Assessment of Climate Change in the Southwest United States: Implications for the San Pedro

San Pedro Riparian NCA Educational Forum
Sierra Vista, Arizona
July 27, 2013

Gregg Garfin, The University of Arizona

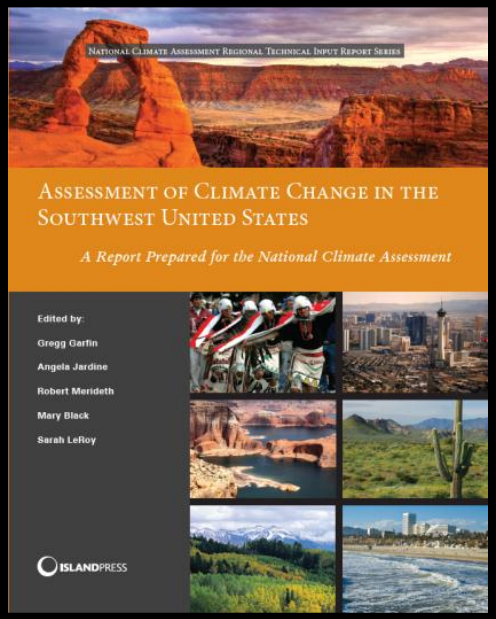
Arizona Cooperative Extension

Institute of the Environment

CLIMAS Climate Assessment for the Southwest

Overview of the talk

- Non-climate stuff
- Climate
- Impacts
- Strategies
- Where to get information



U.S. Global Change Research Program
National Climate Assessment

http://www.swcarr.arizona.edu

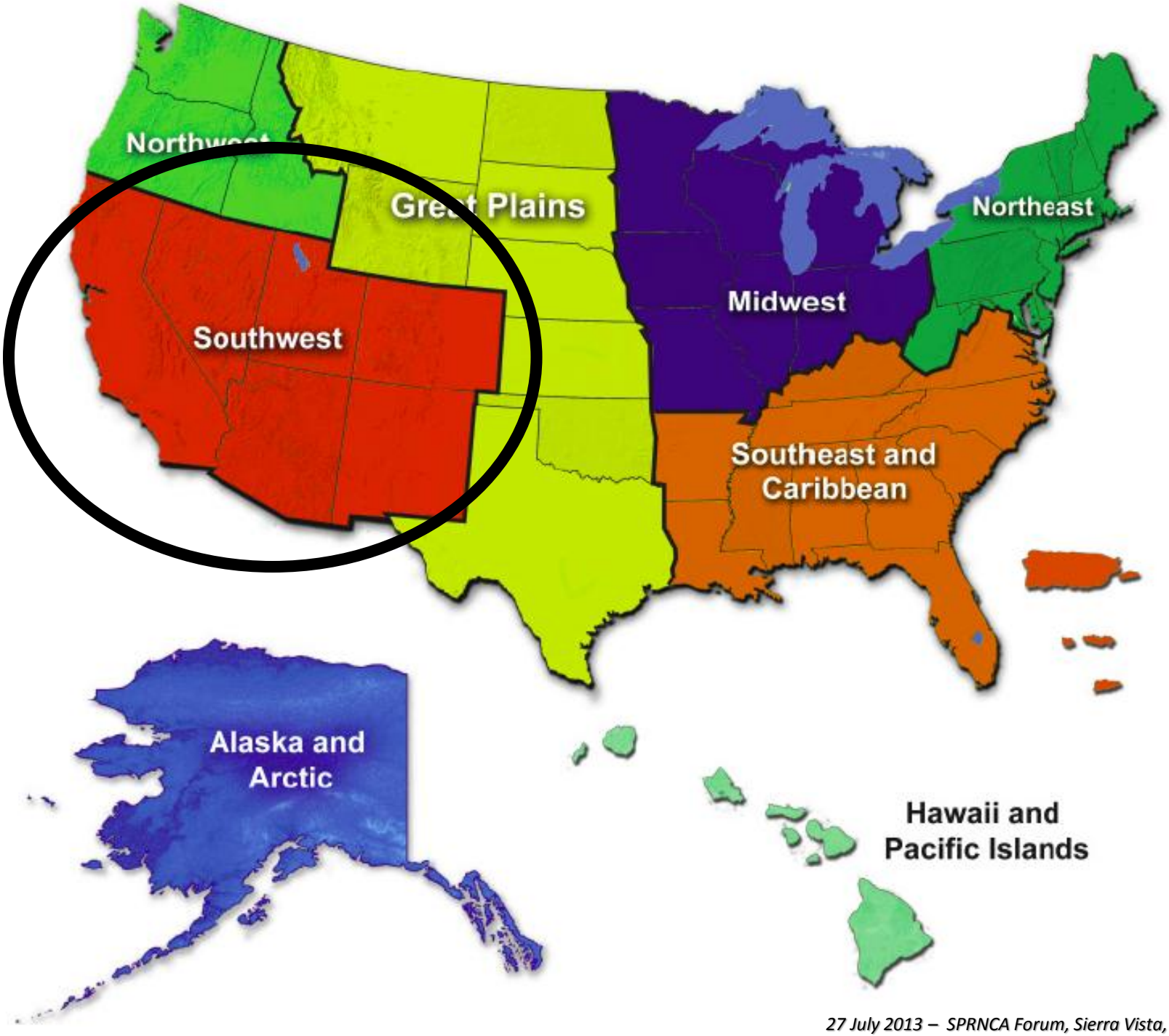
Three key points

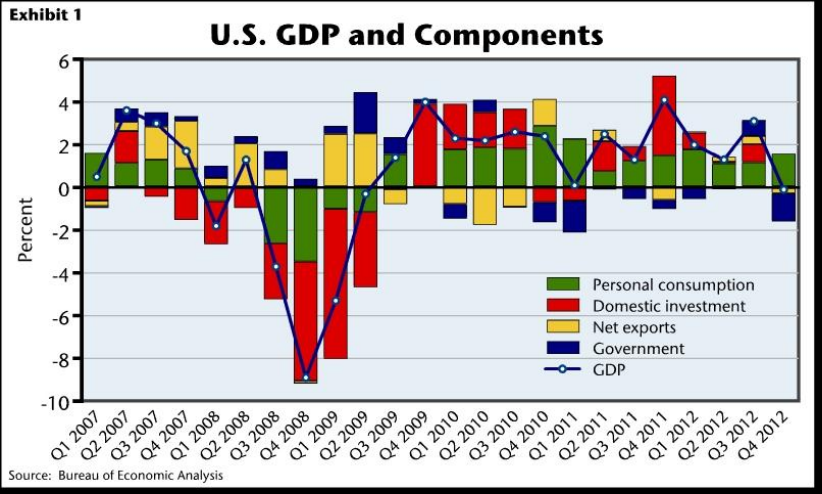
1. Temperatures have been increasing and are projected to continue to increase
2. Impacts on snow, soil moisture, runoff
3. Ramifications for fire, erosion, riparian ecosystems, invasive species

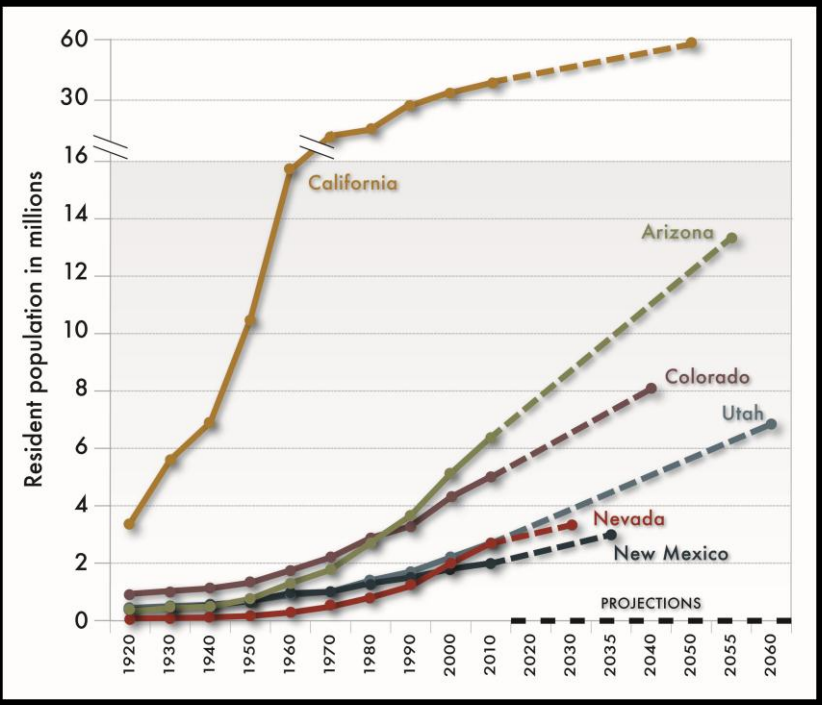
U.S. Global Change Research Program

National Climate Assessment

- http://globalchange.gov/
- Chapter 2 – Our Changing Climate
- Appendix 2 – The Science of Climate Change

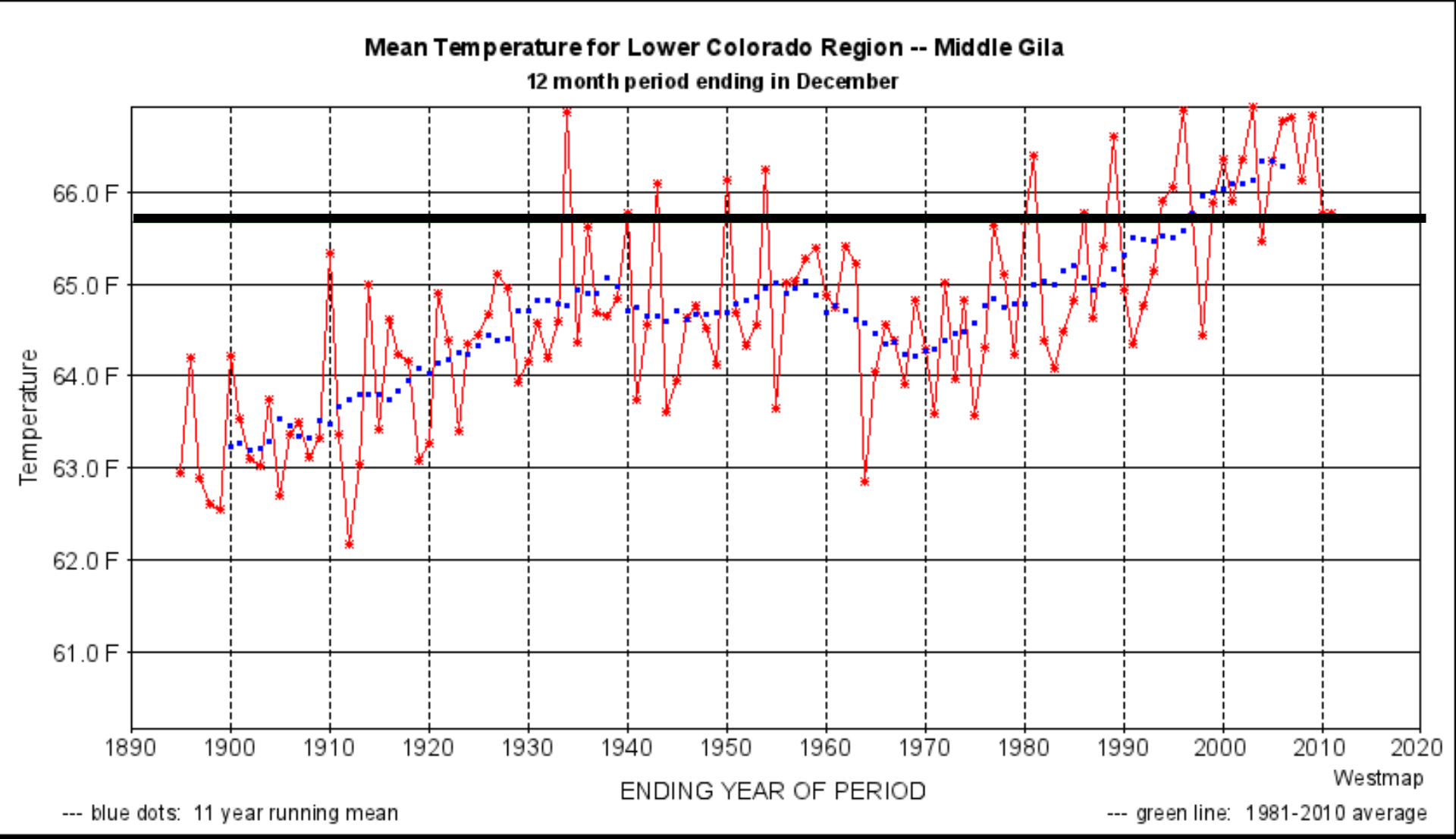

Northwest
Great Plains
Northeast
Midwest
Southwest
Southeast and Caribbean
Alaska and Arctic
Hawaii and Pacific Islands



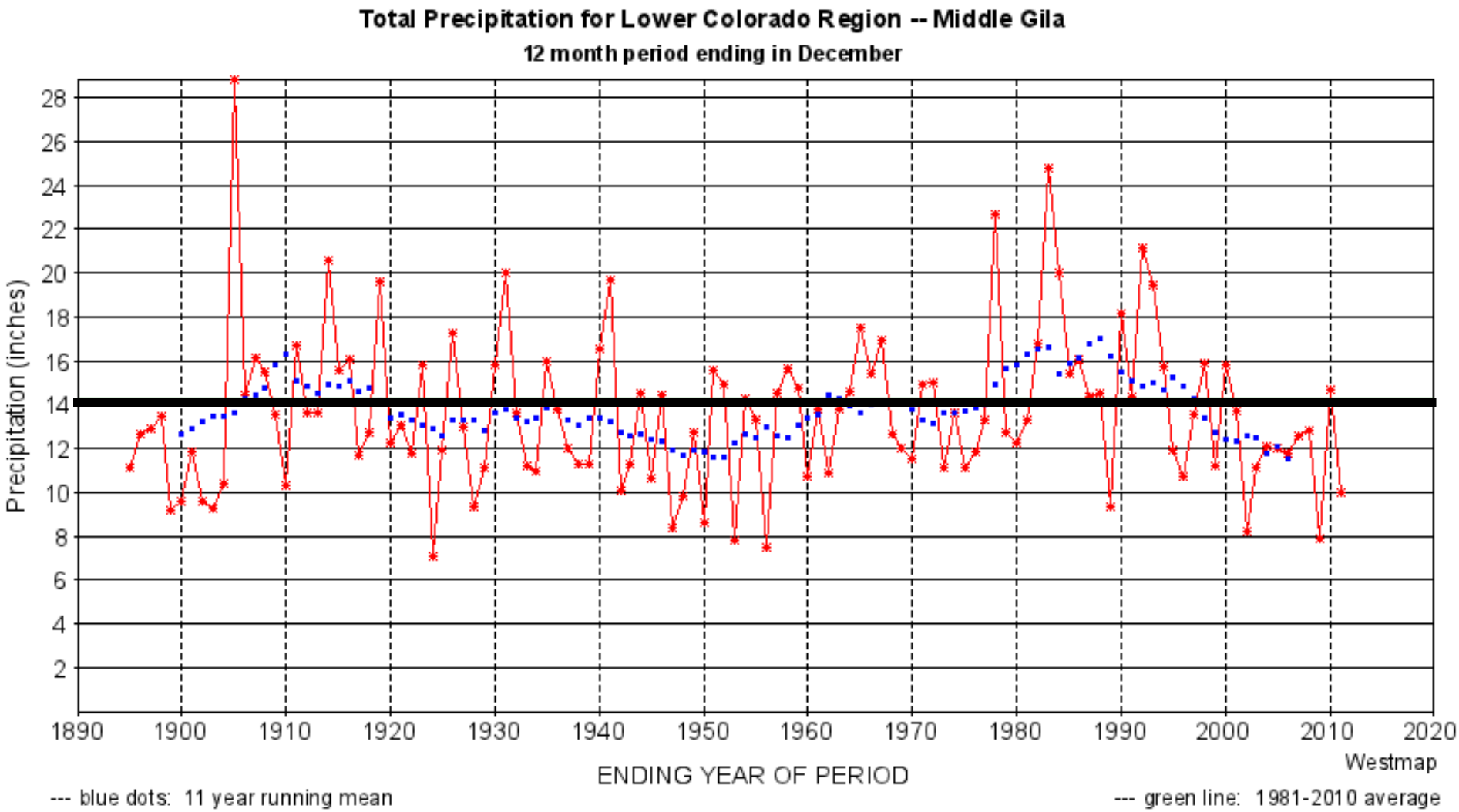


2013 REPORT CARD for America's INFRASTRUCTURE

Climate



http://www.cefa.dri.edu/Westmap/



http://www.cefa.dri.edu/Westmap/

http://www.nps.gov/romo/spring_snowmelt.htm

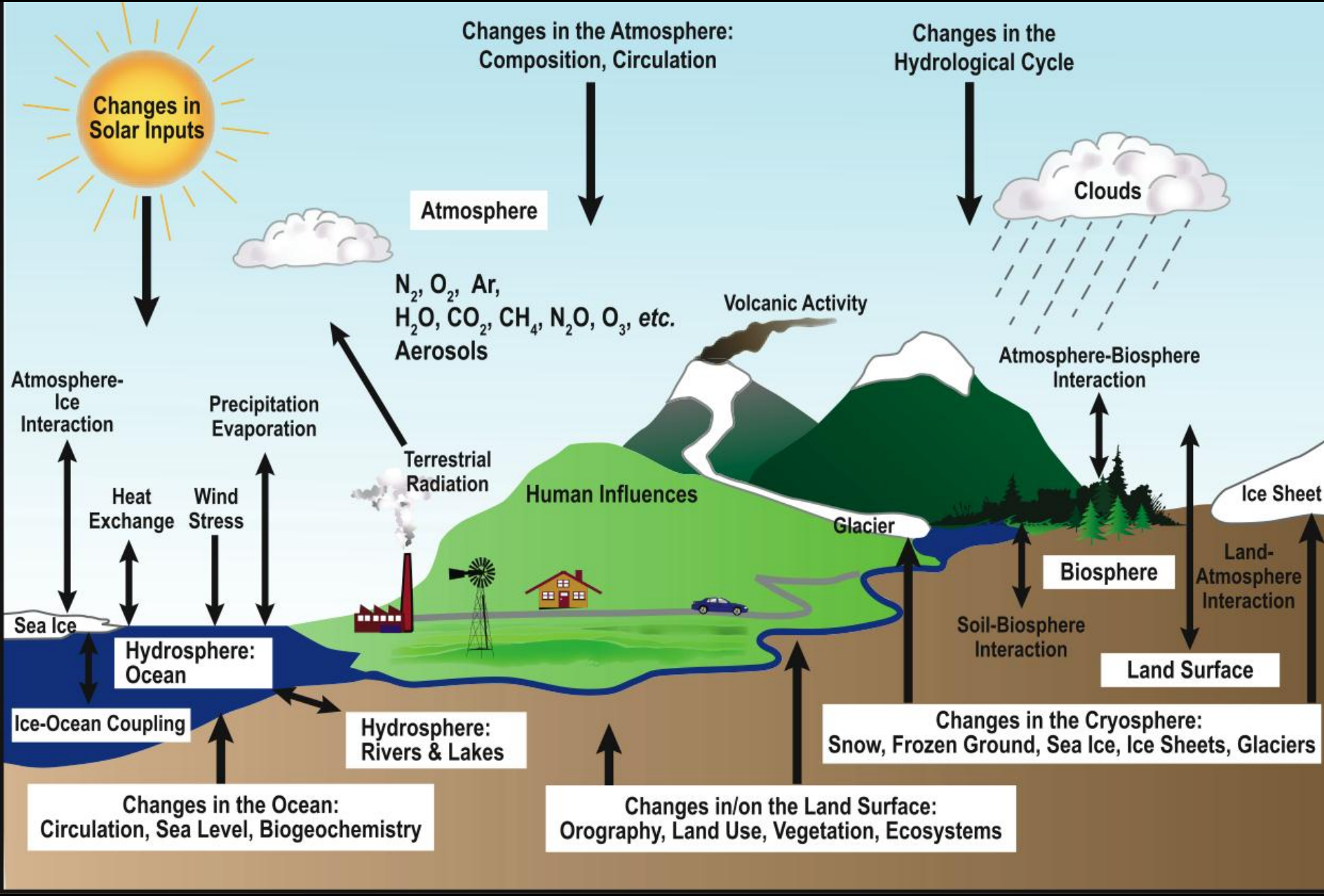
27 July 2013 –
SPRNCA Forum, Sierra Vista, AZ

Conifer Forest Mortality

Photo: Jemez Mountains
Craig Allen, USGS

Monument Fire, 2011

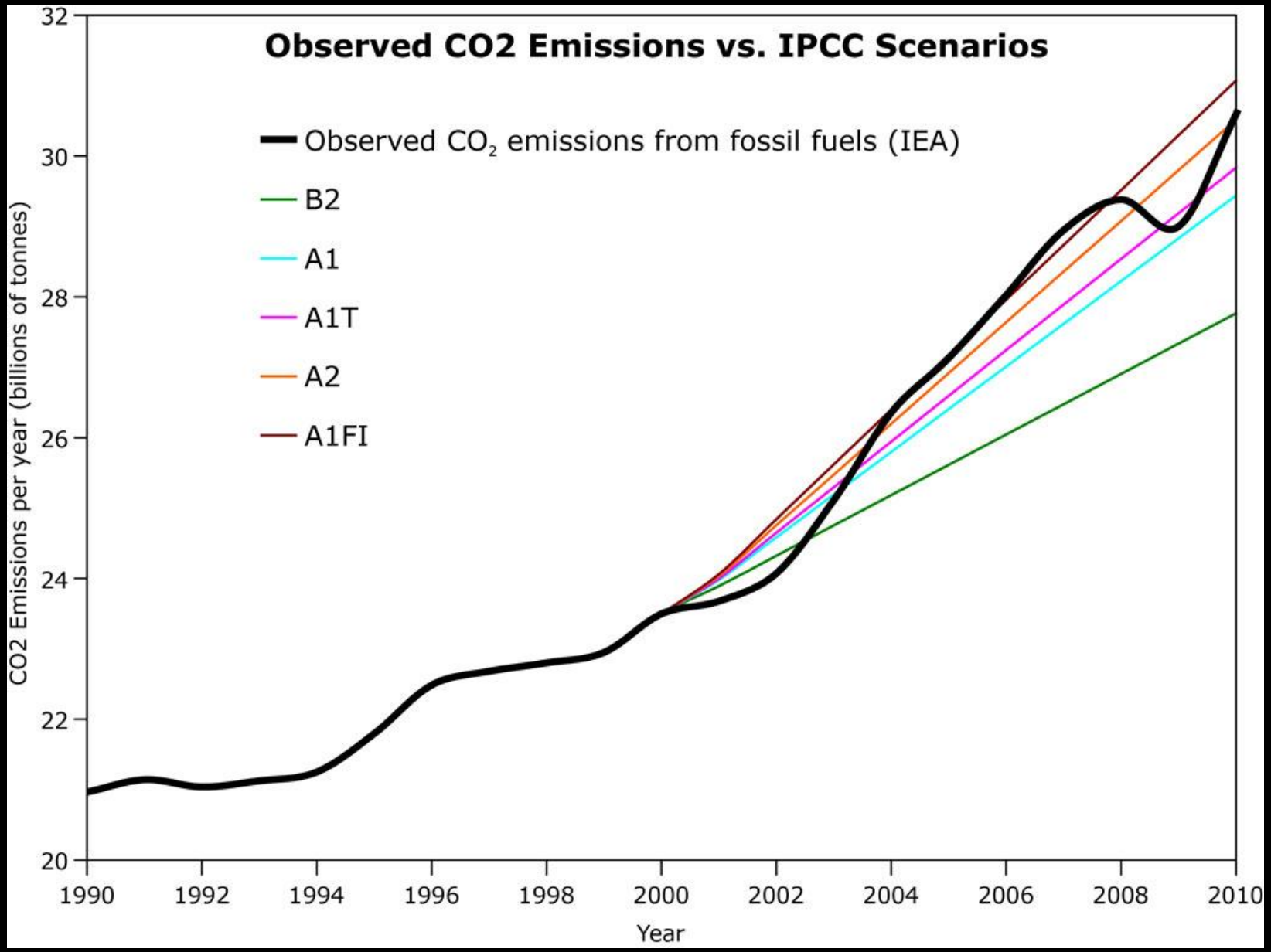
CBS News



The Climate System

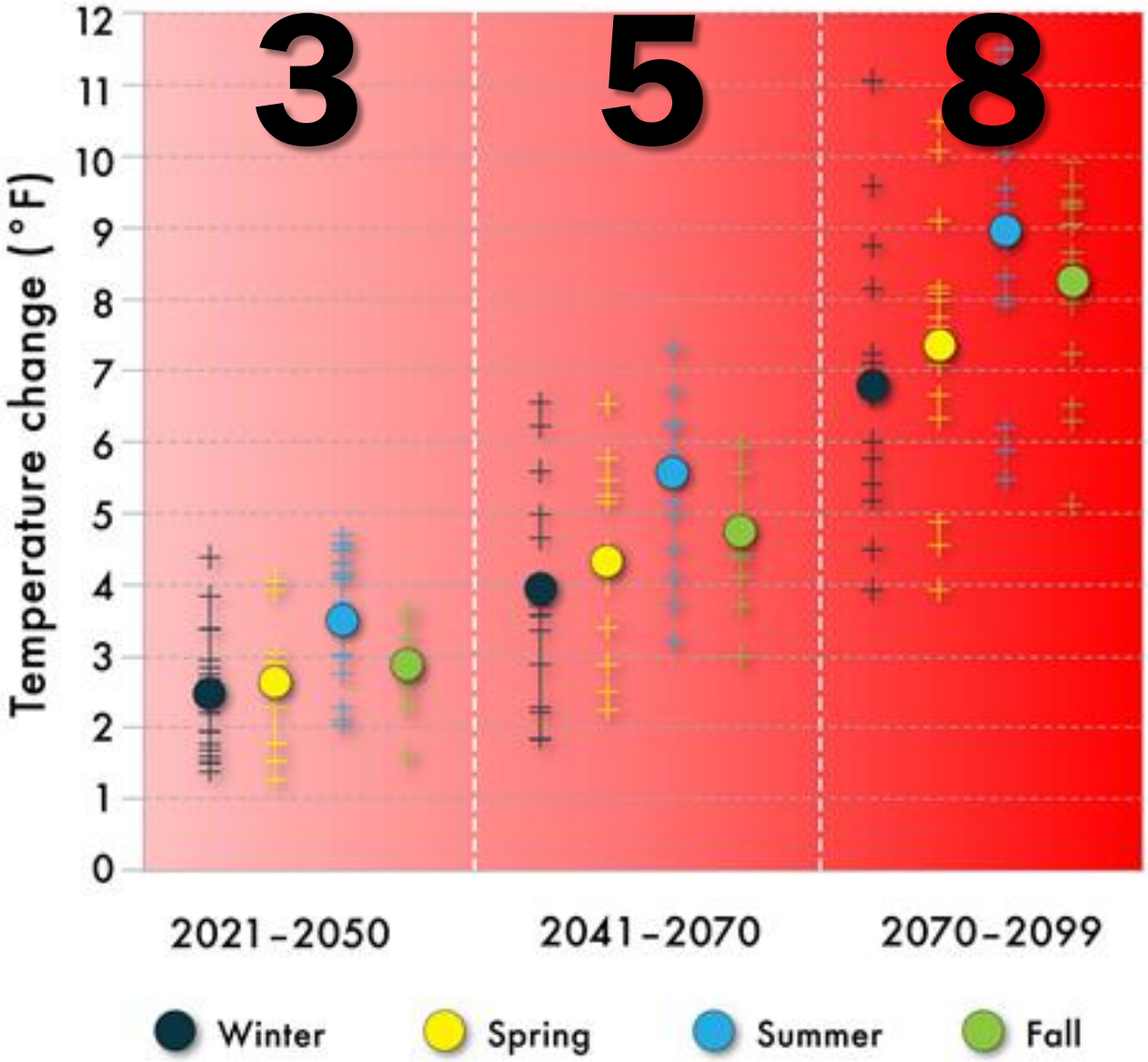
?

$$$



http://www.skepticalscience.com/iea-co2-emissions-update-2010.html

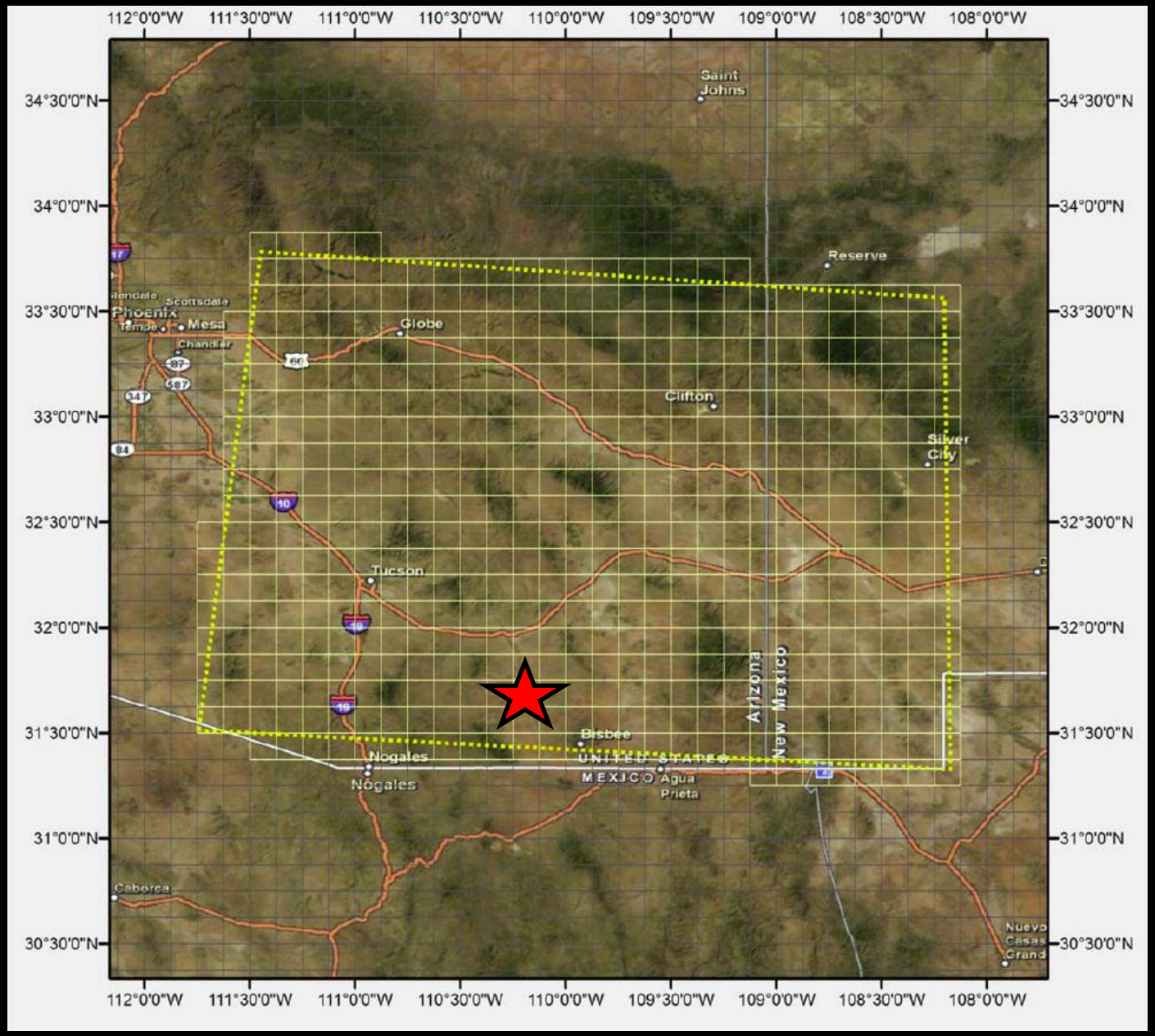
Average Annual Temperature



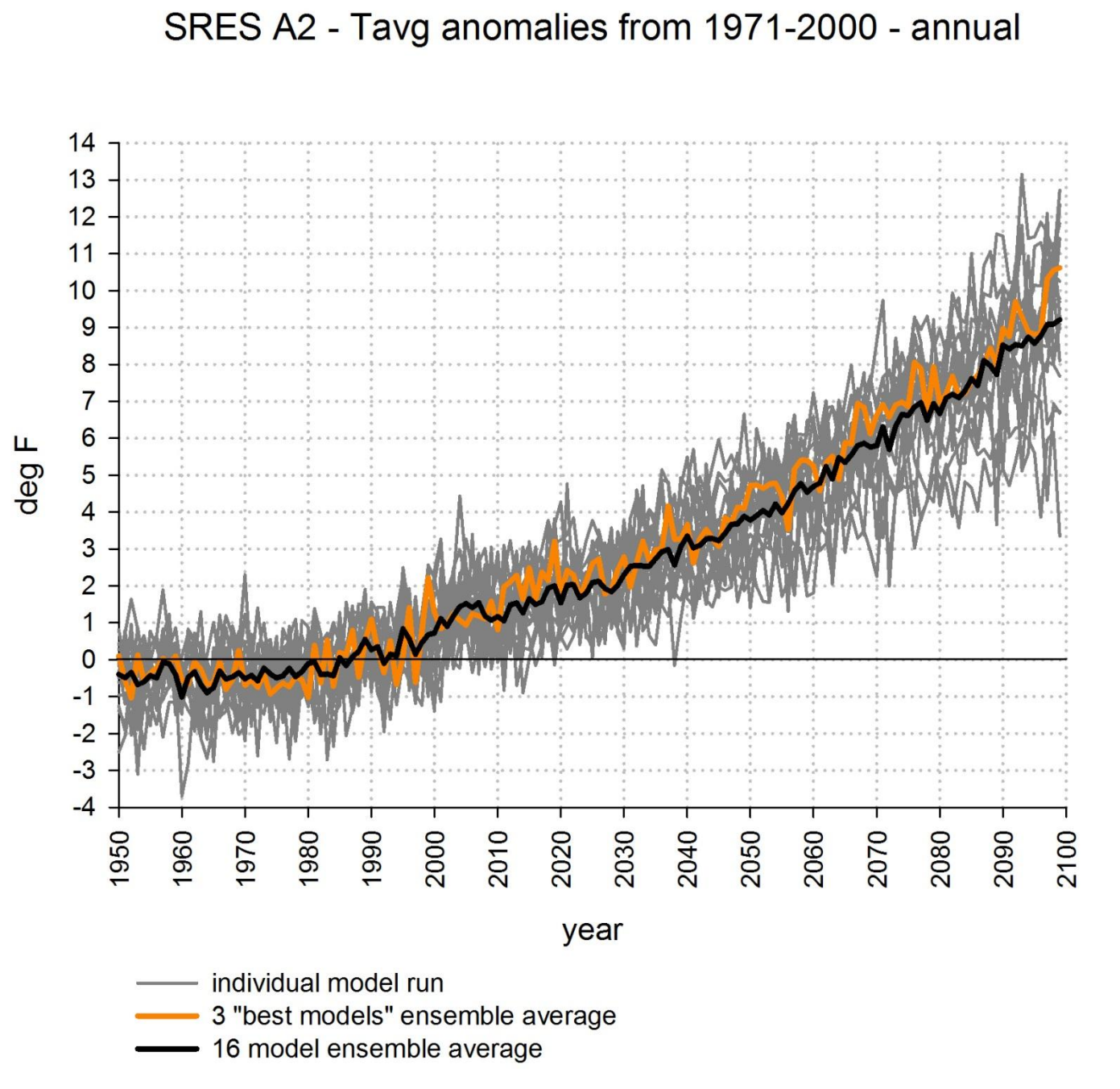
High emissions

A2

Average Annual Temperature
1981-2010
Data: NCDC



Jeremy Weiss, University of Arizona (unpublished)



Jeremy Weiss, University of Arizona (unpublished)

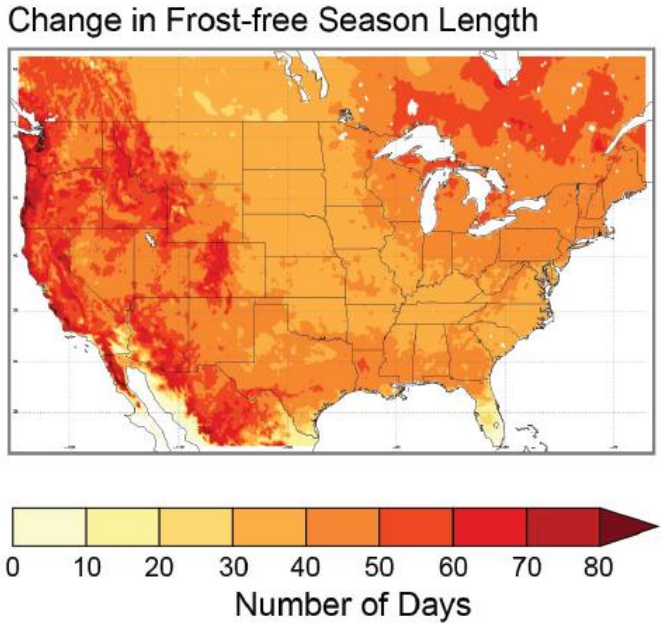
Federal Advisory Committee

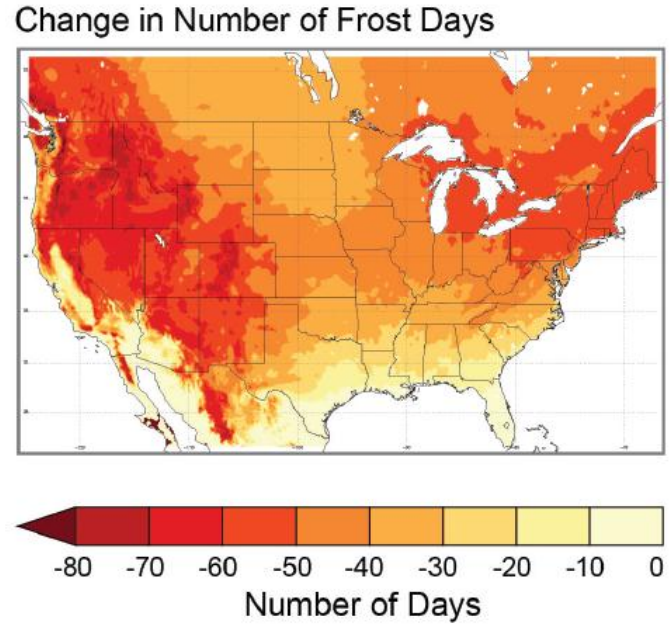
Draft Climate Assessment Report

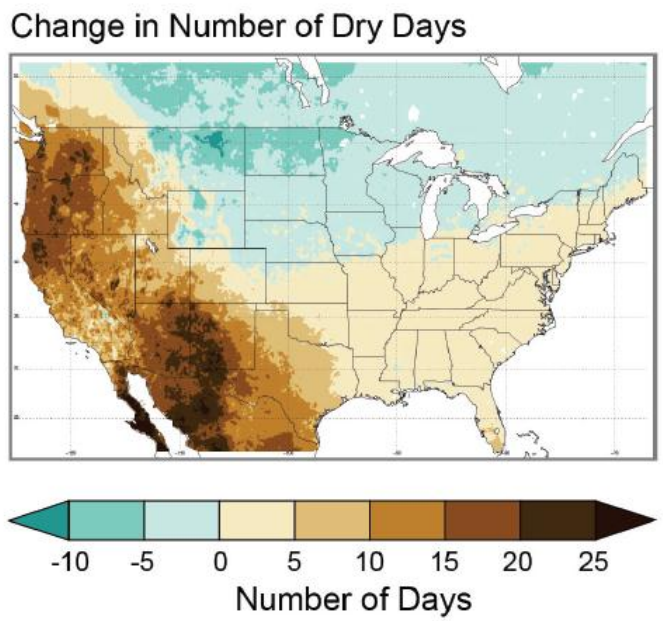
Now Available

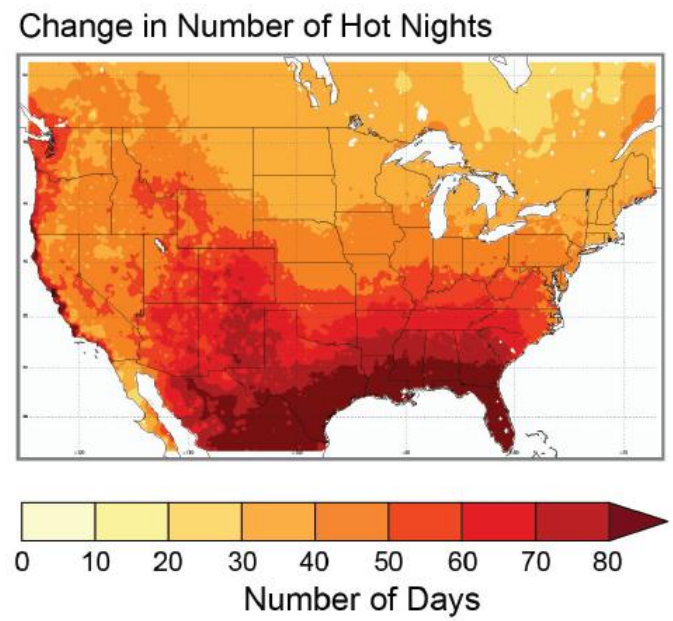
High emissions

A2

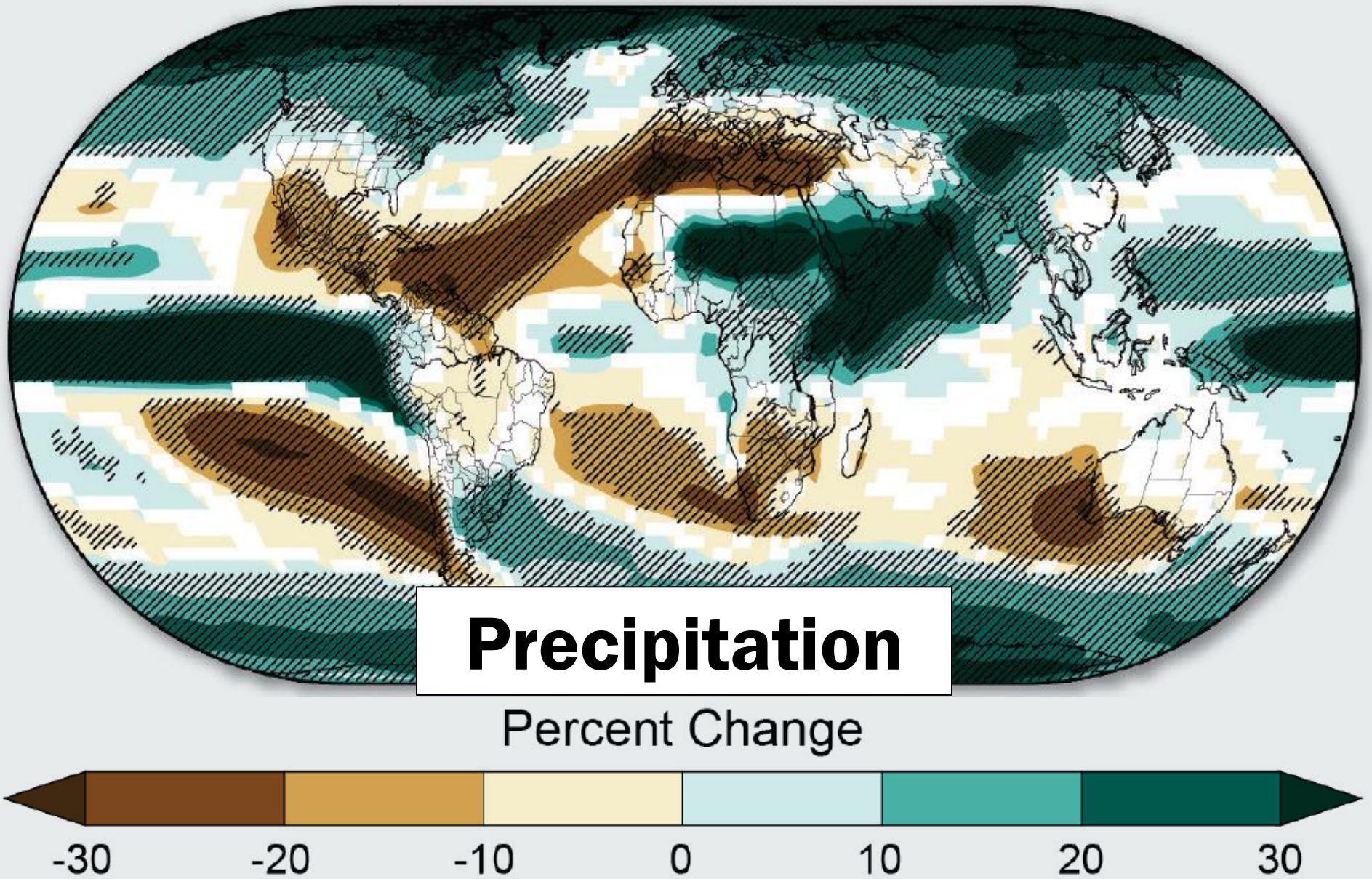


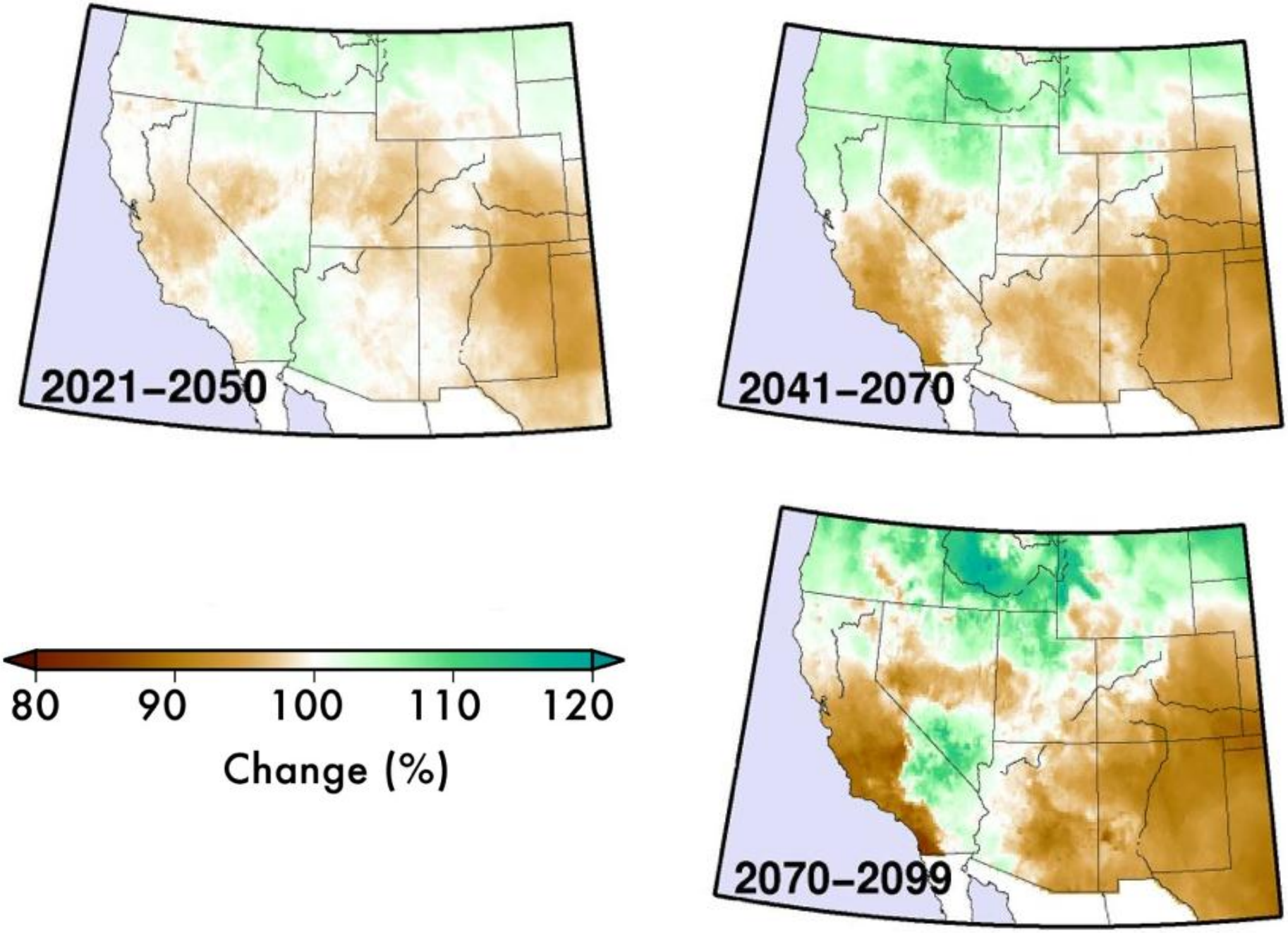


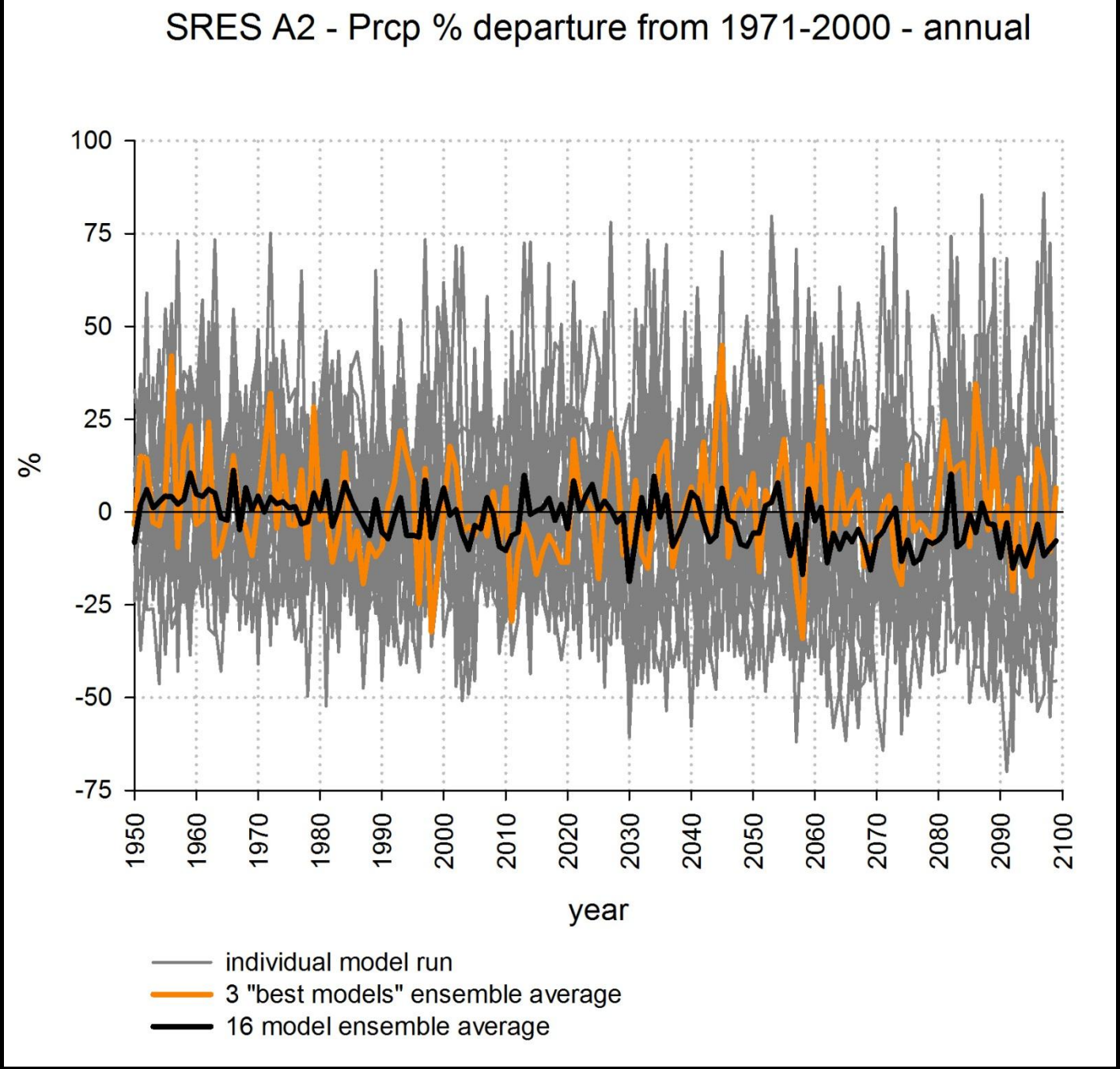




High Pathway (RCP 8.5)

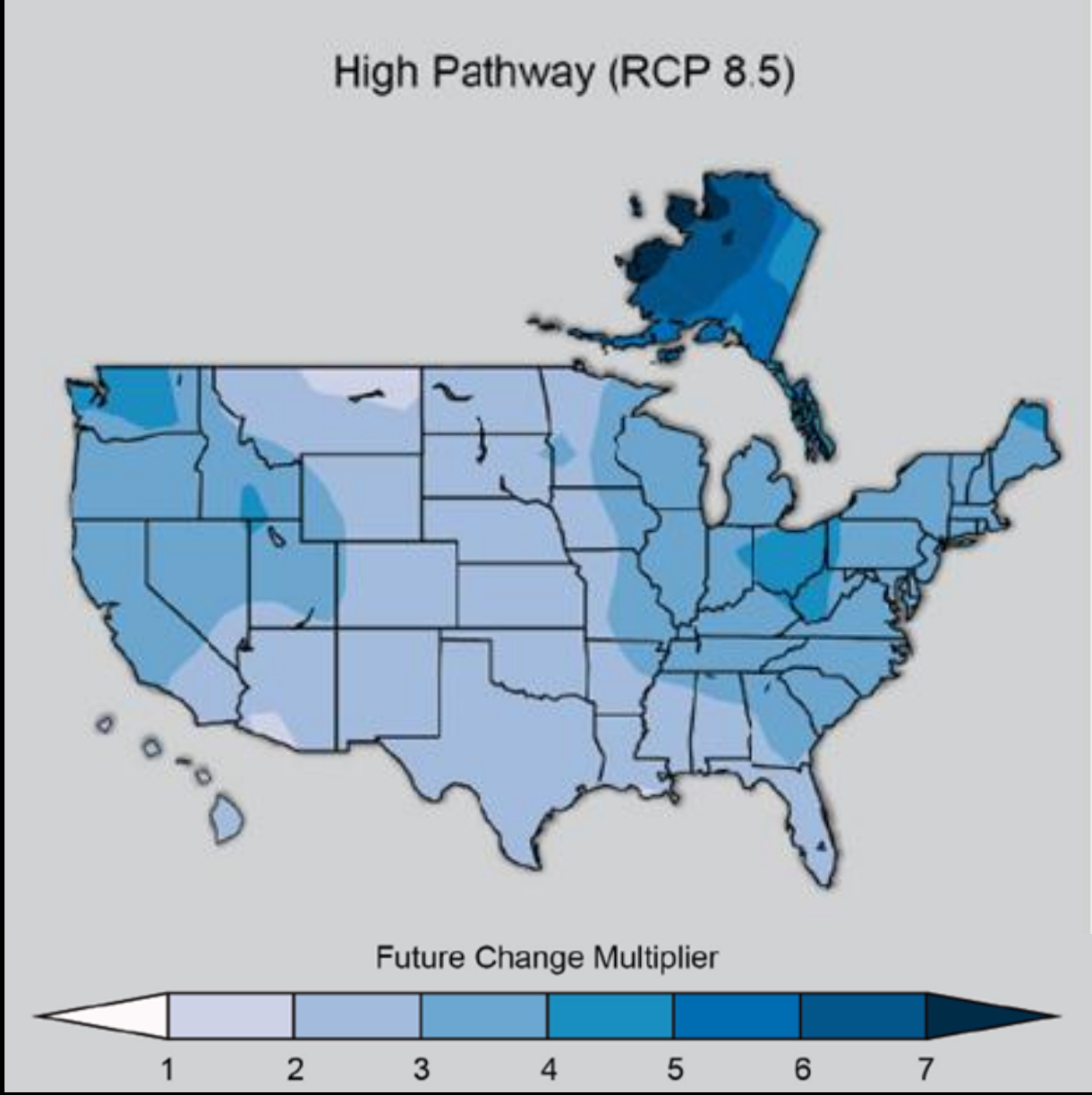



2021–2050
2041–2070
2070–2099
80
90
100
110
120
Change (%)



Jeremy Weiss, University of Arizona (unpublished)

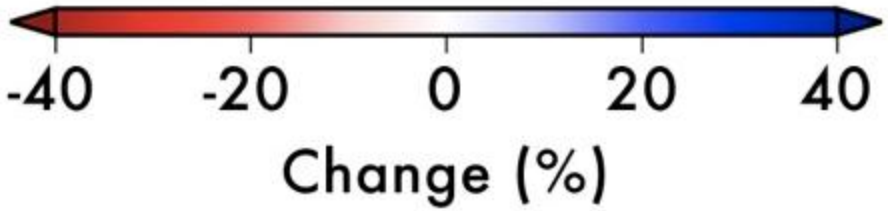
Photo: Daniel Griffin, University of Arizona


High Pathway (RCP 8.5)
Future Change Multiplier
1
2
3
4
5
6
7

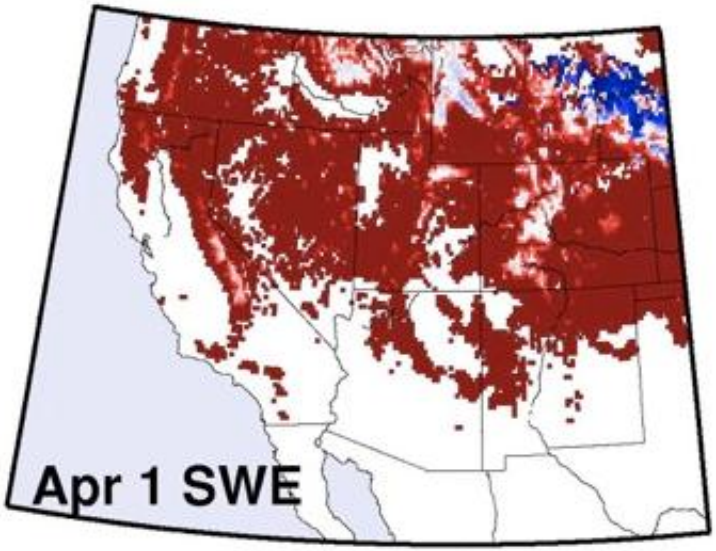
Impacts

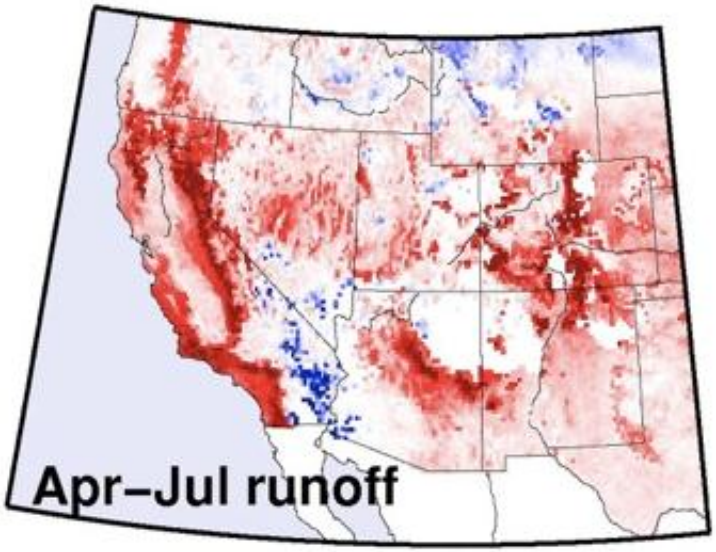
Less Snow
Less Runoff
Less Soil Moisture

A2 High Emissions Scenario



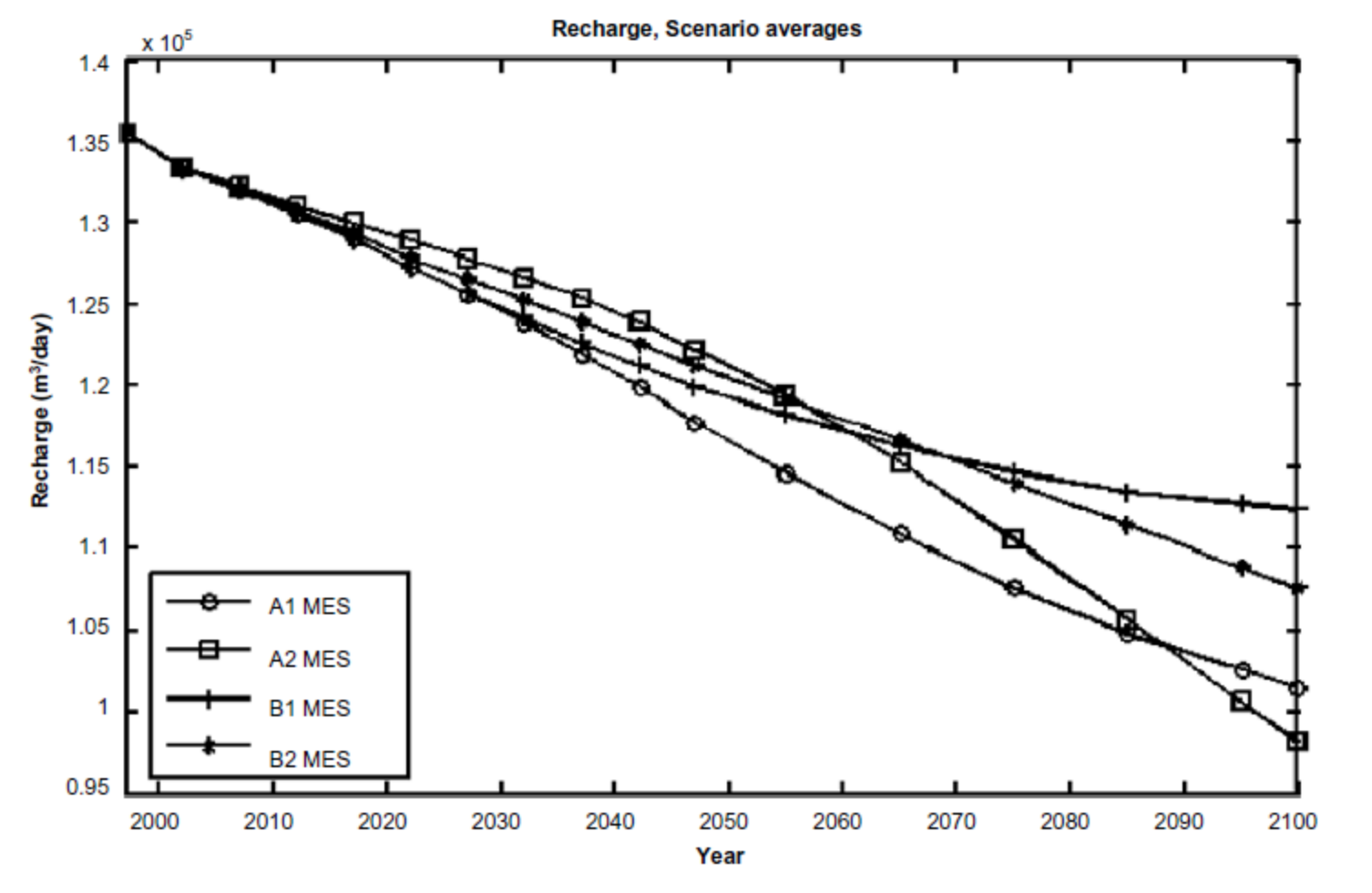
High emission scenario
2041–2070



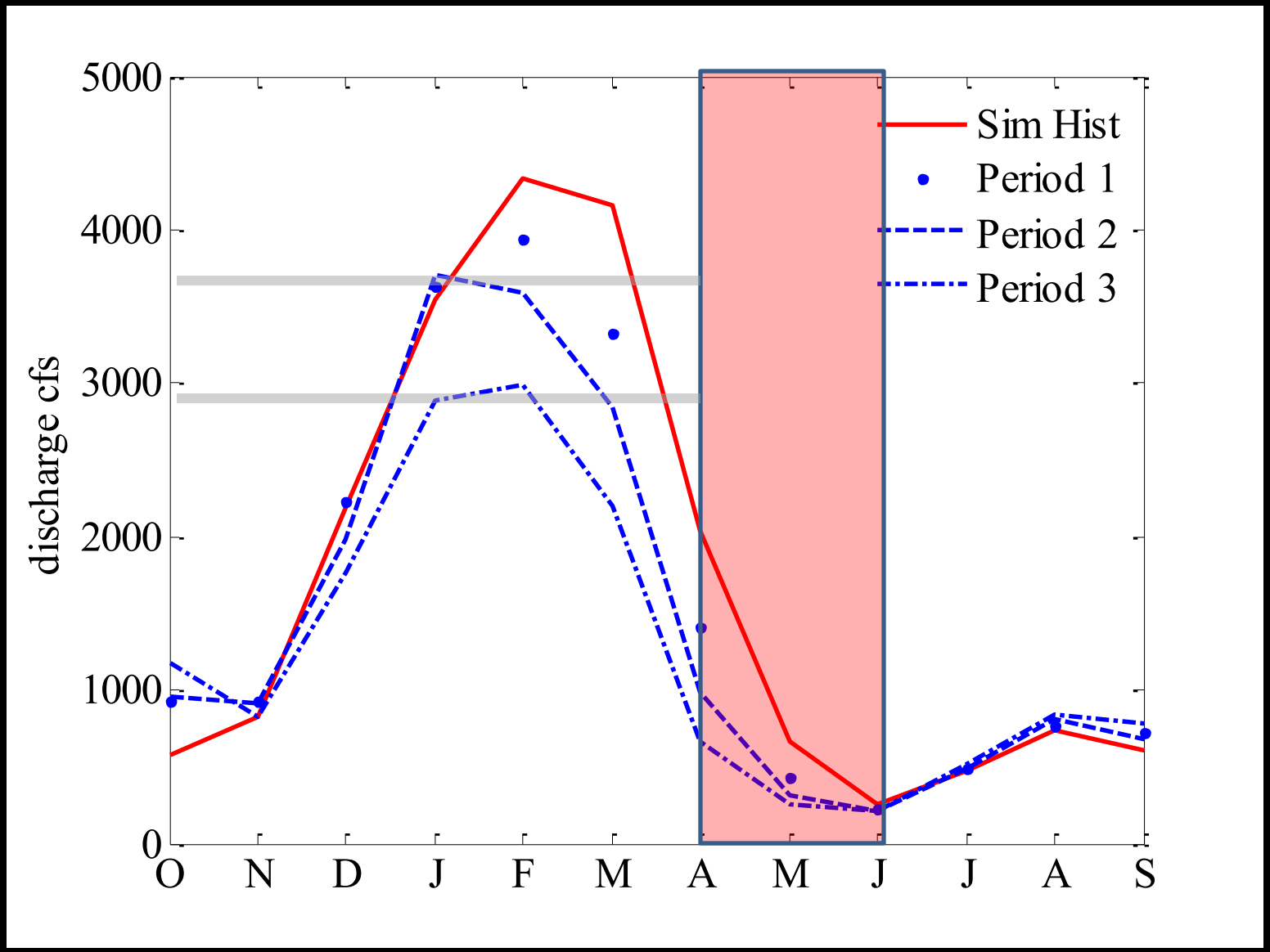


Lake Mead, Colorado River

San Pedro River Recharge



A. Serrat-Capdevila et al., 2007, *Journal of Hydrology*

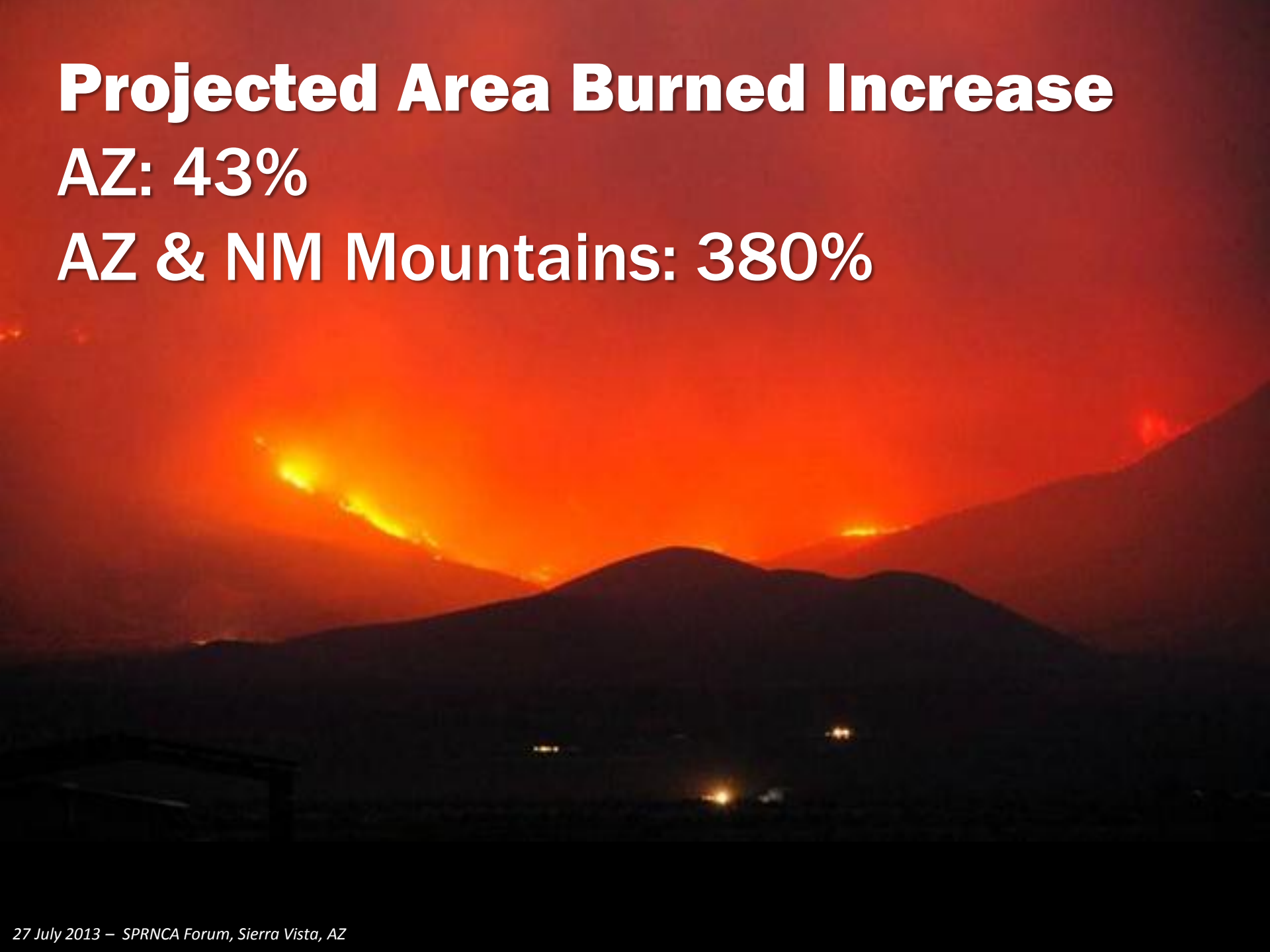


S. Rajagopal, F. Dominguez, H. Gupta – University of Arizona – (unpublished)

Projected Area Burned Increase

AZ: 43%

AZ & NM Mountains: 380%



$120 Billion

globalchange.gov

Federal Advisory Committee

Draft Climate Assessment Report

Now Available

Carbon Sequestration

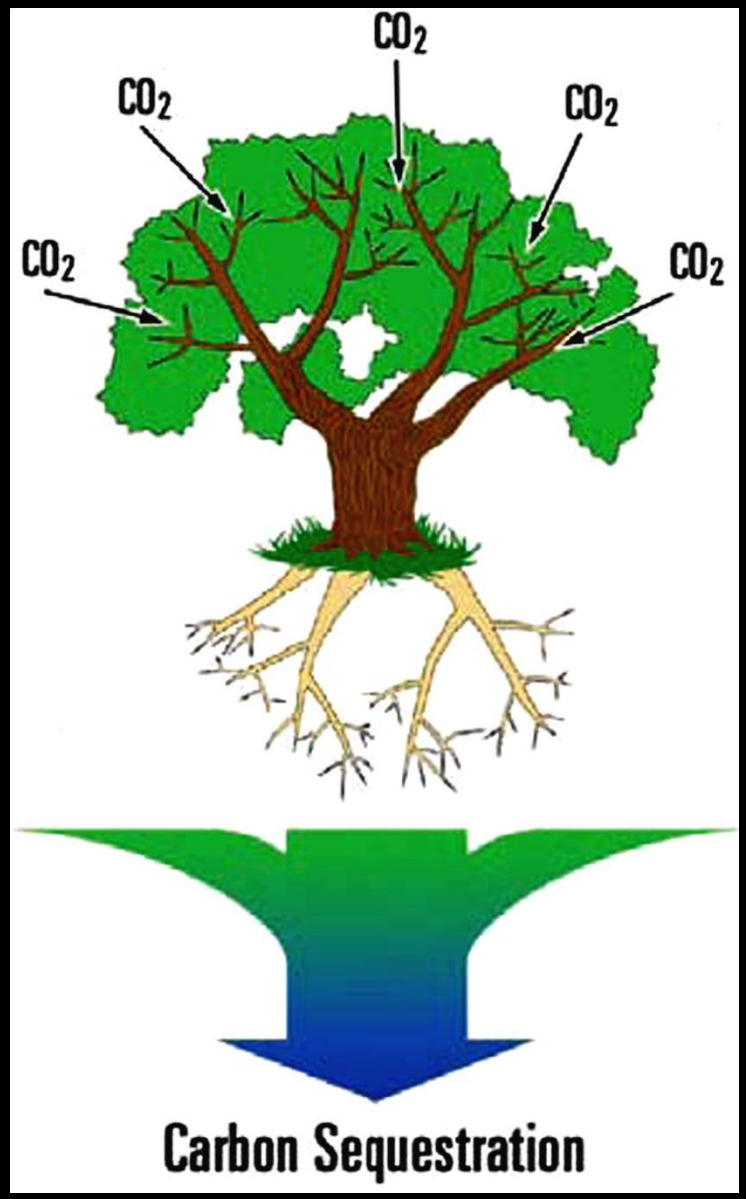


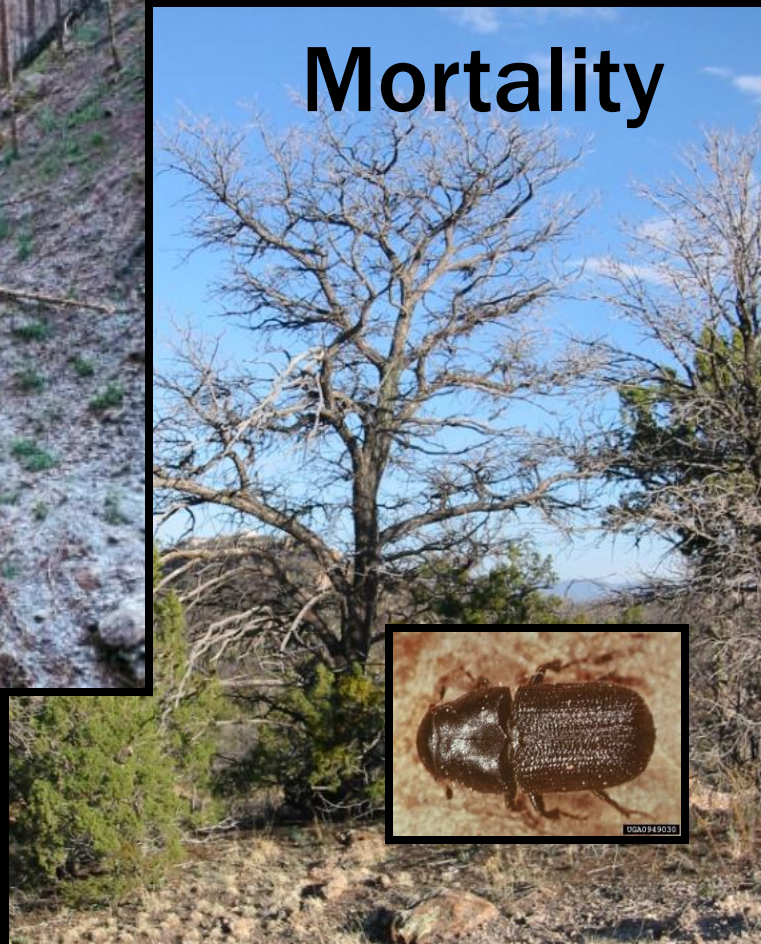
Photo courtesy of USDA Natural Resources Conservation Service

Intersecting Challenges

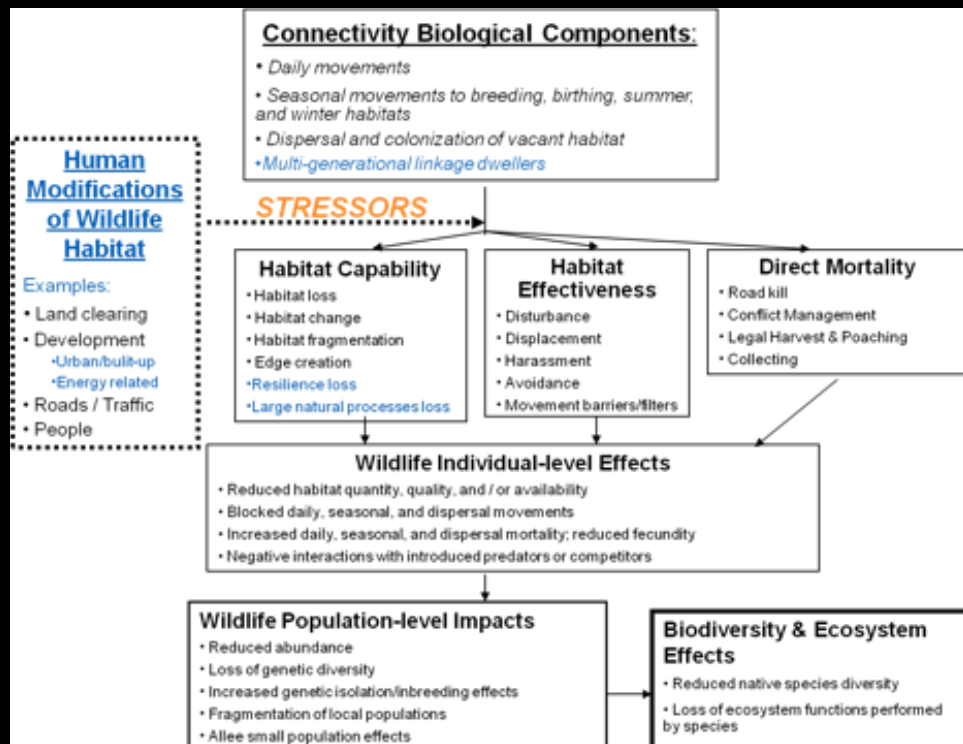
Erosion

Fire

Mortality



Strategies


Connectivity Biological Components:
• Daily movements
• Seasonal movements to breeding, birthing, summer, and winter habitats
• Dispersal and colonization of vacant habitat
• Multi-generational linkage dwellers
Human Modifications of Wildlife Habitat
Examples:
• Land clearing
• Development
•Urban/built-up
•Energy related
• Roads / Traffic
• People
STRESSORS
Habitat Capability
• Habitat loss
• Habitat change
• Habitat fragmentation
• Edge creation
•Resilience loss
•Large natural processes loss
Habitat Effectiveness
• Disturbance
• Displacement
• Harassment
• Avoidance
• Movement barriers/filters
Direct Mortality
• Road kill
• Conflict Management
• Legal Harvest & Poaching
• Collecting
Wildlife Individual-level Effects
• Reduced habitat quantity, quality, and / or availability
• Blocked daily, seasonal, and dispersal movements
• Increased daily, seasonal, and dispersal mortality; reduced fecundity
• Negative interactions with introduced predators or competitors
Wildlife Population-level Impacts
• Reduced abundance
• Loss of genetic diversity
• Increased genetic isolation/inbreeding effects
• Fragmentation of local populations
• Allee small population effects
Biodiversity & Ecosystem Effects
• Reduced native species diversity
• Loss of ecosystem functions performed by species

Supply and Demand Strategies

- New dams (CA, CO)
- Desalination (CA)
- Conservation (All states)
- Effluent treatment and reuse (All states)
- Groundwater banking (AZ)
- Short-term water transfers & purchases

Ecosystem Strategies

- Increased monitoring
- Invasive species removal
- Prescribed fire and thinning
- Riparian restoration, gabions
- Water rights purchases
- Maintain or improve connectivity

Ranching Strategies

Flexible approaches

- Increased precipitation variability = **big threat**
- Adjust herd size to fit forage productivity
  - Lease additional grazing land
- Stocker operations
- Variability means
  - Potential gains are greater in good years
  - Higher financial risks

Photo – http://campusguides.unr.edu/nvrangelands

SWCCAR

Southwest Climate Change Assessment Report

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Assessment of Climate Change in the Southwest U.S.

Assessment of Climate Change in the Southwest United States speaks broadly and clearly about climate and its effects on the people and landscapes of Arizona, California, Colorado, Nevada, New Mexico, Utah, the U.S.– Mexico border region, and the lands of Native Nations.

A landmark study in terms of its coverage and analysis (and a synthesis of knowledge from some 120 contributing experts), the book offers decision makers and stakeholders a substantial basis from which to make informed choices that will affect the well-being of the region's inhabitants in the decades to come.

Read More

www.swcarr.arizona.edu

CLIMAS
Climate Assessment for the Southwest

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