# MVP Winter Webinar Series 2024 #2
# How to Effectively Use ResilientMass Tools: Key Tips from the Office of Climate Science

MVP
Municipal Vulnerability Preparedness

# Webinar Information

- **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**

# MVP Winter Webinar Series 2024

- **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

- 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)

2023 ResilientMass Plan + Recommendations of the Climate Chief Report:

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

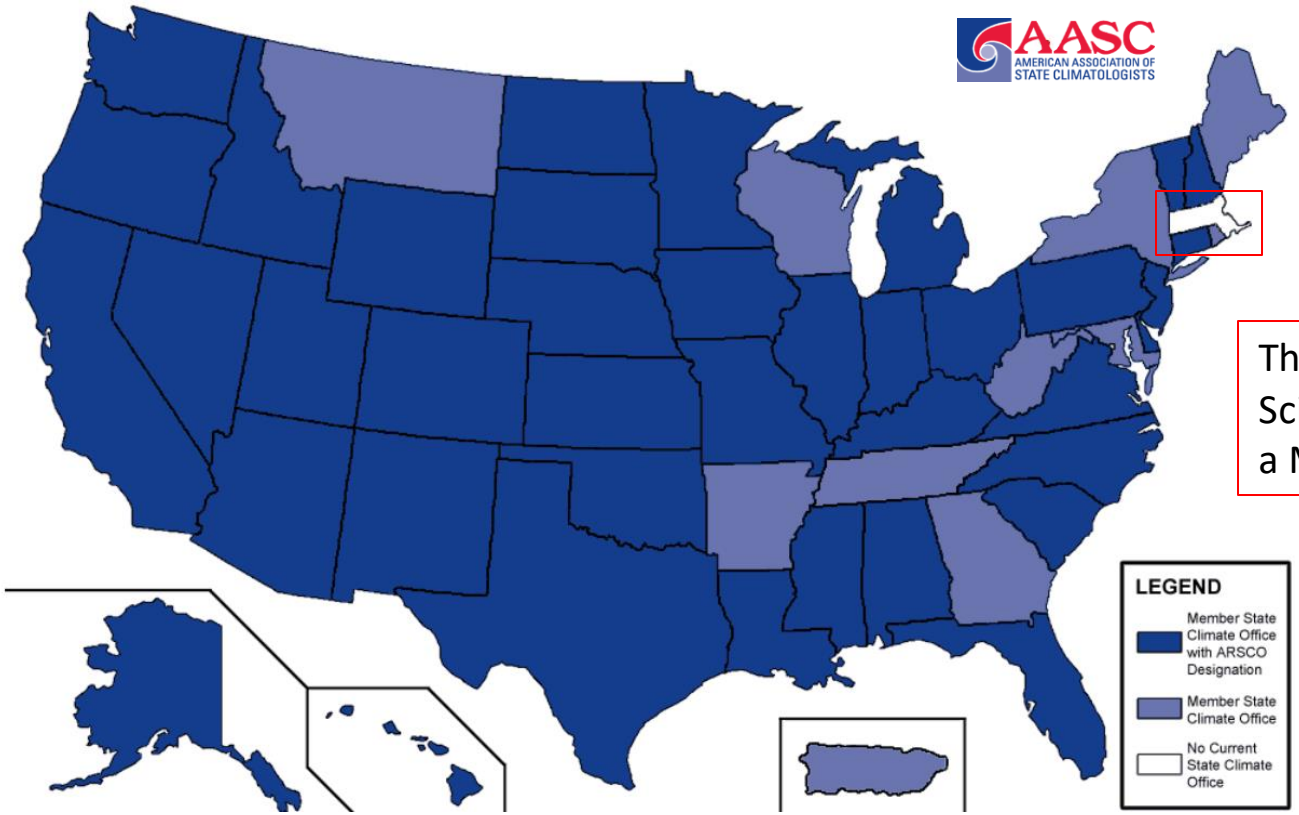
Serve as an authoritative resource, and provide subject matter expertise on statewide climate data and models, and support consistent application across agencies. Convene the academic climate science community and identify opportunities to partner with universities on climate science needs and next steps.

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

climatescience@mass.gov

ResilientMass

# 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)*

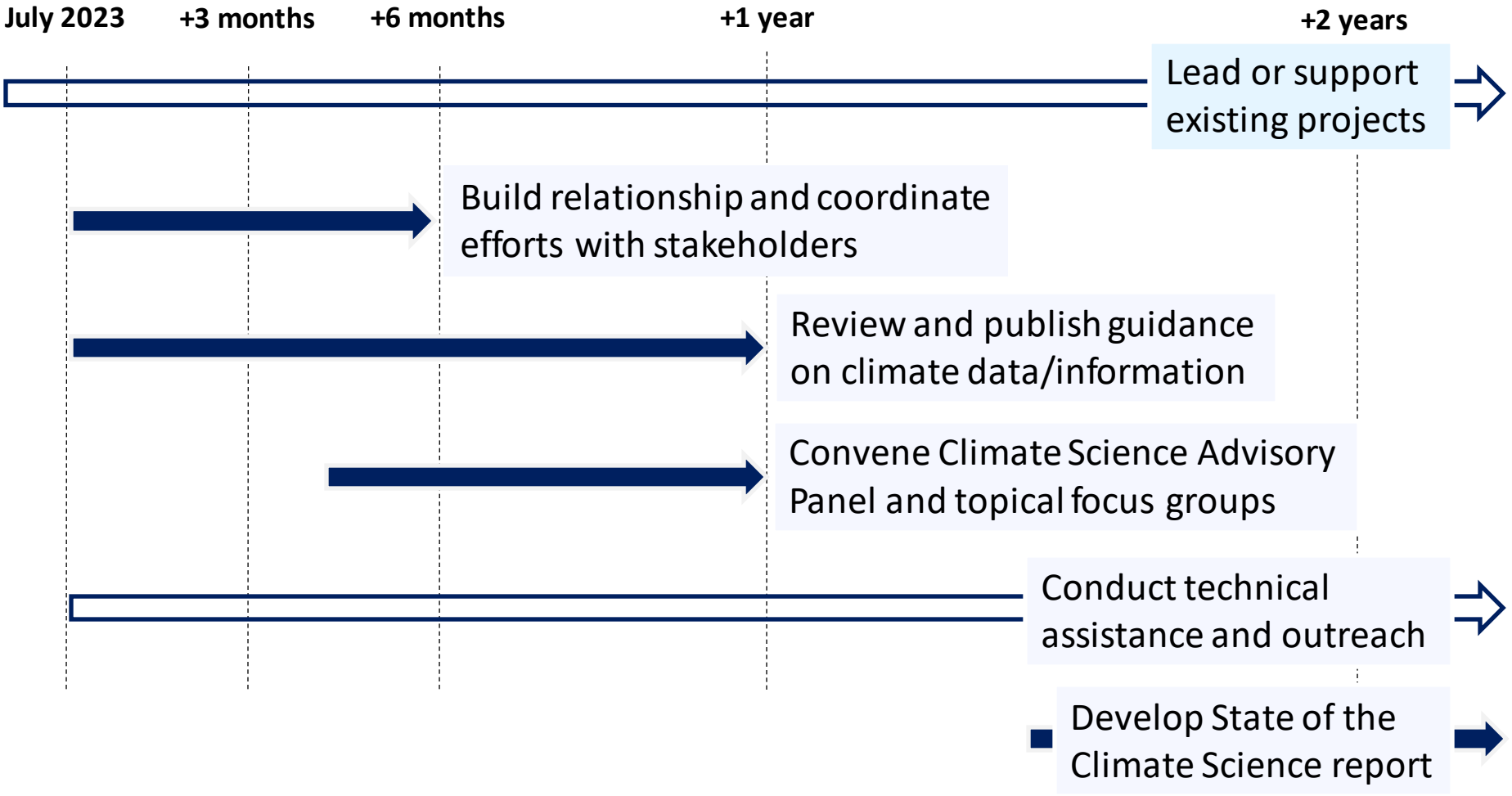
**Expertise:**

- 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

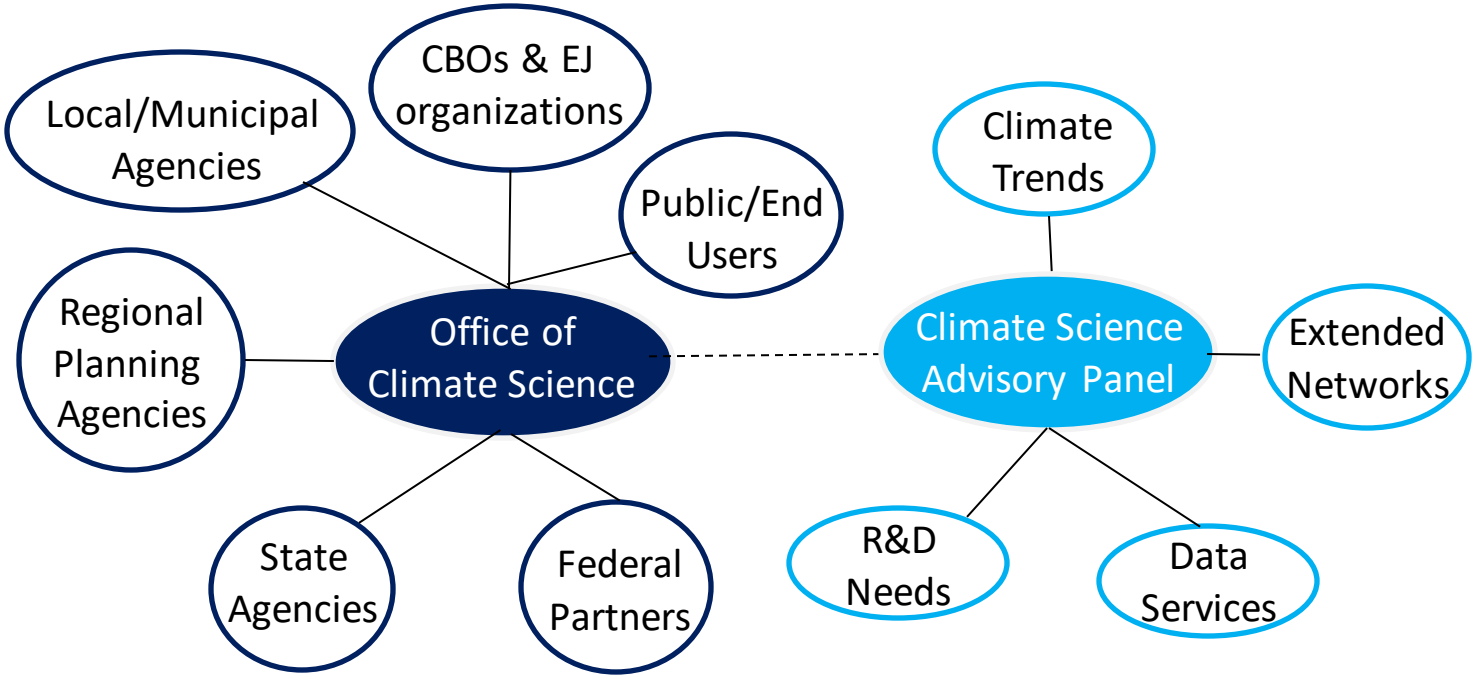
To provide expertise on climate projection, hazards, and development methods and to inform applications, particularly impacts on EJ and other priority populations

**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

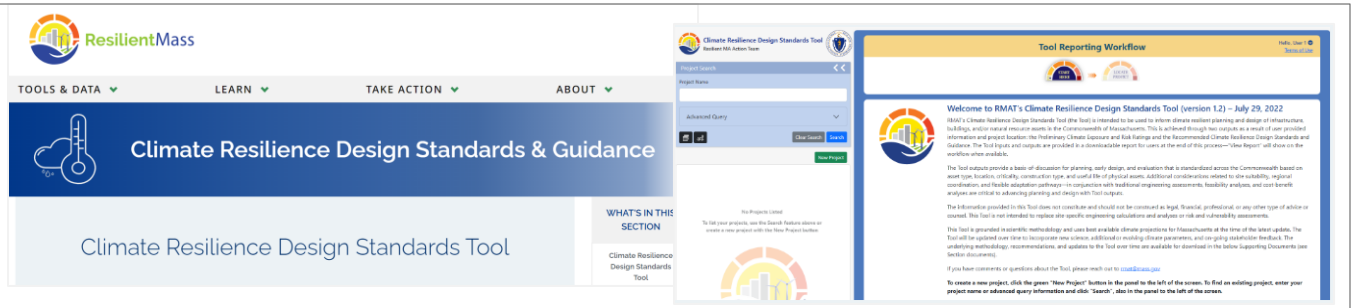


# Examples of OCS-led Projects

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

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

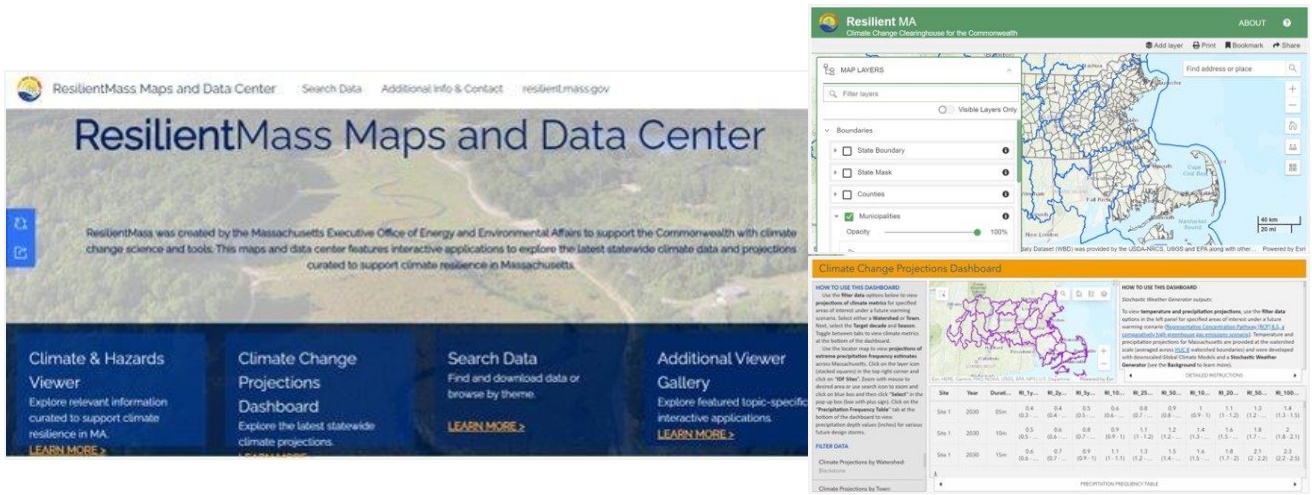
***IN-PROGRESS*** Data updates, revision of guidance




**ResilientMass Maps and Data Center**

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

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



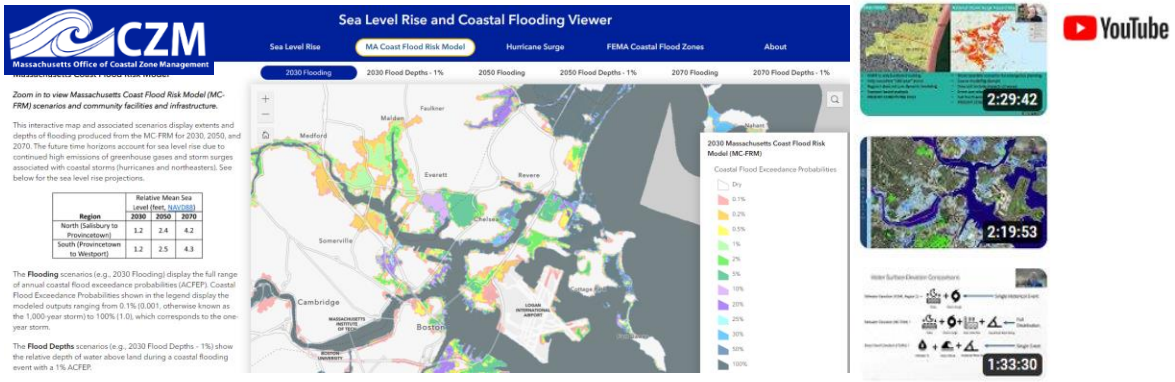
# Examples of OCS-supported Projects

## 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**

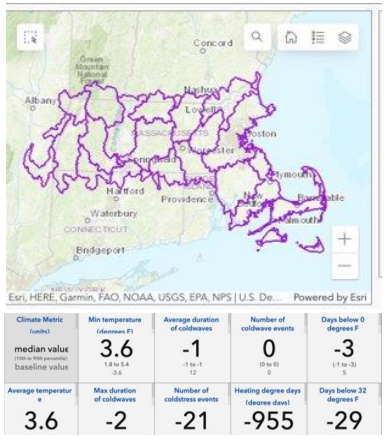


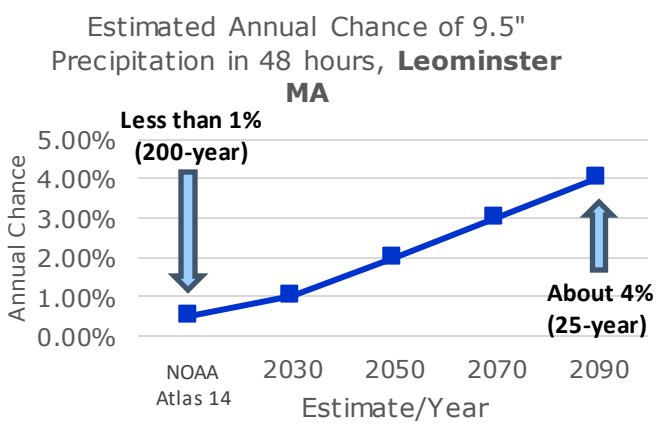

## MA Climate and Hydrologic Risk Project (Phase 2)

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

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

**EEA Water Policy as Lead**



# Learn More

**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

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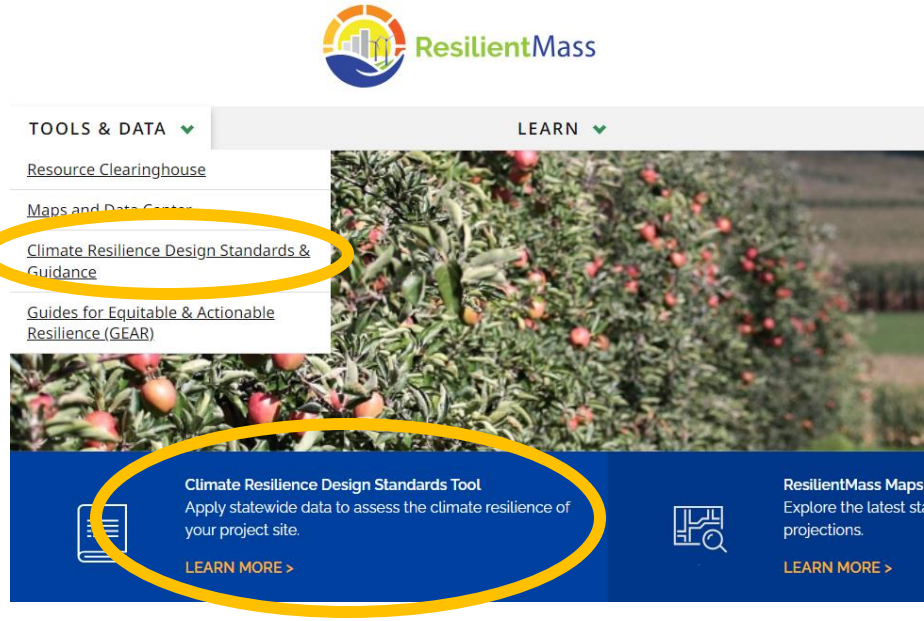
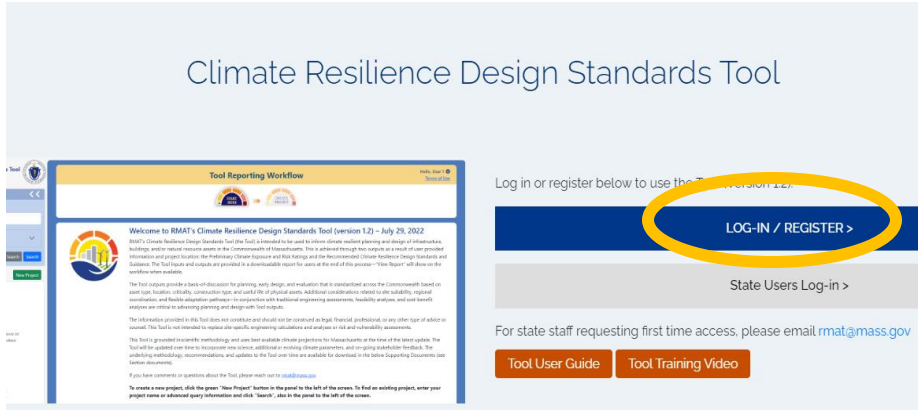
# Climate Resilience Design Standards Tool - Overview

## 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**



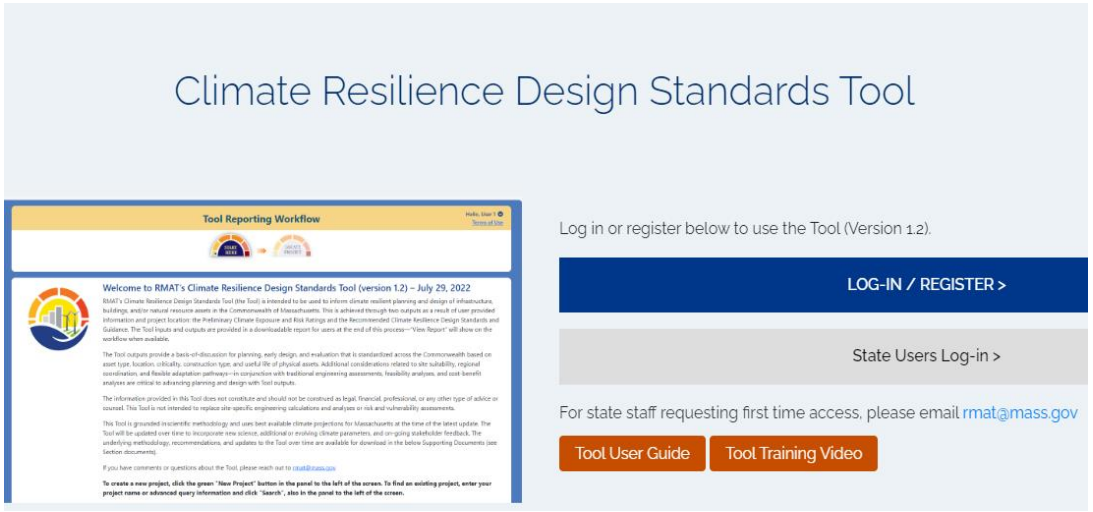




https://resilient.mass.gov/rmat_home/designstandards/

# Climate Resilience Design Standards Tool - Overview

## When to use this tool:

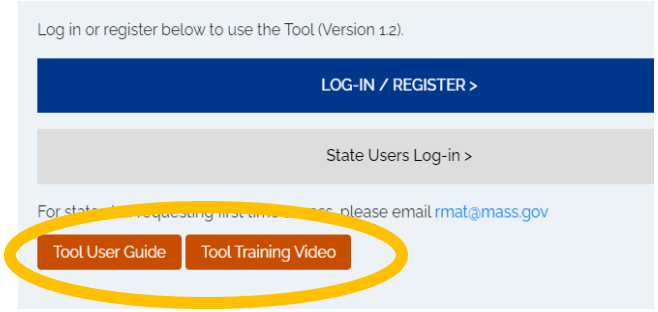
- Improving a state grant application
- Project siting
- Project planning and design/procurement



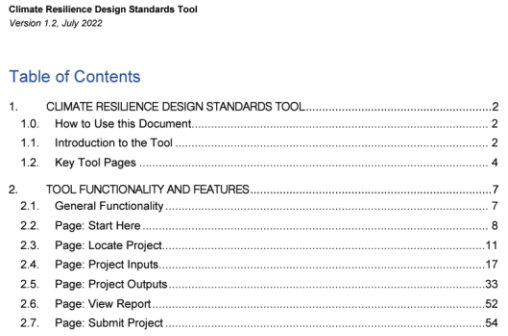

https://resilient.mass.gov/rmat_home/designstandards/

# Climate Resilience Design Standards Tool - Overview

## Key available resources:




*User guide*



Climate Resilience Design Standards Tool
*Version 1.2, July 2022*

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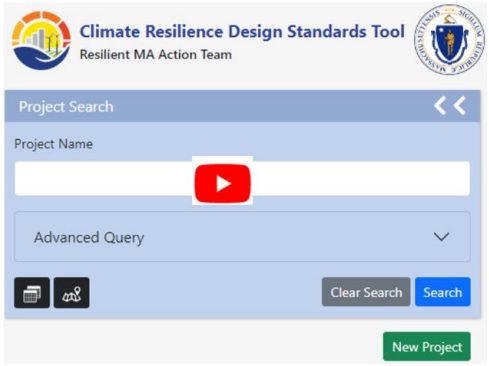
*Training video*




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

### 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

*Climate resilience design guidance and best practices*

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

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

*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/

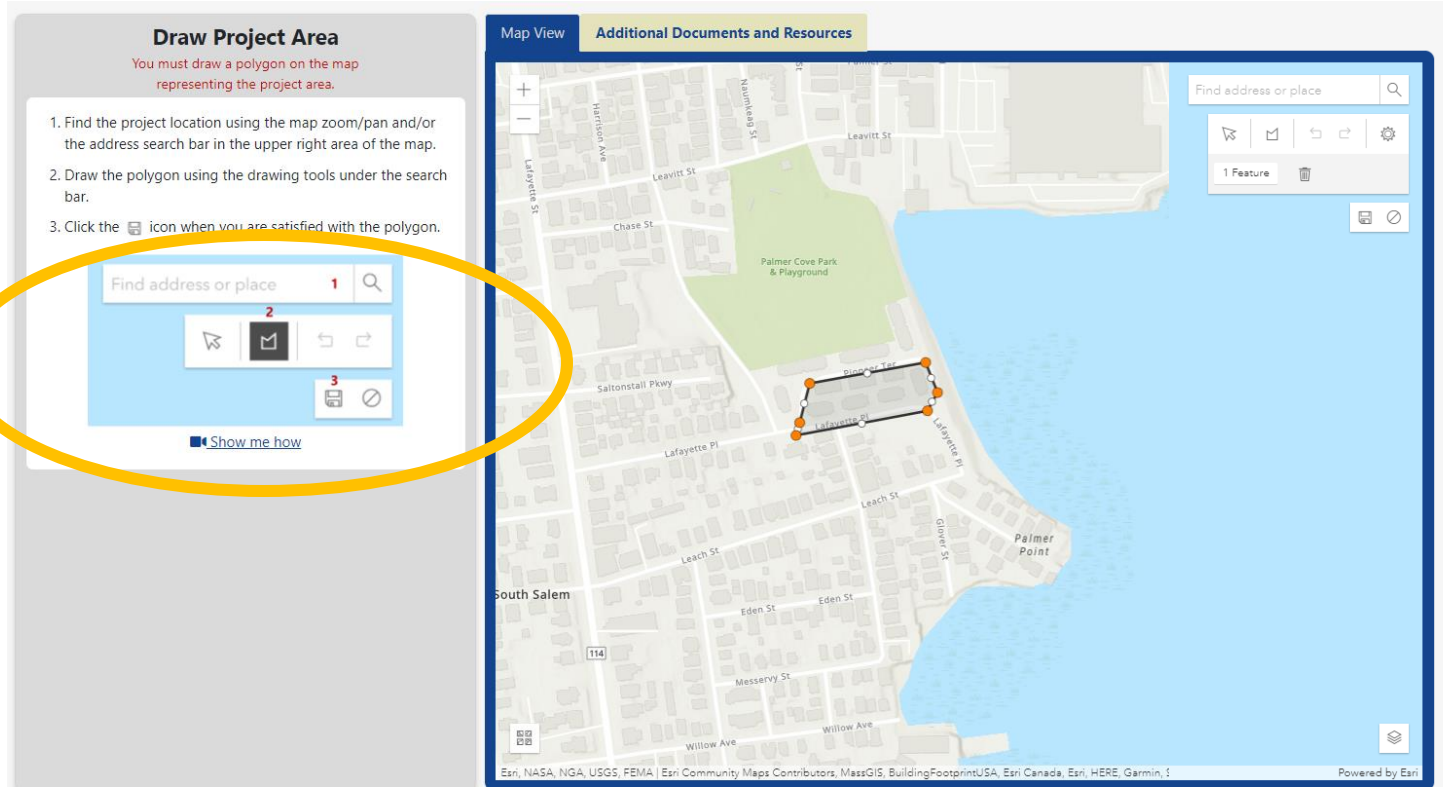
# Climate Resilience Design Standards Tool – Project Inputs

## Tool Reporting Workflow

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

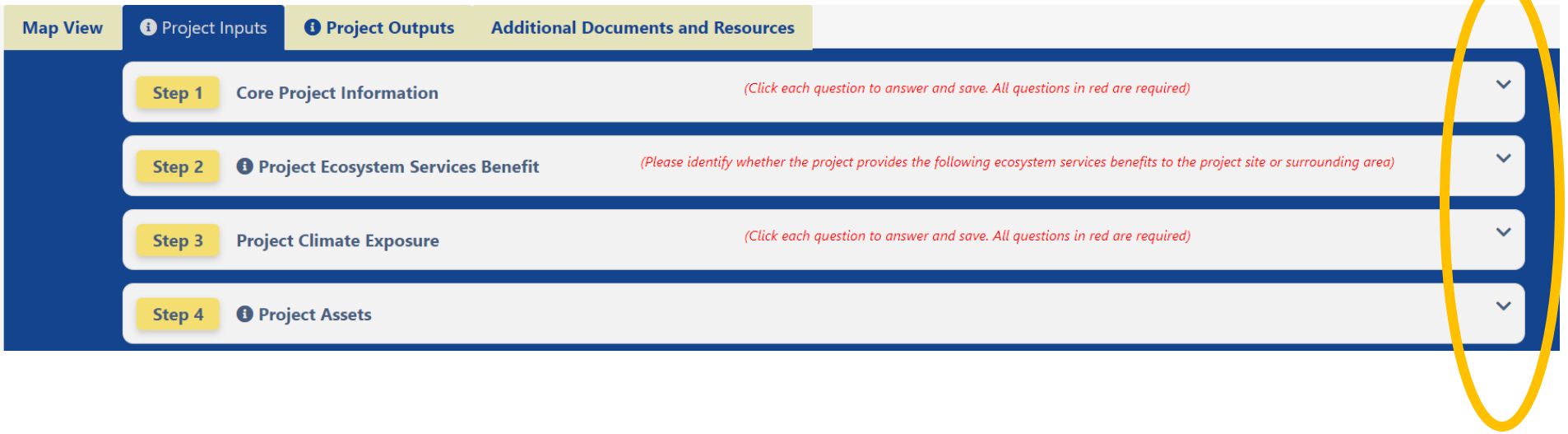
**Project Located**

*Draw project footprint*



# Climate Resilience Design Standards Tool – Project Inputs

## Tool Reporting Workflow

# 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

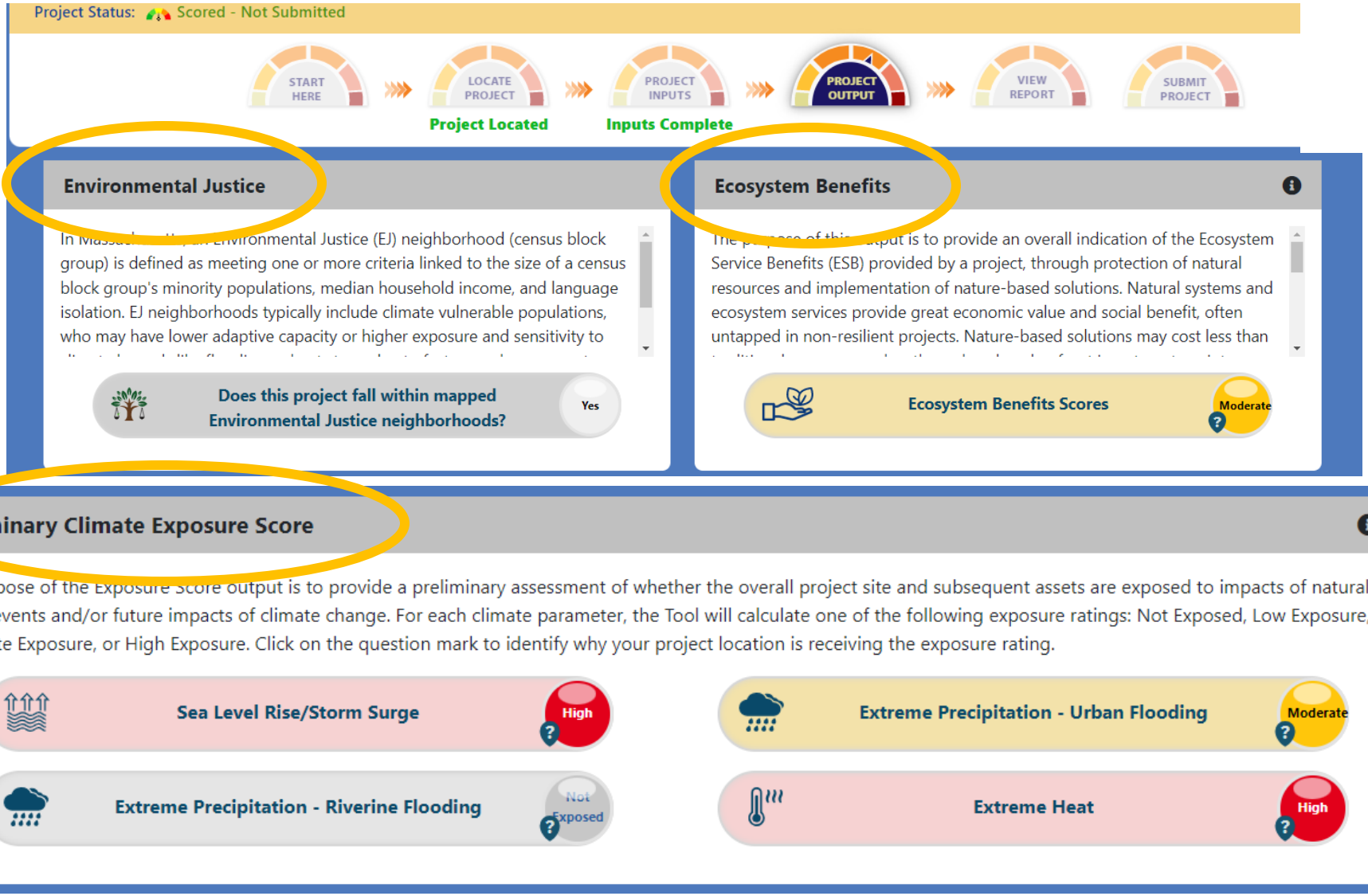
Natural Resources Add

N/A

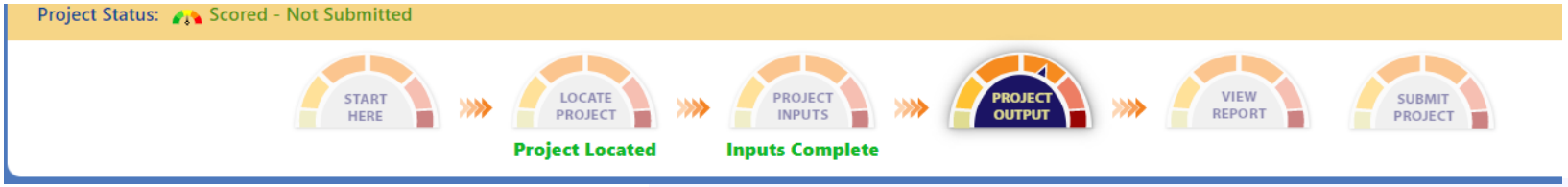
| | |
|---|---|
| **Selected Asset:** | UserGuide Building |
| **Asset Type:** | Typically Occupied |
| **Asset Sub-Type:** | Residential building - Public Housing |
| **Construction Type:** | Maintenance (critical repair) |
| **Construction Year:** | 2025 |
| **Useful Life:** | 15 |

| | |
|---|---|
| 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 |

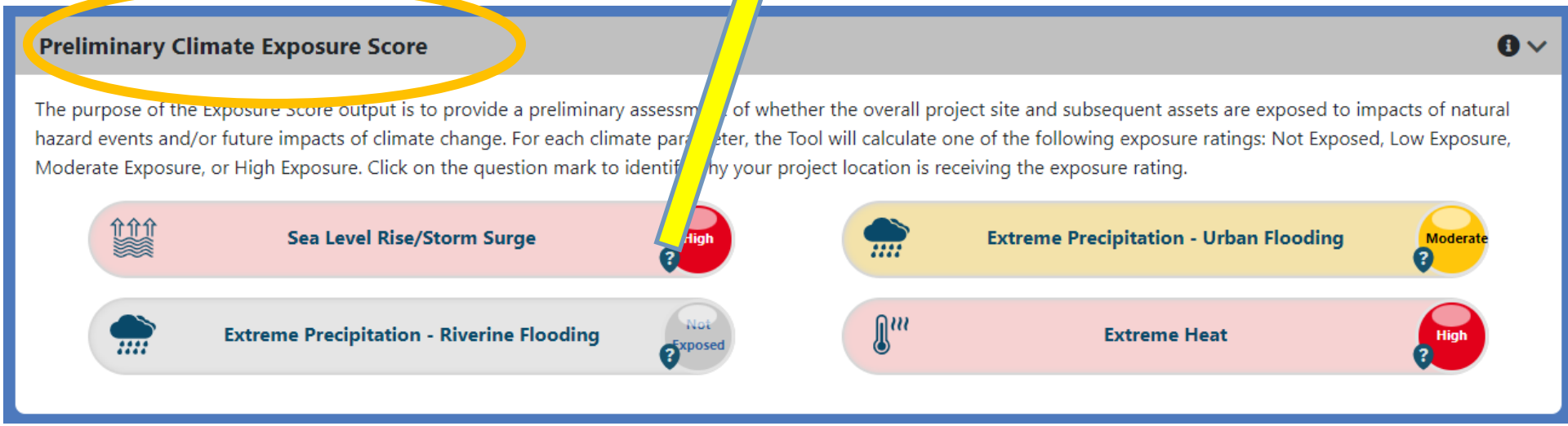
# Climate Resilience Design Standards Tool – Outputs: Project Level Scores



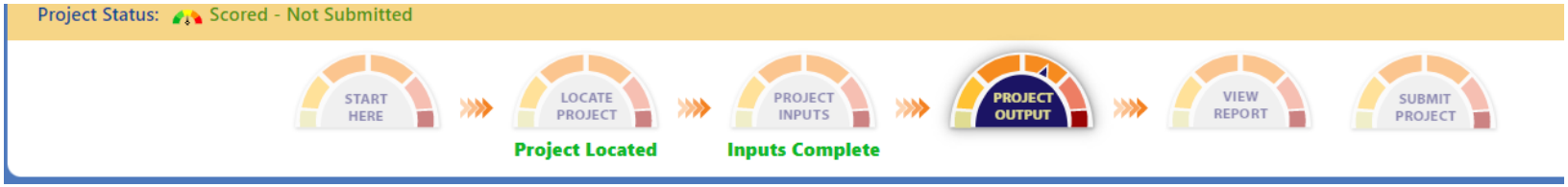
# Climate Resilience Design Standards Tool – Outputs: Project Level Scores

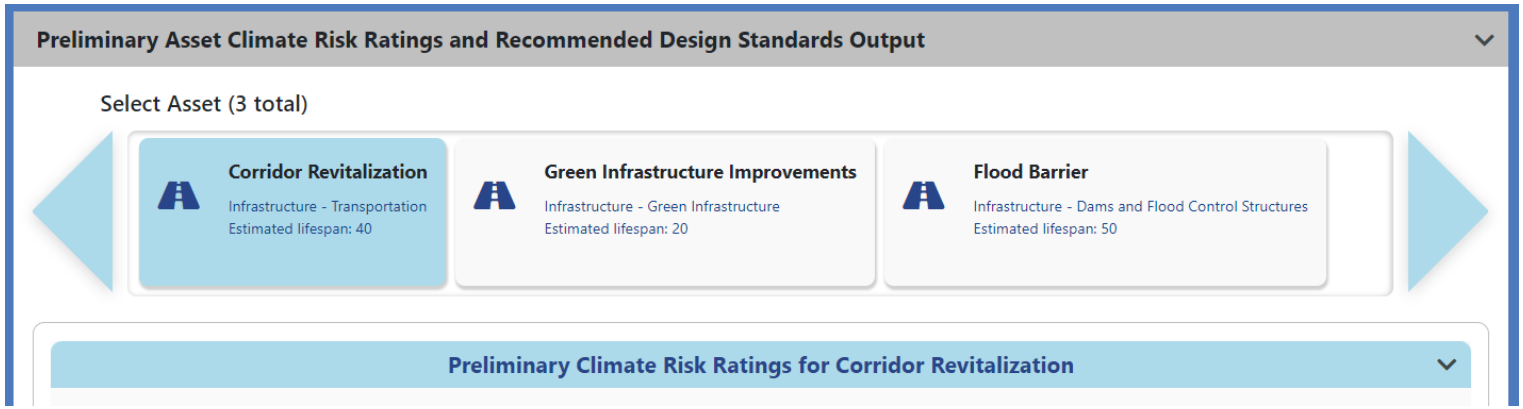




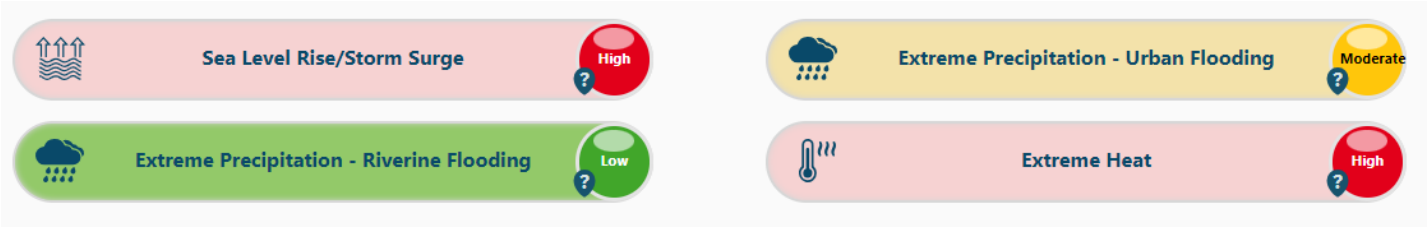


# Climate Resilience Design Standards Tool – Outputs: Asset Climate Risk Rating



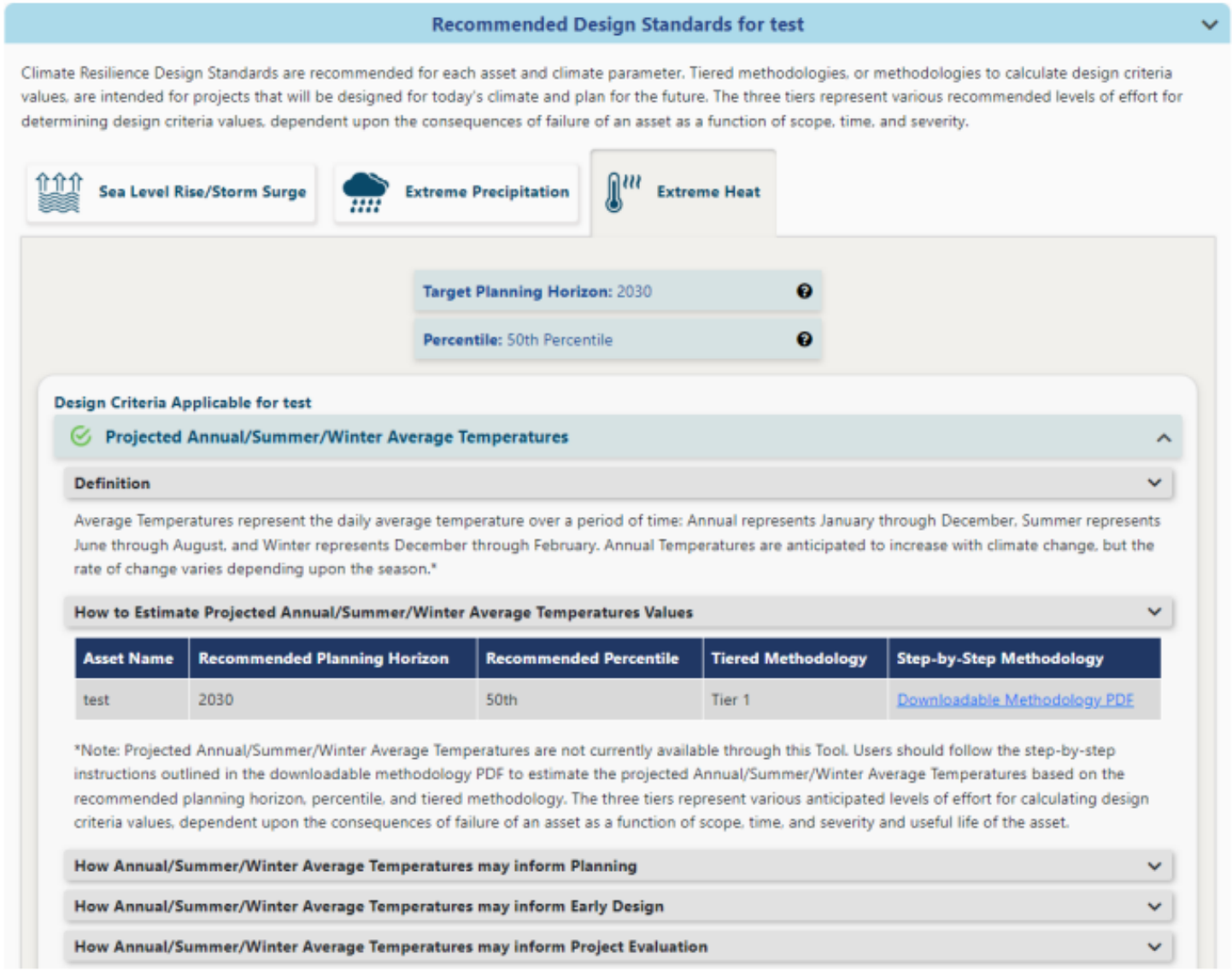

*Tool projects can accommodate multiple assets*




*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 | Downloadable Methodology PDF |

*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

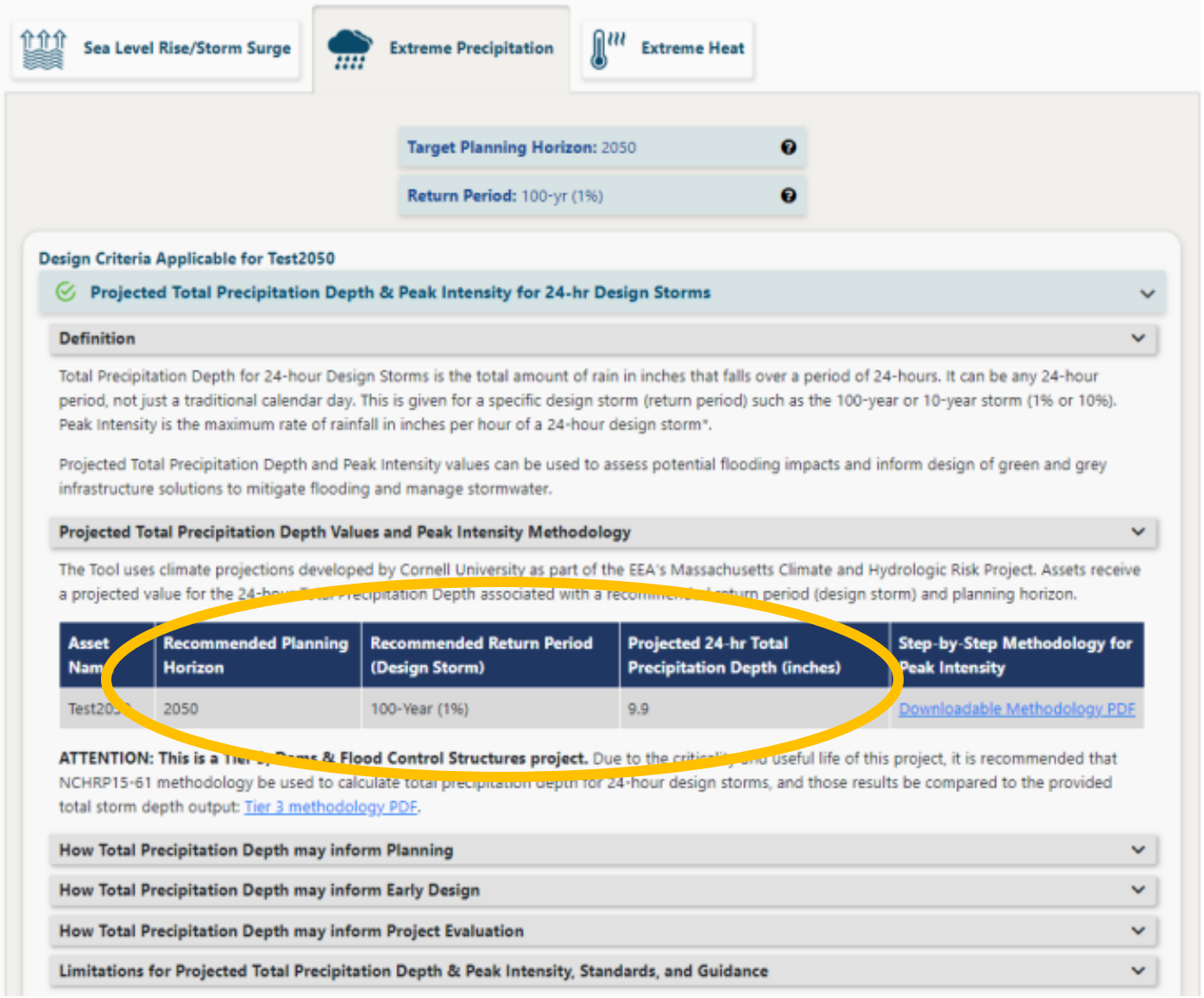
How Annual/Summer/Winter Average Temperatures may inform Project Evaluation

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

***Updates** planned for 2024*

***Guidance** for how to consider outputs*

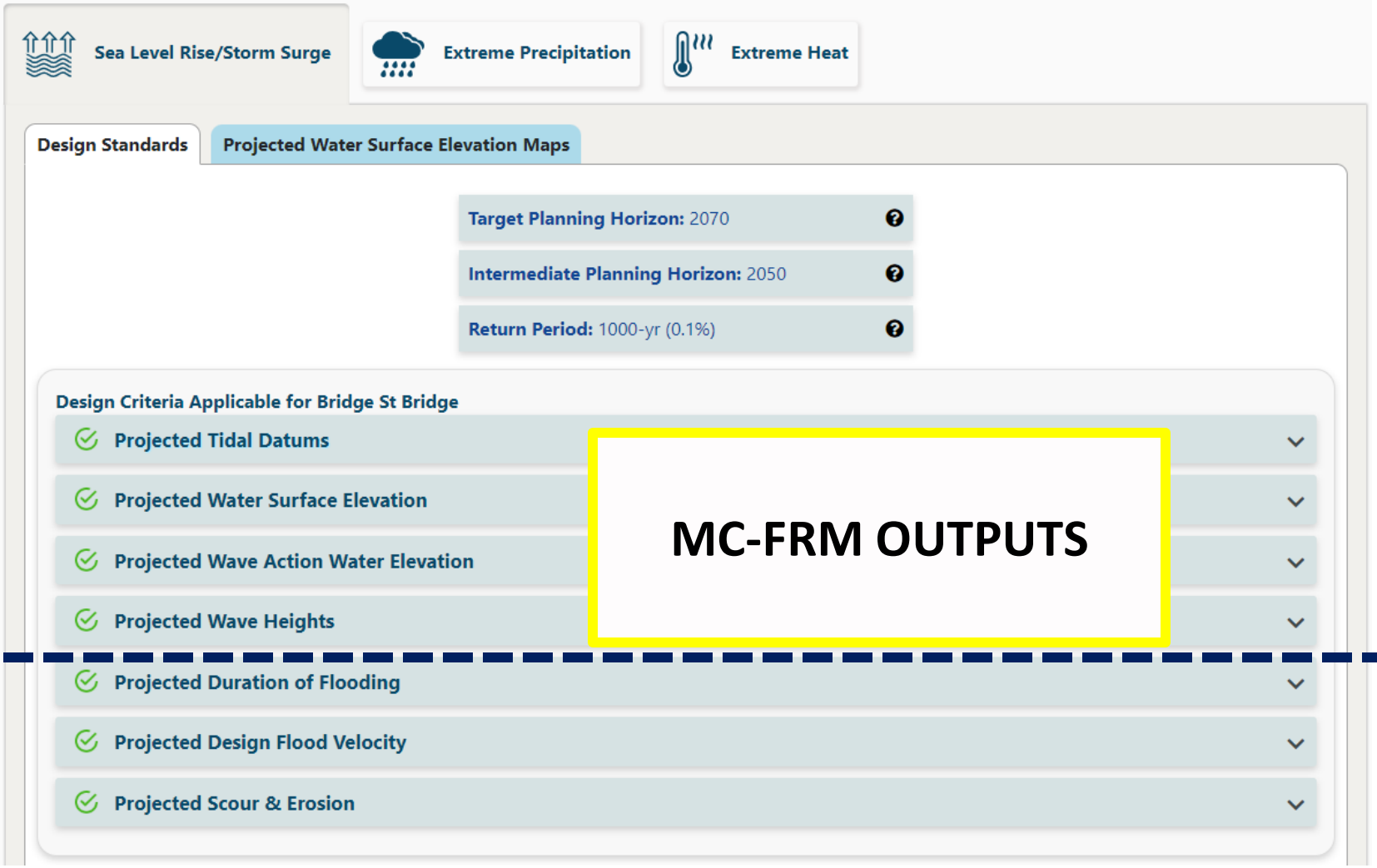
# Climate Resilience Design Standards Tool – Outputs: Standards/Design Criteria for Precipitation




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

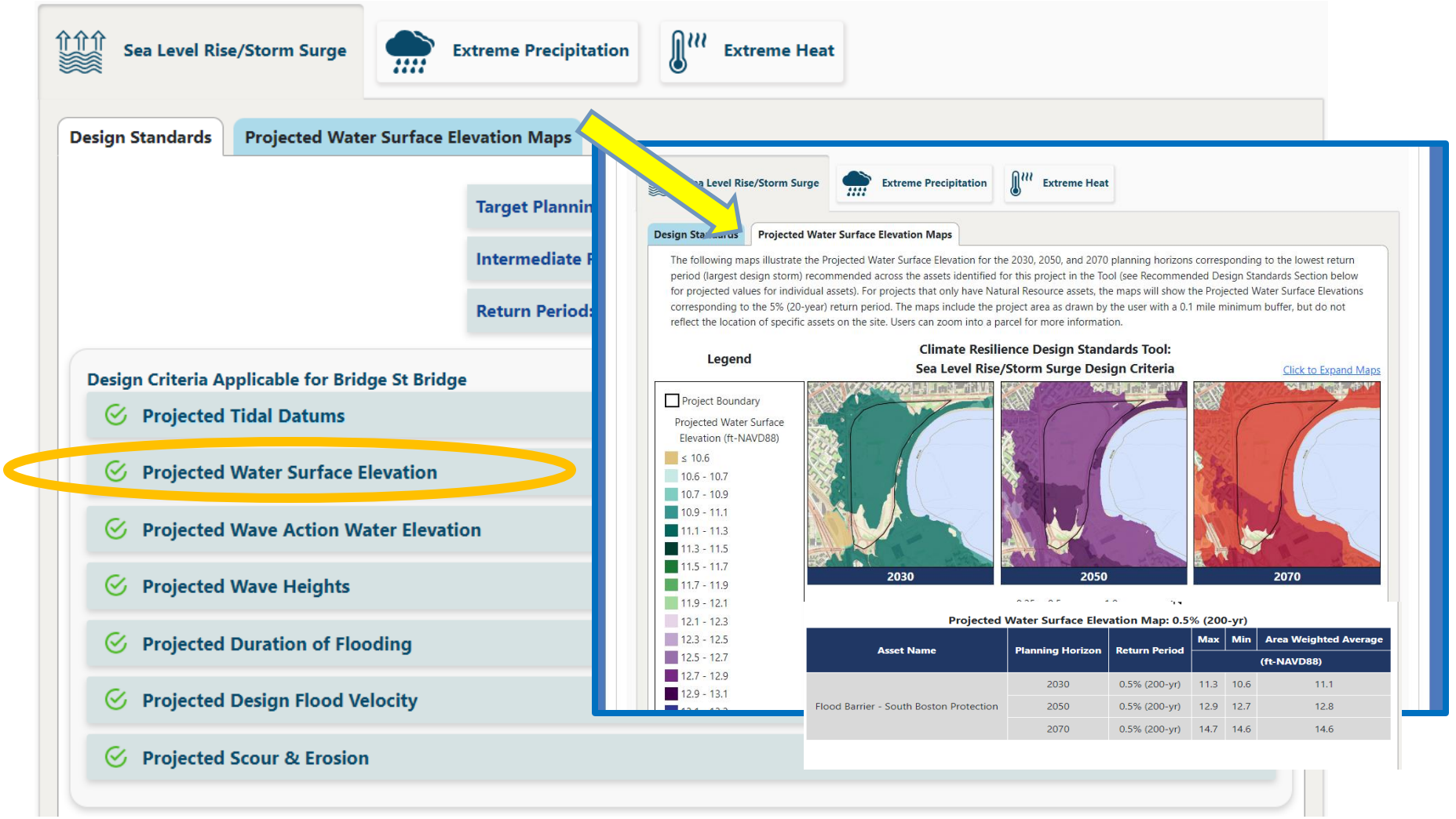
*Explore **additional design storm precipitation values** on external dashboard*

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




*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)***

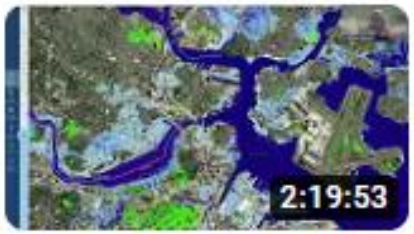
# Coastal Flooding: Massachusetts Coast Flood Risk Model (MC-FRM)

## Key available resources:

*Training Videos*

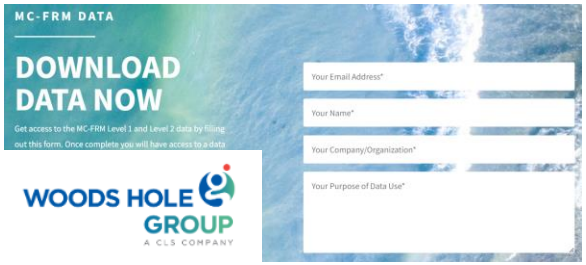
1


2

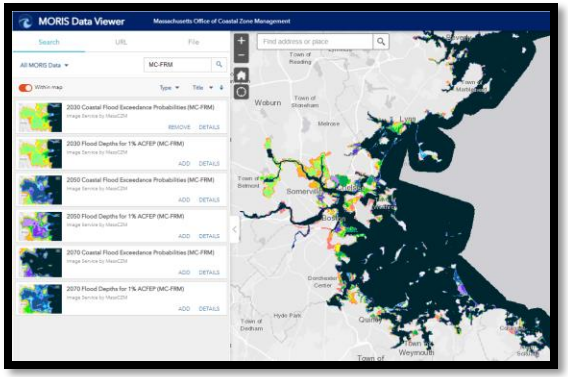



3

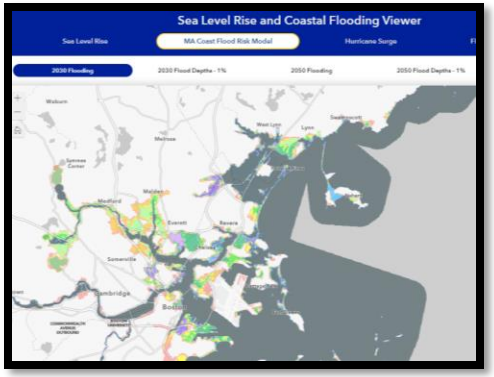

*Data Download Page*



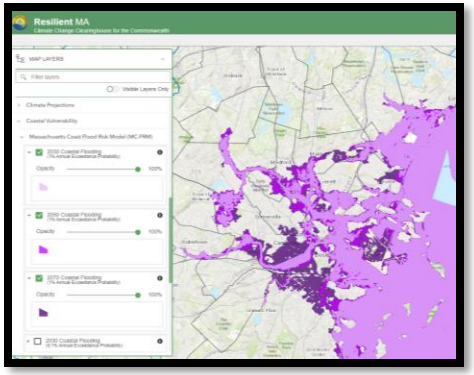

*State Data Viewers*




*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)


*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*

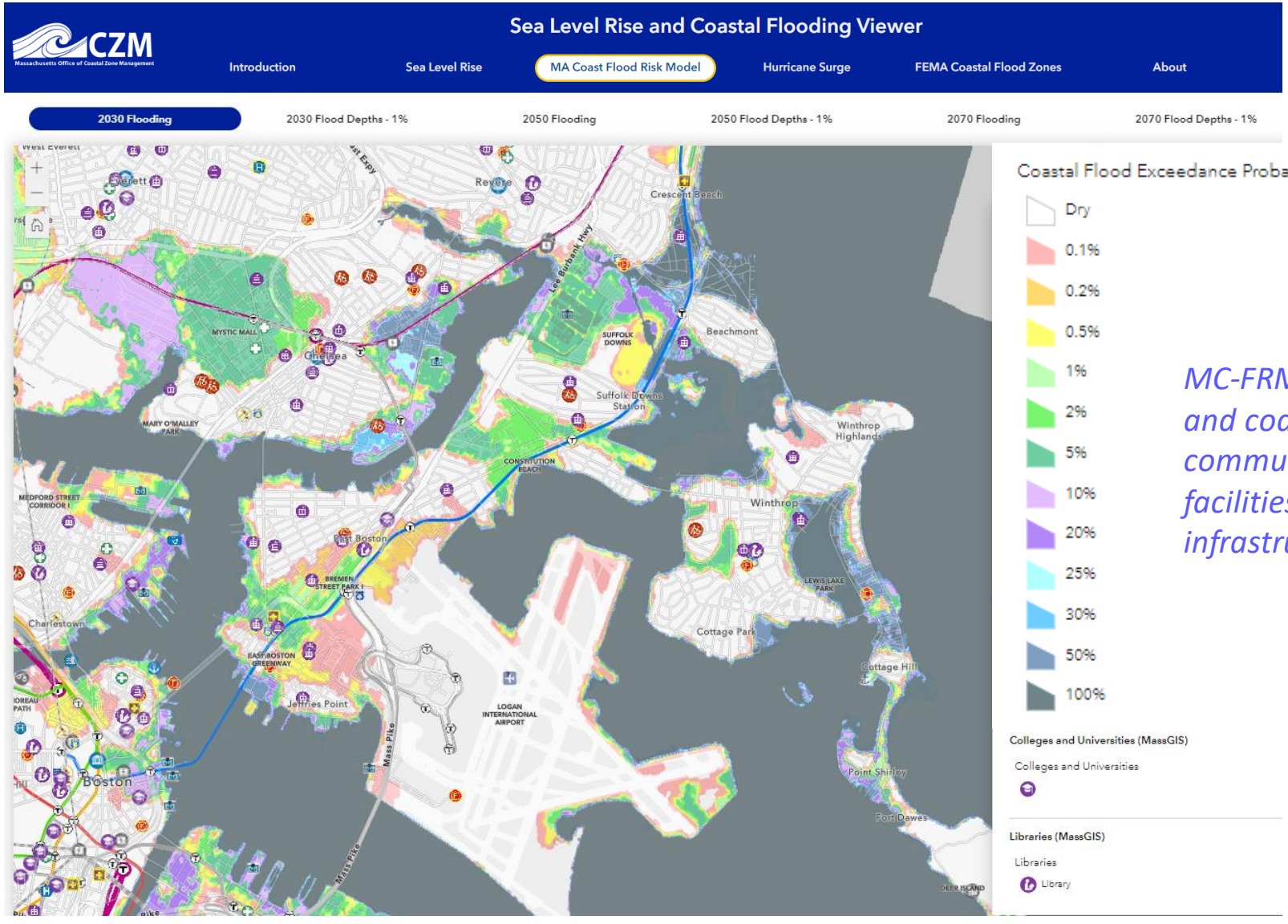
**Hurricane Surge**

*Current worst-case hurricane surge*

**FEMA Coastal Flood Zones**

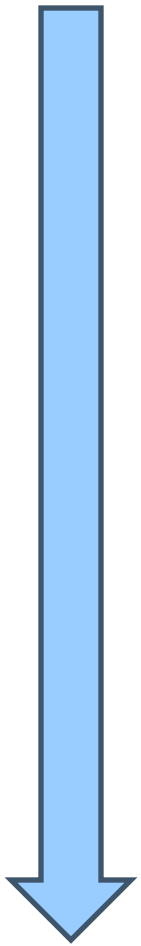
*Areas within the Federal Emergency Management Agency (FEMA) coastal flood zones*

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




*MC-FRM layers and coastal community facilities and infrastructure*

# Climate Resilience Design Standards Tool – Version history



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)

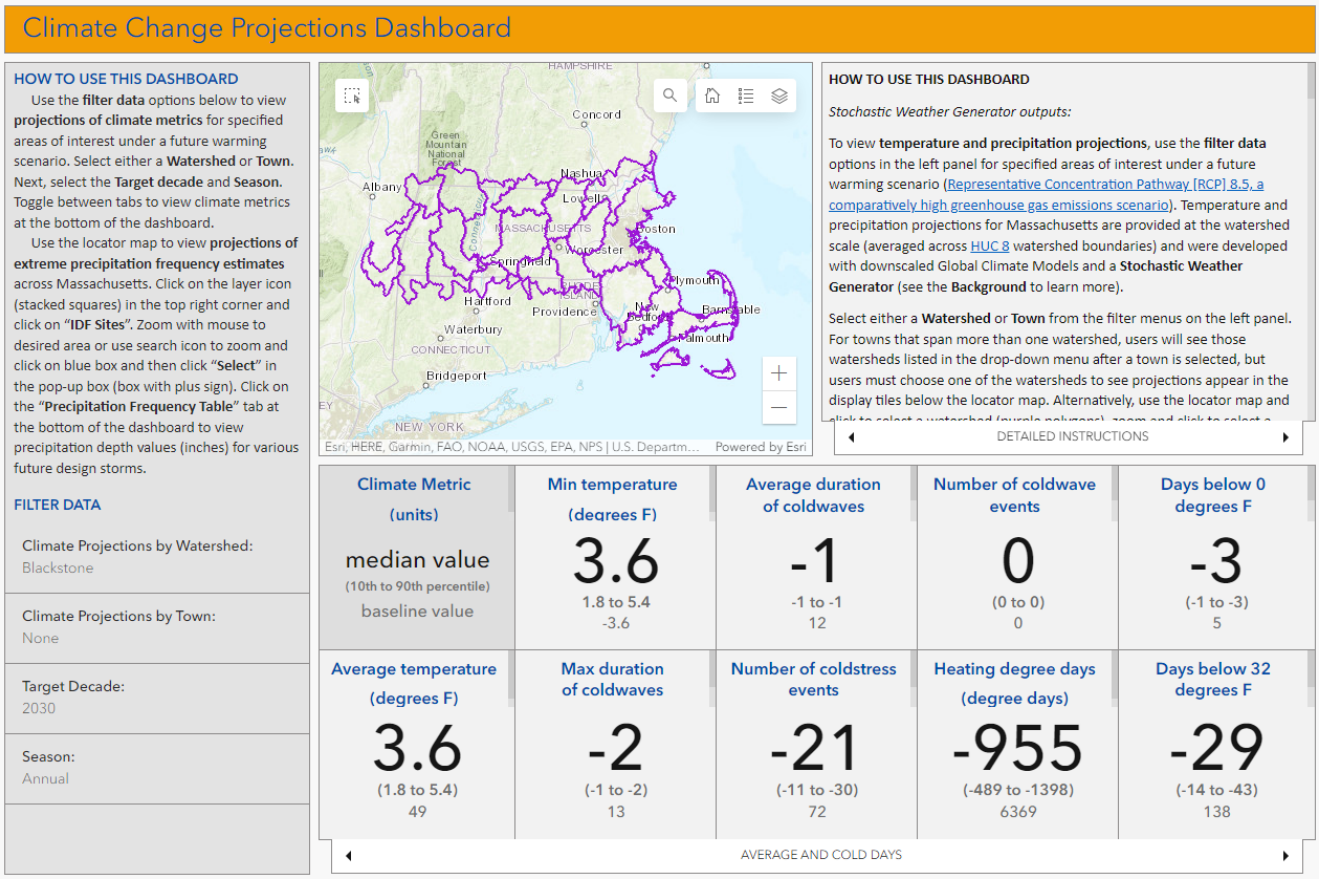
**Version 1.2 (July 2022)**

- **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

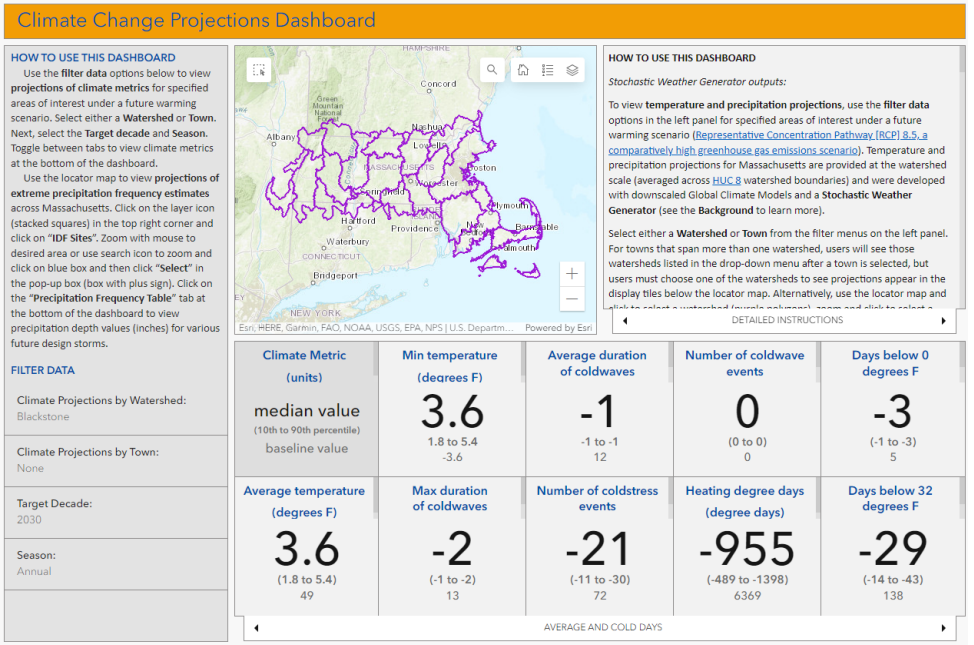



- **One-stop shop for temperature and precipitation projections**
- **Hot & cold days**
- **Changes in average precipitation and temperature**
- **Days with high precipitation**
- **Climate-informed design precipitation**

# Climate Change Projections Dashboard

## When to use the dashboard?

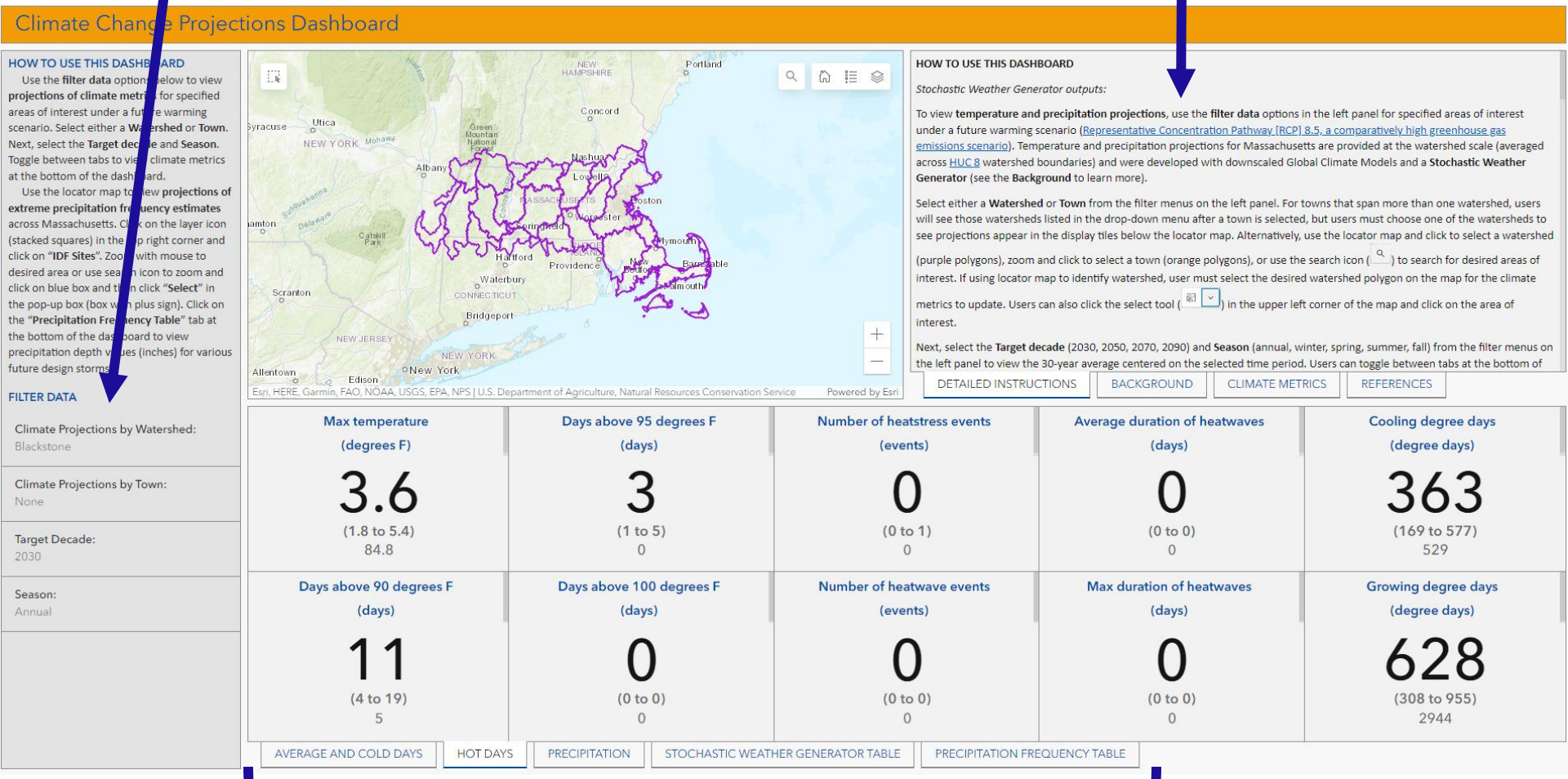
- **Exploring future climate hazards for adaptation planning**
- **Designing stormwater infrastructure to last**
- **Screening for ecosystem/habitat risks**
- **And more!**



# Climate Change Projections Dashboard

**Get projections by location**

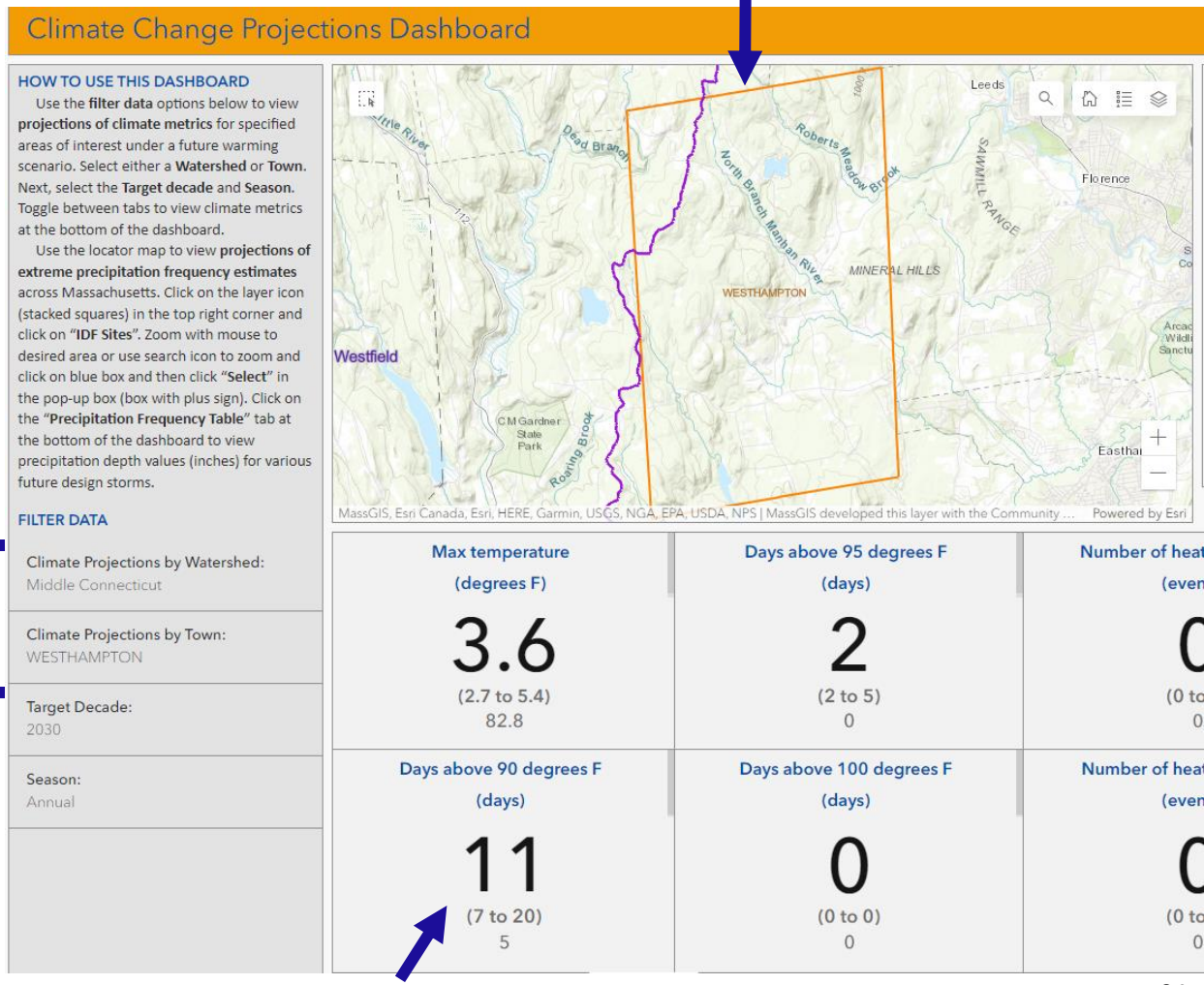
**Read about how metrics were made**




**See projected metrics of interest**

# Climate Change Projections Dashboard

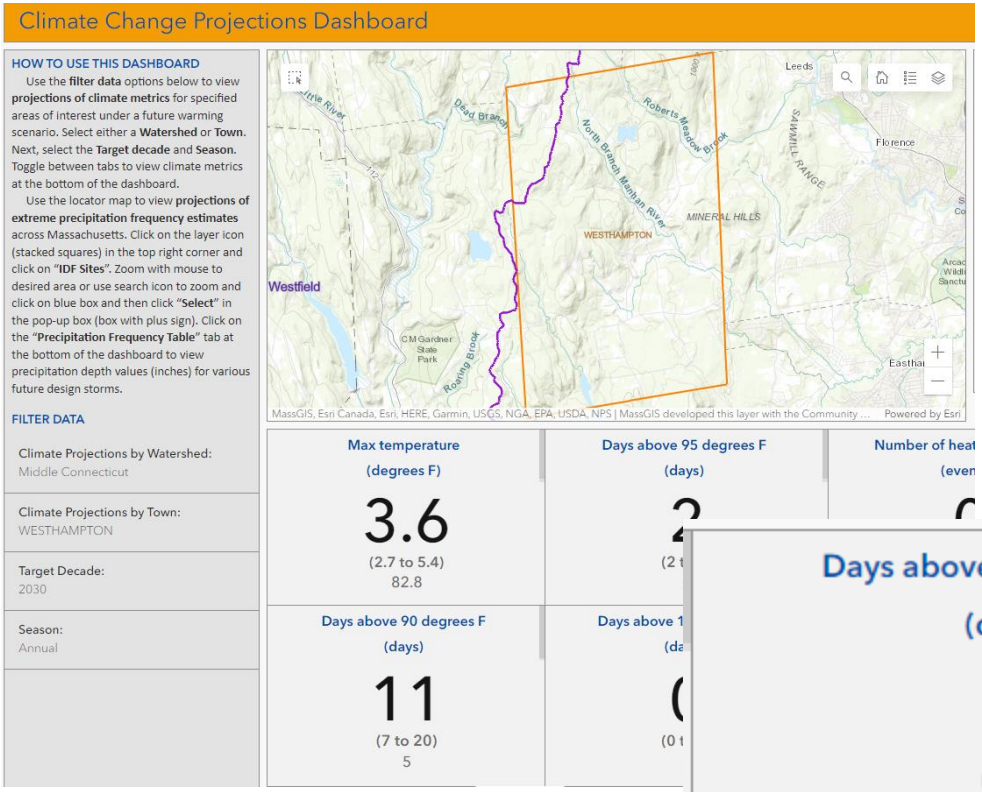
Map zooms to selected area




Select either watershed OR town

Values update in panel

# Climate Change Projections Dashboard



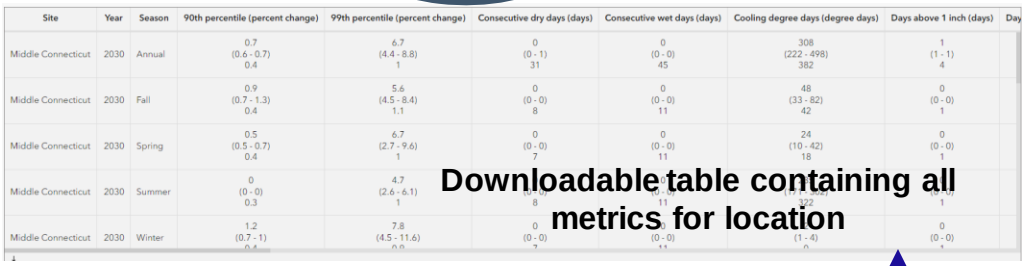

**Median projection: Two more days over 95F than we've typically seen in the past (so... two)**

**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) | Day |
|---|---|---|---|---|---|---|---|---|---|
| Middle Connecticut | 2030 | Annual | 0.7<br>(0.6 - 0.7)<br>0.4 | 6.7<br>(4.4 - 8.8)<br>1 | 0<br>(0 - 1)<br>31 | 0<br>(0 - 0)<br>45 | 308<br>(222 - 498)<br>382 | 1<br>(1 - 1)<br>4 | |
| Middle Connecticut | 2030 | Fall | 0.9<br>(0.7 - 1.3)<br>0.4 | 5.6<br>(4.5 - 8.4)<br>1.1 | 0<br>(0 - 0)<br>8 | 0<br>(0 - 0)<br>11 | 48<br>(33 - 82)<br>42 | 0<br>(0 - 0)<br>1 | |
| Middle Connecticut | 2030 | Spring | 0.5<br>(0.5 - 0.7)<br>0.4 | 6.7<br>(2.7 - 9.6)<br>1 | 0<br>(0 - 0)<br>7 | 0<br>(0 - 0)<br>11 | 24<br>(10 - 42)<br>18 | 0<br>(0 - 0)<br>1 | |
| Middle Connecticut | 2030 | Summer | 0<br>(0 - 0)<br>0.3 | 4.7<br>(2.6 - 6.1)<br>1 | 0<br>(0 - 0)<br>8 | 0<br>(0 - 0)<br>11 | 122<br>(77 - 177)<br>122 | 0<br>(0 - 0)<br>1 | |
| Middle Connecticut | 2030 | Winter | 1.2<br>(0.7 - 1)<br>0.4 | 7.8<br>(4.5 - 11.6)<br>0.0 | 0<br>(0 - 0)<br>7 | 0<br>(0 - 0)<br>11 | 0<br>(0 - 4)<br>0 | 0<br>(0 - 0)<br>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 | HOT DAYS | PRECIPITATION | STOCHASTIC WEATHER GENERATOR TABLE | PRECIPITATION FREQUENCY TABLE

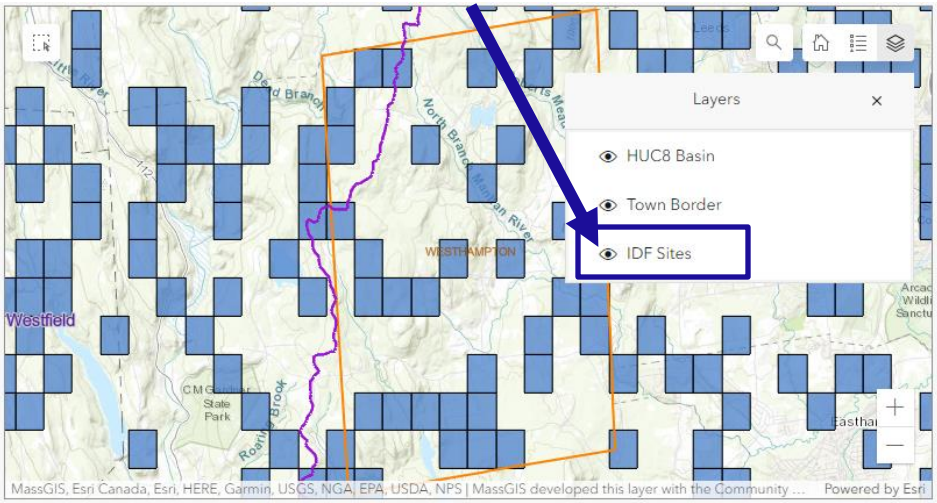
- Lowest one-day temperature
- Average temperature
- Number of cold stress events
- Number of cold waves
- Maximum cold wave duration
- Number of days below 0F
- Number of days below 32F
- Heating degree days

- 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

- 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)

# 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

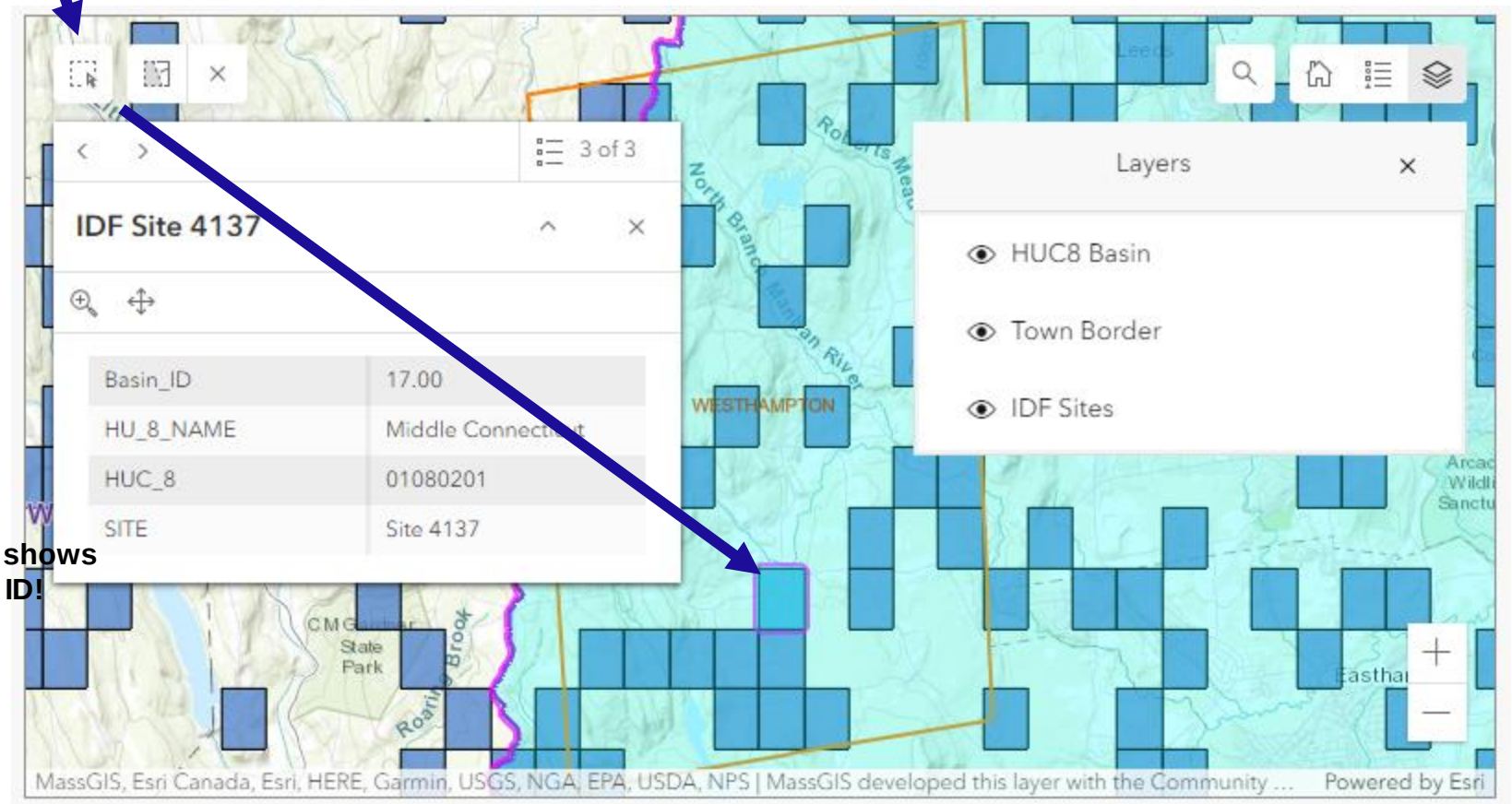
| Site | Year | Duration | RI_1yr_50th | RI_2yr_50th | RI_5yr_50th | RI_10yr_50th | RI_25yr_50th | RI_50yr_50th | RI_100yr_50th | RI_200yr_50th | RI_500yr_50th | RI_1000yr_50th |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site 1 | 2030 | 05m | 0.4 (0.3 - 0.4) | 0.4 (0.4 - 0.5) | 0.5 (0.5 - 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) |
| | | | 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

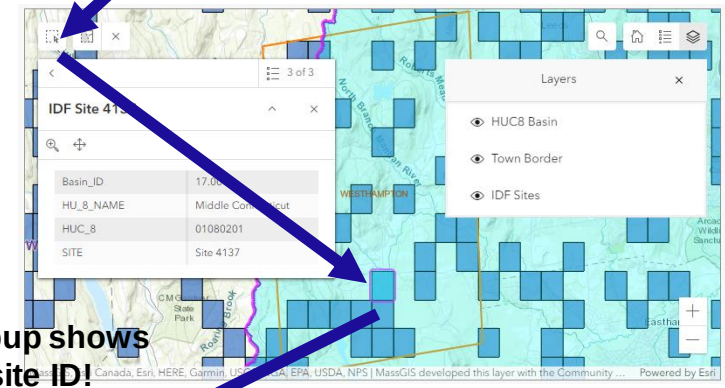
**Use selection tool to highlight one of the sites close to your point of interest**




**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) |
| | | | 2 | 2.4 | 3.1 | 3.7 | 4.5 | 5.1 | 5.7 | 6.5 | 7.7 | 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 - 2.9) | (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**

6.6
(5.9 - 7)

**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

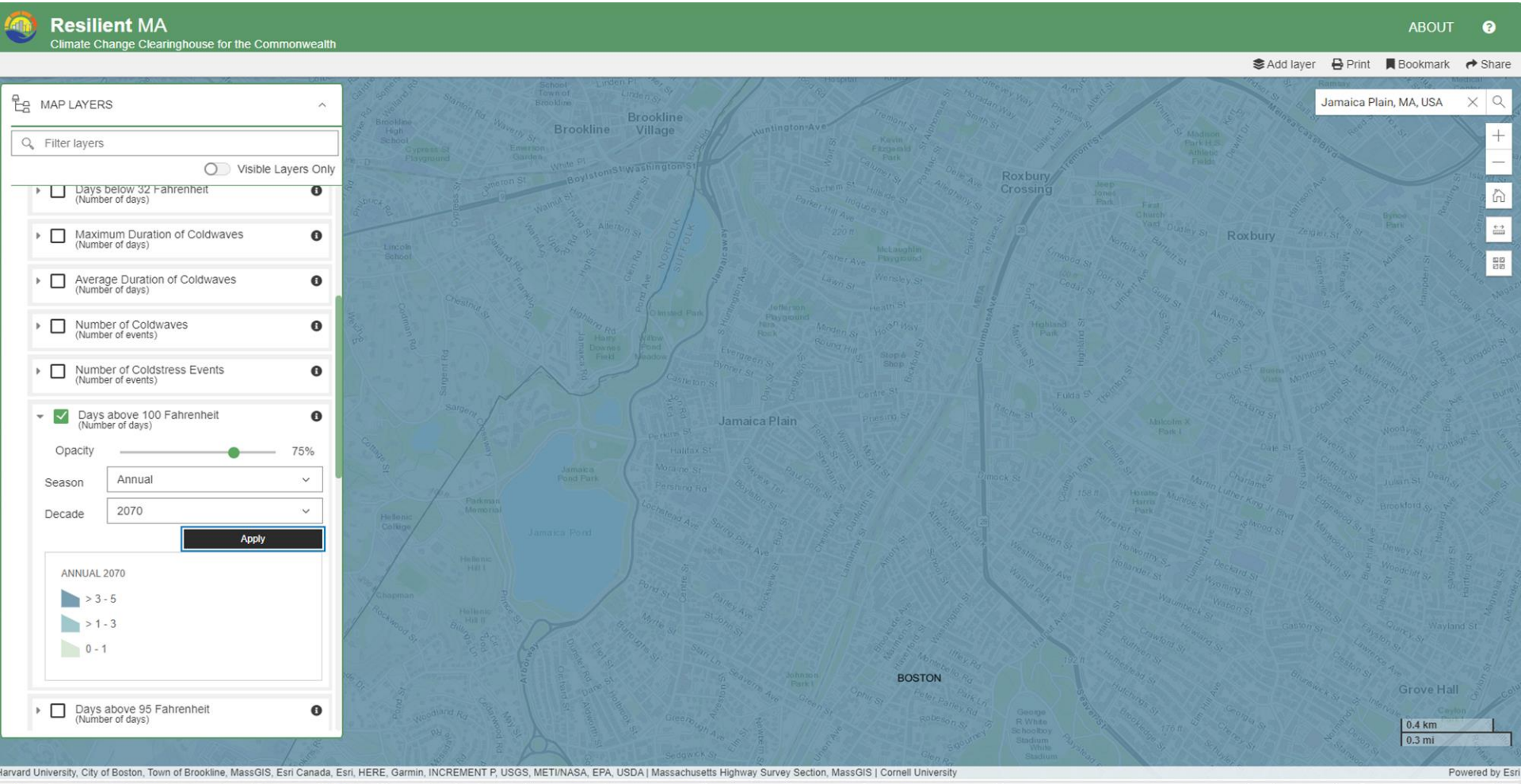
View data and create maps of climate projections

Technical/specific scenarios at multiple time intervals

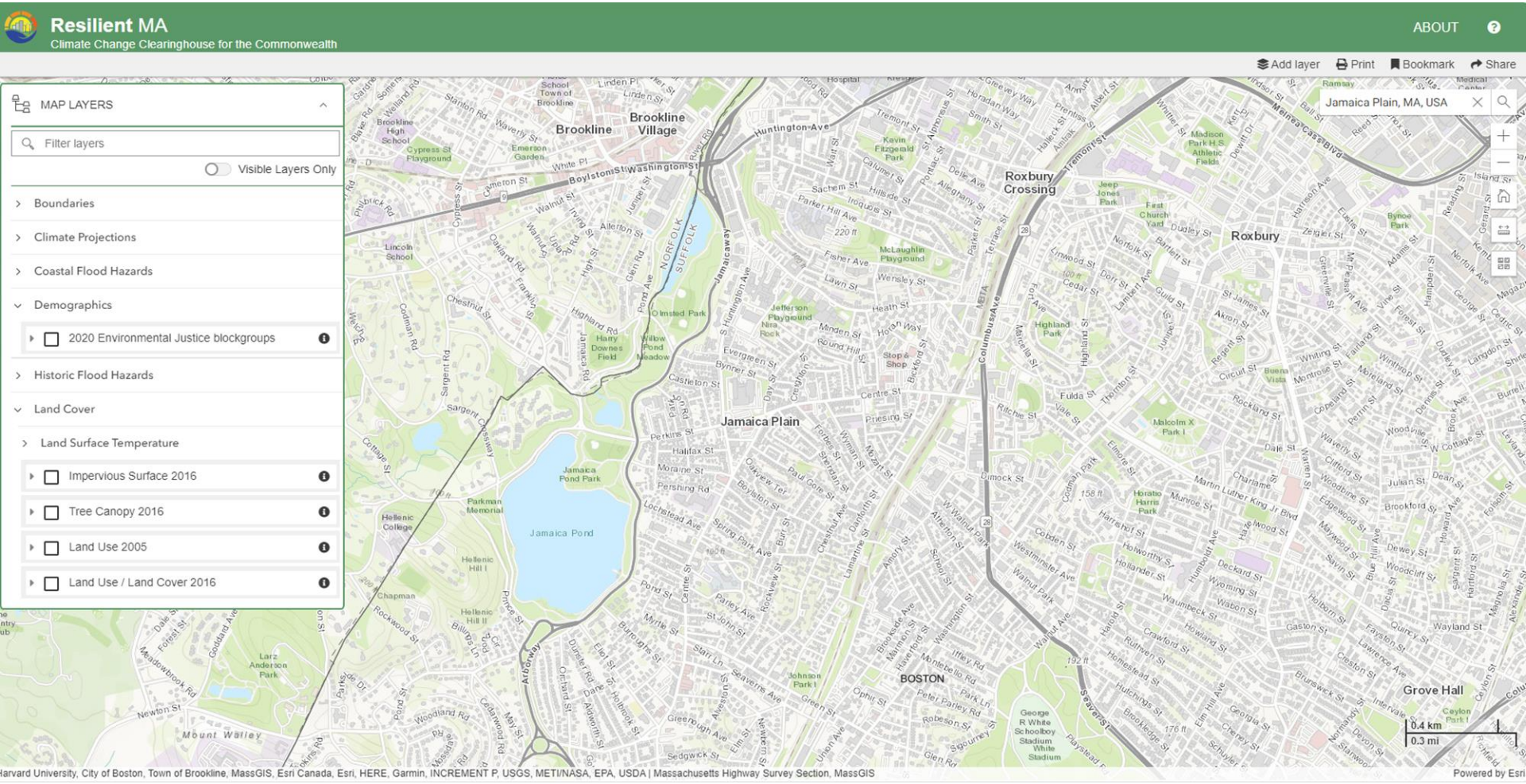
- Precipitation, Temperature, and Sea Level Rise scenarios
- 2030, 2050, 2070, and 2090 projections
- Limited demographic & land use data

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

**Guides for Equitable and Actionable Resilience**

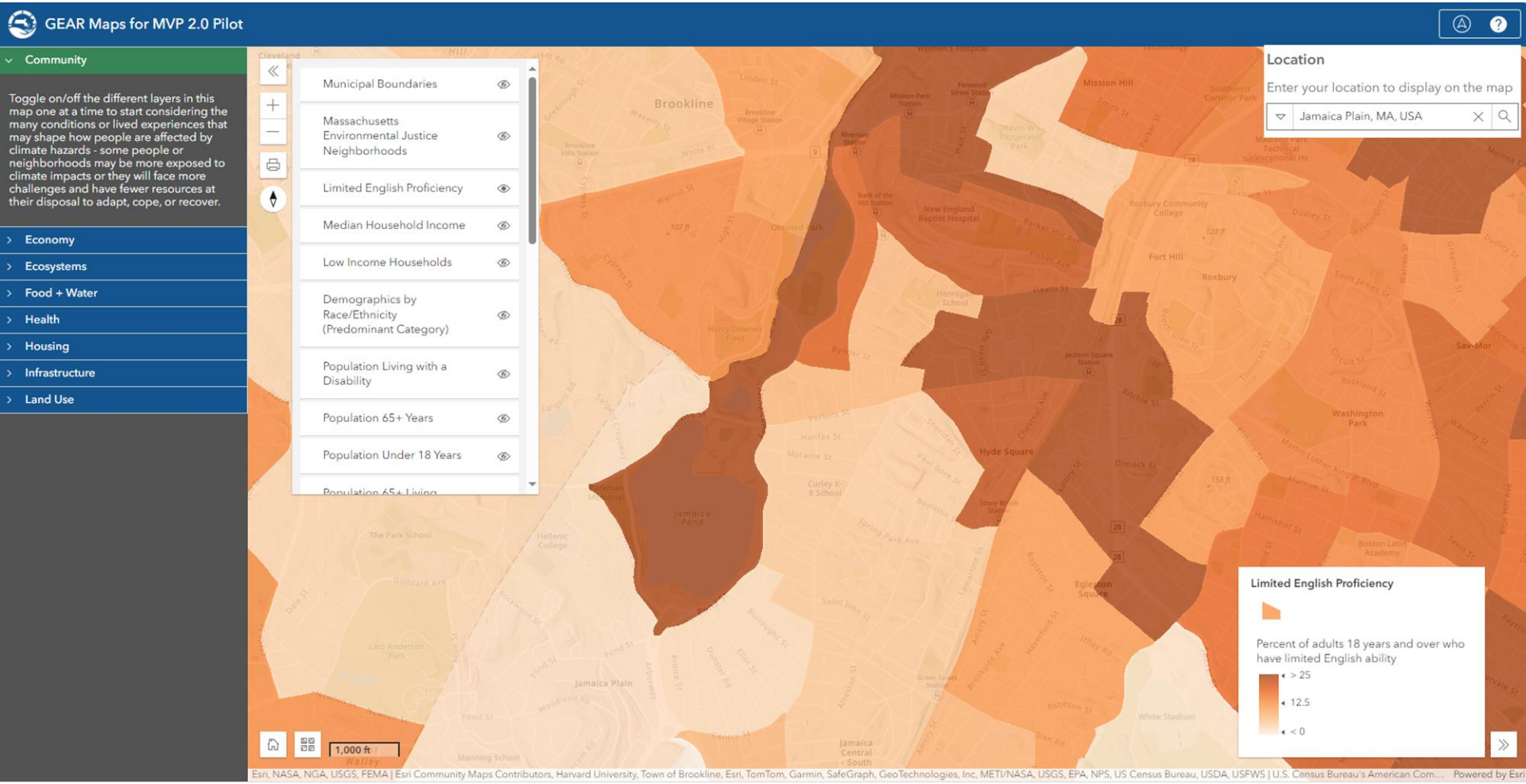
Created for the MVP 2.0 planning process

Allows users to evaluate the intersections of

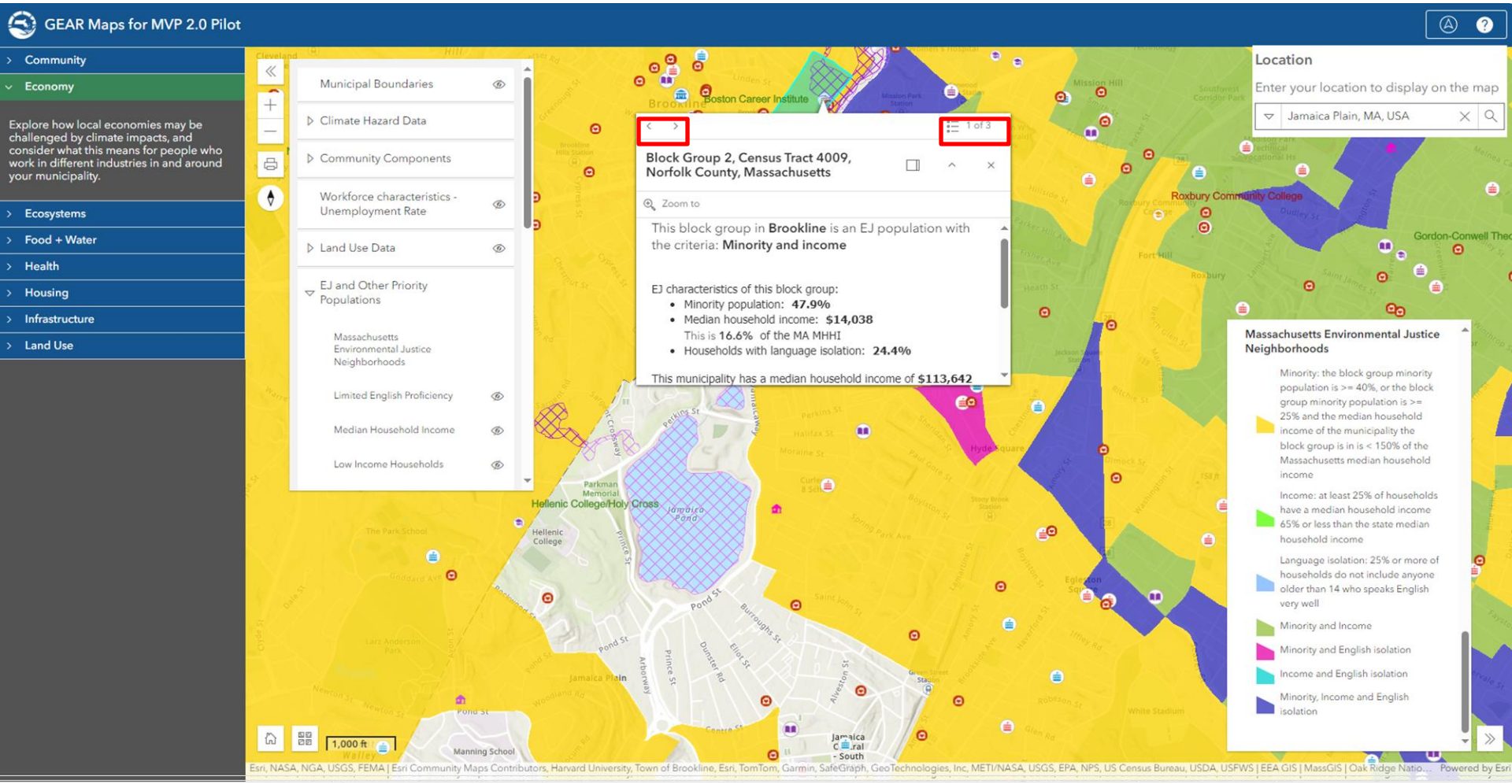
- Social Components
- Climate Hazard Components
- Industry/Sector Components

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

# MVP GEAR Tool



# MVP GEAR Tool



# MVP GEAR Tool

**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

- **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!

- 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**