

WHAT DOES THE SCIENCE TELL US? THE THIRD U.S. NATIONAL ASSESSMENT (2013)

Ellen L. Mecray

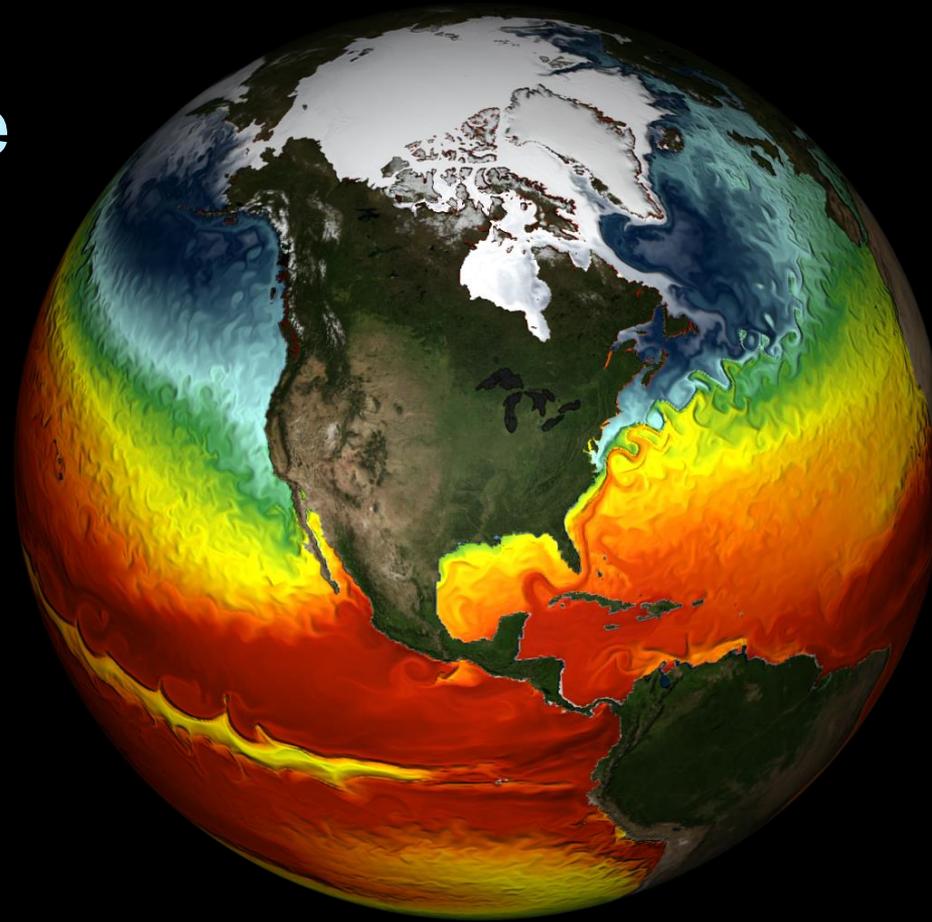
NOAA Regional Climate Services Director, Eastern
Region
Taunton, MA

Regions of the US National Climate Assessment



What we Observe: Climate changes and impacts

- Extreme precipitation and storm events (timing, level)
- Decreased air quality, incl wildfires
- Increases in harmful algal blooms
- Increases in illnesses from pests incl mosquitos and ticks
- Social and economic impacts, incl mental health



GFDL CM2.4
climate model
SSTs

What We Know: An Overview of 3 Climate Science Questions



Is the planet's climate changing
in significant ways?

[DETECTION]



If so, what is causing it to
change? (people, natural, both?)

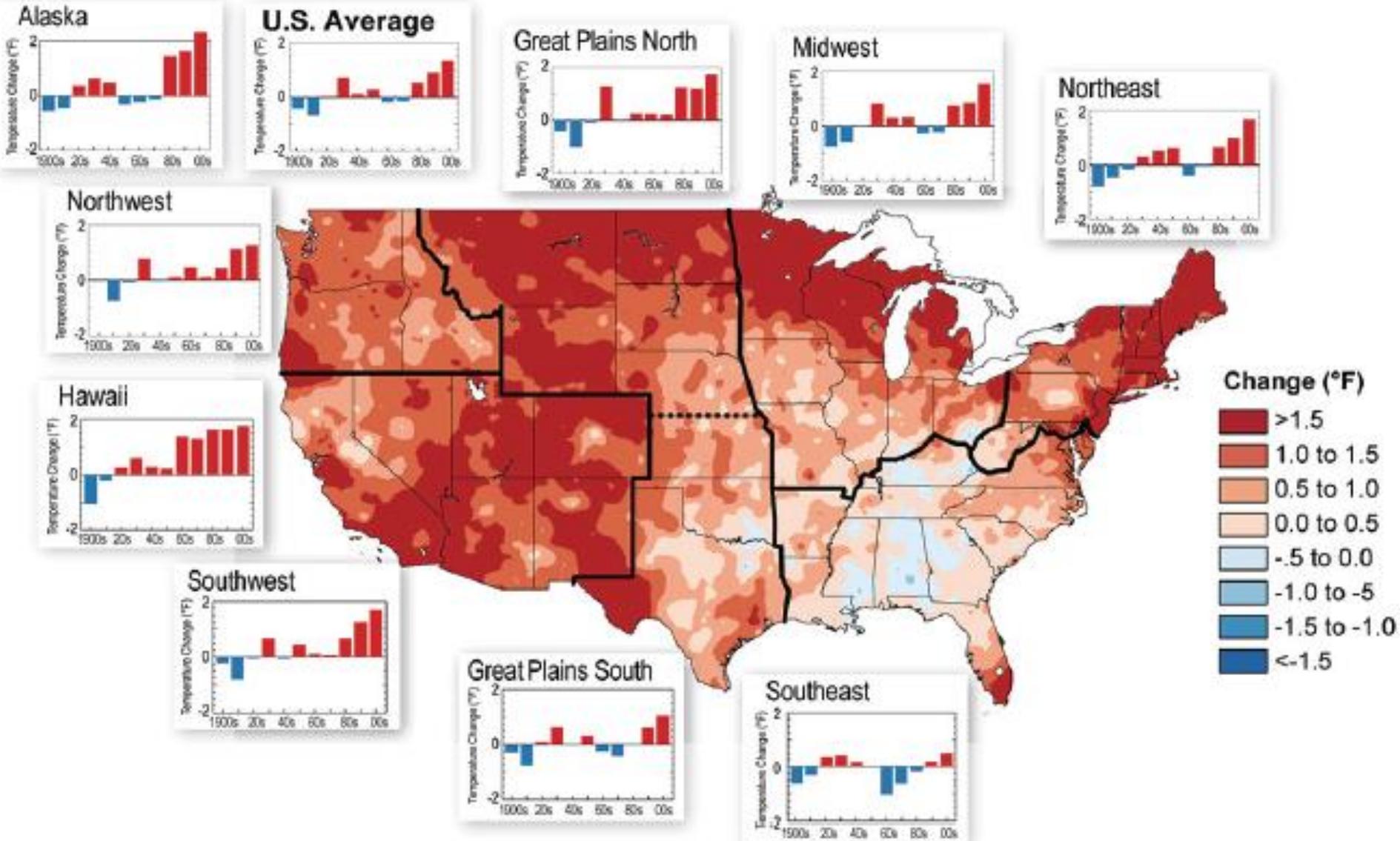
[ATTRIBUTION]



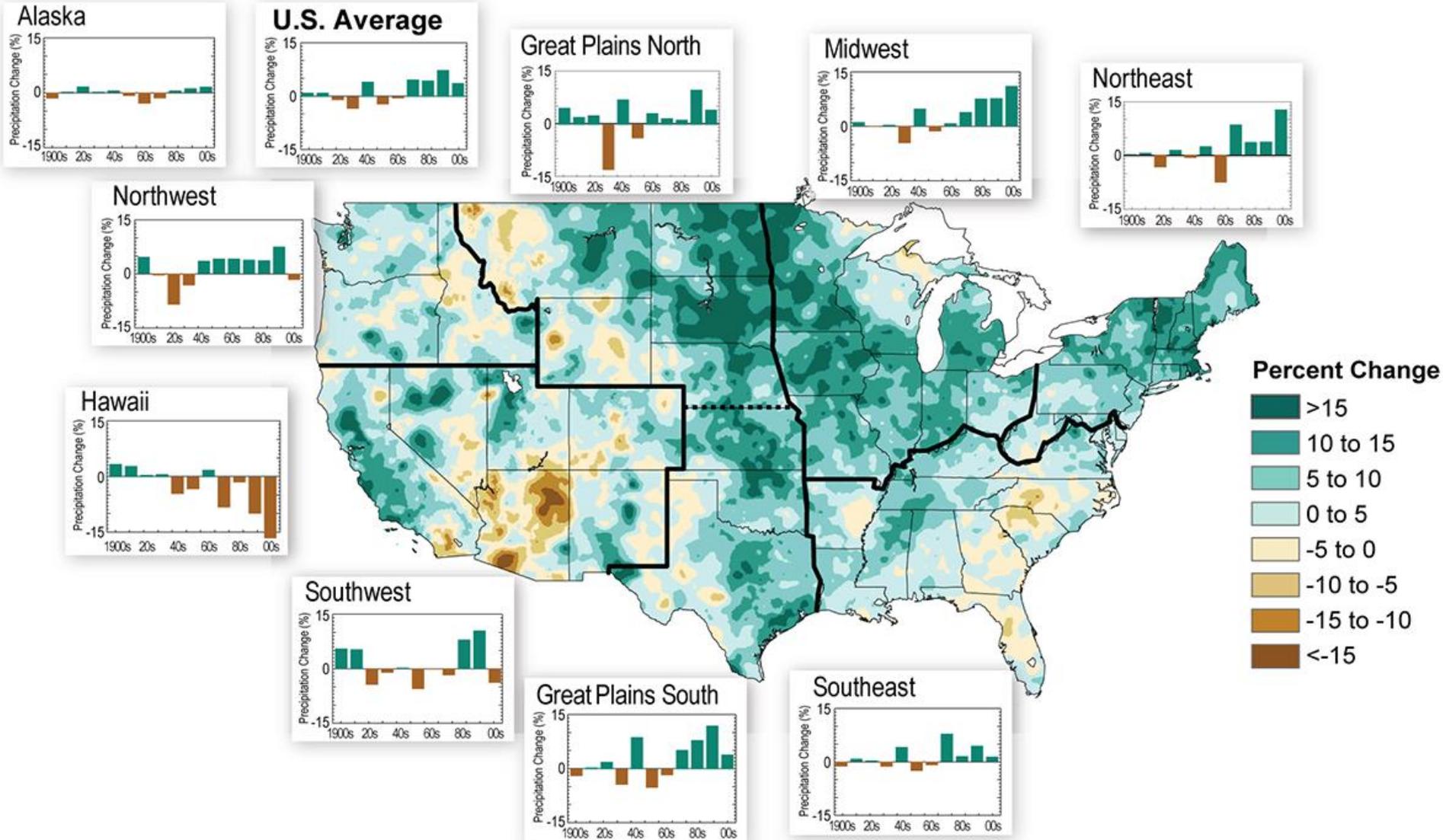
How might the Earth's climate
change in 10 or 100 years?

[PROJECTION]

Trends in U.S. Temperature: Decadal trends and 1991-2011 relative to 1901-1960

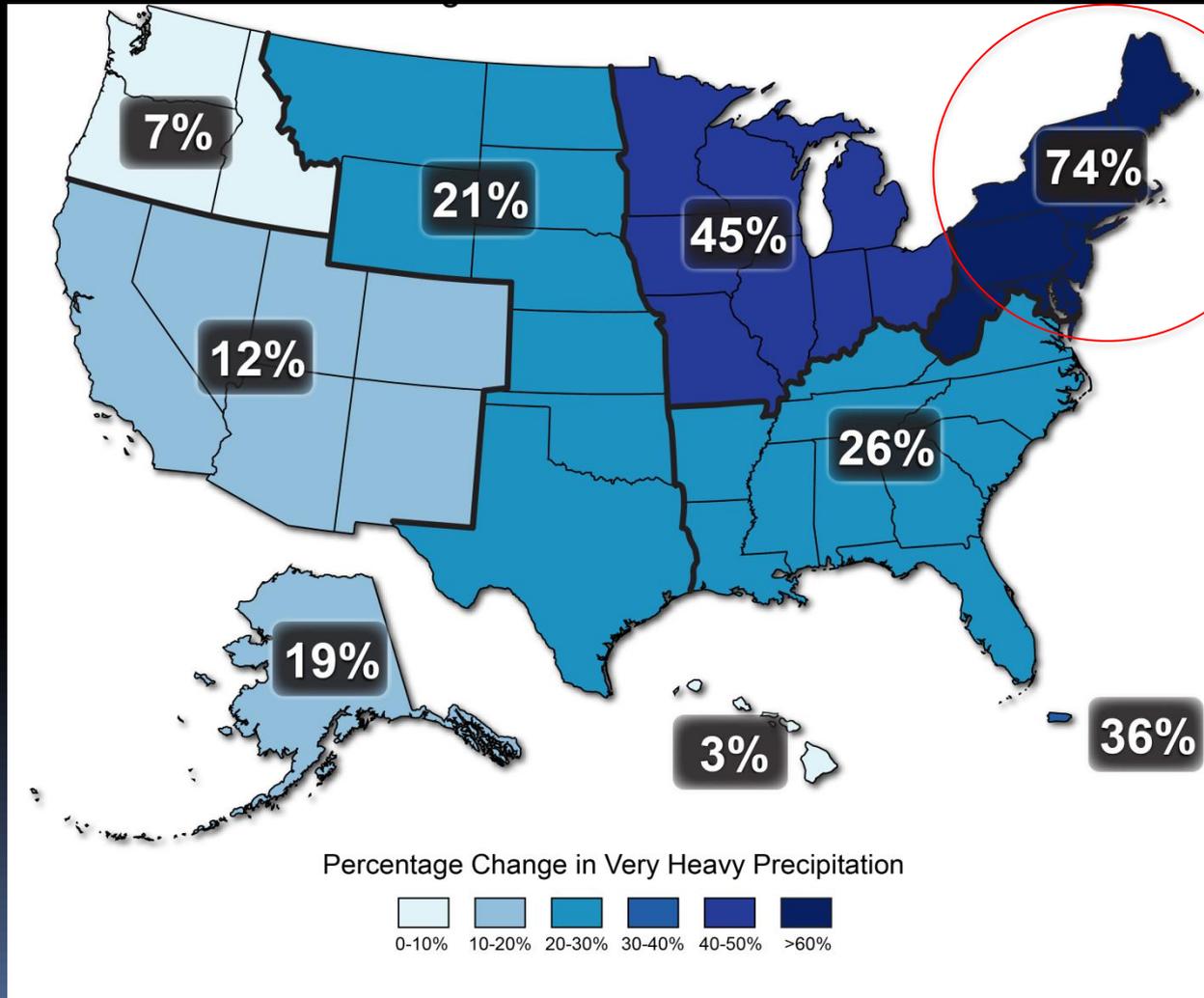


Trends in U.S. Precipitation: Decadal trends and 1991-2011 relative to 1901-1960



Change in Heavy Rainfall Events

*U.S. Increase in the amount falling in very heavy rain events**

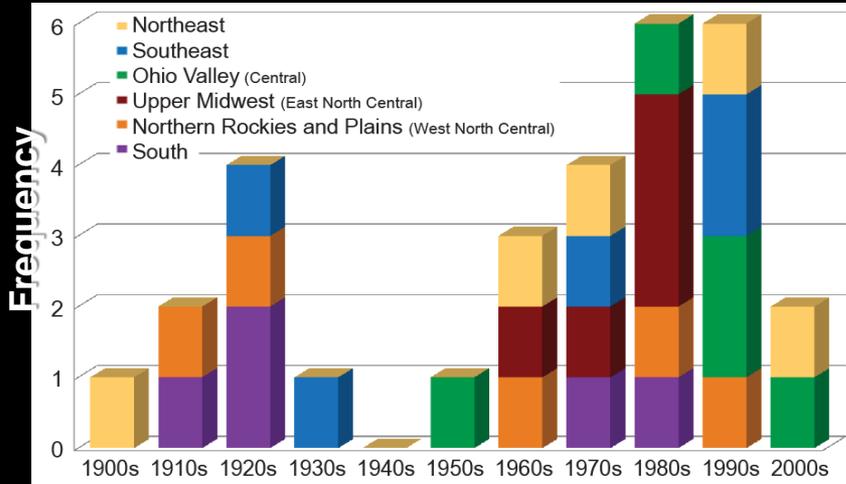


2009 Report
for the
Northeast:
67% increase
relative to
1958 to 2007

* Defined as the
heaviest 1 percent
of all daily events
from 1958 to 2010

Extreme Snowstorms

Most severe storms for each of the six climate regions from 1900 to 2010



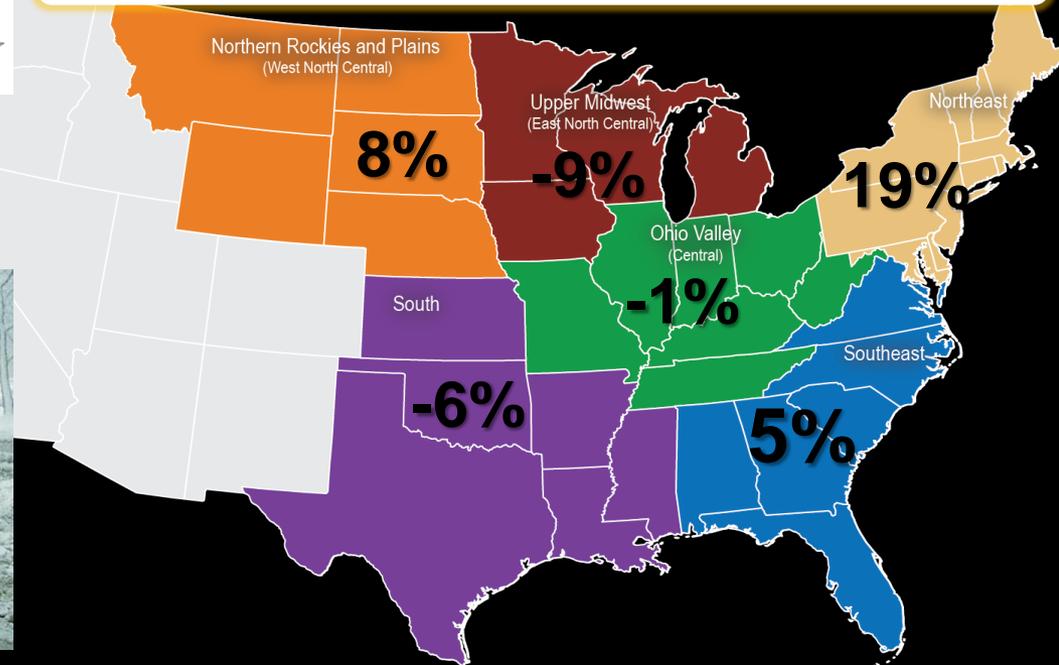
Number of extreme snowstorms occurring each decade within the six U.S. climate regions in the eastern two-thirds of the contiguous U.S.



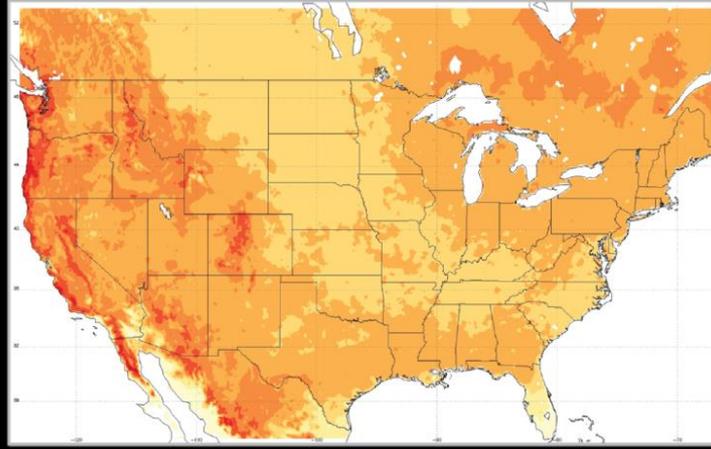
Temperature Anomalies During Season of Extreme Events

- Every region had two of the five storms of record occurring during seasons with above average temperatures

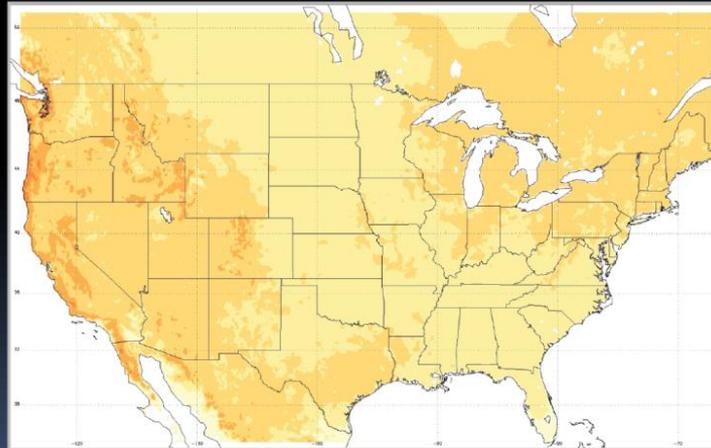
Precipitation Anomalies During Season of Extreme Events



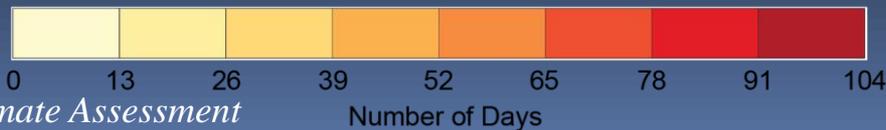
PROJECTED CHANGES IN FROST-FREE SEASON LENGTH 2081-2100 COMPARED TO 1971-2000



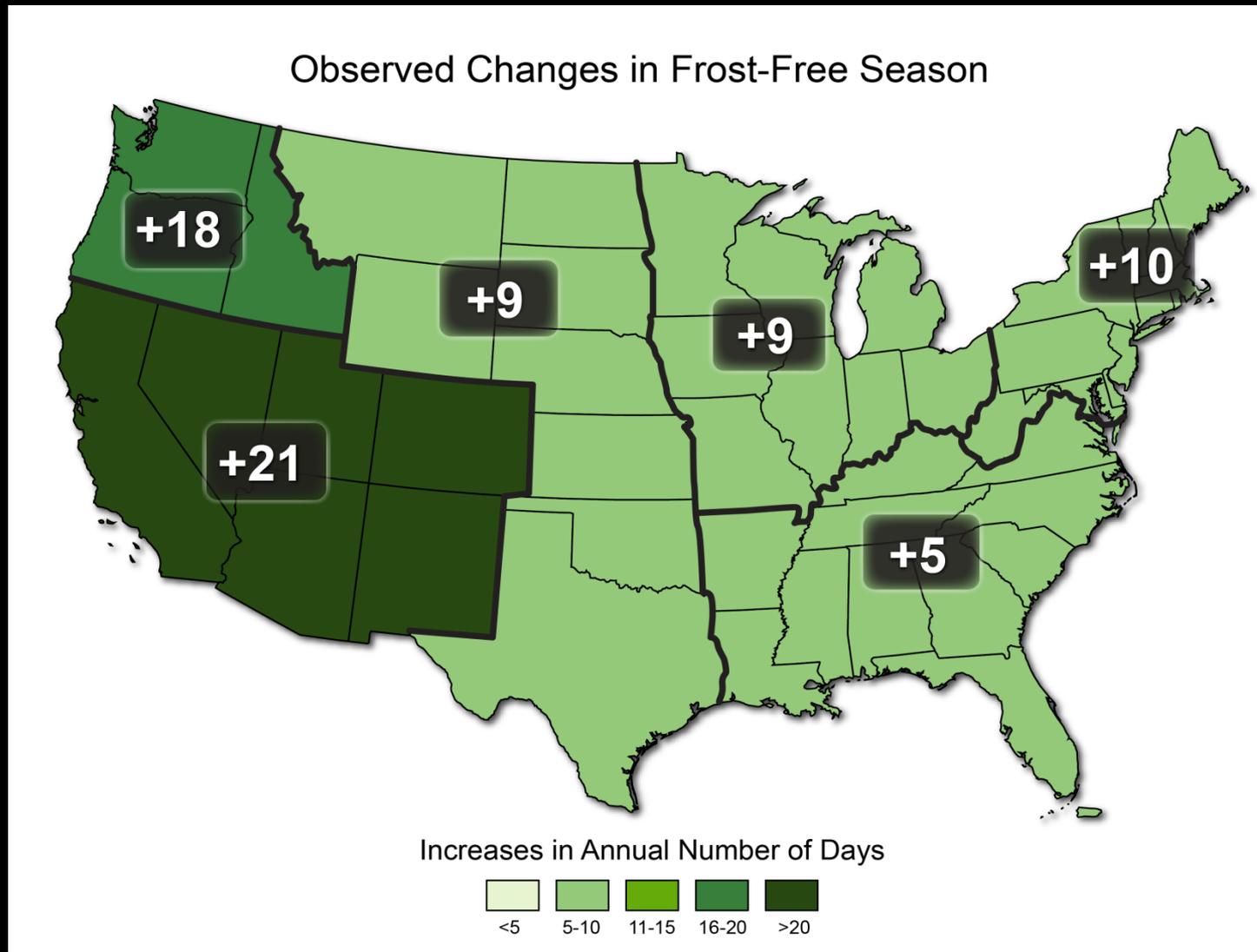
**Higher
emissions**



**Lower
emissions**



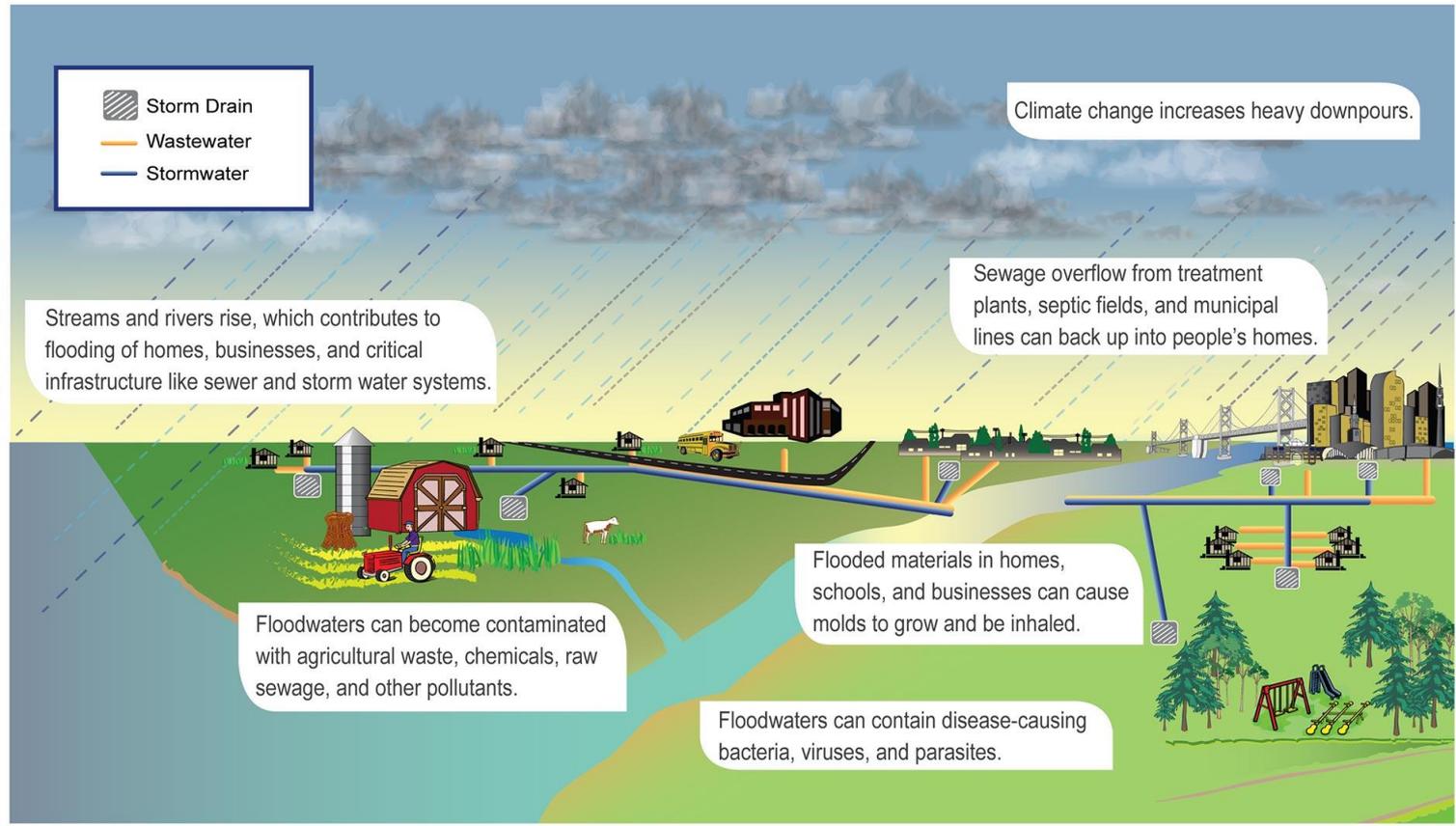
U.S. Growing season is lengthening



Impacts

Heavy Downpours are Increasing Exposure to Disease

Heavy Downpours are Increasing Exposure to Disease



Pests, Pathogens, and Invasive Species

- Leading cause of disturbance in forest ecosystems.
- Likely to become more abundant, widespread, and virulent under climate change.



Asian
Longhorn
Beetle



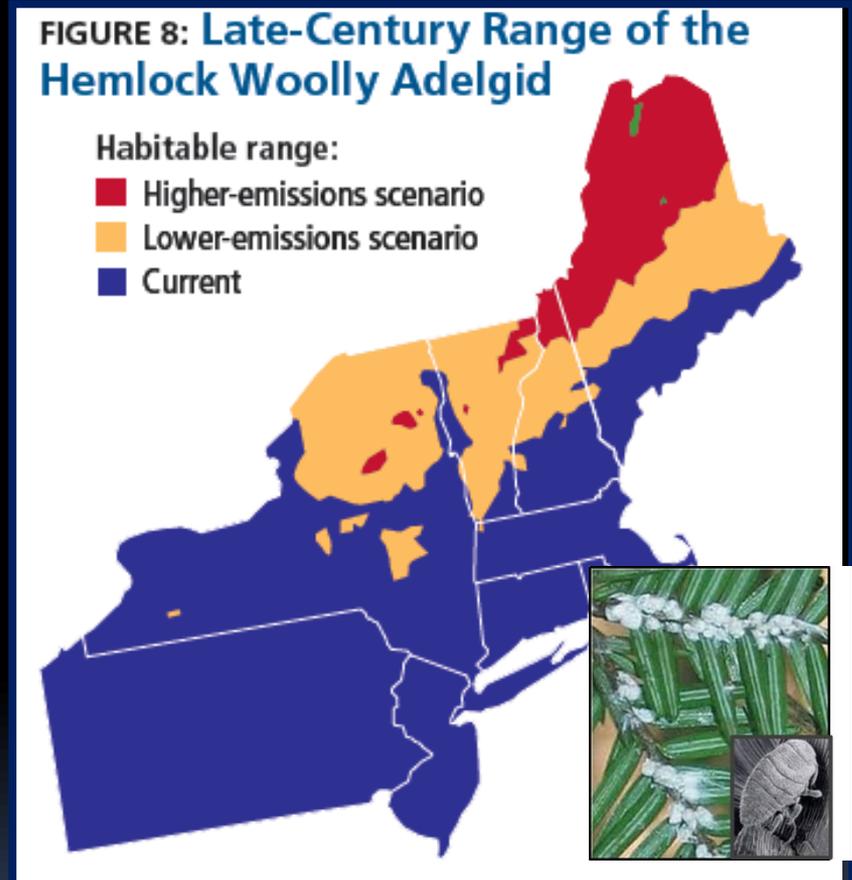
Armillaria
"Butt Rot"



Oriental
Bittersweet

Pests, Pathogens, and Invasive Species

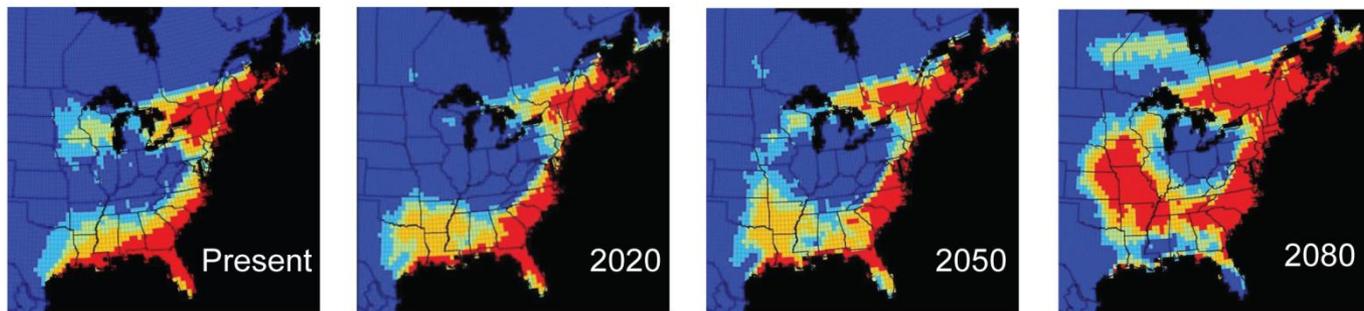
- Leading cause of disturbance in forest ecosystems.
- Likely to become more abundant, widespread, and virulent under climate change.
- Range is often limited by low temperature extremes



Range is limited by min. temp (> -28.8 degrees C)

Projected Changes in Tick Habitat

Projected Changes in Tick Habitat



Establishment Probability (%)



Harmful Bloom Algae

Harmful Bloom of Algae

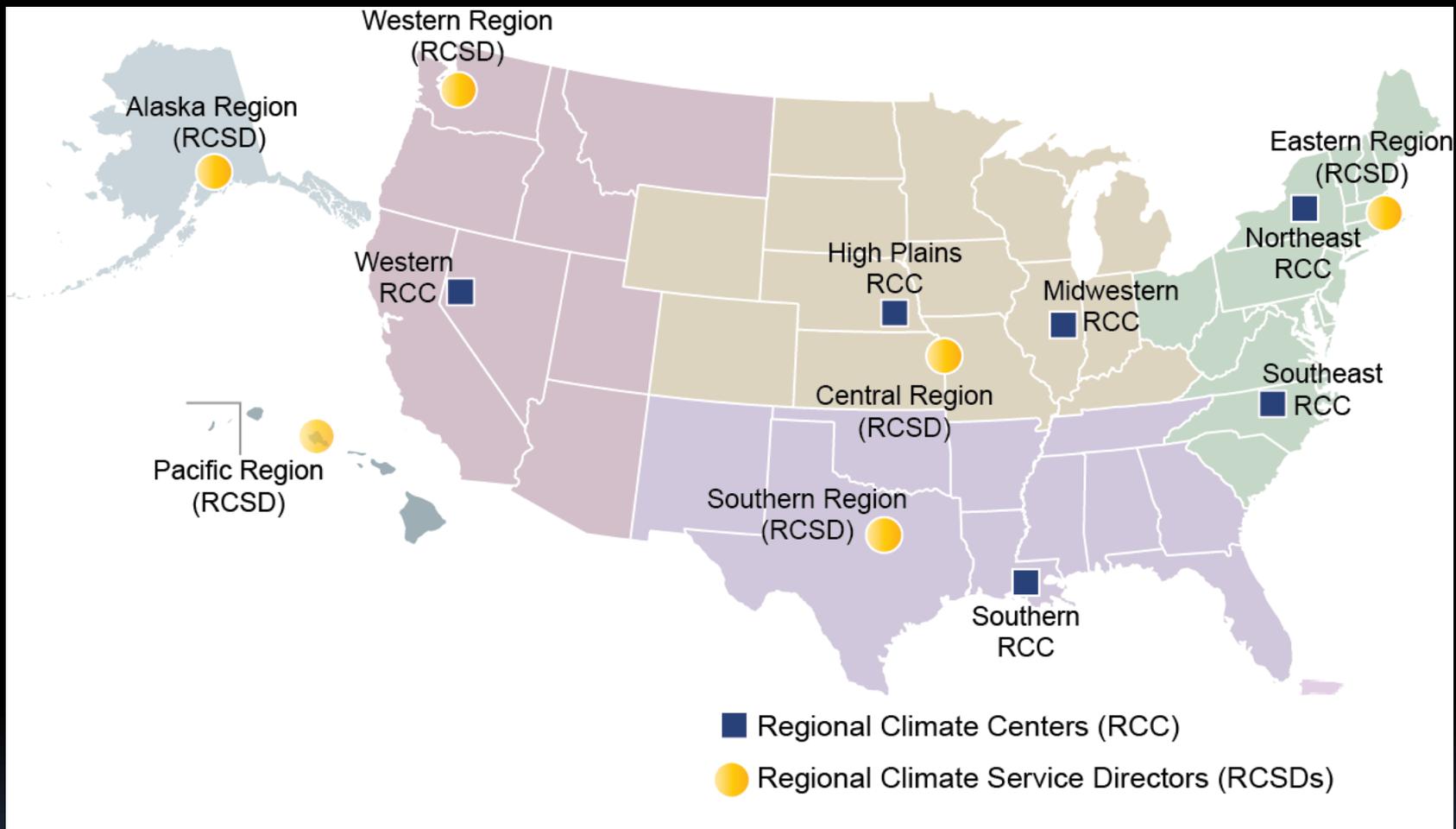


Projection

What are we doing about it?

- Climate portal
- Partnerships
- Assessments and Reports
- The future depends on scientific innovation
- The future hinges on informed decision-makers

NOAA's Regional Climate Services Directors



Alaska Region



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NOAA's Climate Services Portal

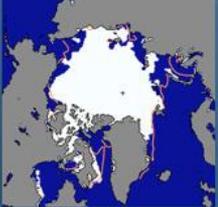
<http://www.climate.gov>

NOAA HOME WEATHER OCEANS FISHERIES CHARTING SATELLITES CLIMATE RESEARCH COASTS CAREERS

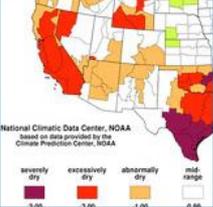
 **NOAA CLIMATE SERVICES**
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Explore: [ClimateWatch Magazine](#) [Data & Services](#) [Understanding Climate](#) [Education](#)

Past & Present Climate ▶ **Outlooks** ▶ **US & Global Regions** ▶ **Serving Society** ▶ **Data Library** ▶



Climate at a Glance
Read and explore summaries and digests of recent climate-related phenomena from NOAA's distributed climate service community.



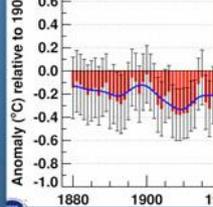
Looking Ahead
Discover explorations short-term evaluations of how climate phenomena are likely to unfold in coming days, weeks, and months.



Explore NOAA by Region
Explore the climate services and products NOAA experts prepare for specific regions of our nation and the world.



Utilizing Climate Data
Climate information is essential for business and community planning. These resources focus on needs of specific sectors of society.



Visualizing & Explore
NOAA is a leading provider of access to data from research projects, stations, and satellites to the nation and the world.

The NCS Portal Prototype offers one well-integrated, online presentation of NOAA's climate data & services.

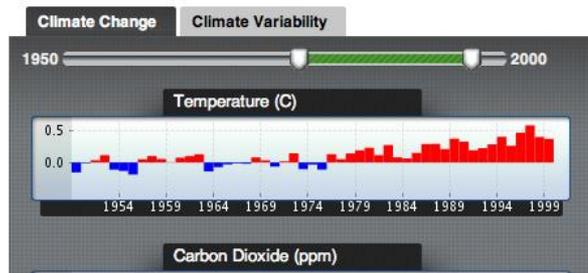
The prototype features four audience-focused sections:

- **ClimateWatch** for the public
- **Data & Services** for scientists and data users
- **Understanding Climate** for policy leaders
- **Education** for educators & students

The **Dashboard** is a data-driven synoptic overview of the state of the global climate system.

Past Weather allows users to easily retrieve weather data for any given location & date.

Global Climate Dashboard



City, State or Zip
10-16-2009

News

NOAA: September Temperature Above-Average for the U.S.

The average September temperature of 66.4 degrees F was 1.0 degree F above the 20th Century average. Precipitation across the contiguous United States in September averaged 2.48 inches, exactly the 1901-2000 average.

Thu, 08 Oct 2009

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nexus ['neksəs] n pl nexuses

1. a means of connection between members of a group or things in a series; link; bond
2. a connected group or series [from Latin: a binding together, from nectere to bind]



This website was developed through the collaborative efforts of NOAA, NALCC, NWF and EPA.

NEclimateUS.org (a.k.a. 'neXus') is a searchable online database that provides a gateway to climate information for the Eastern US. It summarizes needs for climate information as articulated in publications; identifies available data, products and services; and captures planned and on-going projects. The goal is to offer a tool to search for regionally relevant climate information, and to facilitate collaborative opportunities across the network of climate-focused programs and partners in the Eastern US. NeclimateUS.org is in its early stages of development. Content will change with time to reflect developments in climate work within the region, and in response to individual sector needs when necessary. For detailed information about the content of NEclimateUS.org and tips for using the site, please visit [about NEclimateUS.org](#).



Quarterly Regional Climate Outlooks

- Regional outlooks
 - Led by RCSDs with core NOAA and external partner engagement
 - Regional extension of NCDC's monitoring and assessment capacity
 - Informs NCDC product and service requirements

Quarterly Climate Impacts and Outlook

Gulf of Maine Region

March 2014 (Experimental)

Gulf of Maine Significant Events - for December 2013–February 2014

A storm system brought a thick layer of ice and more than 30 cm (12 in.) of snow to much of the region from December 20–23. The airport in Saint John, NB, reported 53 hours of freezing precipitation. The storm left over 170,000 customers in southern New Brunswick and over 100,000 customers in Maine without power for up to 11 days. Bitterly cold temperatures followed the storm with recorded lows of below -25°C (-13°F).

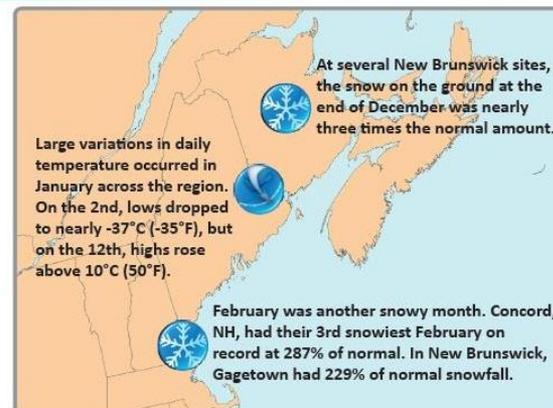
From January 2–3, a Nor'easter dropped up to 61 cm (24 in.) of snow, mainly on coastal New England. The storm packed high winds, which led to blizzard conditions and flooding in southeastern Massachusetts.

Records indicate that each January there tends to be a thaw, usually lasting a few days. This January's thaw, which occurred around mid-month, was quite warm and persistent. In many communities, highs neared or exceeded 10°C (50°F) for more than a week. The mild conditions resulted in ice movement on many rivers as well as significant snow loss.

Freezing rain, rain, and high winds caused transportation problems from January 11–12 in New Brunswick. Bathurst, for example, had 10 hours of freezing rain and a wind gust of 96 km/h (60 mph) was reported in Saint John.

A flash freeze event occurred in New Brunswick on January 27 when temperatures dropped from above-freezing to below-freezing in a short period of time. For example, Doaktown had a 13°C (23°F) temperature variation in one hour.

An intense low pressure system brought blizzard conditions to much of the Maritimes on January 22. There were reports of near-zero visibilities, snowfall amounts of up to 30 cm (12 in.), and wind gusts to 80 km/h (50 mph), with a



Up to 51 cm (20 in.) of snow fell on parts of the region from February 15–16. Winds greater than 100 km/h (62 mph) caused blizzard conditions in several Maritimes communities, downed trees, and left thousands without power. A storm surge in excess of 1 m (3.3 ft.) was reported, but widespread flooding did not occur.

Caribou, ME and Concord, NH set records for consecutive days with measurable snowfall. Caribou had 13 such days from December 15–27, while Concord had seven such days from December 9–15.



TOOLS

TOP PICKS

- [Sea Level Rise Viewer](#)
- [Coastal County Snapshots](#)
- [Multipurpose Marine Cadastre](#)
- [ENOW Explorer](#)
- [Land Cover Atlas](#)



You've Selected

Focus Area >

Land Use Planning ([Clear](#))

Data Type >

Land Cover ([Clear](#))

[Clear all](#)

NARROW YOUR RESULTS

Platform

[Desktop](#) (8)

[Web](#) (9)

Function

[Data Analysis](#) (8)

[Classification](#) (9)

[Change](#) (9)

[Spatial Visualization](#) (15)

[Non spatial](#)

[Visualization](#) (2)

Type

[Data Graphic](#) (1)

[Model](#) (6)

[Participatory](#) (3)

[Viewer](#) (7)

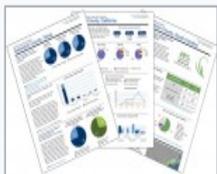
Items per page



C-CAP Land Cover Atlas

National Oceanic and Atmospheric Administration

Enables users to view regional Coastal Change Analysis Program (C-CAP) land cover data and explore land cover changes and trends



Coastal County Snapshots

National Oceanic and Atmospheric Administration

Turns complex data into easy-to-understand stories, complete with charts and graphs



Coastal Resilience Decision-Support Framework

The Nature Conservancy

Provides a framework that supports decisions to reduce the ecological and socioeconomic risks of coastal hazards



Community Resource Inventory (South Carolina)

Clemson University Baruch Institute

Provides an online mapping atlas of the natural and cultural resources in a community

FEATURED TOOL

[NOAA's State of the Coast](#)

Delivers quick facts and detailed statistics through interactive visualizations about coastal communities, ecosystems and the economy

TOOL RESOURCES

[Ecosystem-Based Management](#)

[Tools Network](#)

Supports the implementation of ecosystem-based management tools in coastal and marine environments and the terrestrial environments that affect them

NOAA Climate Services Products & Services

LIVING MARINE RESOURCES AND ECOSYSTEM ISSUES

NOAA Products and Services

- Ocean Warming: Impacts on Distribution & Productivity of Coastal Ecosystems & Fisheries
- Impacts of Loss of Sea Ice on Living Marine Resources
- Physical and Chemical Changes to the Ocean; Ecosystem Habitat Monitoring and Restoration



Key Federal Agencies: **NOAA, DOI, EPA**

WATER ISSUES

NOAA Products and Services

- Monitor and Forecast Drought and Flood Related Conditions
- National Integrated Drought Information System (NIDIS) (www.drought.gov)



www.drought.gov

Key Federal Agencies: **NOAA, DOI, Army Corps, USDA, EPA**

COASTAL ISSUES

NOAA Products and Services

- Coastal Inundation Modeling; Observations and Monitoring of Coastal Areas
- Forecasting of Coastal Storms; Information for Adaptation Planning
- NOAA sea-level standards have been adopted by the Army Corps

Key Federal Agencies **NOAA, DOI, NASA, DOE, Army Corps, FEMA**



Building Partnerships to Address Complex Problems



New England Federal Partners



US Army Corps
of Engineers.

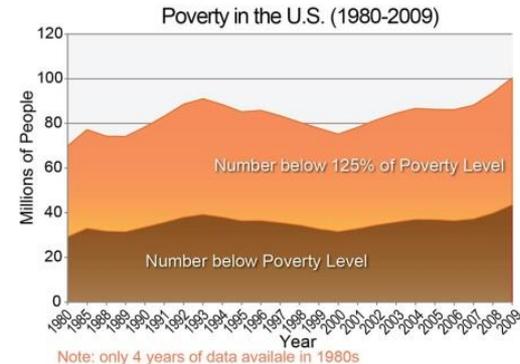
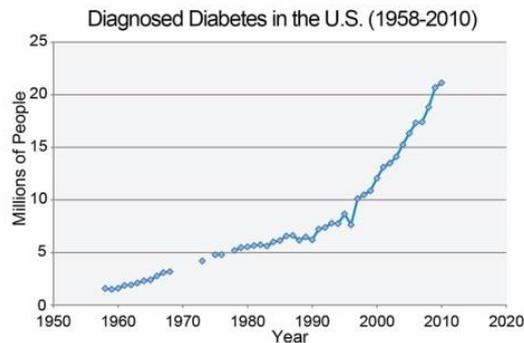
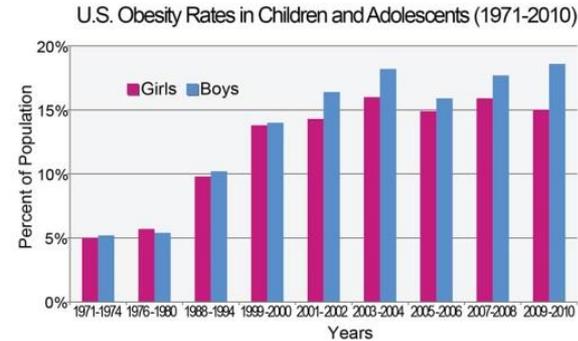
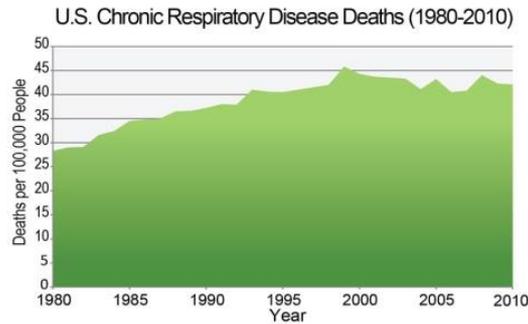
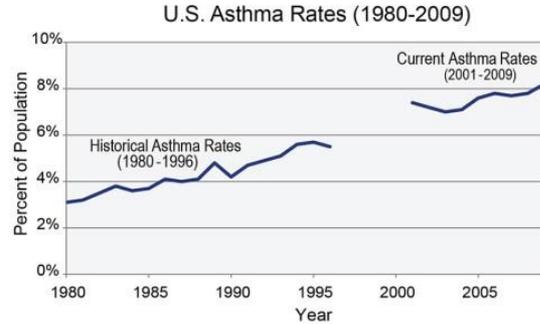
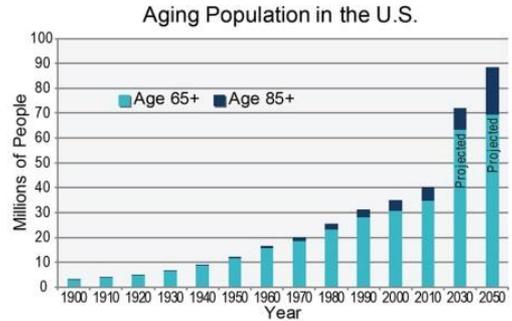


Key Messages

- Public health actions, especially preparedness and prevention, can do much to protect people from some of the impacts of climate change. Early action provides the largest health benefits. As threats increase, our ability to adapt to future changes may be limited.
- Responding to climate change provides opportunities to improve human health and well-being across many sectors, including energy, agriculture, and transportation. Many of these strategies offer a variety of benefits, protecting people while combating climate change and providing other societal benefits.
- Climate change will, absent other changes, amplify some of the existing health threats the nation now faces. Certain people and communities are especially vulnerable, including children, the elderly, the sick, the poor, and some communities of color.

Elements of Vulnerability to Climate Change

Elements of Vulnerability to Climate Change



Backups

Observed Climate Change

- Temperatures across the region have increased by an average of 2°F since 1895
- Annual precipitation across the region has increased by about 5 inches since 1895
- Sea level has risen approximately 1 foot and coastal flooding has increased since 1900
- Precipitation from extreme events has increased 74% since 1958, more than any other US region

Projected Climate Change

- Will be highly dependent on future greenhouse gas emissions
 - Projections for temperature increase by the 2080s ranges from 3°F to 6°F under a low emissions scenario to 4.5°F to 10°F under a high emissions scenario
 - Frequency, intensity and duration of heat waves expected to increase
 - May be most pronounced in parts of MD, WV, DE and NJ
 - Frequency, intensity and duration of cold air outbreaks expected to decrease
 - Precipitation changes less certain, although extreme events and flooding are expected to increase
 - Global sea levels projected to rise 1-4 feet, with the Northeast exceeding global average by roughly 4 inches
 - Hurricane intensity and frequency of more intense hurricanes expected to increase, but overall frequency expected to decrease
 - Arctic Sea Ice melting may be significant factor