

Please note that this presentation was given during the United Nations Climate Change Conference (COP-15) in Copenhagen, December 7-18, 2009 for more information please visit

<http://www.cop15.state.gov/> .

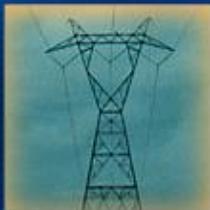
Global Climate Change Impacts in the U.S.

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globalchange.gov/usimpacts
<http://www.commerce.gov/cop15>

This report summarizes the science and impacts of climate change in the U.S.

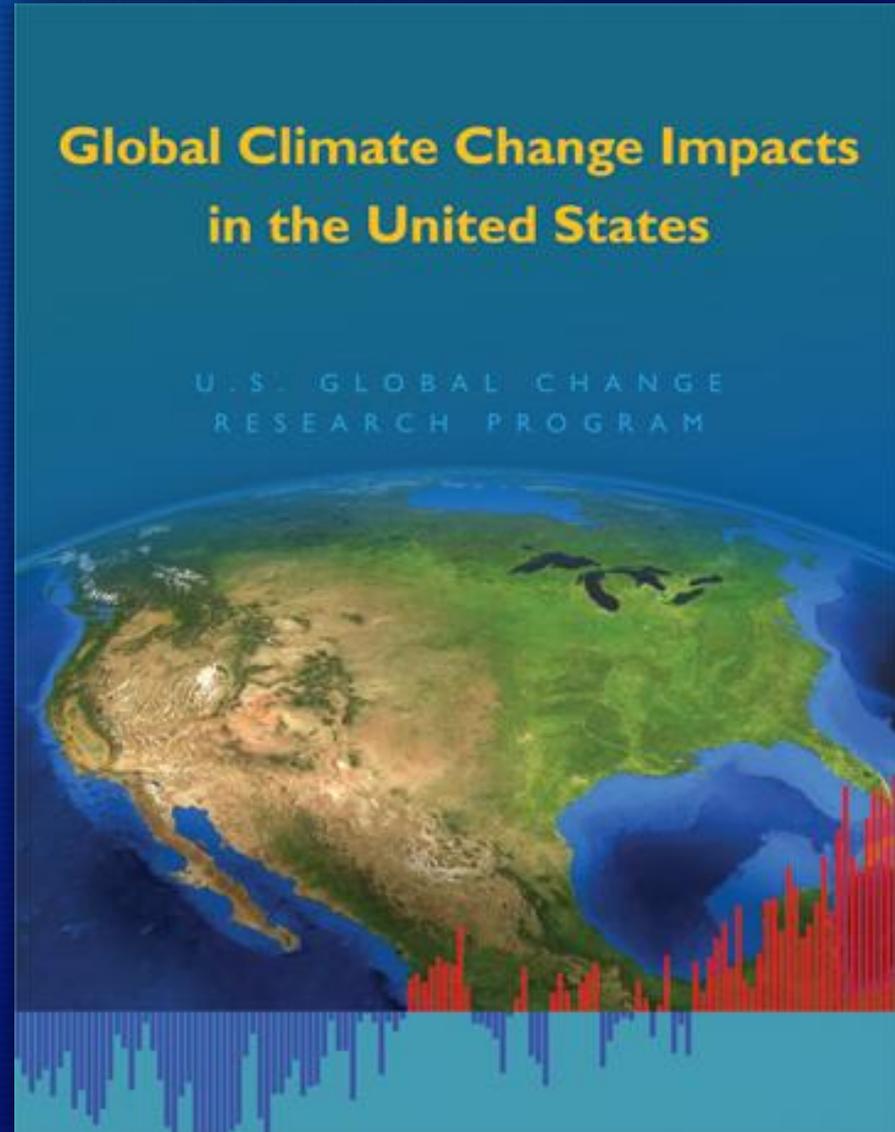
Plain language, authoritative

US Global Change Research Program report, led by NOAA

Extensive review: public (2), blue ribbon expert (2), U.S. federal climate agencies review (2)

Draws from all previous assessments, global and national (IPCC, CCSP etc)

Author team was a 31-member Federal Advisory Committee body and included federal, academic and private sector experts



Report released in June in a White House press briefing

The report breaks down climate change impacts on the U.S. into:



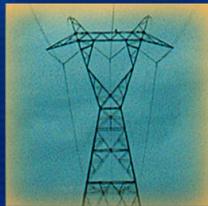
- **9 regions:**

- Northeast, Southeast, Midwest, Great Plains, Southwest, Northwest, Alaska, Islands, coasts

- **7 sectors:**



Water Resources



Energy Supply and Use



Transportation



Agriculture



Ecosystems



Human Health

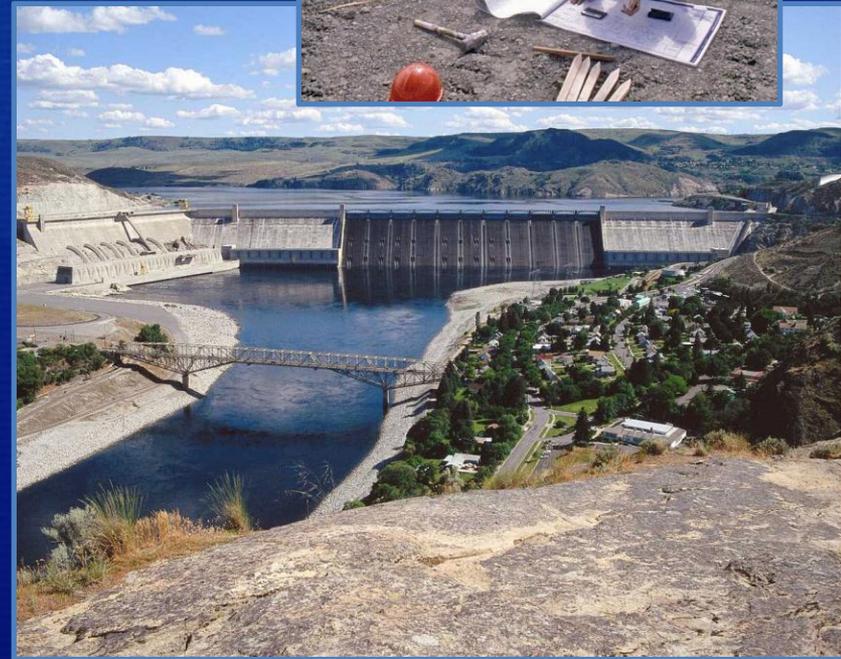
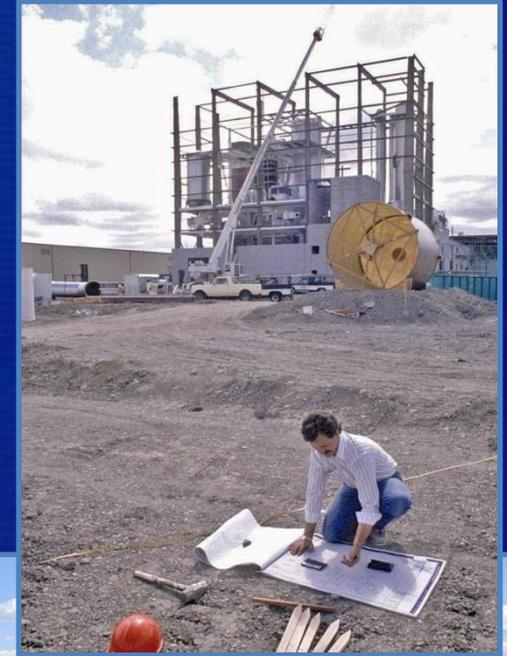


Society

- **Concludes with “An Agenda for Science”**

The report provides information we need....

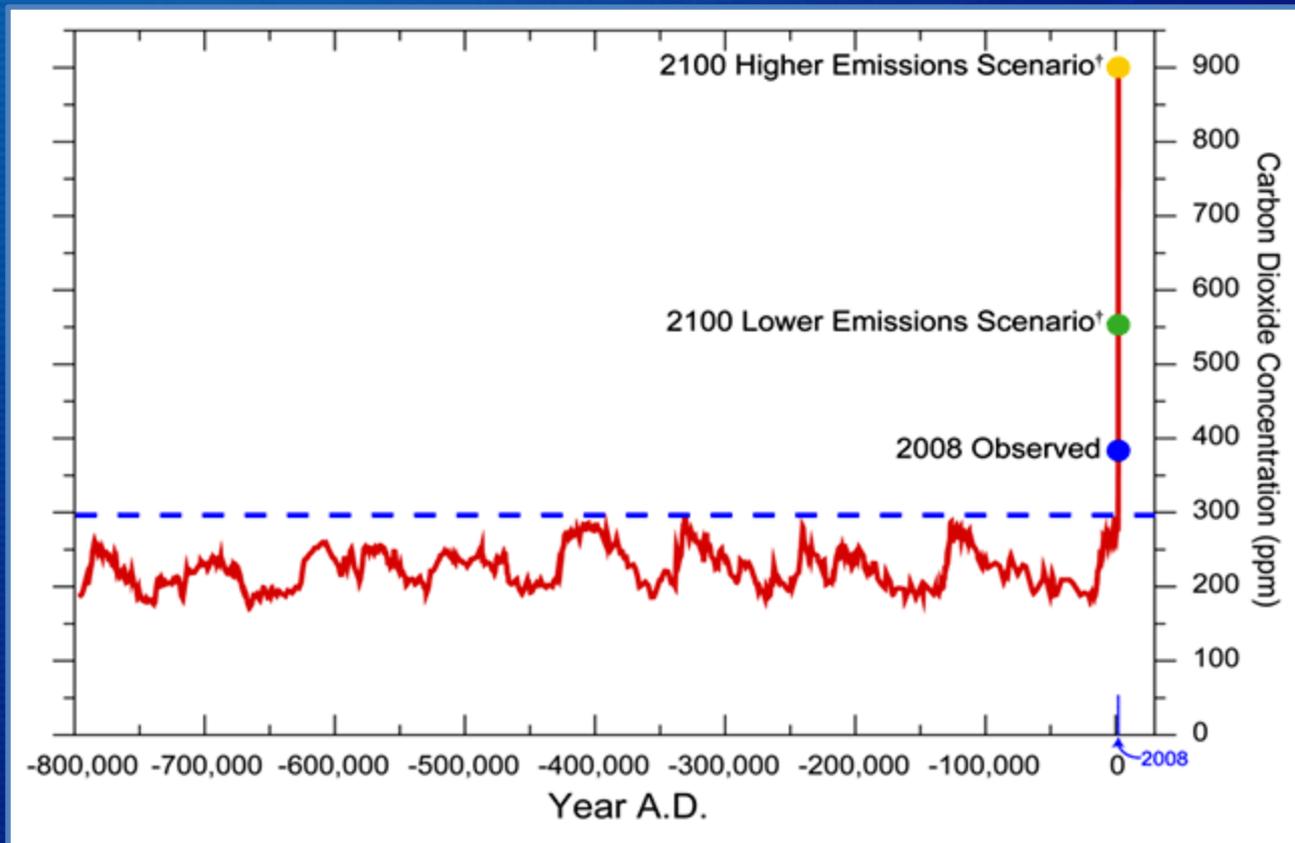
- to make good decisions at the national, regional, and local levels
- so we can avoid some of the impacts outlined here
- to be able to better understand the consequences of our decisions about emissions as well as adaptation



Key Finding: Global warming is unequivocal and primarily human induced

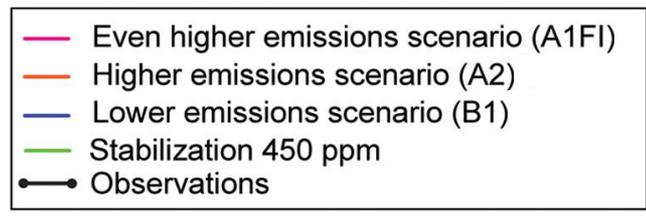
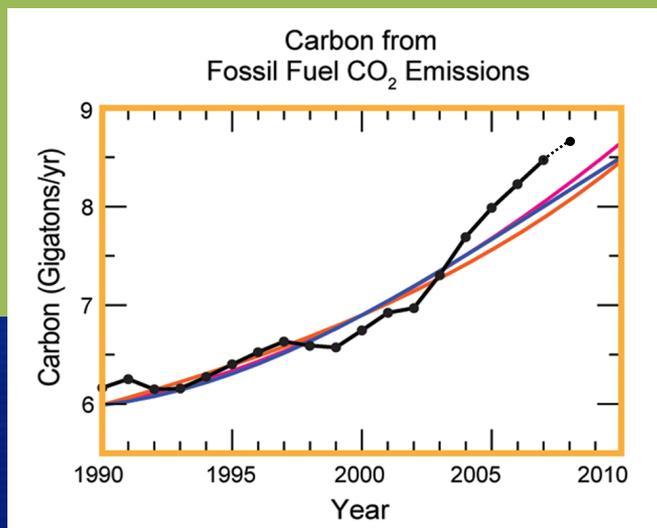
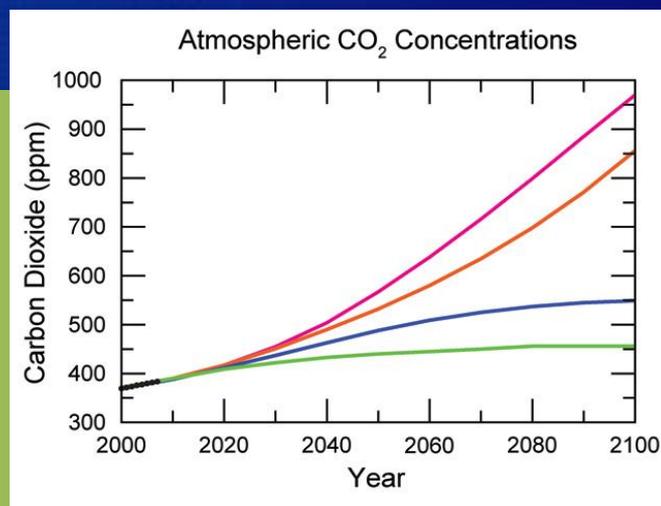
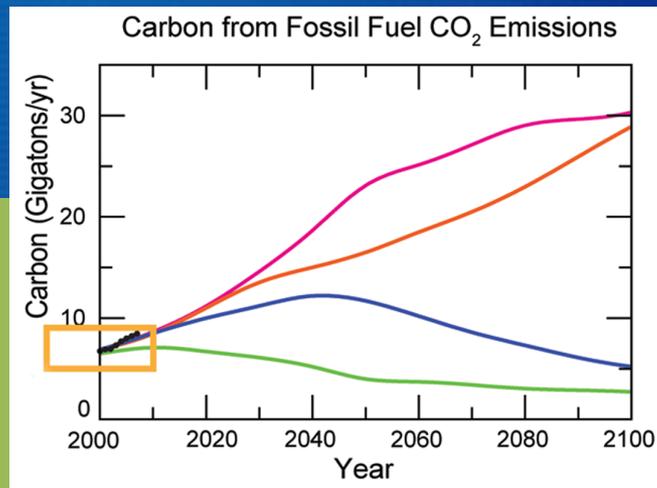
Moving Outside the Range of Historical Variation

800,000 Year Record of Carbon Dioxide Concentration



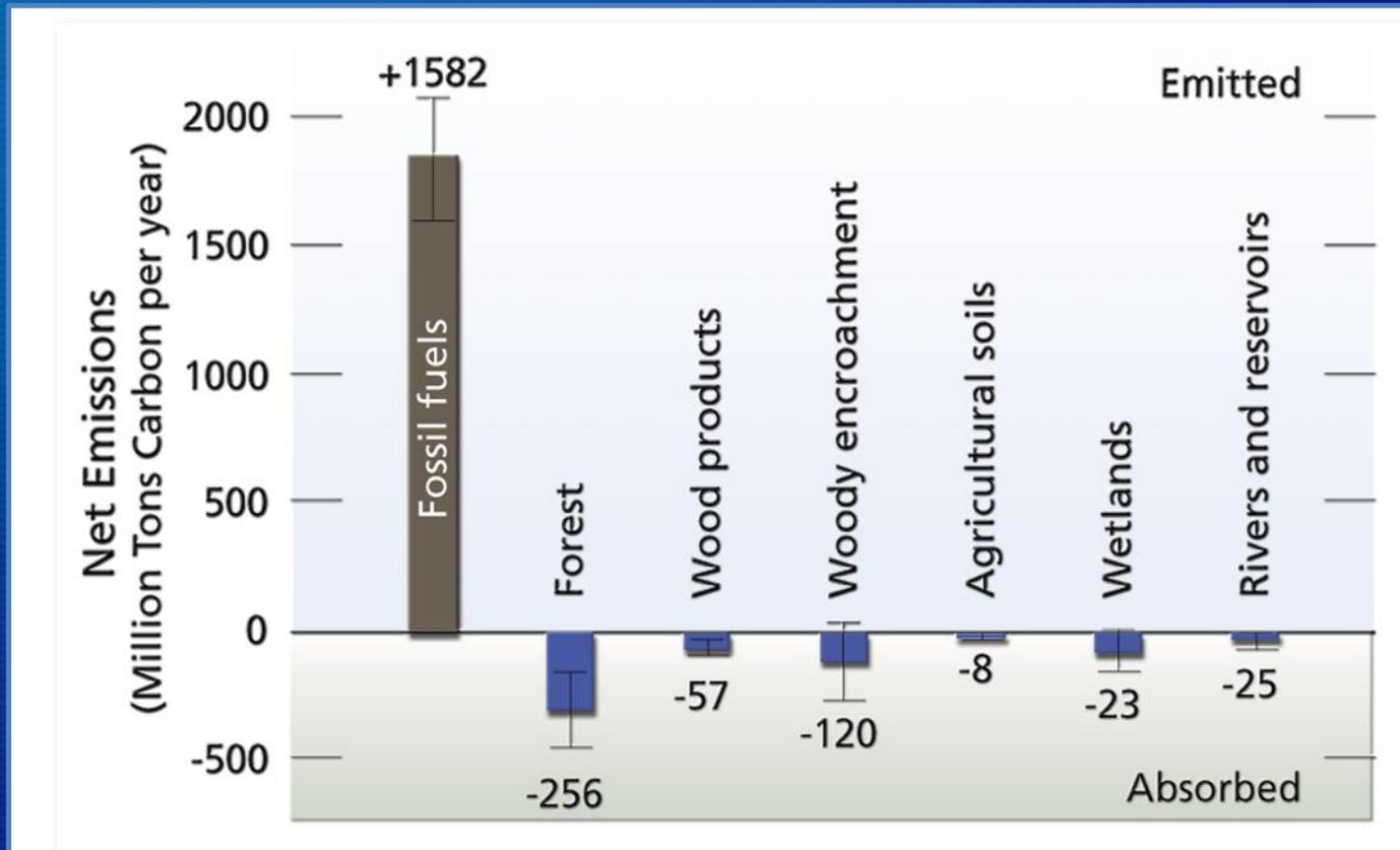
Key Finding: Global warming is unequivocal and primarily human induced

- About 1/3 of the CO₂ from fossil fuel burning remains in the atmosphere after 100 years
- About 1/5 of it remains after 1000 years
- The U.S. is responsible for about 28% of human-induced heat-trapping gases in the atmosphere today



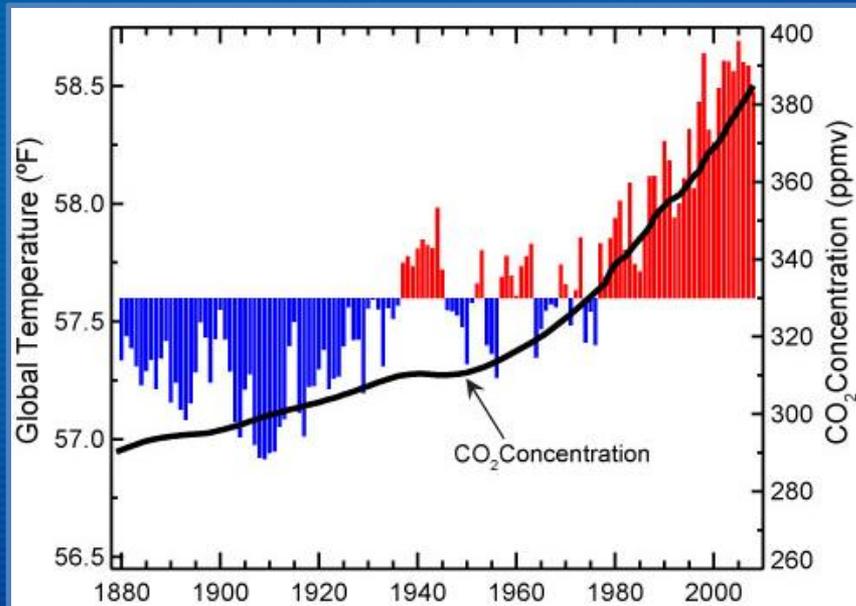
Key Finding: Global warming is unequivocal and primarily human induced

U.S. Carbon Dioxide Emissions and Uptake 2003



Key Finding: Global warming is unequivocal and primarily human induced

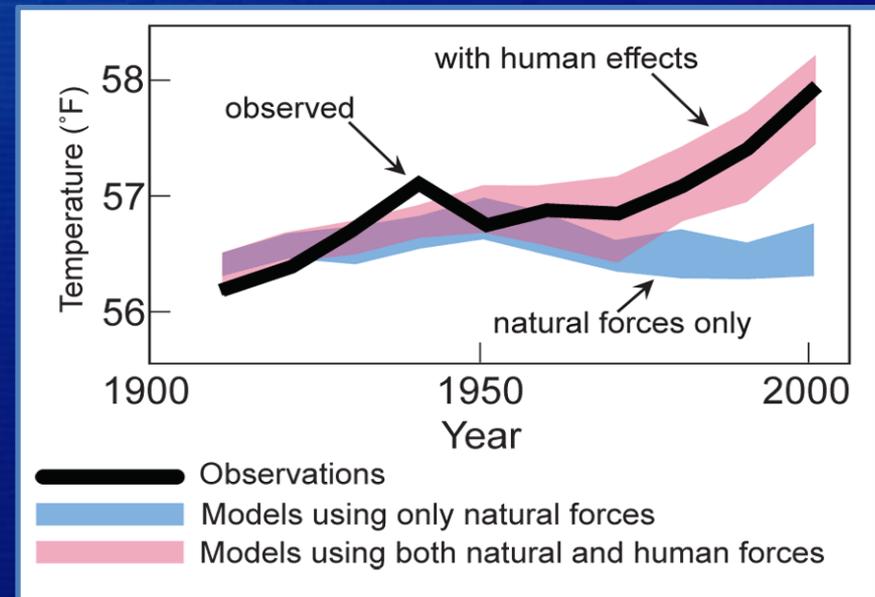
Global Temperature and CO₂



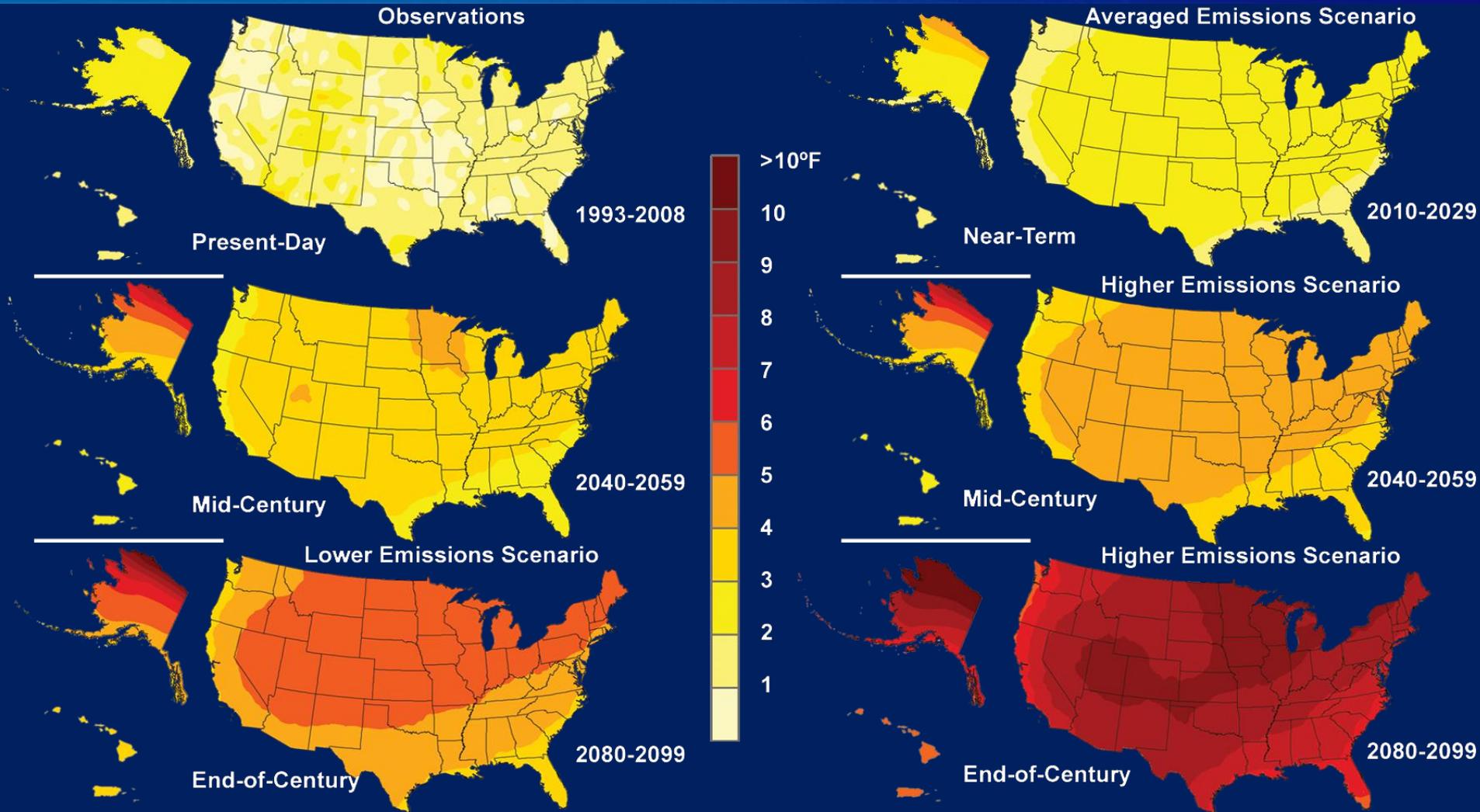
Human fingerprints have been identified in many aspects of climate change

- Temperature
- Precipitation
- Ocean heat content
- Atmospheric moisture
- Arctic sea ice

Separating Human and Natural Influences on Climate

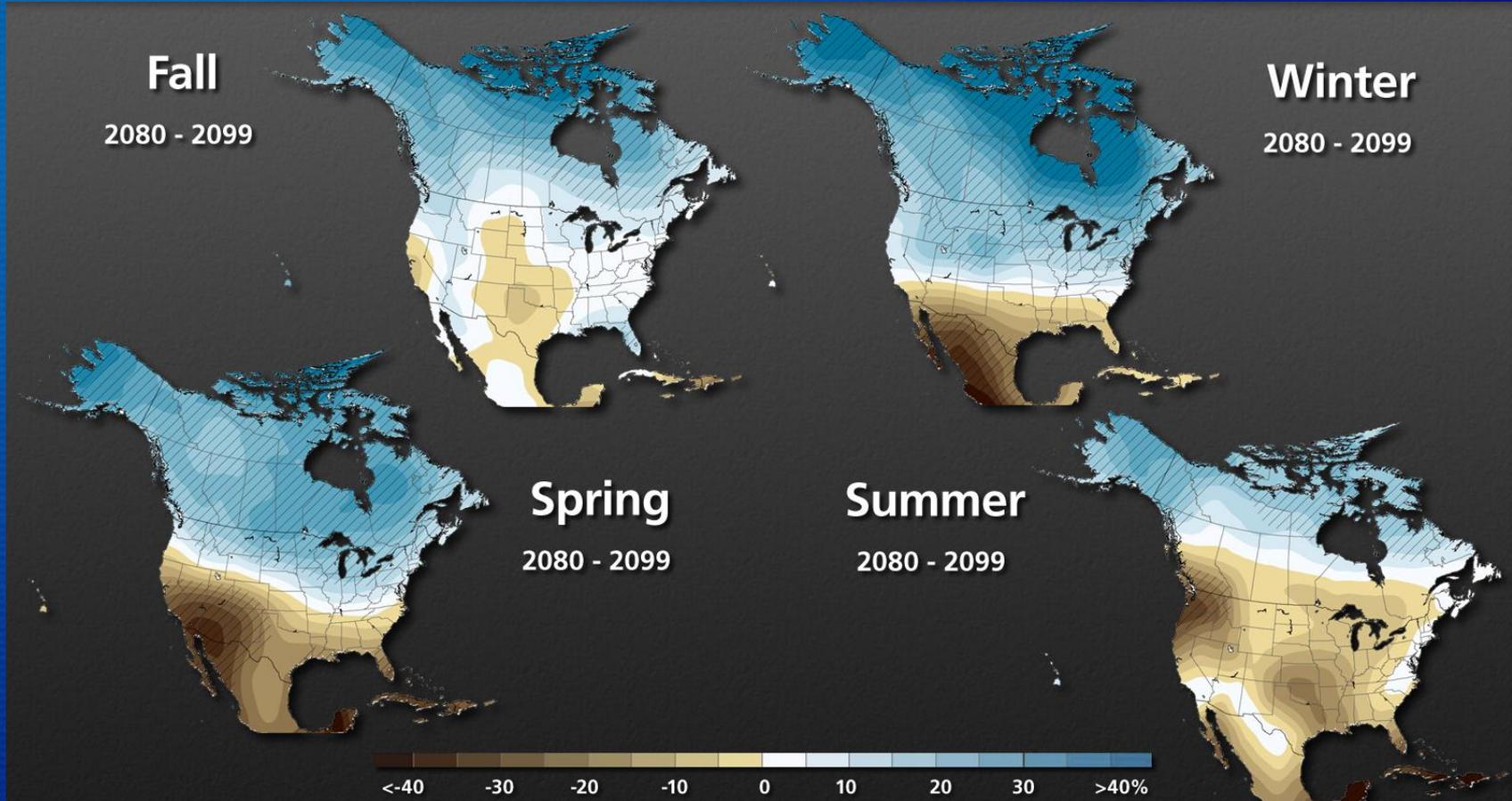


Key Finding: Climate Changes are underway in the U.S. and are projected to grow



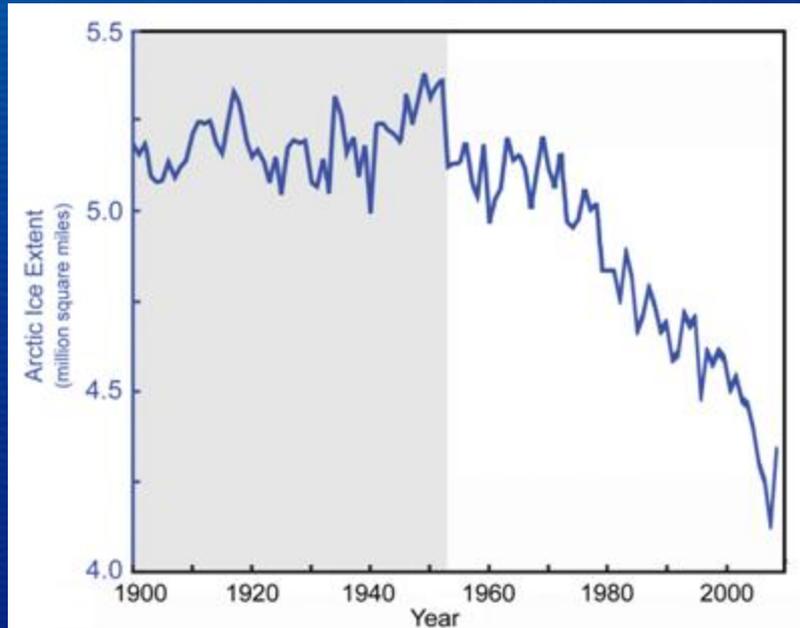
Key Finding: Climate Changes are underway in the U.S. and are projected to grow

Projected Change in North American Precipitation Percent Change



Key Finding: Climate Changes are underway in the U.S. and are projected to grow

- Ice-albedo feedback initiated - tipping point reached?
- Many possible thresholds exist in the physical climate system and in ecological and social systems

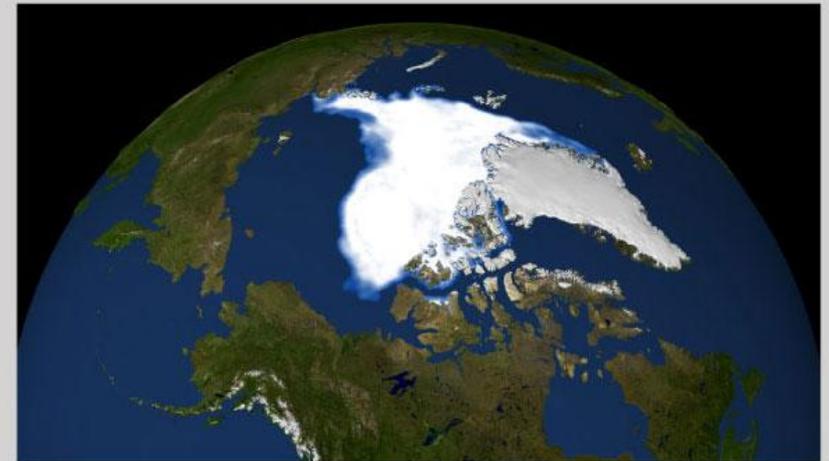


Arctic Sea Ice Annual Minimum

1979



2007



Key Finding: Widespread climate-related impacts are occurring now and are expected to increase

Sea Ice and Permafrost

Risks and costs in Alaska increase as thawing of permafrost damages roads, buildings, and forests, and declining sea ice increases coastal erosion and threatens the existence of some communities.



Forests

Forest growth is generally projected to increase in much of the East, but decrease in much of the West as water becomes even scarcer. Major shifts in species are expected, such as maple-beech-birch forests being replaced by oak-hickory in the Northeast. Insect infestations and wildfires are projected to increase as warming progresses.



Coldwater Fish

Salmon, trout, and other coldwater fish will face additional stresses as water temperatures rise and summer streamflows decline. Ecosystems and the tourism and recreation they support will be adversely affected.



Coral Reefs

Rising water temperatures and ocean acidification threaten coral reefs and the rich ecosystems they support. These and other climate-related impacts on coastal and marine ecosystems will have major implications for tourism and fisheries.



Interacting Stresses

Population shifts and development choices are making more Americans vulnerable to climate change impacts. An aging populace, and continued population shifts to the Southeast, Southwest, and coastal cities amplify risks associated with extreme heat, sea-level rise, storm surge, and increasing water scarcity in some regions.



Key Finding: Widespread climate-related impacts are occurring now and are expected to increase

Heavy Downpours

More rain is already coming in very heavy events, and this trend is projected to increase across the nation. Such events are harmful to transportation infrastructure, agriculture, water quality, and human health.



Coastal Communities

Sea-level rise and storm surge will increase threats to homes and infrastructure including water, sewer, transportation, and communication systems. Many barrier islands and coastal marshes that protect the coastline and support healthy ecosystems will be lost.



Agriculture

Increasing heat, pests, floods, weeds, and water stress will present increasing challenges for crop and livestock production. ecosystems will be lost.



Water and Energy

As warming increases competition for water, the energy sector will be strongly affected as power plants require large amounts of water for cooling.



Heat Waves

Heat waves will become more frequent and intense, increasing threats to human health and quality of life, especially in cities.



Energy Supply

Warming will decrease demand for heating energy in winter and increase demand for cooling energy in summer. The latter will result in significant increases in electricity use and peak demand in most regions.



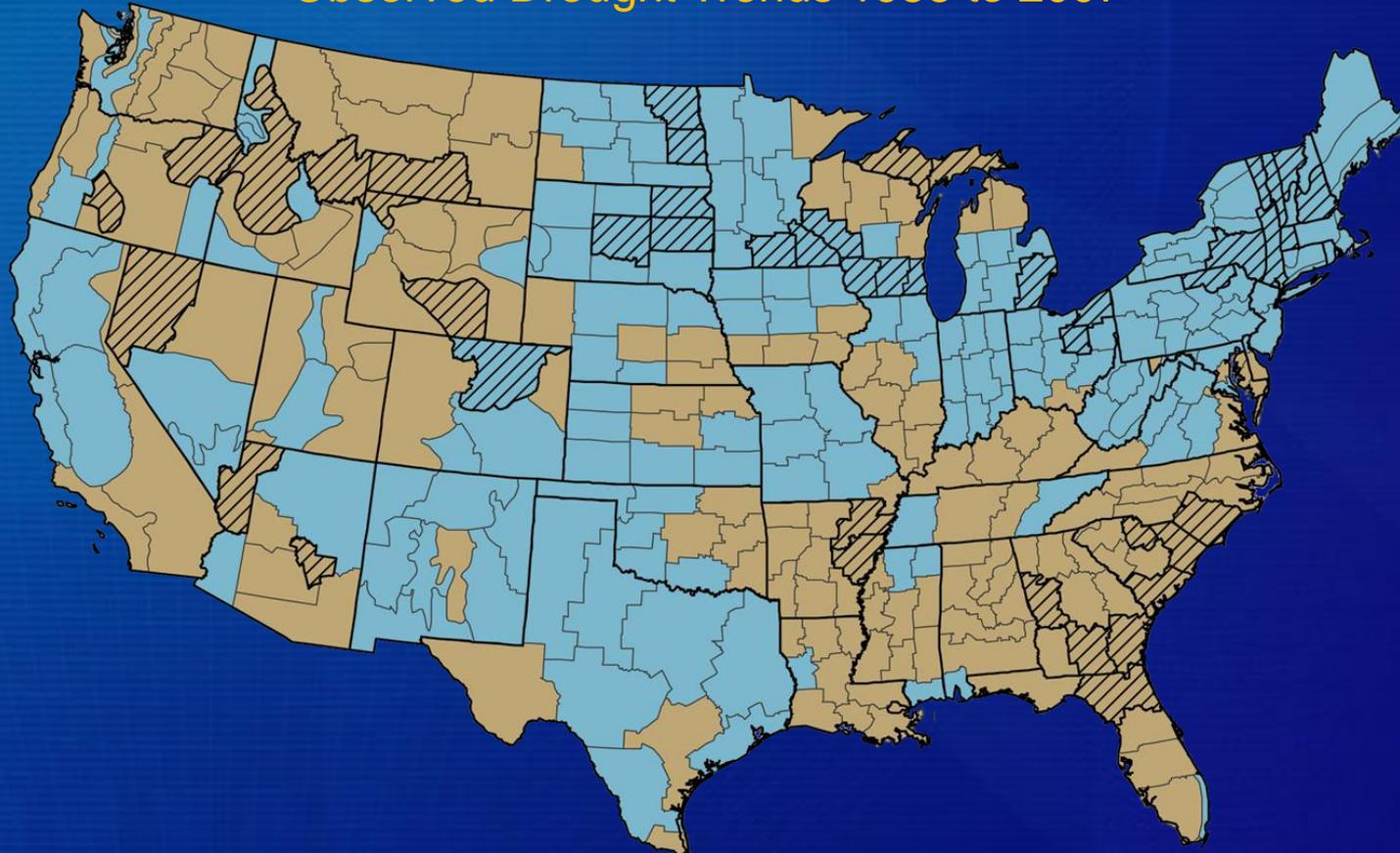
Water Supply

Reduced summer runoff, increased winter runoff, and increasing demands will compound current stresses on water supplies and flood management, especially in the West.



Key Finding: Climate Change will stress water resources

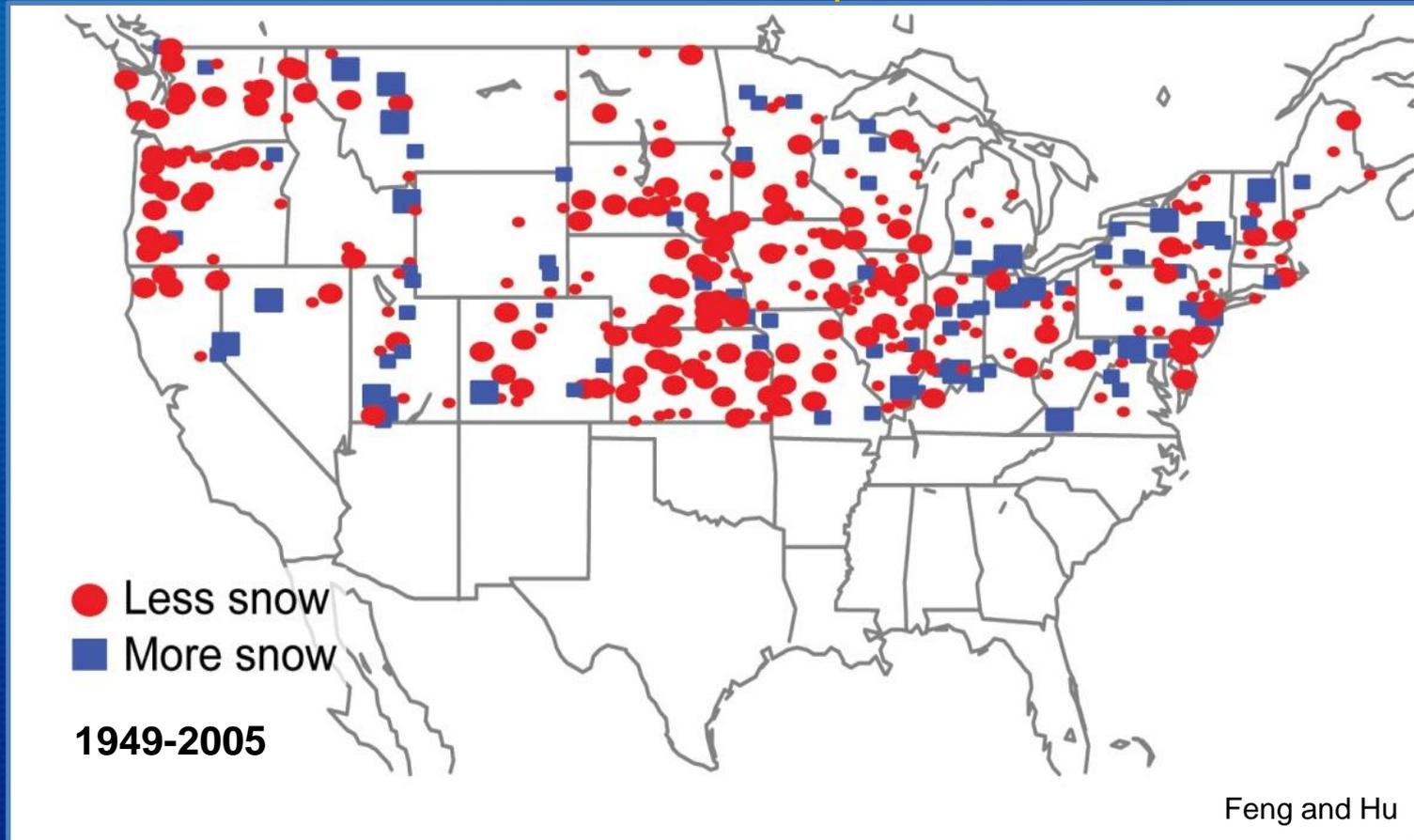
Observed Drought Trends 1958 to 2007



Increasing drought Decreasing drought

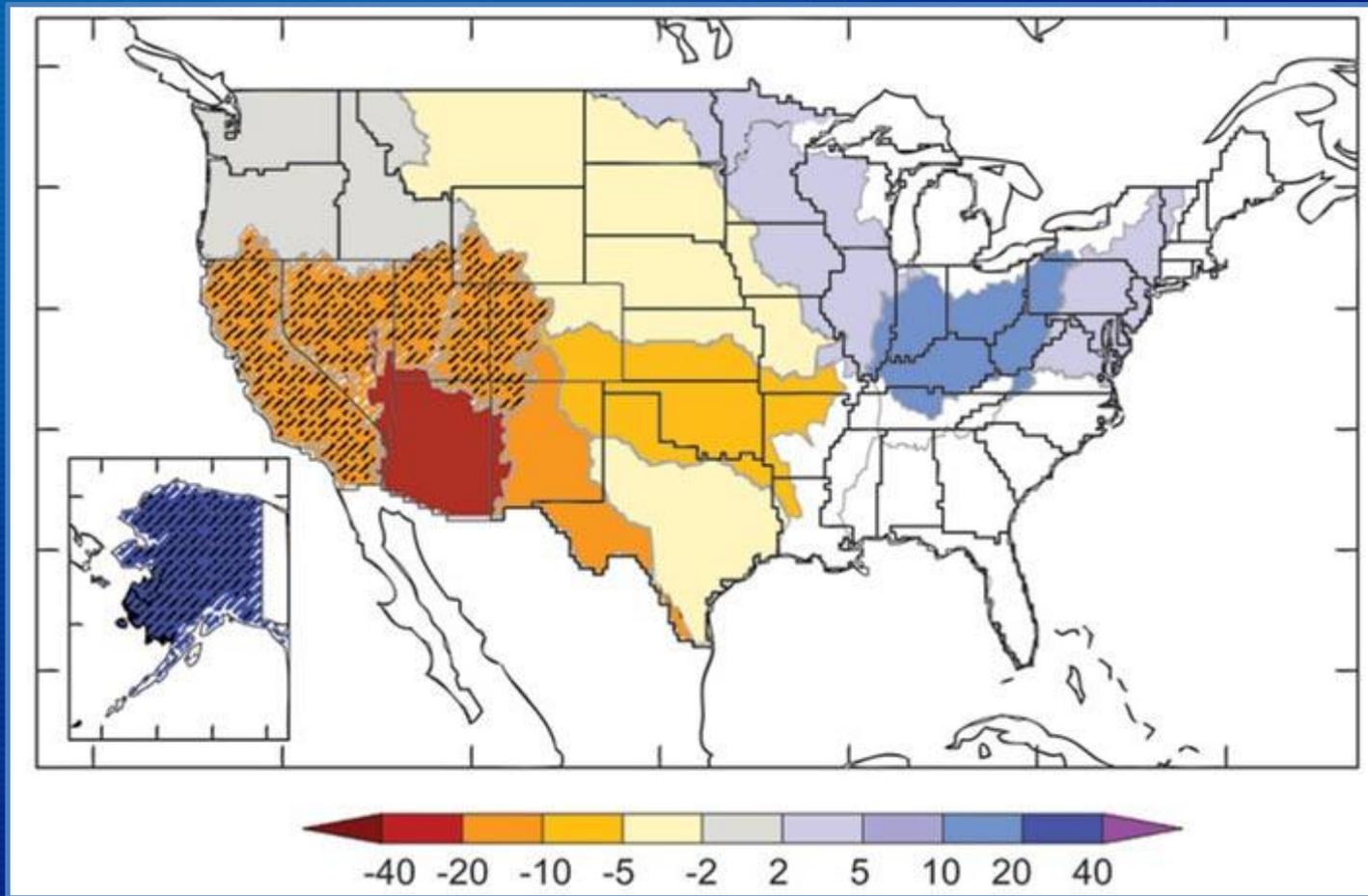
Key Finding: Climate Change will stress water resources

Change in Snowfall Contributions to Wintertime Precipitation



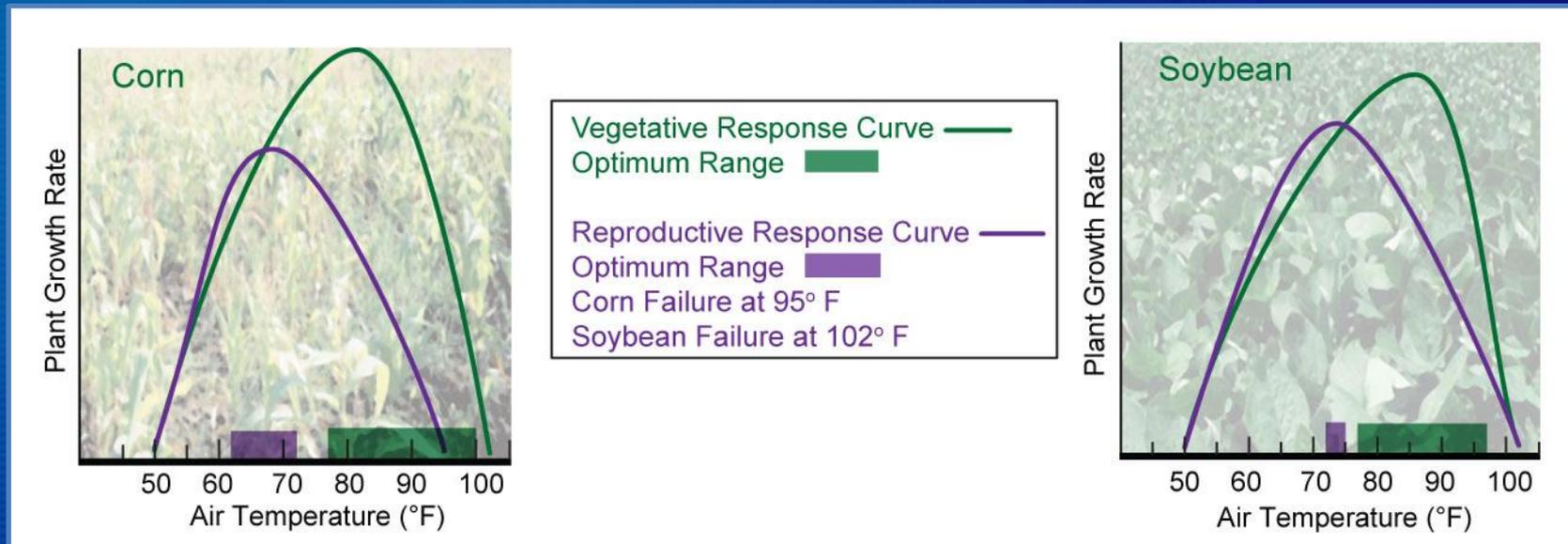
Key Finding: Climate Change will stress water resources

Projected Changes in Annual Runoff



Key Finding: Crop and livestock production will be increasingly challenged

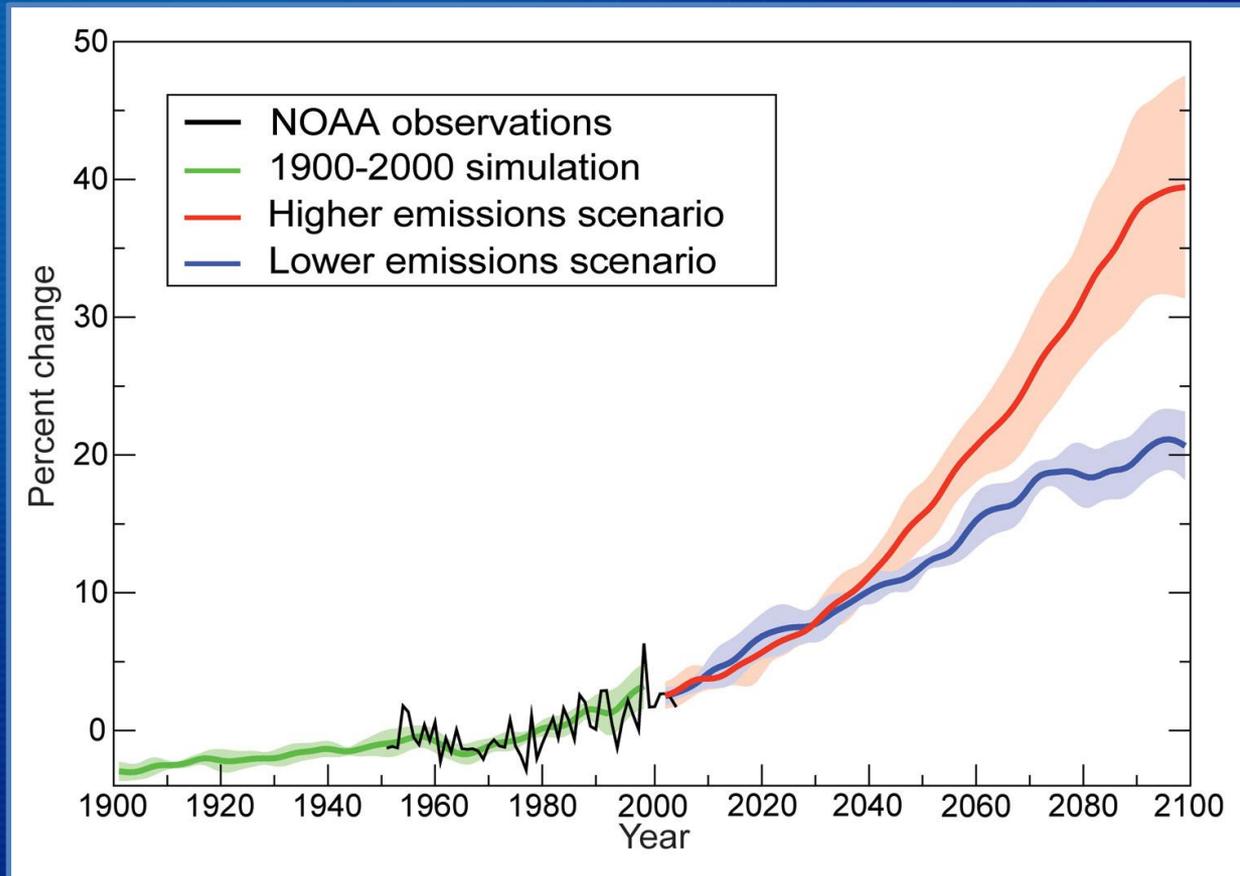
Corn and Soybean Temperature Response



Corn will fail to reproduce at temperatures above 95°F and soybean above 102°F.

Key Finding: Crop and livestock production will be increasingly challenged

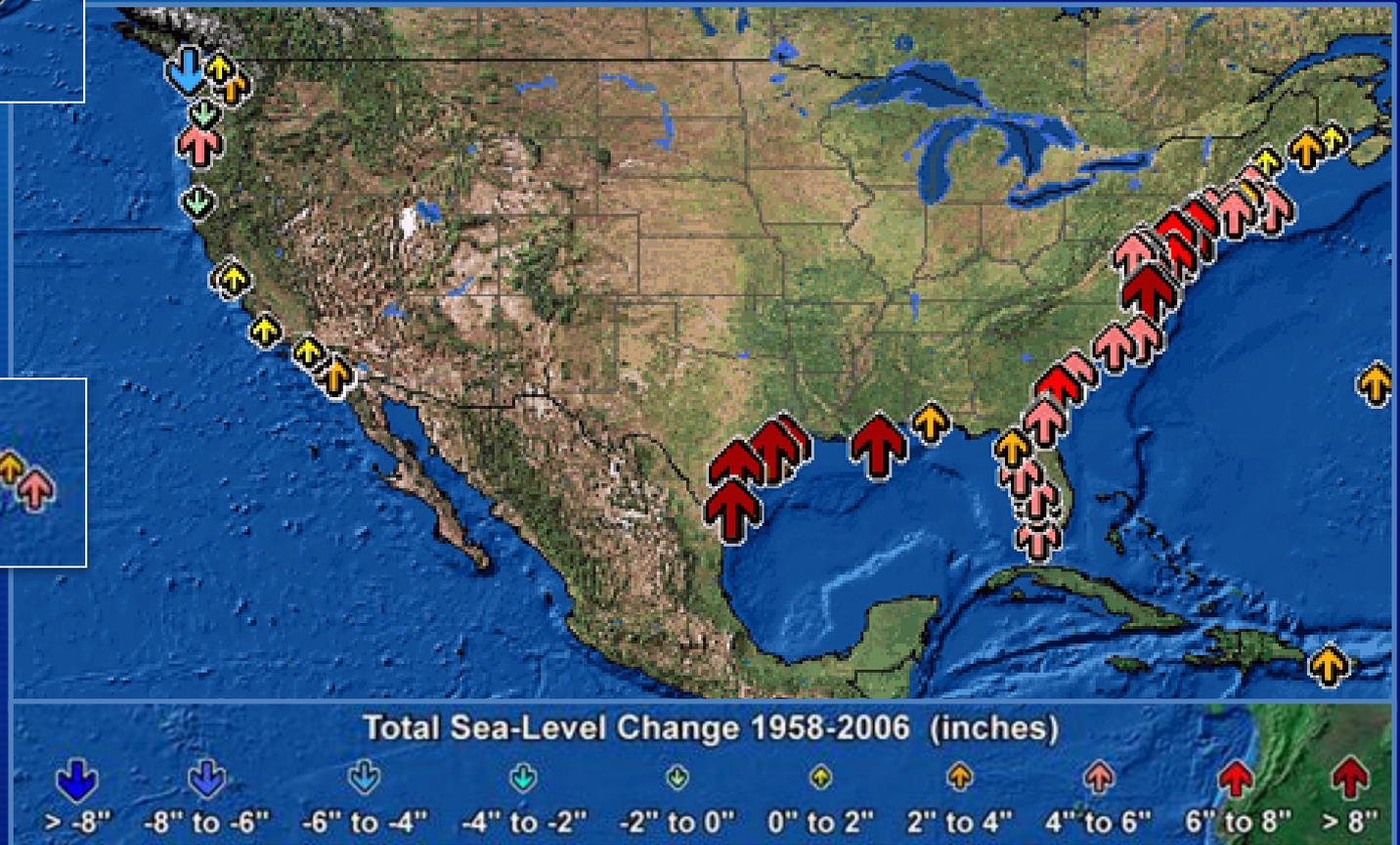
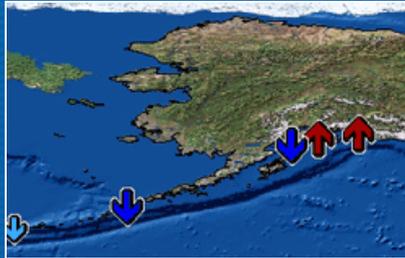
Increase in the Percent of Very Warm Nights



Warm nights increased the respiration rate and reduce the amount of carbon that is captured during the day by photosynthesis to be retained in the fruit or grain.

Key Finding: Coastal areas are at increasing risk from sea-level rise and storm surge

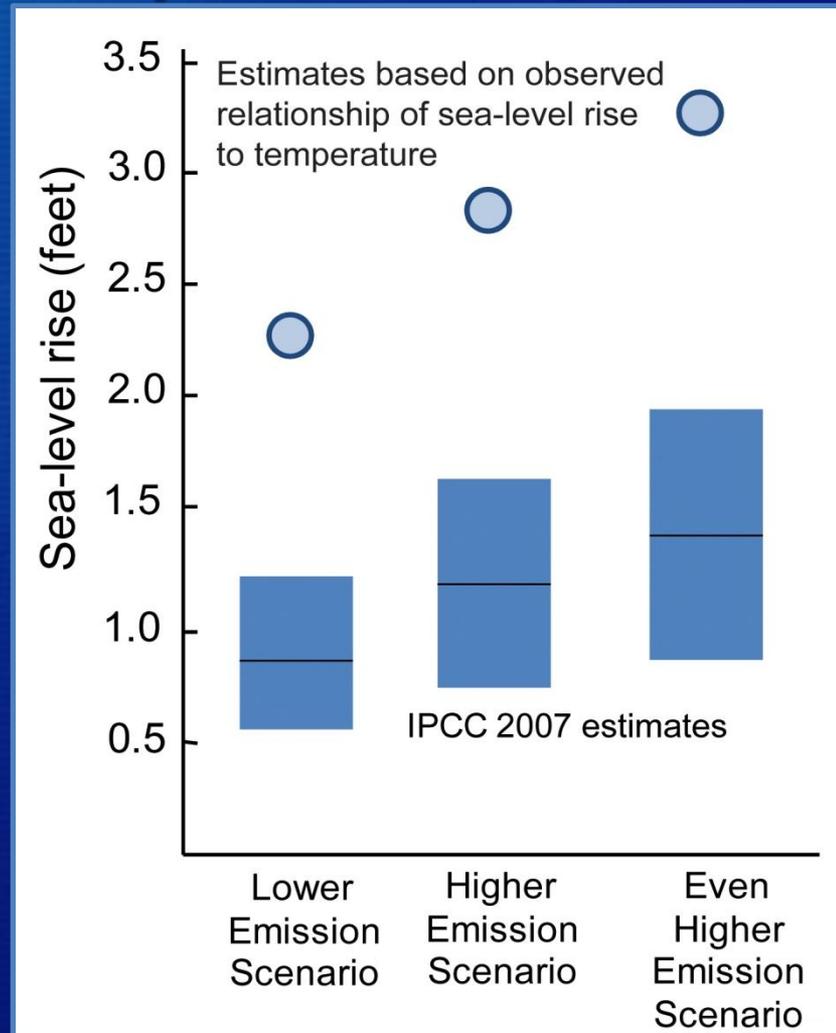
Observed U.S. Sea-Level Changes



Key Finding: Coastal areas are at increasing risk from sea-level rise and storm surge

- Sea-level rise
- Storm surge
- Erosion
- Flooding

Projected Sea-Level Rise



Key Finding: Coastal areas are at increasing risk from sea-level rise and storm surge

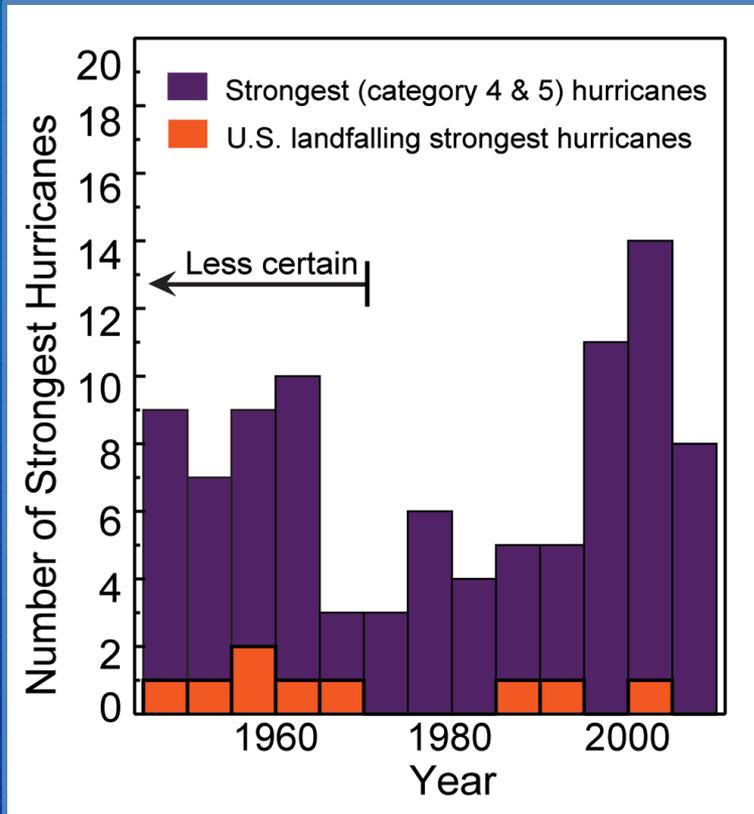
Florida with 3 feet of Sea-Level Rise



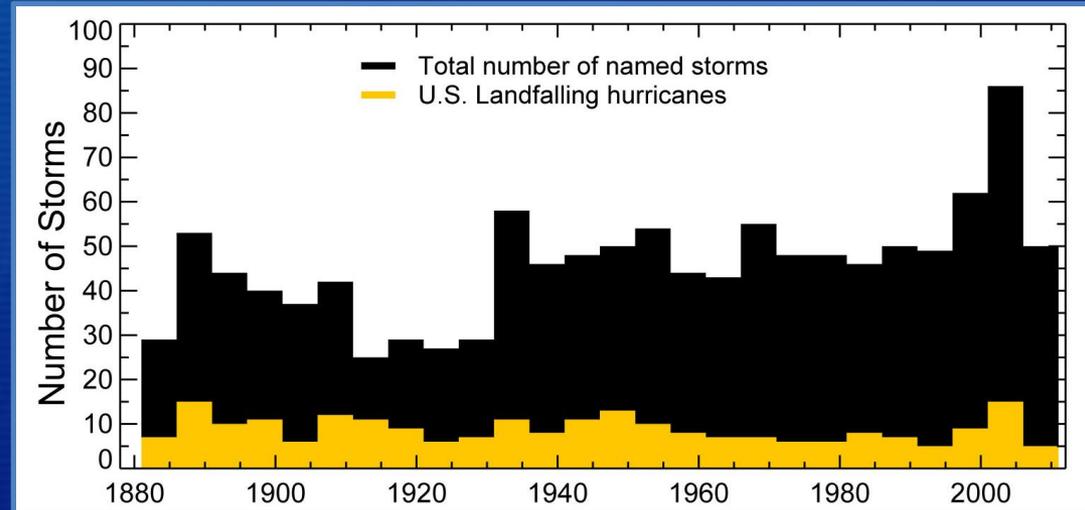
Areas in red would be under water with a 3 foot rise in sea level, projected for this century

Key Finding: Coastal areas are at increasing risk from sea-level rise and storm surge

Atlantic Basin Strongest Hurricanes



Atlantic Tropical Storms and Hurricanes



Key Finding: Coastal areas are at increasing risk from sea-level rise and storm surge

Gulf Coast Area Roads at Risk from Sea-Level Rise

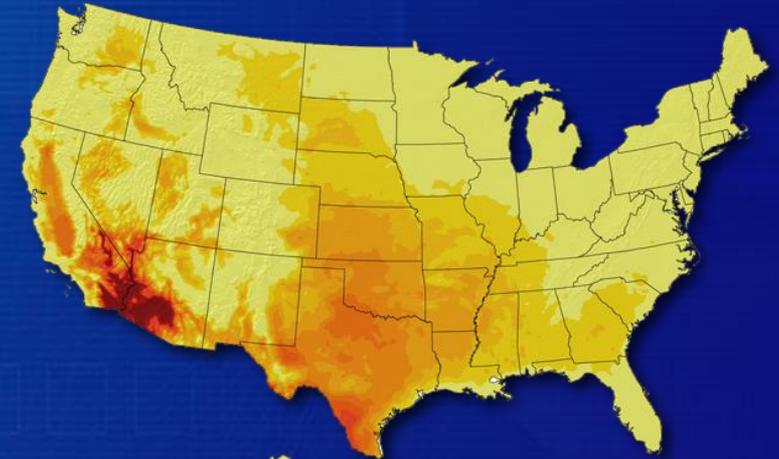


Key Finding: Risks to human health will increase

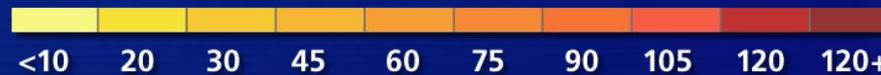
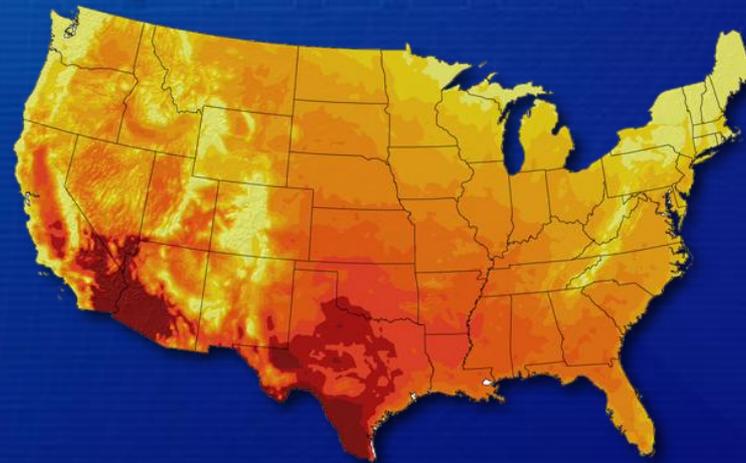
Number of Days Over 100°F

Recent Past 1961 - 1979

Low Scenario (B1) End of Century 2080 - 2099



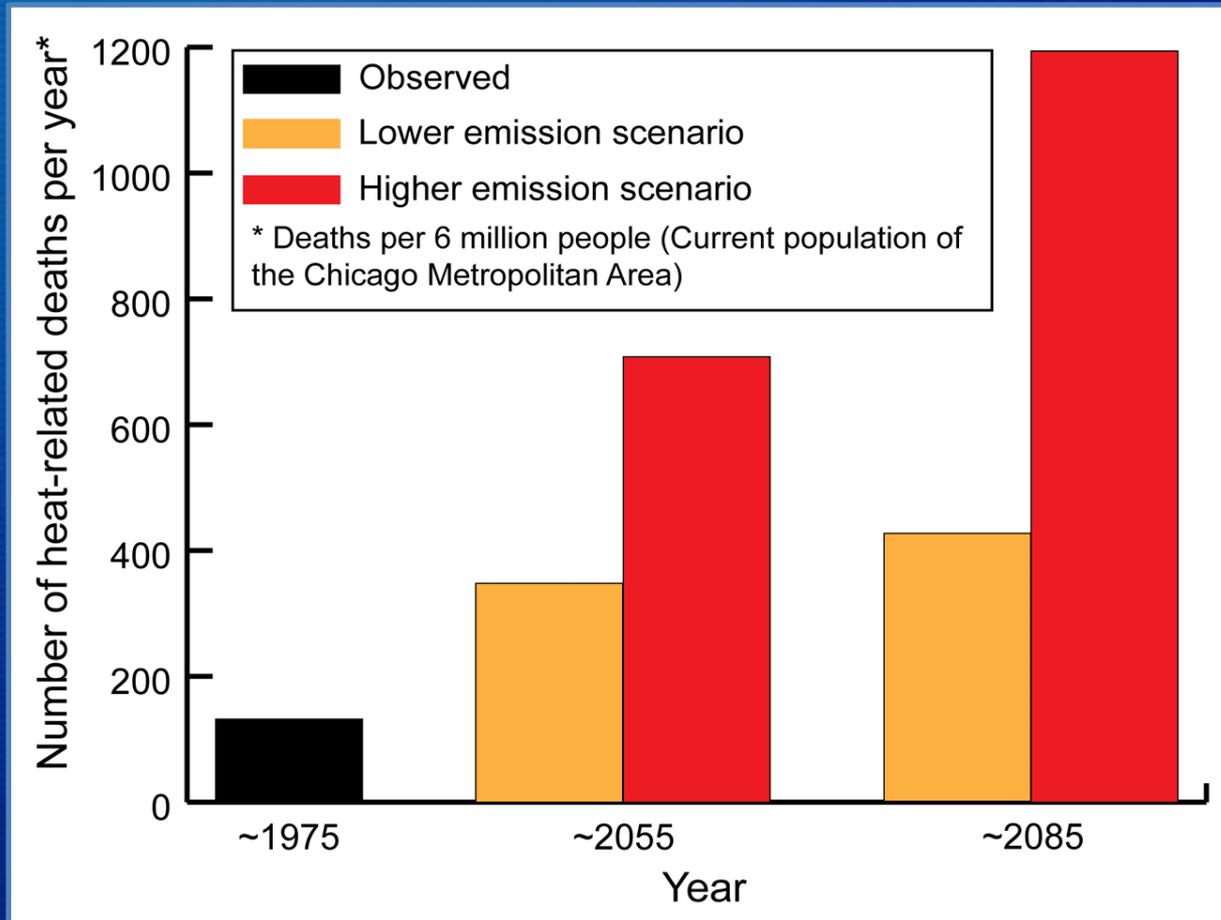
High Scenario (A2)
End of Century
2080 - 2099



Key Finding: Risks to human health will increase

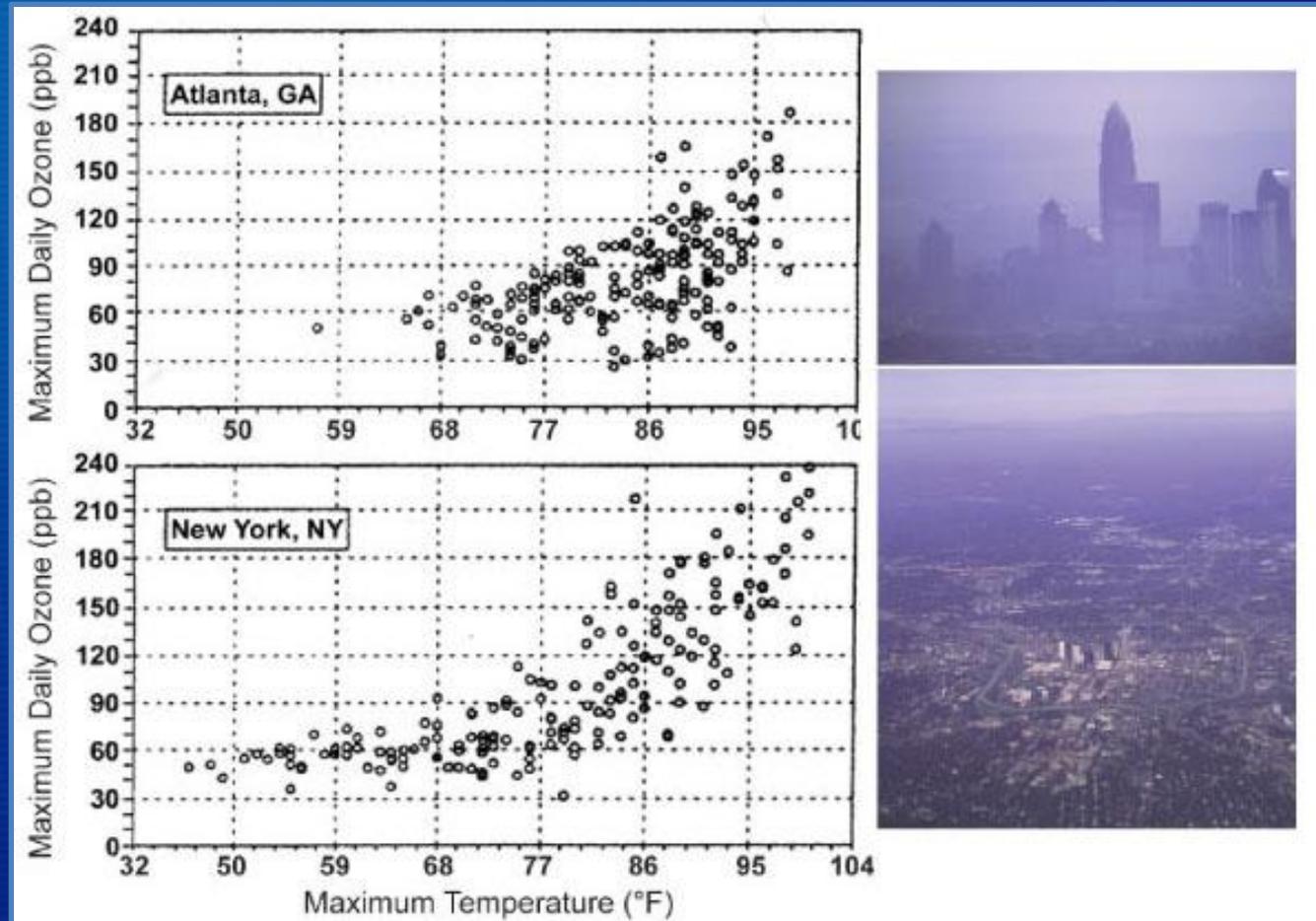
Heat-related illnesses and deaths are projected to increase, especially in cities.

Projected Increase in Heat-Related Deaths in Chicago



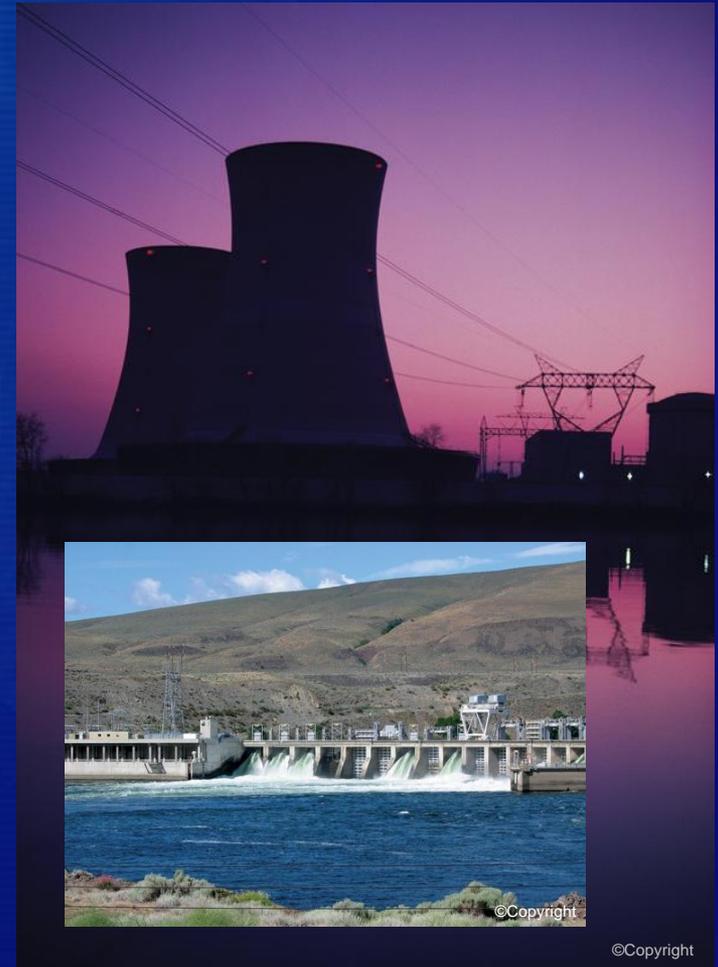
Key Finding: Climate change will interact with many social and environmental stresses

Temperature and Ground-Level Ozone



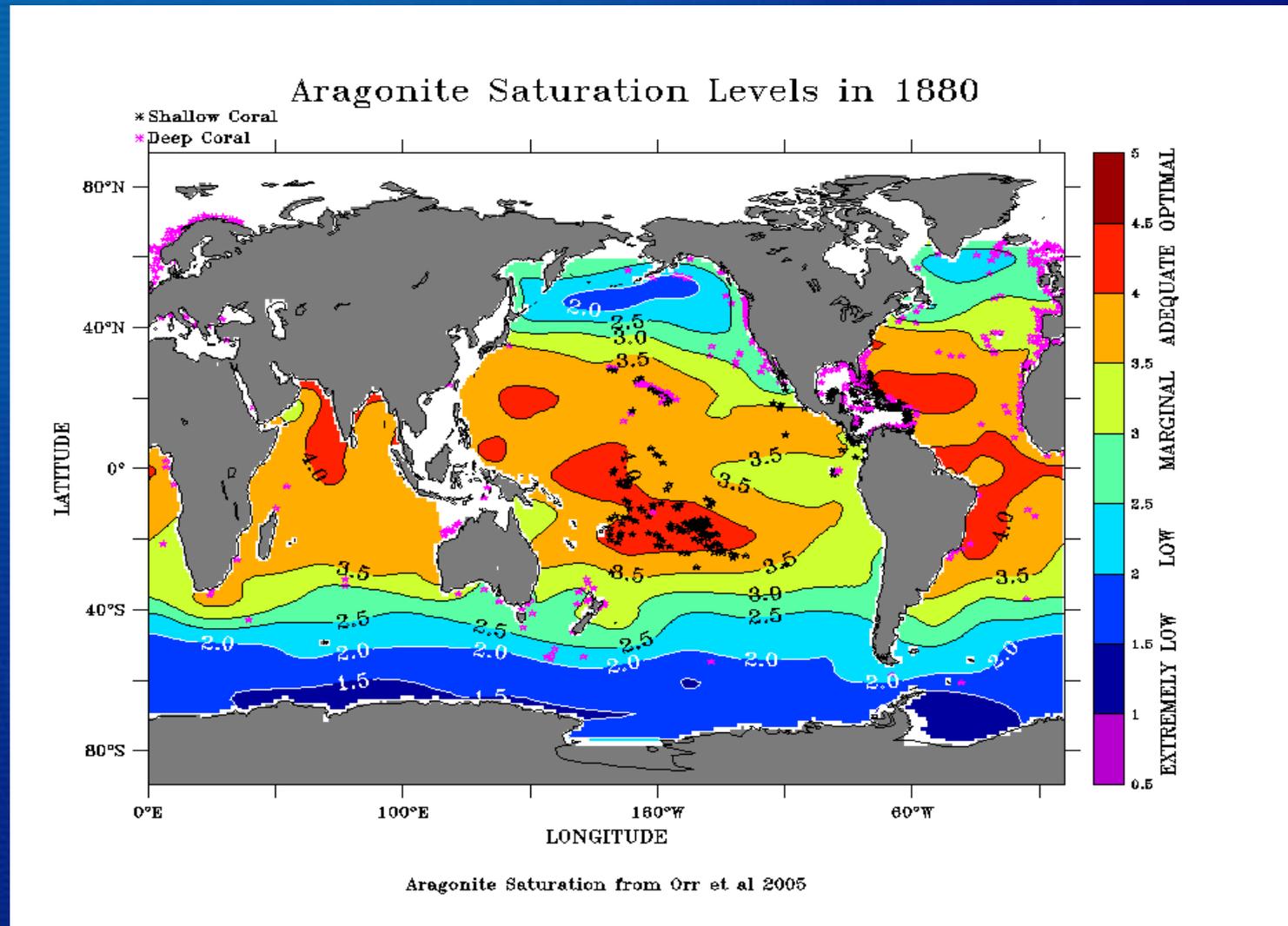
Key Finding: Climate change will interact with many social and environmental stresses

- High likelihood that water shortages will limit power plant electricity production
- Energy is likely to be needed to move and manage water
- Warmer water reduces efficiency of thermal power plant cooling technologies
- Warmer water discharged from power plants can alter species composition in aquatic ecosystems



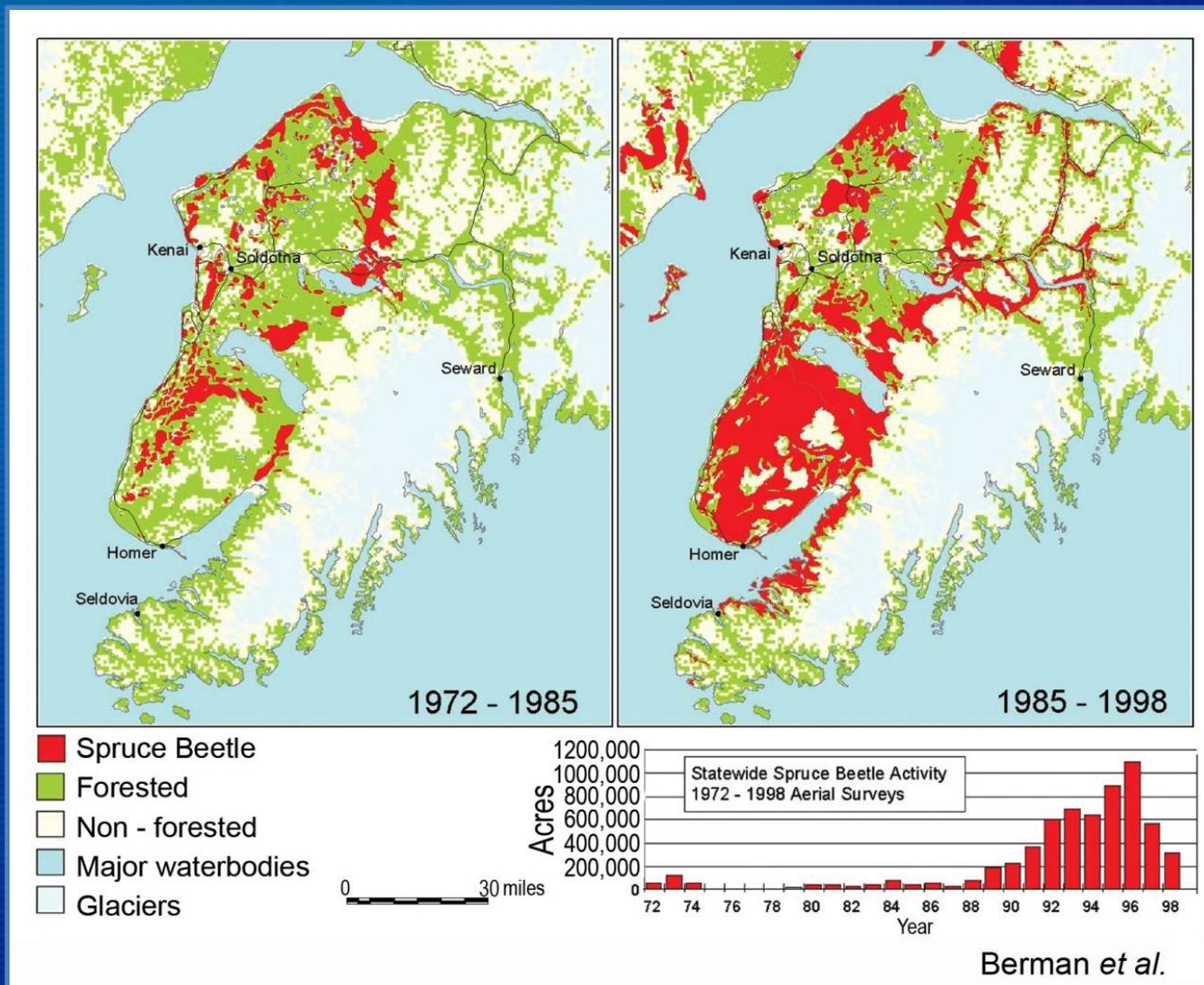
Key Finding: Thresholds will be crossed leading to large changes in climate and ecosystems

Coral calcification may decline 30% under CO₂ doubling



Key Finding: Thresholds will be crossed leading to large changes in climate and ecosystems

Spruce Bark Beetle in AK



Key Finding: Future Climate and its Impacts Depends on Choices Made Today

- Human-induced climate changes are happening now and are projected to increase
- Choices about emissions now and in the coming years will have far-reaching consequences
- The rate and magnitude of future climate change and the resulting impacts depend critically on the amount of global greenhouse gases and atmospheric particles (aerosols)
- Adaptation strategies will be necessary to reduce some of the undesirable impacts
 - We are already committed to significant changes
- Careful planning and regular feedback on climate change impacts will be important for effective mitigation and adaptation policies

Thank you.

Questions?

www.globalchange.gov/usimpacts

<http://www.commerce.gov/cop15>