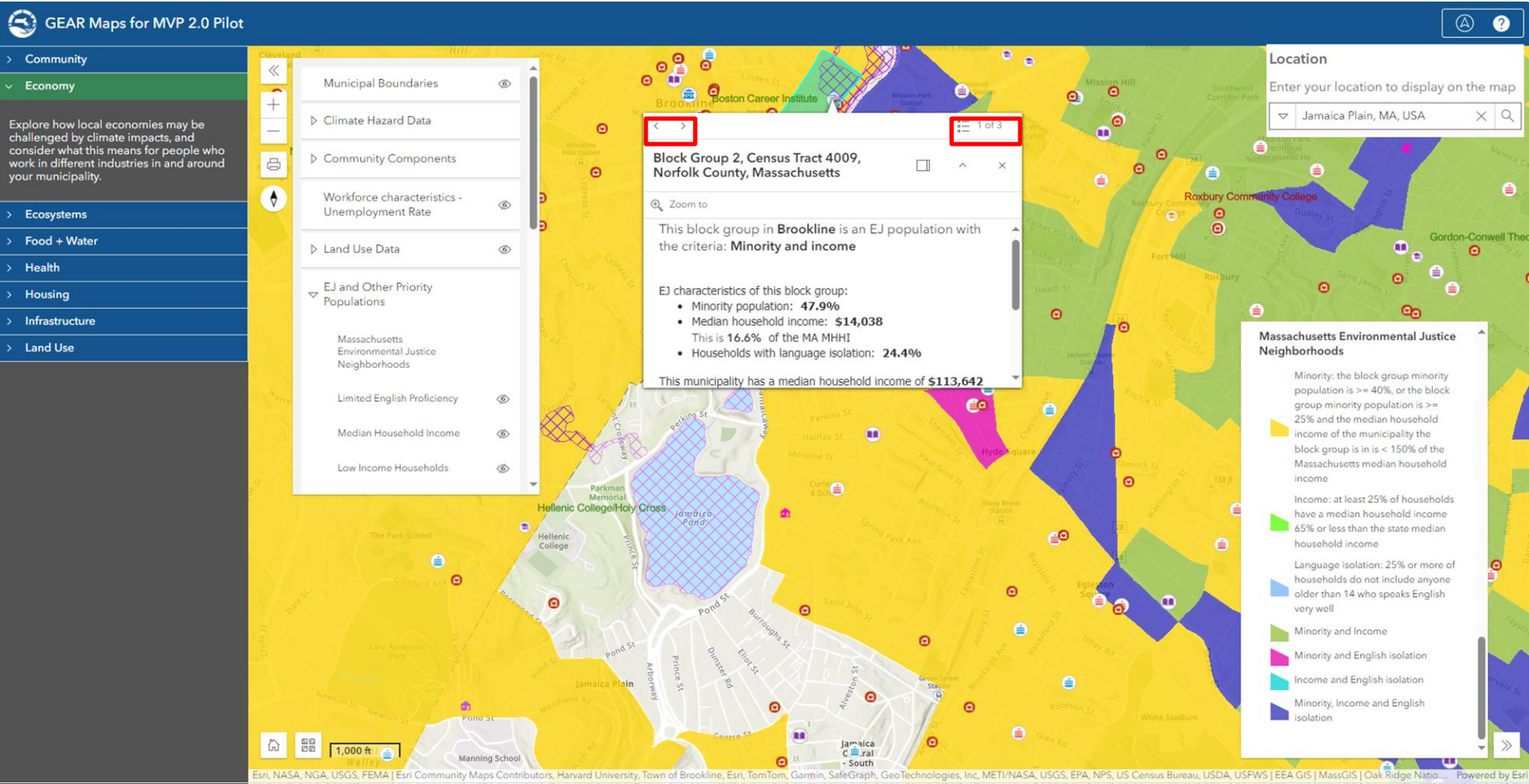
# MVP GEAR Tool







# MVP GEAR Tool





# MVP GEAR Tool

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## **ResilientMass Climate & Hazards Viewer**

Specific climate projection scenarios, can browse the data included in the other tools

Limited demographic and land cover data

## **Guides for Equitable and Actionable Resilience (GEAR)**

General climate hazard scenarios, local experience from past events should also be considered

Focus on who and what are in the impacted areas

Constantly evolving, as we are receiving feedback from towns going through the MVP 2.0 Pilot process



## Q&A

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- **Please put any questions you have in the Q&A section!**
- **Questions to be answered by the Office of Climate Science**





# Thank you for joining!

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- Upcoming Events

- **Webinar #3: February 28th, 2024, 10am-12pm**

- Topic: Natural and Working Lands: Natural Climate Solutions and Municipal Opportunities

- **EEA Climate Newsletter**

- Stay up to date!

- **Additional Questions after the webinar**

- Contact [Patrick.Forde@mass.gov](mailto:Patrick.Forde@mass.gov)