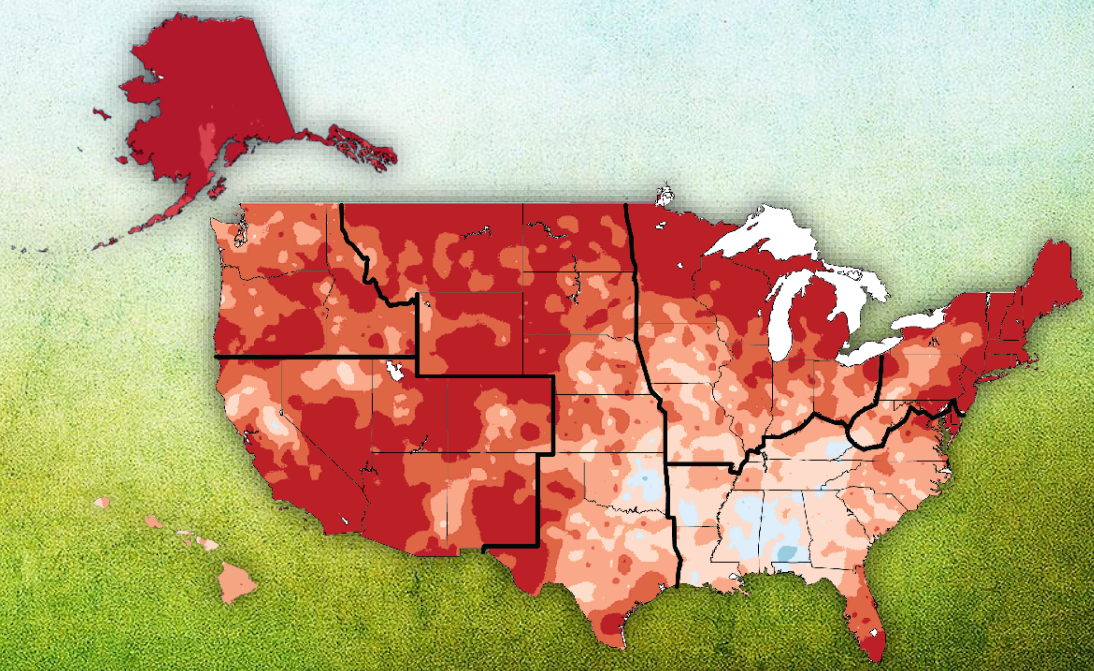
Third National Climate Assessment

Climate Change Impacts in the United States

The Midwest Region



Rosina Bierbaum
University of Michigan
EESI Briefing, July 17, 2014

GlobalChange.gov
U.S. Global Change Research Program

US Global Change Research Program

Global Change Research Act (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

Climate Change Impacts in the U.S.

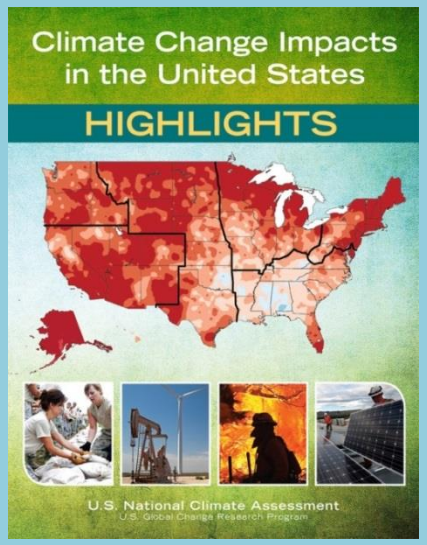
- Full report (digital)
  - Interactive, web-based
  - Includes traceable accounts
  - Linked to data and sources

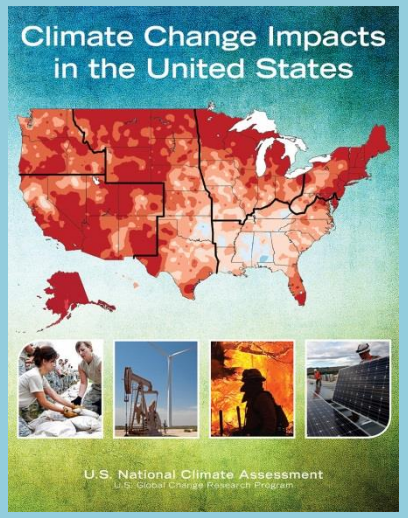
- Website (http://nca2014.globalchange.gov)
  - Full report & Highlights in HTML
  - Graphics (high-resolution files, interactive figures)
  - Supporting information

- Highlights (148 pp) (printed & pdf)

- Overview (20 pp) (printed & pdf)

- Climate Science & Regional Fact Sheets
  (2 pp each) (pdf)





GlobalChange.gov
U.S. Global Change Research Program

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

Photo: Cedar Rapids, IA during the 2008 flooding
Source: AP photo/Jeff Robertson

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

© Stan Honda/AFP/Getty Images

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

© Scott Olson/Getty Images

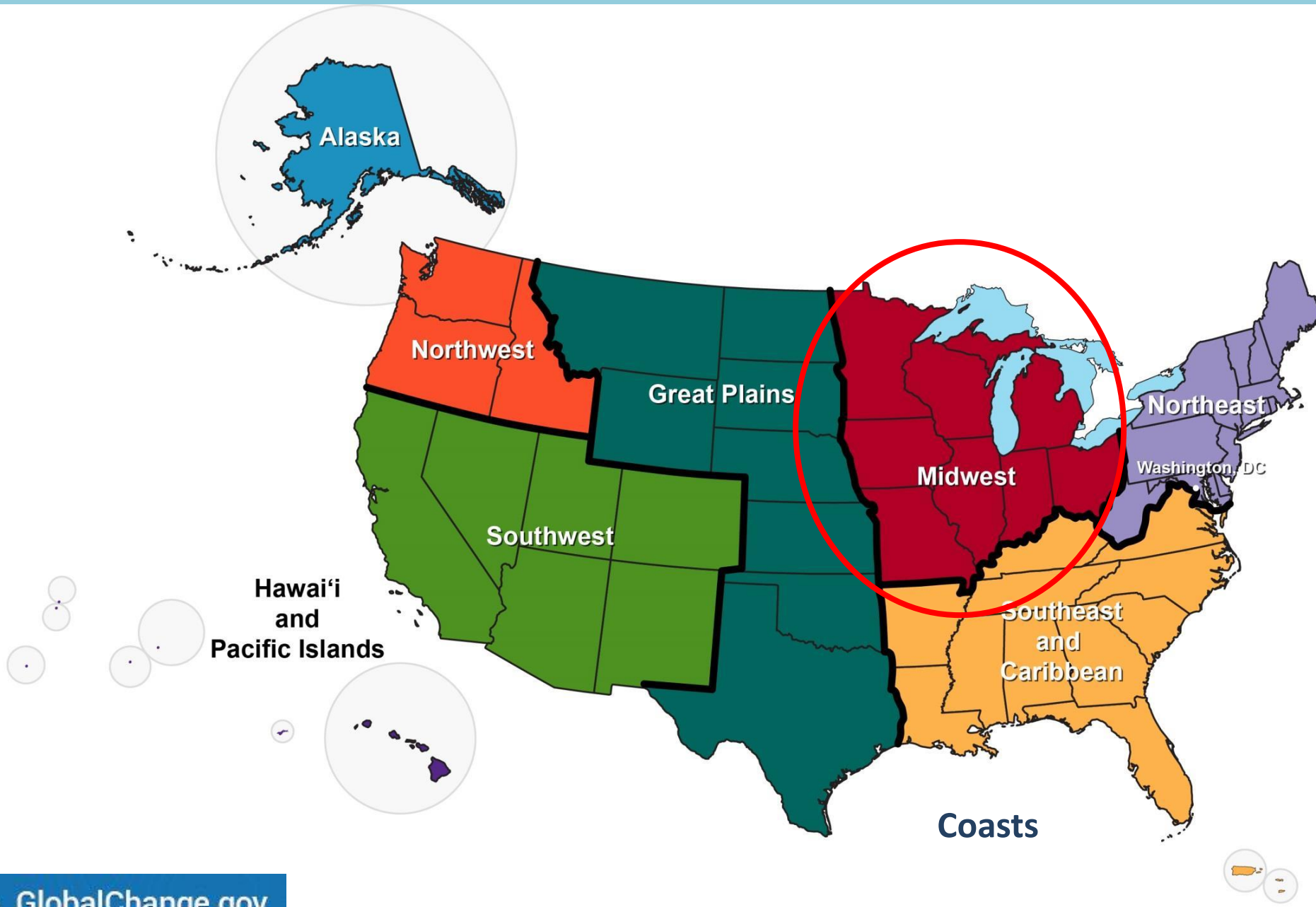
There are many actions we can take to reduce future climate change and its impacts, and to prepare for the impacts we can't avoid.

©Dennis Schroeder, NREL

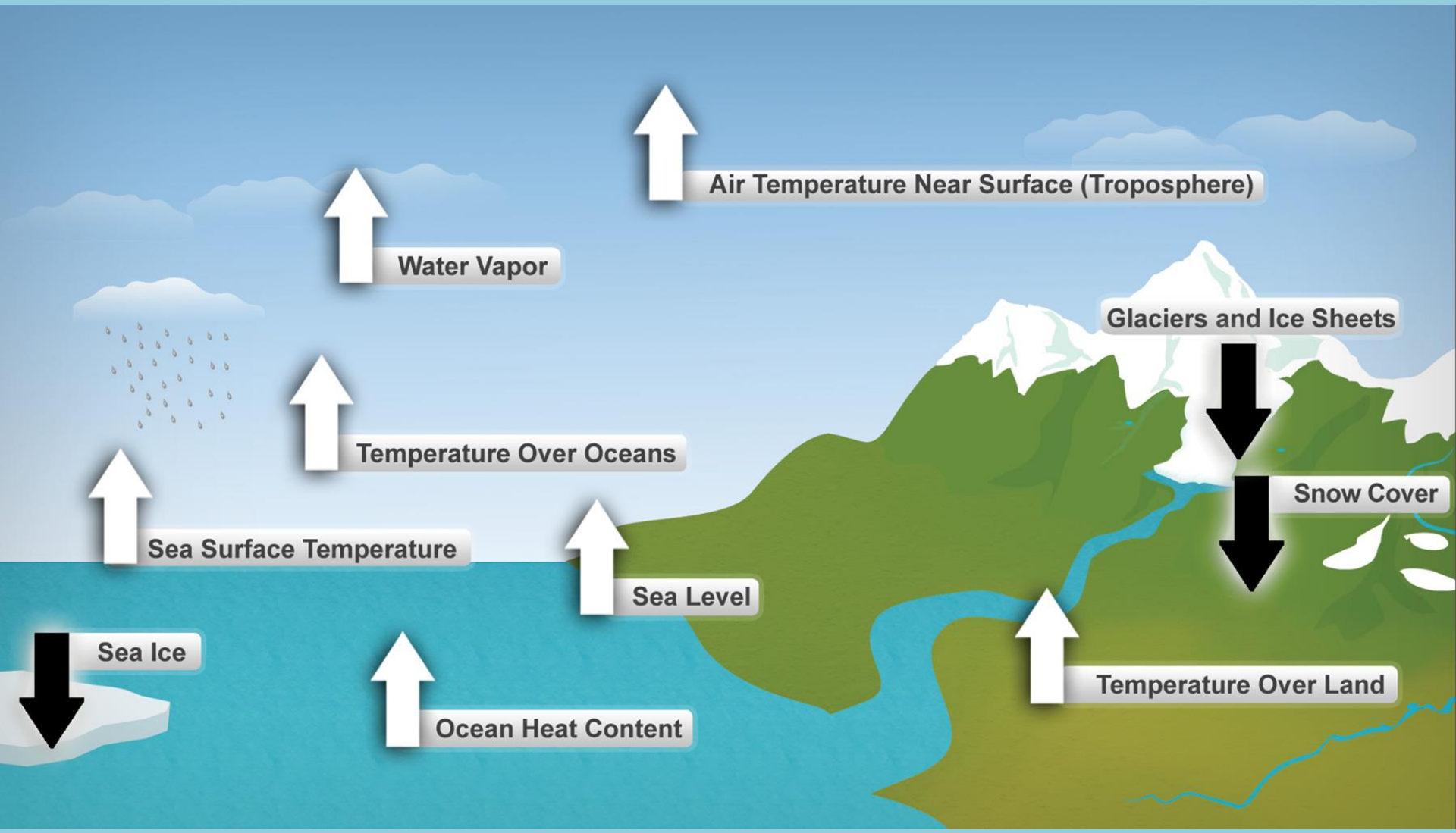
©Esperanza Stancioff, UMaine Extension and Maine Sea Grant

GlobalChange.gov
U.S. Global Change Research Program

Regions in the NCA

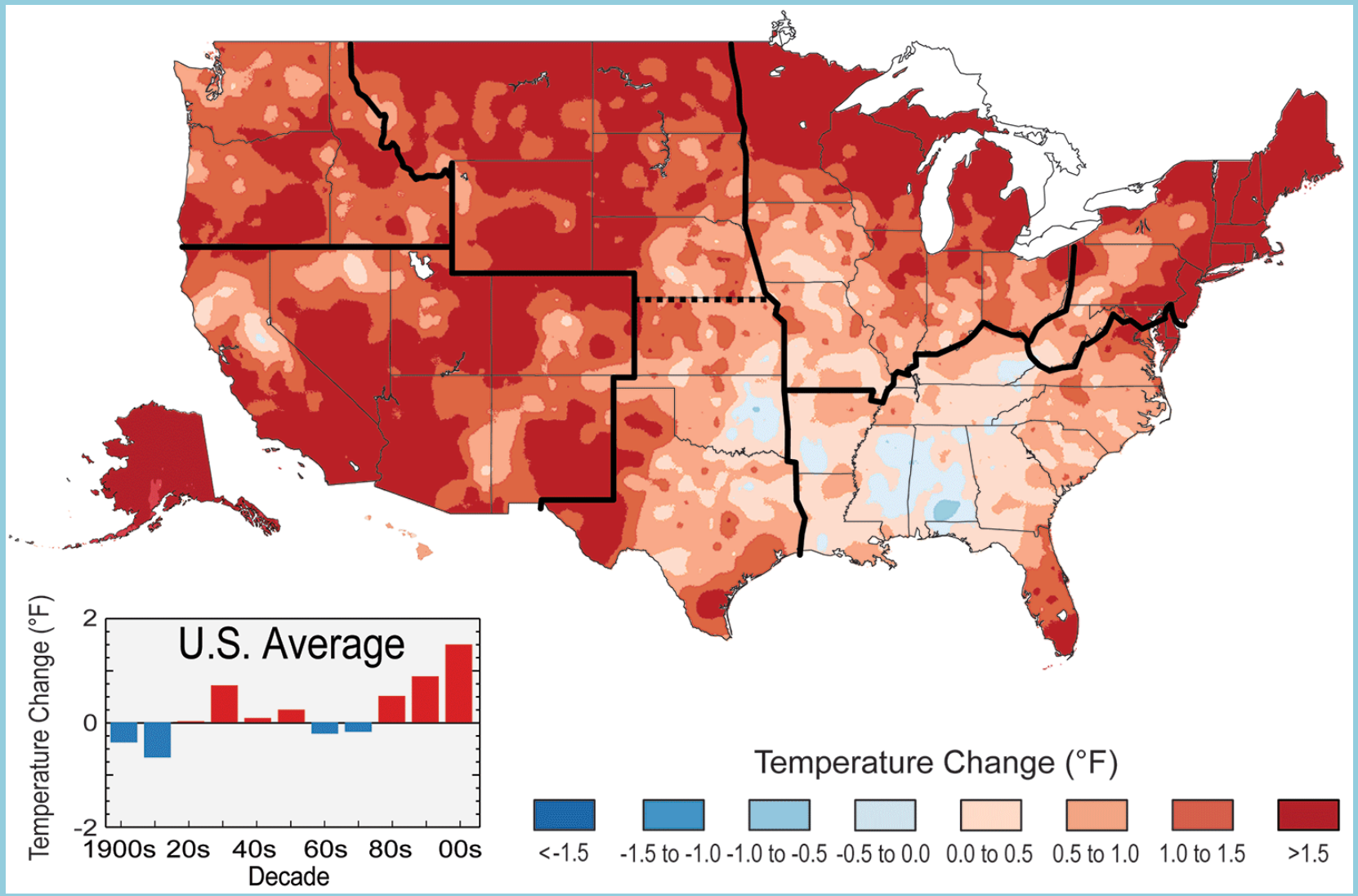


Ten Indicators of A Warming World



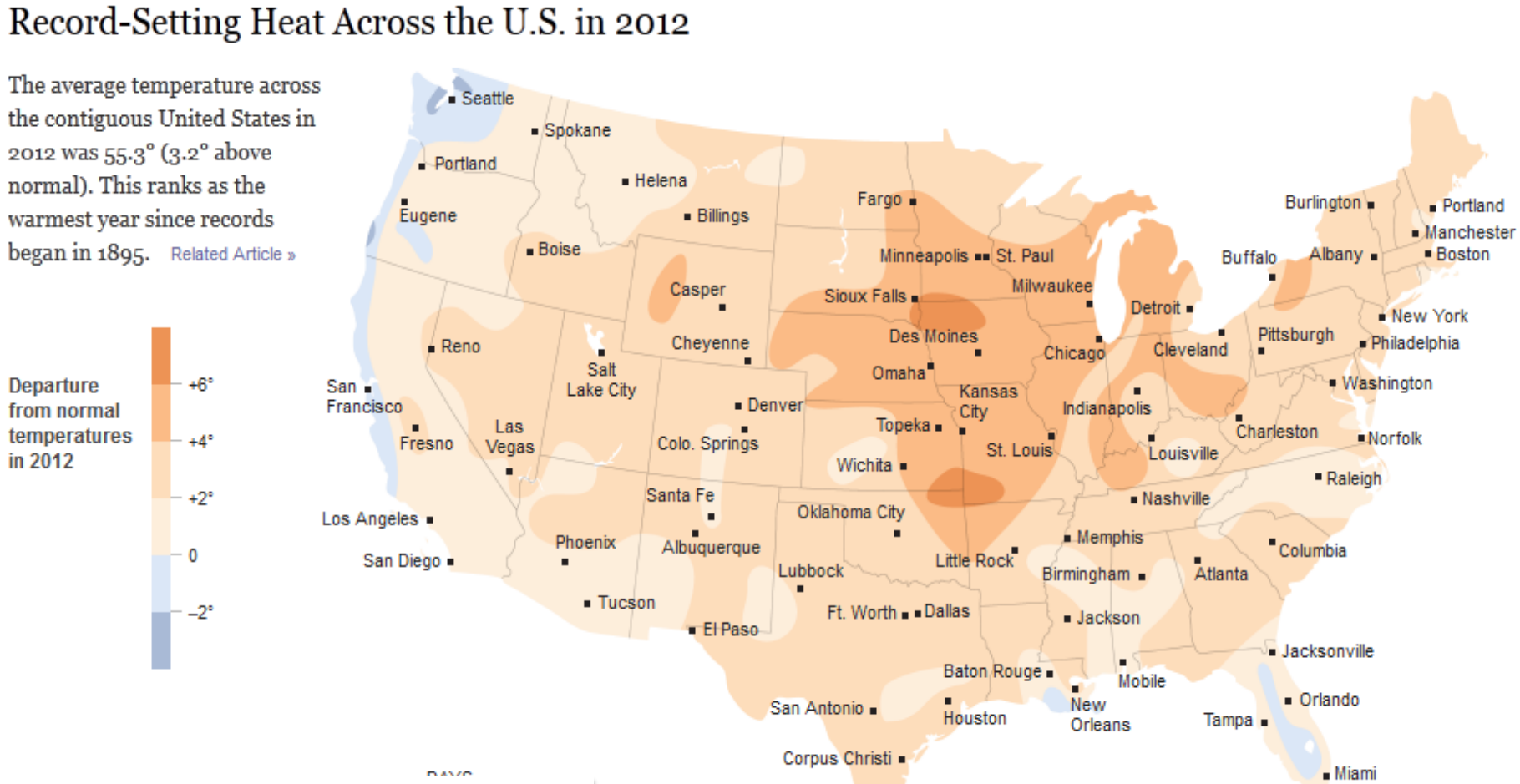
Multiple data sets show all ten of these are occurring as predicted

Observed U.S. Temperature Change



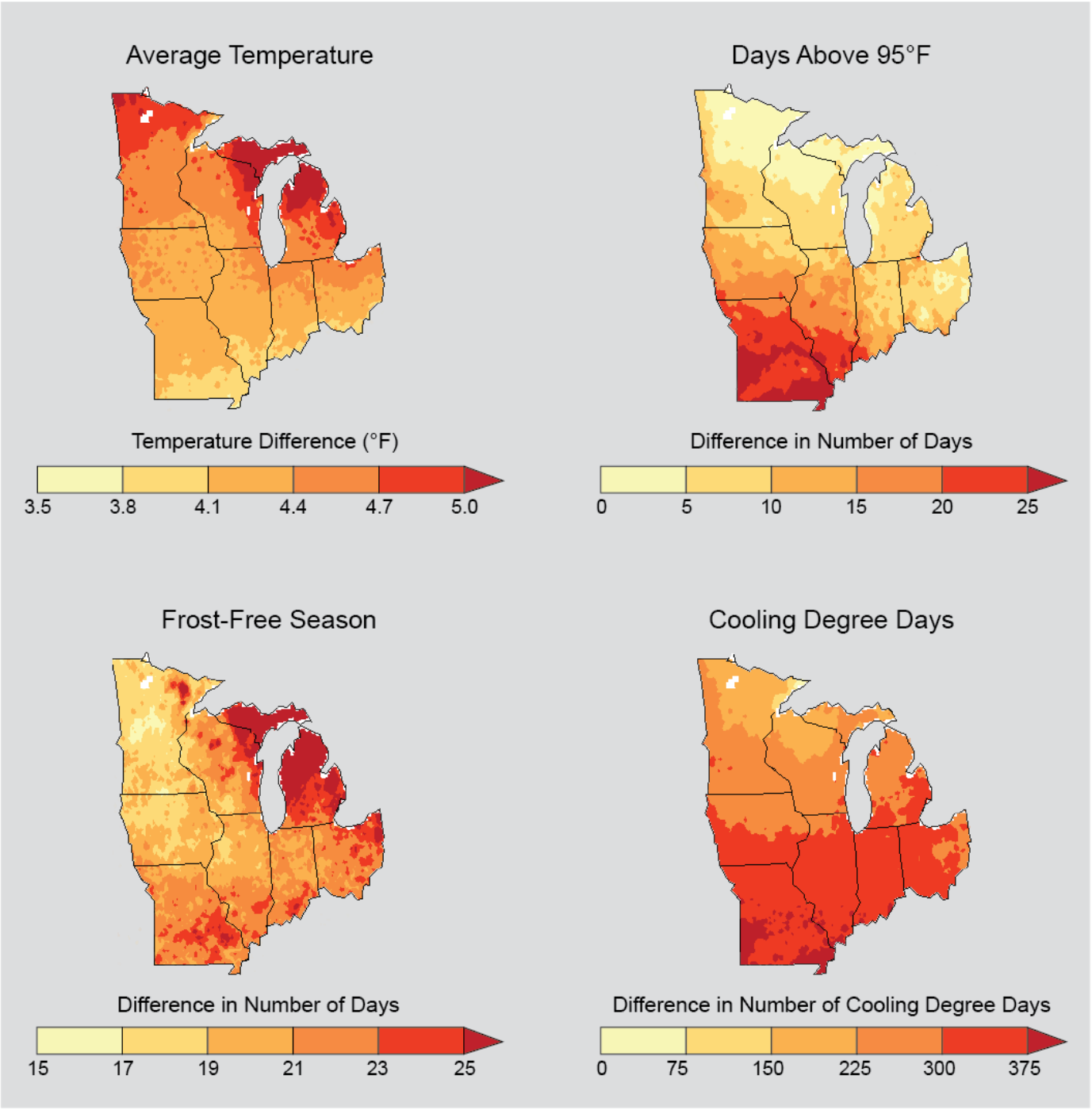
GlobalChange.gov
U.S. Global Change Research Program

The Midwest had some of the largest temperature anomalies in 2012



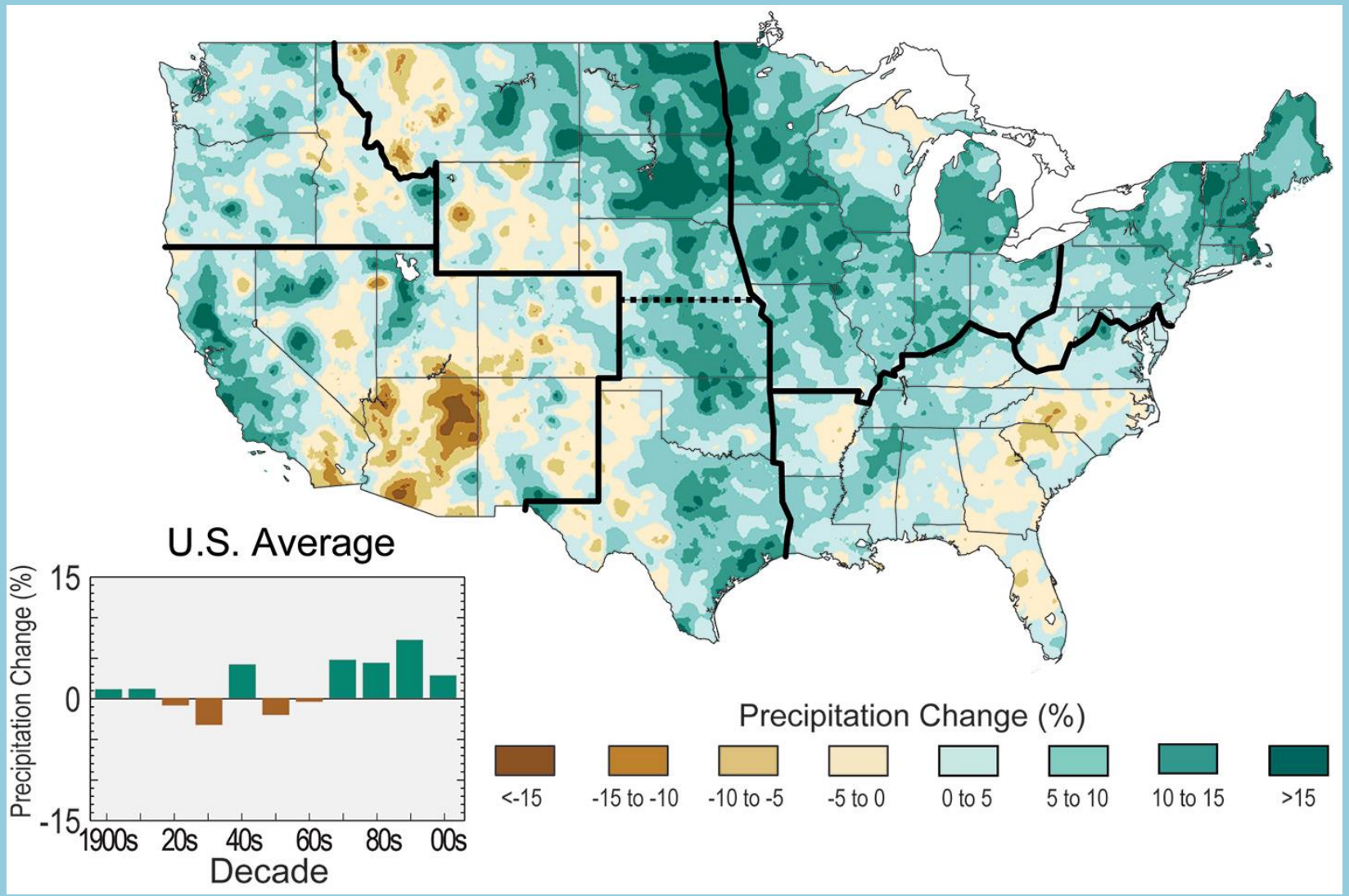
Biggest changes in the Midwest

NYT, 1/13/13 - from NOAA, Accuweather

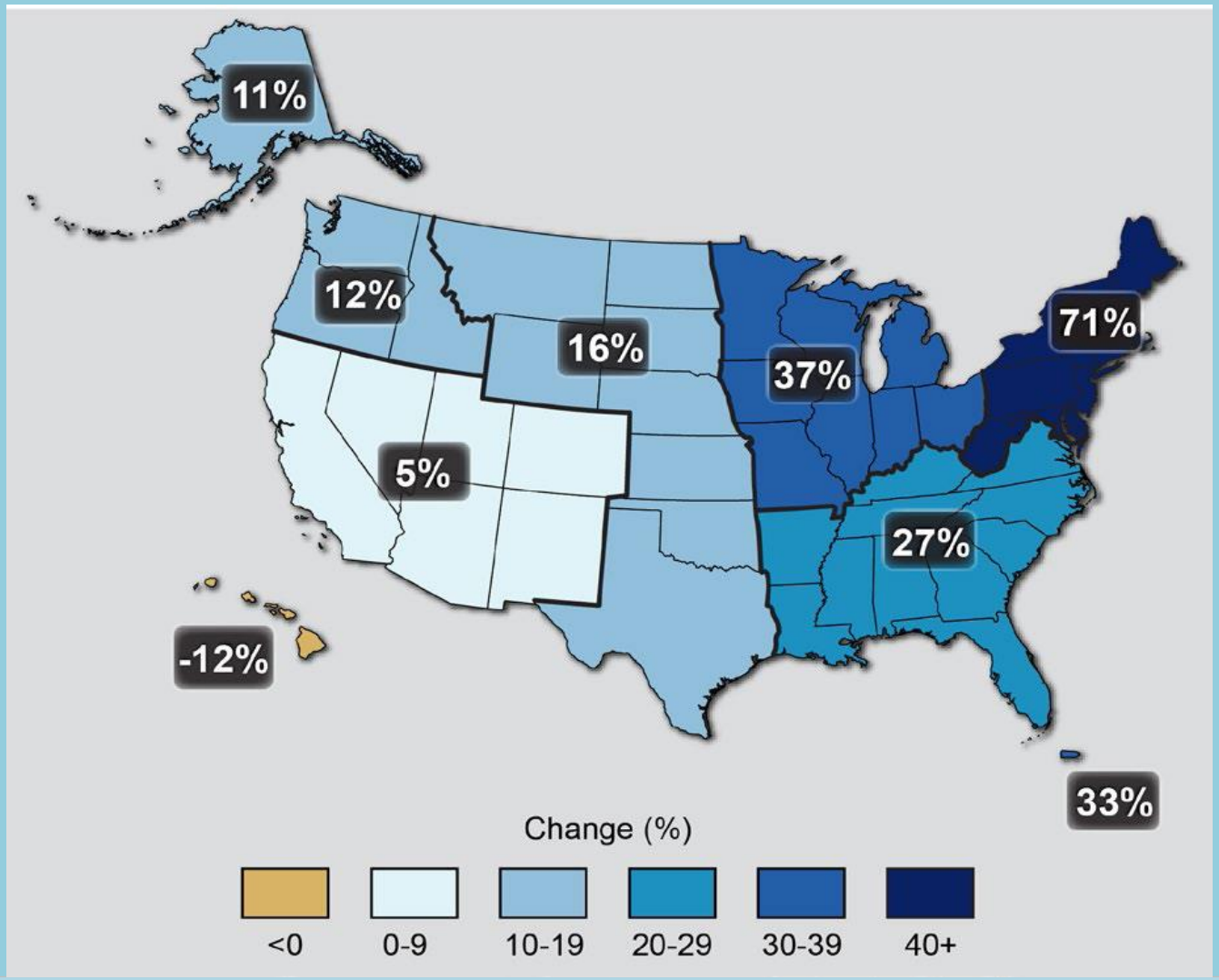


Projected Mid-Century Temperature Changes

Observed change in *TOTAL* U.S. Precipitation



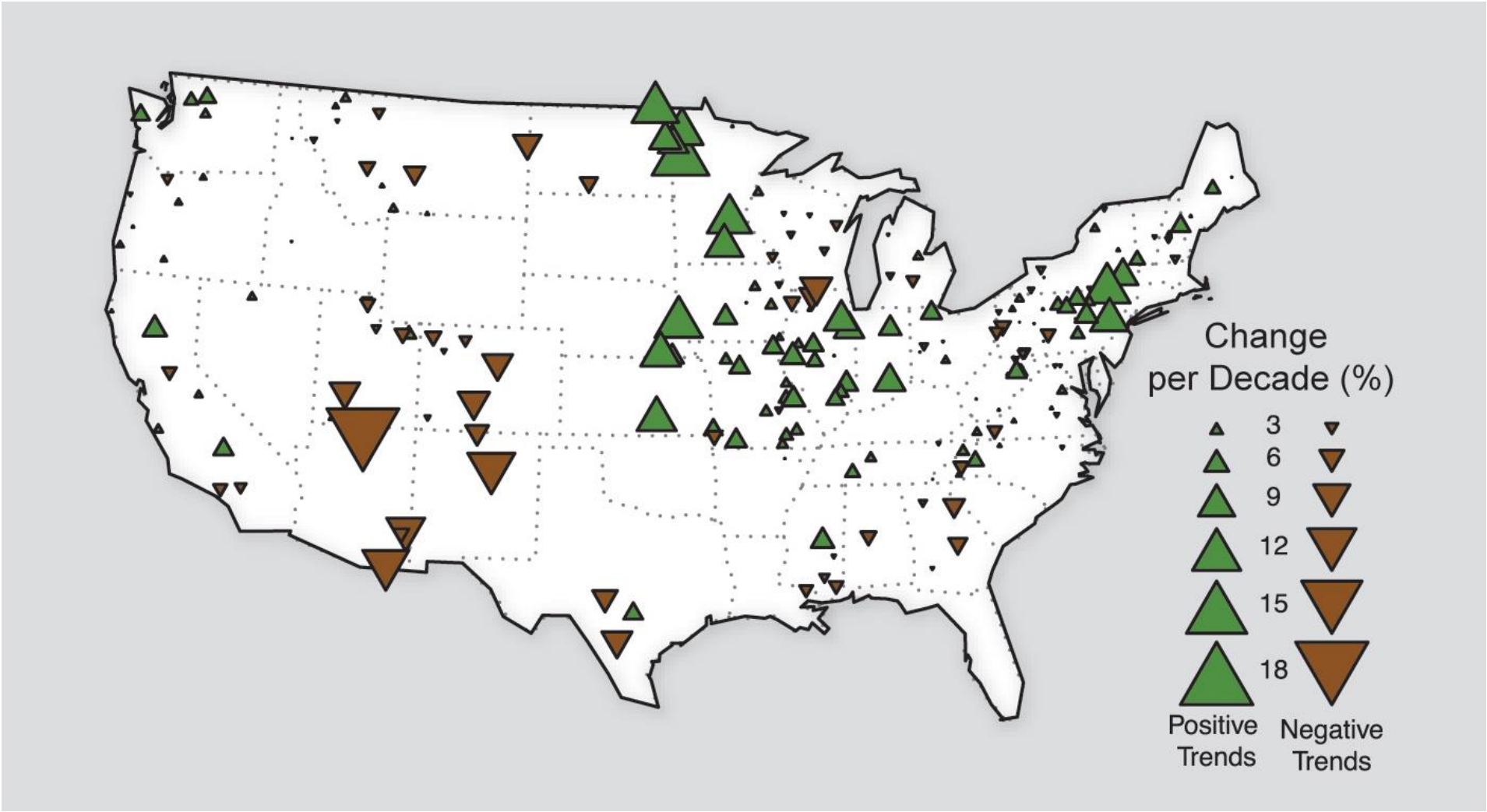
Observed change in *very heavy* Precipitation



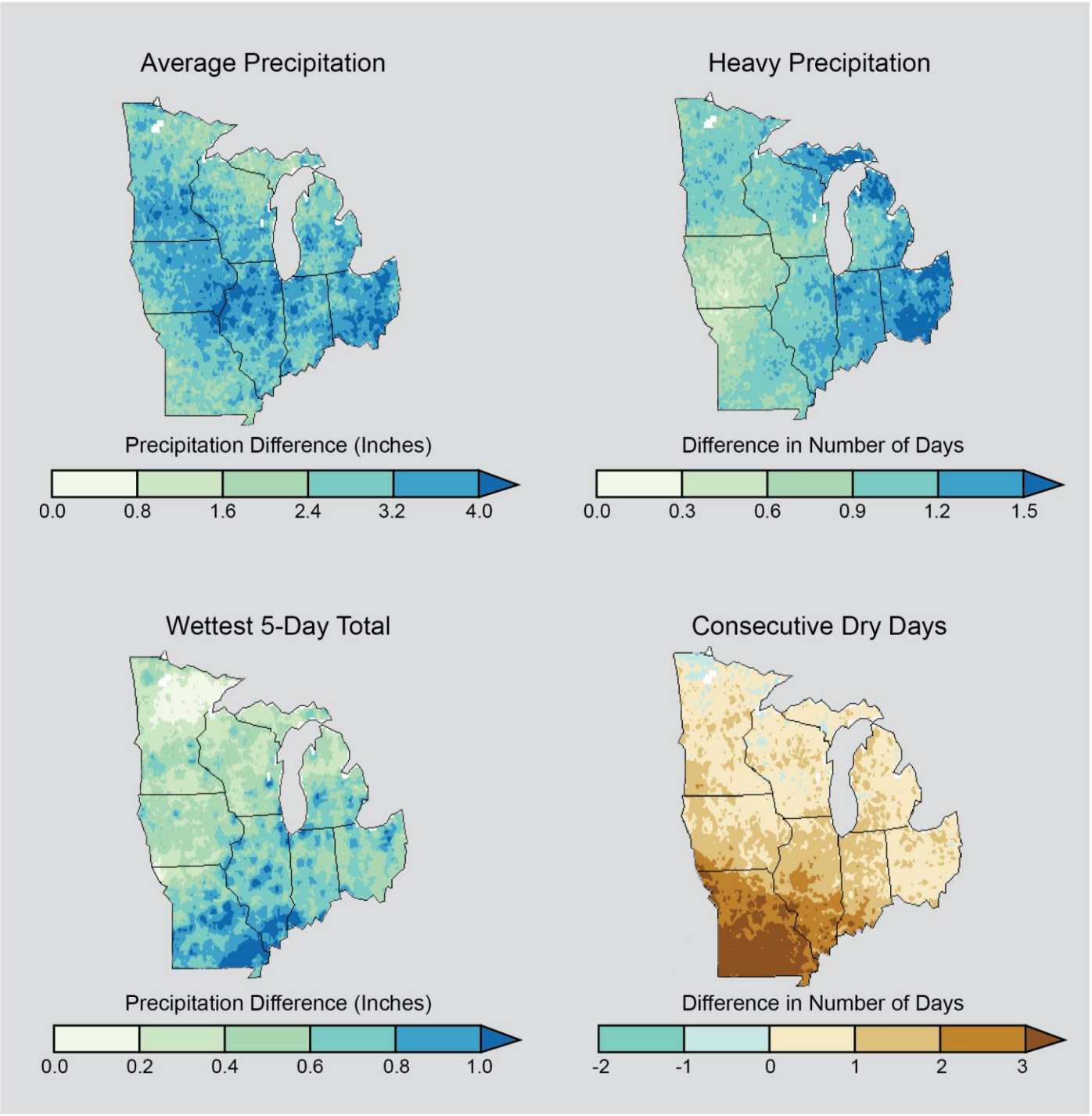
Very heavy precipitation events have increased & are expected to further increase

GlobalChange.gov
U.S. Global Change Research Program

Trends in Flood Magnitude



GlobalChange.gov
U.S. Global Change Research Program



Going forward:

When it Rains, it Pours

Impacts to Agriculture

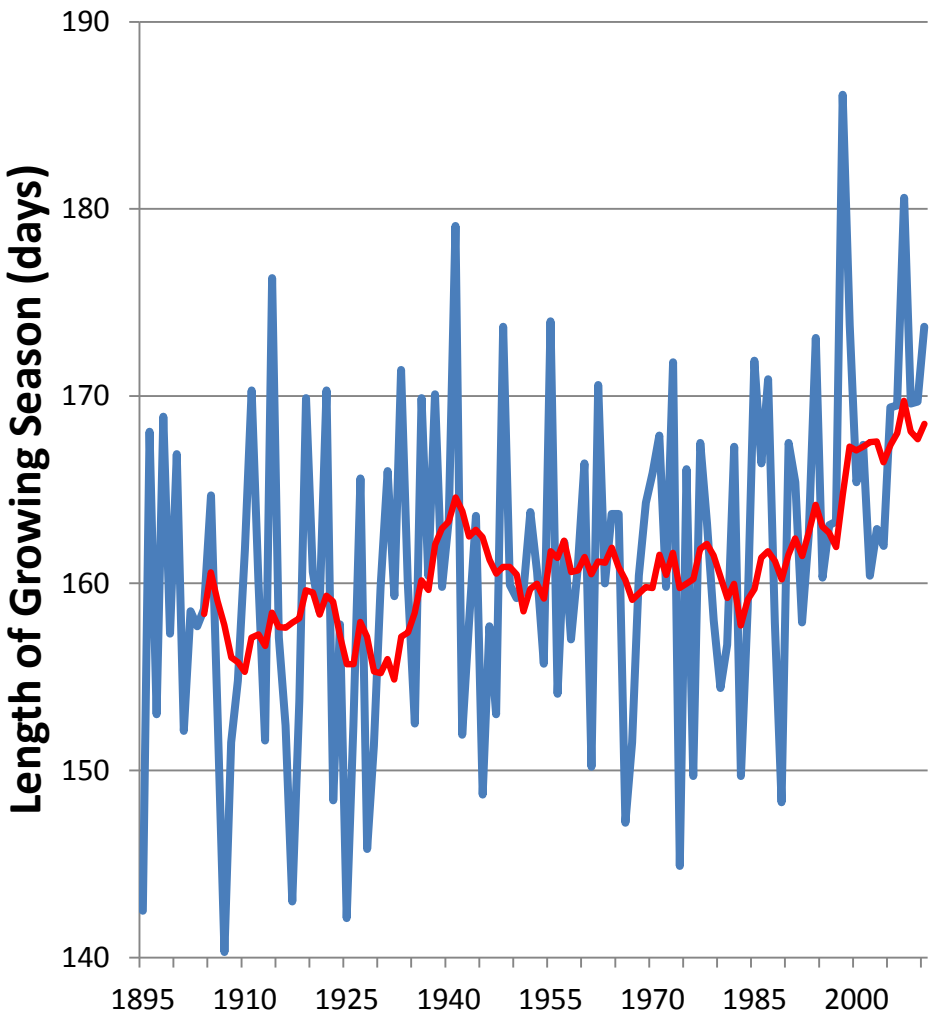
Next few decades:

Longer growing seasons and rising CO_2 will increase some yields, benefits will be offset by extreme weather.

In the long term:

Stresses associated with climate change are expected to decrease agricultural productivity.

Midwestern Growing Season is Longer …



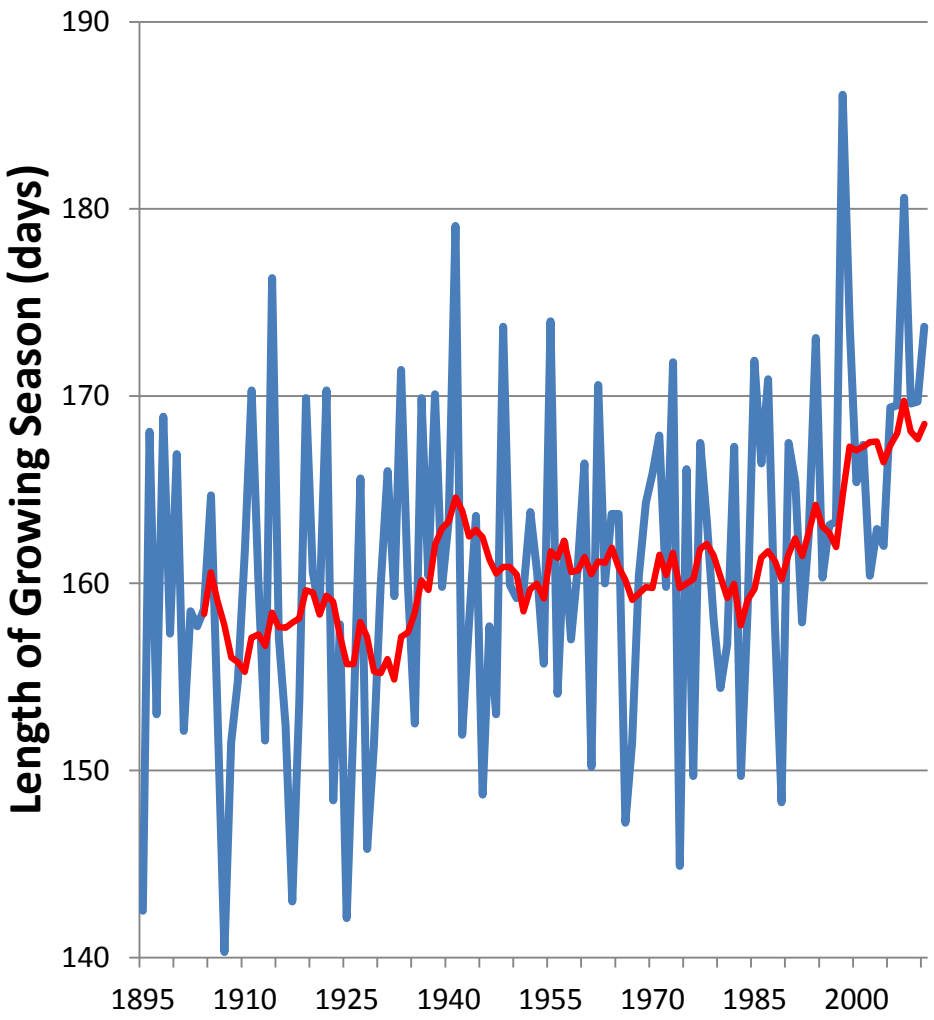
Growing season lengthened by ~1-2 weeks

Mostly due to earlier last winter frost in spring

Based on data from the National Climatic Data Center for the cooperative observer network and updated from Kunkel et al. (2004)

GlobalChange.gov
U.S. Global Change Research Program

Midwestern Growing Season is Longer … and getting longer



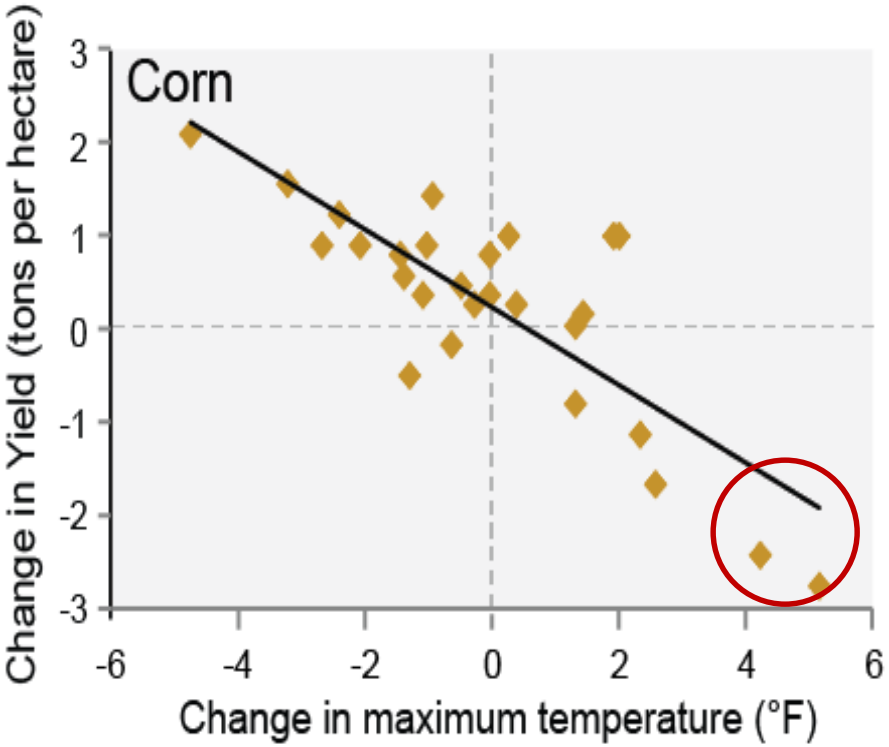
Growing season lengthened by ~1-2 weeks

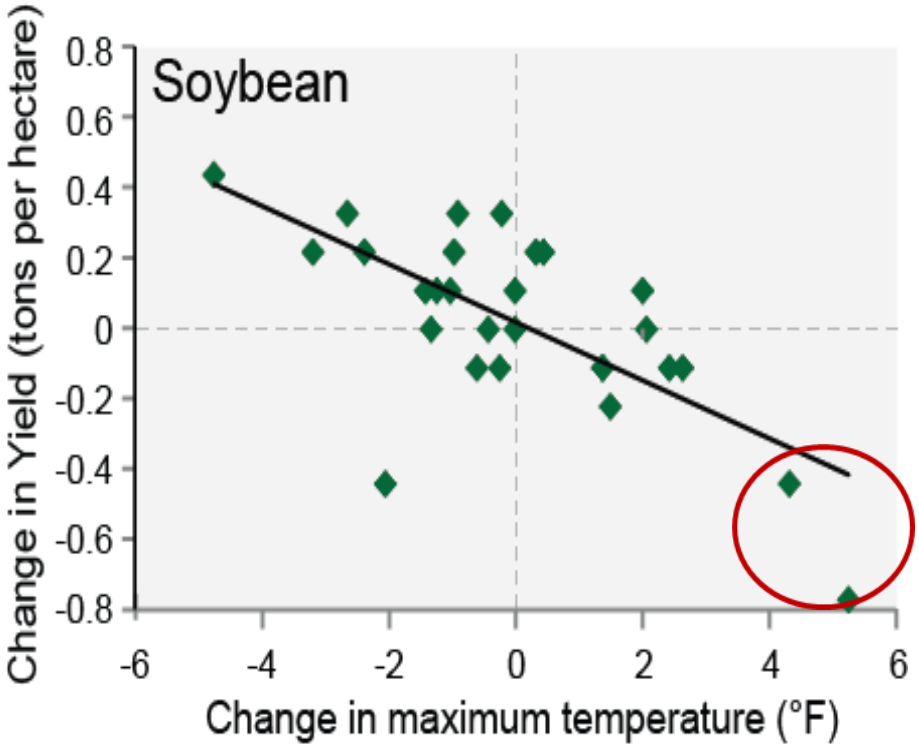
Mostly due to earlier last winter frost in spring

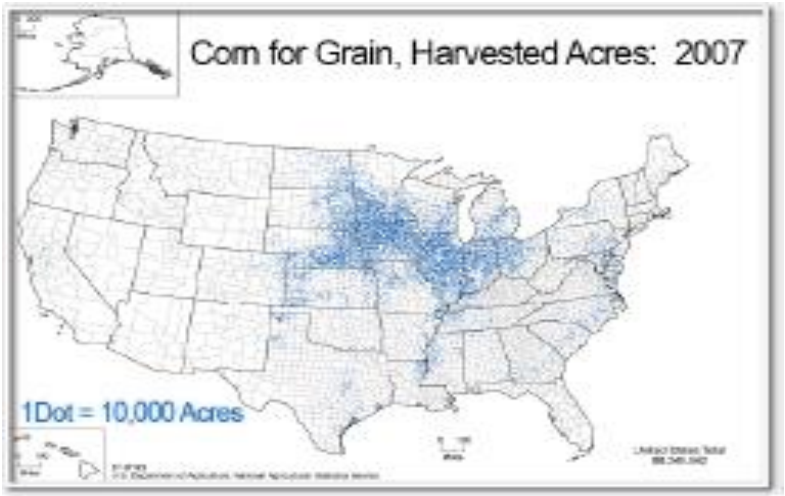
Growing season in 2100 may be 1-2 months longer

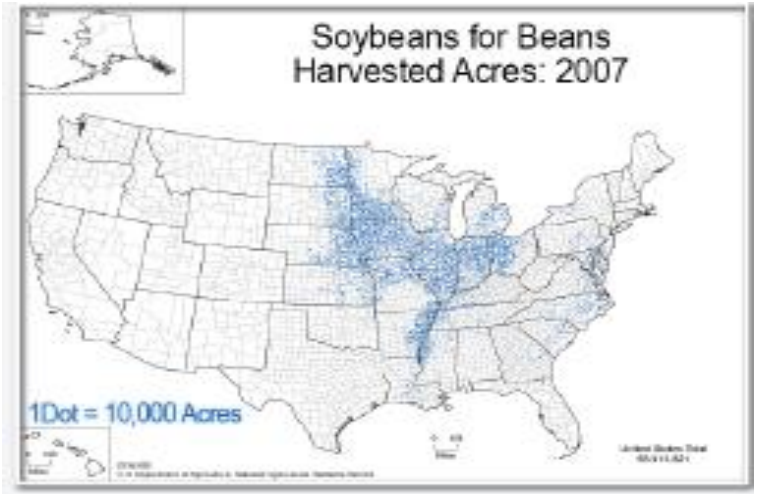
Based on data from the National Climatic Data Center for the cooperative observer network and updated from Kunkel et al. (2004)

Crop Yields Decline under Higher Temperatures







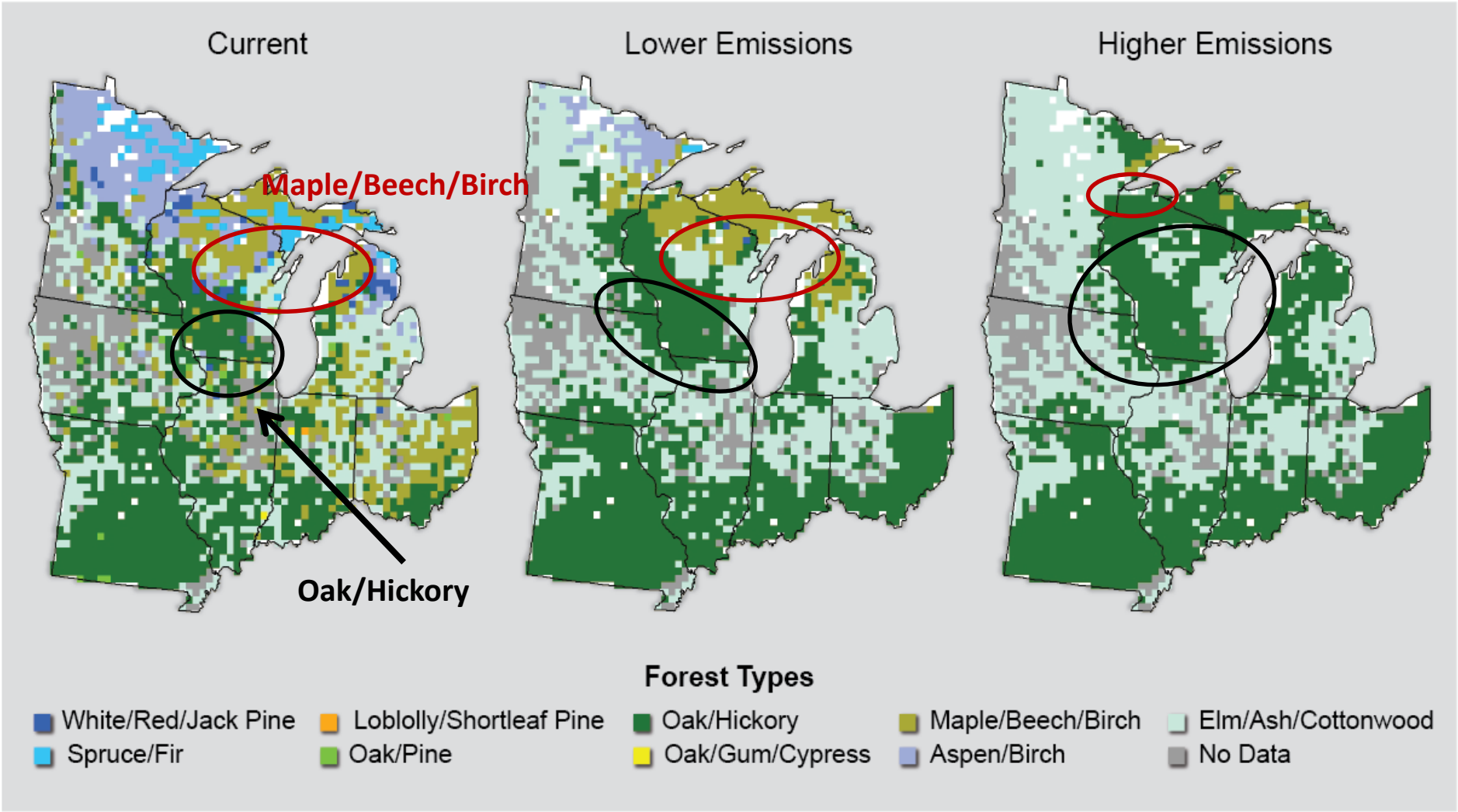


Forest Impacts

Forest composition is expected to change as rising temperatures drive habitats northward.

The role of the region's forests as a net absorber of carbon is at risk.

Forest Composition Shifts



GlobalChange.gov
U.S. Global Change Research Program

Impacts on Biodiversity

Climate amplifies existing stressors

Many species are on the move now and will need to migrate quickly to keep up with the pace of warming …

… but, large agricultural areas and the Great Lakes can be major obstacles

Public Health Risks

Public health risks will increase due to:

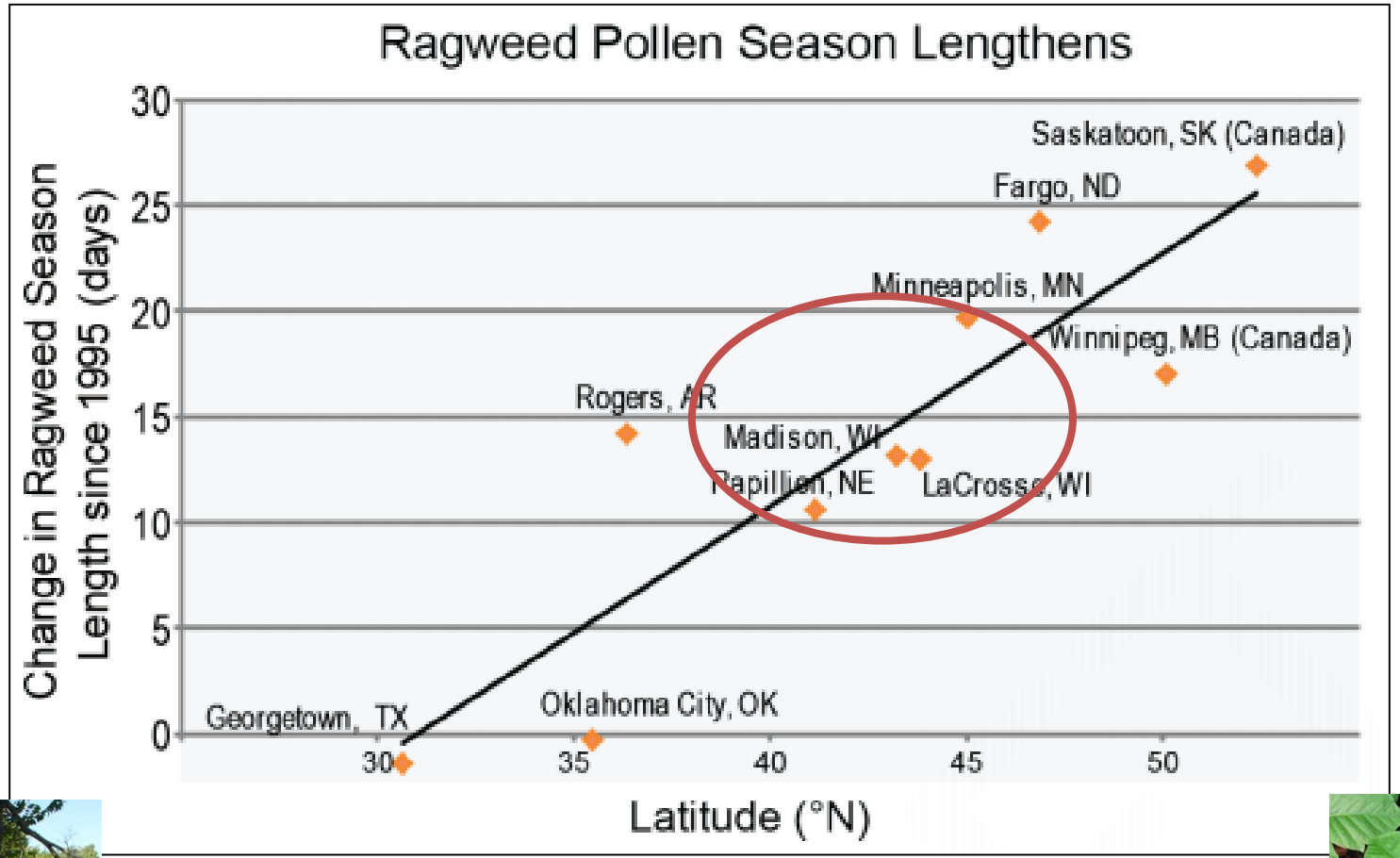
Increased heat waves

Degraded air quality

Increase in pests and allergy season

Reduced water quality

Ragweed Pollen Season is **now**
2-3 weeks longer in the Midwest



Ragweed

Pollen

Poison Ivy

Source: draft U.S. National Climate Assessment, 2013

Historical Heat Waves

Heat-wave health risks increased in most major Midwest cities

Increasing overnight, minimums increased faster, limiting relief

Observed Change in Number of Harmful Heat Waves

Chicago, IL
1948–2011
(63 years)

Increased 1 per year

Detroit, MI
1959–2011
(52 years)

Increased 2 per year

Future Heat Waves

Heat waves health risks increased in most major Midwest cities.

Increasing overnight, minimums increased faster, limiting relief.

E.g., excess heat-related deaths between 150 and 2200 per year for Chicago / year

Observed Change in Number of Harmful Heat Waves

Chicago, IL
1948–2011
(63 years)

Increased 1 per year

Detroit, MI
1959–2011
(52 years)

Increased 2 per year

UCS Heat in the Heartland, 2012

Increased Risk to the Great Lakes

Changes in range and distribution of fish species.

Increased invasive species

Increased harmful algal blooms

Declining beach health.

Less ice will lengthen navigation season.

Potential Impacts on Shipping

Less lake ice cover allows for a longer shipping season

… but with potential lower lake levels, every lost inch of water depth:

- **Reduces cargo capacity 50-270 tons**
- **Costs $10k-30k per transit**

GlobalChange.gov
U.S. Global Change Research Program

Impacts in the Midwest

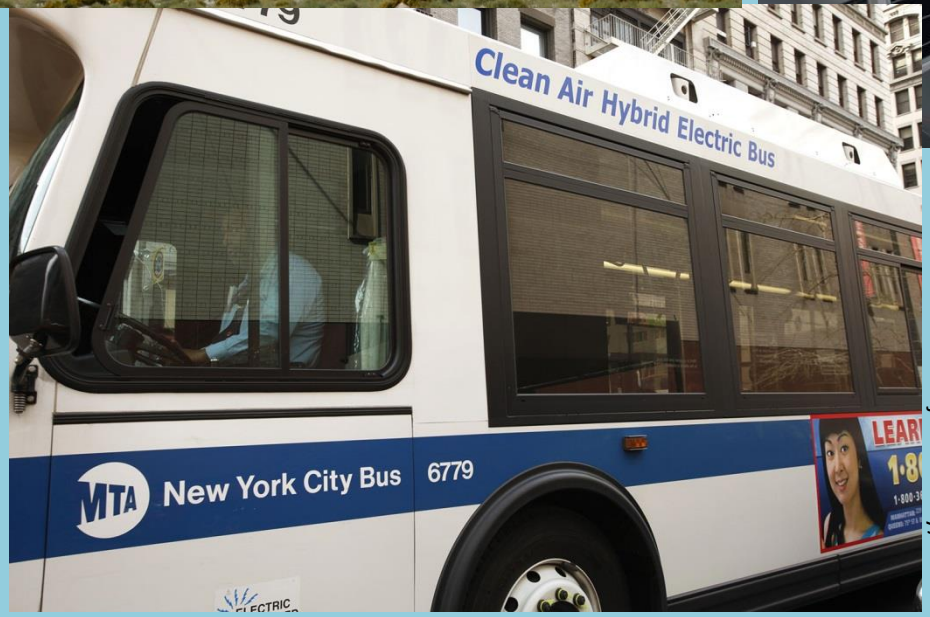
Changes in temperature and precipitation will impact both engineered and natural environments.

Fish
Water
Energy
Forests
Agriculture
Biodiversity
Public Health
Transportation
Birds and Wildlife
Tourism and Recreation

Mitigation

© Jerome Levitch/Corbis

©Dennis Schroeder, NREL



© Najlah Feanny/Corbis

GlobalChange.gov
U.S. Global Change Research Program

Adaptation

©Esperanza Stancioff, UMaine Extension and Maine Sea Grant

©Proehl Studios/Corbis

FEMA photo by Wendell A. Davis Jr.

GlobalChange.gov
U.S. Global Change Research Program

Adaptation is still very nascent!

There is no "one-size fits all" adaptation, but there are similarities in approaches across regions and sectors.

We need to begin sharing best practices and " lessons learned" so wise practices can be put in place.

Adaptation can yield Co-Benefits: Address Existing Stressors & Enhance Resilience to climate change

- Dubuque, IA – new green alley program and expanded its storm sewer to deal with flooding
- Urban heat island mitigation in Chicago (via green roofs) and NYC via white roofs
- Sea level rise preparedness in Miami-Dade County, FL
- Santa Clara, CA – increased water conservation
- Keene, NH - Increasing storm pipe diameter
- Dayton, OH - Urban forestry program reduces stormwater run-off by 7%
- Ann Arbor, MI – stormwater utility charges by amount of impervious surface
- Flagstaff, AZ – reducing fire risk

Photo: Brian Ray AP

Third National Climate Assessment

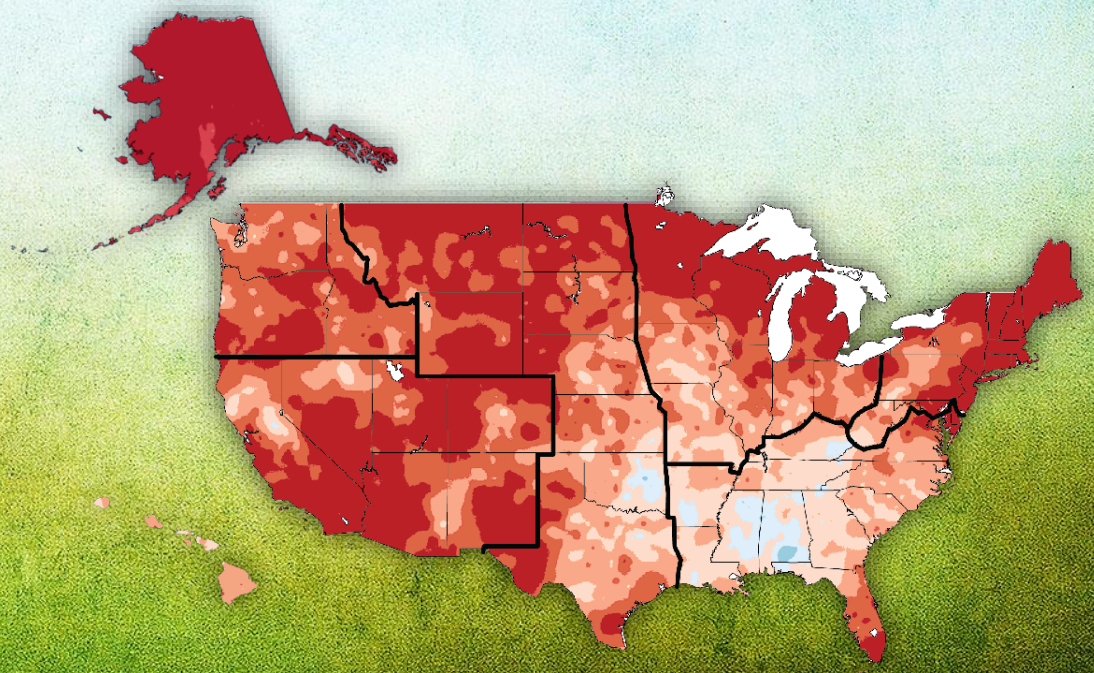
Climate Change Impacts in the United States

- http://nca2014.globalchange.gov -

#NCA2014

facebook.com/usgcrp

@usgcrp



GlobalChange.gov
U.S. Global Change Research Program