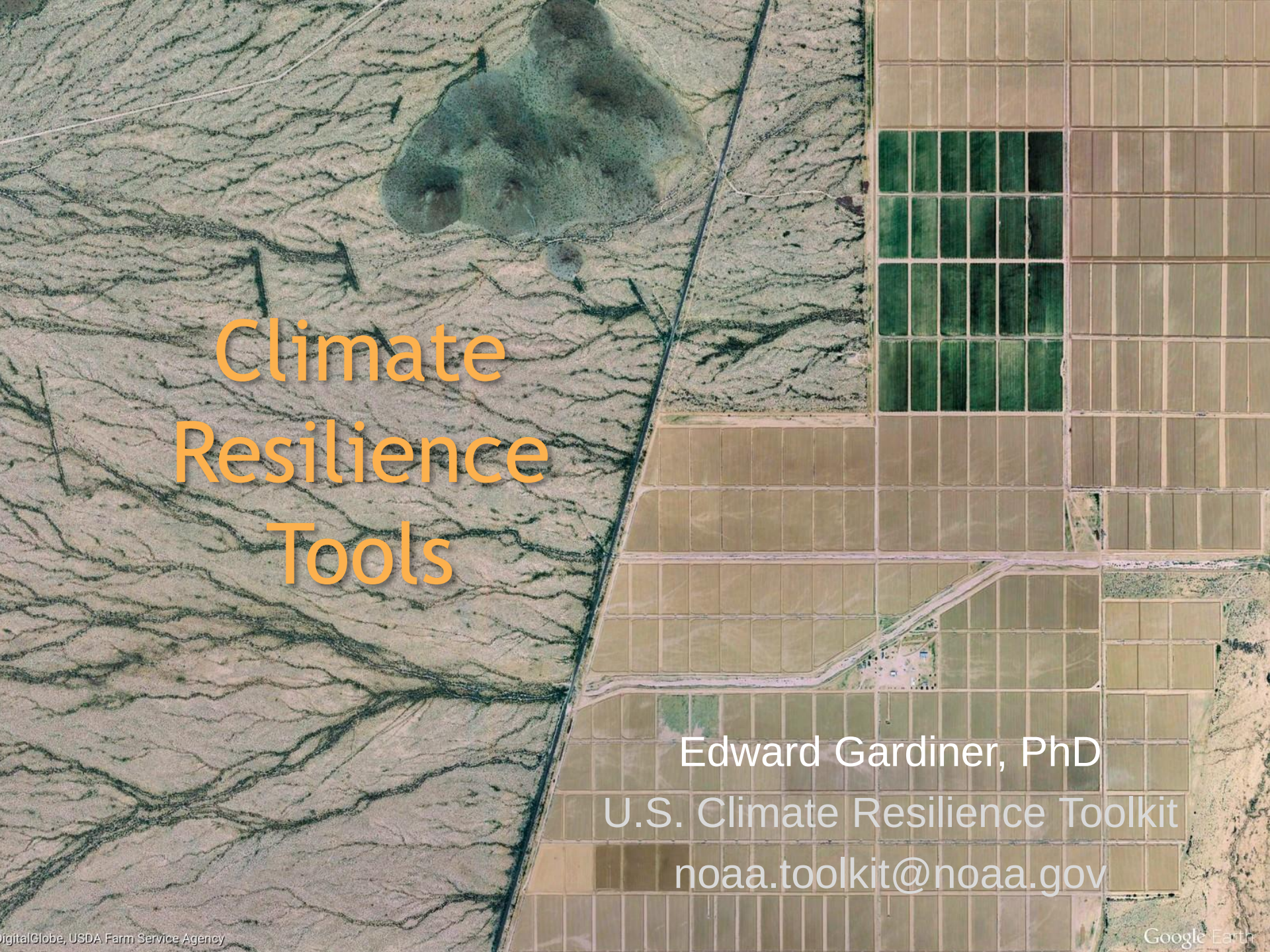

Climate Resilience Tools
Edward Gardiner, PhD
U.S. Climate Resilience Toolkit
noaa.toolkit@noaa.gov
DigitalGlobe, USDA Farm Service Agency
Google Earth

U.S. Climate Resilience Toolkit

The single biggest problem in communication is the illusion that it has taken place.

— *George Bernard Shaw*
Playwright
Co-founder of London School of Economics

It's solvable. It's serious. It's simple.

What can we do to reduce global warming?

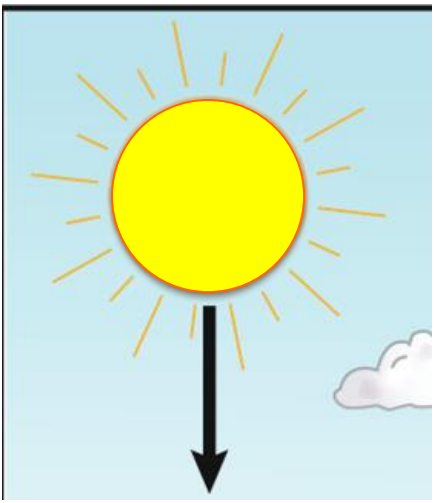
What harm will global warming cause?

How do you know that global warming is occurring?

Alarmed	Concerned	Cautious	Disengaged	Doubtful	Dismissive
13%	31%	23%	7%	13%	13%

*Roser-Renouf, C., Maibach, E., Leiserowitz, A., Feinberg, G., Rosenthal, S., & Kreslake, J. (2014): Global Warming's Six Americas, October 2014: Perception of the Health Consequences of Global Warming and Update on Key Beliefs. Yale University and George Mason University. New Haven, CT: Yale Project on Climate Change Communication.

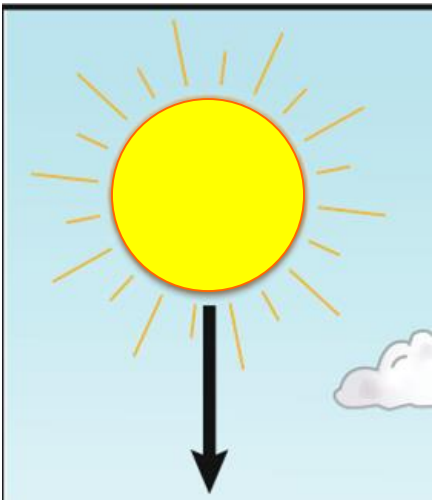
It's solvable. It's serious. It's simple.



Energy reflected & emitted from Earth to space - Energy absorbed into Earth's climate system = Earth's energy budget is in balance

U.S. Climate Resilience Toolkit

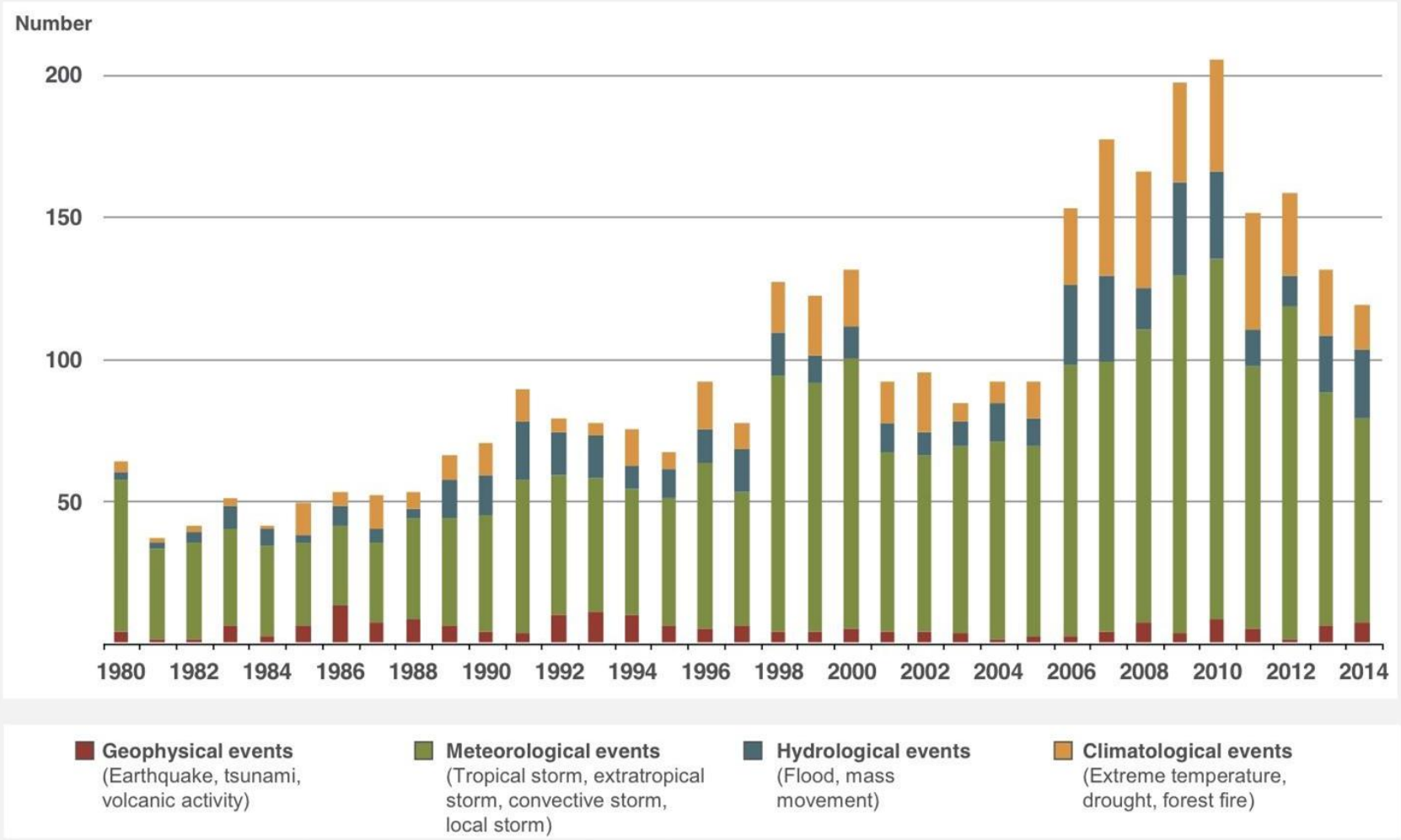
It's solvable. It's serious. It's simple.



Energy reflected & emitted from Earth to space < Energy absorbed into Earth's climate system = Earth is warming

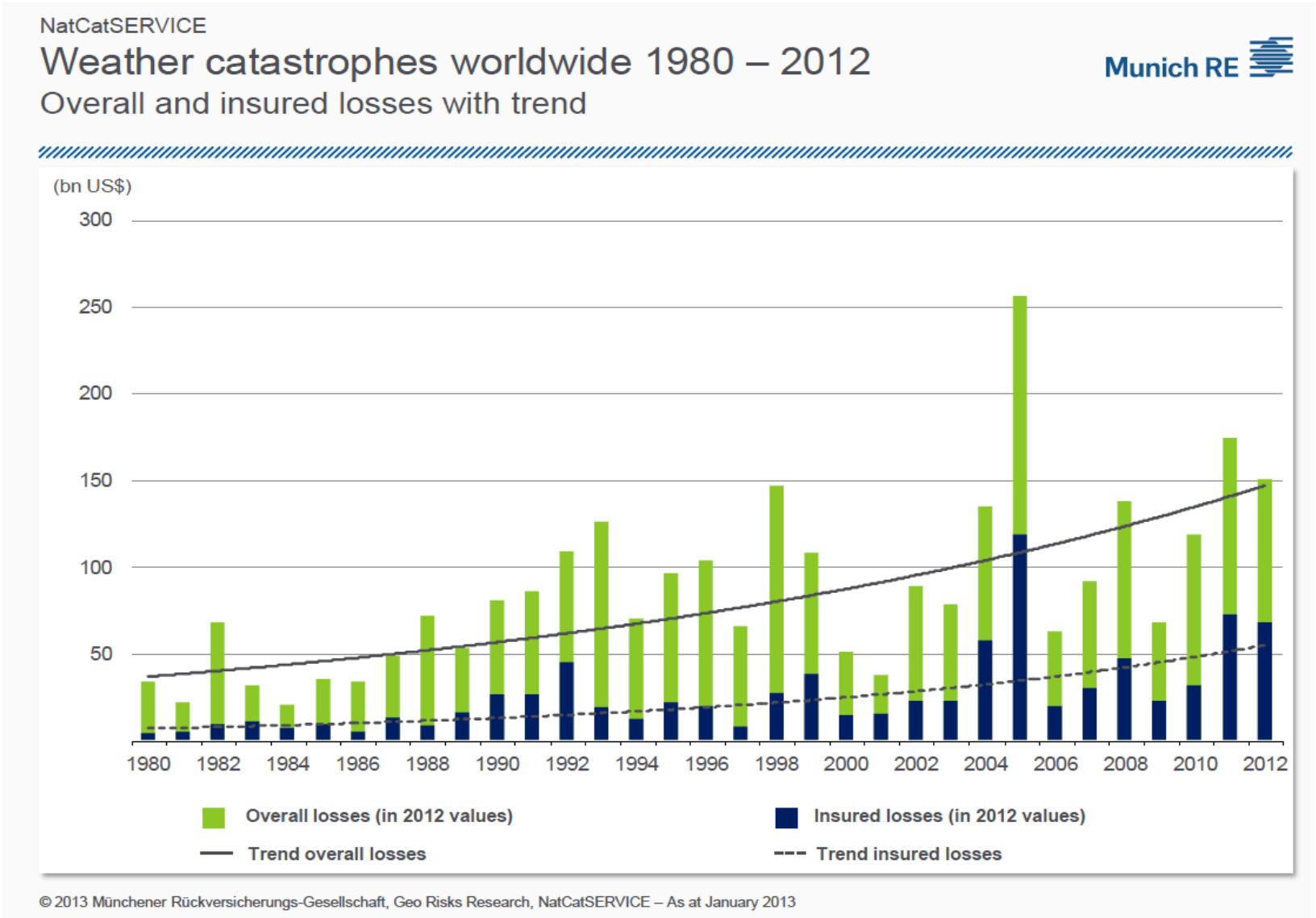
U.S. Climate Resilience Toolkit

It's solvable. **It's serious.** It's simple.



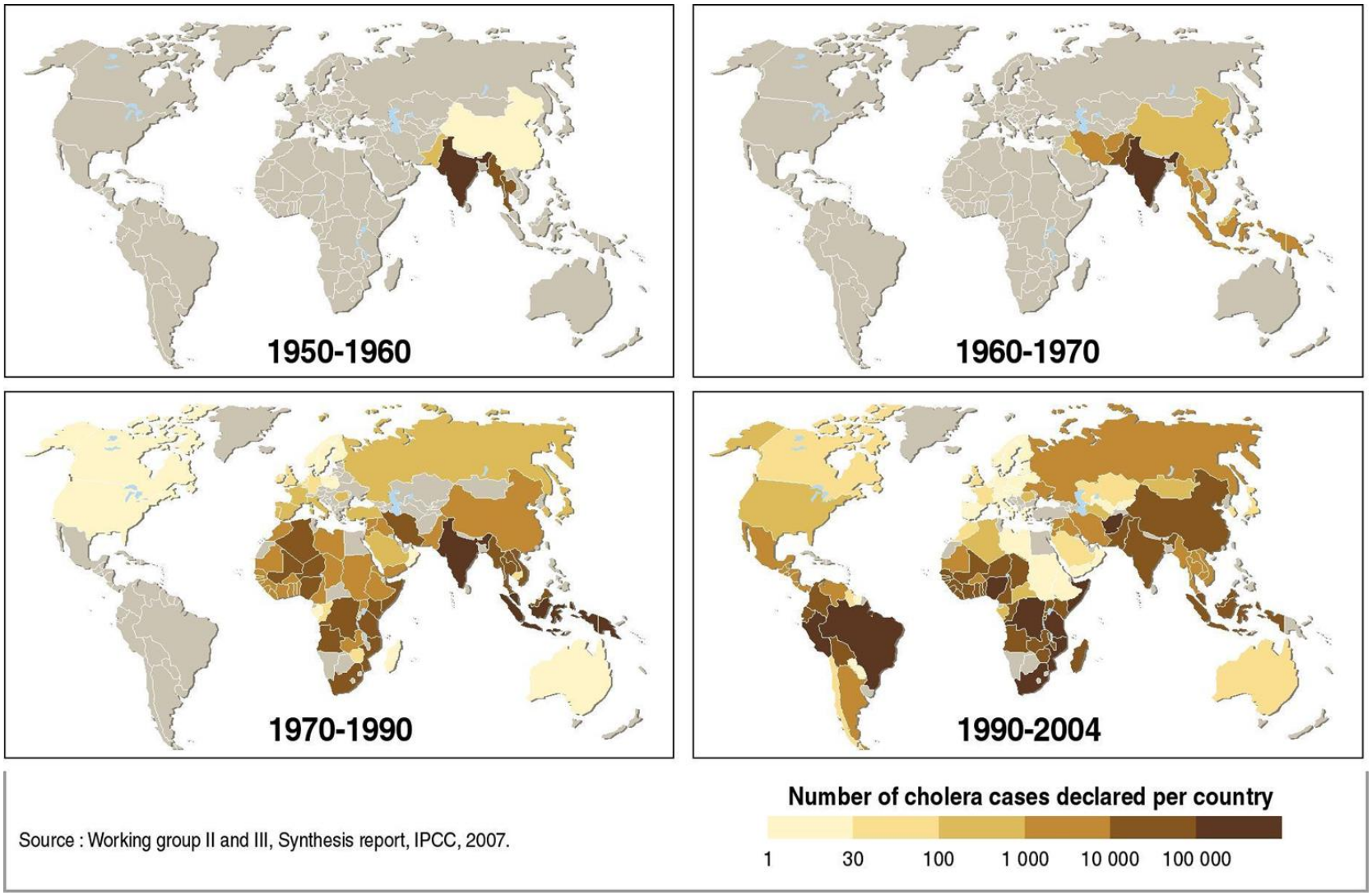
Weather & climate disasters globally are rising

It's solvable. **It's serious.** It's simple.



Financial losses are rising globally too

It's solvable. **It's serious.** It's simple.



Source : Working group II and III, Synthesis report, IPCC, 2007.

Exposure to disease is increasing

U.S. Climate Resilience Toolkit

U.S. Climate Resilience Toolkit

Steps to Resilience | Case Studies | Tools | Topics | Expertise

Search

Welcome to the new Climate Resilience Toolkit. We've redesigned our site with your web experience in mind.

Meet the Challenges of a Changing Climate

Find a framework and tools to understand and address climate issues that impact people and their communities.

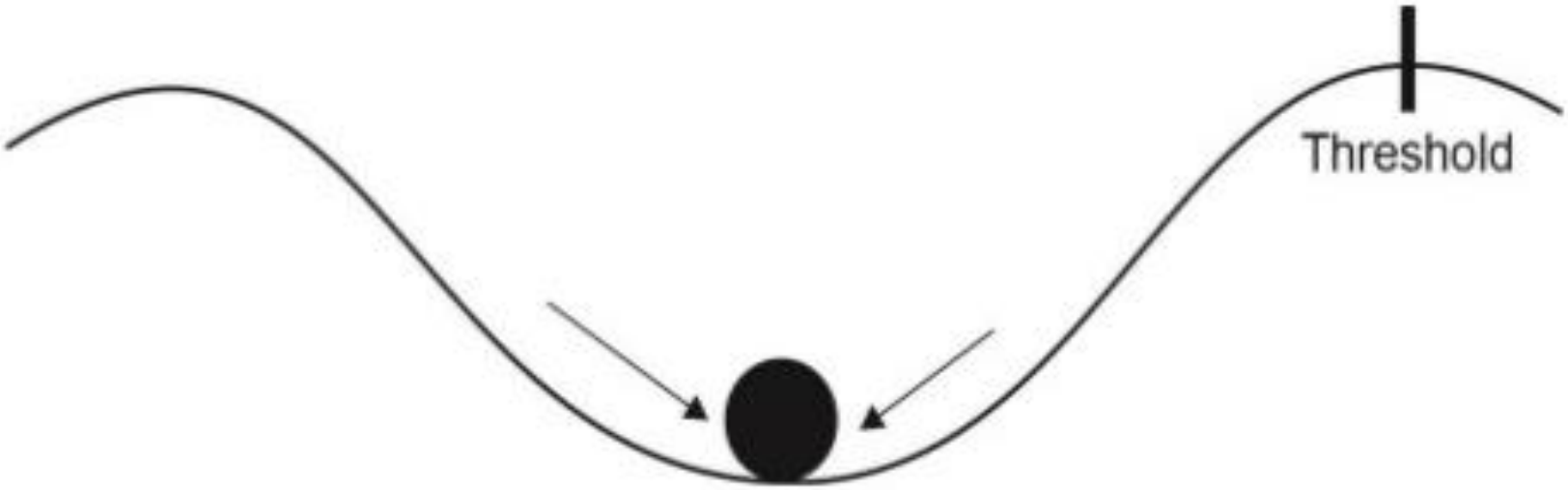
SEE WHAT OTHERS ARE DOING ›

BUILD YOUR RESILIENCE TO CLIMATE IMPACTS ›

EXPLORE CLIMATE IN YOUR LOCATION ›

EXPLORE THE TOOLKIT ∨

Resilience: the capacity of a system (community, business, or natural environment) to withstand or recover from a disruption.

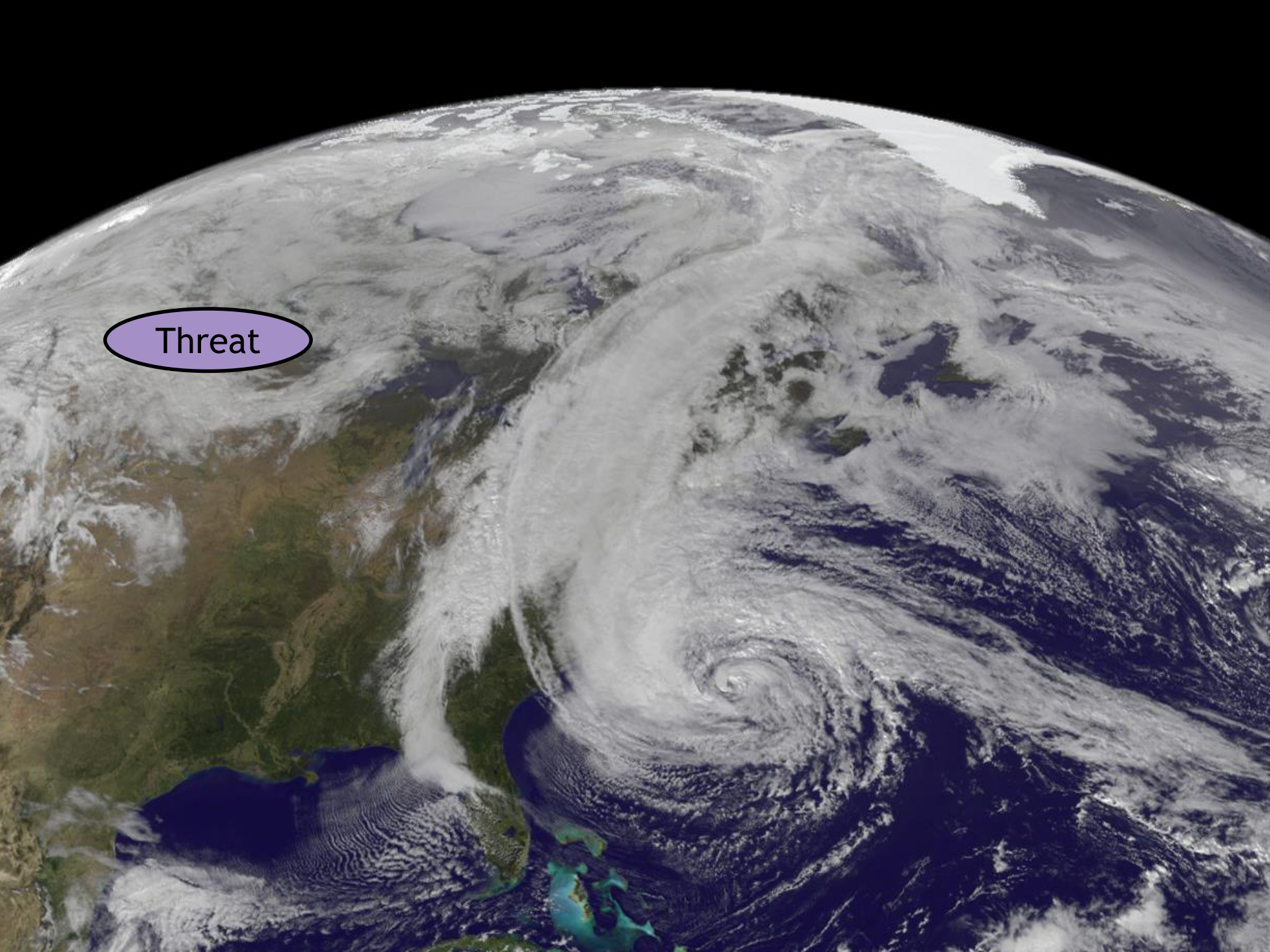


U.S. Climate Resilience Toolkit

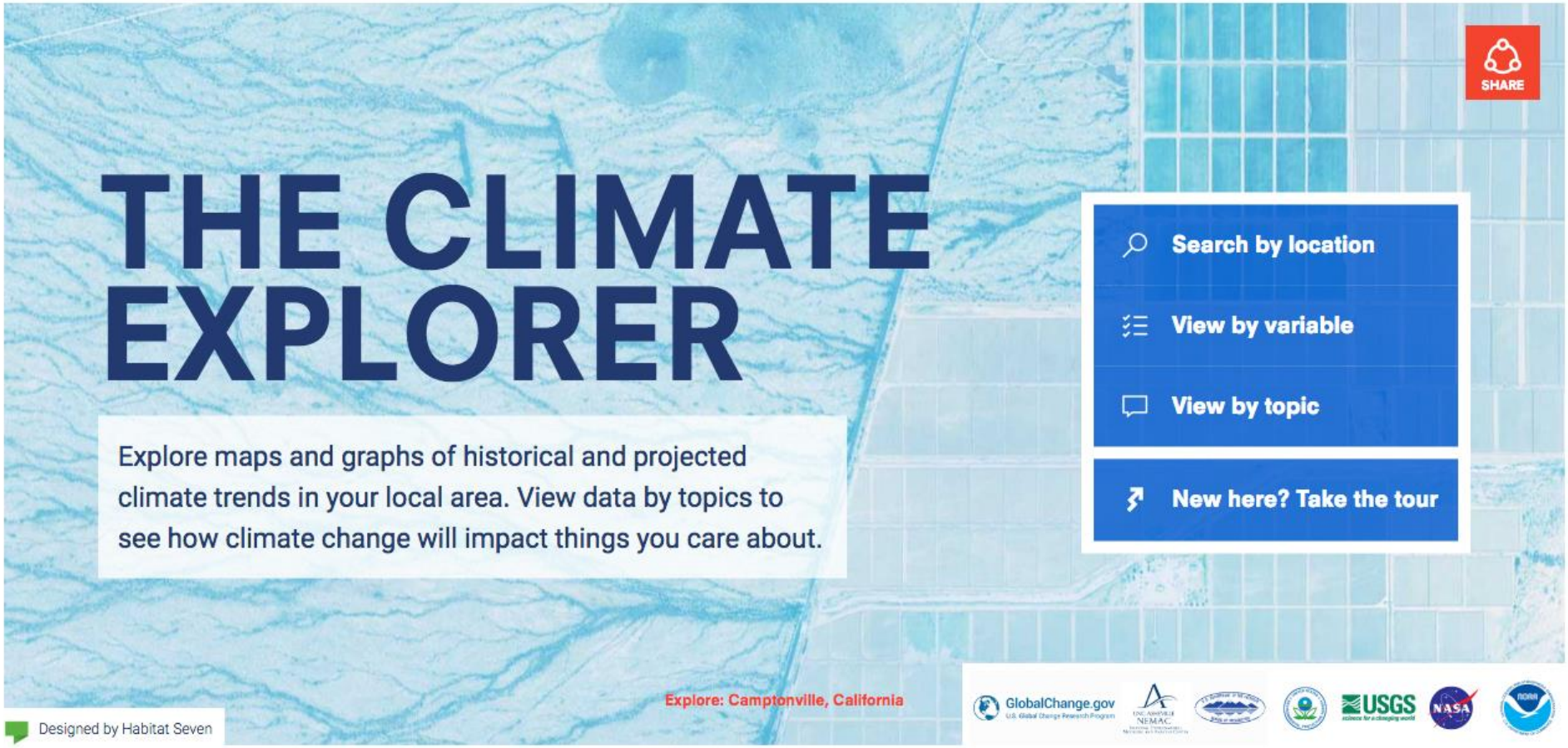
U.S. Climate Resilience Toolkit

U.S. Climate Resilience Toolkit

U.S. Climate Resilience Toolkit


Threat

U.S. Climate Resilience Toolkit

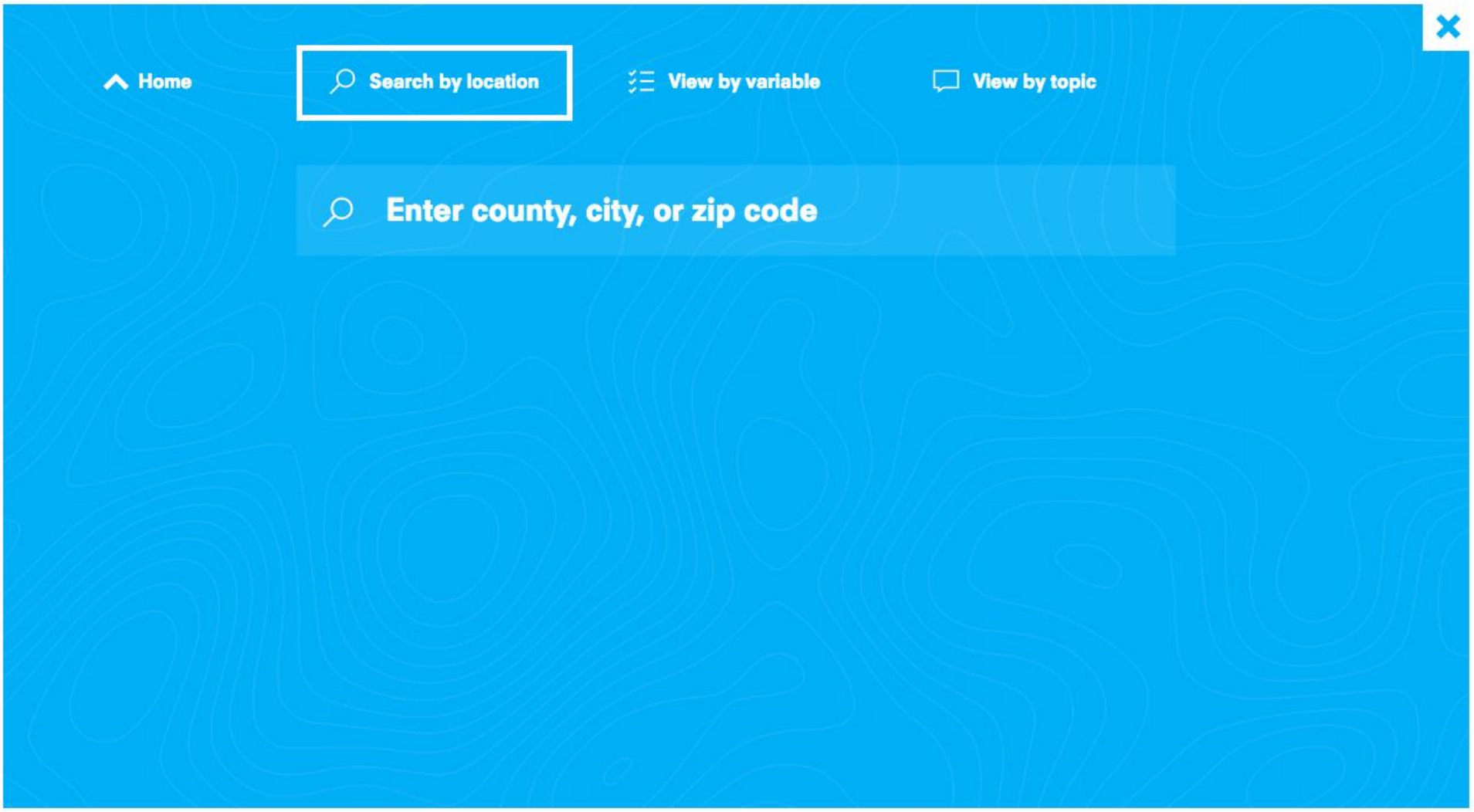

SHARE
THE CLIMATE EXPLORER
Explore maps and graphs of historical and projected climate trends in your local area. View data by topics to see how climate change will impact things you care about.
Search by location
View by variable
View by topic
New here? Take the tour
Explore: Camptonville, California
Designed by Habitat Seven
GlobalChange.gov
USGS
NASA

Search by location

View by variable

View by topic

U.S. Climate Resilience Toolkit



U.S. Climate Resilience Toolkit

Search another City, County or Zip code

SHARE

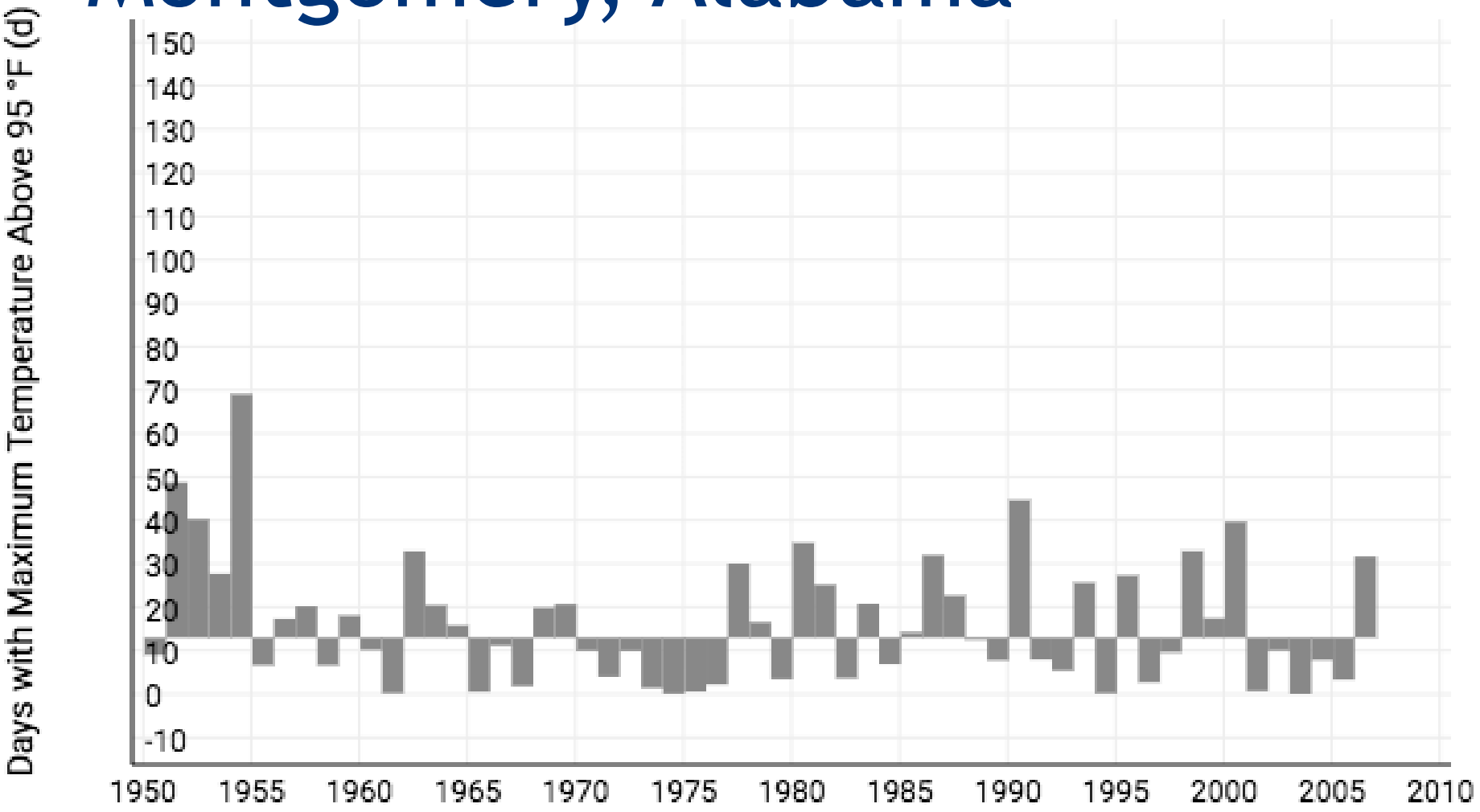
CAMPTONVILLE, CA

Yuba County

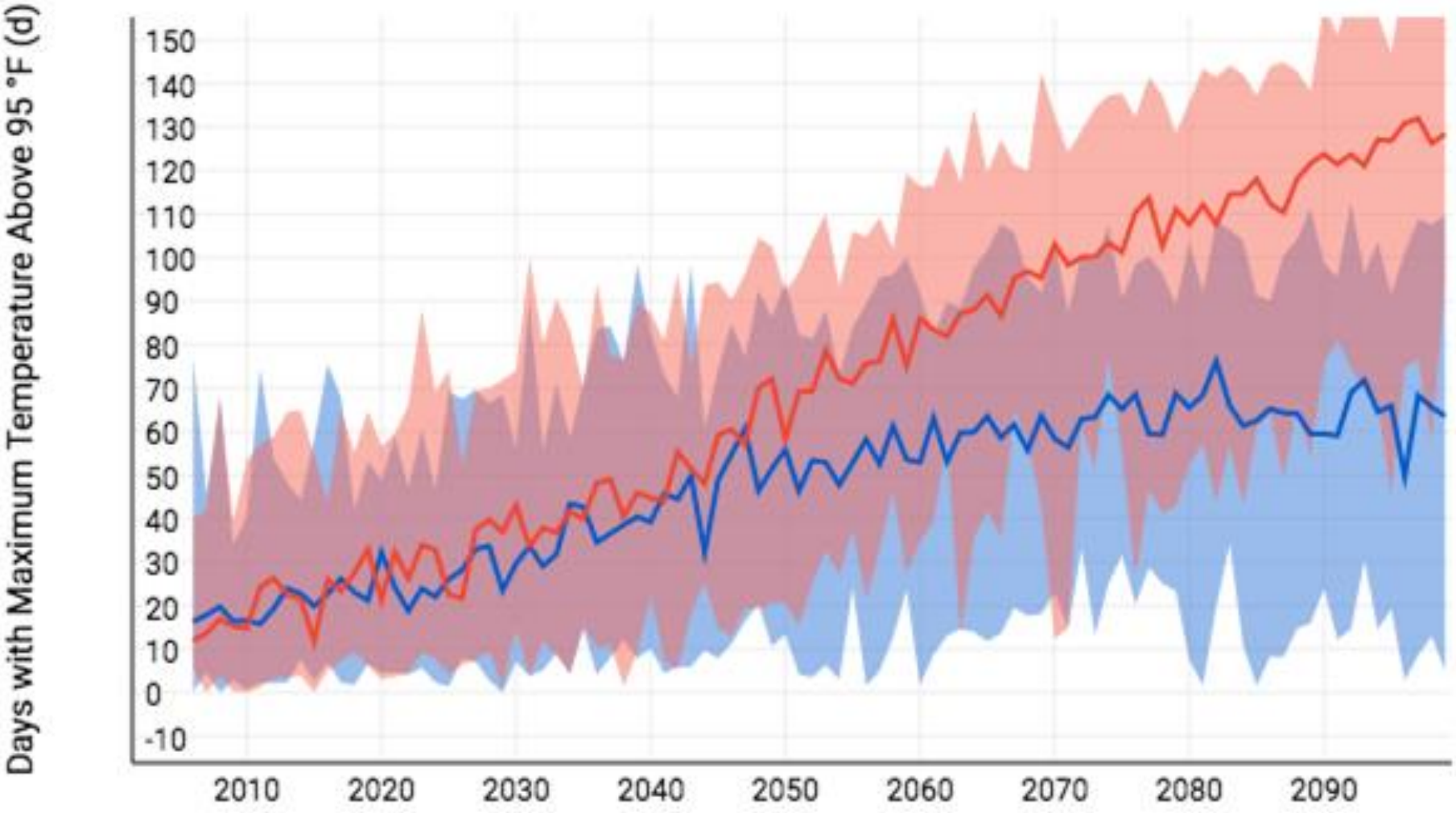
Graphs and maps below show observed and modeled data for the county of your selected location. Adjust the displays to focus on times or regions of interest.

JUMP TO: Temperature Precipitation Other Weather Stations

Montgomery, Alabama

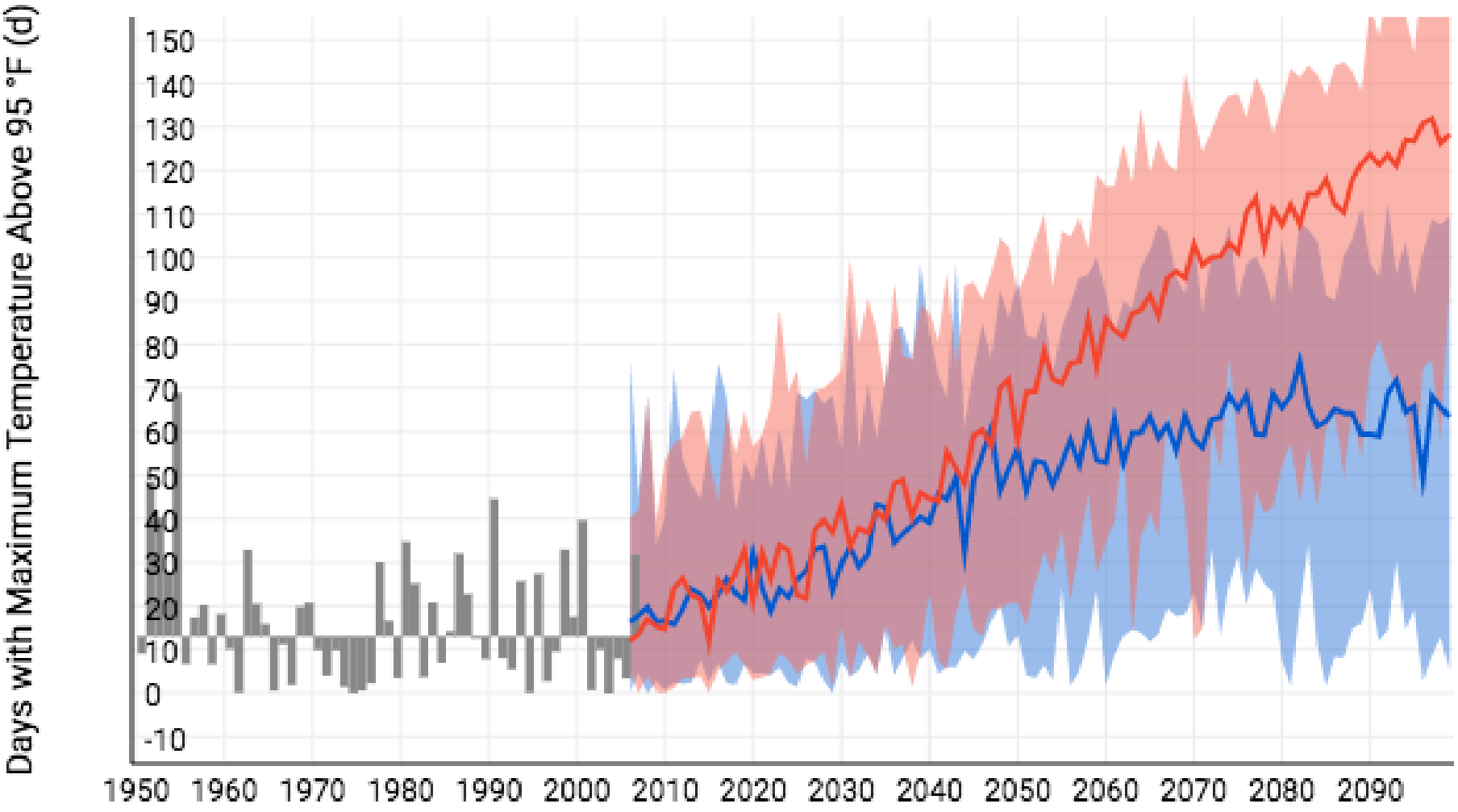


Montgomery, Alabama

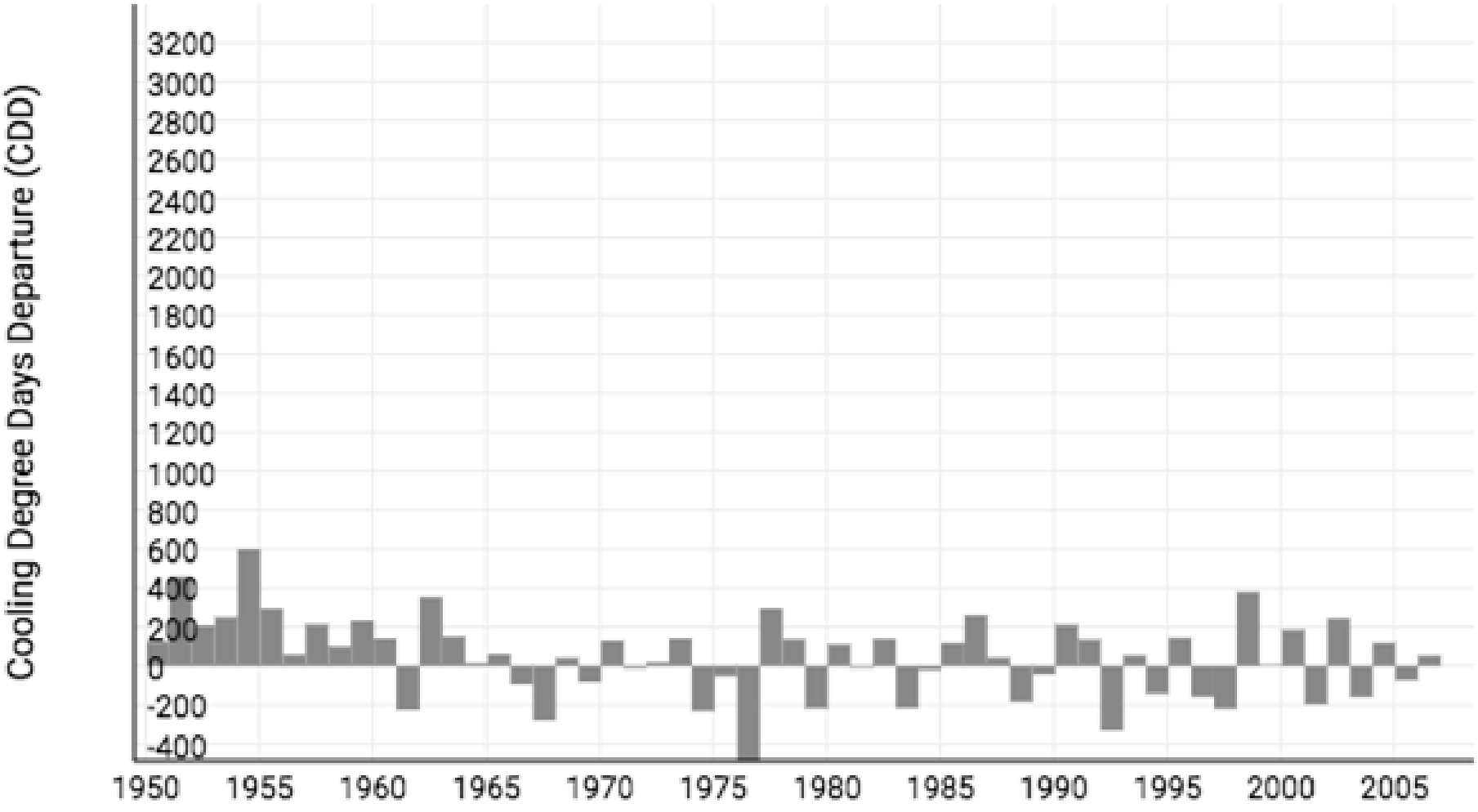


U.S. Climate Resilience Toolkit

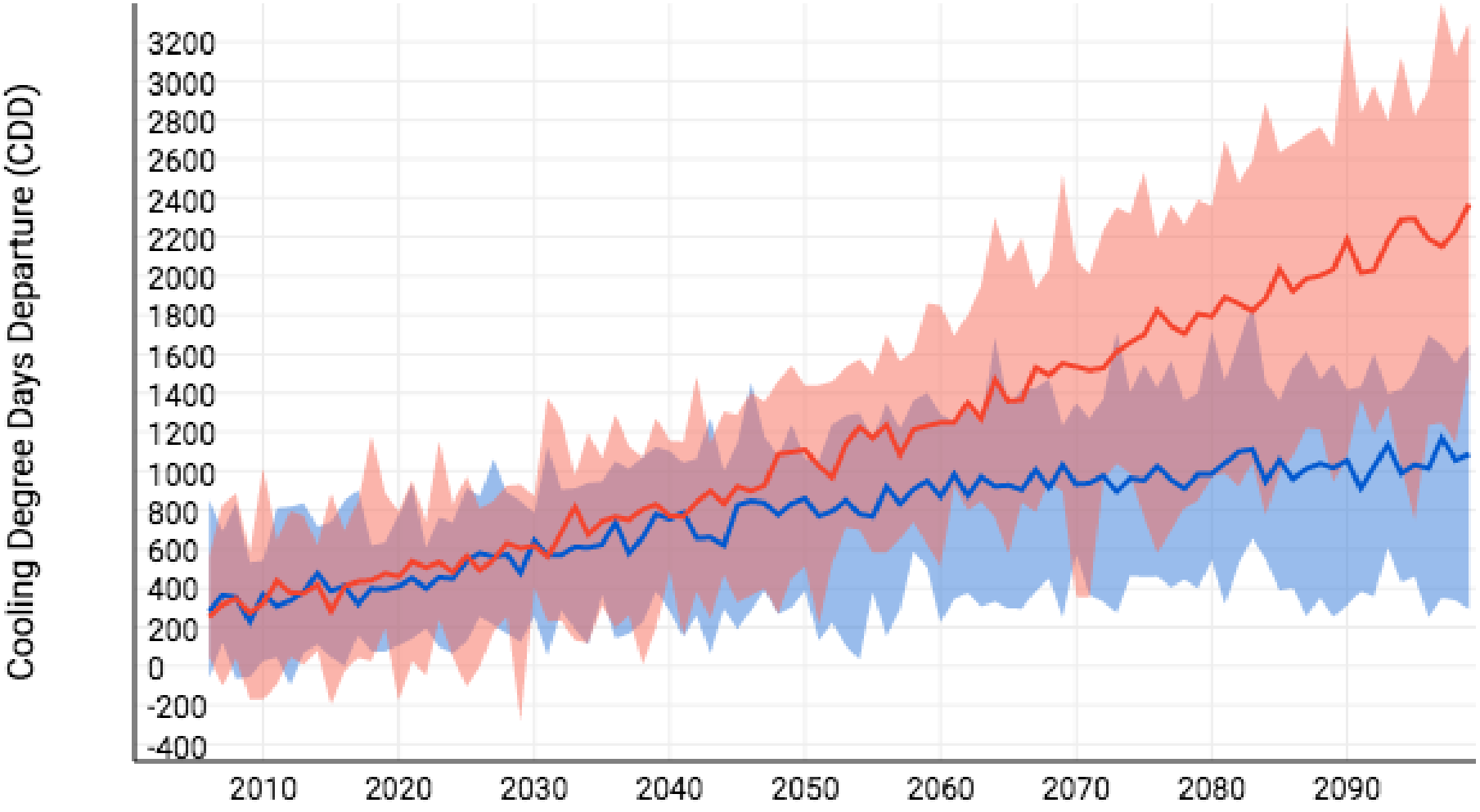
Montgomery, Alabama



Montgomery, Alabama

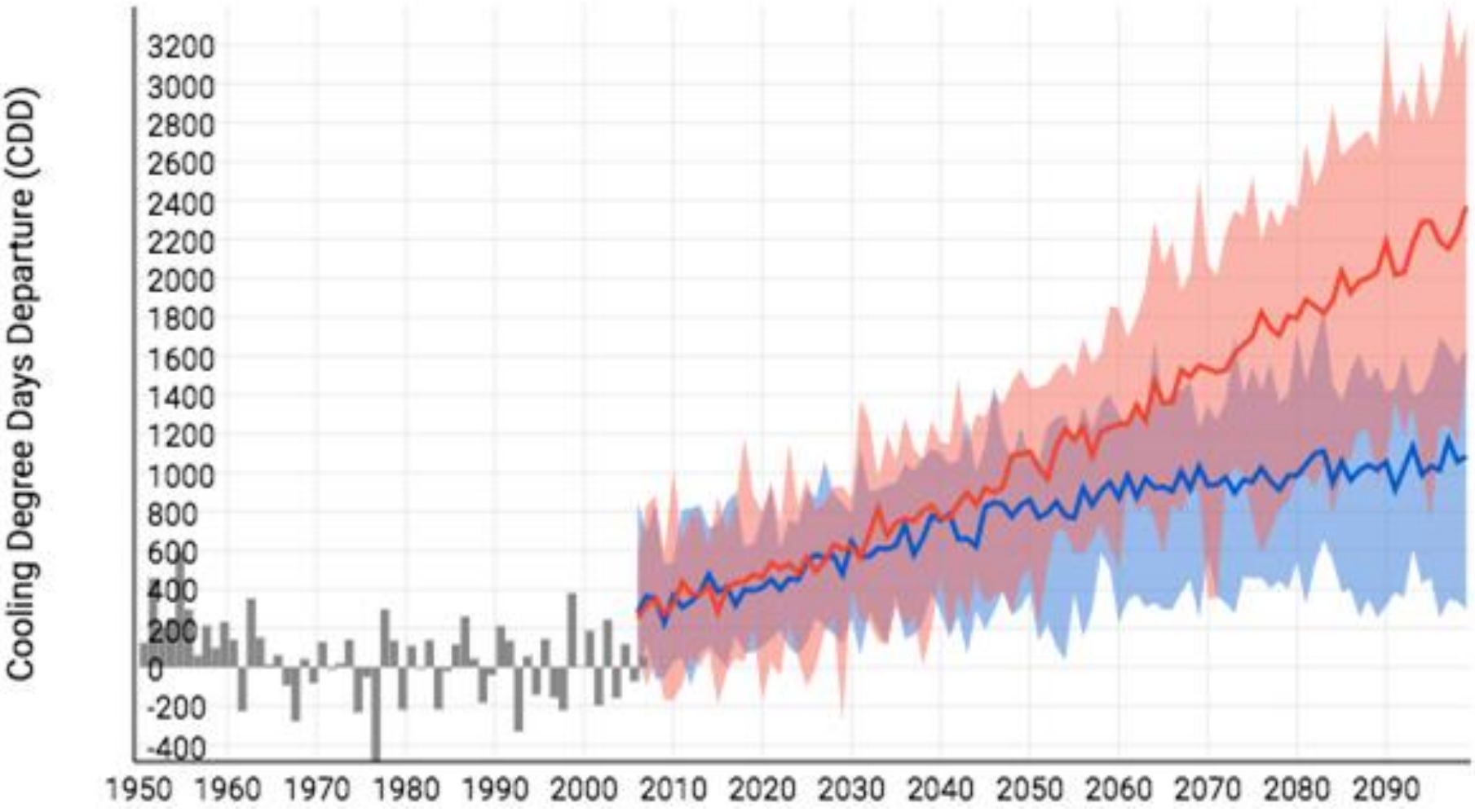


Montgomery, Alabama



U.S. Climate Resilience Toolkit

Montgomery, Alabama

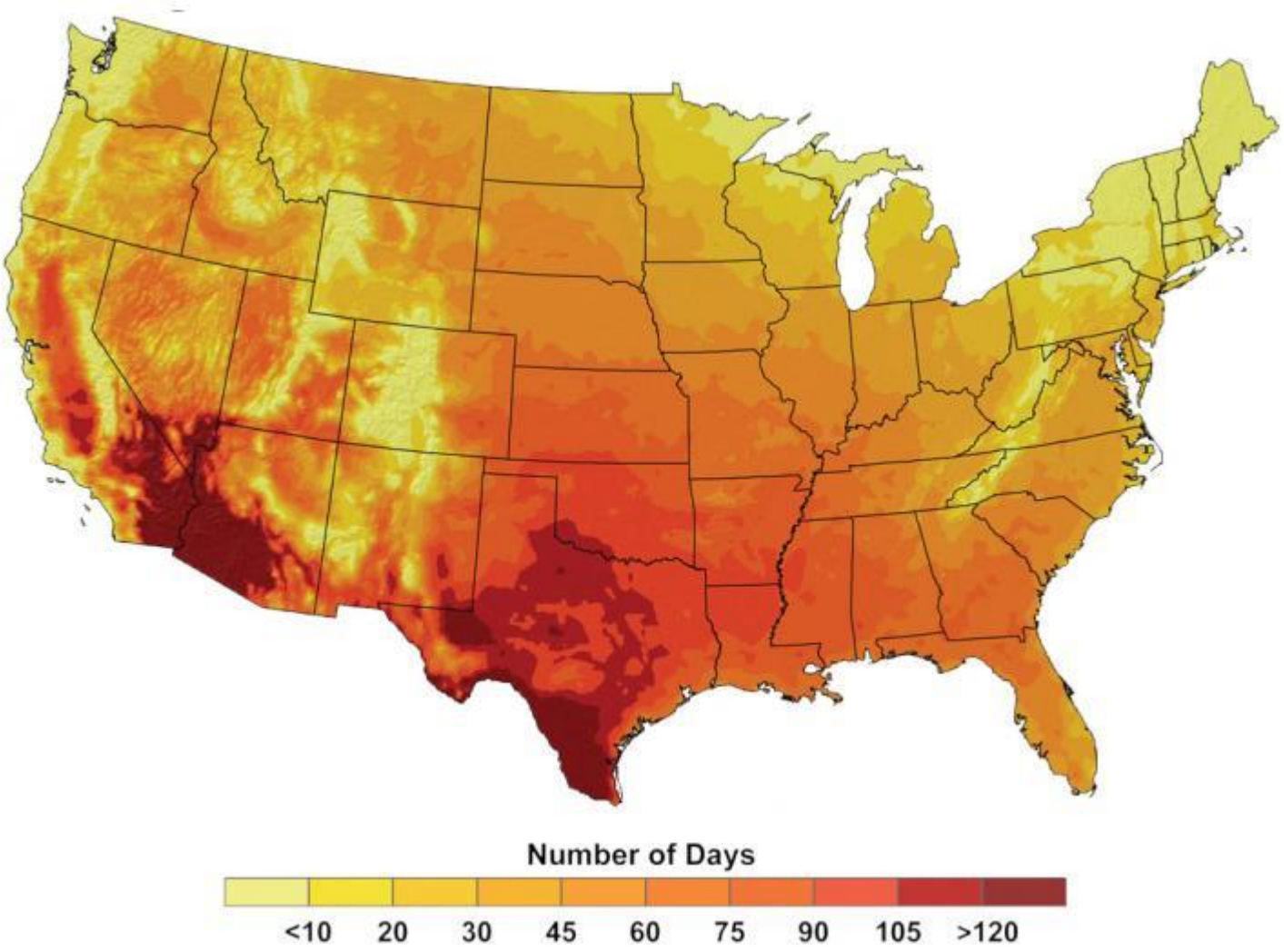


U.S. Climate Resilience Toolkit

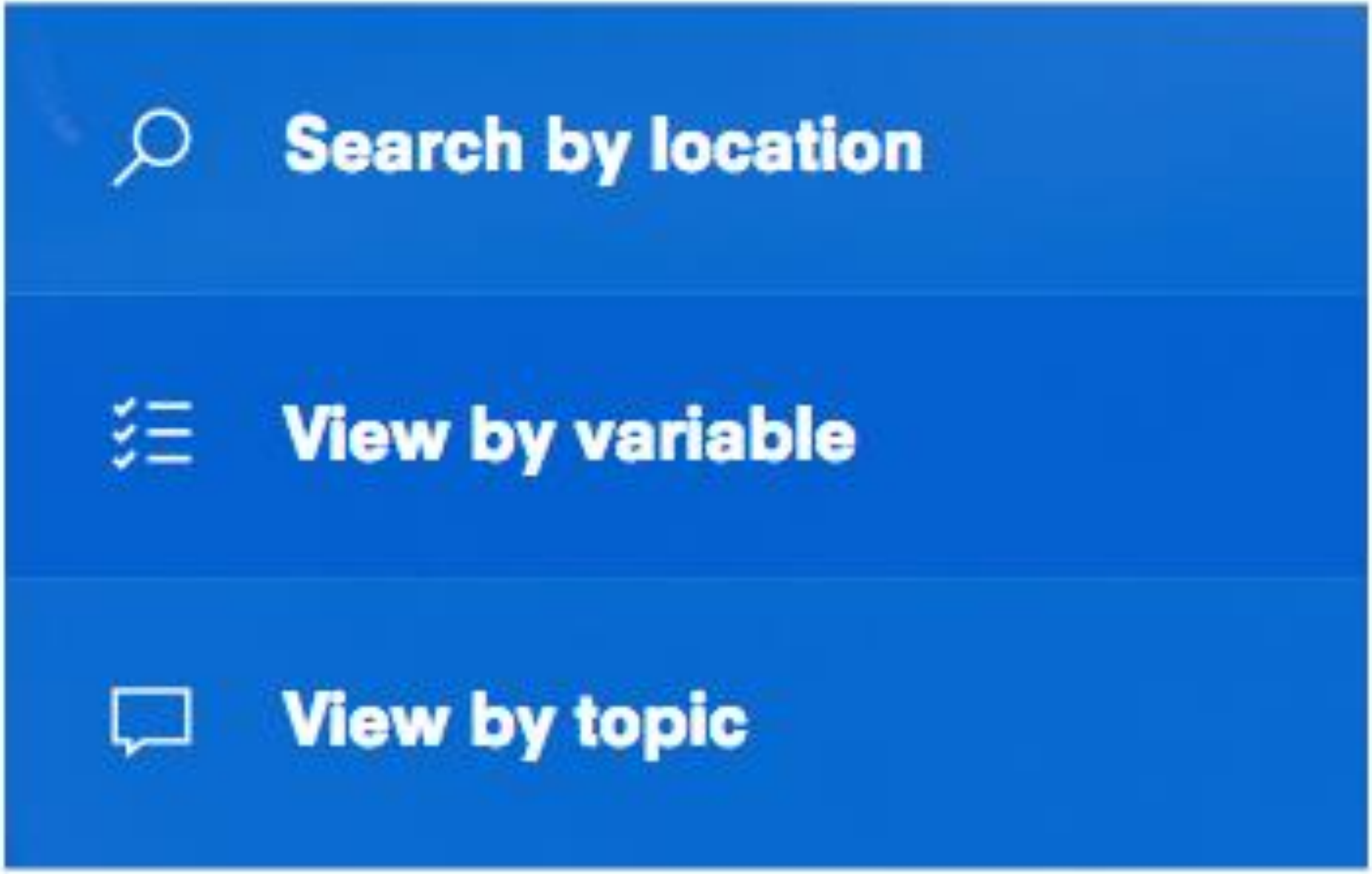
NIHHIS

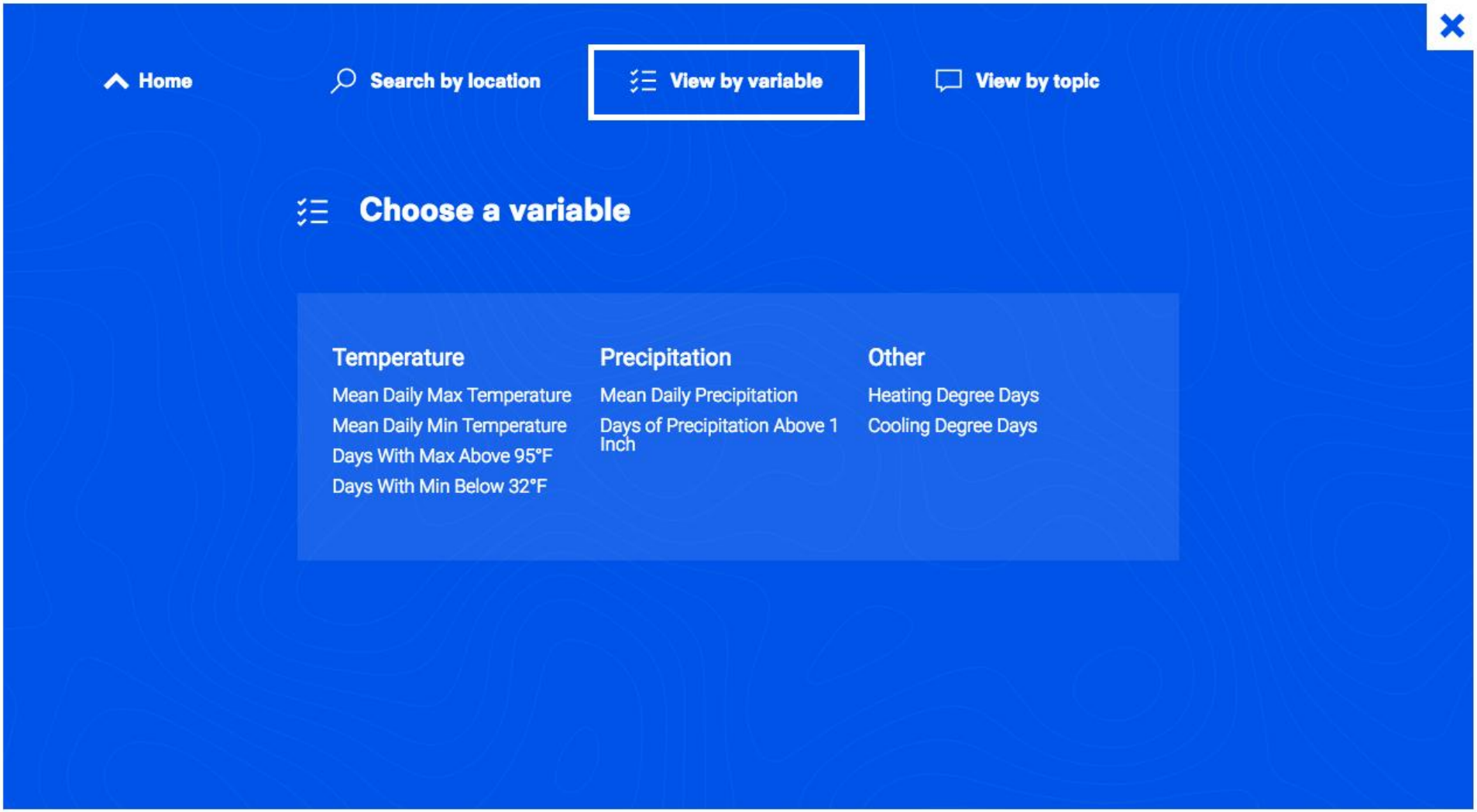
NATIONAL INTEGRATED HEAT HEALTH INFORMATION SYSTEM

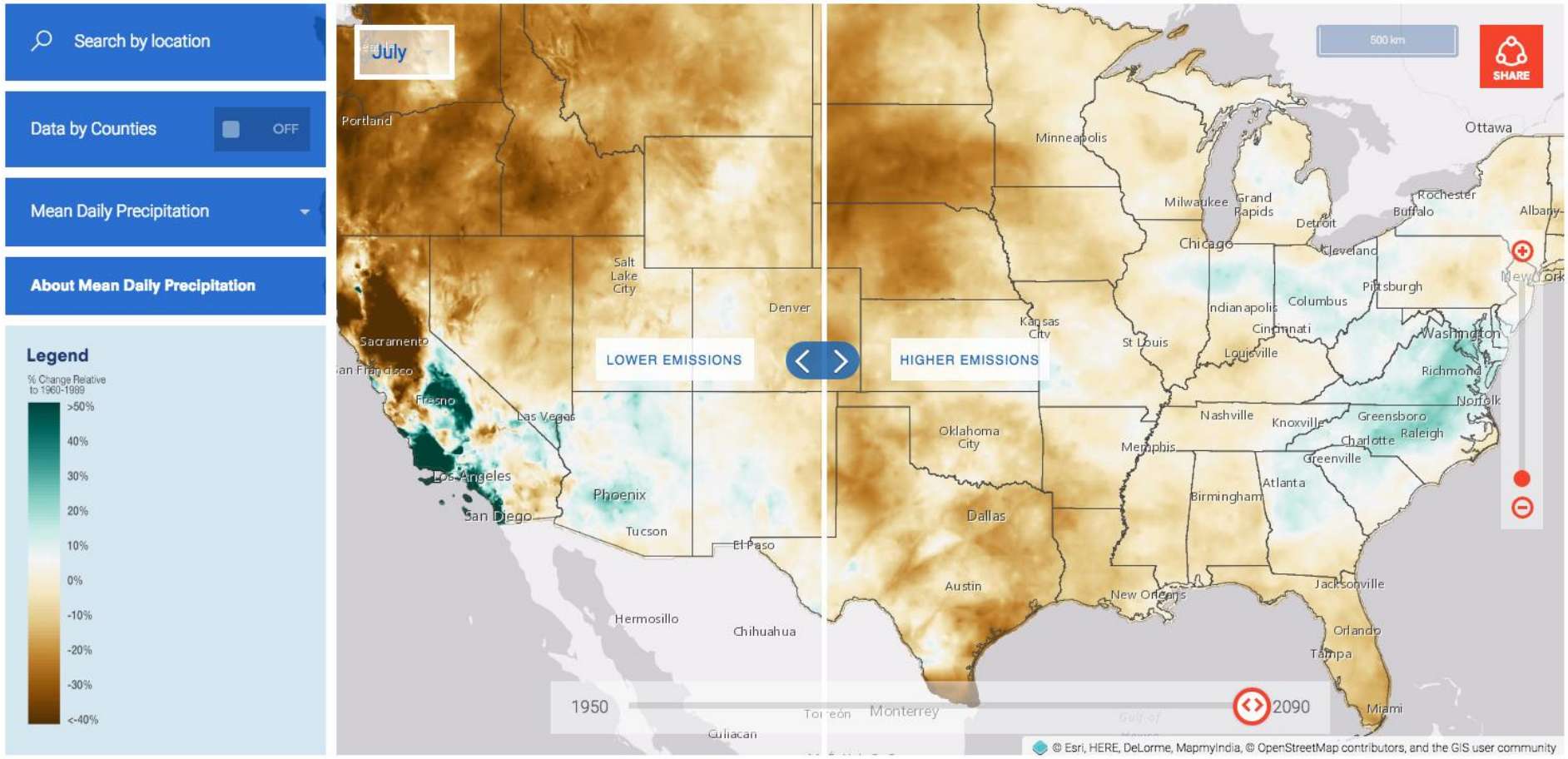
Resources tailored to addressing health risks associated with heat.

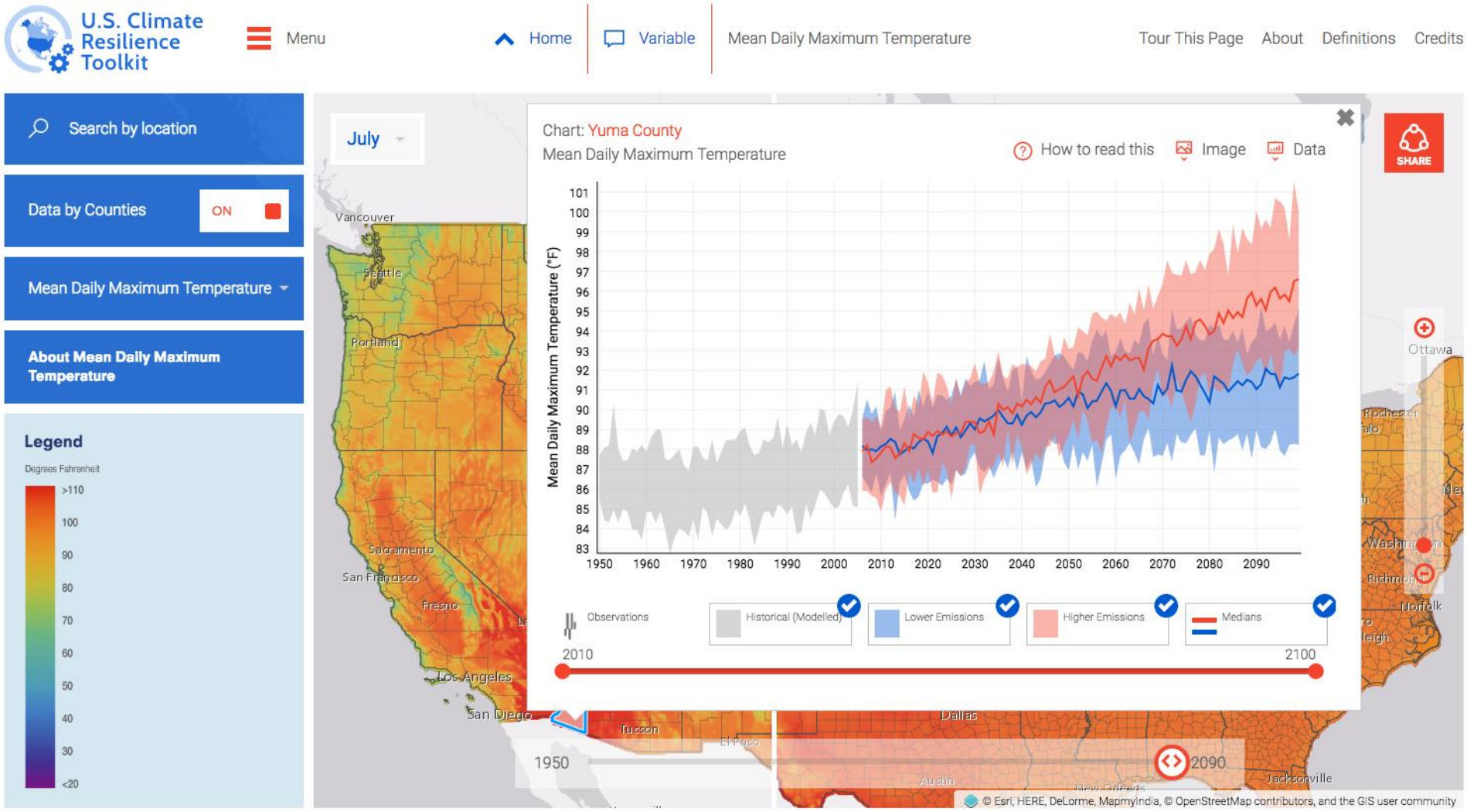


U.S. Climate Resilience Toolkit

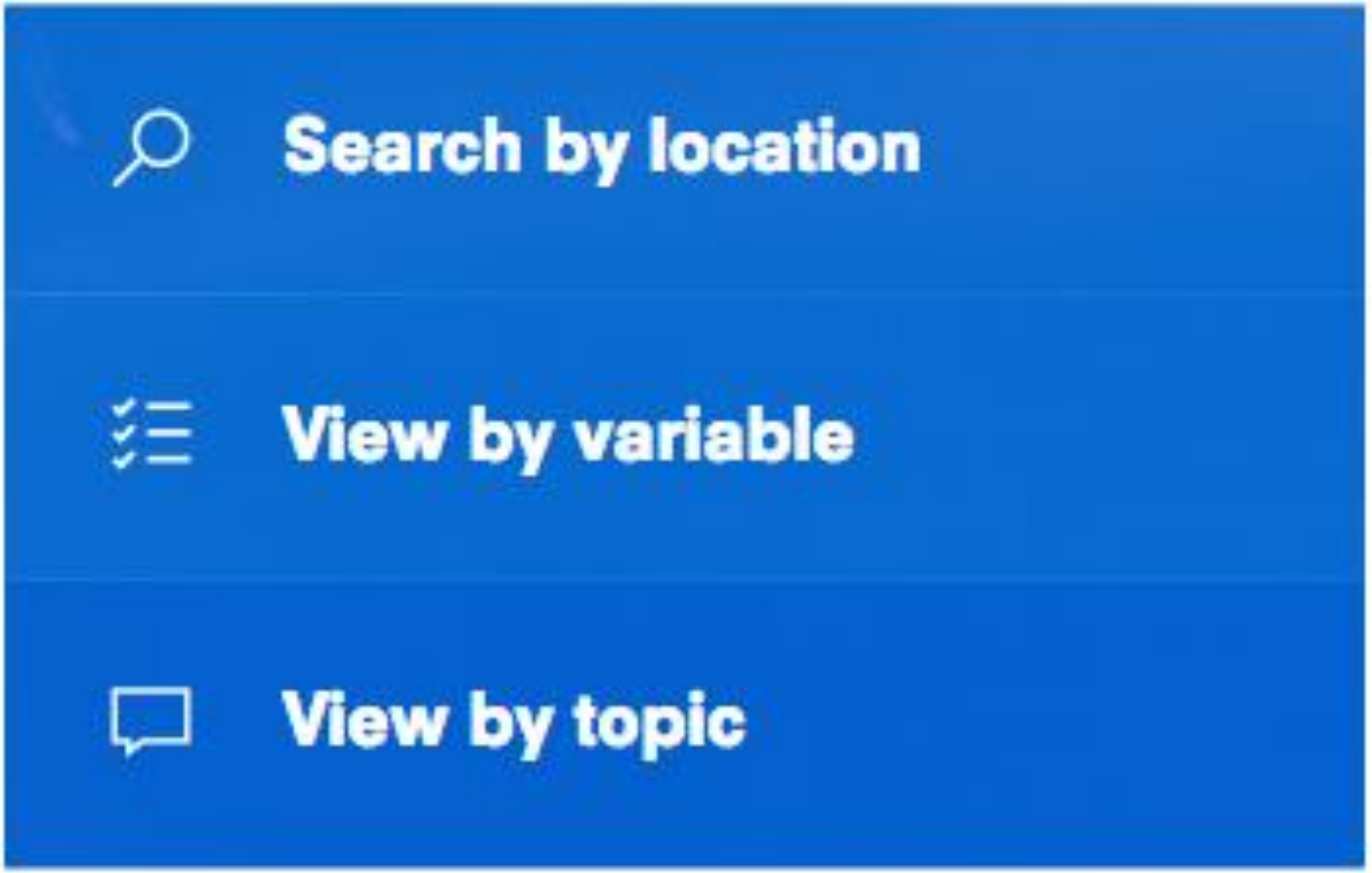


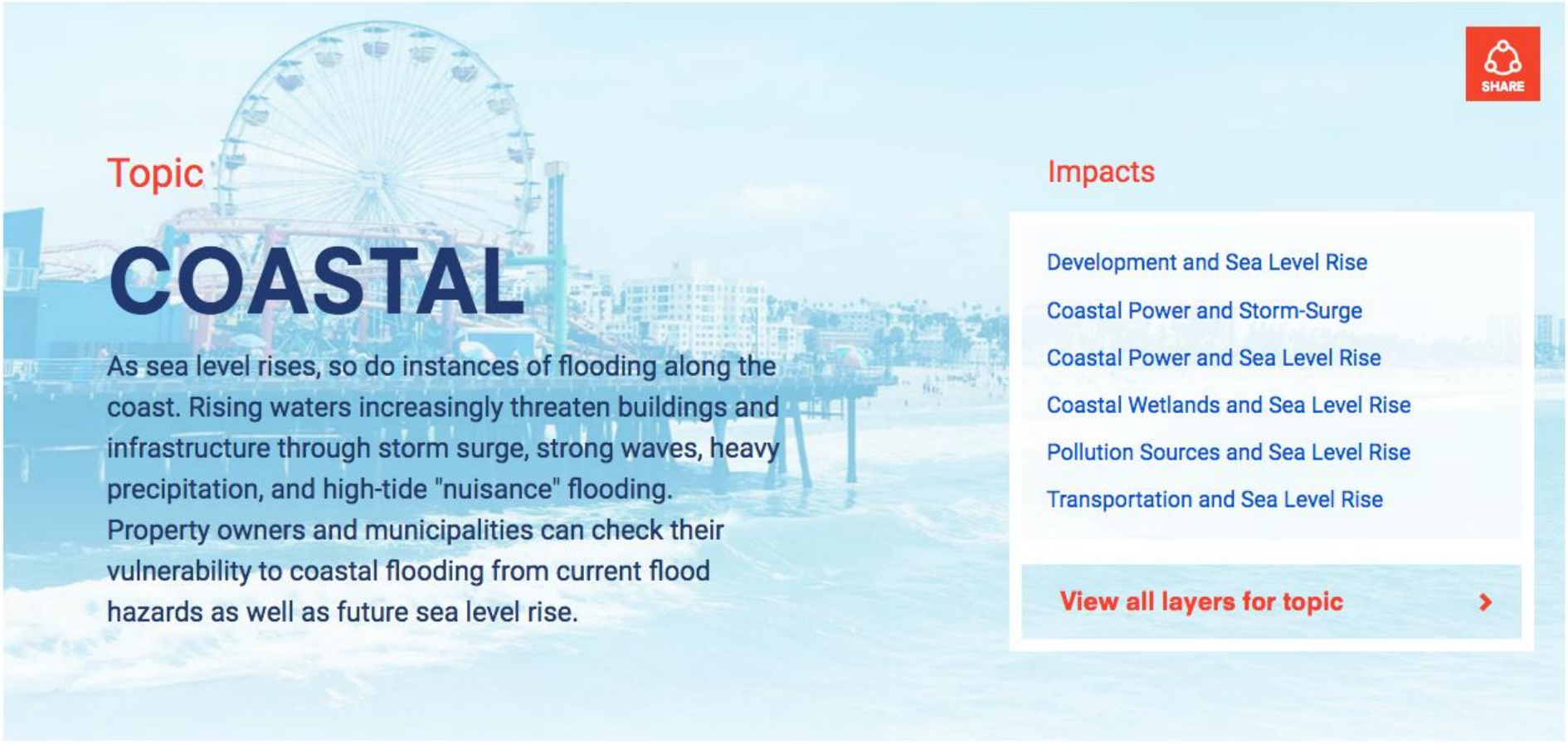



Search by location
Data by Counties
OFF
Mean Daily Precipitation
About Mean Daily Precipitation
Legend
% Change Relative to 1960-1989
>50%
40%
30%
20%
10%
0%
-10%
-20%
-30%
<-40%
July
500 km
SHARE
LOWER EMISSIONS
HIGHER EMISSIONS
1950
2090
Portland
Minneapolis
Ottawa
Milwaukee
Grand Rapids
Rochester
Buffalo
Albany
Detroit
Chicago
Cleveland
Salt Lake City
Denver
Pittsburgh
Indianapolis
Columbus
Kansas City
Cincinnati
St Louis
Louisville
Washington
Sacramento
San Francisco
Fresno
Las Vegas
Richmond
Norfolk
Nashville
Knoxville
Greensboro
Raleigh
Charlotte
Oklahoma City
Memphis
Greenville
Atlanta
Los Angeles
Phoenix
Birmingham
San Diego
Tucson
Dallas
El Paso
Austin
New Orleans
Jacksonville
Hermosillo
Chihuahua
Orlando
Tampa
Miami
Torreón
Monterrey
Culiacan
© Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community



U.S. Climate Resilience Toolkit





SHARE

Topic

COASTAL

As sea level rises, so do instances of flooding along the coast. Rising waters increasingly threaten buildings and infrastructure through storm surge, strong waves, heavy precipitation, and high-tide "nuisance" flooding. Property owners and municipalities can check their vulnerability to coastal flooding from current flood hazards as well as future sea level rise.

Impacts

- Development and Sea Level Rise
- Coastal Power and Storm-Surge
- Coastal Power and Sea Level Rise
- Coastal Wetlands and Sea Level Rise
- Pollution Sources and Sea Level Rise
- Transportation and Sea Level Rise

View all layers for topic ›

Search by location

Sea Level Rise (For 1 to 6 Feet)

Showing from 1 to 1 Feet

Development Density

Inundation from Sea Level Rise

Shallow
Water Depth
Deep
Low-Lying Areas
Area Not Mapped

Development Intensity

High
Medium
Low
Open Space

Sea Level Rise (For 1 to 6 Feet)

Layer description

View areas that will be covered by seawater during high tides after the indicated amount of local sea level rise. A few inches of water will cover the lightest blue areas; water will be deeper where the map is dark blue. Bright green areas will be below sea level, but are not connected to the ocean. Visualize changes over time by turning on progressively higher sea levels. Source

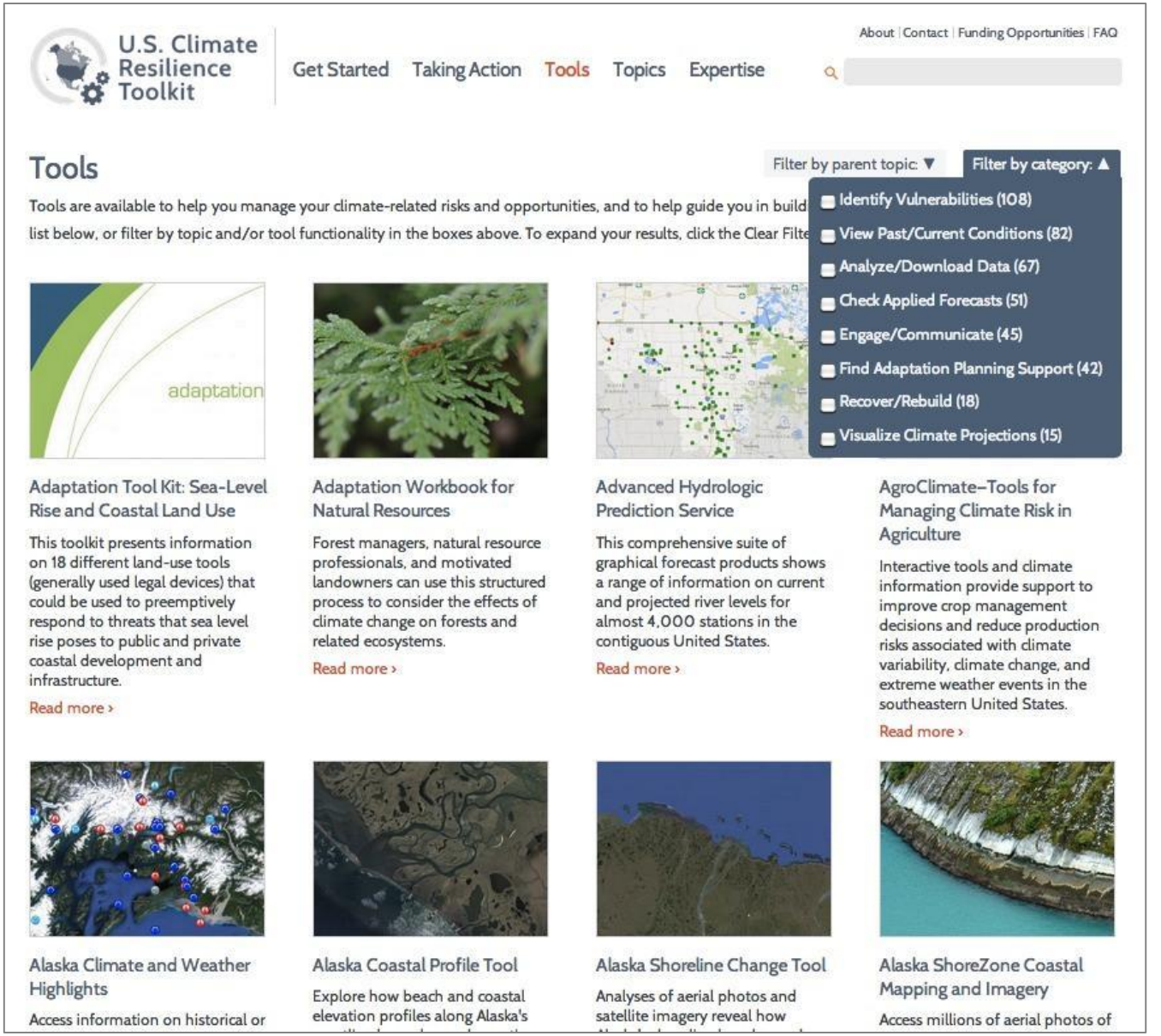
Legend

Layer opacity

Close | Next

Our main '**Tools**' page presents more than 220 science-based decision-support tools.

Users can quickly filter by parent topic of interest or by functional category, or both.



U.S. Climate Resilience Toolkit

1. Go to the CRT's **Tools** section and, using the filter functions (top right), select the following:

   Category » View Past/Current Conditions

   Category » Analyze/Download Data

1. How many tools are left? Which one(s) best match your search criteria?
2. Select "Climate At A Glance." Click to visit that website and explore its functionality.

Climate at a Glance

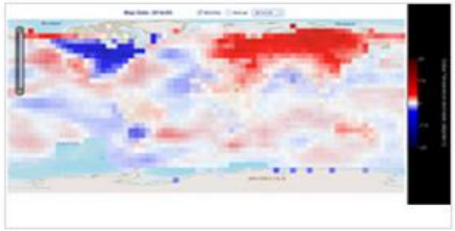
Generate graphs and maps of monthly temperature and precipitation values, ranks, and anomalies for the globe, contiguous U.S., states, climate divisions, and selected cities.

Climate at a Glance allows near-real-time analysis of monthly temperature and precipitation data across the contiguous United States. Users can request data for select cities, states, regions, and the nation as a whole to compare current conditions with the historical record. Data are available for the period 1895 to the present.

The tool is ideal for studies of climate variability and change. The tool's graphing functions allow users to determine whether, and how much, a given location or area is warming or cooling; or experiencing an overall change in precipitation. Features include:

Global temperature anomalies

Global-scale maps of monthly and yearly temperature anomalies show where it was warmer or cooler than the long-term average from 1981 to 2010. Clicking any grid cell on the map produces a bar graph of annual temperature anomalies for that cell from the time data collection began at that location through the present.



The mapping tool shows temperature anomalies calculated

URL:

http://ncdc.noaa.gov/cag/ ›

Topic:

Human Health › Extreme Heat ›

Human Health ›
Food- and Water-Related Threats ›

Transportation and Supply Chain ›
Land-Based Transportation ›

Taking Action:

Balancing Variable Water Supply With Increasing Demand in a Changing Climate ›

Documentation:

Background ›

Partners:

National Oceanic and Atmospheric Administration | National Centers for

Parameter: Cooling Degree Days

Time Scale: Year-to-Date

Month: December

Start Year: 1895

End Year: 2016

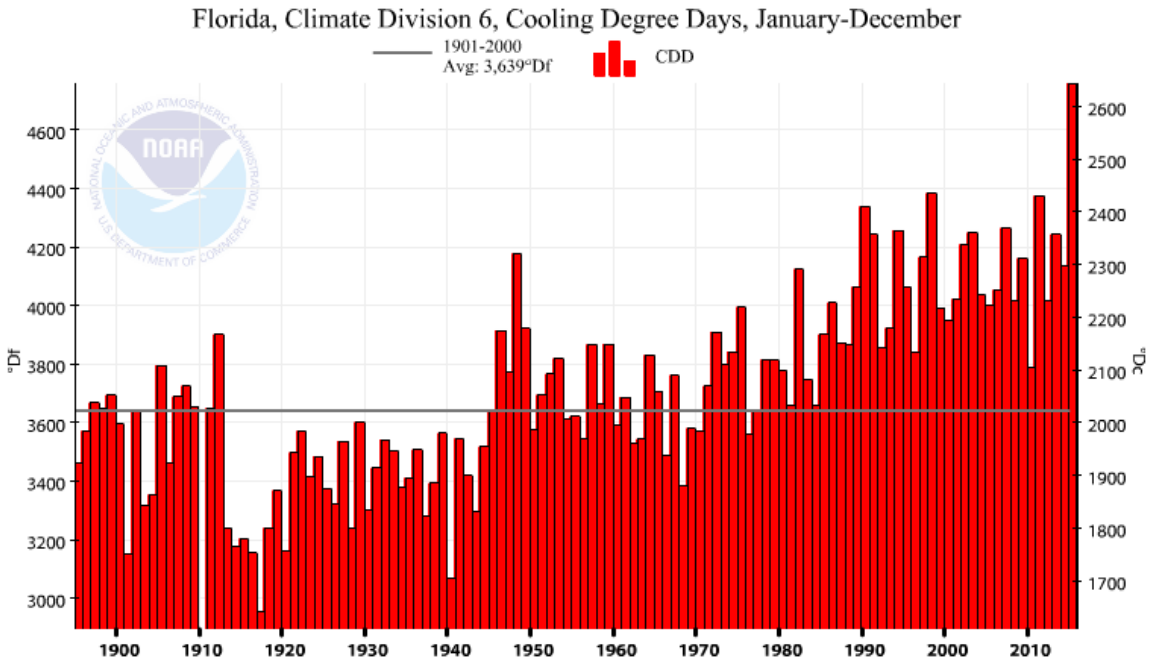
State/Region: Florida

Climate Division/City: CD 6. Lower East Coast

Plot

Options

- [x] Display Base Period
  Start: 1901 End: 2000
- [ ] Display Trend
  - (•) per Decade ( ) per Century
  Start: 1895 End: 2016
- [ ] Smoothed Time Series
  - (•) Binomial Filter ( ) LOESS



U.S. Climate Resilience Toolkit

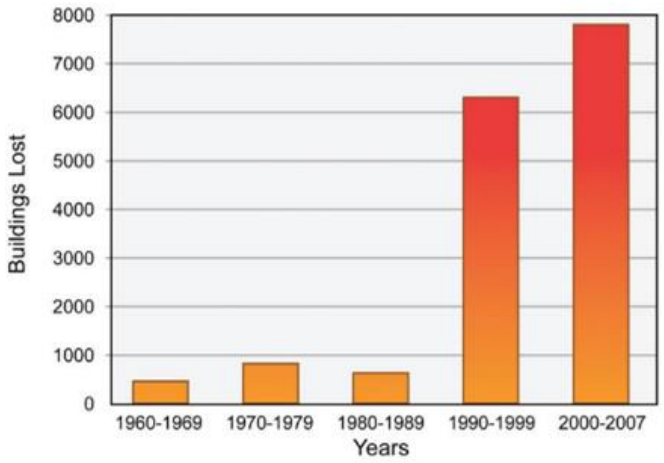
Fire Regimes

Increasing temperatures and decreasing precipitation can change the frequency and severity of fires in natural vegetation, altering the succession of plants and animals that can thrive in an area.

Wildland fire regimes are a function of the interactions between vegetation, land use, and climate. Climate change, through increasing temperatures and decreasing precipitation may result in changes to fire behavior, occurrence and severity. In the western United States, which is currently undergoing a severe drought, the fire season is already longer now than it was several decades ago, and the region experiences many more large-scale fires.

Looking to the future, the National Research Council projects that for every 1°C warming across the western United States, there will be a two- to six-fold increase in the amount of area burned by wildfire. Potential impacts of this increase include: reduced provisioning of timber supplies, large-scale release of carbon into the atmosphere, increased water scarcity, soil erosion and

Building Loss by Fires at California Wildland-Urban Interfaces



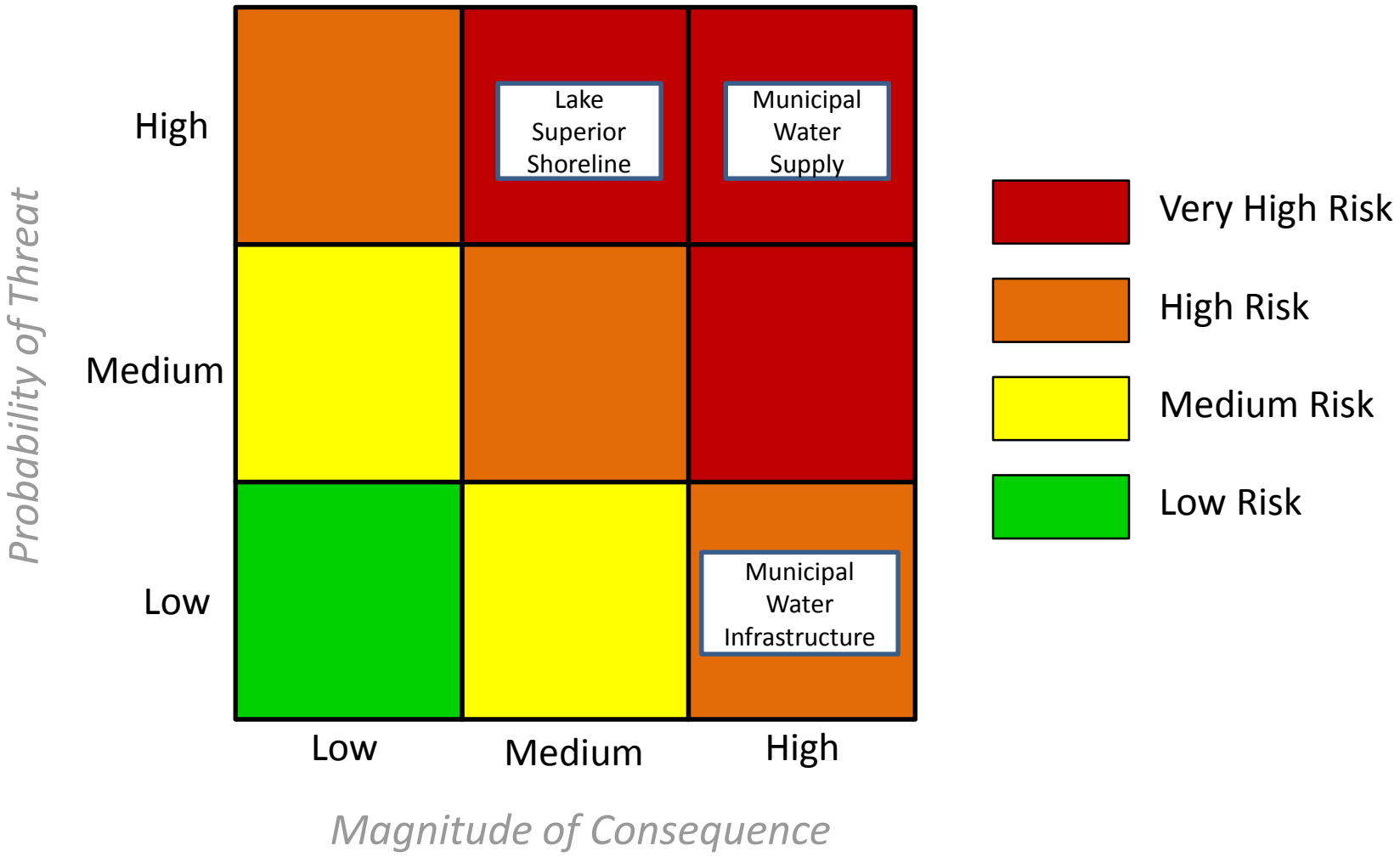
Browse Topics

- Arctic
- Built Environment
- Coasts
- Ecosystems
  - Fire Regimes
  - Water
  - Carbon Balance
  - Invasive Species
  - Biodiversity Conservation
  - Protecting and Enhancing the Resilience of Ecosystems
- Energy
- Food
- Health
- Marine
- Transportation
- Tribal Nations

U.S. Climate Resilience Toolkit

Asset	Threat	Indicator	Stressors	Projected Change	Degree of Sensitivity / Impact	Adaptive Capacity	Critical Threshold?	Vulnerability
Municipal Water Supply	Drought	Inability to meet Demand	Extended periods	increasing	varied	low	no	medium
Municipal Water Infrastructure	Extreme Cold Snaps	Frozen Water Lines, loss of drinking water	Variability	continuing	widespread	low	yes	medium
Lake Superior Shoreline	Coastal Erosion	Road Closure	Lake Level fluctuation	continuing	widespread			high
Lake Superior Recreation	Coastal Erosion	Beach Loss						
Sands Plain Aquifer	Declining Levels	Dry wells, inland lake level decline	Climate – drought, non-climate, users	increasing	high	low	yes	high
Forested Ecosystems	Drought	Loss of species	Increased temp, invasive species					low
Forested Ecosystems	Urbaniz-ation	Loss of forest cover	Disease	increasing	moderate	low		low

Risk = Probability x Consequence



U.S. Climate Resilience Toolkit

U.S. Climate Resilience Toolkit

Case Studies

Clear Filters | Filter by climate threat/stressor: ▼ | Filter by topic: ▼ | Filter by steps to resilience: ▼ | Filter by region: ▼

Communities and businesses are taking action to reduce their vulnerability to climate-related impacts and to build resilience to extreme events. The stories below illustrate the application of the process and tools featured in this Toolkit. Browse the stories, or filter by topic, step to resilience, and/or region in the boxes above. To expand your results, click the Clear Filters link.

Partnerships Promote Healthy Forests and Clean Water

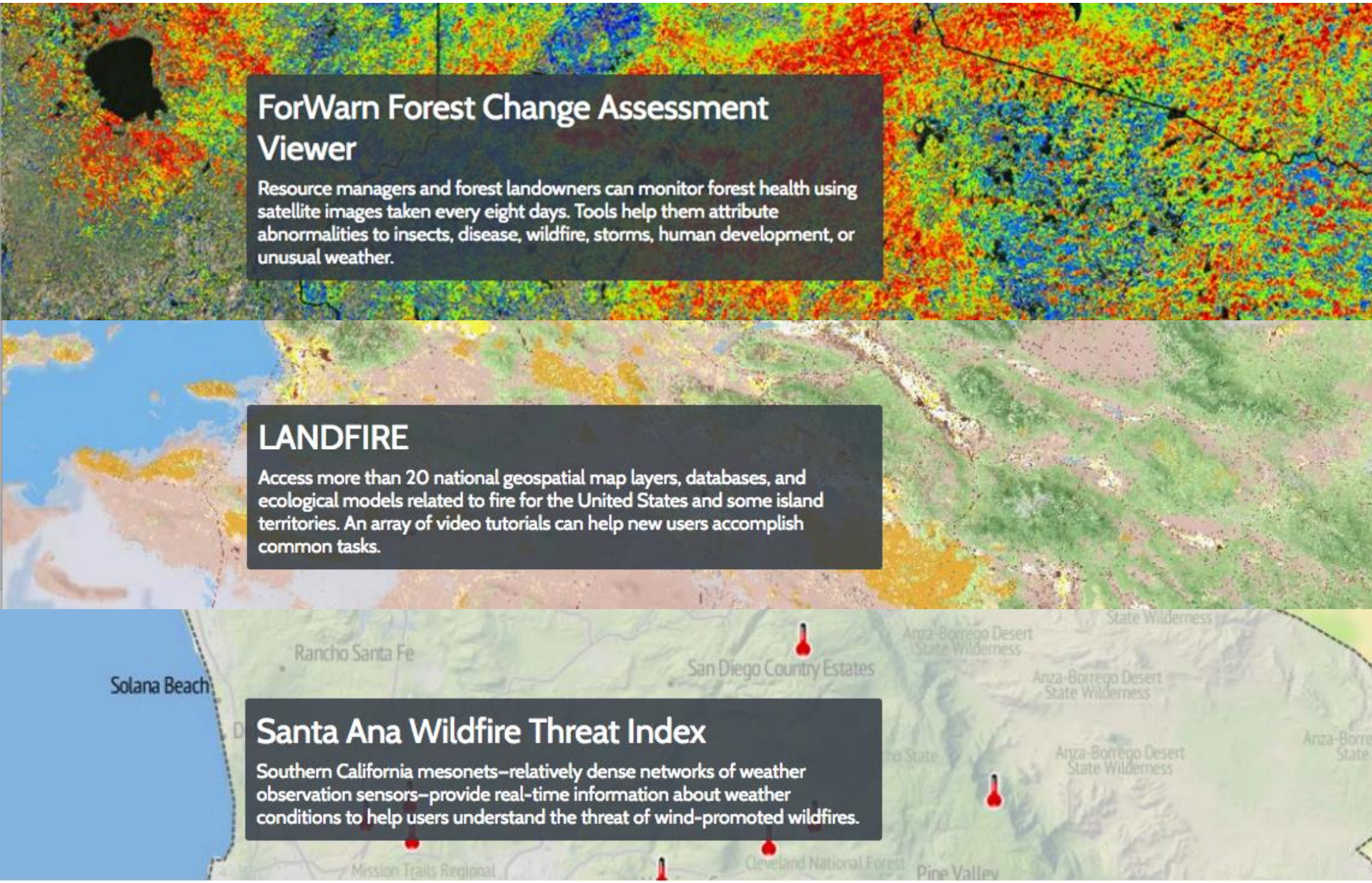
Two major fires and subsequent flooding events wreaked havoc on a

Health Care Facilities Maintain Indoor Air Quality Through Smoke and Wildfires

When smoke from wildfires swirls around health care facilities,

Watching for Wind: An Effort to Get the Upper Hand on Wildfire

After Santa Ana winds contributed to devastating wildfires in 2007,



ForWarn Forest Change Assessment Viewer

Resource managers and forest landowners can monitor forest health using satellite images taken every eight days. Tools help them attribute abnormalities to insects, disease, wildfire, storms, human development, or unusual weather.

LANDFIRE

Access more than 20 national geospatial map layers, databases, and ecological models related to fire for the United States and some island territories. An array of video tutorials can help new users accomplish common tasks.

Santa Ana Wildfire Threat Index

Southern California mesonets–relatively dense networks of weather observation sensors–provide real-time information about weather conditions to help users understand the threat of wind-promoted wildfires.

FORECAST REPORT

Forecast issued at: 05:06 AM **on** 09/02/2016
Valid for: 09/02/2016

Area	Threat Level
Zone 4: Santa Barbara	NO RATING

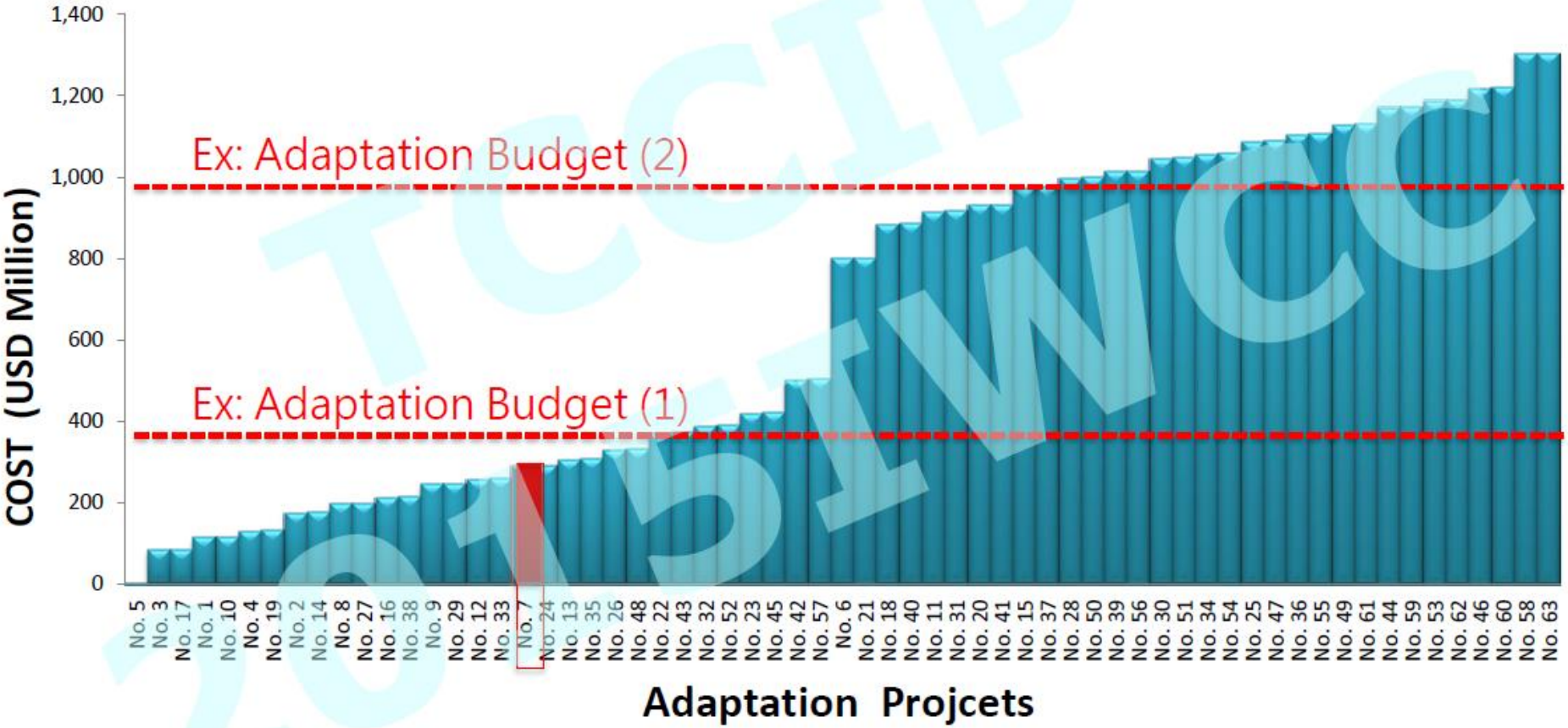
Event Description
Santa Ana winds are either not expected, or will not contribute to significant fire activity.

Recommended Action(s)
Make sure that your emergency preparedness kit is in order. An emergency can happen at any time. For additional information visit: www.sbsheriff.org www.preventwildfireca.org

LEGEND

- **NO RATING:** Santa Ana winds are either not expected, *or* will not contribute to significant fire activity.
- **MARGINAL:** Upon ignition, fires *may* grow rapidly.
- **MODERATE:** Upon ignition, fires *will* grow rapidly and *will* be difficult to control.
- **HIGH:** Upon ignition, fires will grow *very* rapidly, will burn intensely, and will be *very* difficult to control
- **EXTREME:** Upon ignition, fires will have extreme growth, will burn *very* intensely, and will be uncontrollable.
- **Active fire**
- **Inactive fire**
- **Weather observations**

U.S. Climate Resilience Toolkit

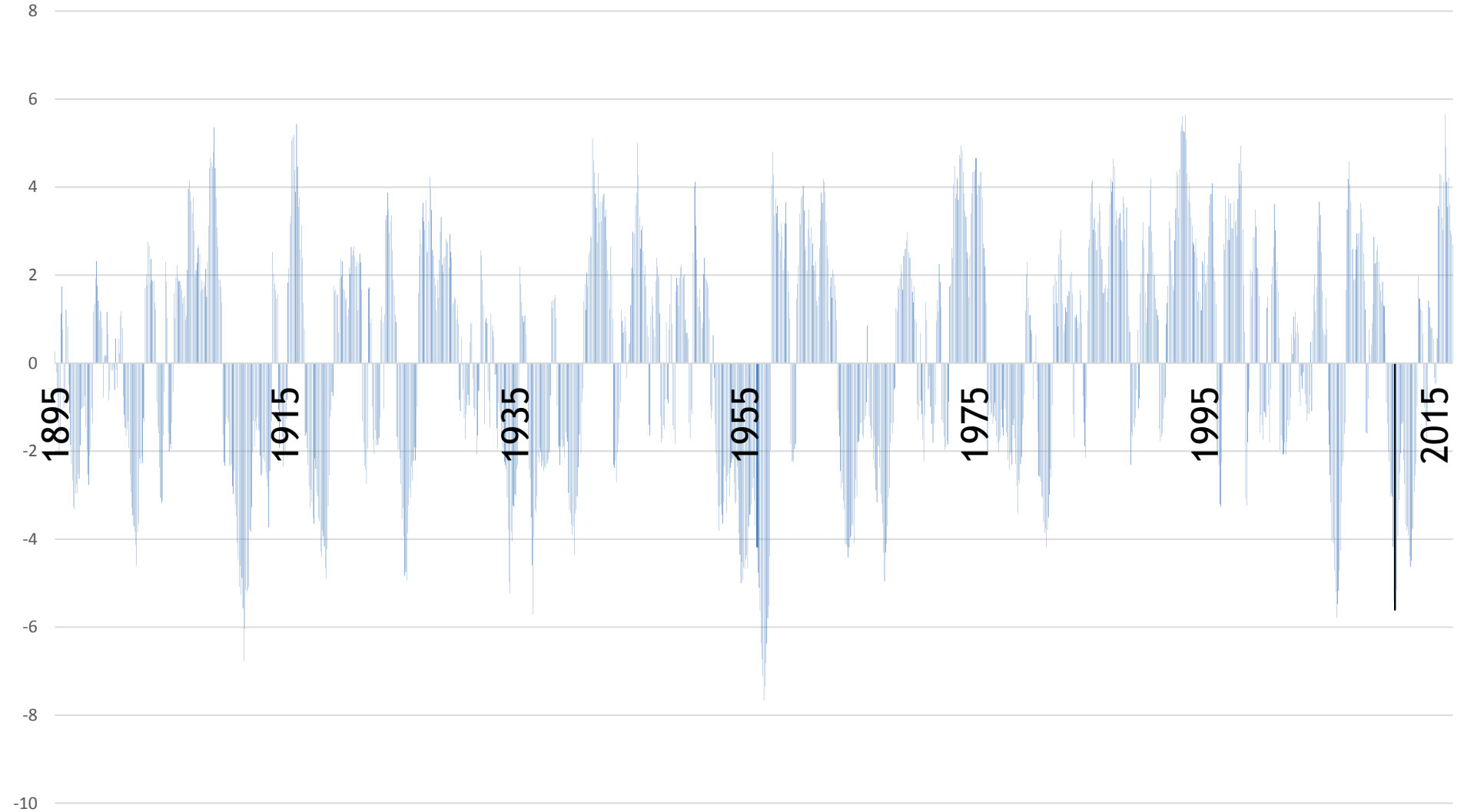


U.S. Climate Resilience Toolkit

1. Go to the site's Topics section
2. Select a Topic and sub-topic of interest
3. Note the right-hand navigation items. Identify:
   a) one case study that interests you
   b) one tool that might be helpful to you

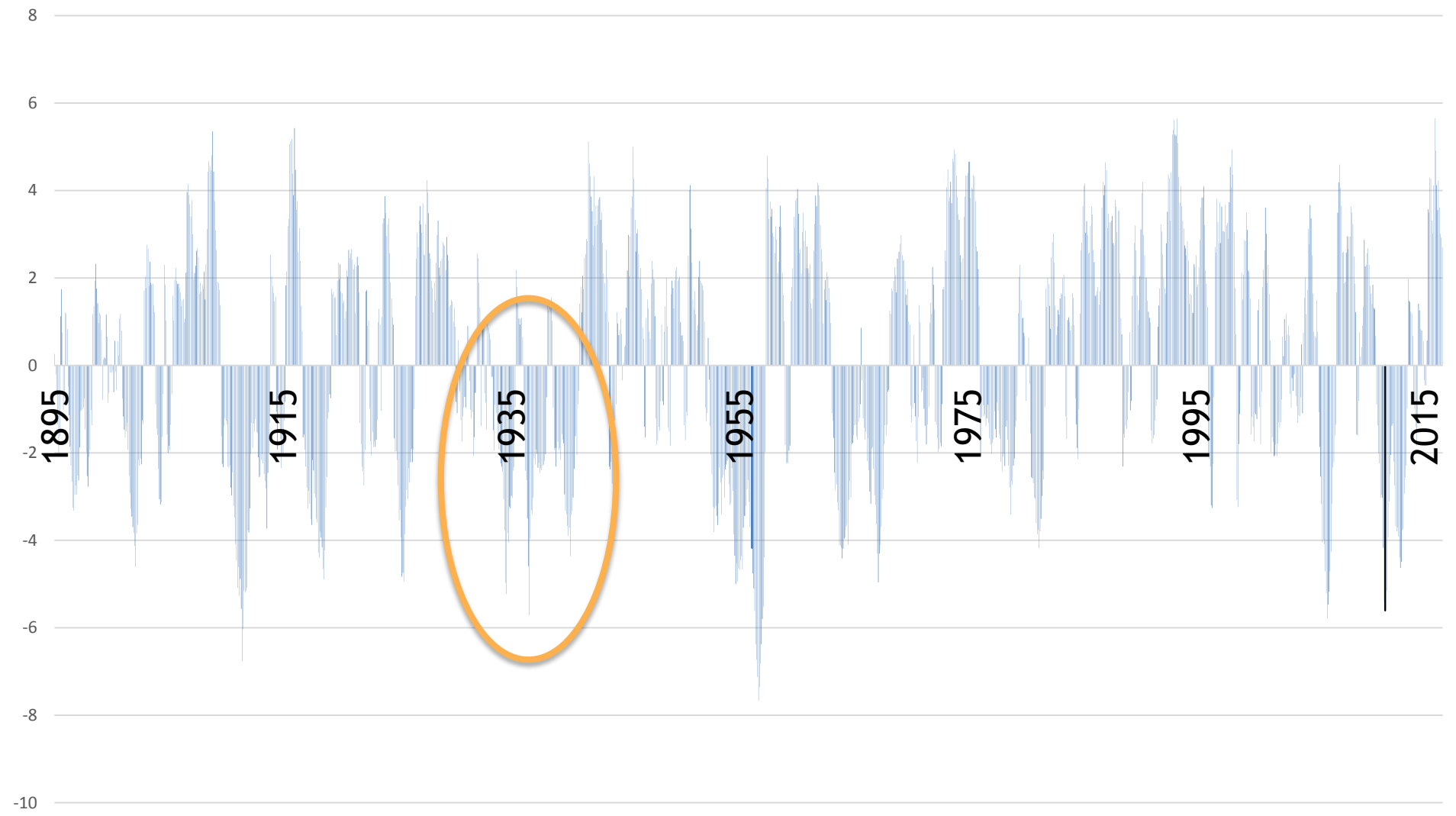
A farmer and his two sons during a dust storm
in Cimarron County, Oklahoma, 1936.
Photo: Arthur Rothstein

Palmer Hydrologic Drought Index

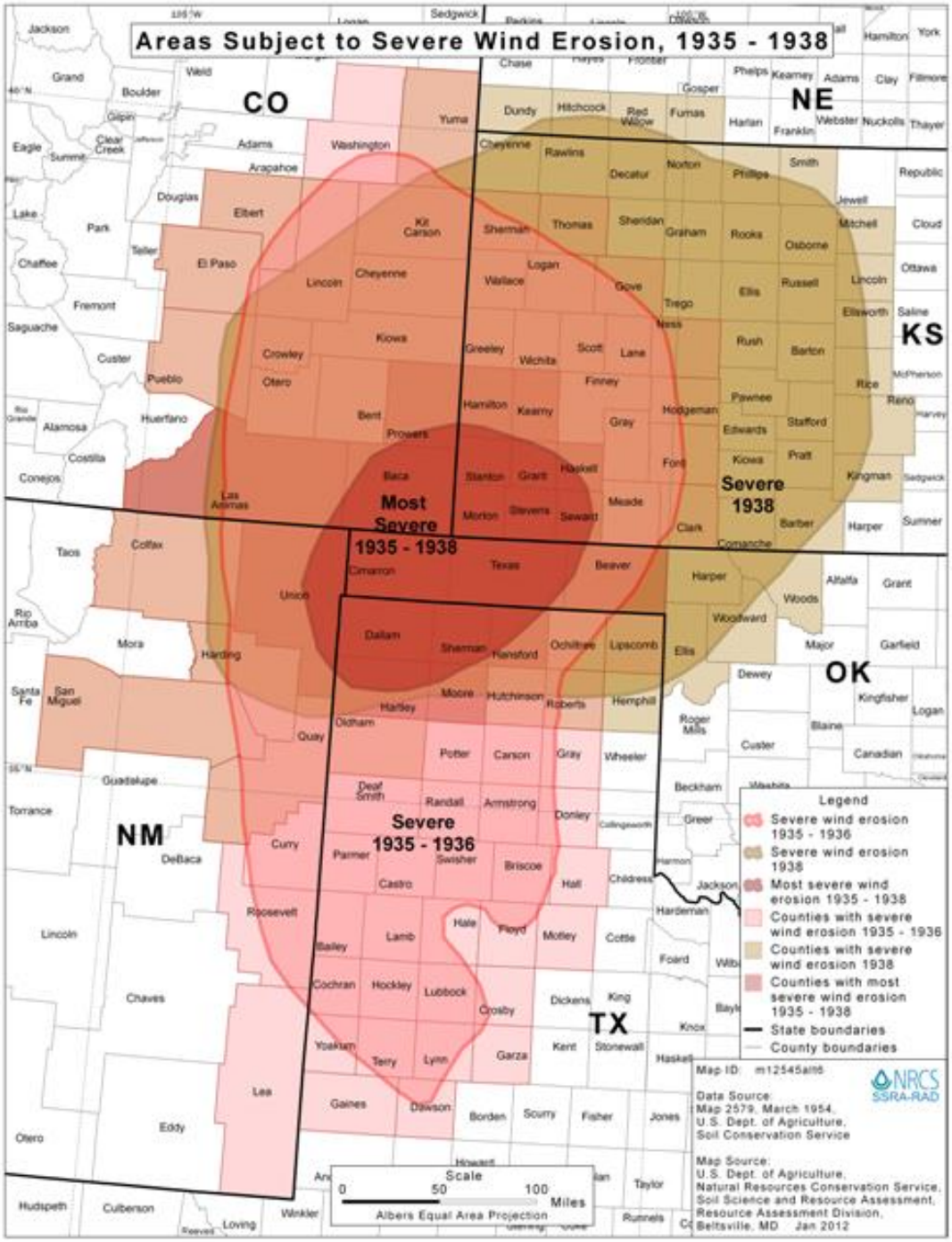


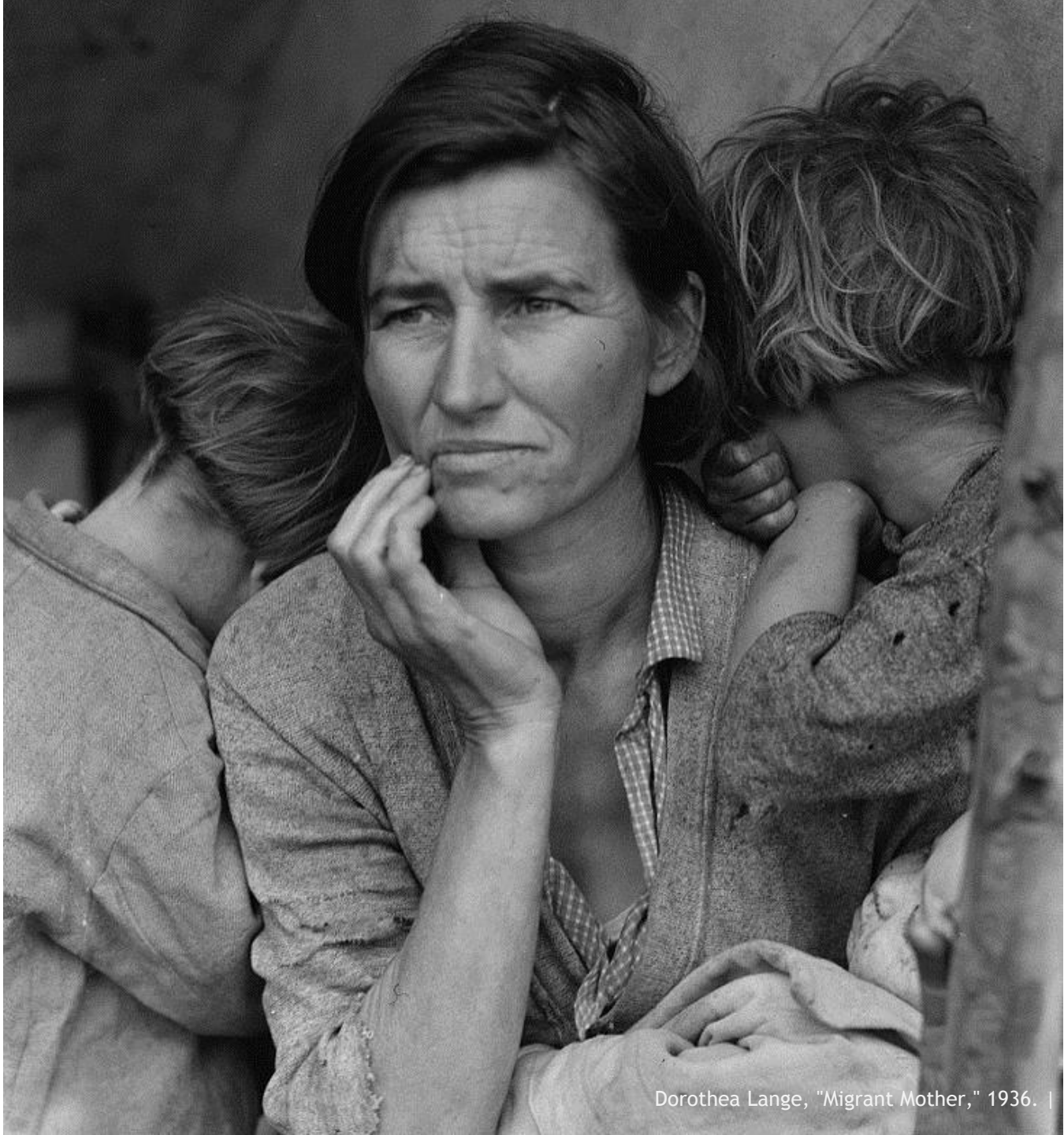
U.S. Climate Resilience Toolkit

Palmer Hydrologic Drought Index



U.S. Climate Resilience Toolkit





Dorothea Lange, "Migrant Mother," 1936. |

U.S. Climate Resilience Toolkit

Soils

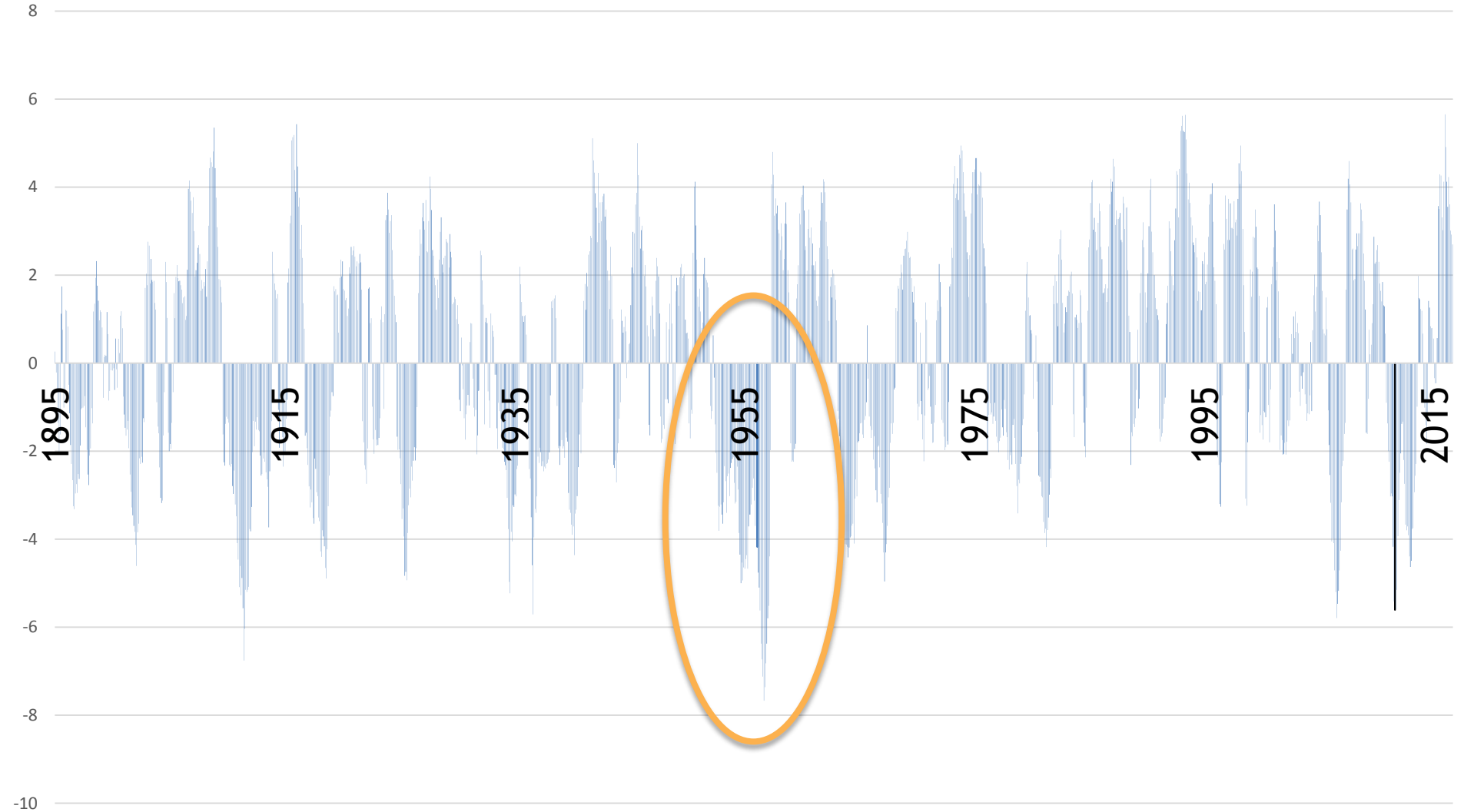
Soil Health

Related Links

- Get Started with NRCS
- Cover Crop Plant Guides
- Cover Crop Topic Room (SARE)
- La Salud de los Suelos en Español
- Core Practices Soil Health Checklist
- USDA Service Center Locator
- Korean -language Soil Health Fact Sheets

Soil Health

Palmer Hydrologic Drought Index



U.S. Climate Resilience Toolkit

U.S. Climate Resilience Toolkit

U.S. Climate Resilience Toolkit

Steps to Resilience | Case Studies | Tools | Topics | Expertise

Search

Welcome to the new Climate Resilience Toolkit. We've redesigned our site with your web experience in mind.

Meet the Challenges of a Changing Climate

Find a framework and tools to understand and address climate issues that impact people and their communities.

SEE WHAT OTHERS ARE DOING ›

BUILD YOUR RESILIENCE TO CLIMATE IMPACTS ›

EXPLORE CLIMATE IN YOUR LOCATION ›

EXPLORE THE TOOLKIT ∨