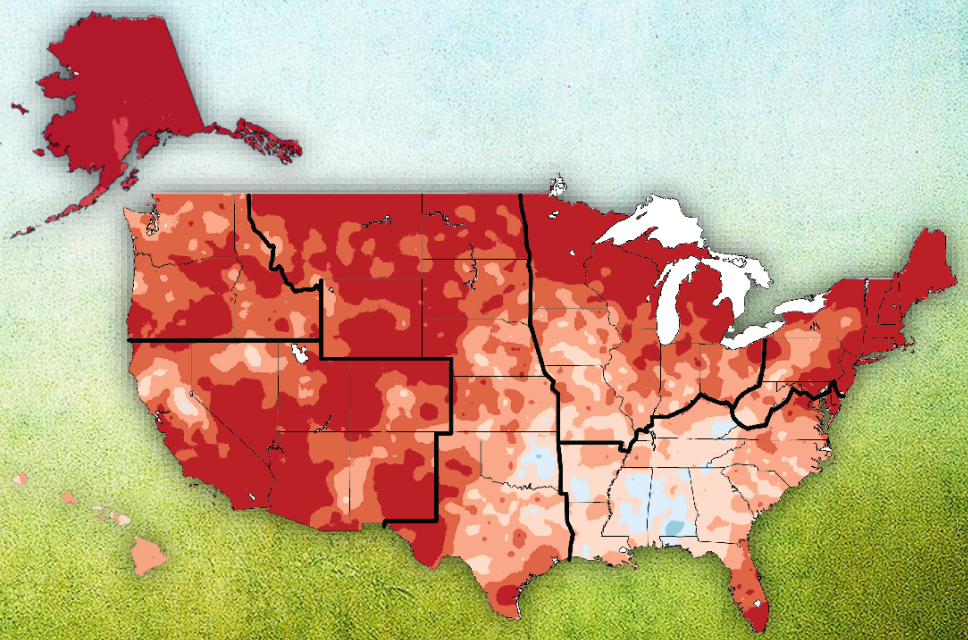
Third National Climate Assessment

Climate Change Impacts in the United States

Donald Wuebbles and Gary Yohe



EESI Briefing
May 8, 2014

GlobalChange.gov
U.S. Global Change Research Program

US Global Change Research Program

Global Change Research Act (GCRA 1990):

"To provide for development and coordination of a comprehensive and integrated United States research program which will assist the Nation and the world to **understand, assess, predict, and respond** to human-induced and natural processes of global change."

United States Global Change Research Program

13 Federal Departments & Agencies + Executive Office of the President

More information at http://www.globalchange.gov

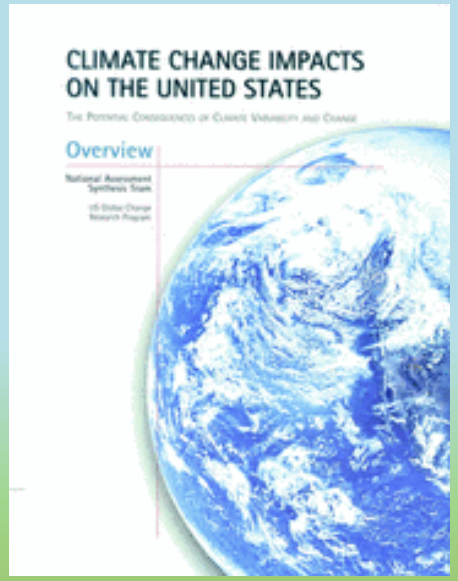
National Climate Assessment: GCRA (1990), Section 106

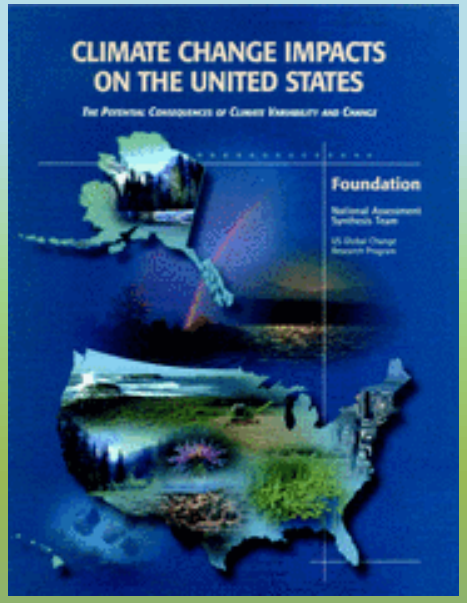
…not less frequently than every 4 years, the Council… shall prepare… an assessment which –

- integrates, evaluates, and interprets the findings of the Program (USGCRP) and discusses the scientific uncertainties associated with such findings;
- analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and
- analyzes current trends in global change, both human-induced and natural, and projects major trends for the subsequent 25 to 100 years.

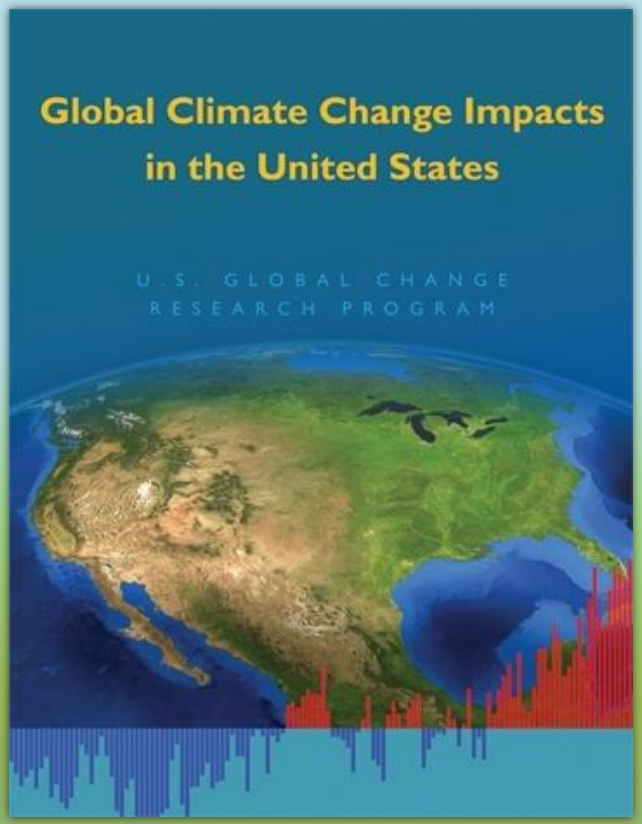
Previous National Climate Assessments

Climate Change Impacts on the United States (2000)





Climate Change Impacts in the United States (2009)

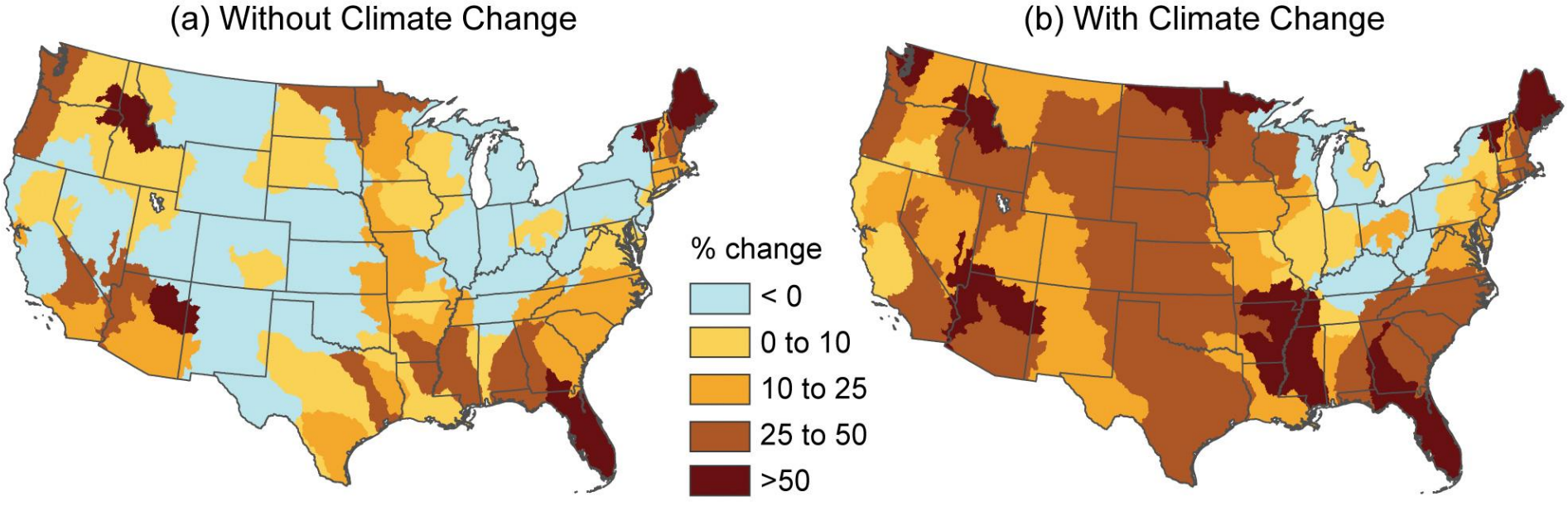


http://nca2009.globalchange.gov/

The NCA Process: What's New?

Risk – Based Framing

For example: Climate change is only one of multiple factors affecting water supply availability



Projected Changes in Water Withdrawals

The NCA Process, What's New? (cont.)

New topics covered

Oceans, Coasts, Urban, Rural, Land use

Cross-sector links like Energy/Water/Land

New format

Digital products and interactive website

Highlights, GCIS, traceable accounts

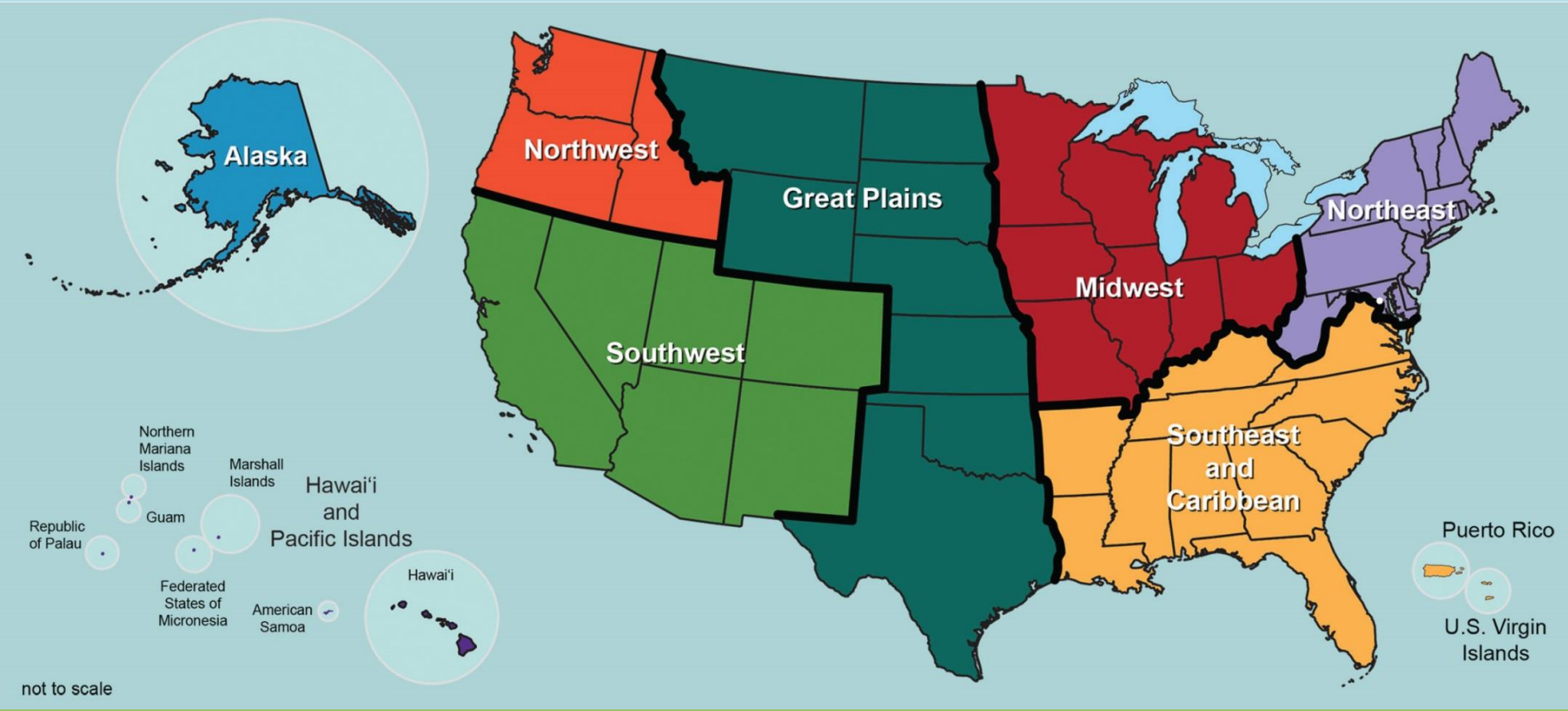
Extensive Review and Transparency

- National Academy of Sciences, agencies, public review, responses to all comments
- Links to underlying data and references, traceable accounts

Sectors

- Water Resources
- Energy Supply and Use
- Transportation
- Agriculture
- Forestry
- Ecosystems and Biodiversity
- Human Health

U.S. Regions


Alaska
Northwest
Great Plains
Northeast
Midwest
Southwest
Southeast and Caribbean
Northern Mariana Islands
Marshall Islands
Hawai'i and Pacific Islands
Republic of Palau
Guam
Federated States of Micronesia
American Samoa
Hawai'i
Puerto Rico
U.S. Virgin Islands
not to scale

Responses

- Decision Support
- Mitigation
- Adaptation
- Research Needs
- The Sustained Assessment Process

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FEMA photo by Wendell A. Davis Jr.

Human-induced climate change has moved firmly into the present.

Impacts are apparent in every region and in important sectors including health, water, agriculture, energy, and more.

Americans are already feeling the effects of increases in some types of extreme weather and sea level rise.

There are many actions we can take to reduce future climate change and its impacts and to prepare for the impacts we can't avoid.

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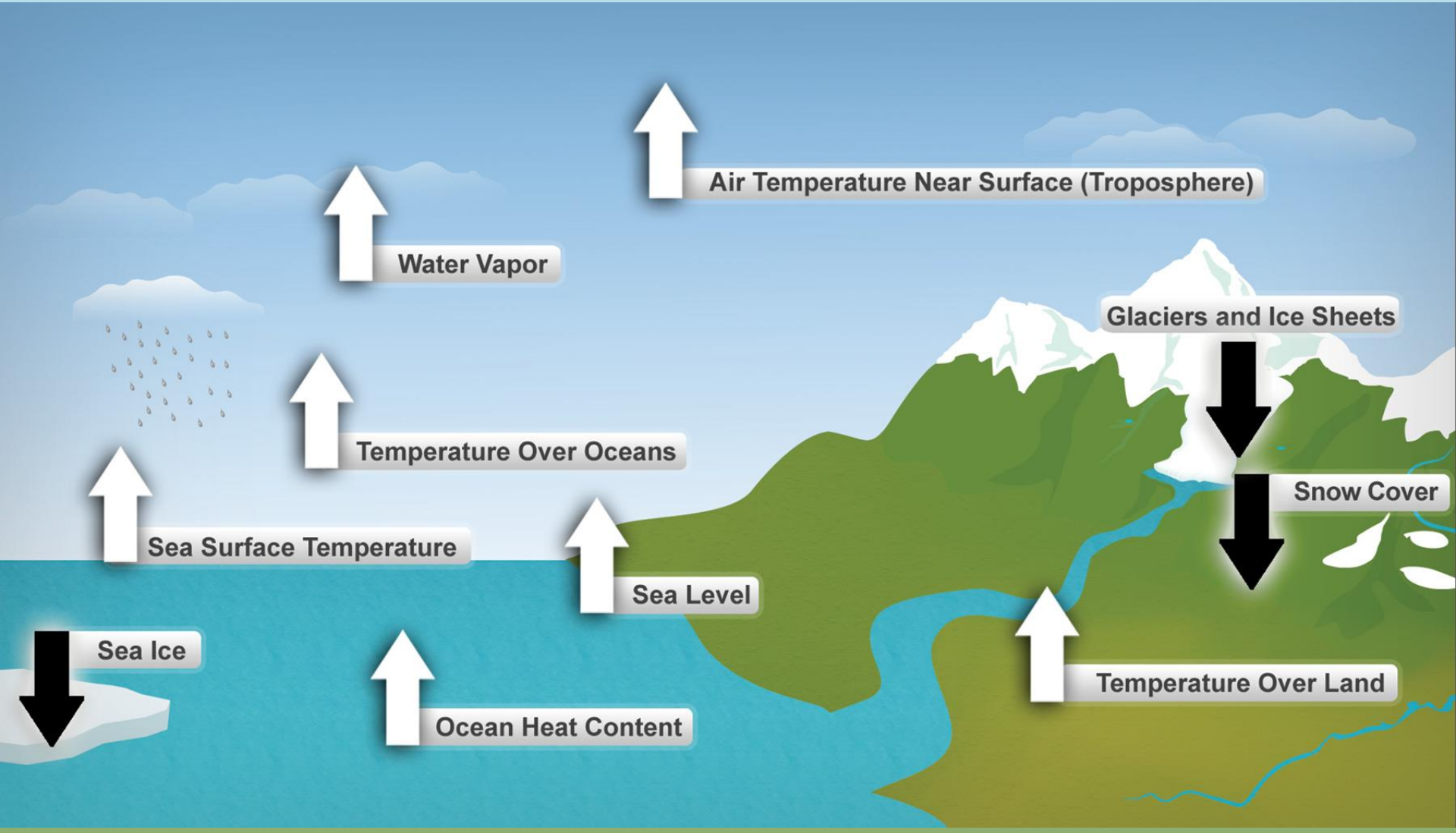
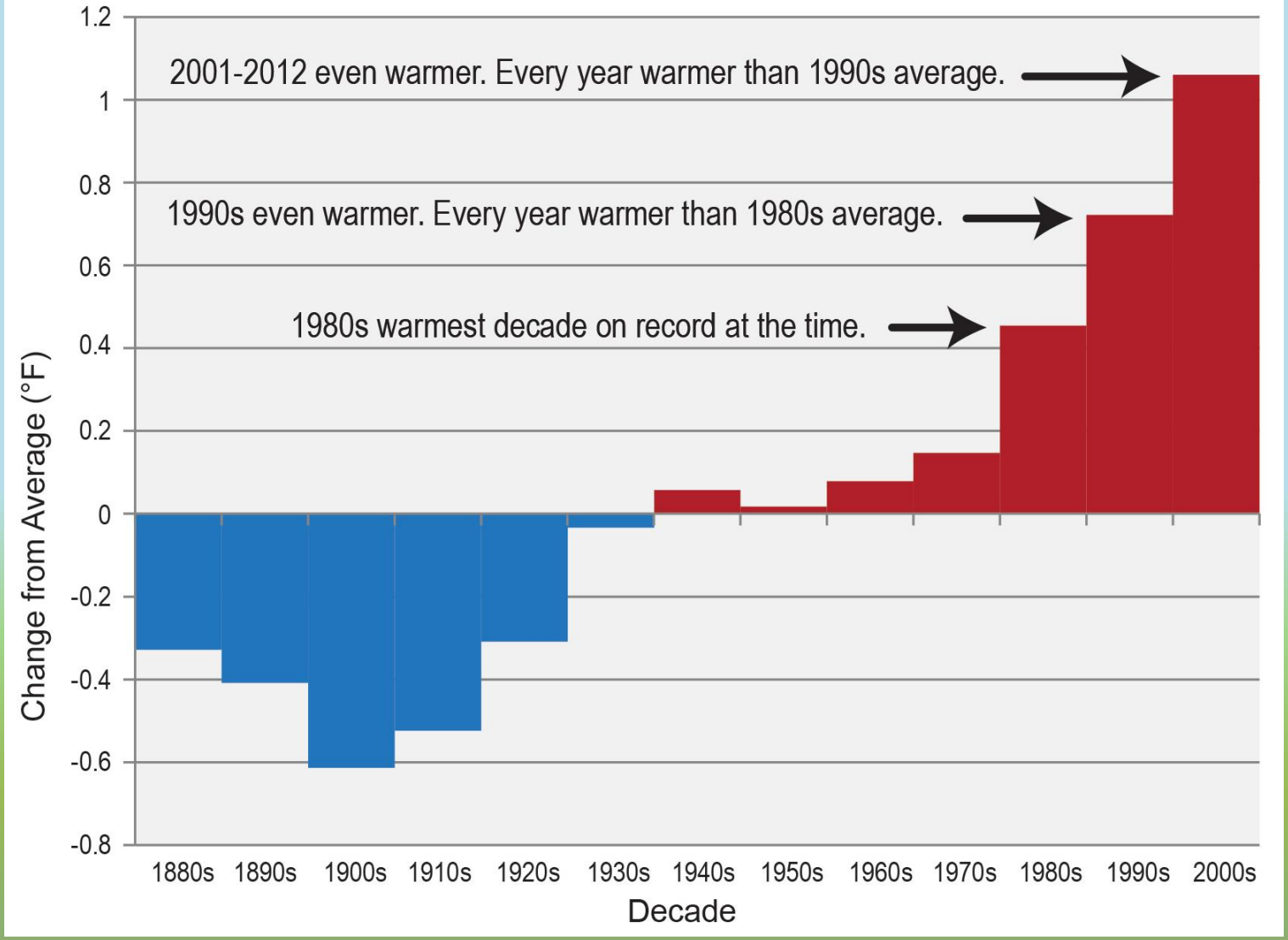
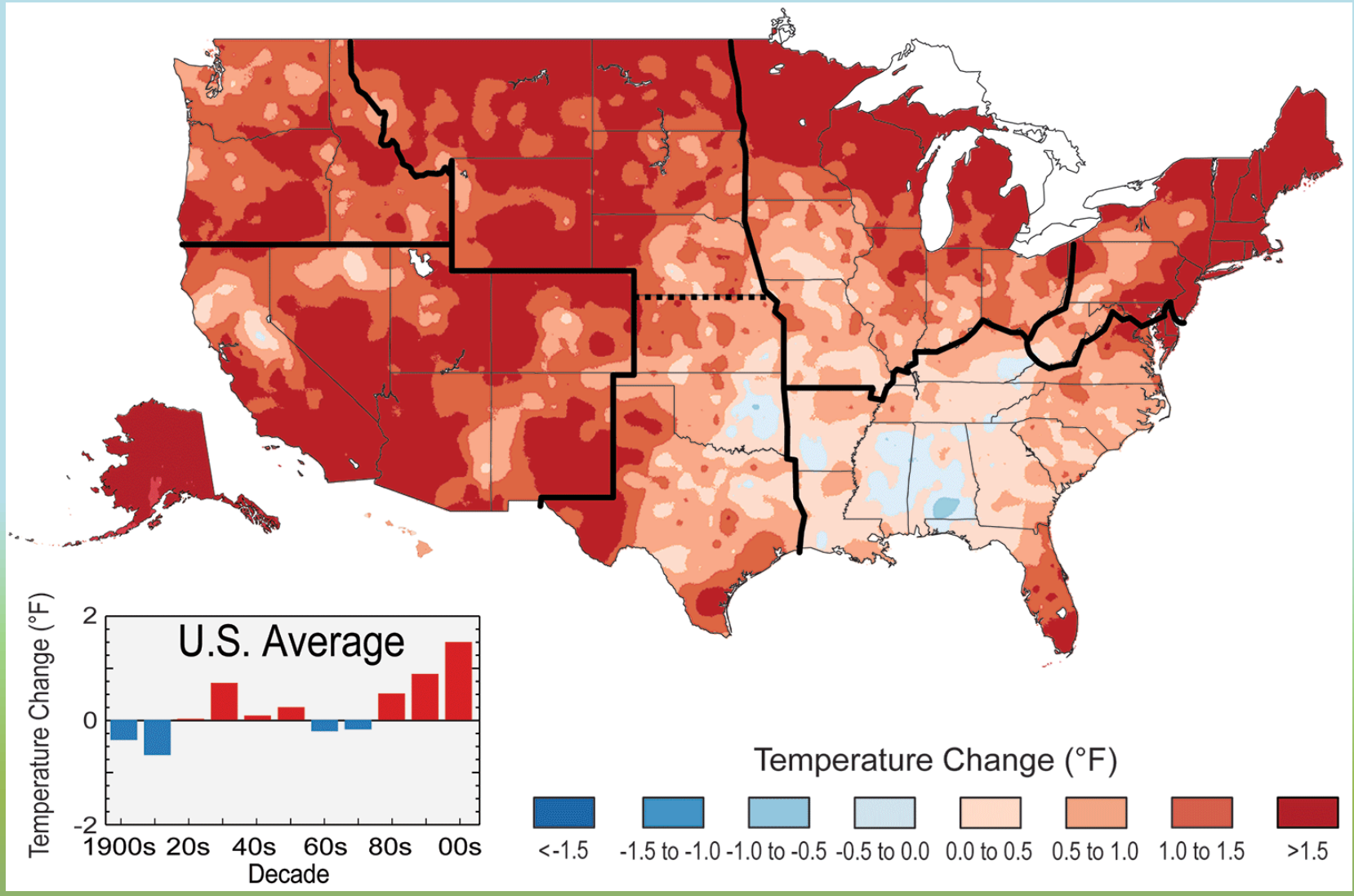
There are Many Indicators of A Warming World



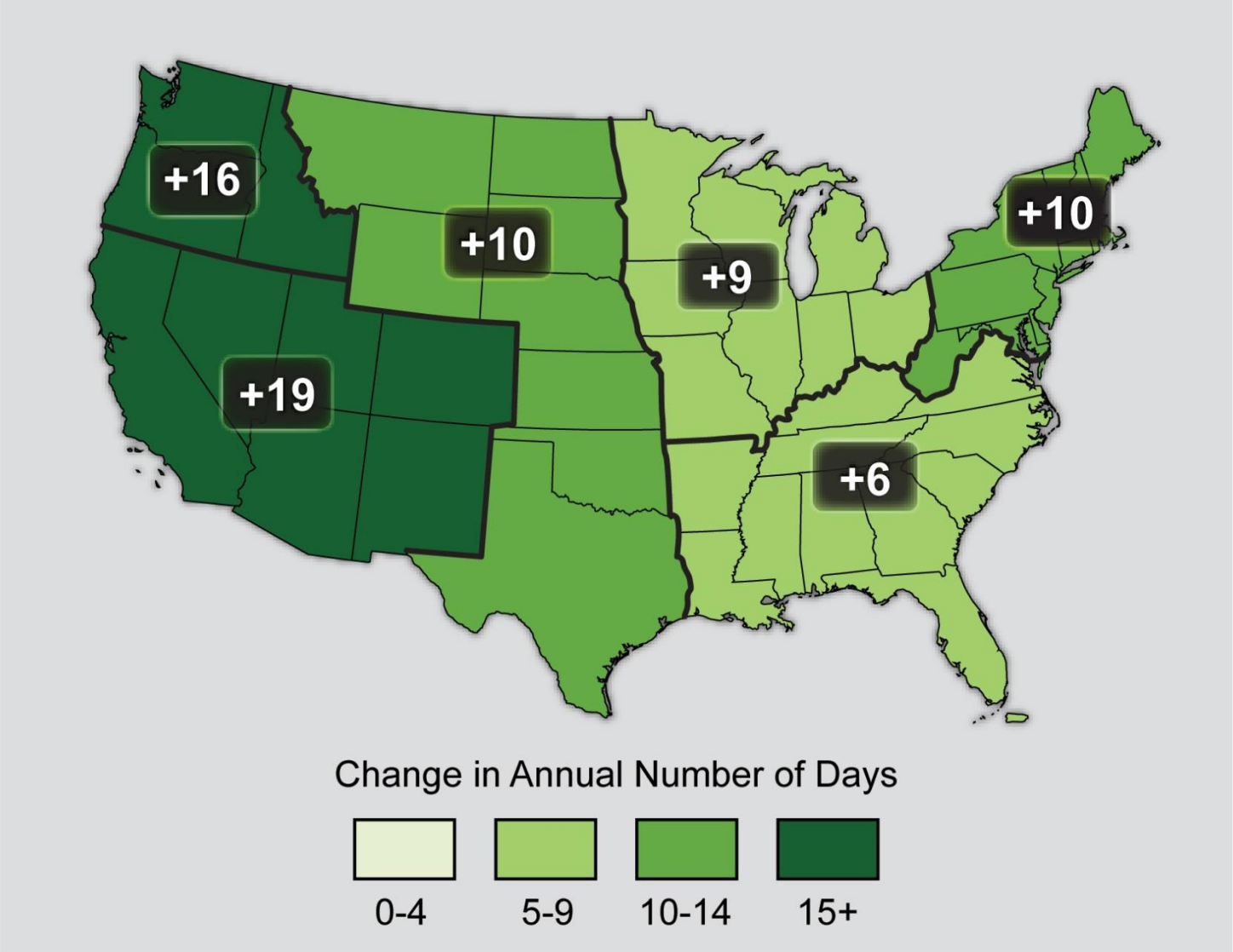
Temperature Change by Decade



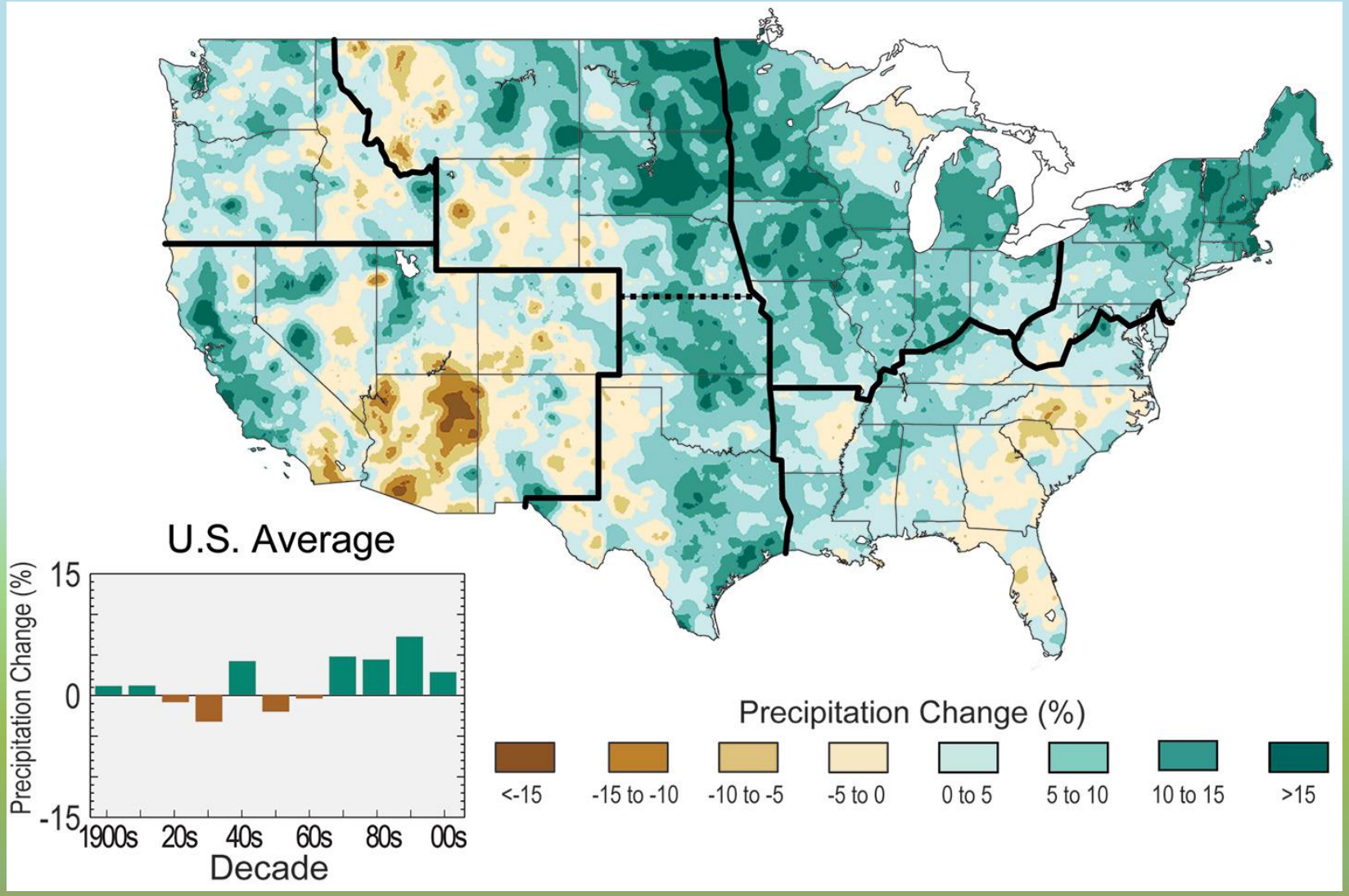
Observed U.S. Temperature Change



Observed Increases in Frost-Free Season



Observed U.S. Precipitation Change

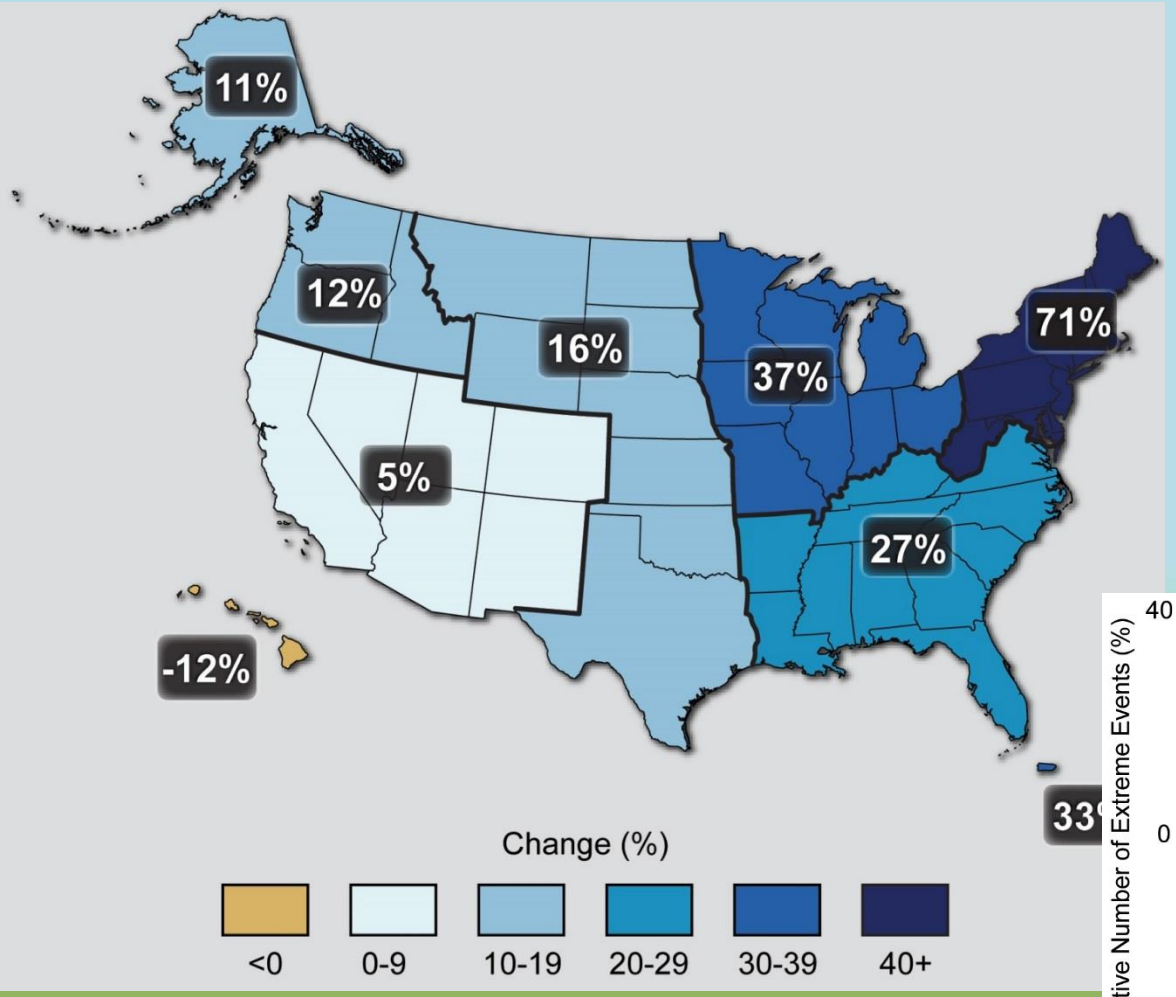


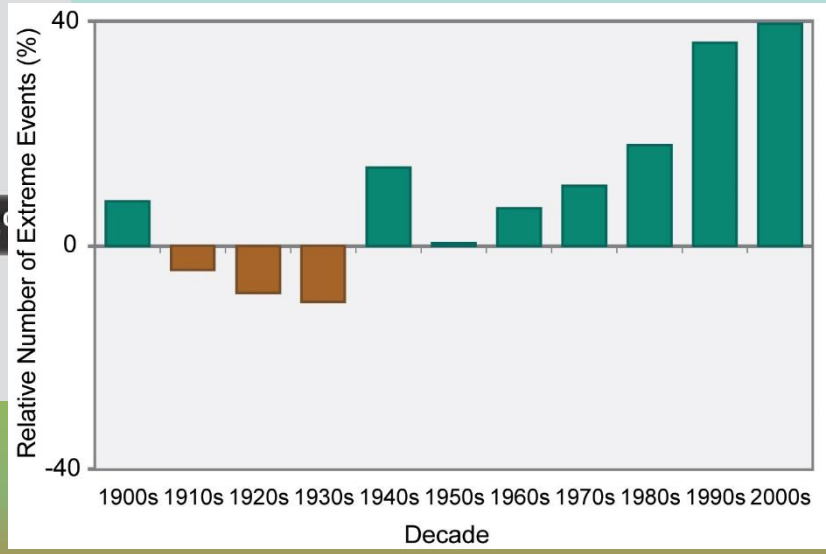
Certain Types of Extreme Events Becoming More Common

Trends are likely to continue.

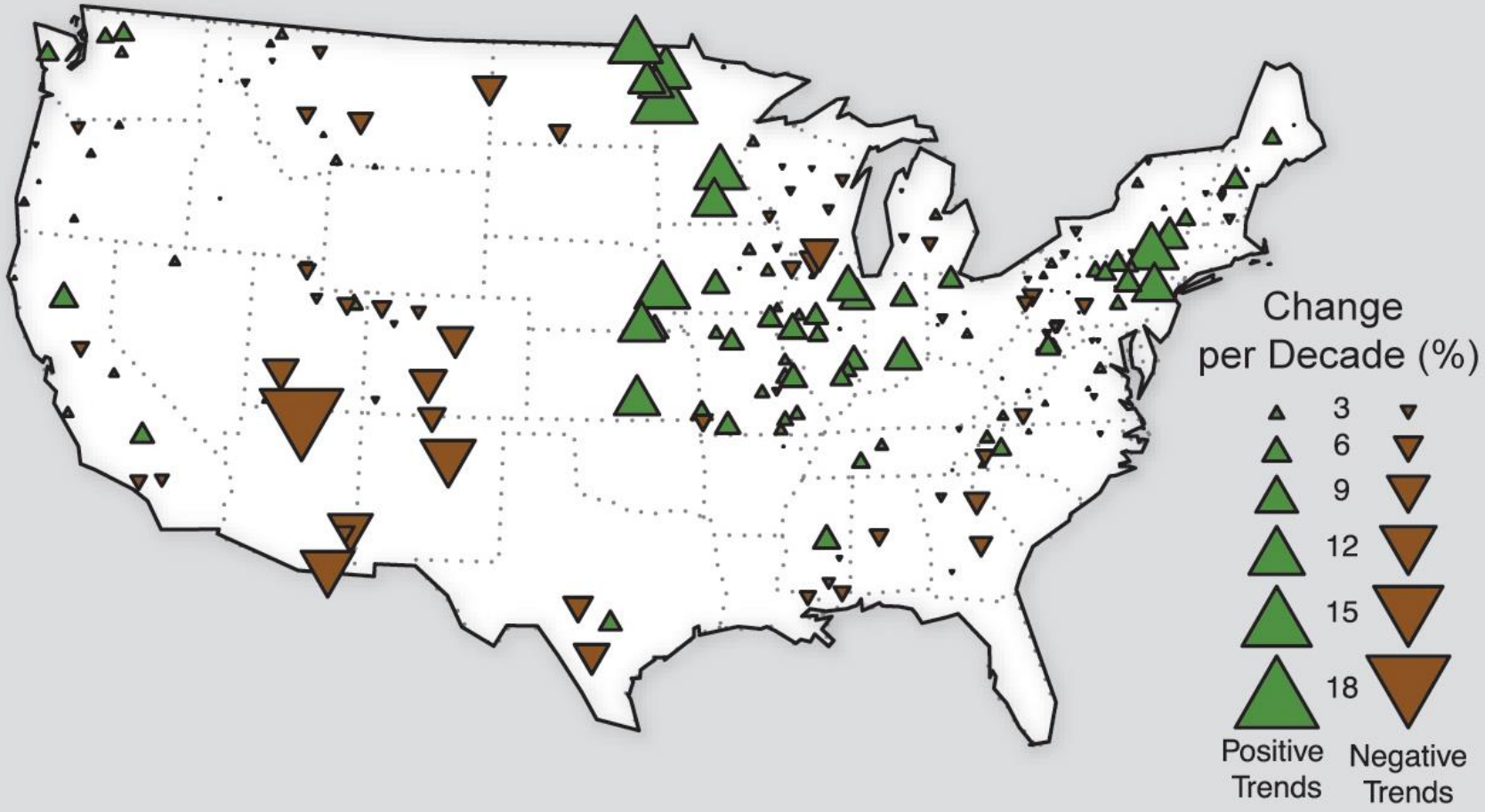
- **Heat waves are generally increasing; will likely become longer and more severe.**
- **Cold waves are decreasing.**
- **More precipitation coming as larger events.**
- **Increasing risk of floods in some regions (NE, MW).**
- **Droughts increasing in some regions (SW, SE).**
- **Increasing intensity of Atlantic hurricanes is likely.**

Observed U.S. Trends in Heavy Precipitation

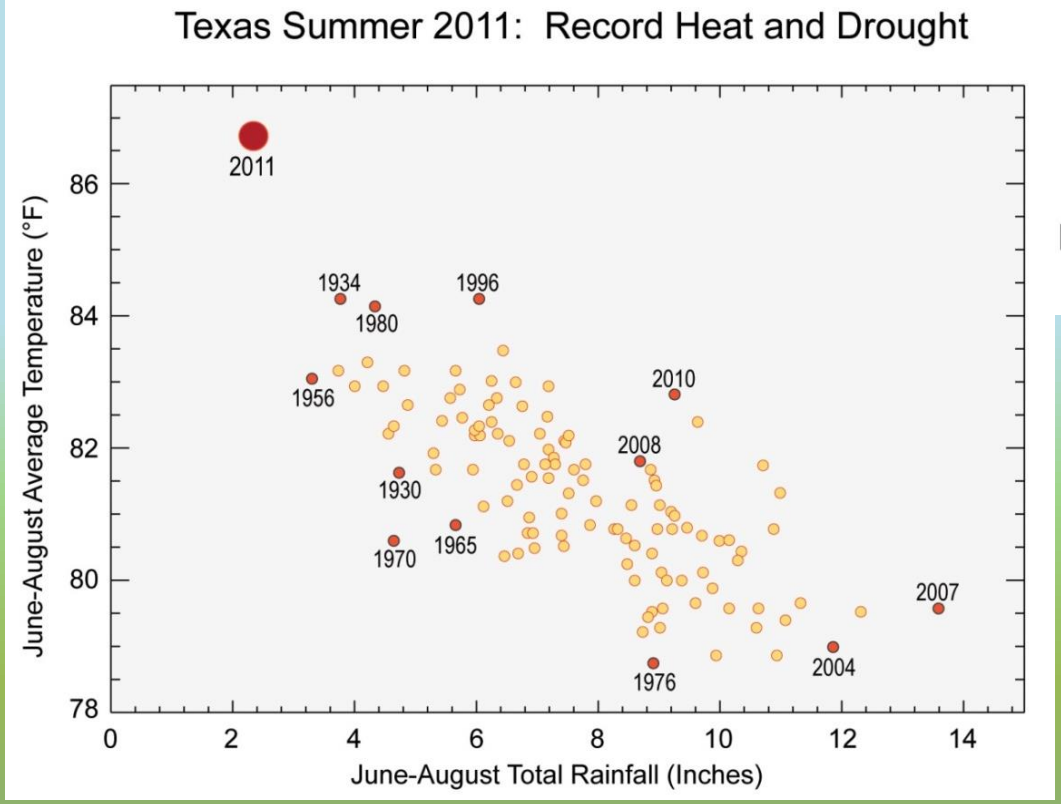


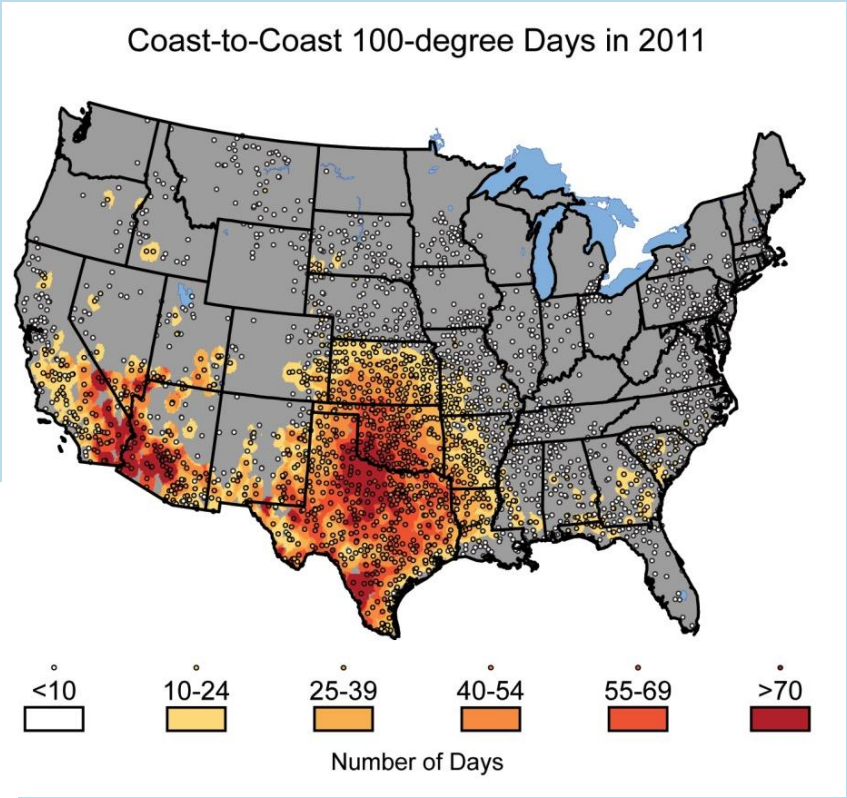


Trends in Flood Magnitude



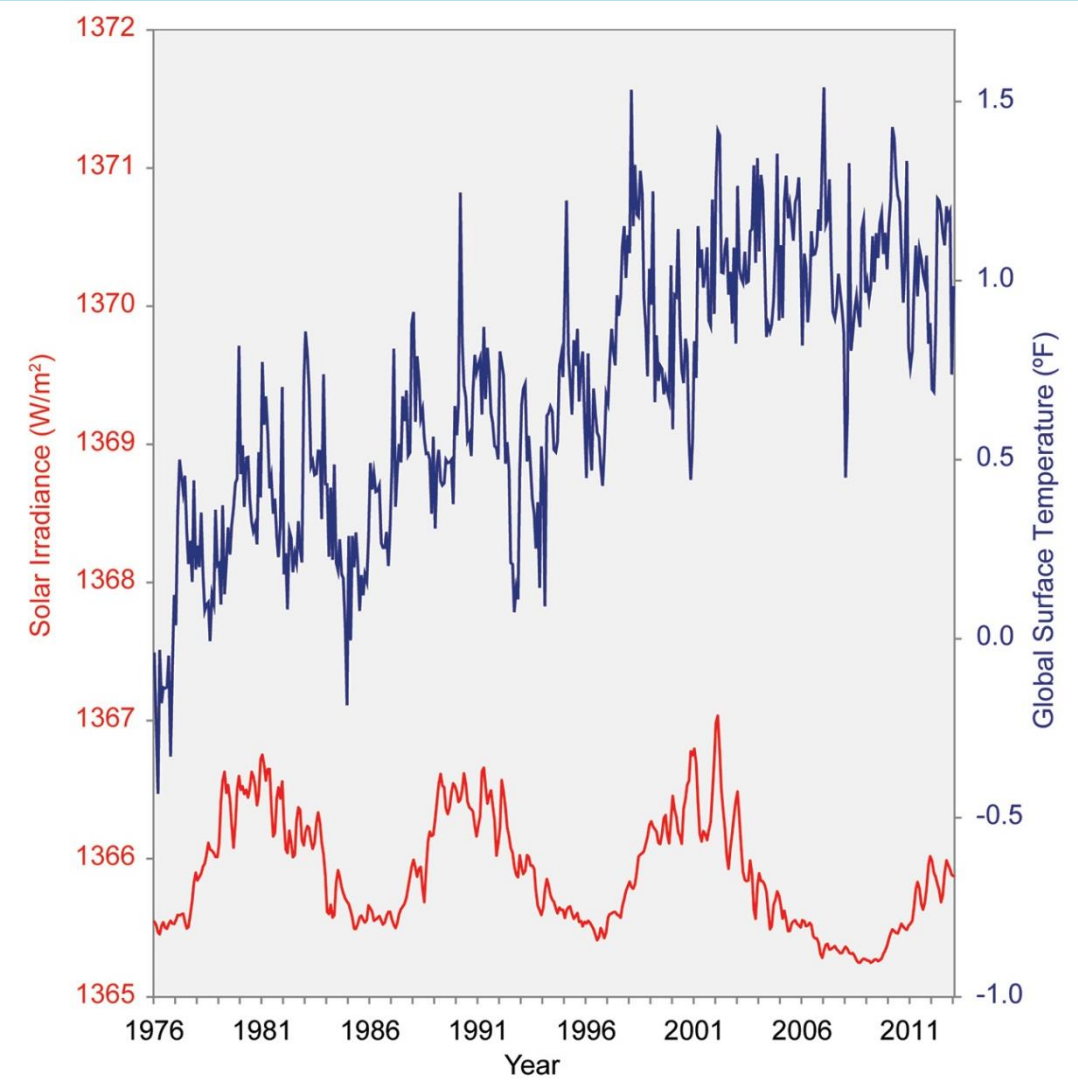
Texas Heat Wave and Drought: Twice as likely due to Climate Change



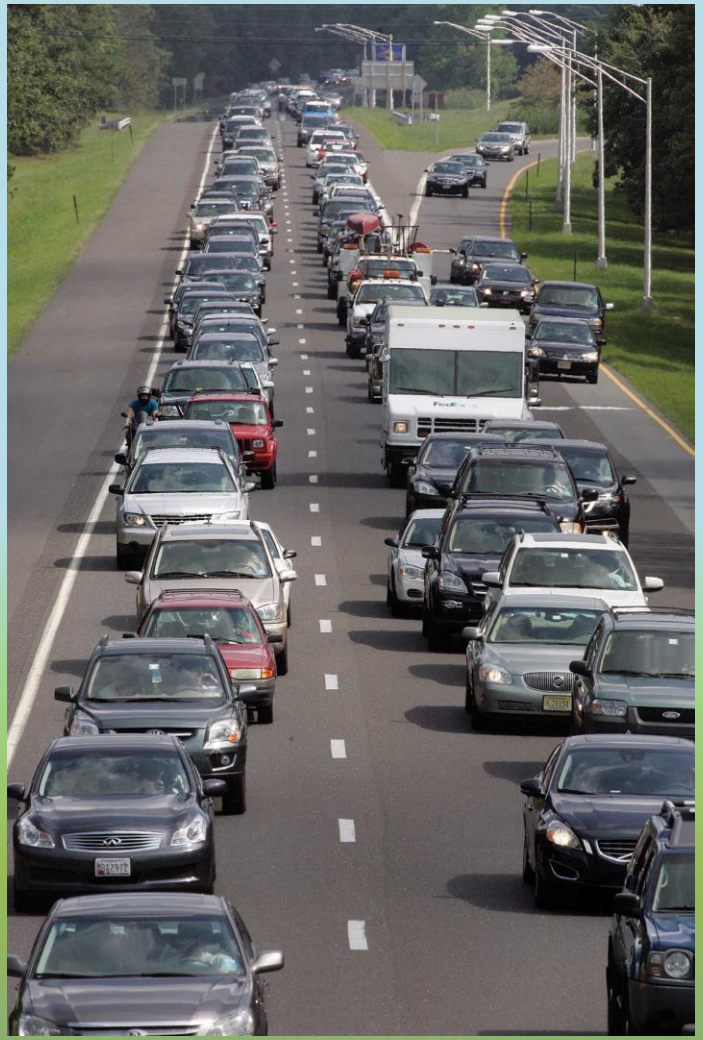


No longer true to say "we can't attribute any particular event…"

Surface Temperature and Sun's Energy



Human Activity is the Primary Cause



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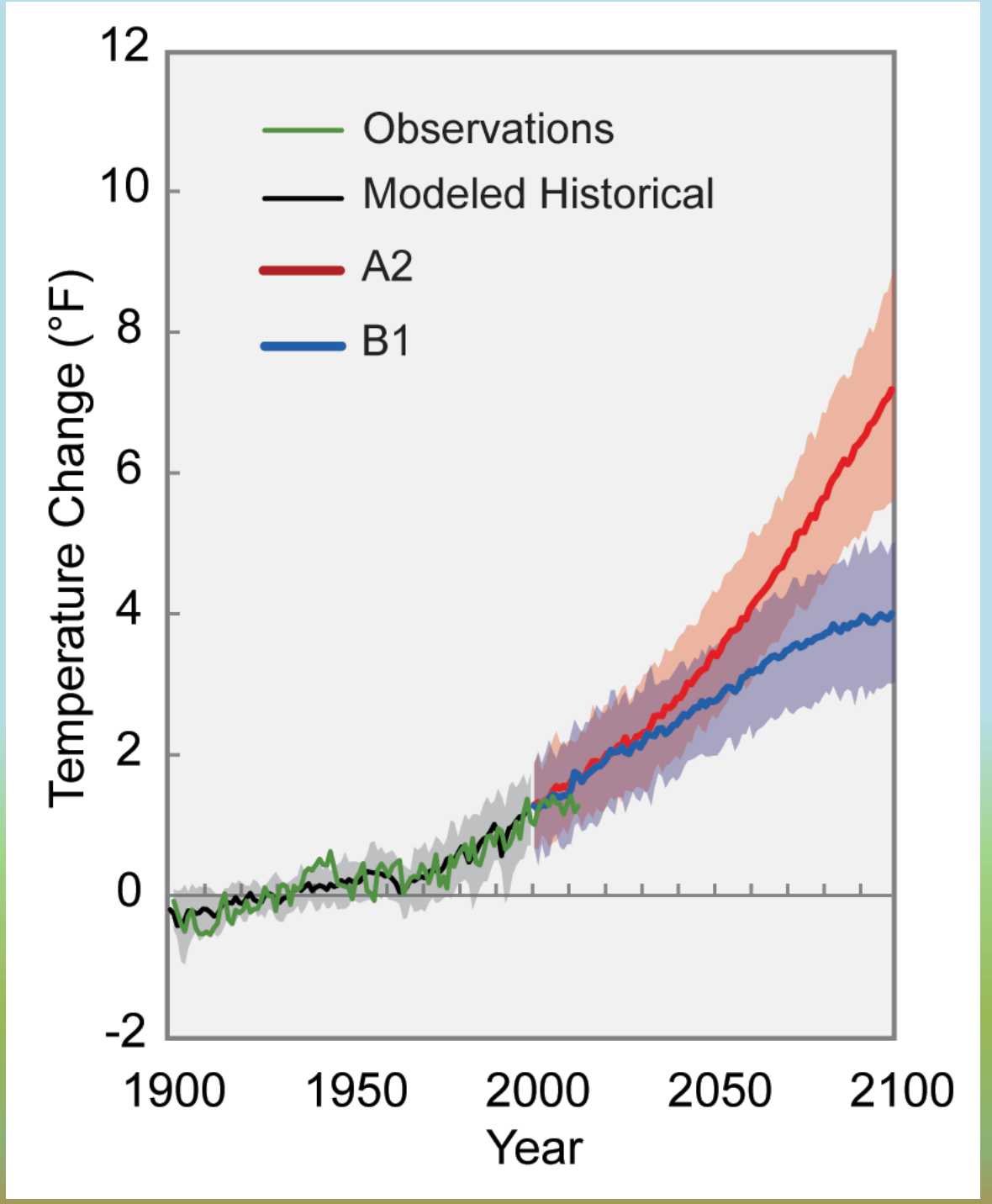
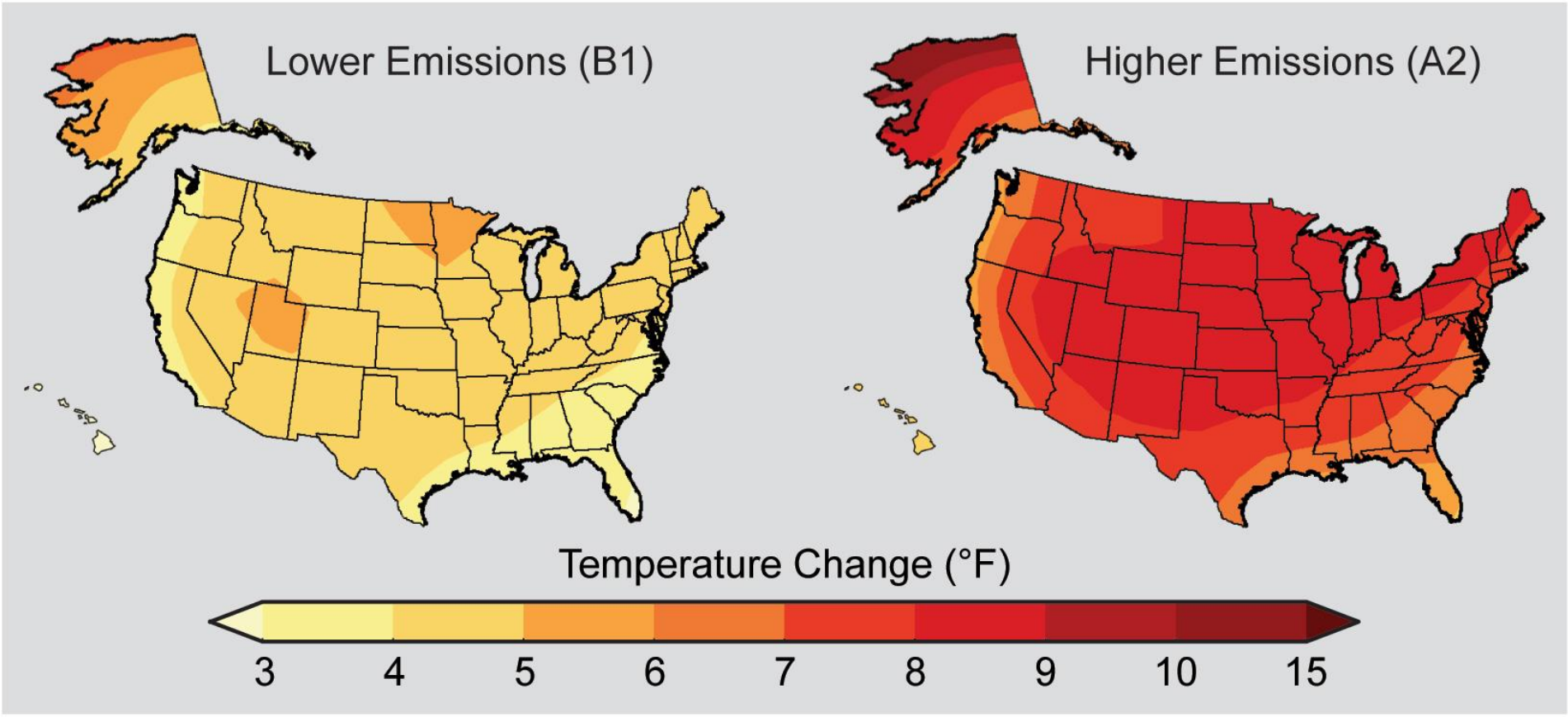
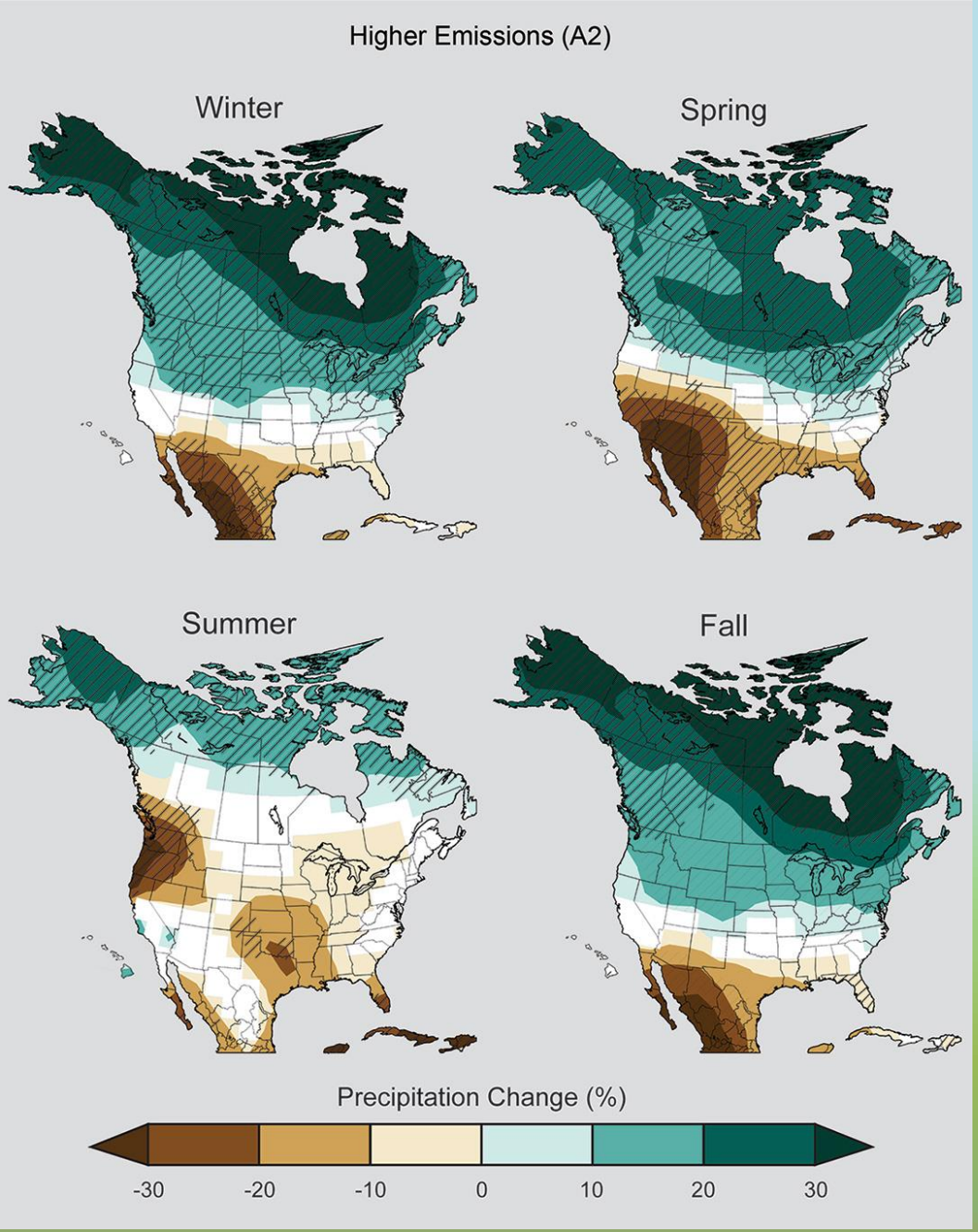
Projected Global Temperature Change



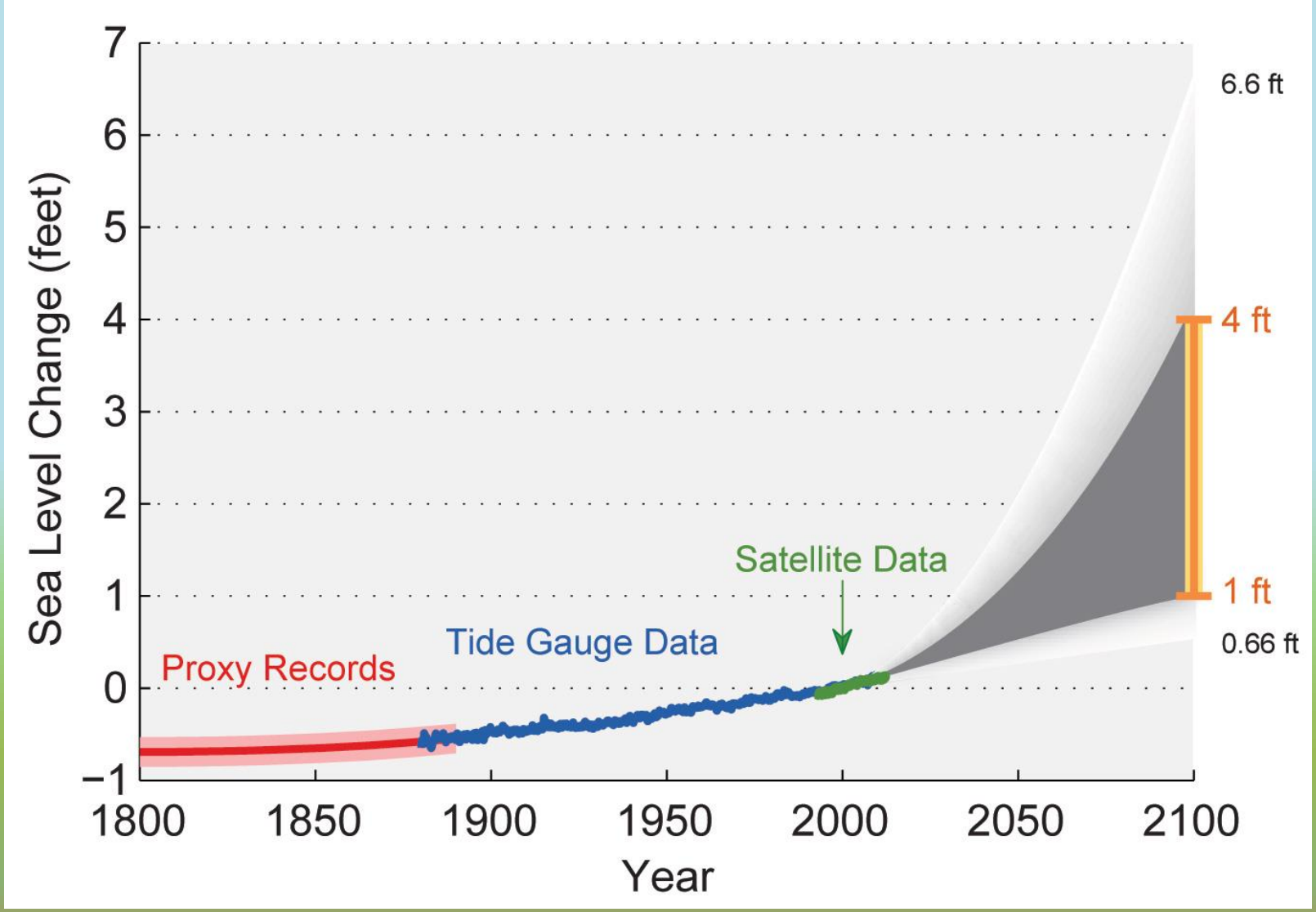
Projected Temperature Change



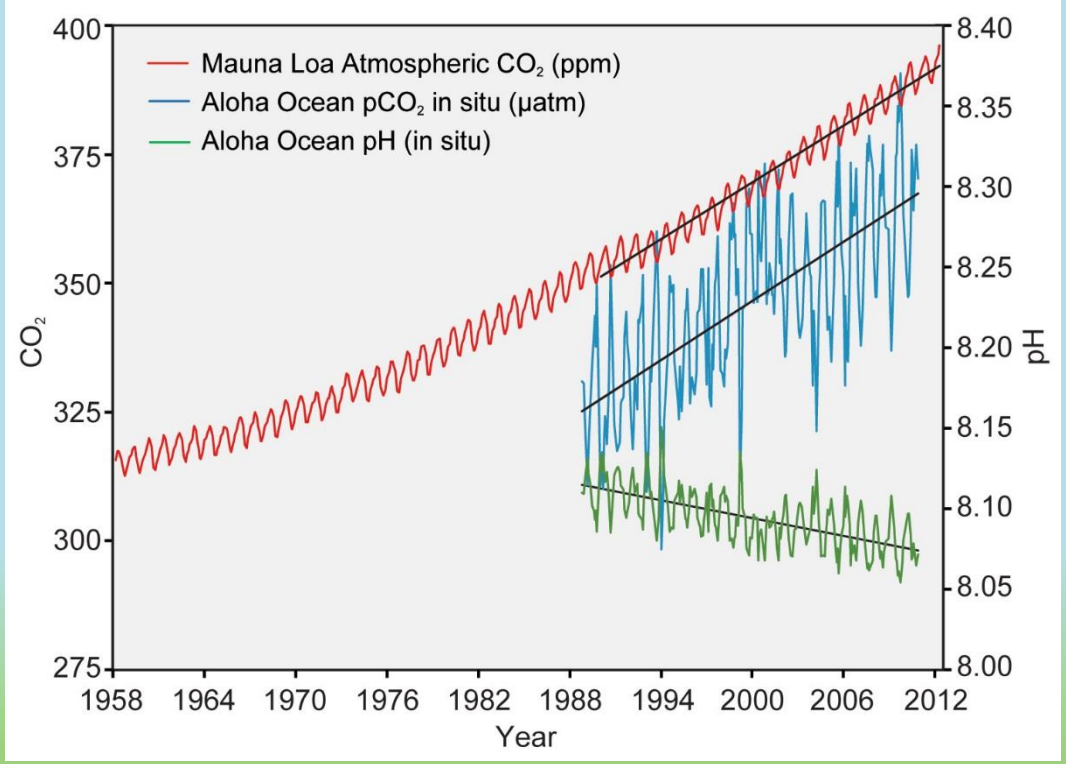
Projected Precipitation Change by Season

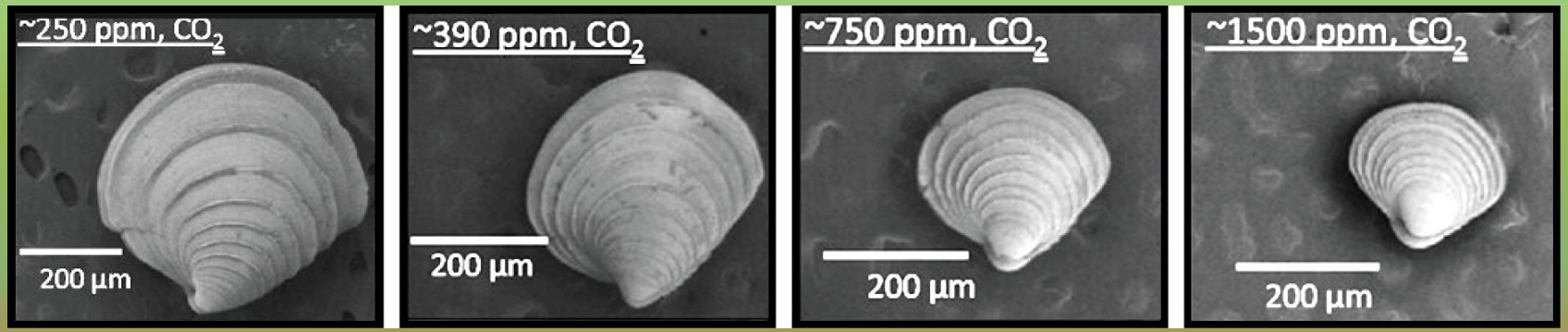


Past and Projected Changes in Global Sea Level

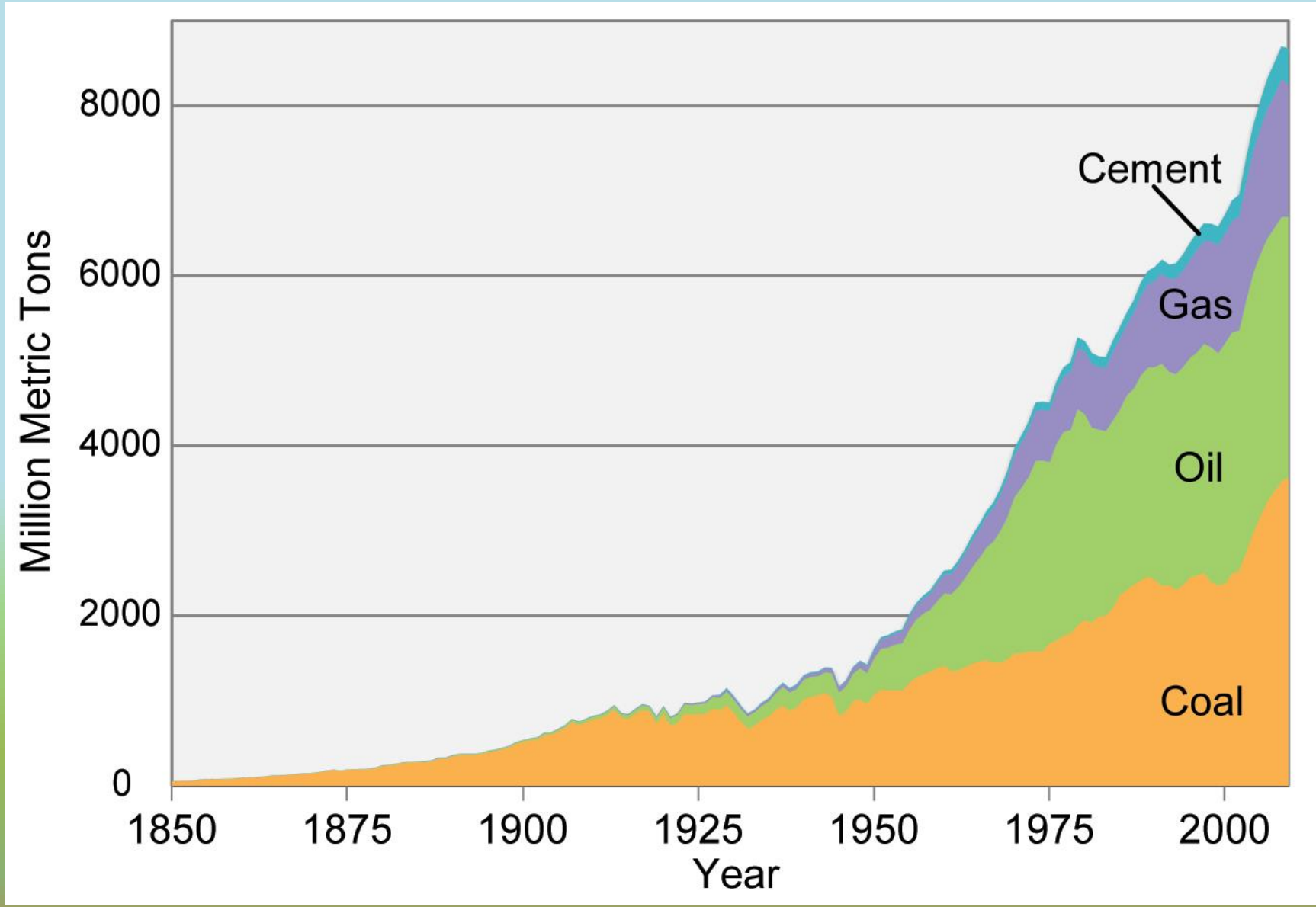


As Oceans Absorb CO_2 They Become More Acidic





Carbon Emissions in the Industrial Age



Report Findings: Regions

Northeast	Communities are affected by heat waves, more extreme precipitation events, and coastal flooding due to sea level rise and storm surge.
Southeast and Caribbean	Decreased water availability, exacerbated by population growth and land-use change, causes increased competition for water. There are increased risks associated with extreme events such as hurricanes.
Midwest	Longer growing seasons and rising carbon dioxide levels increase yields of some crops, although these benefits have already been offset in some instances by occurrence of extreme events such as heat waves, droughts, and floods.
Great Plains	Rising temperatures lead to increased demand for water and energy and impacts on agricultural practices.

Report Findings - Regions

Southwest	Drought and increased warming foster wildfires and increased competition for scarce water resources for people and ecosystems.
Northwest	Changes in the timing of streamflow related to earlier snowmelt reduce the supply of water in summer, causing far-reaching ecological and socioeconomic consequences.
Alaska	Rapidly receding summer sea ice, shrinking glaciers, and thawing permafrost cause damage to infrastructure and major changes to ecosystems. Impacts to Alaska Native communities increase.
Hawai'i and Pacific Islands	Increasingly constrained freshwater supplies, coupled with increased temperatures, stress both people and ecosystems and decrease food and water security.

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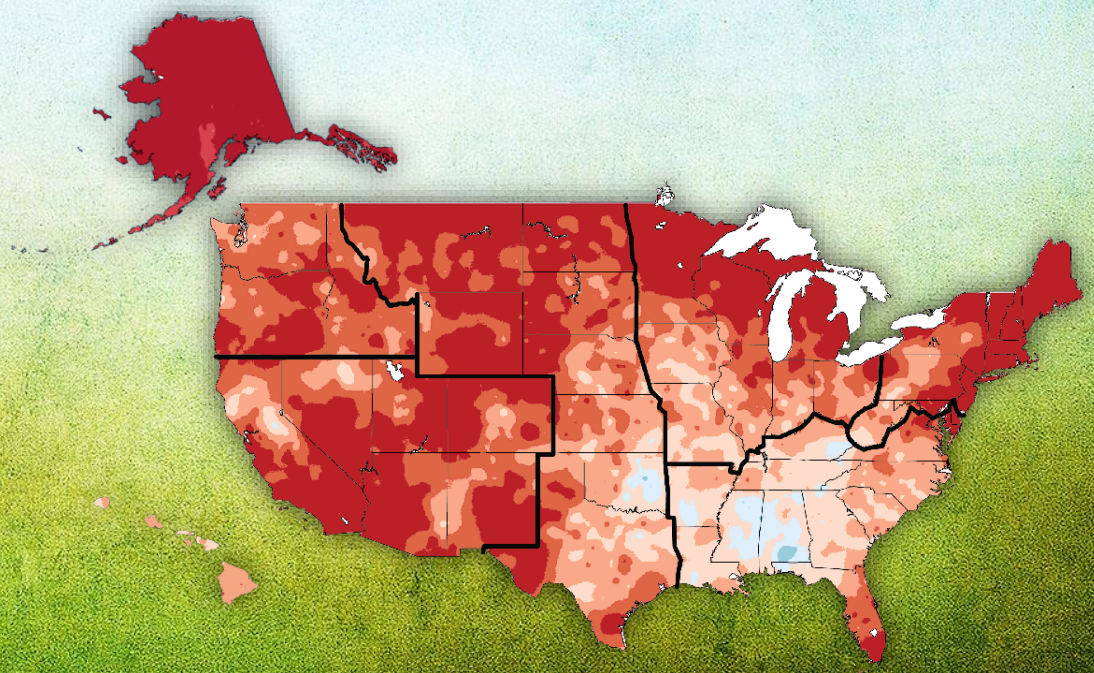

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BACKUPS