



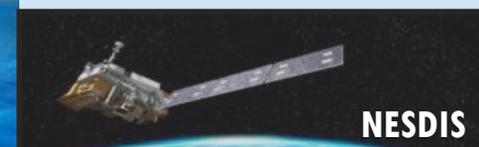
# NOAA Climate Science and Services: Climate Trends in the Northeast

National Centers for  
Environmental Information (NCEI)

December 4, 2023

**Ellen Mecray**, NOAA Regional Climate Services Director-  
Eastern Region

To understand and predict changes in climate, weather, oceans, and coasts; to share that knowledge and information with others; and to conserve and manage coastal and marine ecosystems and resources.



# NOAA's Authoritative Products and Services

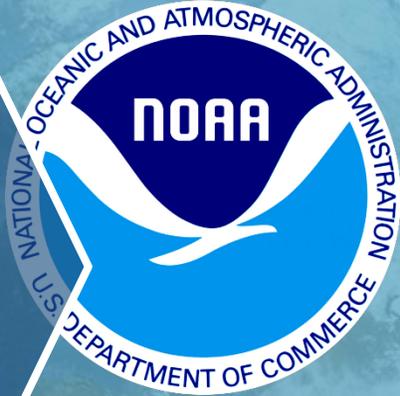


NOAA's Mission: To understand and predict changes in climate, weather, oceans, and coasts; to share that knowledge and information with others; and to conserve and manage coastal and marine ecosystems and resources.



# Making Data Useful

## Earth Observing Systems



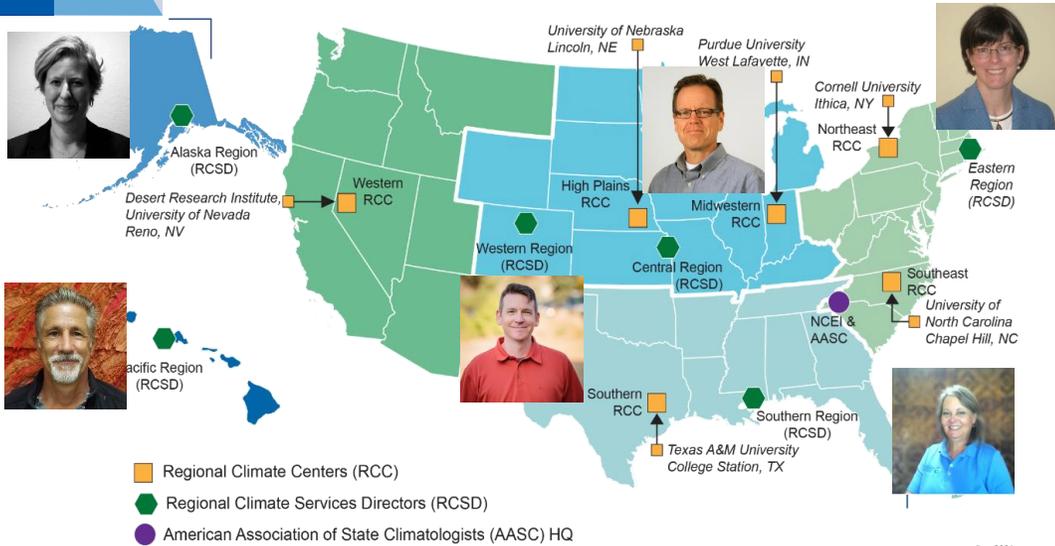
National Centers  
for  
Environmental  
Information  
*Scientific Data  
Stewardship*

## Research-quality products for decision-making

Snowfall Impact Index <i>FEMA</i>	Tsunami Warning <i>Emergency Managers</i>	Heating & Cooling Degree Days <i>Energy Sector</i>
Hurricane Tracks <i>Emergency Planners</i>	Coastal Digital Elevation Models <i>Hazard Mitigation</i>	Solar Activity/Sun Spots <i>Power Distribution</i>
Annual State of the Climate Reports <i>Decision Makers</i>	Global & U.S. Climate Summaries <i>Numerous Sectors</i>	Temperature & Precipitation Outlooks <i>Agriculture</i>
IPCC & National Climate Assessments <i>Gov't Policymakers</i>	Billion \$ Disasters, Climate Extremes Index <i>Insurance</i>	Climate Normals <i>Construction, Infrastructure, Agriculture</i>



# NCEI National Climate Services Partnership

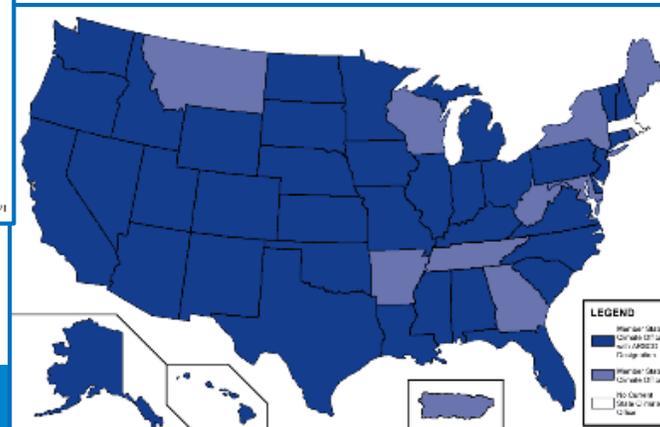
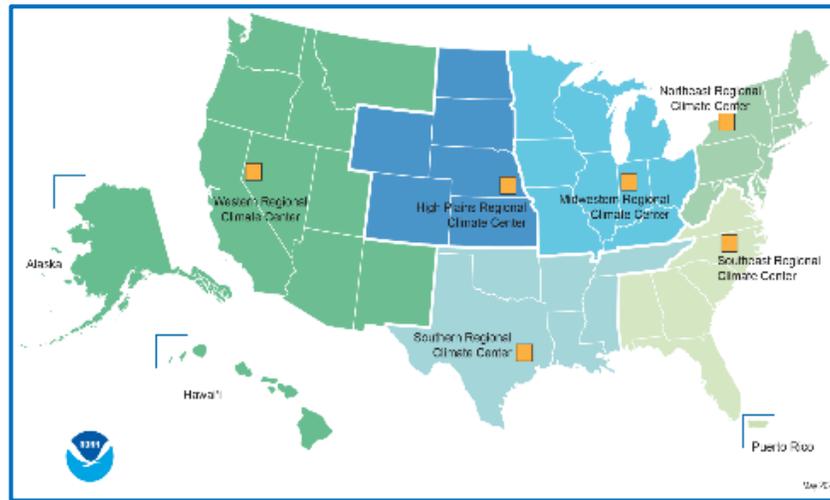


## National Scope

- 6 Regional Climate Service Directors
- *Voice of NOAA Climate* in each region
- NOAA and cross-Agency engagement and coordination

## Implemented Regionally

- 6 Regional Climate Centers (RCC)
- Regional themes
- Regional partners in NOAA and with other Federal and tribal partners
- Inter-state coordination



and at the  
**State level**  
 - State climatologists

<https://www.ncei.noaa.gov/regional>



# Climate Impacts and Land Management

  
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- Resilience Toolkit
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Home > News & Features > Features

## The New Climate Normals: Gardeners Expect Warmer Nights

BY JENNIFER FREEMAN  
PUBLISHED JUNE 25, 2011

### HIGHLIGHTS

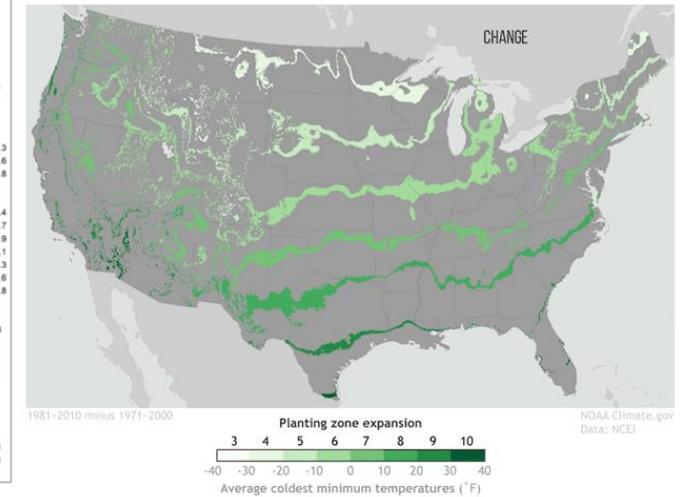
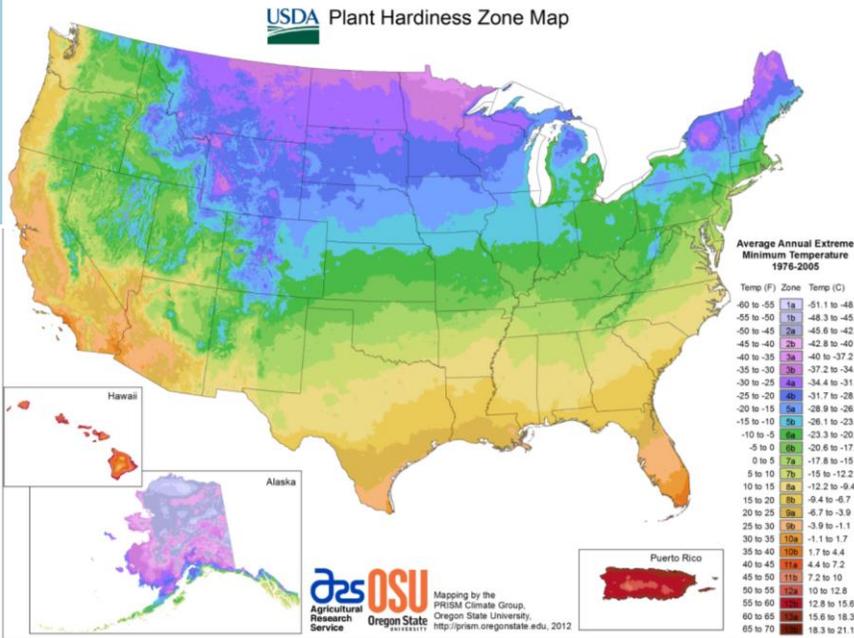
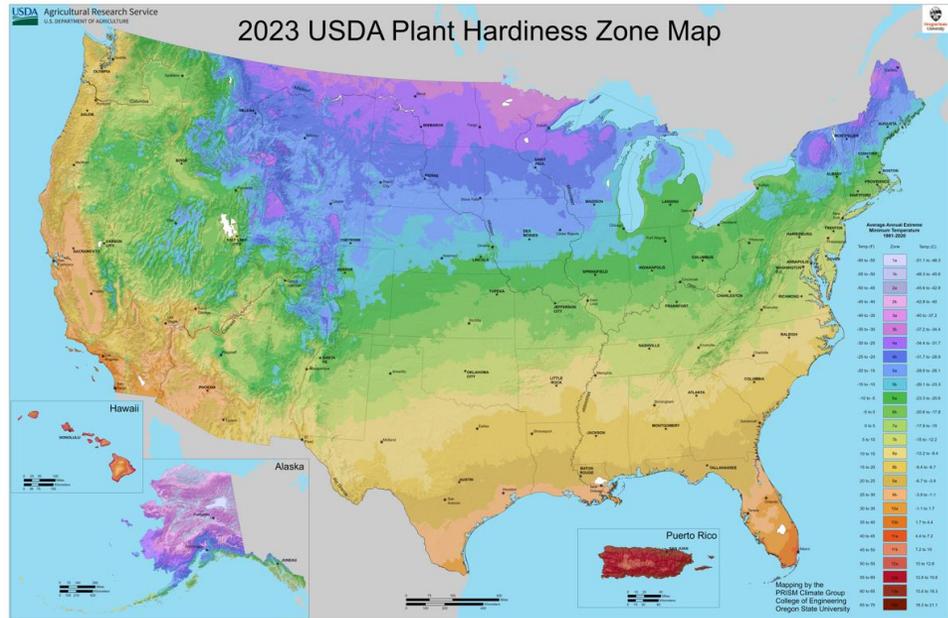
- U.S. Climate Normals are 30-year averages of many pieces of weather information collected from thousands of weather stations nationwide.
- Climate Normals are part of a reliable, long-term data record that can be used for studying natural climate patterns and climate change, and also helping people understand what conditions they can expect wherever they may live.



Spring blooms at Longwood Gardens. Photo by Andrea Poe, [Washington Times Communities](#).



# Climate Impacts and Land Management

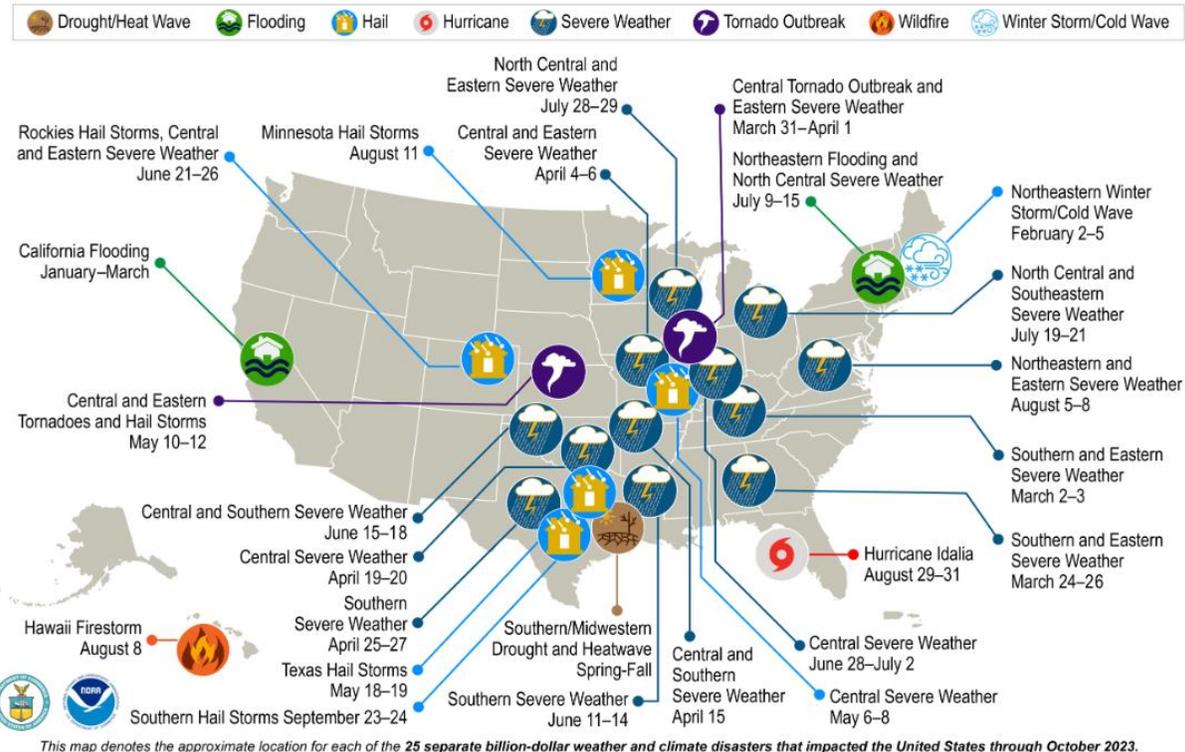


Changes in U.S. climate-related planting zones between the 1971-2000 Normals and the 1981-2010 Normals. Many places' coldest temperatures of the year grew warmer between the two periods, leading to a shift in plant hardiness zones. NOAA Climate.gov, based on data from NCEI. Explore an interactive map.



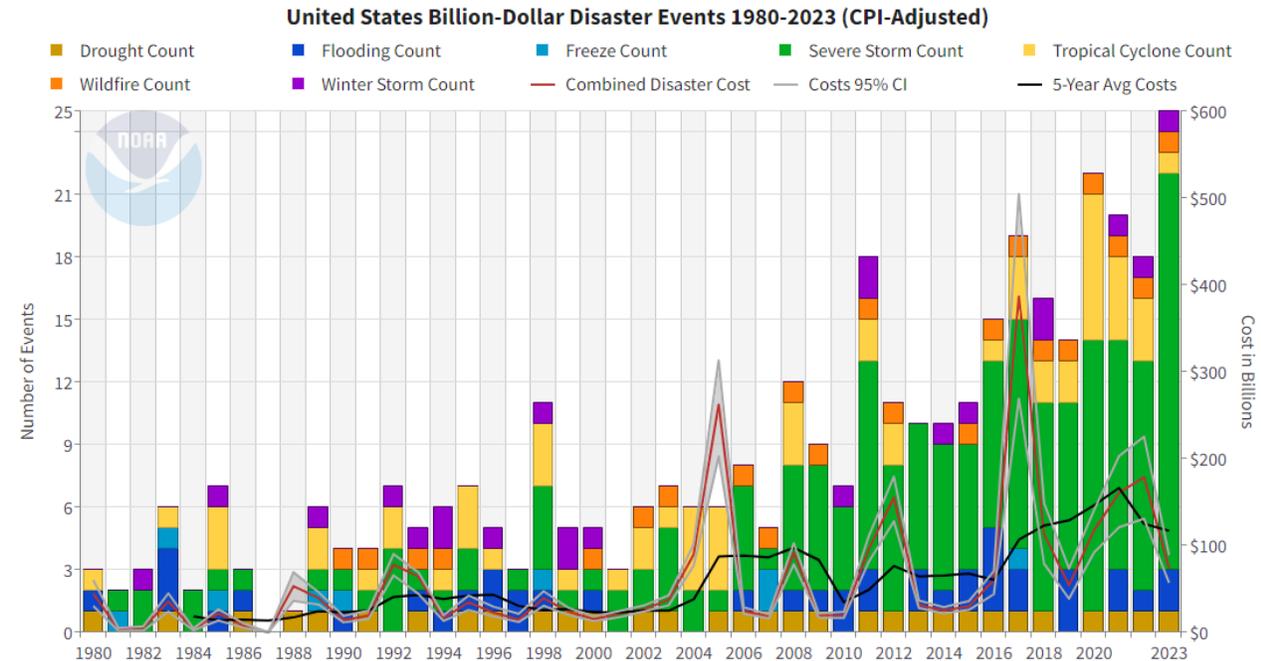
# Disaster Trends and Why Our Work Matters

U.S. 2023 Billion-Dollar Weather and Climate Disasters



- Western wildfires, severe storms, inland flooding and hurricane costs all on the rise
- 5-year annual cost average = \$124.1 billion; disaster costs over the last 6.5 years (2017-2023) = \$1.061 trillion**

U.S. Billion-dollar event frequency (1980–2023), annual cost, 5-year cost average



Updated: November 8, 2023

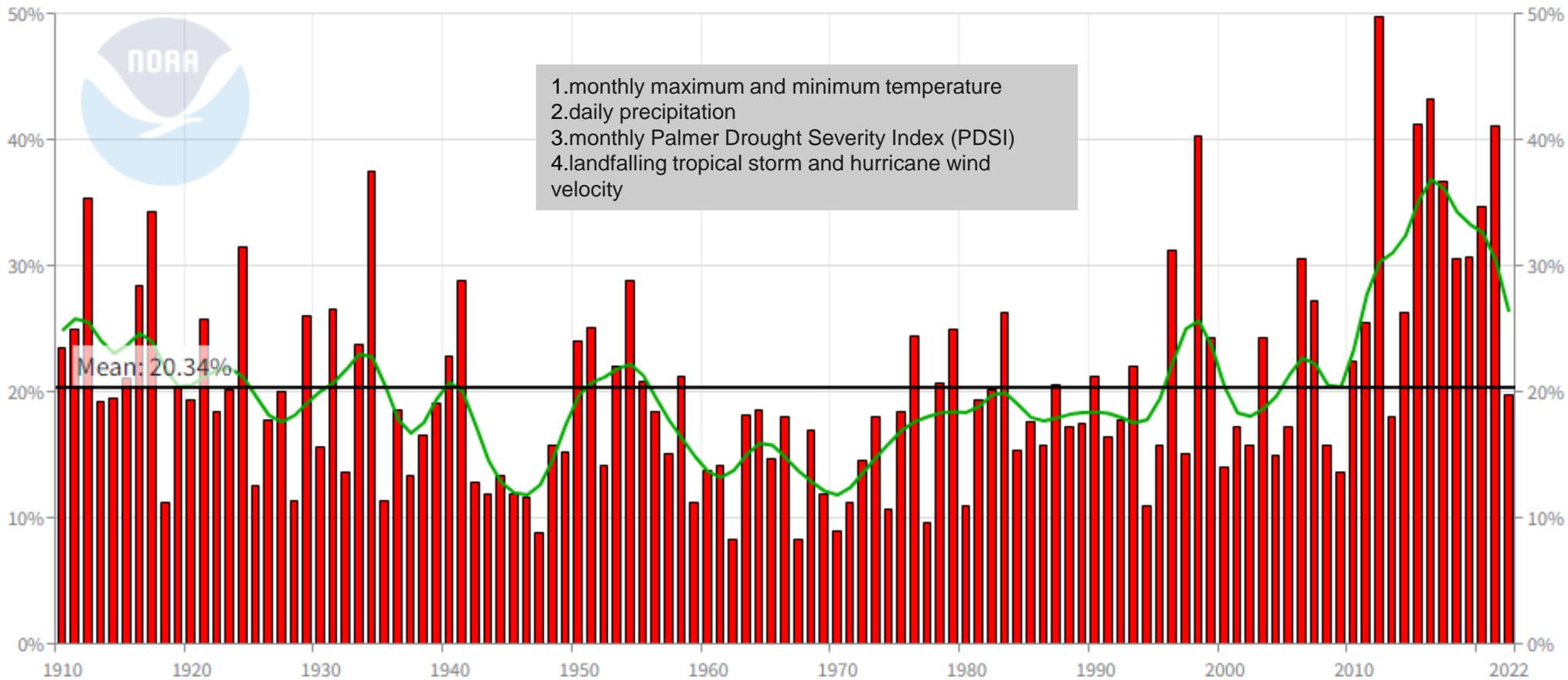
Powered by ZingChart



# Climate Extremes on the Rise in the U.S.

## Contiguous U.S. Without Tropical Cyclone Indicator

Annual (January-December)

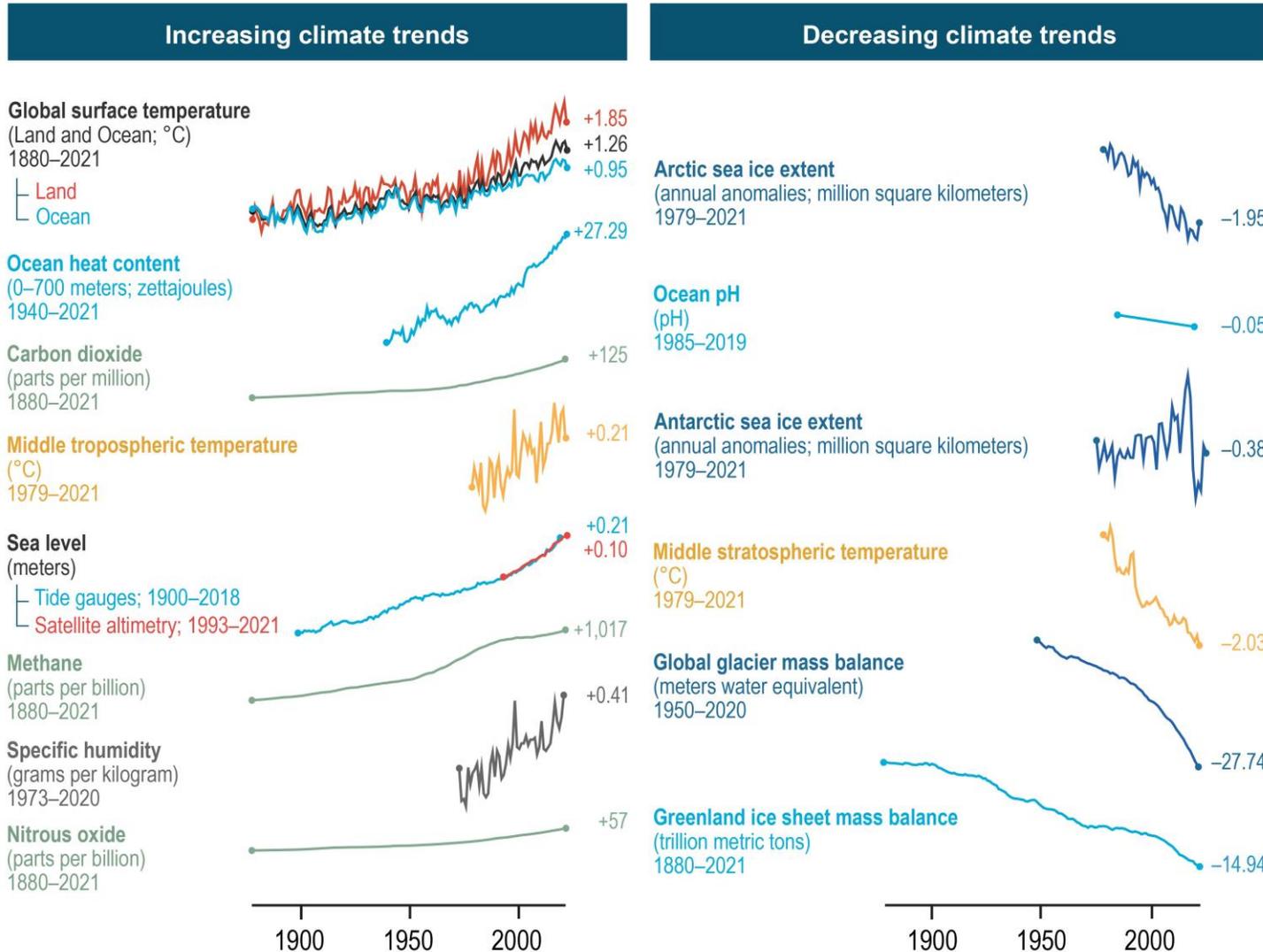


<https://www.ncei.noaa.gov/access/monitoring/cei/graph>



# Tracking Climate with Indicators

## Evidence for Climate Change Across Multiple Variables



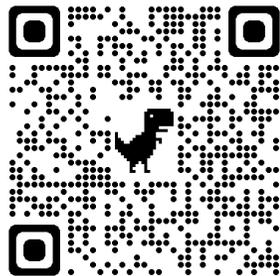
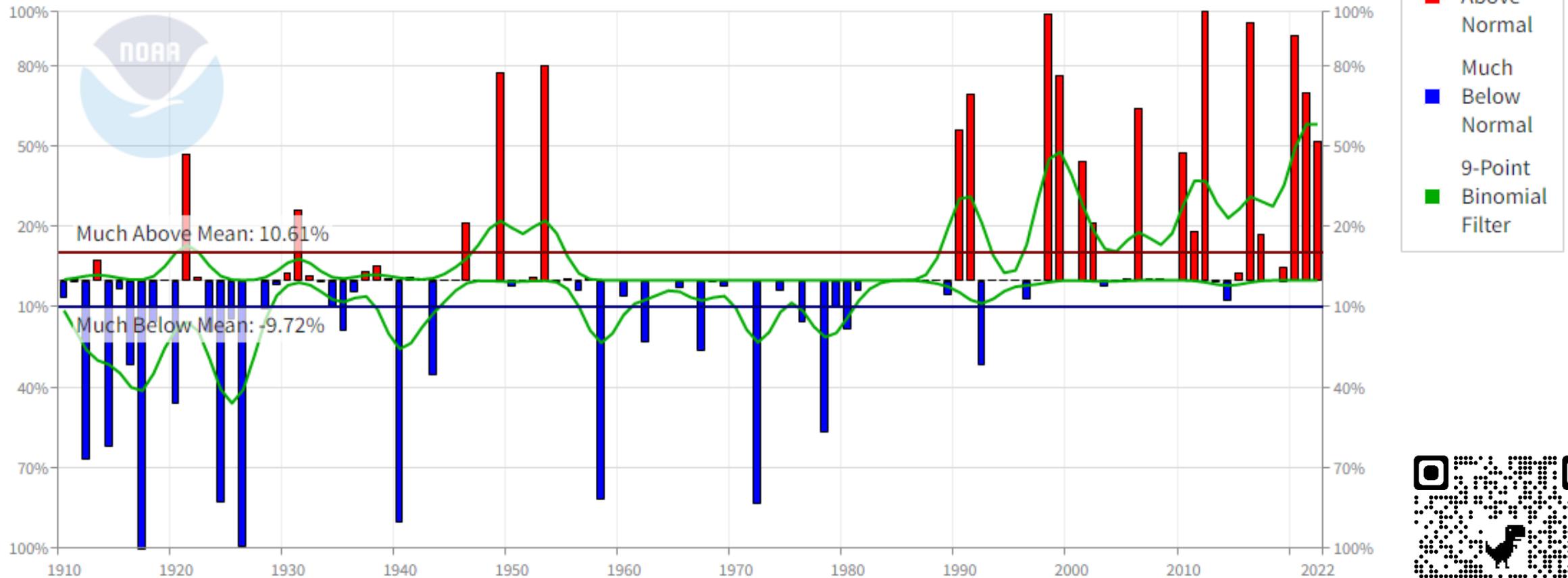
NCA5, 2023.  
Chapter 2: Climate  
Trends, Figure 3.



# Temperature Extremes (compared to normals)

## Northeast Extremes in Maximum Temperature (Step 1)

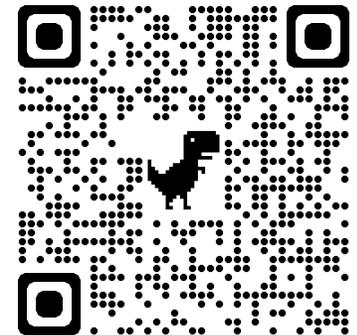
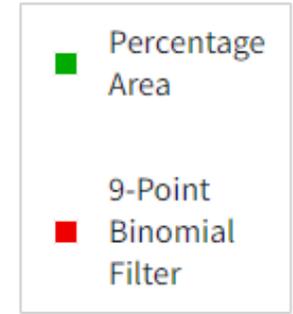
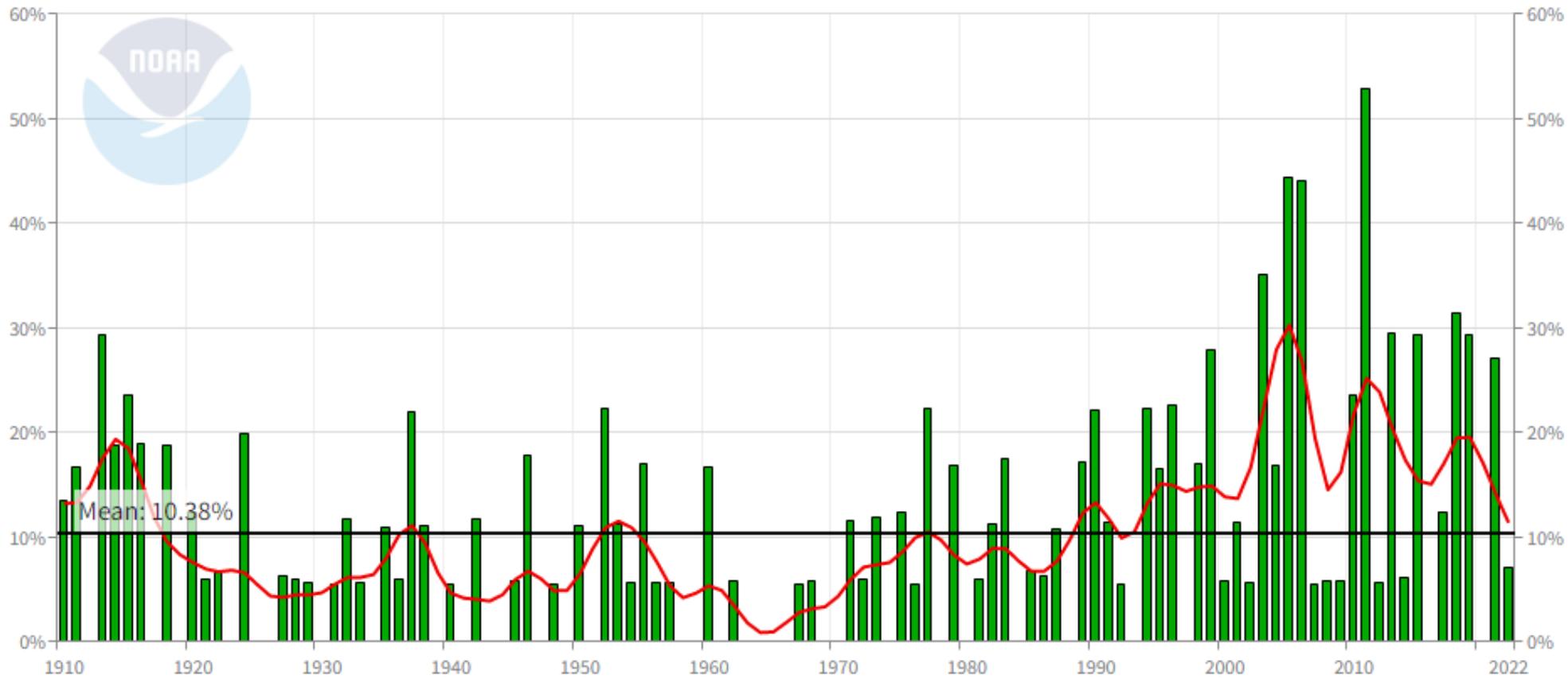
Annual (January-December)



# Precipitation Extremes (area of NE)

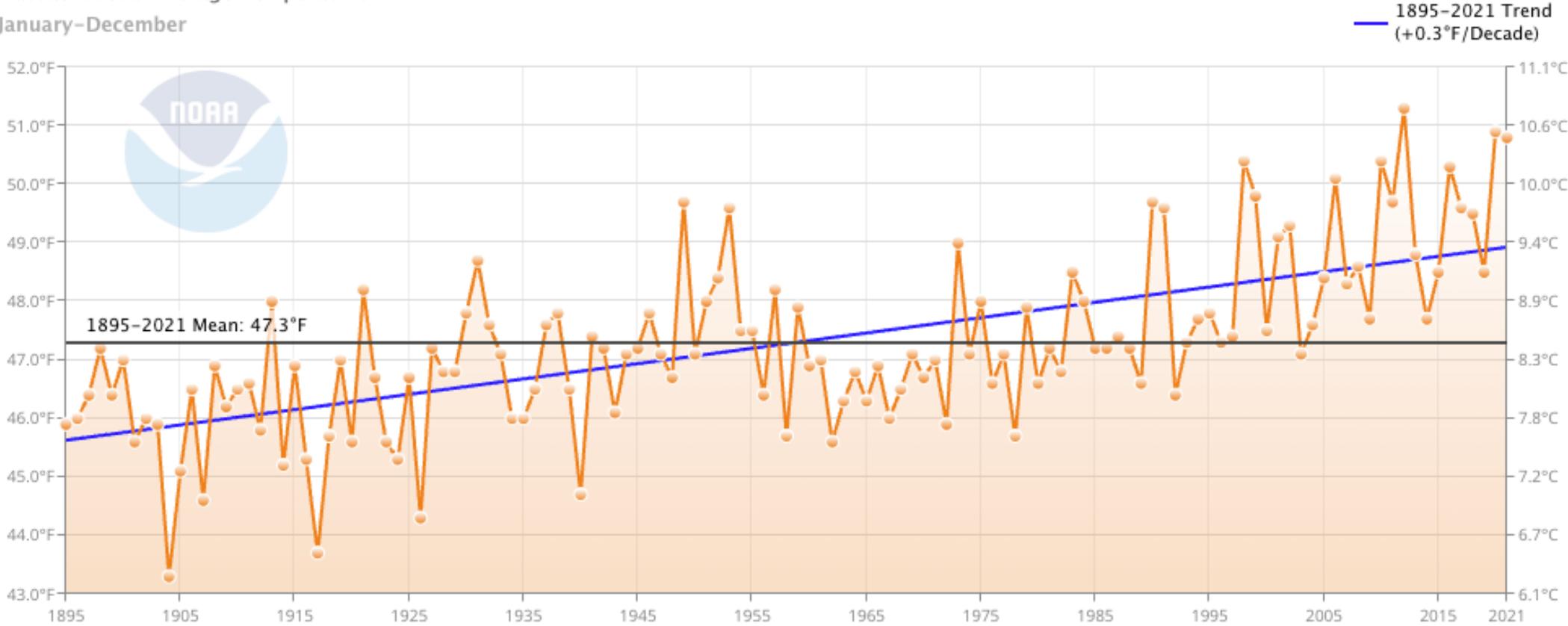
## Northeast Extremes in 1-Day Precipitation (Step 4)

Annual (January-December)



# Temperature Trends *Massachusetts*

Massachusetts Average Temperature  
January–December



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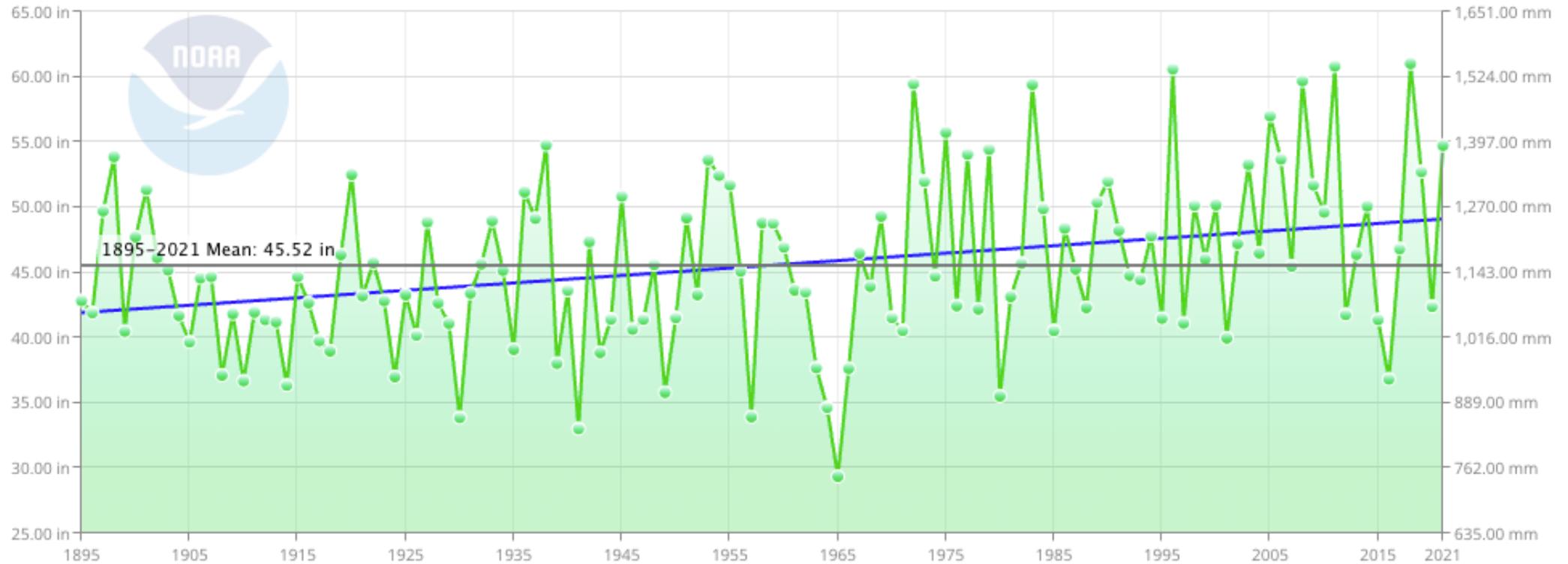


<https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/>

# Precipitation Trends

## Massachusetts

Massachusetts Precipitation  
January–December

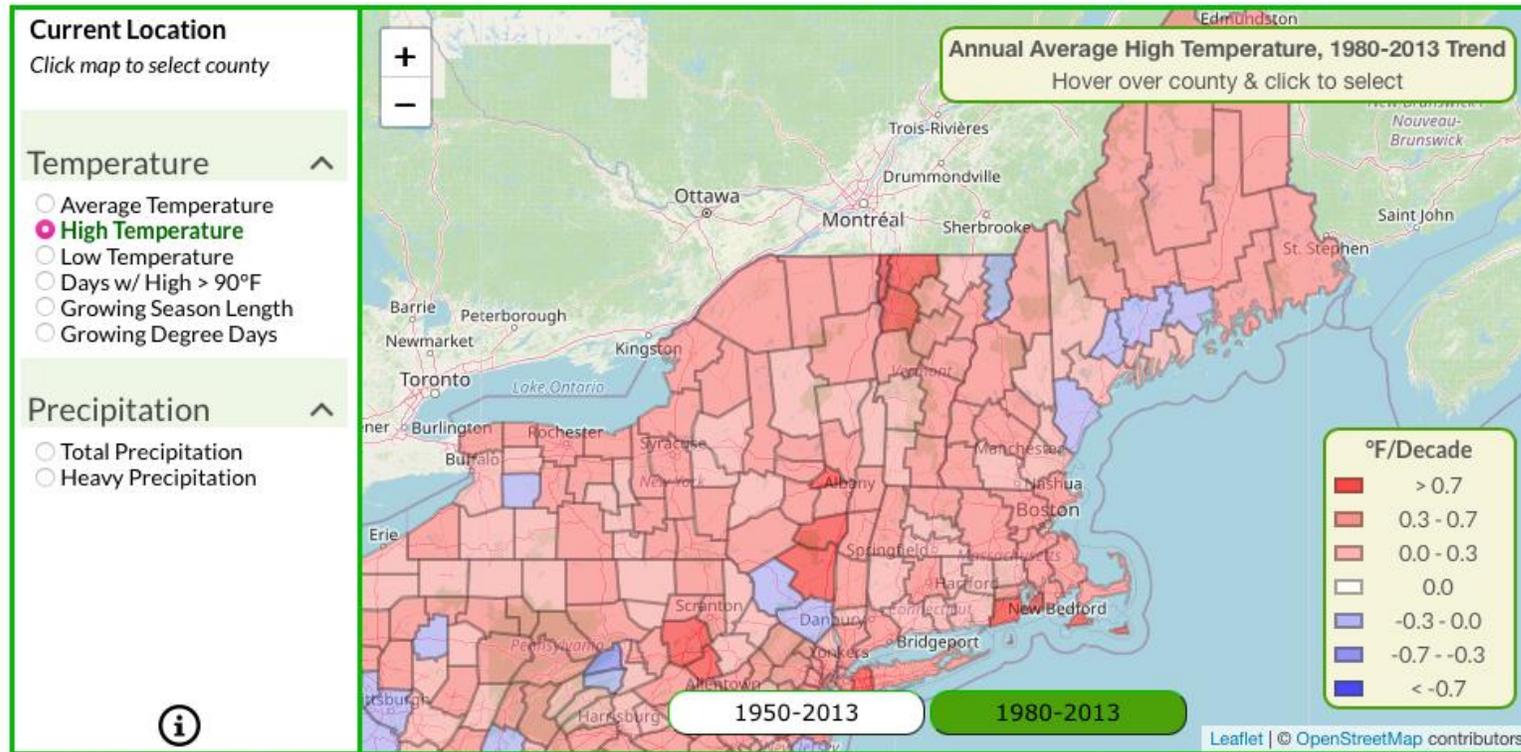


<https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/>



## CSF Climate Change in Your County

Climate Tools Team Resources Videos



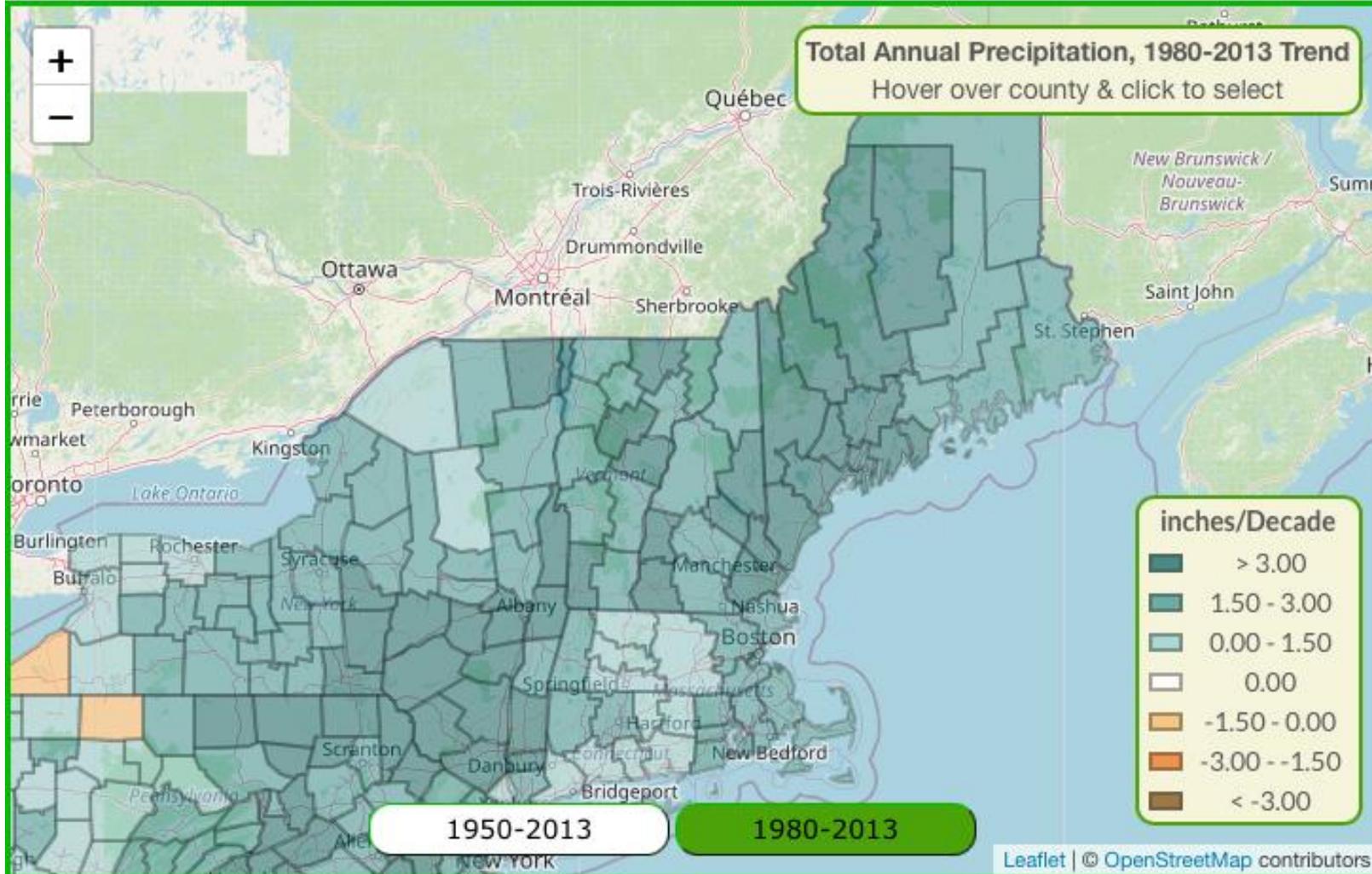
© Cornell University, 2018.

Credits: Developed by Art DeGaetano, Brian Belcher and Ben Eck with the [CICSS](#) team. Data requests powered by [ACIS](#) web services

Leaflet | © OpenStreetMap contributors

<http://climatesmartfarming.org/tools/csf-county-climate-change/>





Suffolk County - Days w/ maximum temp > 95°F

Days w/ maximum temp > 95°F

Graph

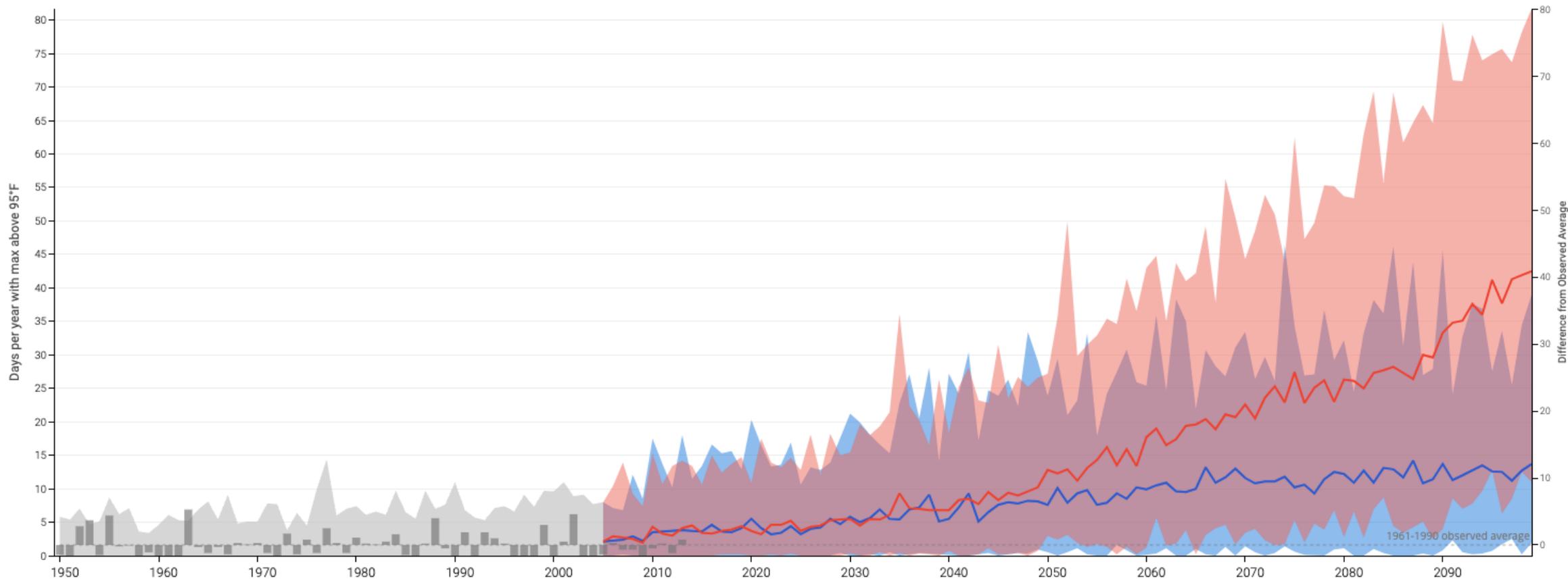
Map

Annual

Monthly

Downloads

About



Observations

Modeled History

Lower Emissions

Higher Emissions



<https://crt-climate-explorer.nemac.org/>





Boston, MA

Stations



### Suffolk County - Days w/ > 2" Precipitation

Days w/ > 2" Precipitation

Graph

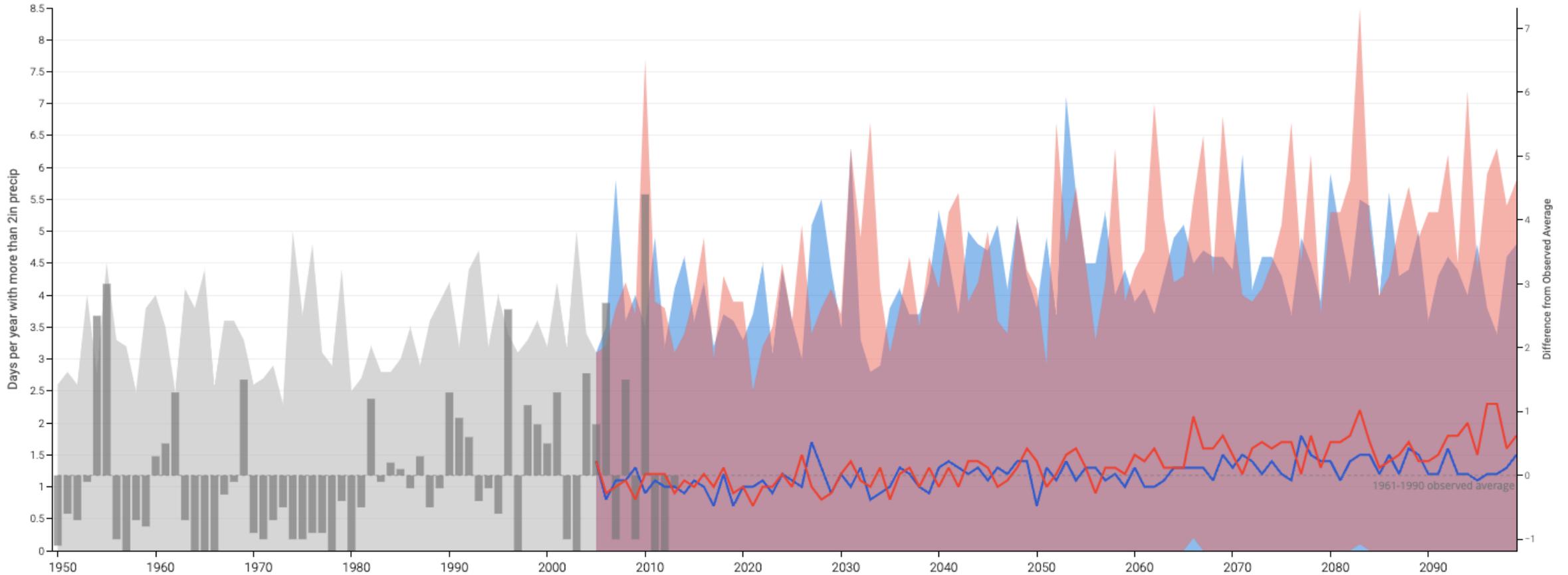
Map

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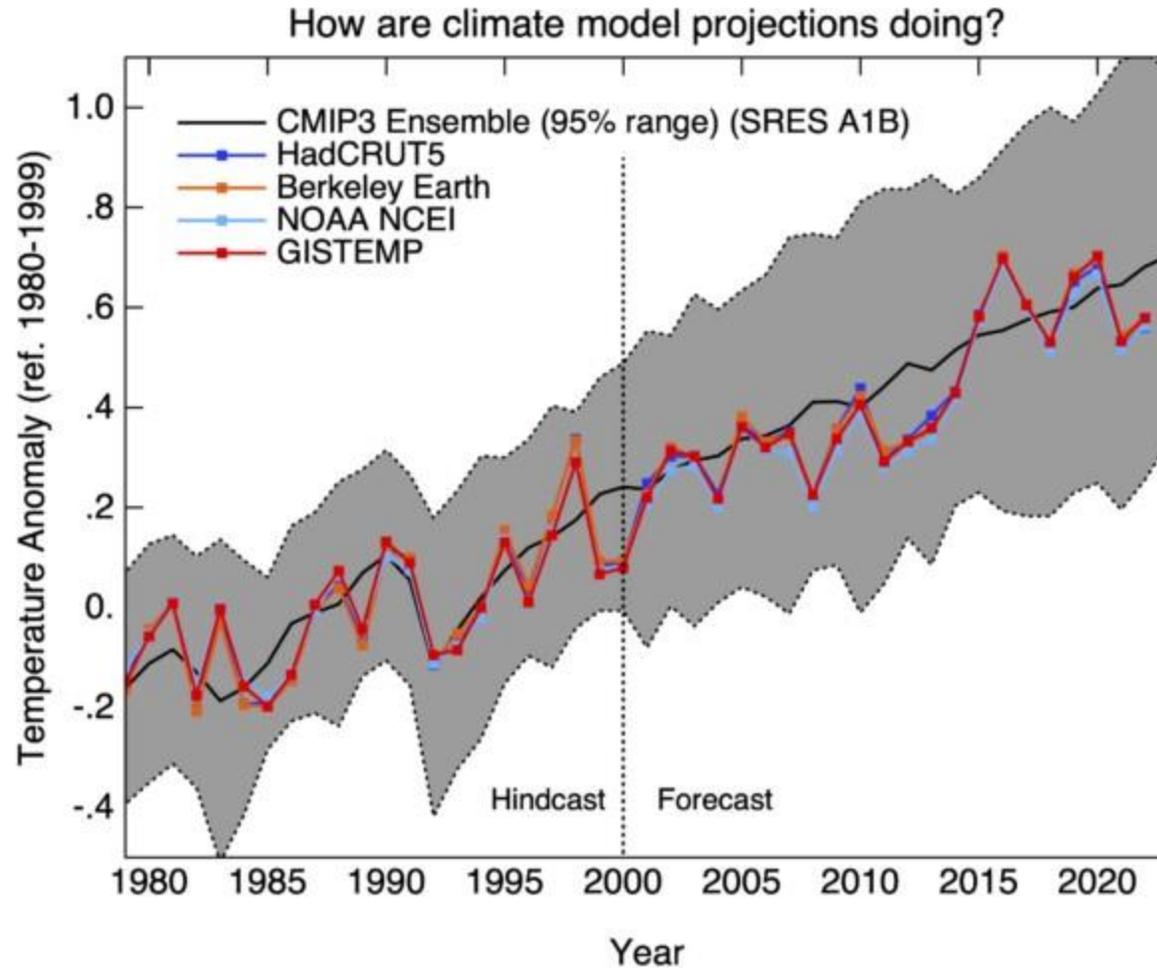


- Observations
- Modeled History
- Lower Emissions
- Higher Emissions



# But how good are the projections?

*Model spread is the 95% envelope of global mean surface temperature anomalies from all individual CMIP3 simulations (using the SRES A1B projection post-2000). Observations are the standard quasi-global estimates of anomalies with no adjustment for spatial coverage or the use of SST instead of SAT over the open ocean. Last updated: 16 Jan 2023.*



Source: Schmidt, Gavin- RealClimate.org



# NCEI - Authoritative Climate Products & Services

## US Extremes Index

National Centers for Environmental Information  
U.S. Climate Extremes Index (CEI)

Home / Climate Monitoring / CEI / Regional Overview

Introduction Data Used Definition Graph **Regional Overview** References

Choose a period/season from the options below to display a regional analysis of the most recent year.

Year: 2022 Period: Annual (January-December) Plot

Indicator: Days with Precip

Extremes in Days with Precipitation  
Annual (January-December 2022)

Region	Percentage
Northwest	0.00%
Northern Rockies and Plains	13.00%
Upper Midwest	7.70%
Northeast	21.30%

<https://www.ncei.noaa.gov/access/monitoring/cei/>



## B&D County Hazard Mapping

Disaster and Risk Mapping Summary

Overview Risk Mapping Time Series Climatology Stats Events FAQ References

County Risk Assessment

Risk Score disaster types:

All Disasters Drought Flooding Freeze **Severe Storm** Tropical Cyclone Wildfire Winter Storm

Hazard Risk Social Vulnerability

Severe Storm Risk

Risk Score 0 100

Parameter	United States	Texas	Dallas County
Severe Storm Risk	34.99	30.52	19.00
Social Vulnerability	38.34	42.74	42.84

<https://www.ncei.noaa.gov/access/billions/>



## Climate at a Glance

NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

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Home > Climate Monitoring > Climate at a Glance

### Climate at a Glance

Climate Monitoring  
State of the Climate  
Temp, Predp, and Drought  
**Climate at a Glance**  
Extremes  
Societal Impacts  
Snow and Ice  
Teleconnections  
Monitoring References

Global **National** Regional Statewide Divisional County

Mapping Time Series Rankings Haywood Plots Data

### National Mapping

Choose from the options below and click "Plot" to create a map. Select Precipitation Maps are available for download.

Parameter: Average Temperature  
Year: 2020  
Month: May  
Time Scale: 1-Month

Plot

<https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/>



# US 5<sup>th</sup> National Climate Assessment

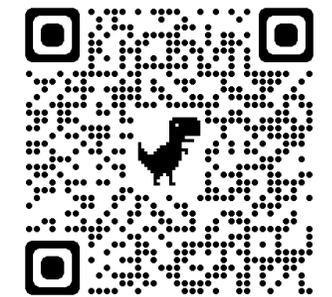
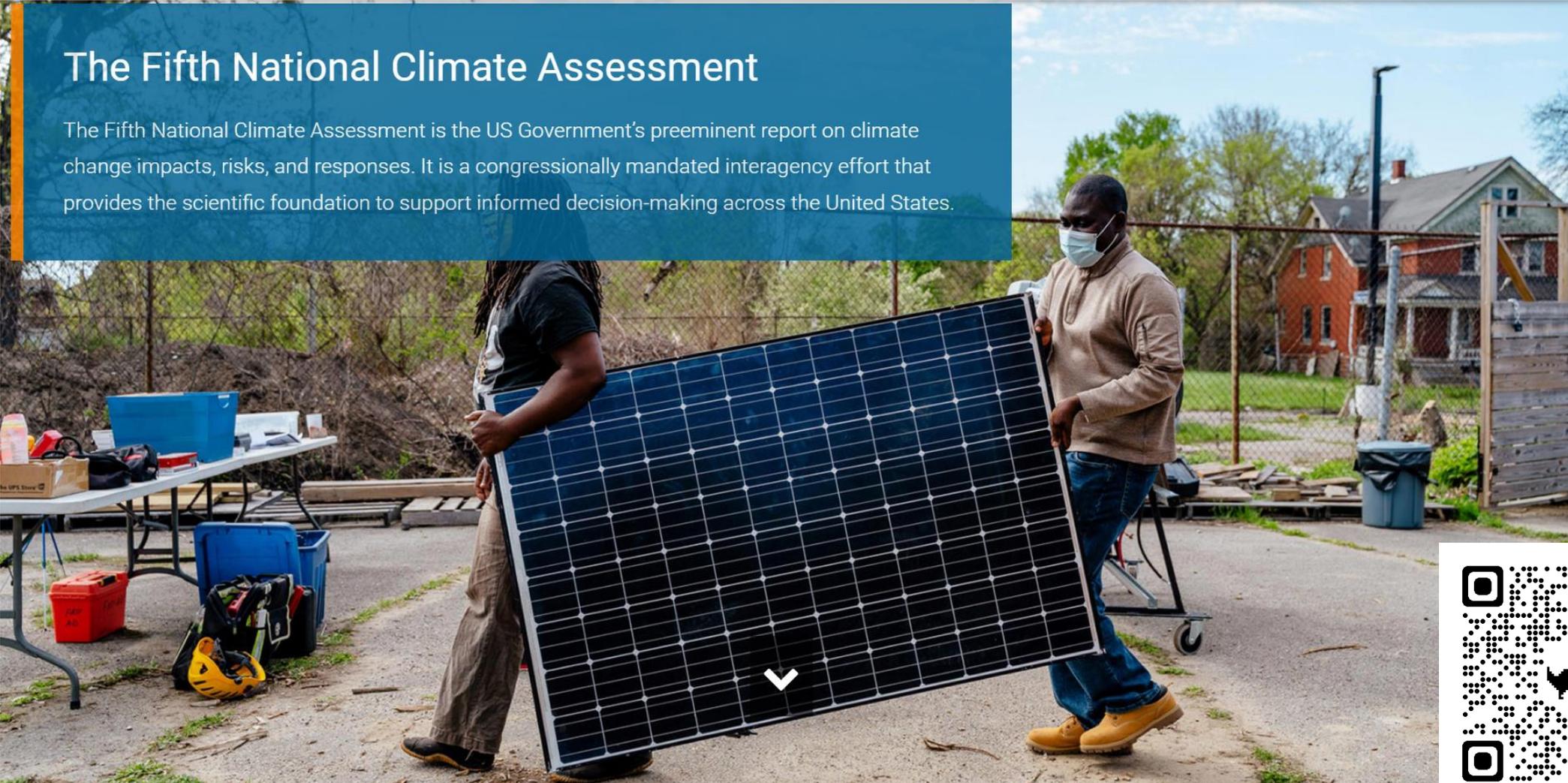
NCA5

ABOUT ▾ CHAPTERS ▾ DOWNLOADS ▾ ART × CLIMATE



## The Fifth National Climate Assessment

The Fifth National Climate Assessment is the US Government's preeminent report on climate change impacts, risks, and responses. It is a congressionally mandated interagency effort that provides the scientific foundation to support informed decision-making across the United States.



# NCA5 Key Message on Risk



ABOUT ▾ CHAPTERS ▾ DOWNLOADS ▾ ART × CLIMATE

Addressing Climate Change

Experiencing Climate Change

Current and Future Risks

Determining the Future

A Resilient Nation

## Cascading and compounding impacts increase risks

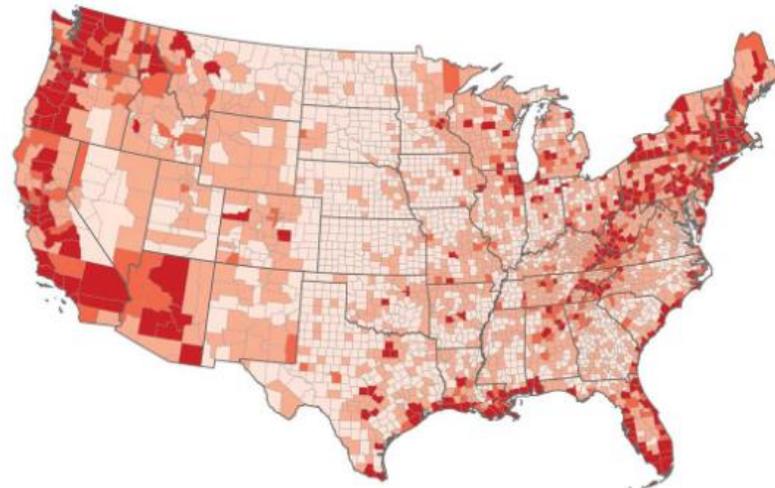
The impacts and risks of climate change unfold across interacting sectors and regions. For example, wildfire in one region can affect air quality and human health in other regions, depending on where winds transport smoke. Further, climate change impacts interact with other stressors, such as the COVID-19 pandemic, environmental degradation, or socioeconomic stressors like poverty and lack of adequate housing that disproportionately impact overburdened communities. These interactions and interdependencies can lead to cascading impacts and sudden failures. For example, climate-related shocks to the food supply chain have led to local to global impacts on food security and human migration patterns that affect US economic and national security interests. [{11.3, 17.1, 17.2, 17.3, 18.1, 22.3, 23.4, 31.3; Introductions in Chs. 2, 17, 18; Focus on Compound Events; Focus on Risks to Supply Chains; Focus on COVID-19 and Climate Change}](#)

The risk of two or more extreme events occurring simultaneously or in quick succession in the same region—known as compound events—is increasing. Climate change is also increasing the risk of multiple extremes occurring simultaneously in different locations that are connected by complex human and natural systems. For instance, simultaneous megafires across multiple western states and record back-to-back Atlantic hurricanes in 2020 caused unprecedented demand on federal emergency response resources. [{2.2, 3.2, 15.1, 22.2, 26.4; Focus on Compound Events; Ch. 4, Introduction}](#)

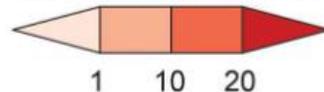


# NCA5 on Flooding 2020 v. 2050

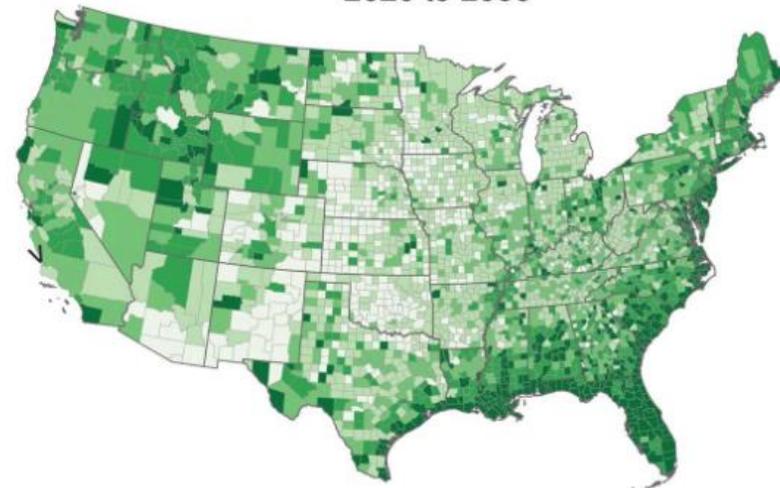
c) Annual average loss from all types of flooding, 2020



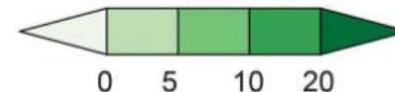
Millions of 2020 Dollars



d) Projected percent change in average annual loss, 2020 to 2050

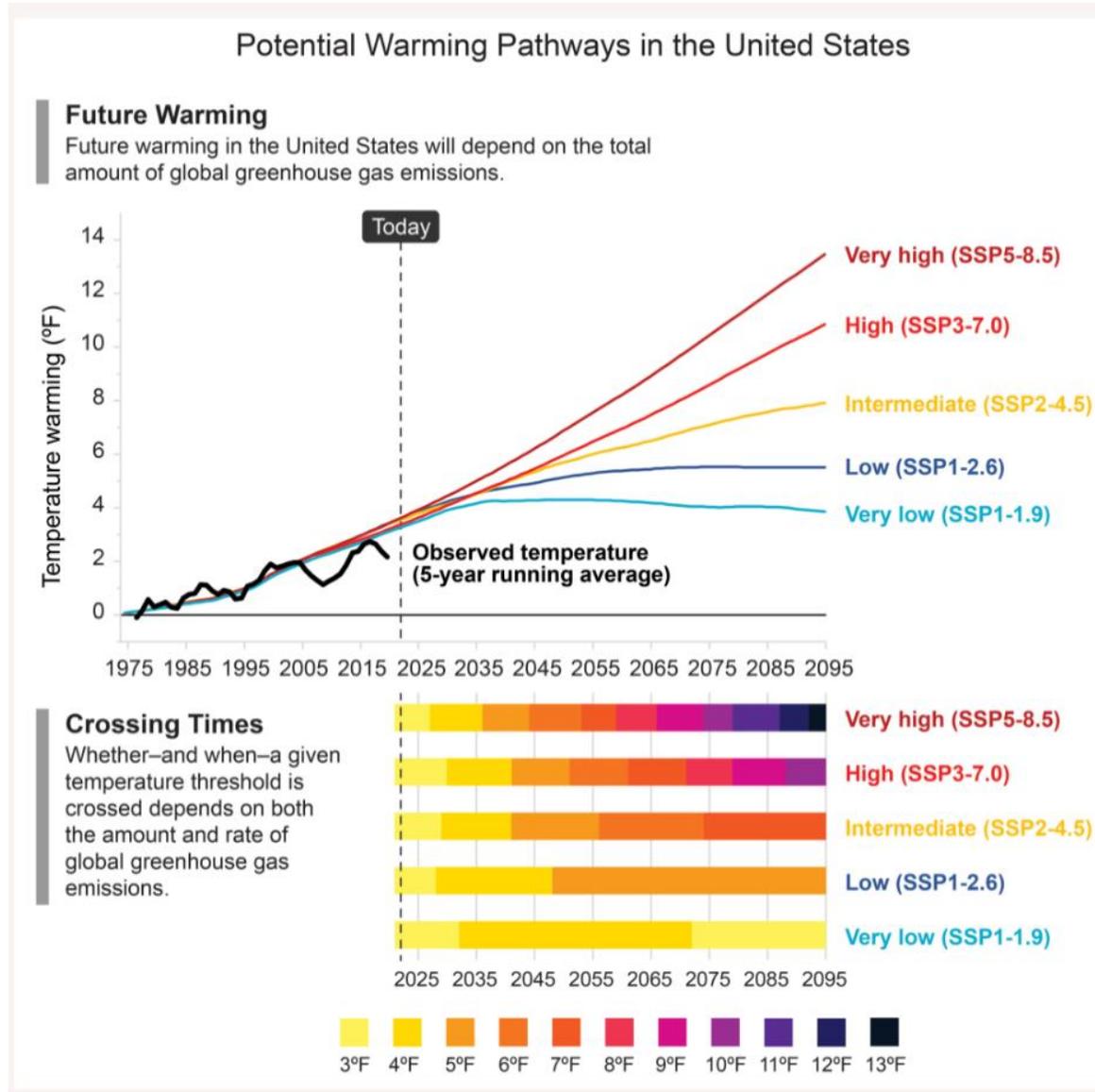


Percent Change



Increasing flooding puts more people and assets at risk.

# NCA5, Future Warming and the Human Choice



# Questions?



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<https://www.ncei.noaa.gov/regional/regional-climate-services-directors/eastern>

December 4, 2023

Middlesex County Conservation District (MA)

Virtual

