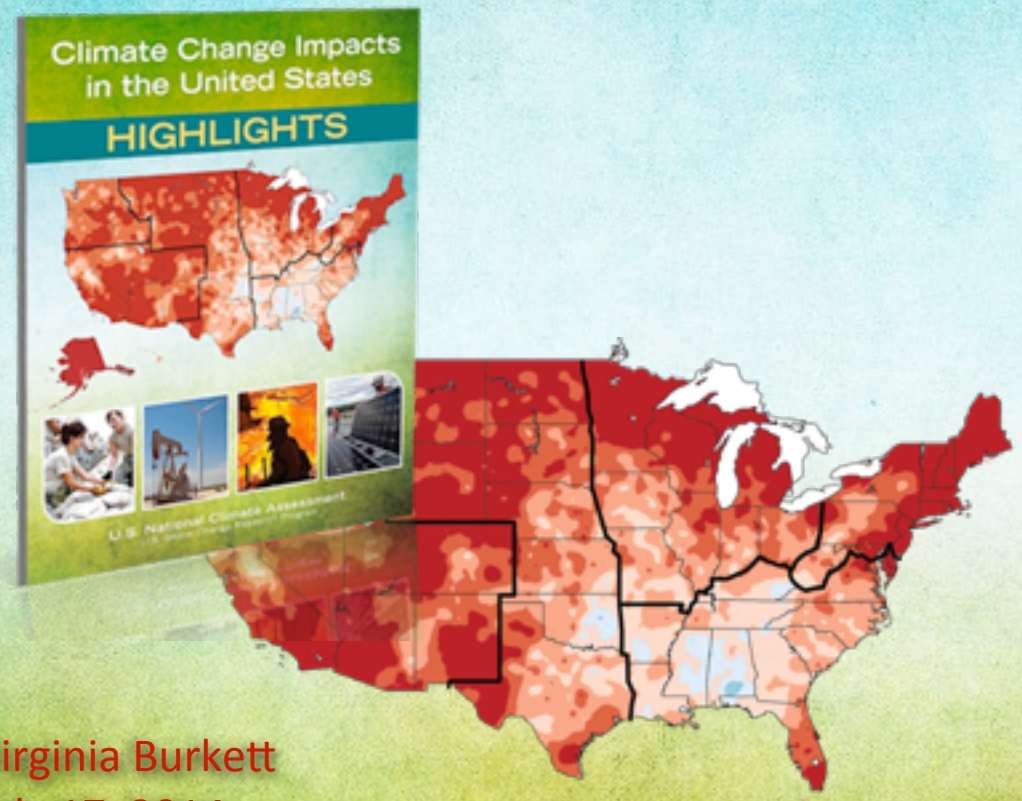
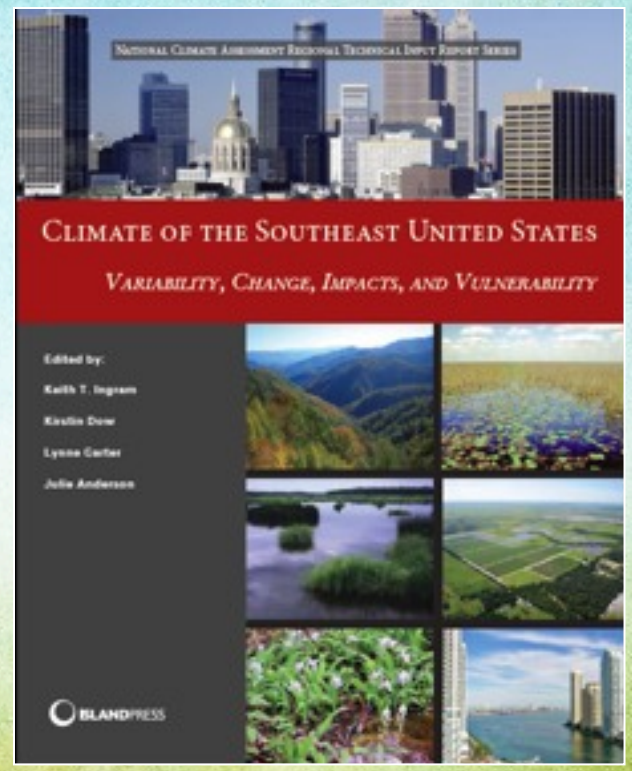
Third National Climate Assessment
Key Findings for the Southeast





Virginia Burkett
July 17, 2014

U.S. Department of the Interior
USGS
science for a changing world

Gulf Coastal Plain and Ozarks LCC
Steering Committee Meeting

United States Global Change Research Program

The U.S. Global Change Research Act (GCRA, 1990) mandate to the 13 agencies:

"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."

National Climate Assessment: GCRA (1990), Section 106

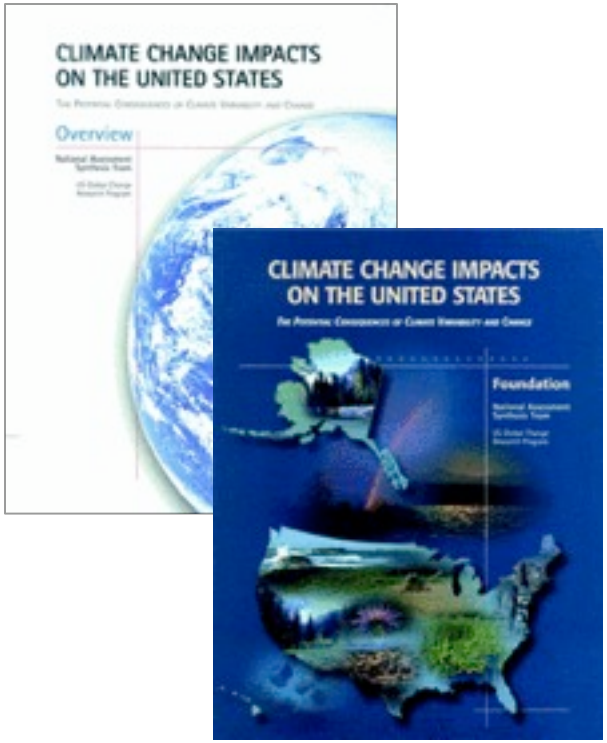
…not less frequently than every 4 years, NSTC shall prepare… an assessment which

- 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.

Maintaining an assessment capacity is a major goal of the USGCRP strategic plan.

Previous National Climate Assessments

2000

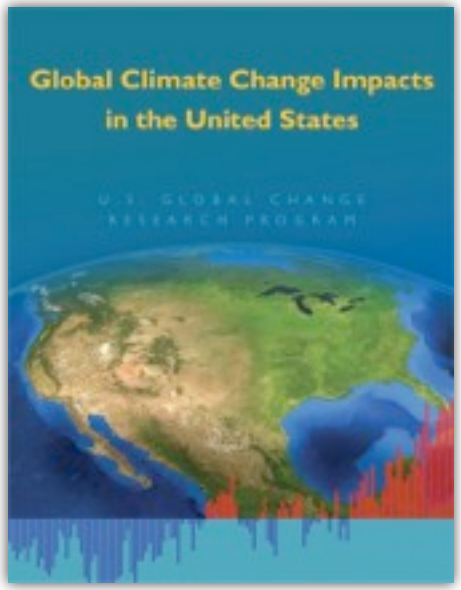


NCA1

21 Synthesis and
Assessment Products

2004-2009

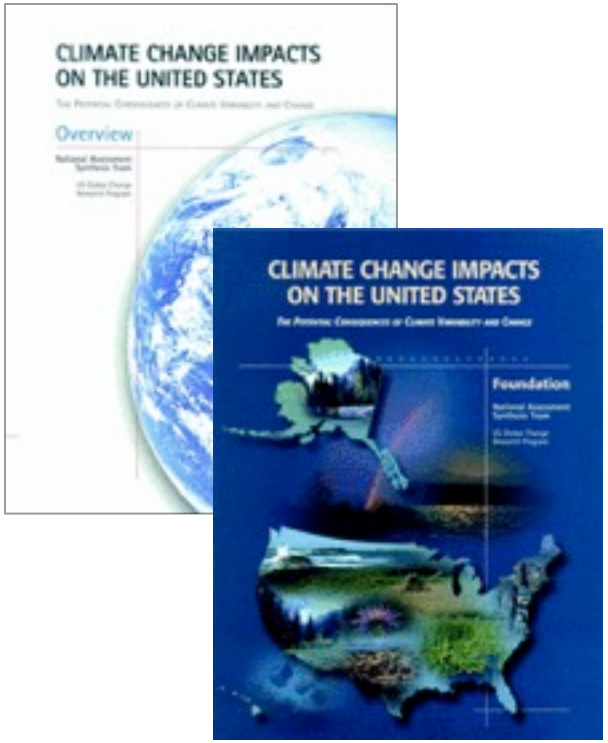
2009



NCA2

Previous National Climate Assessments

2000



NCA1

21 Synthesis and
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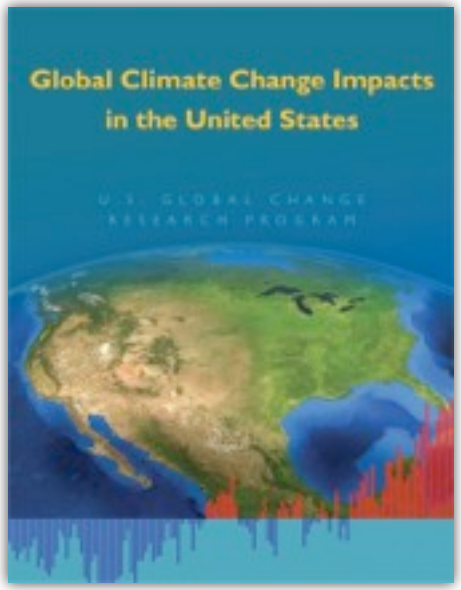
2004-2009

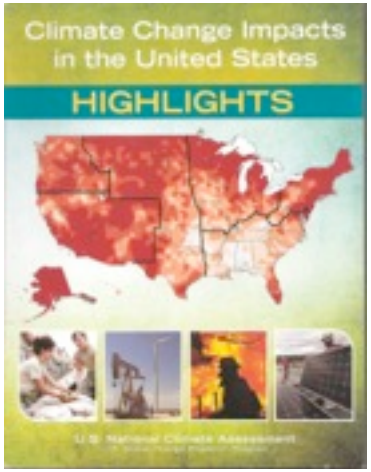
2009



NCA2

NCA3 was released on May 6, 2014

- Presents an overview of observed and projected climate change



Gulf Coastal Plain and Ozarks LCC

Three Key Messages from the SE

- **Sea level rise** poses widespread and continuing threats to both natural and built environments and to the regional economy.

Terrebonne Parish, LA

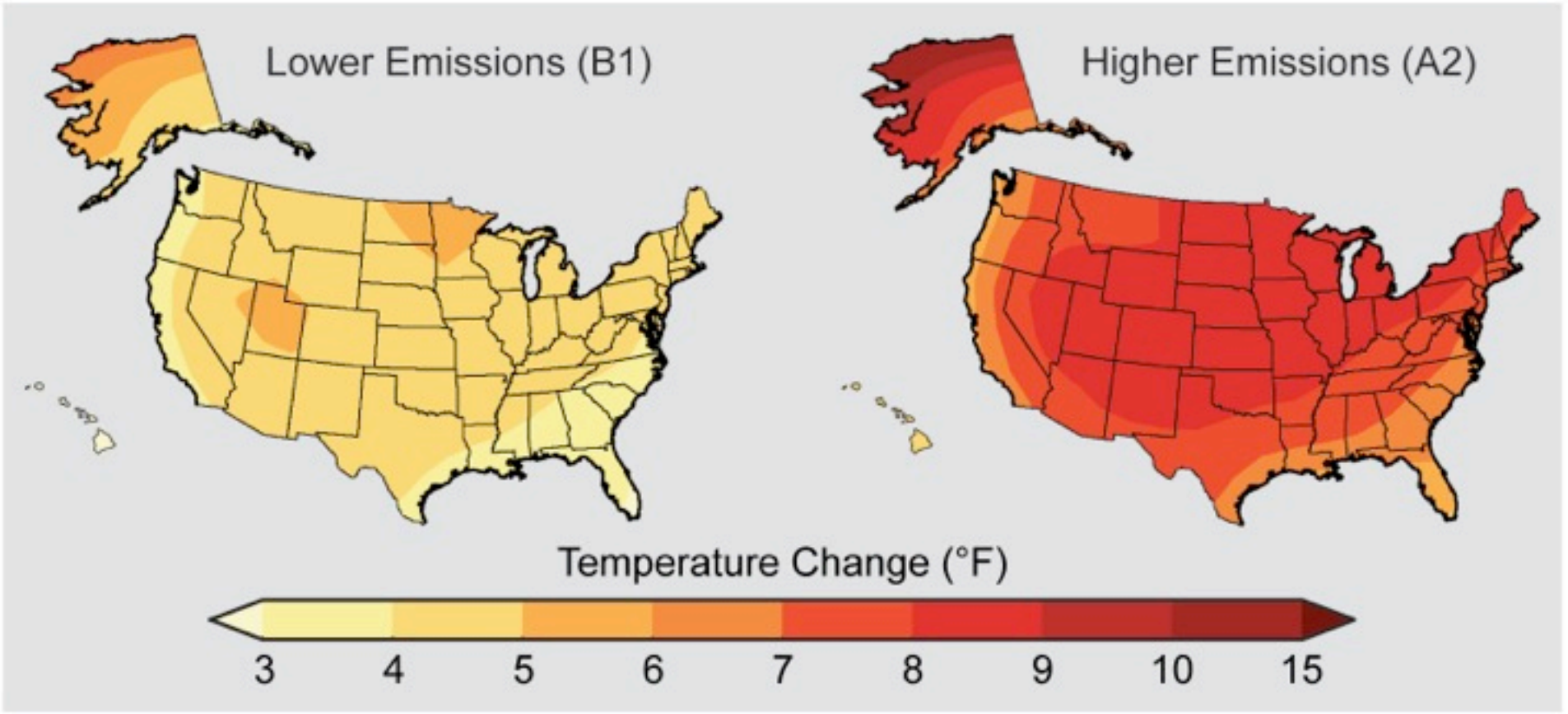
- **Increasing temperatures** and the associated increase in frequency, intensity, and duration of extreme heat events will affect public health, natural and built environments, energy, agriculture, and forestry.

S. Florida

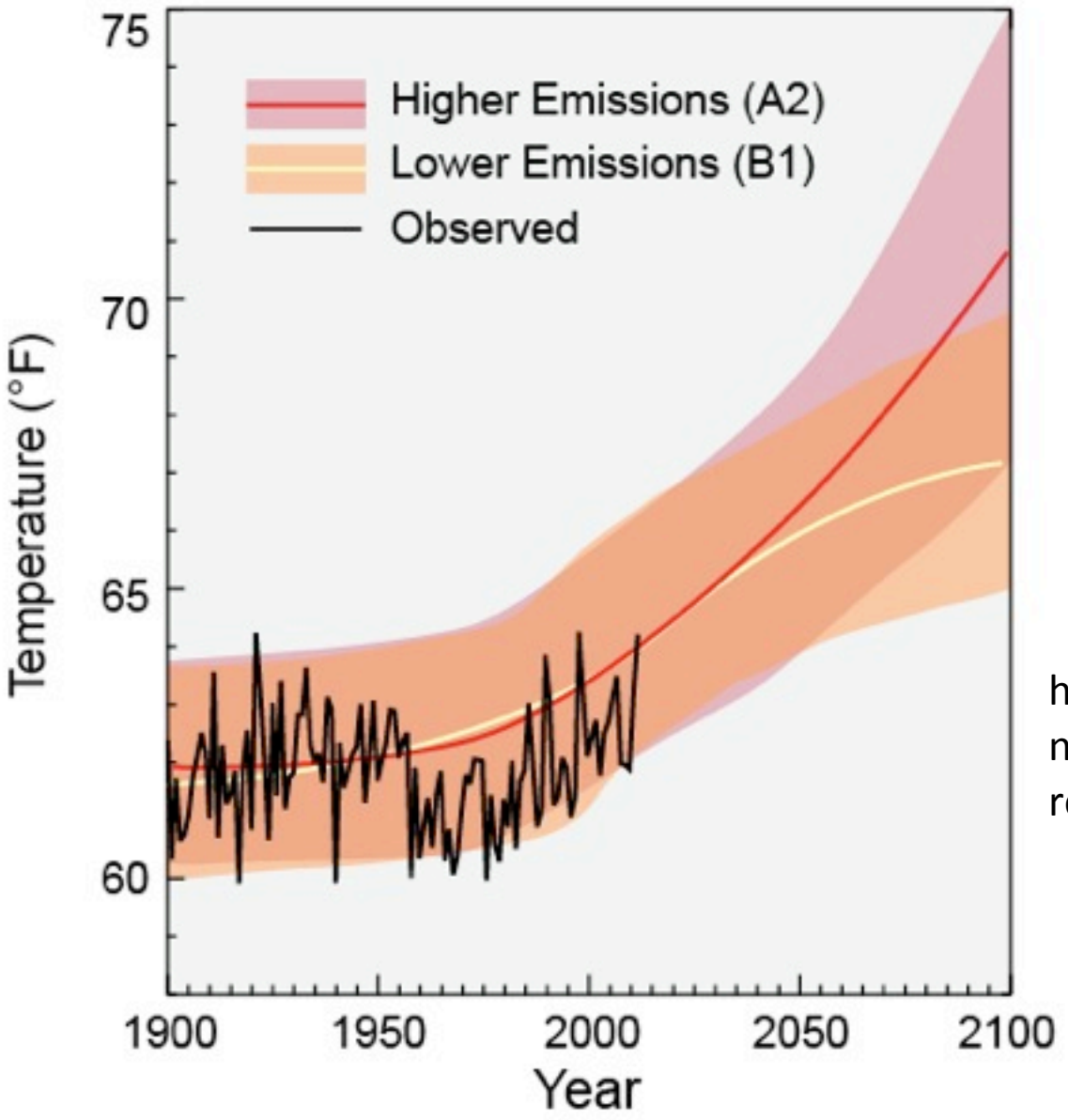
- **Decreased water availability**, exacerbated by population growth and land-use change, will continue to increase competition for water and affect the region's economy and unique ecosystems.

Lake Lanier, Georgia

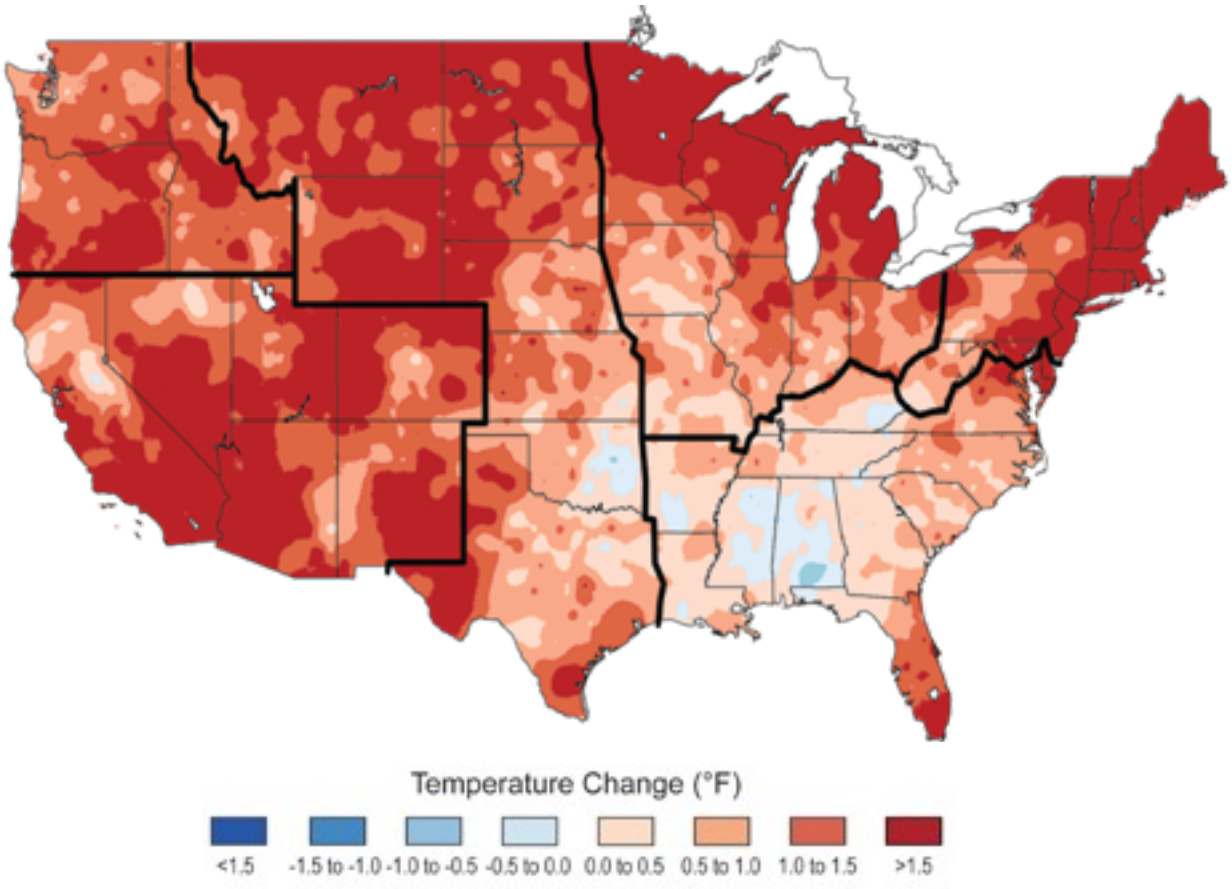
Projected Temperature Change for the United States by end of Century



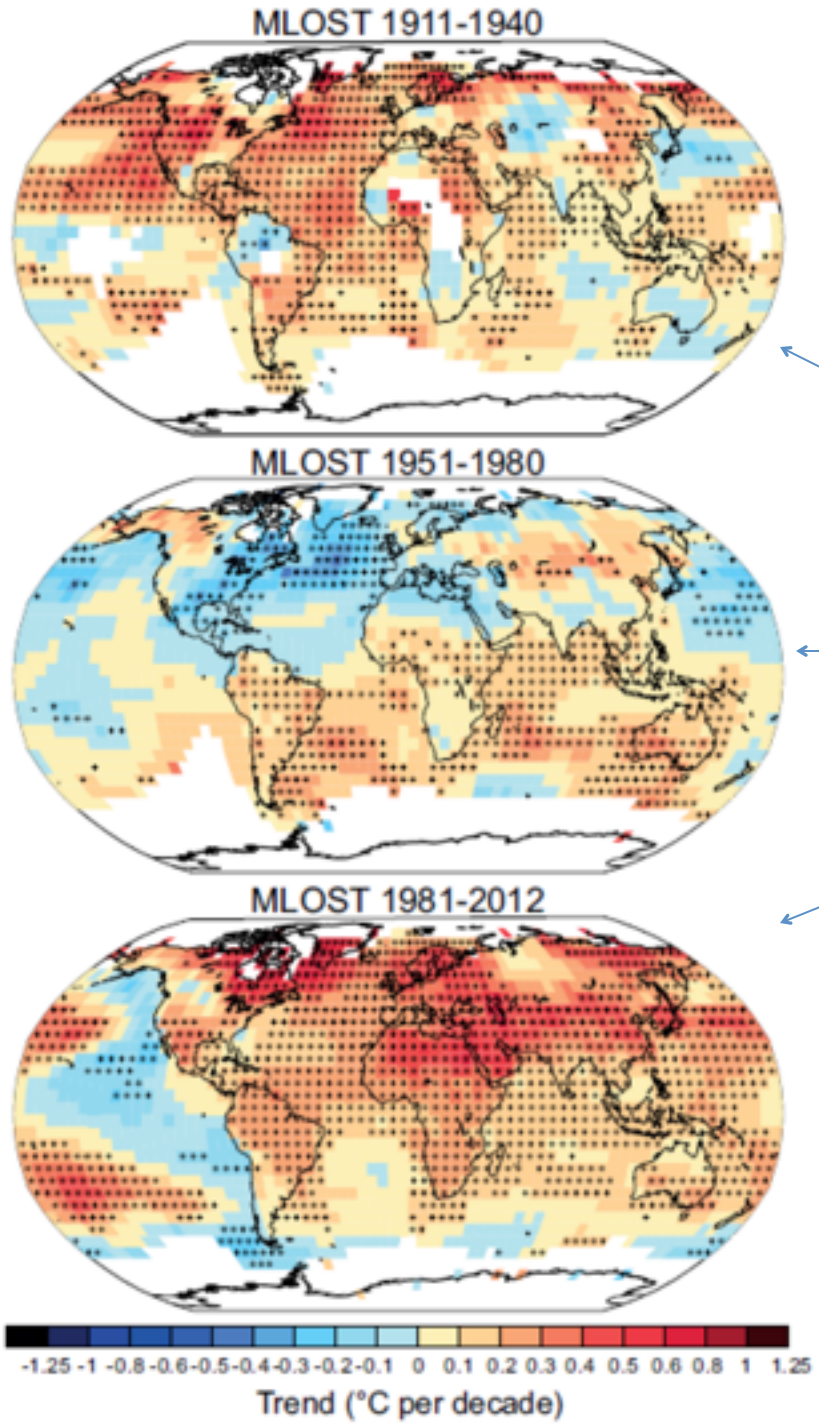
Southeast Temperature: Observed and Projected



http://
nca2014.globalchange.gov/
report/regions/southeast



NCA cover figure shows difference in temperature over the past 22 years (1991-2012) compared to the 1901-1960 average. The Southeast warmed during the early part of last century, cooled for a few decades, and is now warming at rates comparable to the global average.



Trends in global surface temperature for three non-consecutive periods:

1911–1940

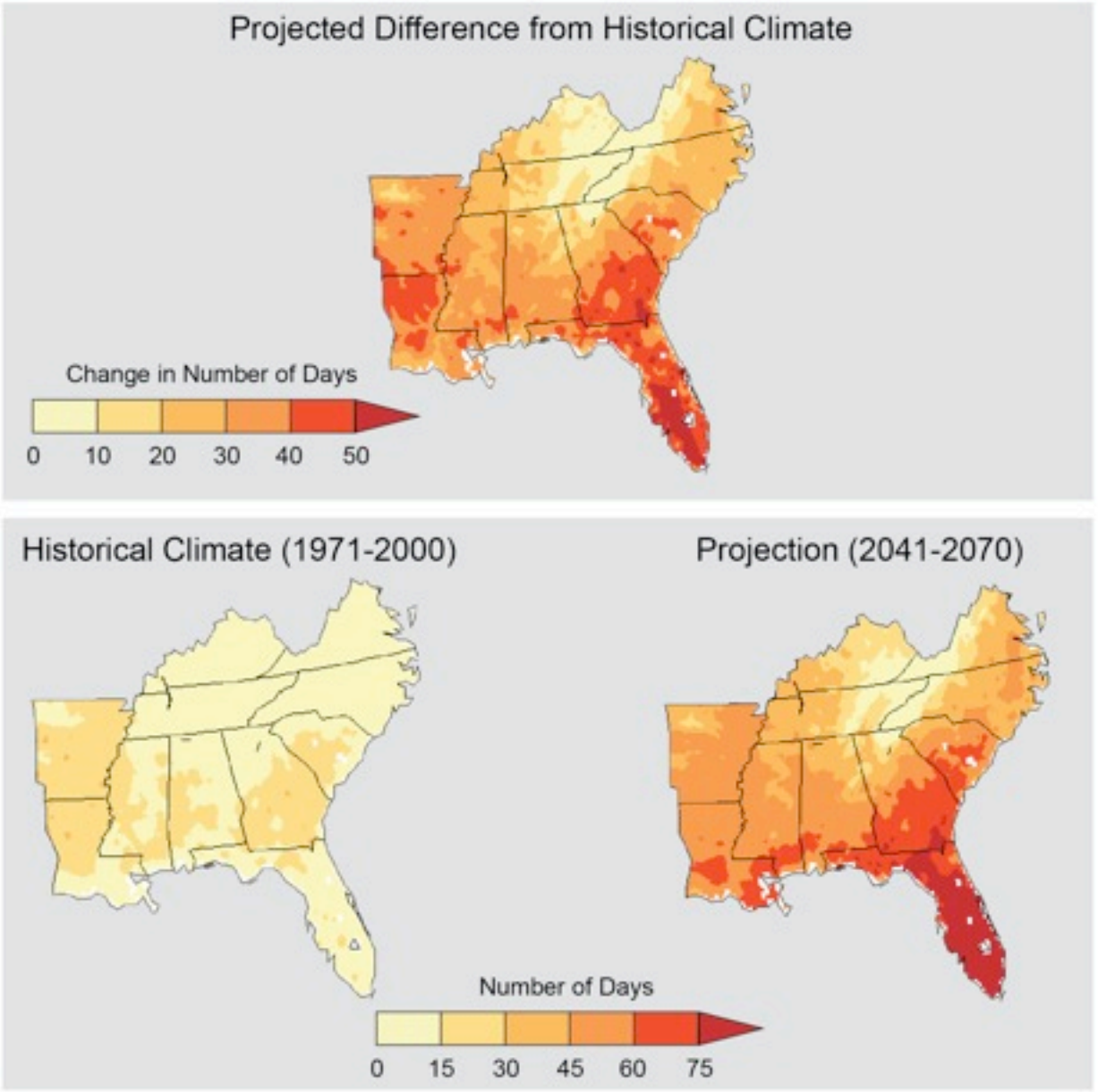
1951–1980

1981–2012

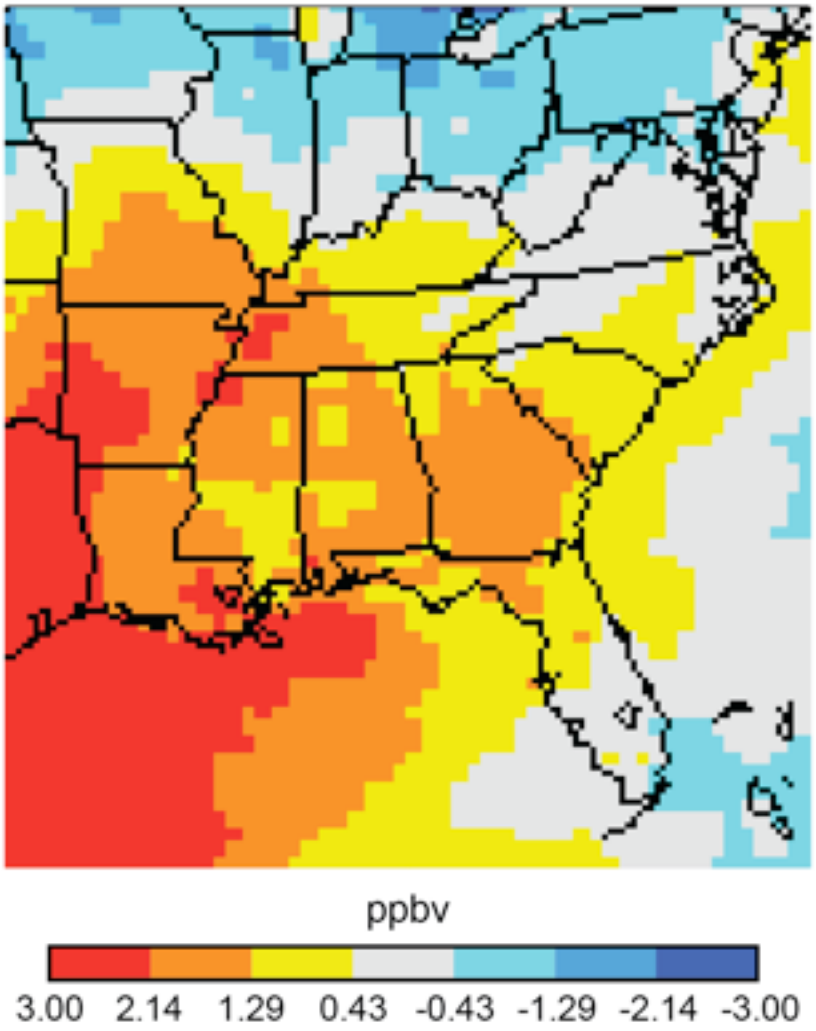
Figure is based on Merged Land-Ocean Surface Temperature (MLOST) Analysis by NOAA's NCDC. White areas indicate incomplete or missing data.

(Source: IPCC Working Group I, 2013, Figure 2-22)

Projected Change in Number of Days in SE Over 95° F



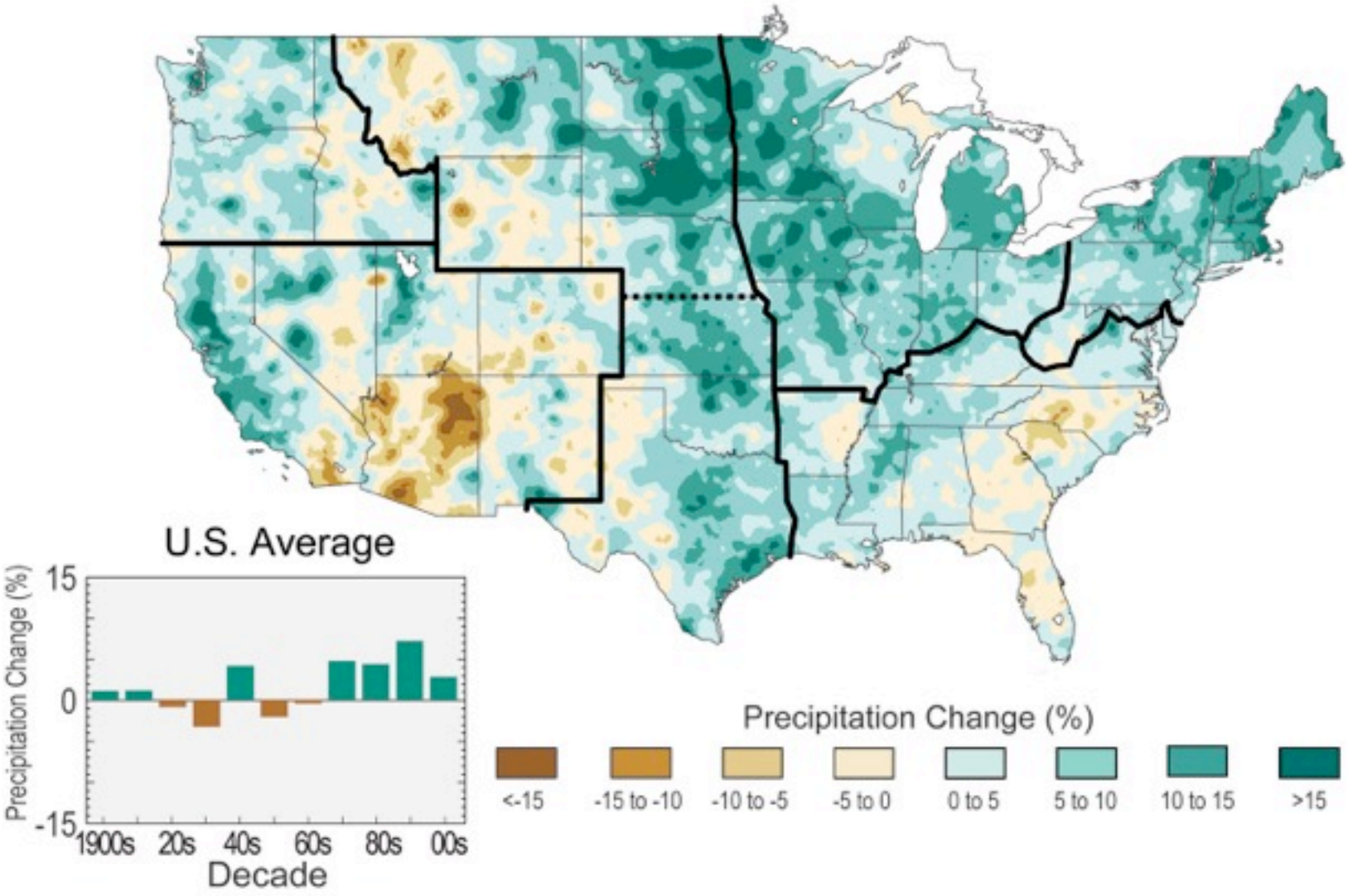
Ground-level Ozone
generally increases with temperature



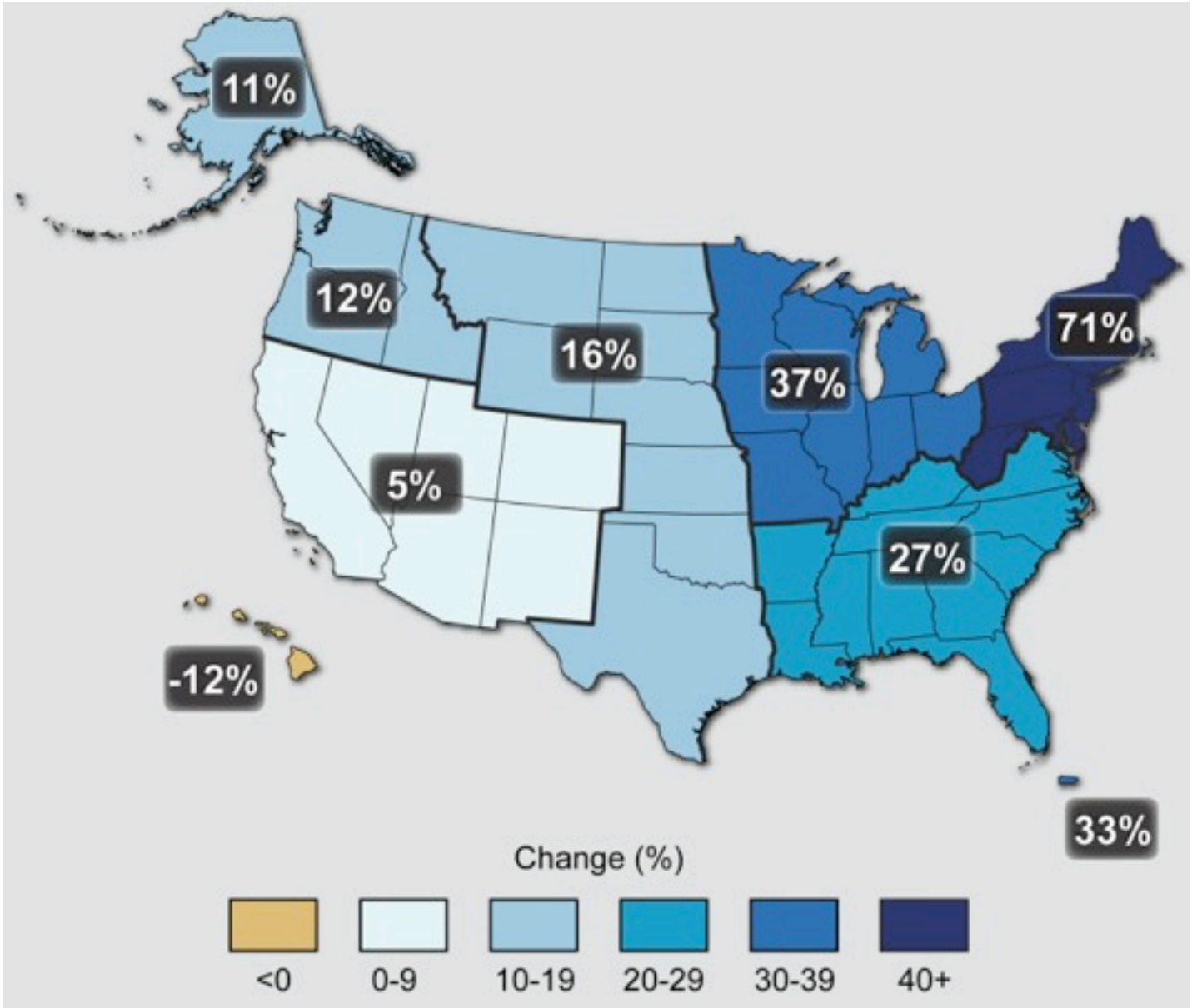
Map shows projected changes in average annual ground ozone in 2050 compared to 2001, using a mid-range emissions scenario (A1B)

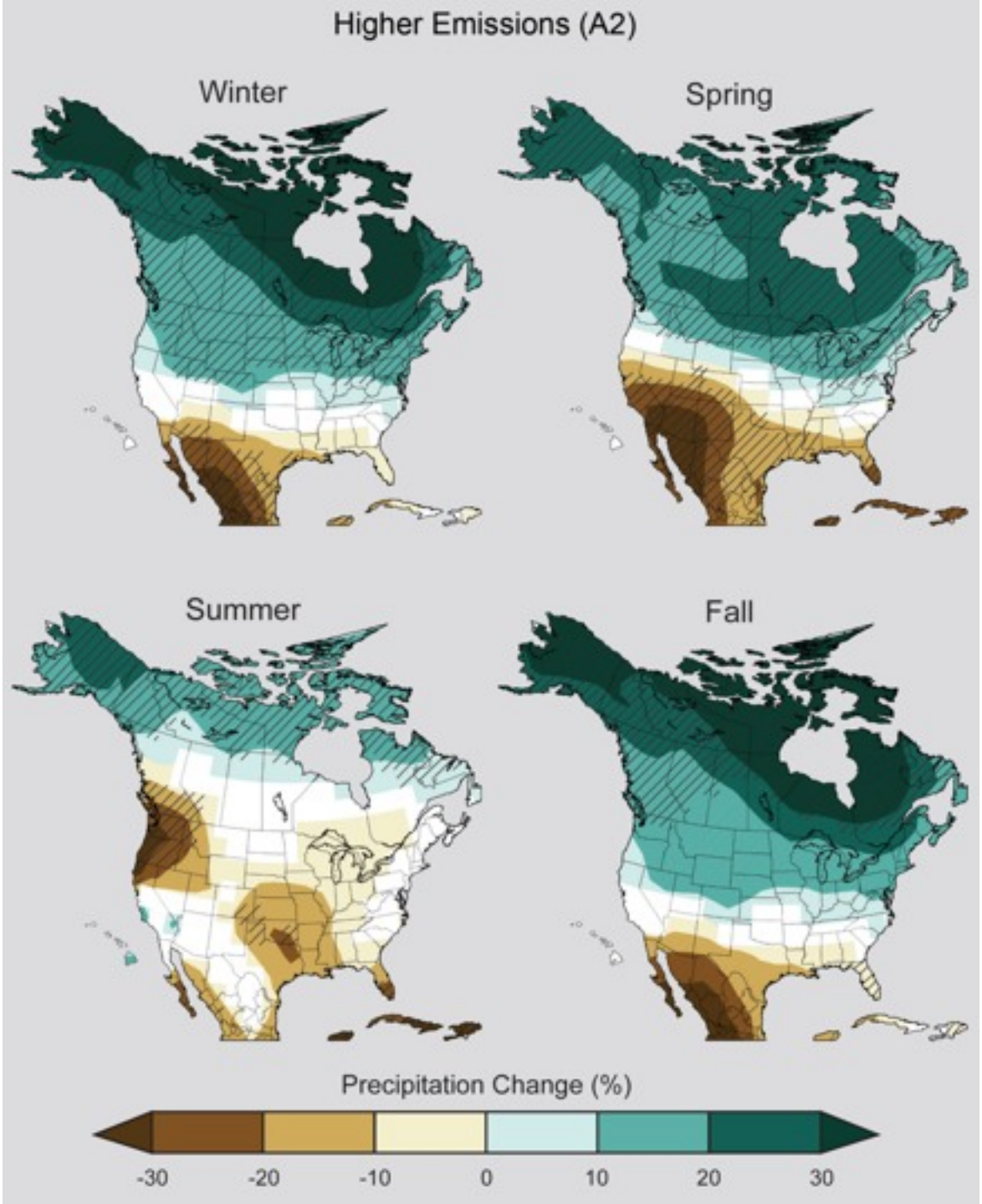
Observed precipitation change

for 1991-2012 compared to the 1901-1960 average



Observed Change in Very Heavy Precipitation from 1958 to 2012

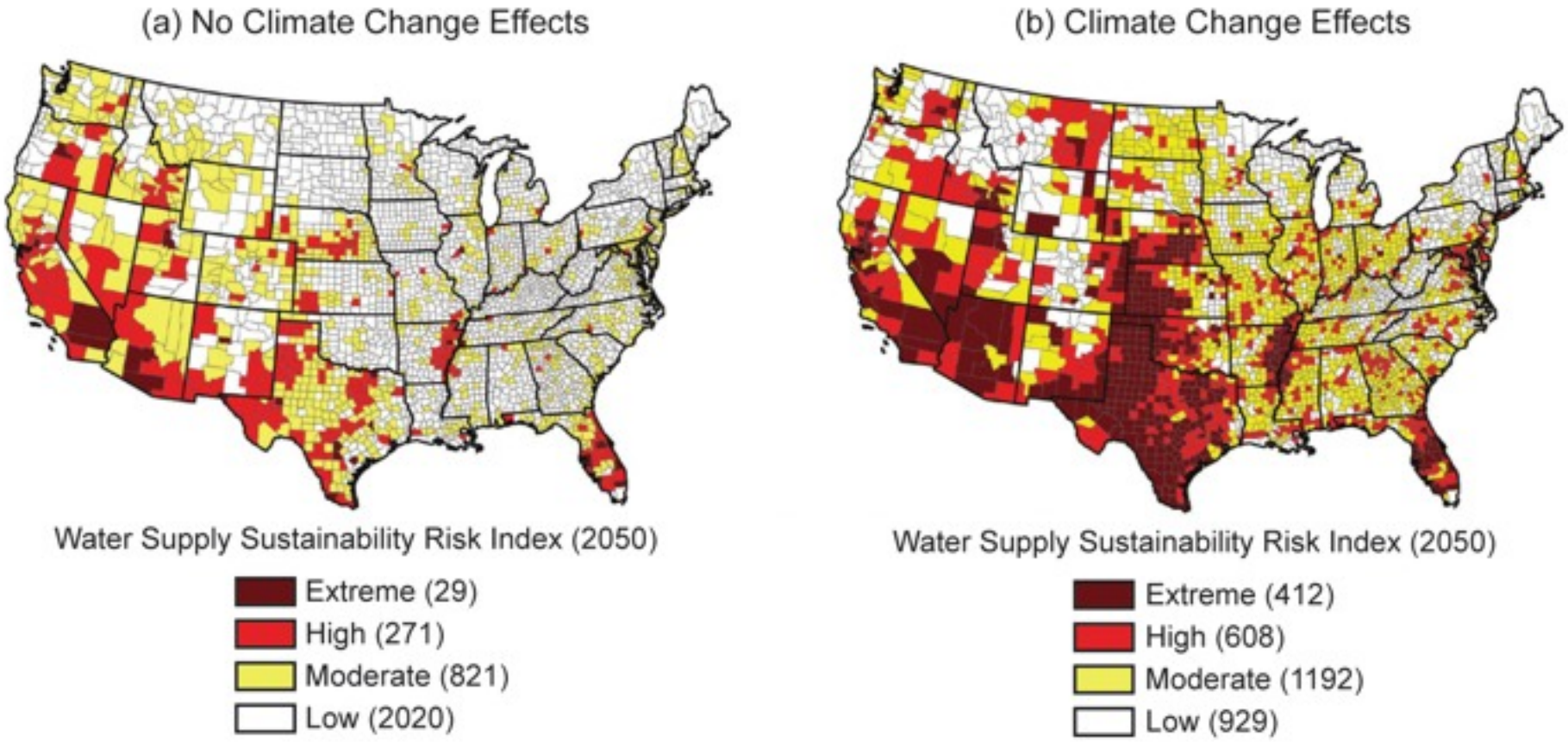




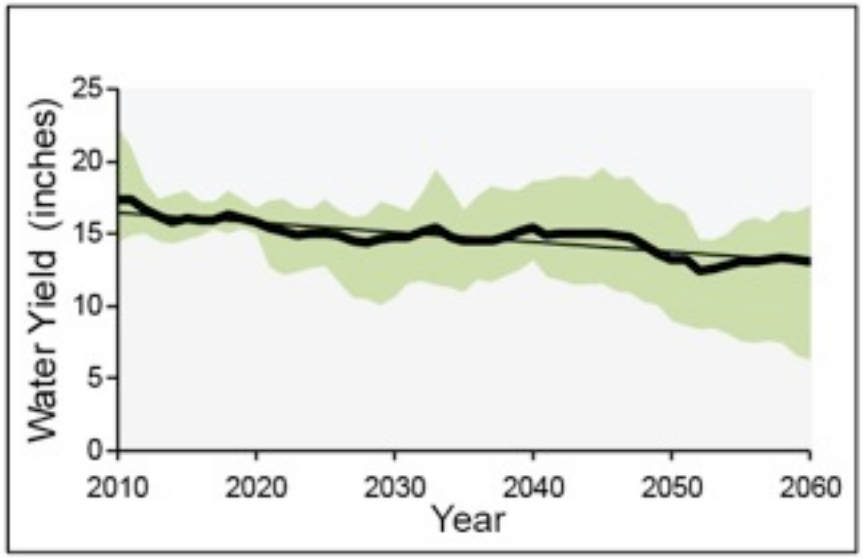
Projected change in seasonal precipitation

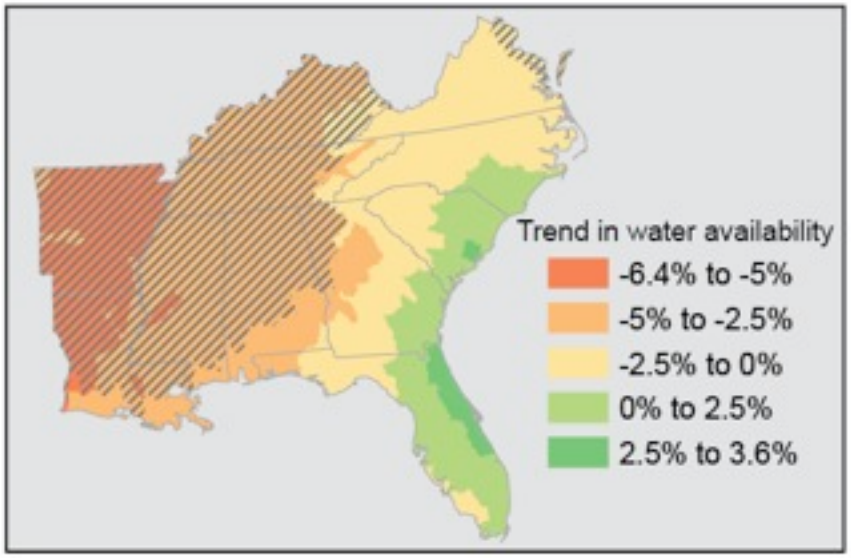
for 2071-2099 (compared

Water Supplies Projected to Decline



Projected Trends in SE



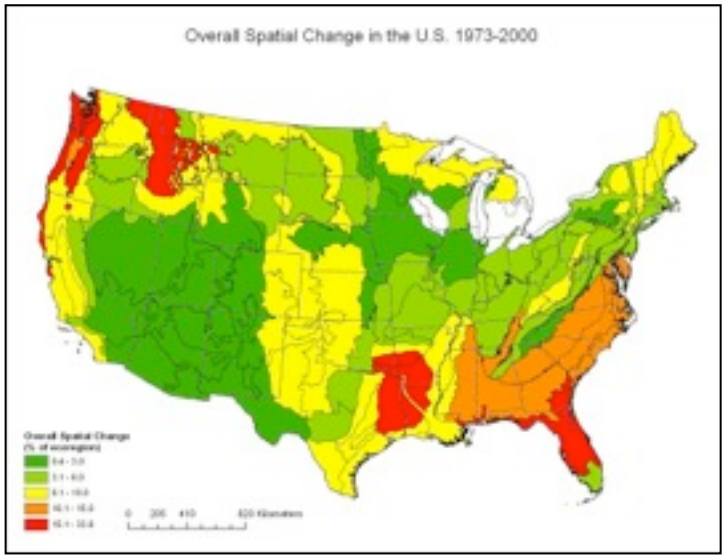


Projected trend in Southeast-wide annual water yield (equivalent to water availability) due to climate change. The green area represents the range in predicted water yield from four climate model projections based on the A1B and B2 emissions scenarios.

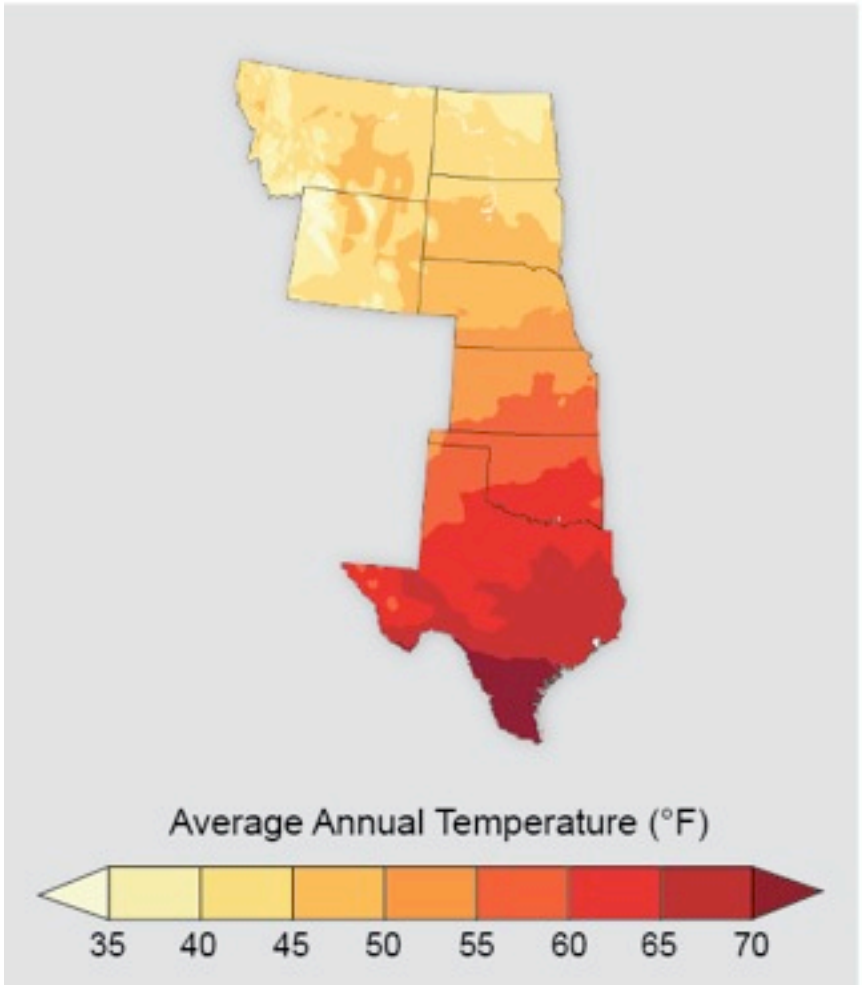
Spatial pattern of change in water yield for 2010-2060 (decadal trend relative to 2010). The hatched areas are those where the predicted negative trend in water availability associated with the range of climate scenarios is statistically significant (w/ 95% confidence).

Three Key Messages from the Great Plains

- **Rising temperatures** are leading to increased demand for water and energy. This will constrain development, stress natural resources, and increase competition for water among communities, agriculture, energy production, and ecological needs.
- **Changes to crop growth** cycles due to warming winters and alterations in the timing and magnitude of rainfall events have already been observed; as these trends continue, they will require new agriculture and livestock management practices
- **Landscape fragmentation** is increasing. A highly fragmented landscape will hinder adaptation of species when climate change alters habitat composition and timing of plant development cycles.



Temperature and Precipitation Distribution in the Great Plains



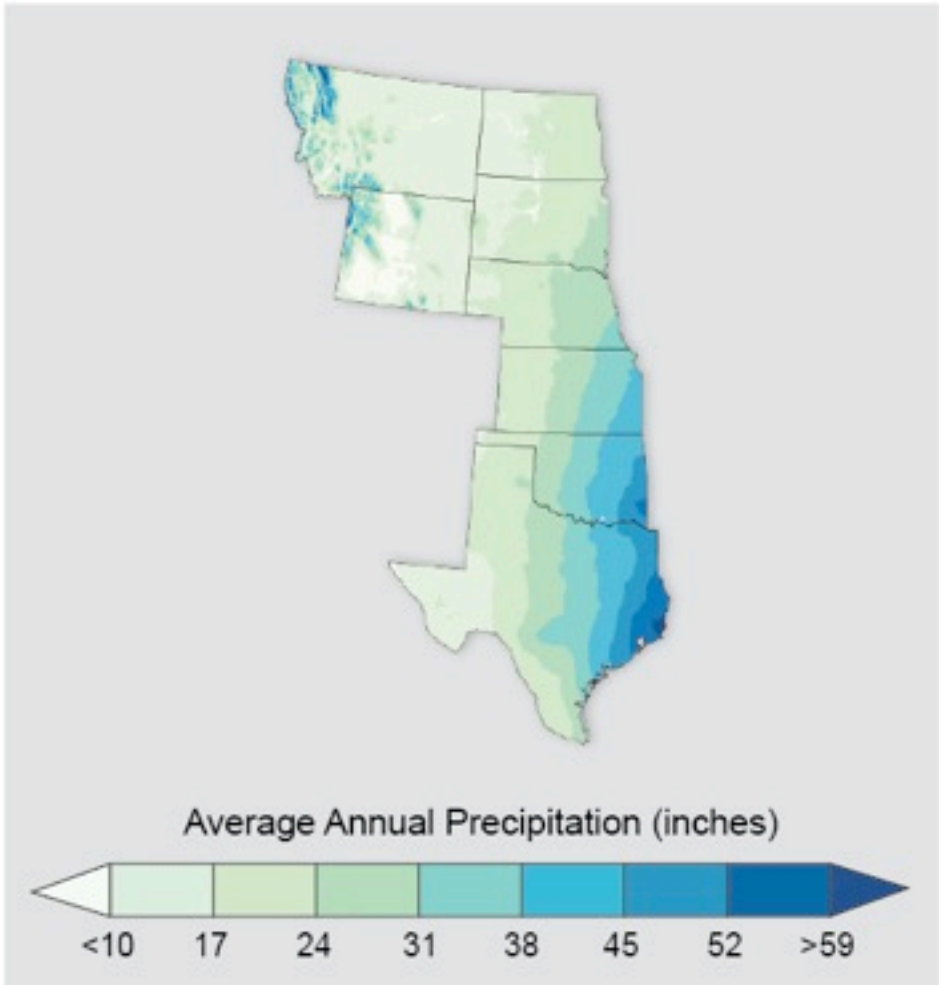


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Figure source: adapted from Kunkel et al. 2013

Projected Change in Number of Hot Days

The historical (1971-2000) distribution of temperature for the hottest 2% of days (about seven days each year) echoes the distinct north-south gradient in average temperatures. However, by mid-century (2041-2070), the projected change in number of days exceeding those hottest temperatures is greatest in the western areas and Gulf Coast for both the lower emissions scenario (B1) and for the higher emissions scenario (A2).

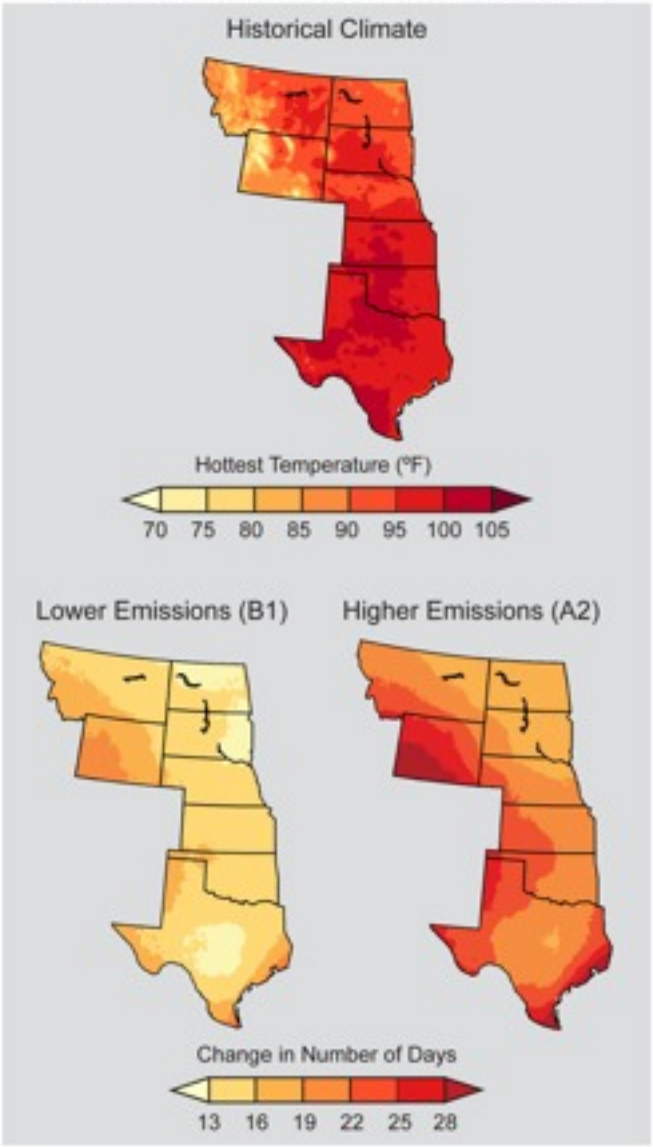

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Figure source: NOAA NCDC / CICS-NC

Projected Change in Number of Warm Nights

The historical (1971-2000) distribution of temperature for the warmest 2% of nights (Top: about seven days each year) echoes the distinct north-south gradient in average temperatures. By mid-century (2041-2070), the projected change in number of nights exceeding those warmest temperatures is greatest in the south for both the lower emissions scenario (B1) and for the higher emissions scenario (A2).

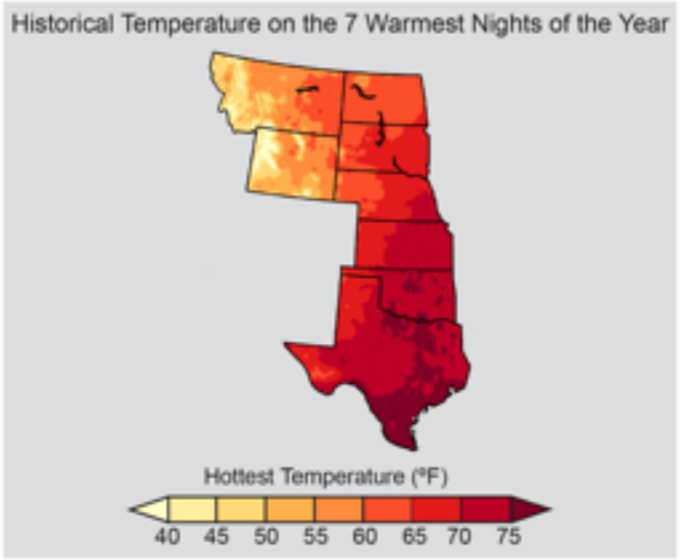

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Figure source: NOAA NCDC / CICS-NC

Projected Change in Number of Consecutive Dry Days: Great Plains Region

Current regional trends of a drier south and a wetter north are projected to become more pronounced by mid-century (2041-2070 as compared to 1971-2000 averages).

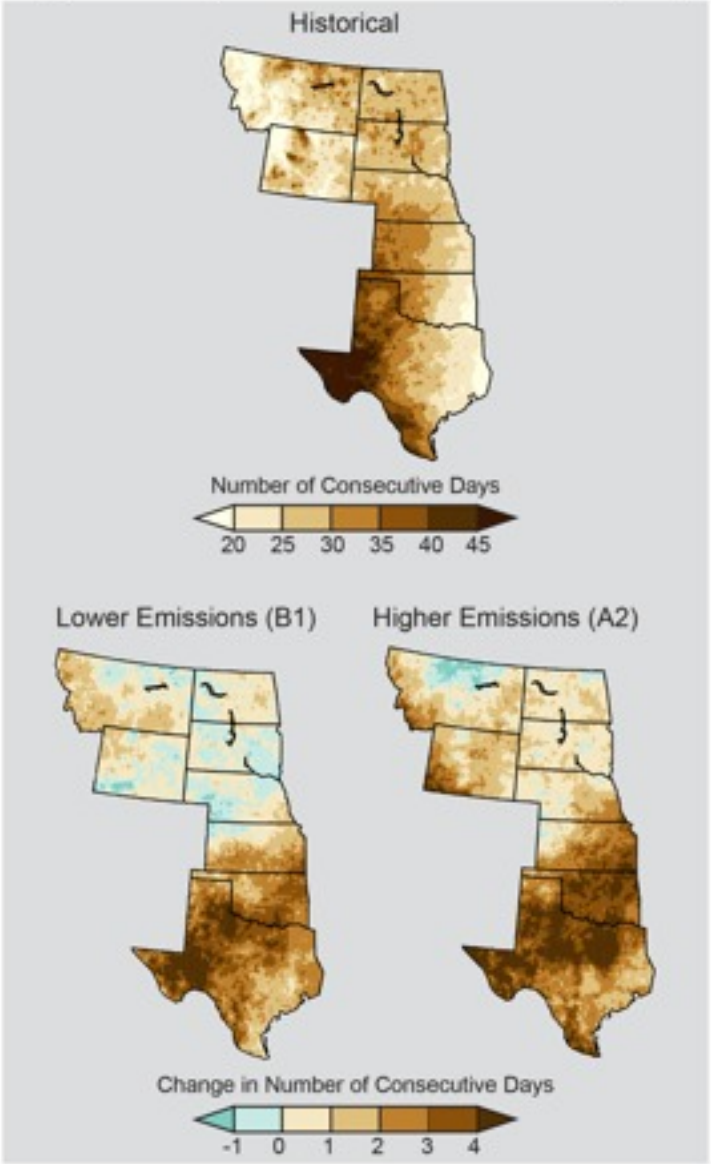

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Figure source: NOAA NCDC / CICS-NC

Projected Change in Number of Heavy Precipitation Days: Great Plains Region

The historical (1971-2000) distribution of the greatest 2% of daily precipitation (Top: about seven days each year) echoes the regional east-west gradient in average precipitation. By mid-century (2041-2070), the projected change in days exceeding those precipitation amounts remains greatest in the northern area for both the lower emissions scenario (B1) and for the higher emissions scenario (A2).

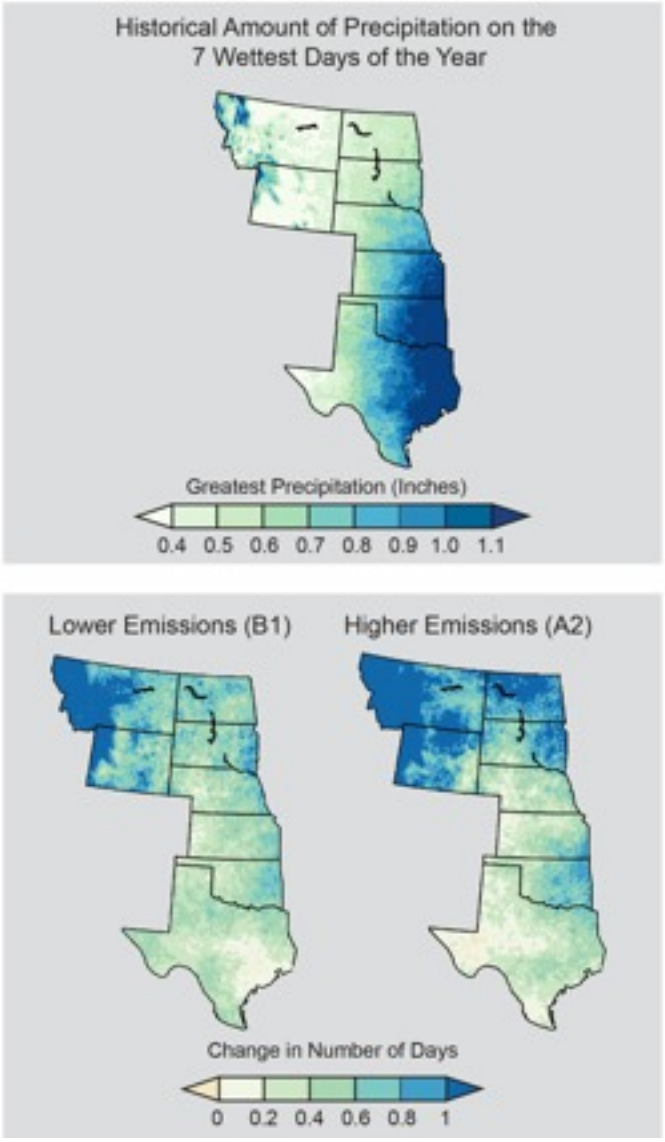

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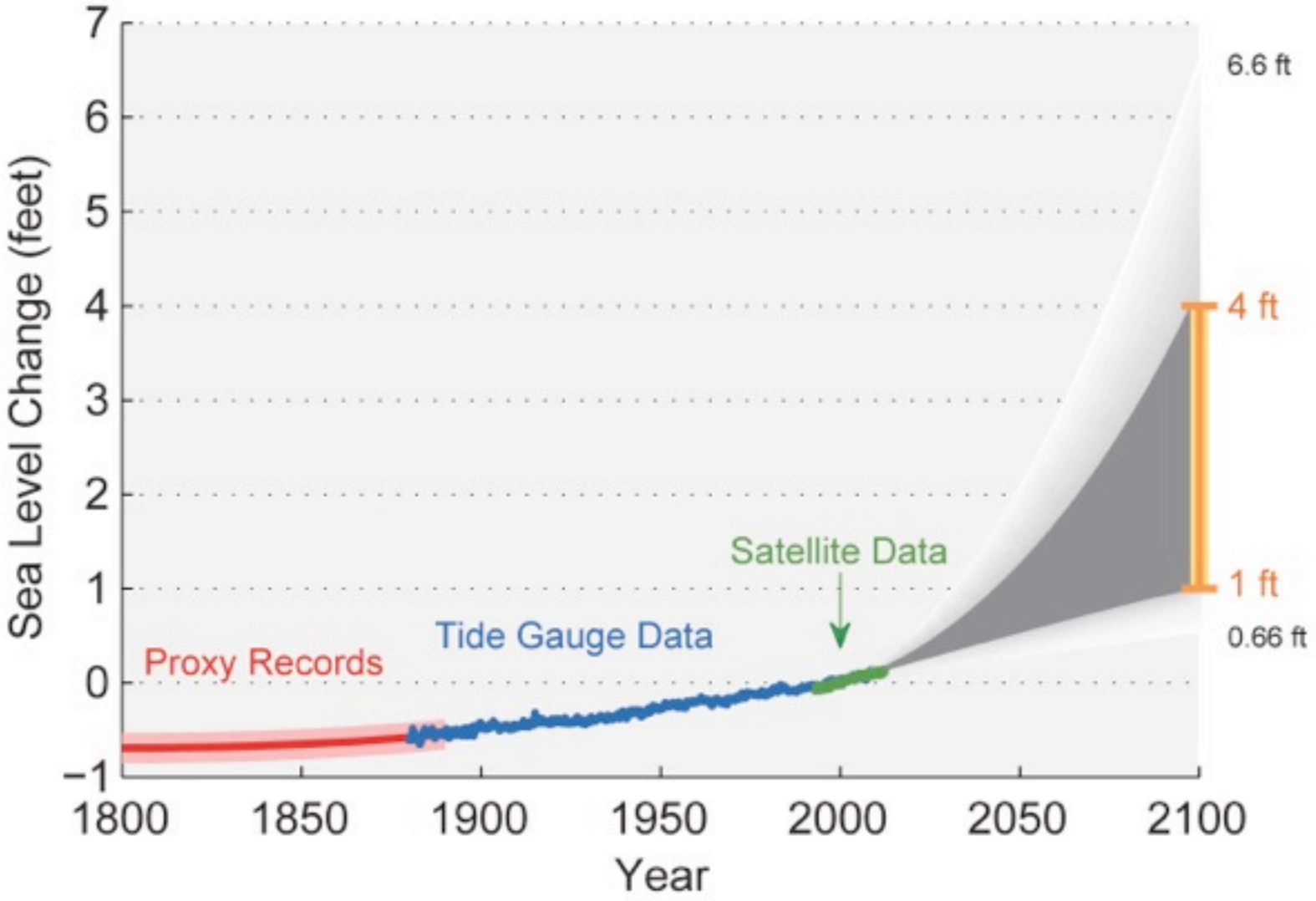
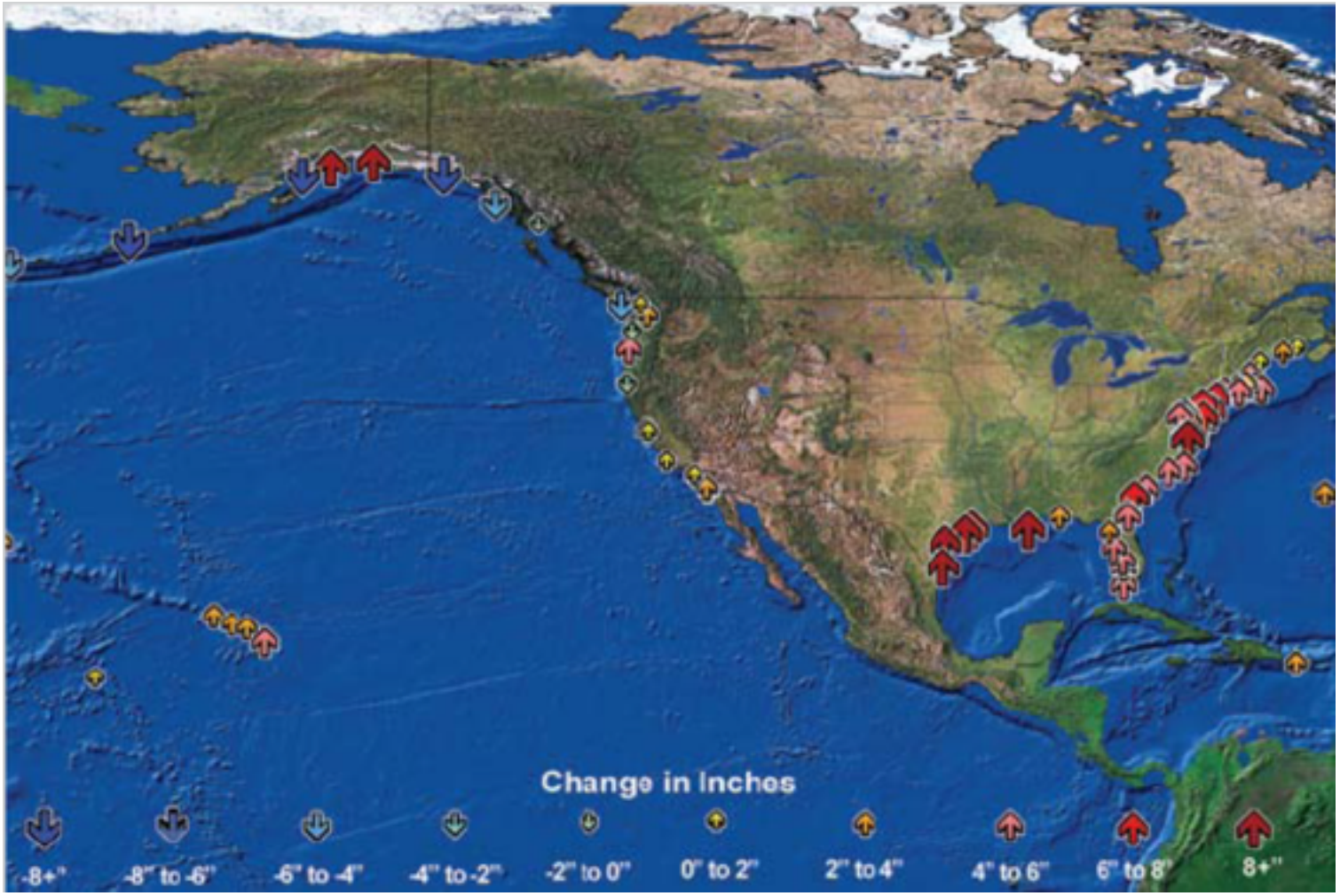
Figure source: NOAA NCDC / CICS-NC

Past and Projected Changes in Global Sea Level



Net effect of “relative” sea level change from 1958 to 2008 for locations on the U.S. coast



(USGCRP, 2009)

Vulnerability to Sea Level Rise

Net Effect of Relative Sea Level Rise in Lafourche Parish, LA

Wendell Curole photo

Shrinking Coastal Lands for

Source of photos: Isle De Jean Charles band

Thresholds in community sustainability are being crossed in some low-lying coastal regions.

http://www.indiancountrytoday.com/home/content/61447992.html

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Indian group says it will abandon ancestral home

By Cain Burdeau, Associated Press Writer
Story Published: Sep 28, 2009
Story Updated: Sep 25, 2009

NEW ORLEANS – After 170 years fishing and crabbing in southern Louisiana's swamps and marshes, a group of American Indians repeatedly flooded by hurricanes says it is intent on moving from its ancestral island home.

The band's chief said Sept. 22 that the group is seeking to start a new life as a community behind levees on higher ground.

A migration inland would symbolize one of the most obvious defeats in south Louisiana's losing battle with land loss and hurricanes. The Mississippi River Delta, on which south Louisiana sits, has lost about 2,000 square miles of marsh and swamp since the 1930s.

But relocation was inevitable, said Albert Naquin, the chief of the Isle de Jean Charles Band of Biloxi-Chitimacha-Choctaw. He said the marsh community had been flooded five times in the past six years. About 25 families still call it home.

Naquin said the tribe hoped to use about $12 million in federal aid to build 60 homes on 50 acres in Bourg, which is about 10 miles inland.

But many details had to be worked out and the plan was not a done deal.

Naquin said Terrebonne Parish and state officials would have to sign off on it.

State Sen. Butch Gautreaux, D-Morgan City, said he was working with the tribe and Louisiana congressional members to get the relocation plan executed.

Christina Stephens, a spokeswoman for the Louisiana Recovery Authority, said she was unfamiliar with the

Isle de Jean Charles tribe pursues relocating from island (Houma Courier, Sept. 22, 2009)

HOUMA — Members of a local American Indian tribe are making a new push for government help moving away from their ancestral home on a remote Terrebonne Parish island.

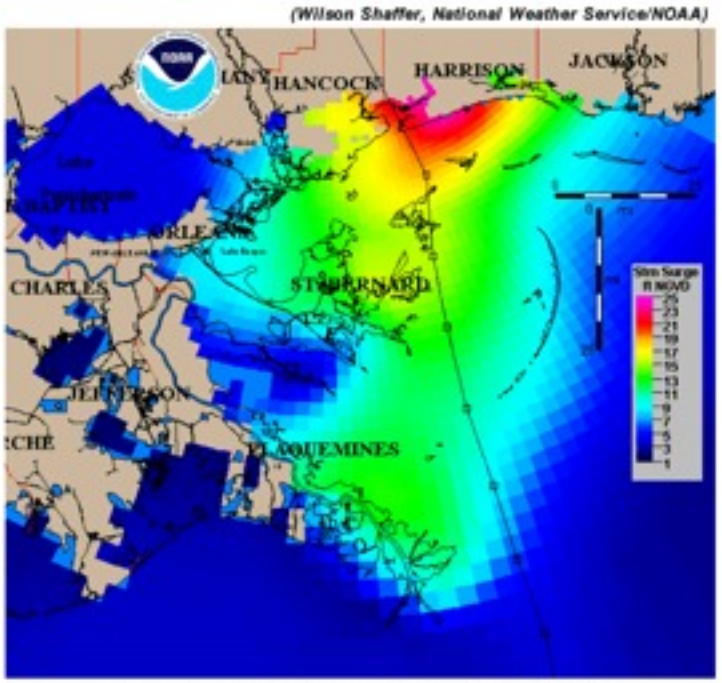
Related Links:

Council to take up potential relocation of islanders
In search of higher ground
Island Road repairs will cost millions
Island residents insist on staying put

NCA3 key findings regarding Atlantic hurricanes:

Past:

- substantial increase in intensity, frequency, and duration as well as the number of strongest (Category 4 and 5) storms since the early 1980s
- increases in hurricane intensity are linked, in part, to higher sea surface temperatures



Camille's Envelope of High Water From SLOSH Model

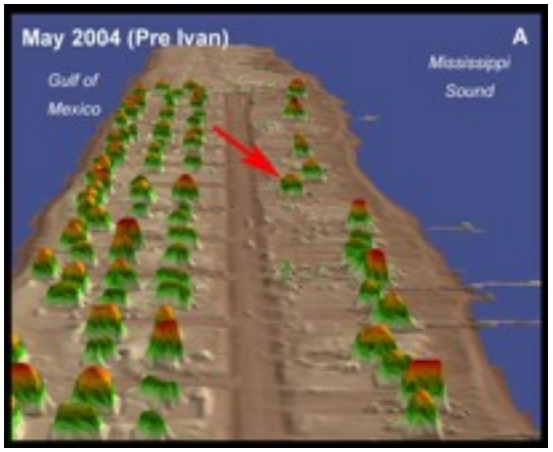
Future:

- by late this century, models, on average, project an increase in the number of the strongest (Category 4 and 5) hurricanes
- greater rainfall rates in hurricanes in a warmer climate, with increases of about 20% averaged near the center of hurricanes

Low-lying Gulf and Atlantic coastal ecosystems will erode more rapidly if hurricanes continue to increase in intensity.

Dauphin Island, Alabama

Low-lying Gulf and Atlantic coastal ecosystems will erode more rapidly if hurricanes continue to increase in intensity.



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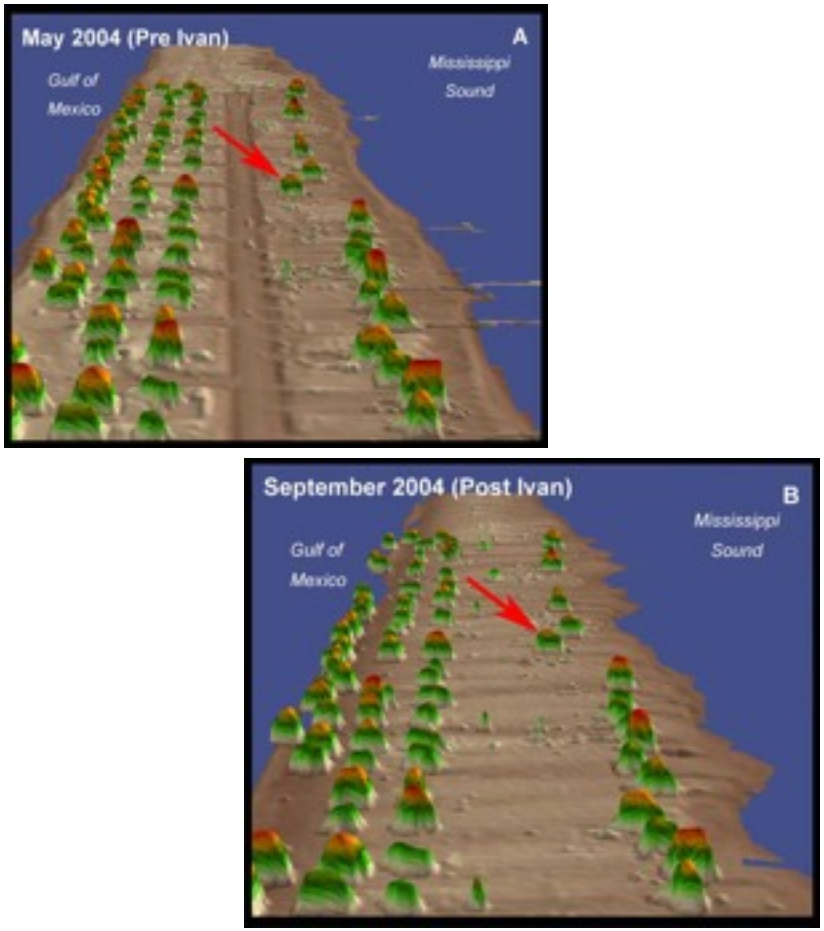

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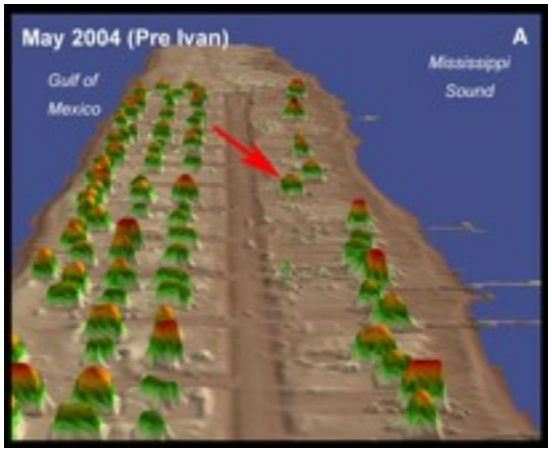

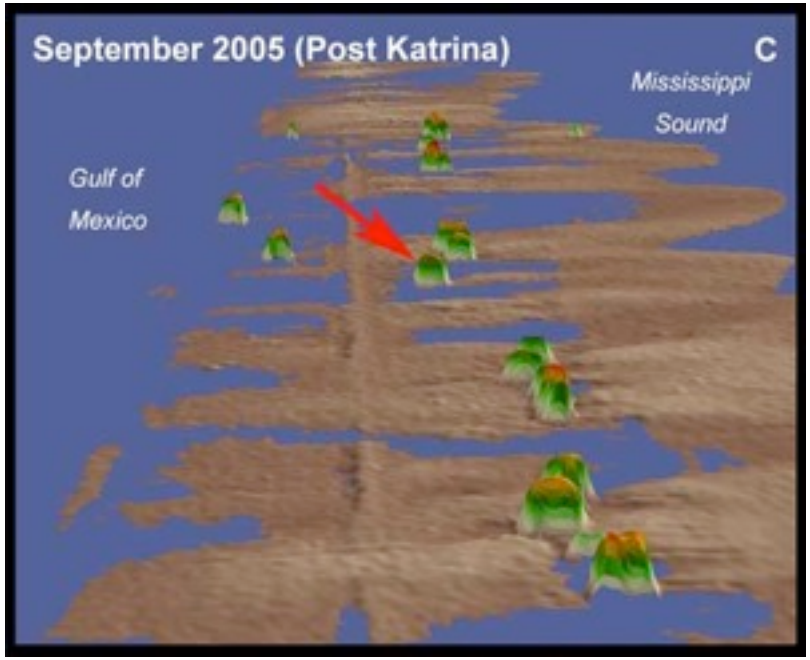

Dauphin Island, Alabama

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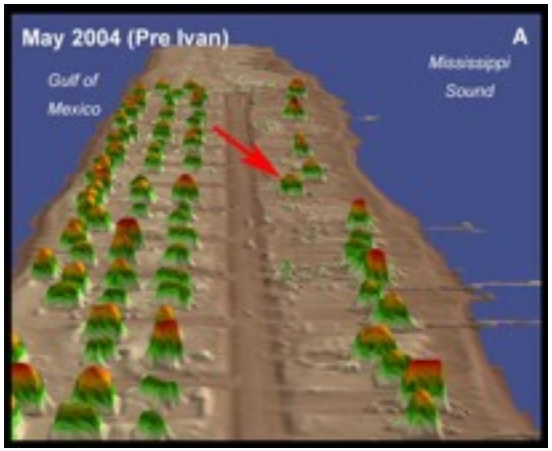
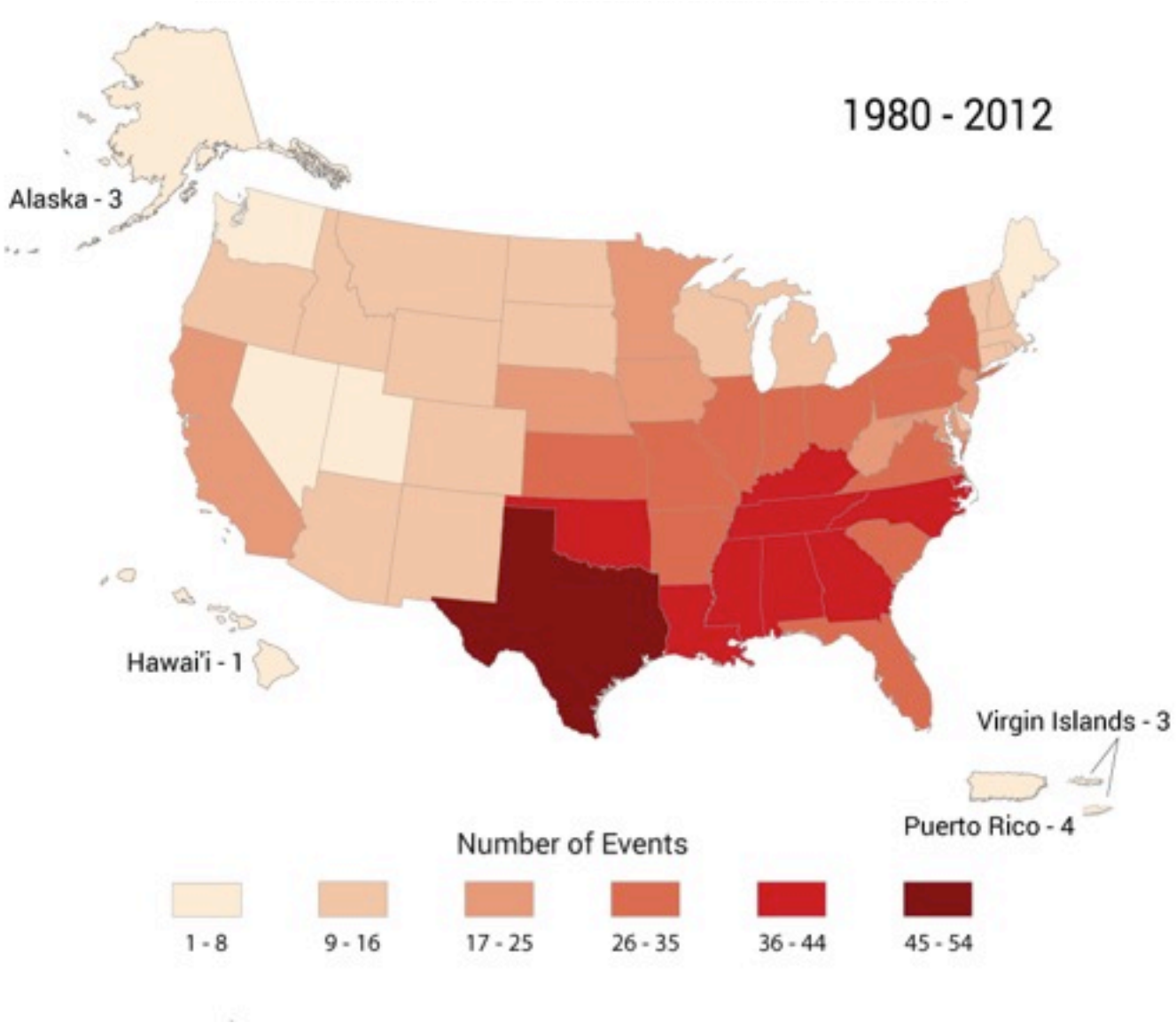


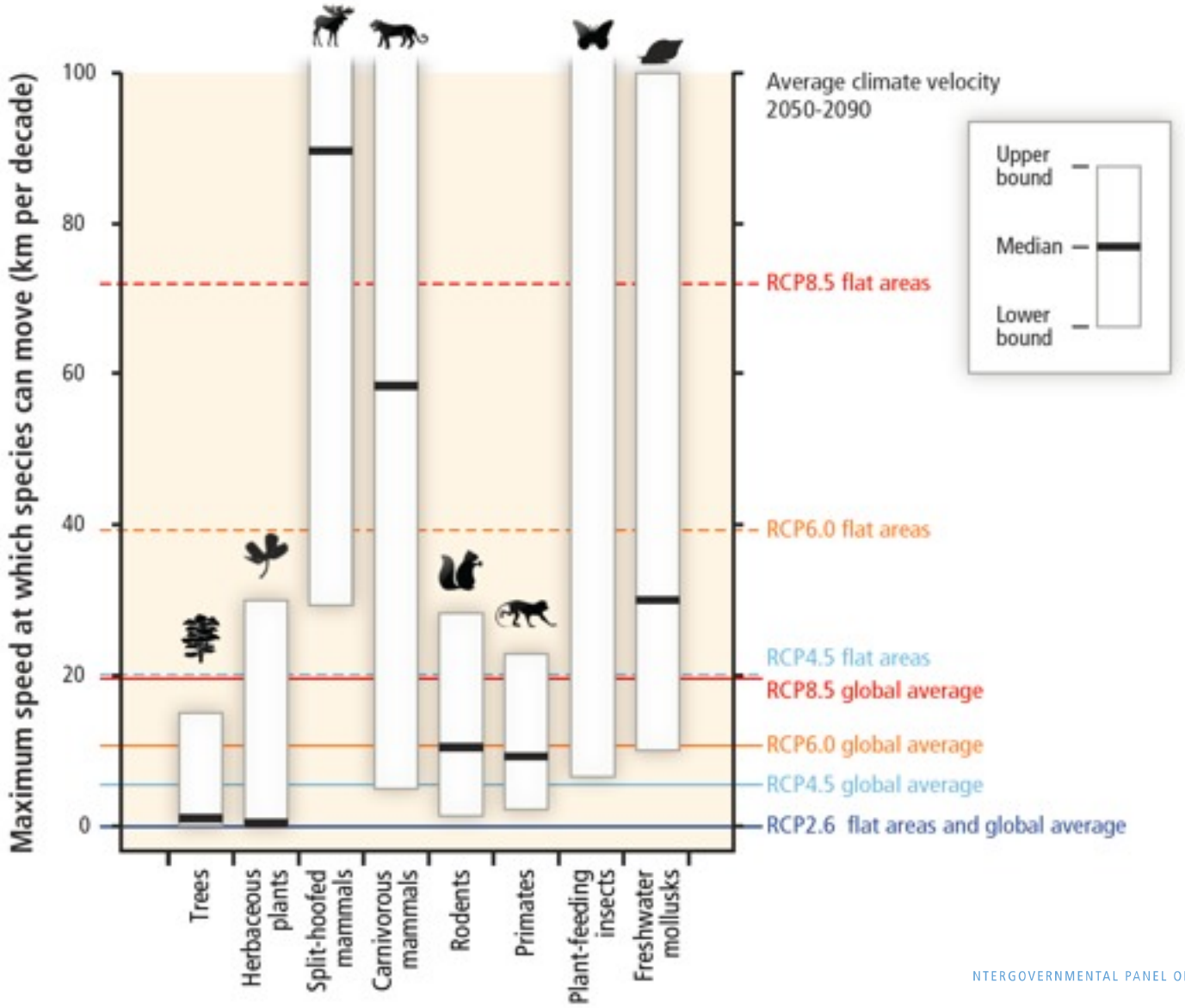
Dauphin Island, Alabama

Billion Dollar Weather / Climate Disasters



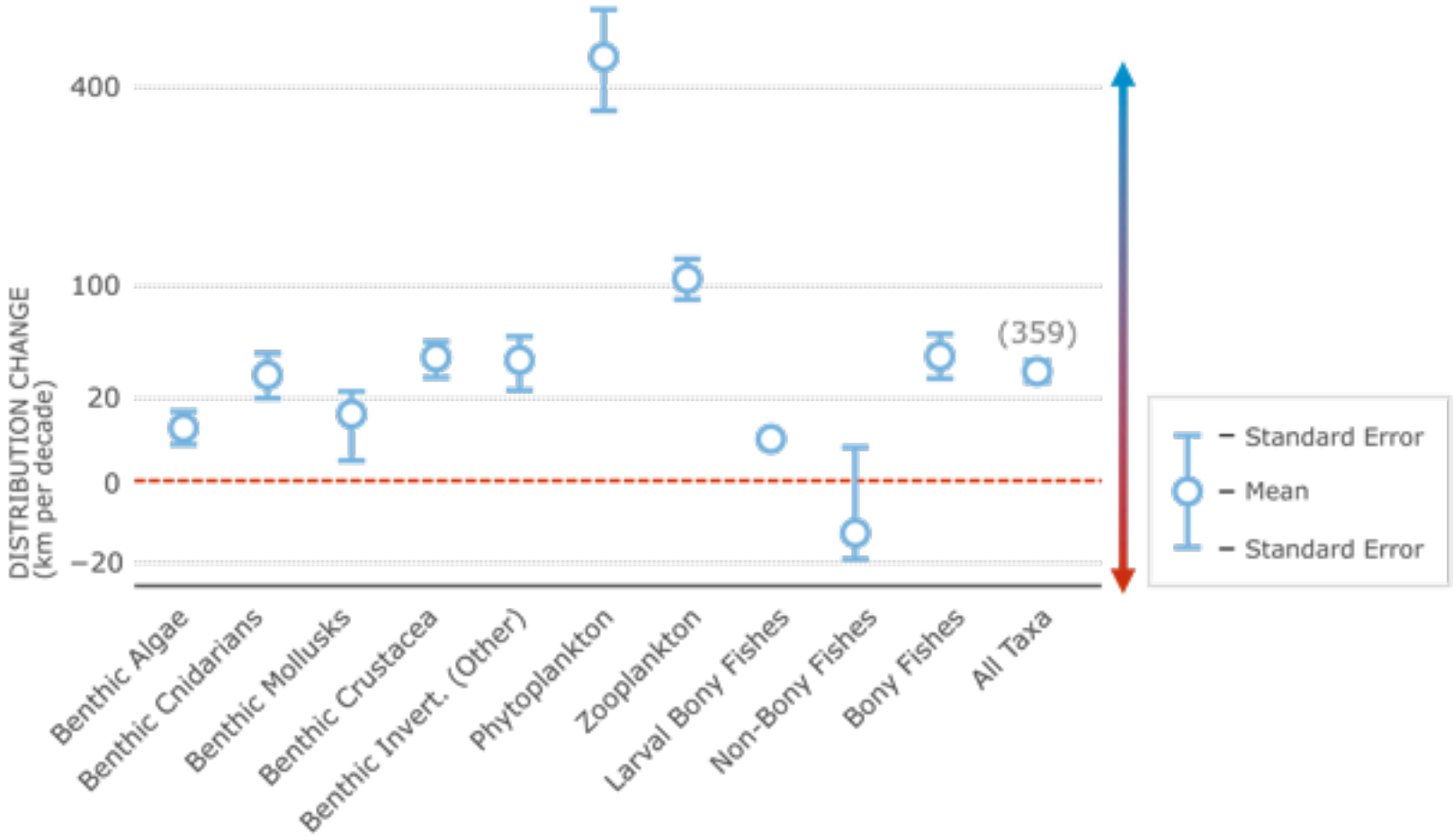
Many SE communities are developing climate change adaptation strategies, as are many sectors of

Maximum speeds at which species can move across landscapes (based on observations and models; vertical axis on left), compared with speeds at which temperatures are projected to move across landscapes (climate velocities for temperature; vertical axis on right).



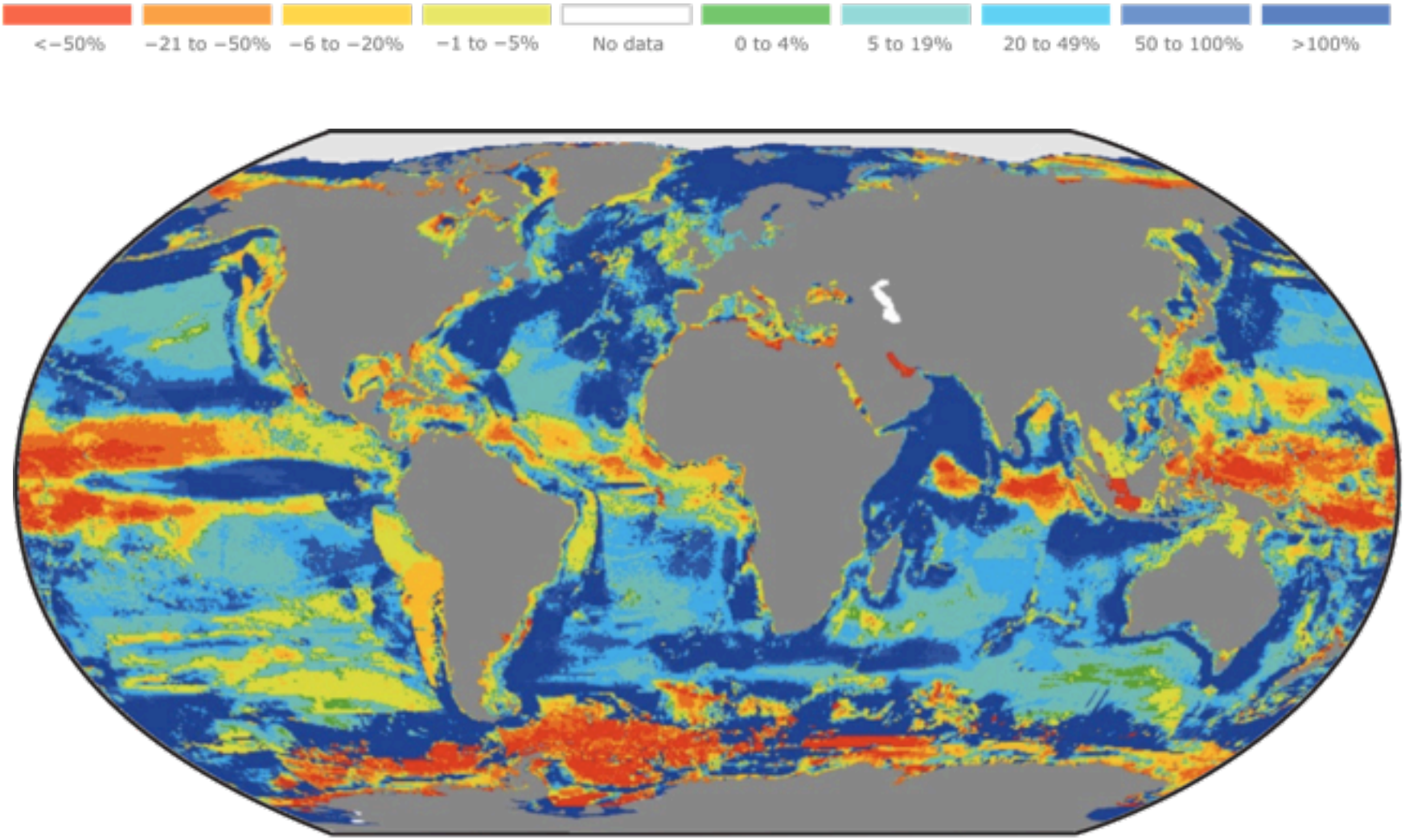
ipcc
NTERGOVERNMENTAL PANEL ON C imate change

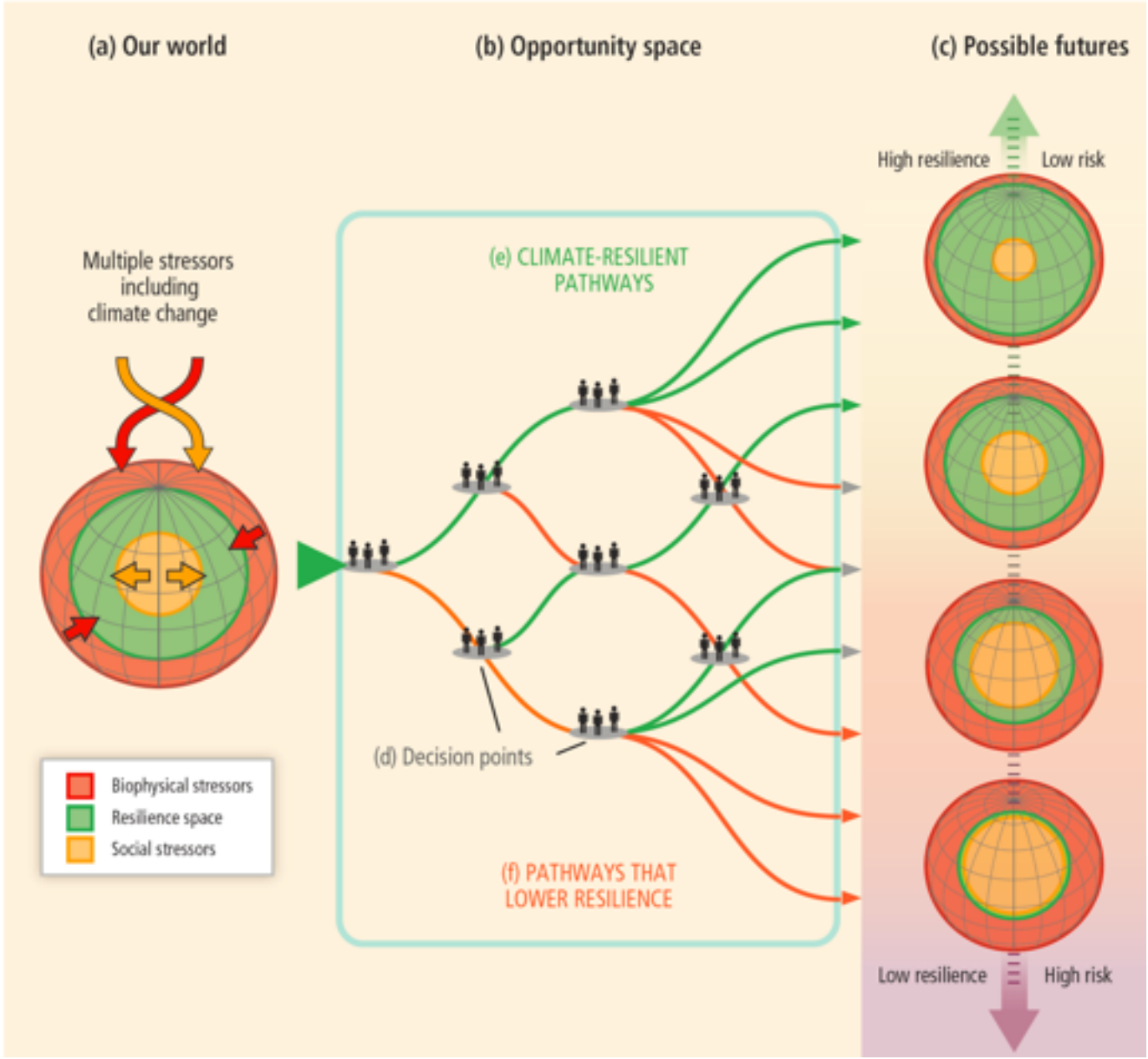
Average rates of change in distribution (km per decade) for marine taxonomic groups based on observations over 1900-2010



Positive distribution changes are consistent with warming (moving into previously cooler waters, generally poleward).

CHANGE IN MAXIMUM CATCH POTENTIAL (2051-2060 COMPARED TO 2001-2010, SRES A1B)





Opportunity space and climate-resilient pathways.

Some thoughts about what I would do differently as a state natural resource manager:

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Some thoughts about what I would do differently as a state natural resource manager:

- Focus more on Water – for the coast

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Some thoughts about what I would do differently as a state natural resource manager:

- Focus more on Water – for the coast
- Stop damage to coast, put River back in delta

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Some thoughts about what I would do differently as a state natural resource manager:

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- Inventory and Monitoring

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- Threatened and Endangered Species

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- Focus more on Water – for the coast
- Stop damage to coast, put River back in delta
- Inventory and Monitoring
- Threatened and Endangered Species
- Develop predictive tools

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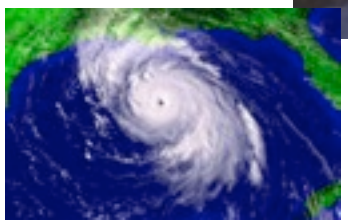
- Develop predictive tools
- Understand disturbance



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Some thoughts about what I would do differently as a state natural resource manager:

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- Stop damage to coast, put River back in delta
- Inventory and Monitoring
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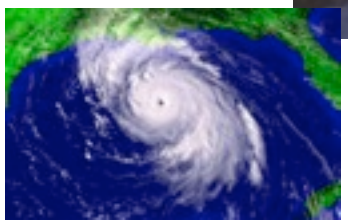
- Develop predictive tools
- Understand disturbance
- More dynamic view of systems



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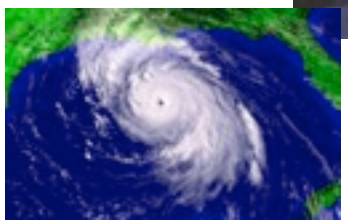

FWS Photo, Mid-Coast NWR, TX

Courtesy NC Aquarium

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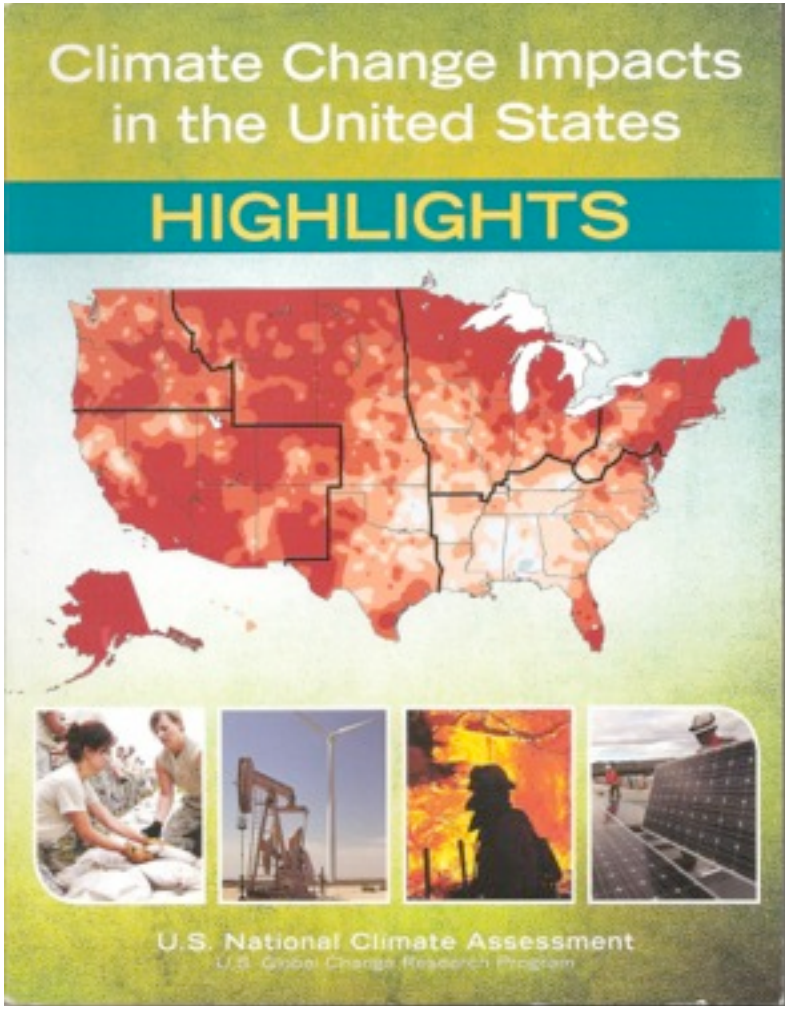
United States Global Change Research Program
National Climate Assessment

- Full report (1300+ pp.)
  - HTML & PDF from globalchange.gov
- Highlights document (140 pp.)
  - HTML & PDF from globalchange.gov
  - Hard copy available from globalchange.gov Resource Library

The following are directly from Highlights

- Overview (~ 20 pp.)
  - PDF from globalchange.gov
  - Hard copy available from globalchange.gov Resource Library
- Regional fact sheets (2 pp. each)
  - PDF from globalchange.gov



Third National Climate Assessment

Climate Change Impacts in the United States

http://nca2014.globalchange.gov

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