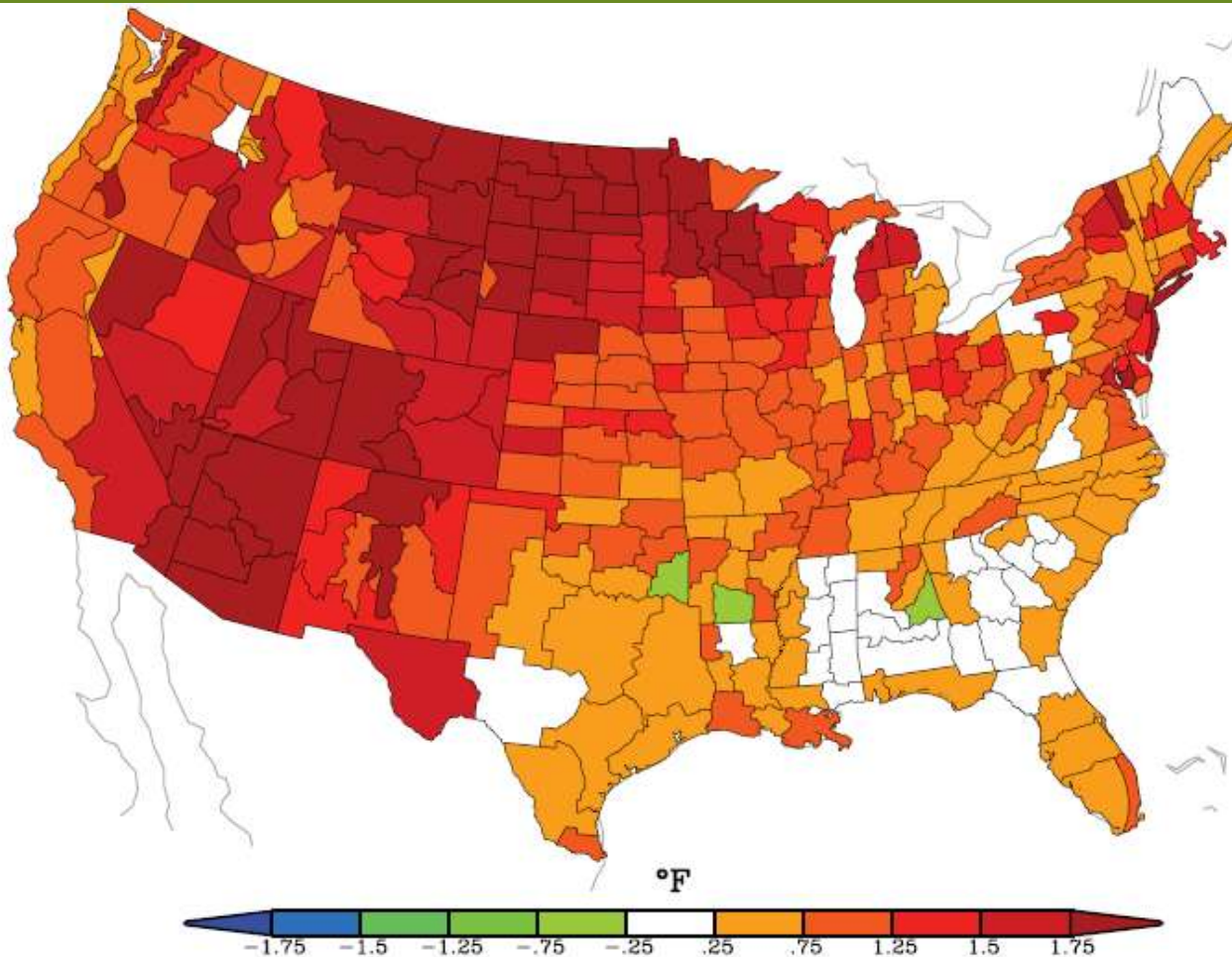


Southwest Climate Change Initiative: *Managing Changing Landscapes*

Marcos Robles
The Nature Conservancy



Southwest is a climate-change hotspot in United States



More Rapid Warming in the West

2003 to 2007 5-Year Average Temperatures Compared to 20th Century Averages

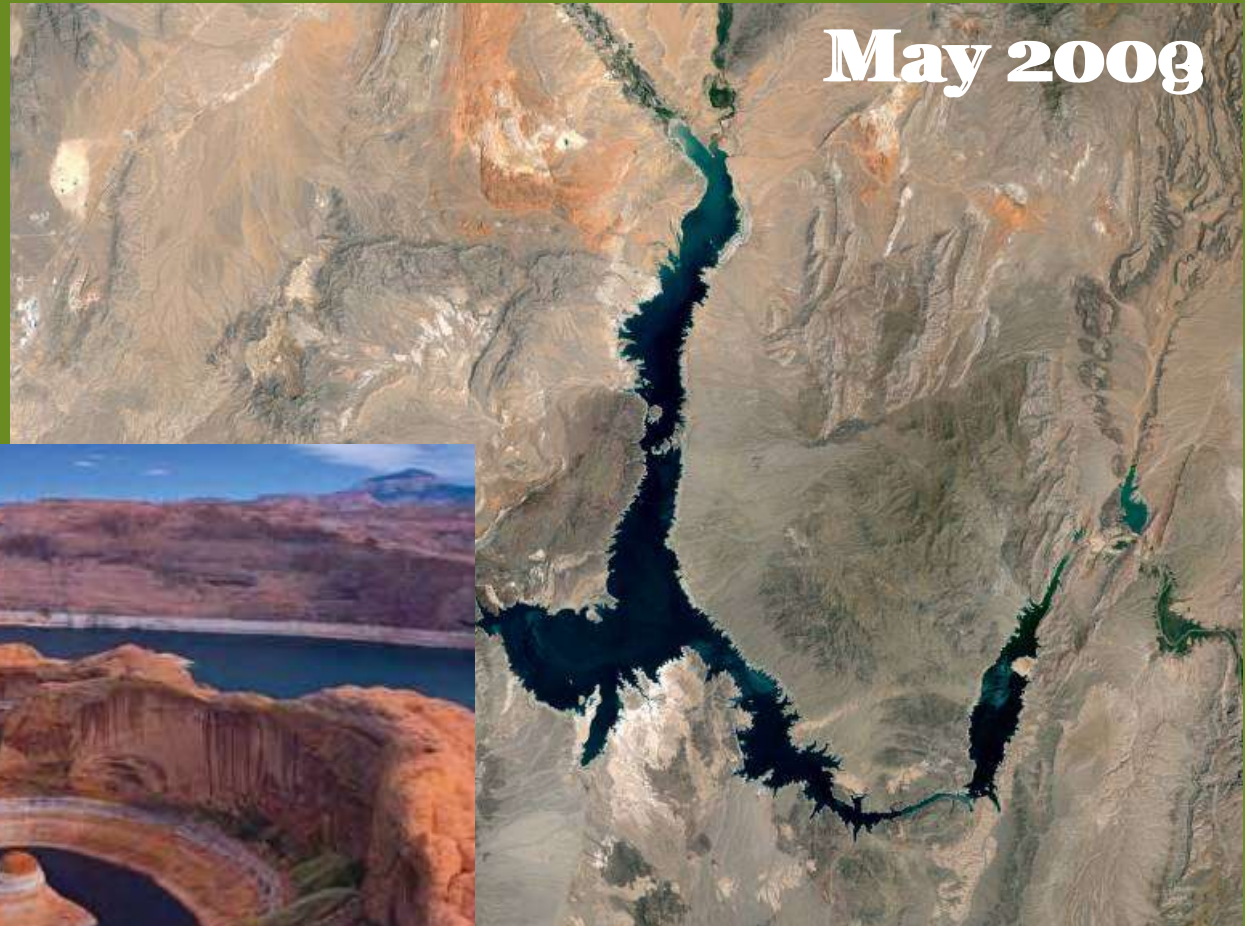
Planet	+1.0°F
Western United States	+1.7°F
Colorado River Basin	+2.2°F
Arizona	+2.2°F
California	+1.1°F
Colorado	+1.9°F
Idaho	+1.8°F
Montana	+2.1°F
Nevada	+1.7°F
New Mexico	+1.3°F
Oregon	+1.4°F
Utah	+2.1°F
Washington	+1.4°F
Wyoming	+2.0°F

Impacts on our Forests



Climate change is already impacting Southwest

Impacts on our water supply

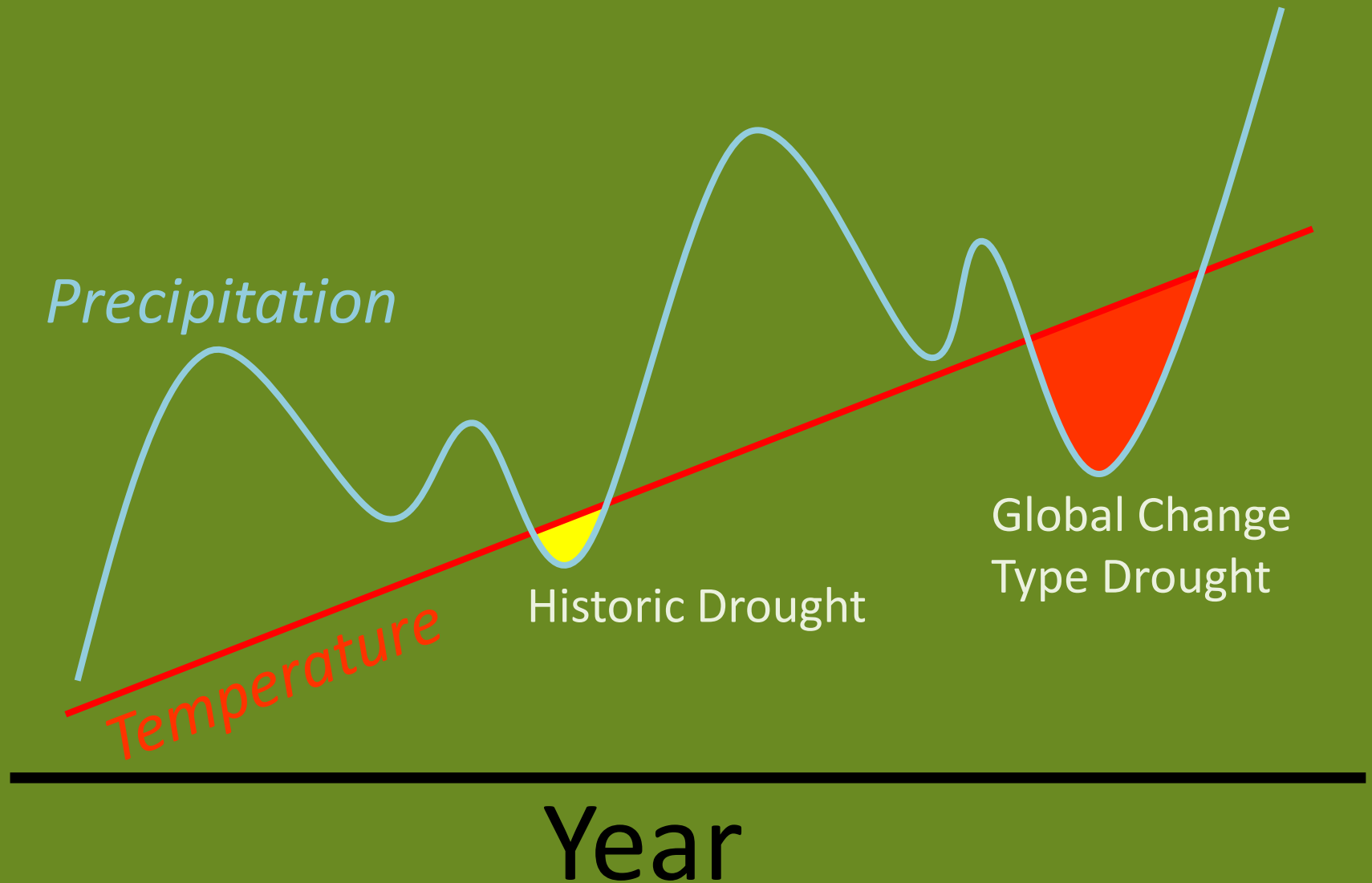


© NASA 2003

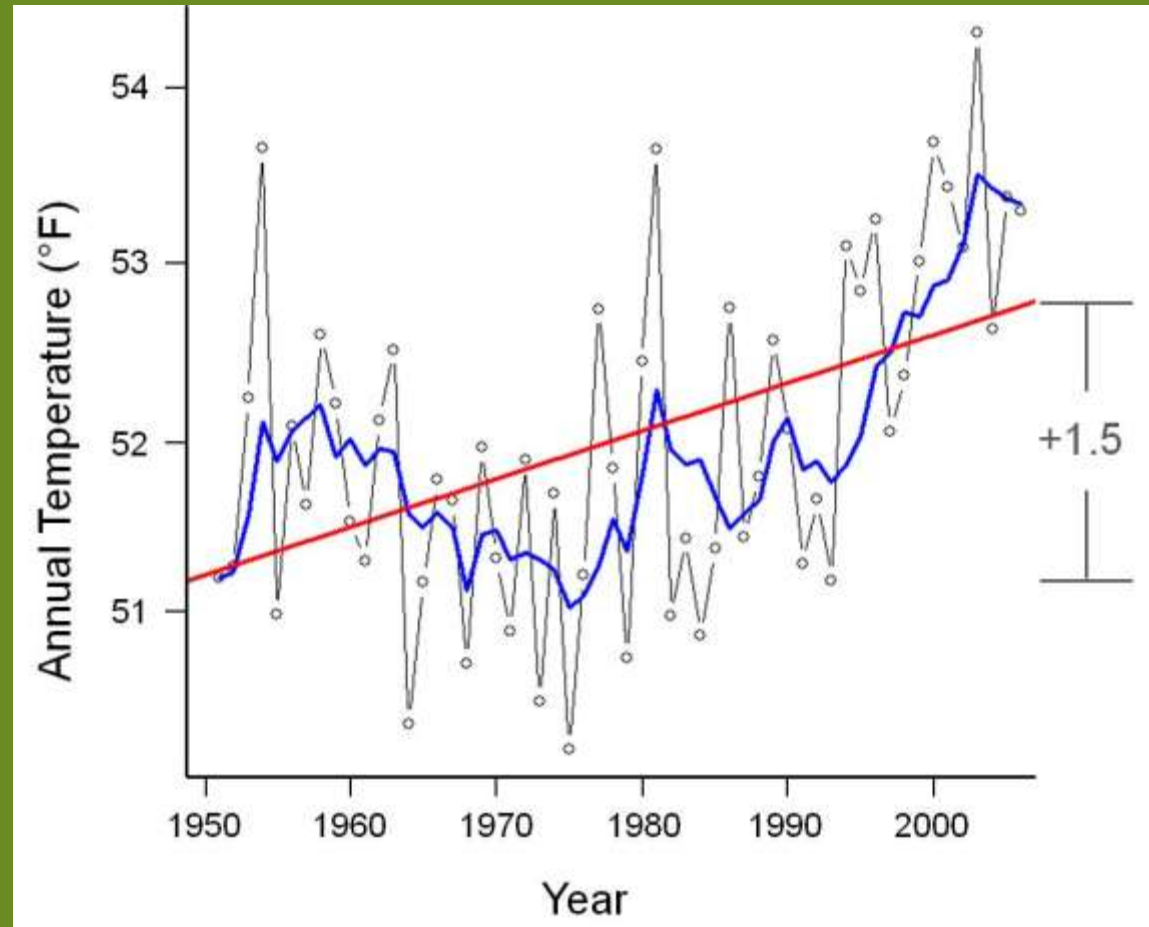
© NRDC 2008

Climate change is already impacting Southwest

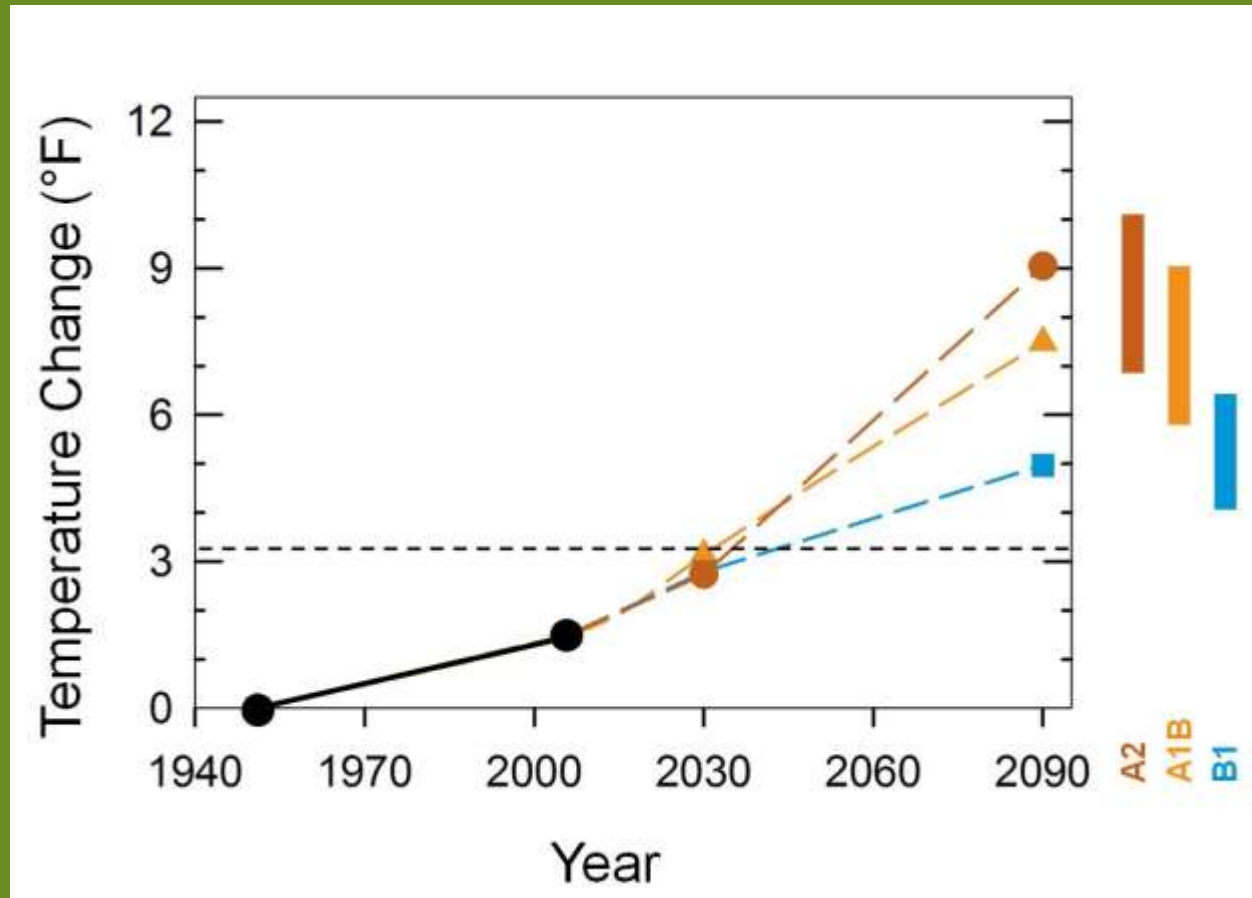
Climate Variability + Climate Change



Recent Temperature Change in the Southwest



Future Temperature Change in the Southwest



Southwest Climate Change Initiative

I. Regional climate change assessment

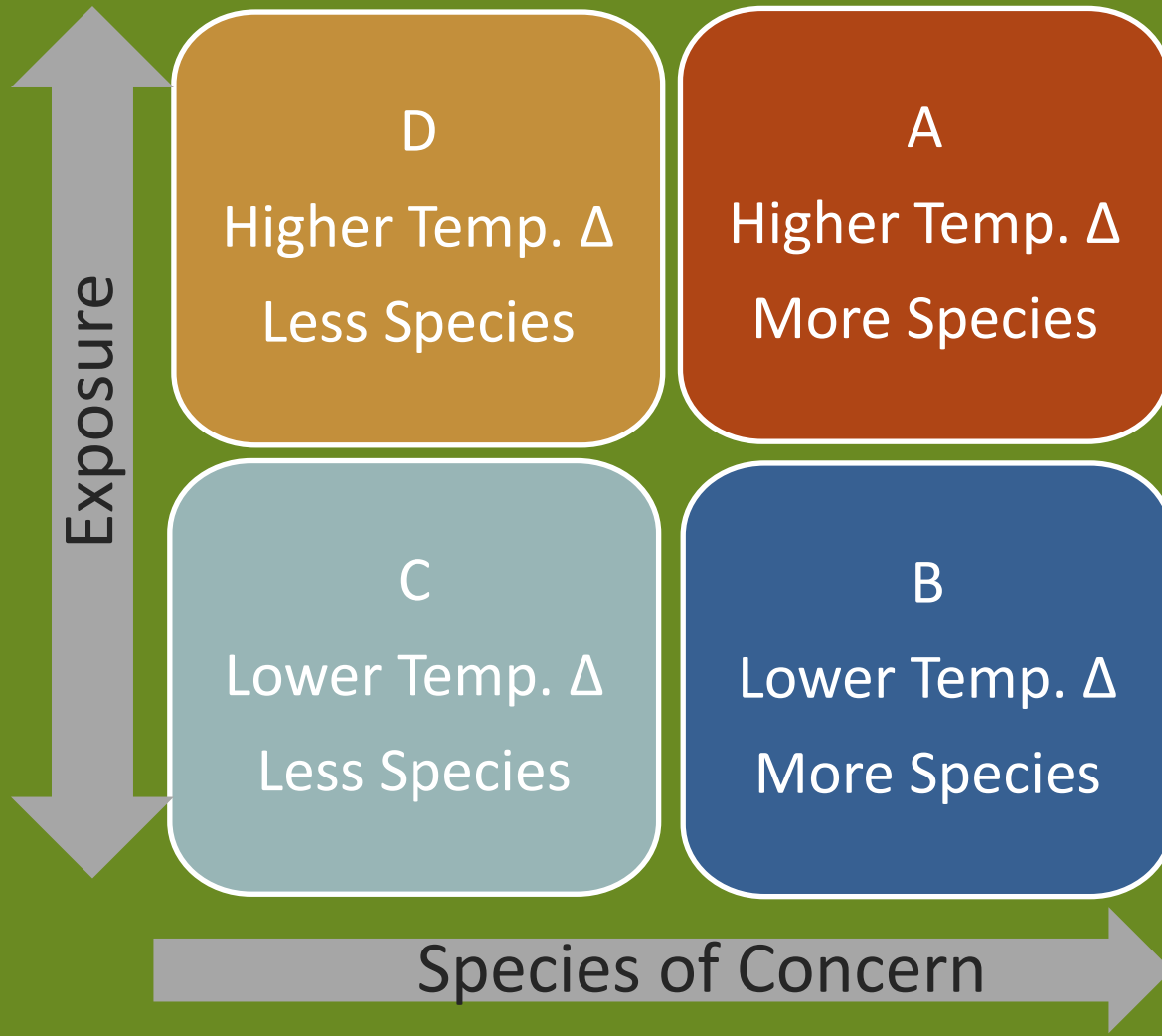
Analyze recent climate change impacts on habitats, watersheds & species of concern

II. Landscape adaptation planning

Case study in each state

Assessment Methods

- Evaluate Climate Change Exposure
Temperature Change (1951-2006)
- Important Natural “Places”
Habitats & Watersheds
- Place-based Sensitivity
Species of Conservation Concern



Habitats using NatureServe data

- **MacroGroups**

- ✓ Groups of communities with similar characteristics
- ✓ Broader than Ecological Systems; Finer than Divisions

- **Endemic Species**

- ✓ 90% occurrences within 1 ecoregion
- ✓ Number of Species by macrogroup

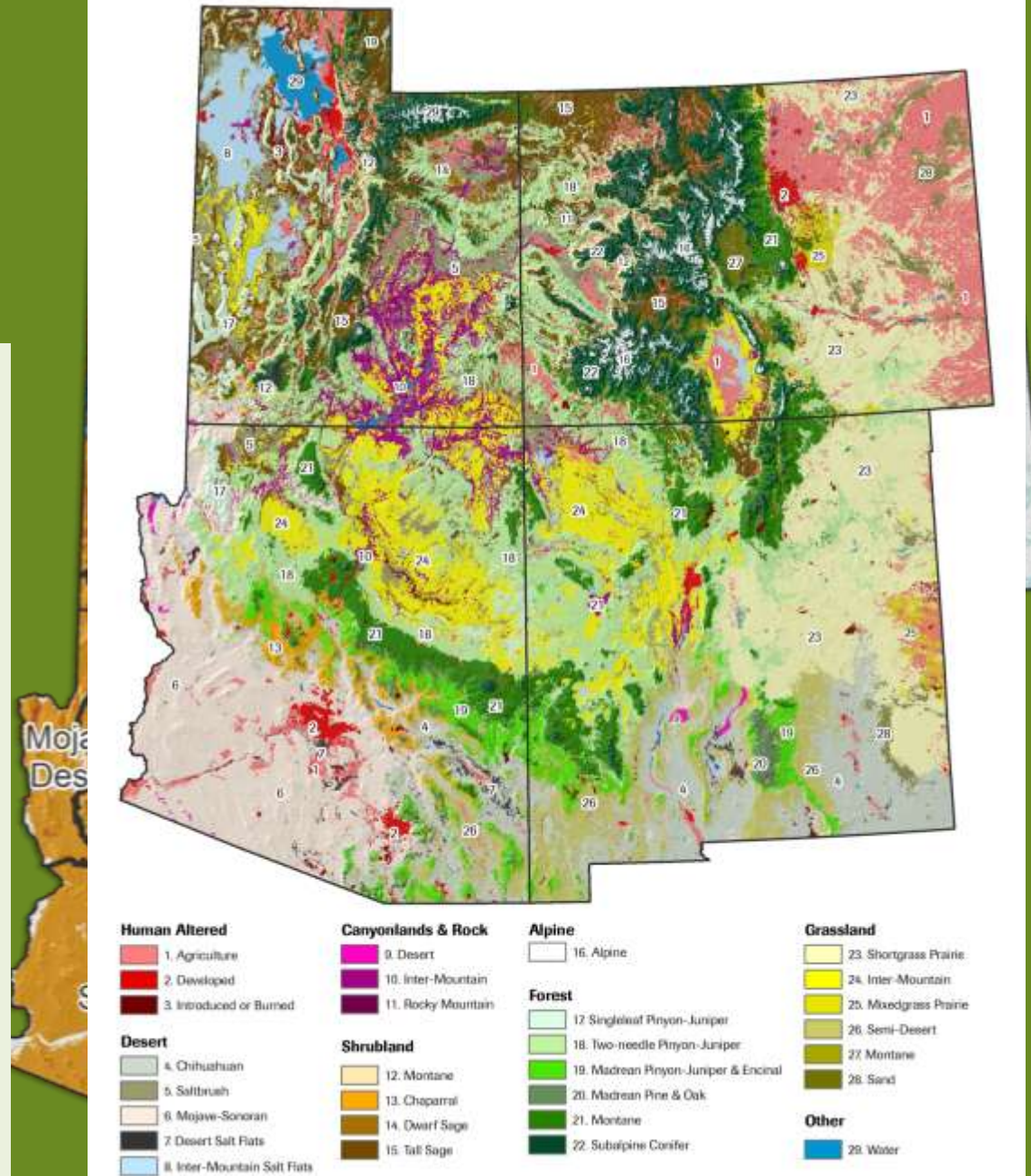
Habitats

Higher Exposure—High Endemism

- Alpine (+2.0 °F)
- Madrean Pine & Oak (+1.9 °F)
- Madrean Pinyon-Juniper (+1.6 °F)
- Inter-Mountain Cliff & Rock (+1.9 °F)
- Subalpine Forest (+1.6 °F)
- Montane Shrubland (+1.6 °F)
- Tall Sage Shrubland (+1.6 °F)
- Desert Cliff & Rock (+2.0 °F)

Lower Exposure—Lower Endemism

- Mixedgrass Prairie (+0.8 °F)
- Semi-desert Grassland (+1.3 °F)
- Chihuahuan Desert (+1.1 °F)
- Intermountain Salt Flats (+0.8 °F)
- Shortgrass Prairie (+0.8 °F)
- Sand Grassland (+0.9 °F)



Watersheds using NatureServe data

- **Watersheds**

 - USGS HUC 6

 - ~ 50 in Southwest

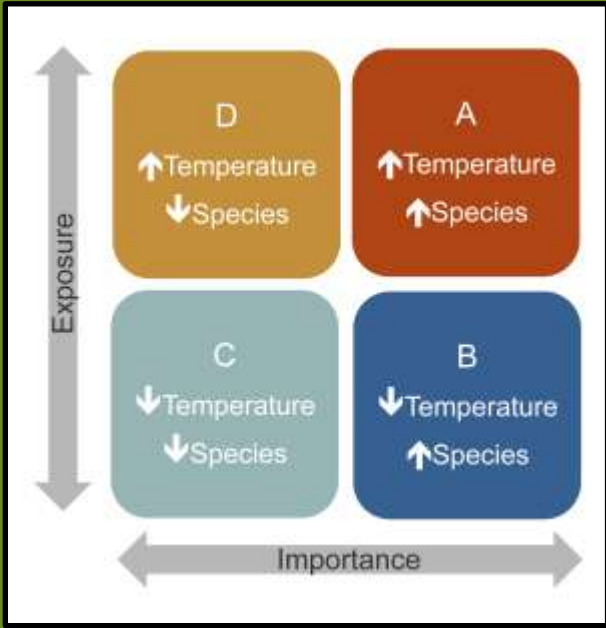
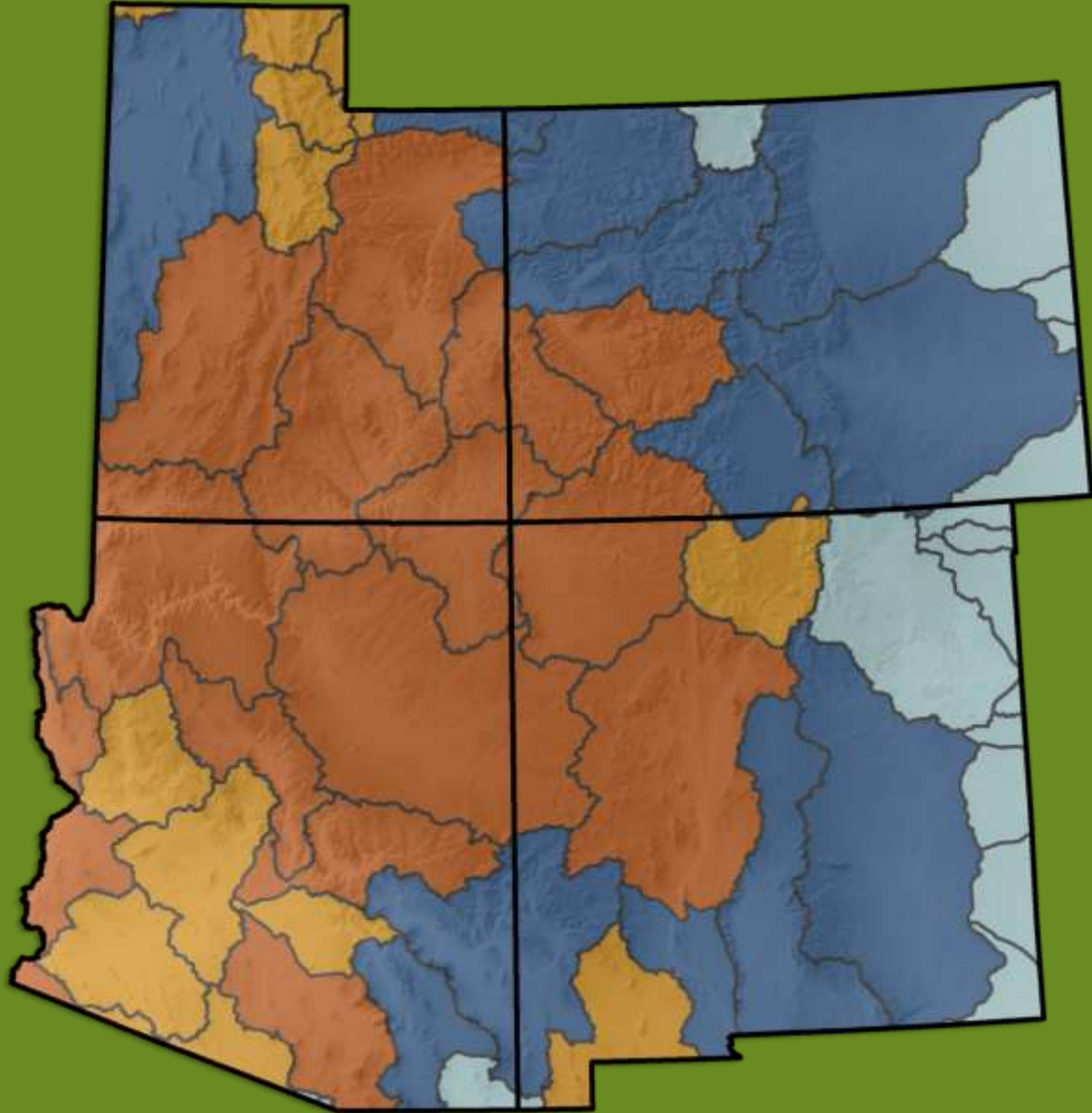
 - Examples: Verde (AZ) Great Salt Lake (UT)

- **Species of Conservation Concern**

 - G1/T1-G3/T3, USESA

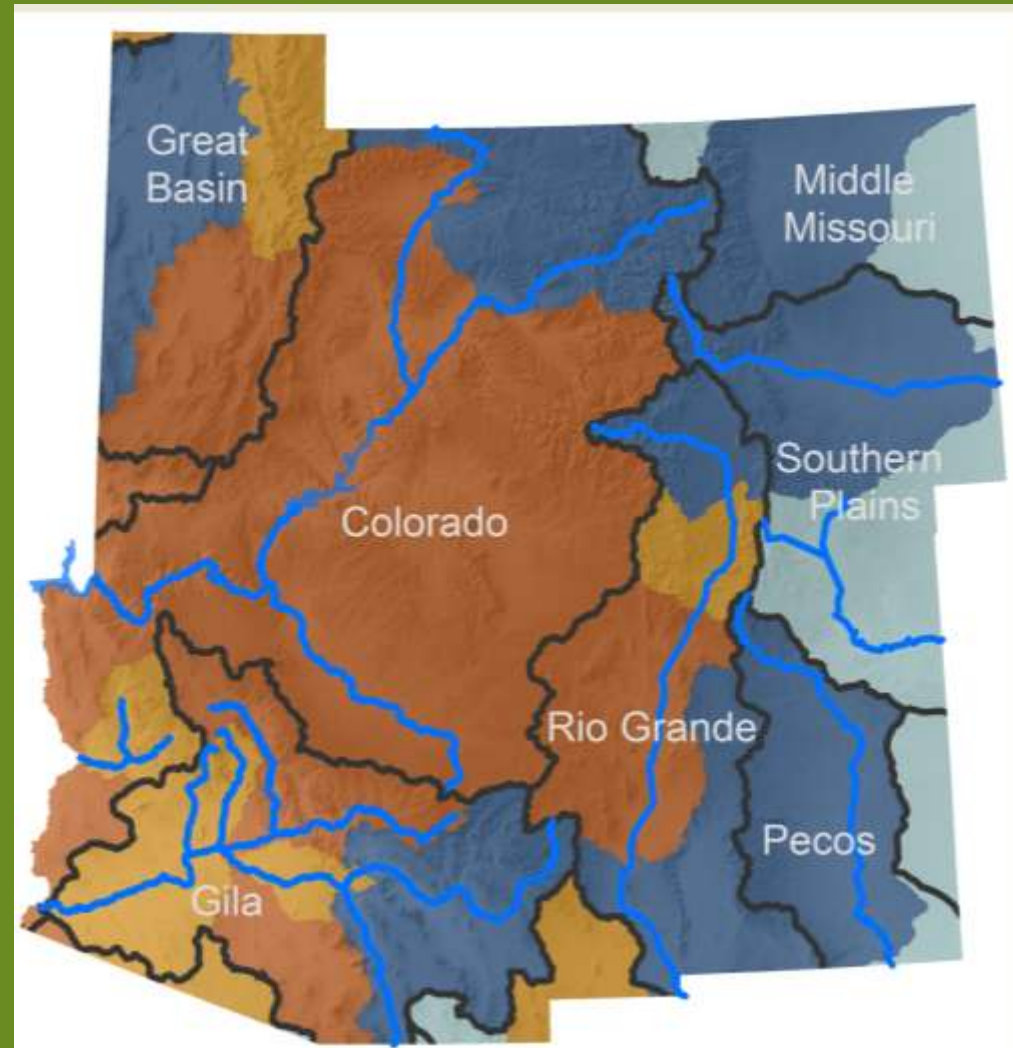
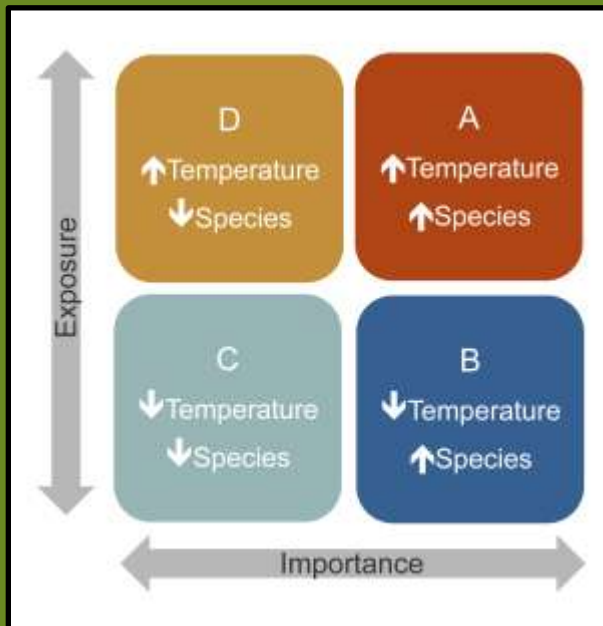
 - Number of Species by watershed

Watersheds



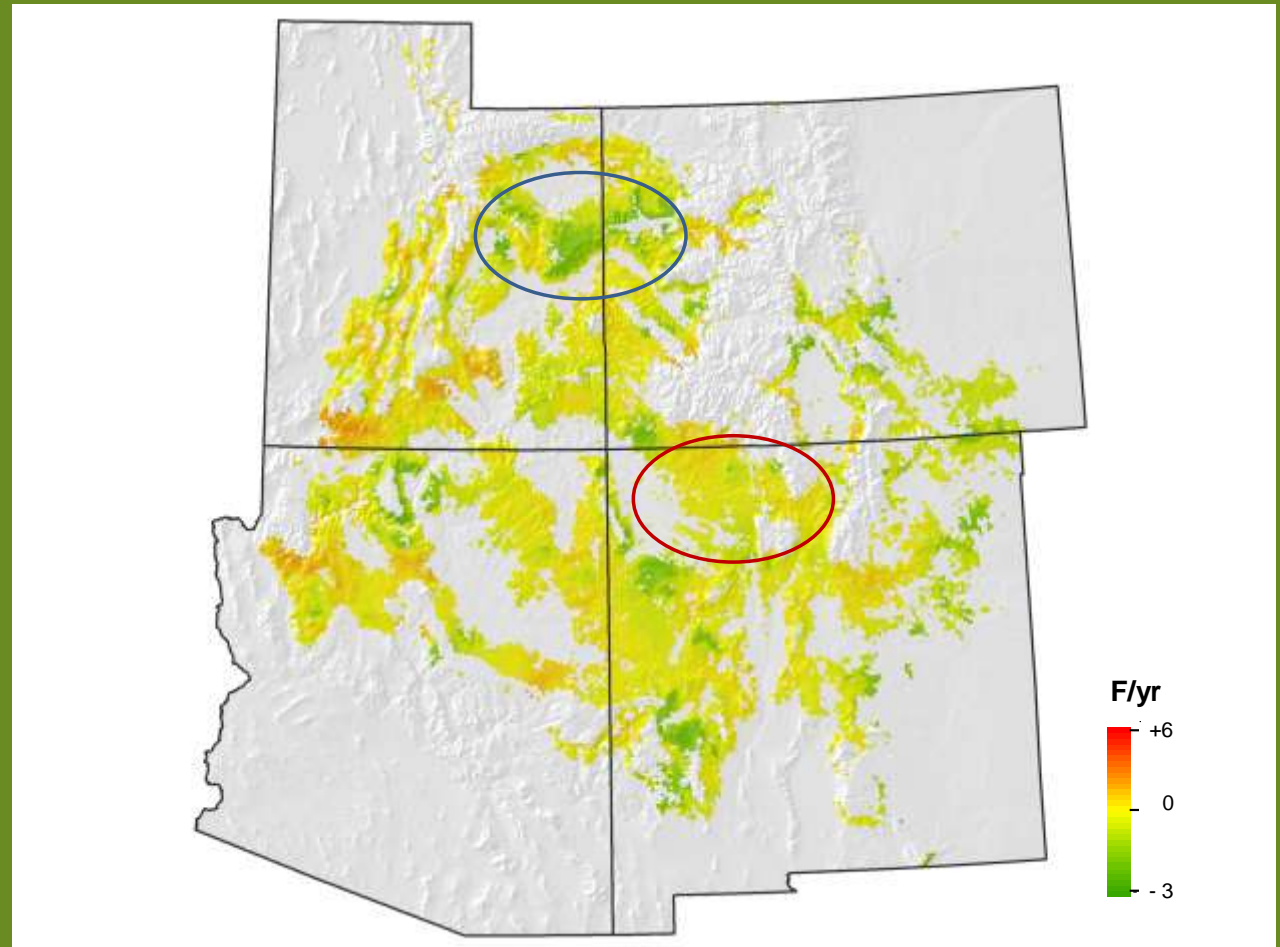
Watersheds

Shown by Ecoregion



Application: *Regional Coordination*

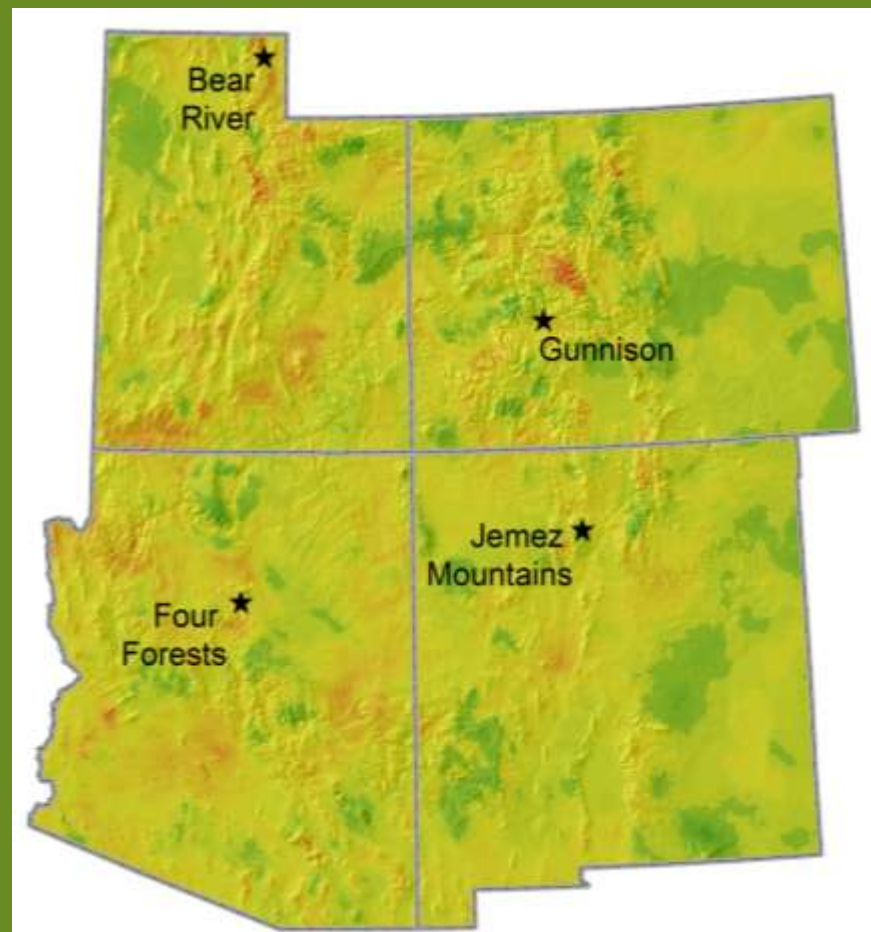
Recent
temperature
change across
pinyon-juniper
range in the
Southwest



Application: *Adaptation Planning*

4 Case-Study Landscapes

- 2-Day Workshops
- Resource Managers & Scientists
- Adaptation planning framework (NCEAS)
- Select 2-3 Targets (species, processes)
- Identify practical adaptation actions for 2 climate change scenarios



Summary

- Climate Change already impacting SW resources. Warming *amplifies* drought.
- Most habitats & watersheds have experienced warming; some have warmed *more rapidly* (2x) than others
- Results highlight need for *regional coordination*
- Results may highlight places to look for unnoticed climate change impacts

Limitations, BUT...

- Missing those *short-term events*, warming + drought, that lead to ecological & hydrological disturbance
- Future impacts will almost certainly occur, but we are *uncertain* about where and when
- *Uncertain* about thresholds, sensitivity

SWCCI Team

For more information : www.nmconservation.org and www.climatewizard.org

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Joel Tuhy & Staff (TNC-UT)

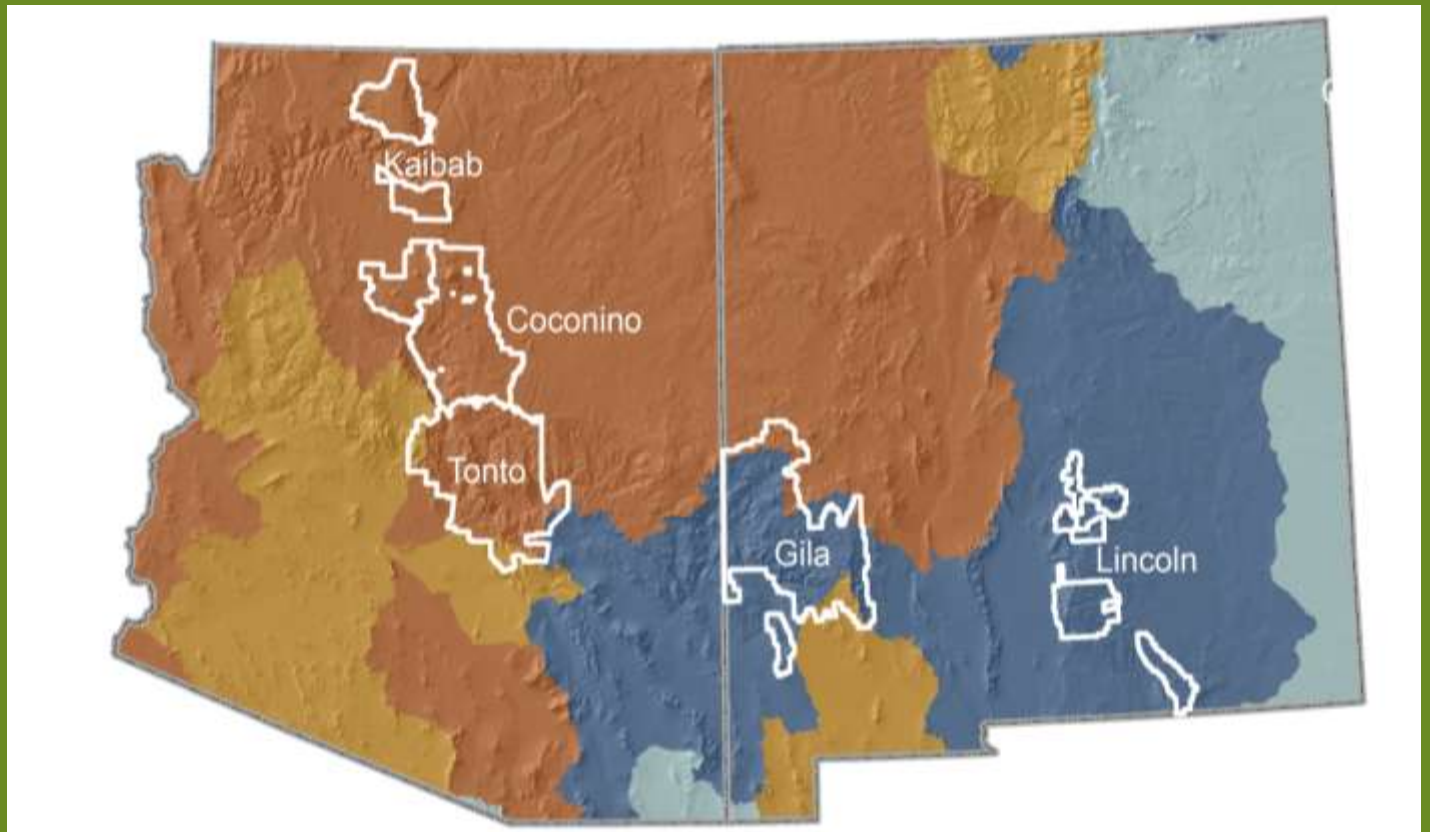
Jack Triepke (USFS-R3)

Deborah Finch, Karen Bagne (USFS-RMRS)



Questions?

Application: *Prioritization*

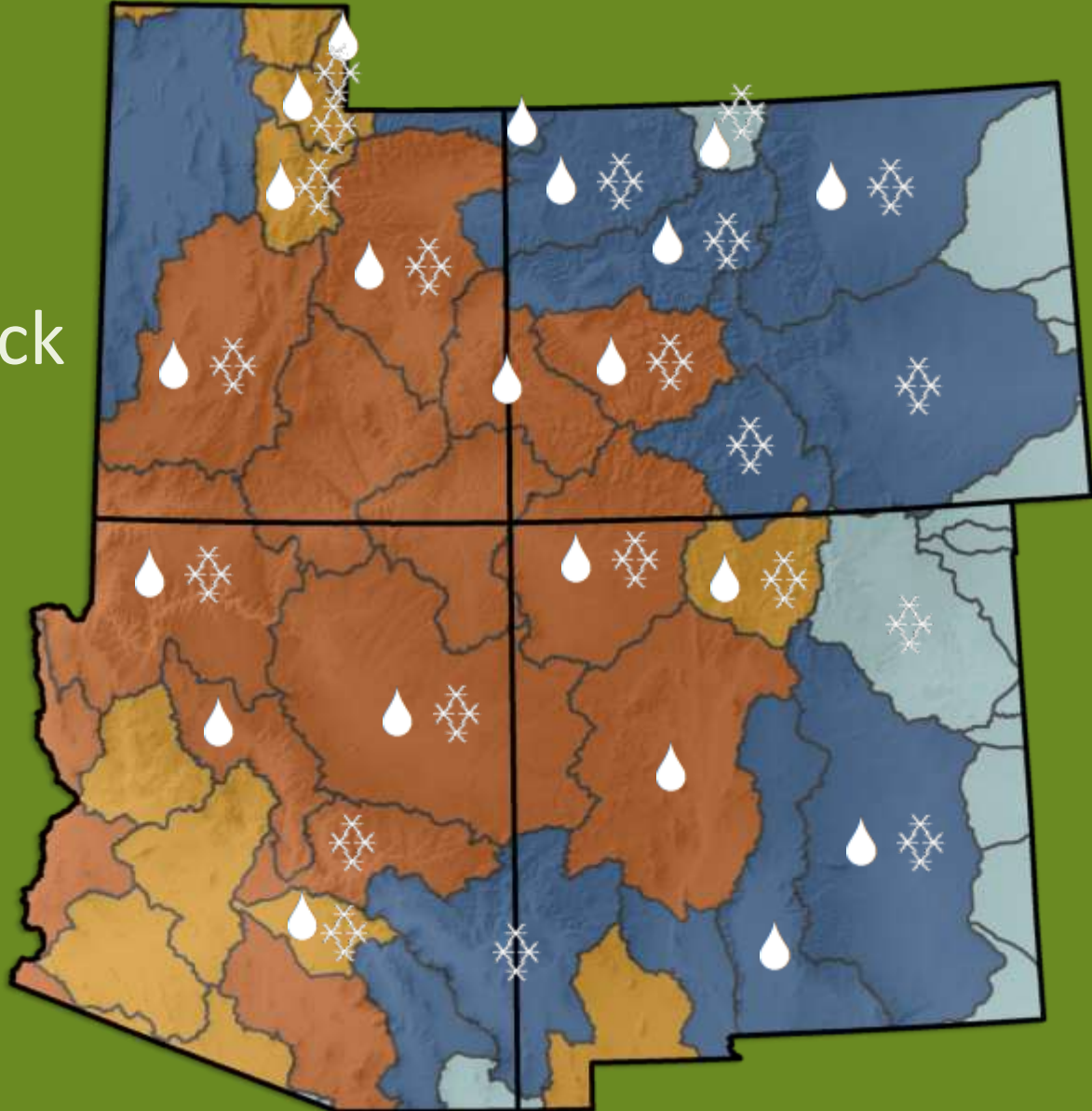
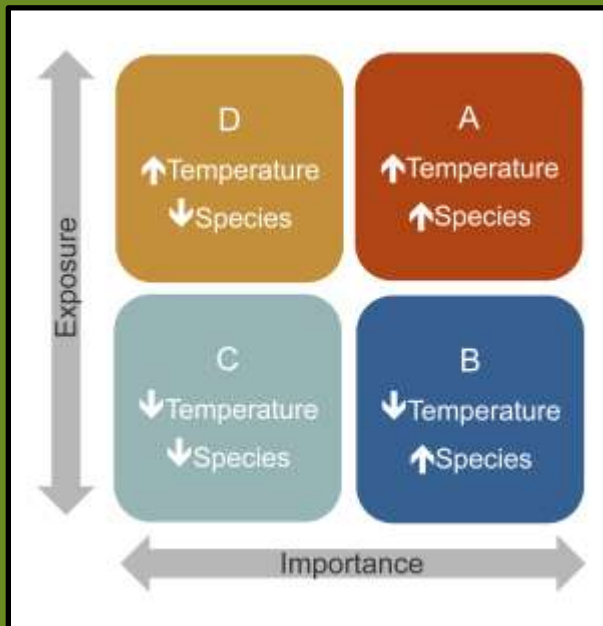


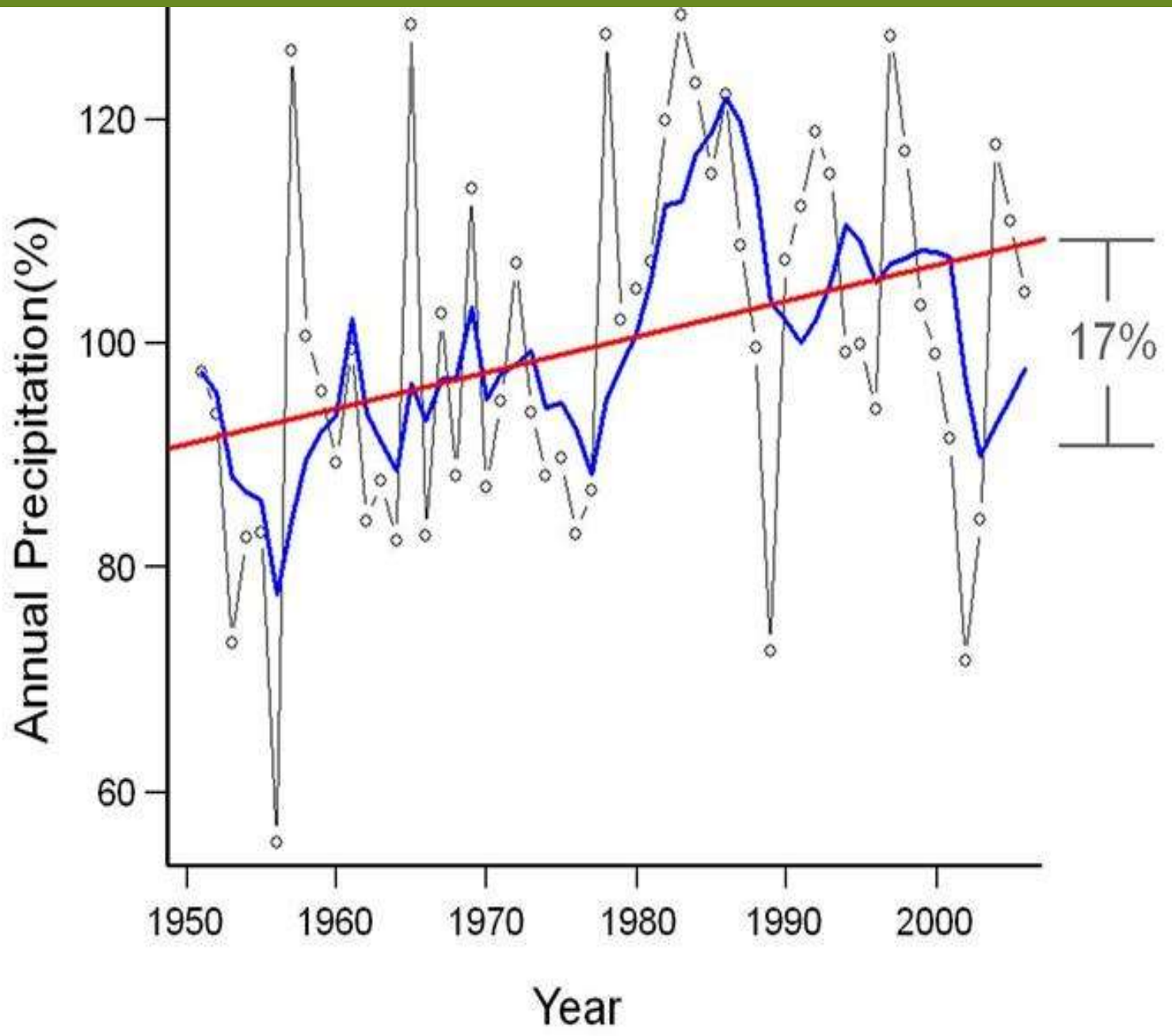
Extras

Watersheds

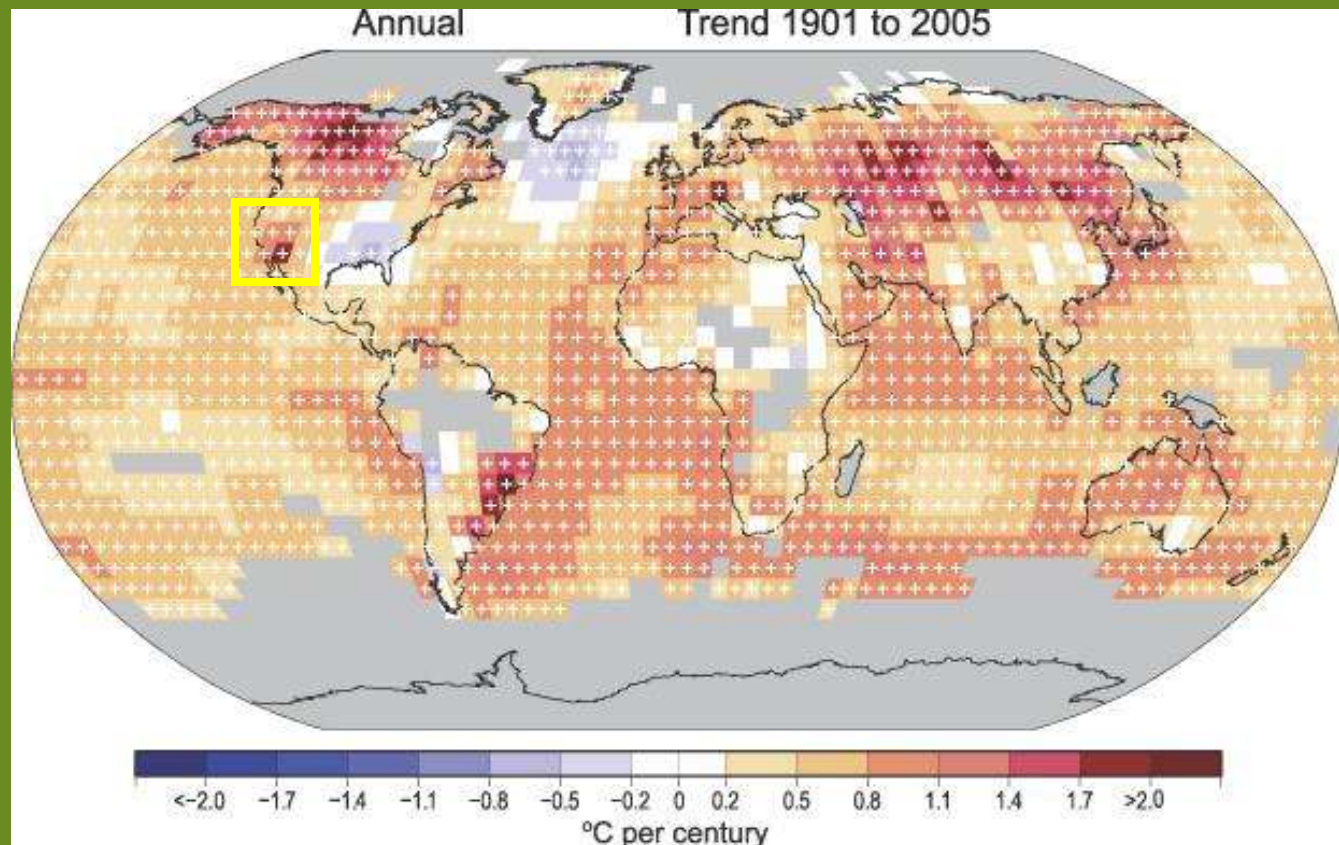
Early Streamflow

Declining Snowpack





Scientific Evidence



Warming is unequivocal and very likely due to human activities (IPCC 2007)