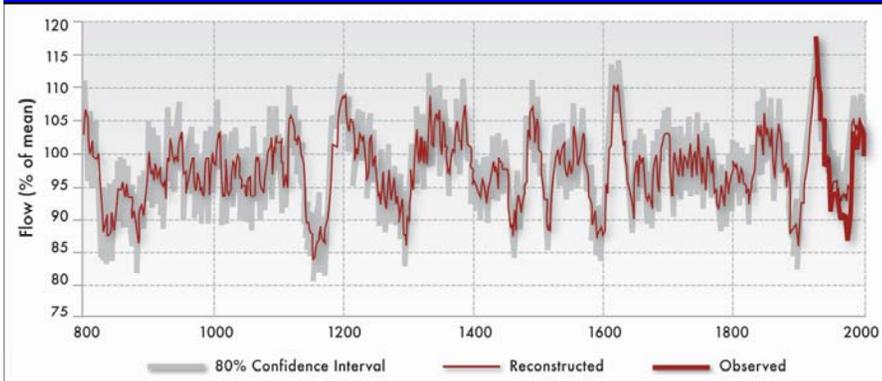


Drought Management Challenges and Opportunities in the U.S.-Mexico Border Region

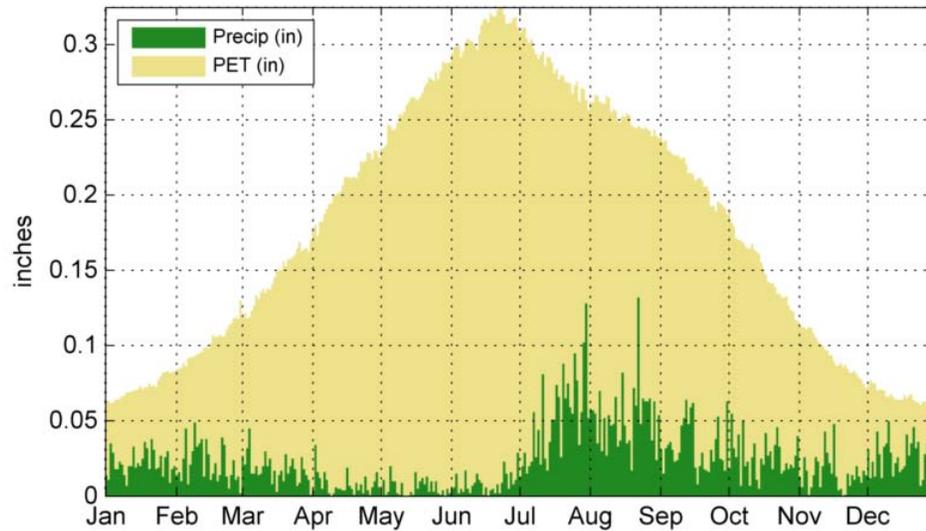


IBWC Southeast Arizona Citizens Forum
18 September 2014

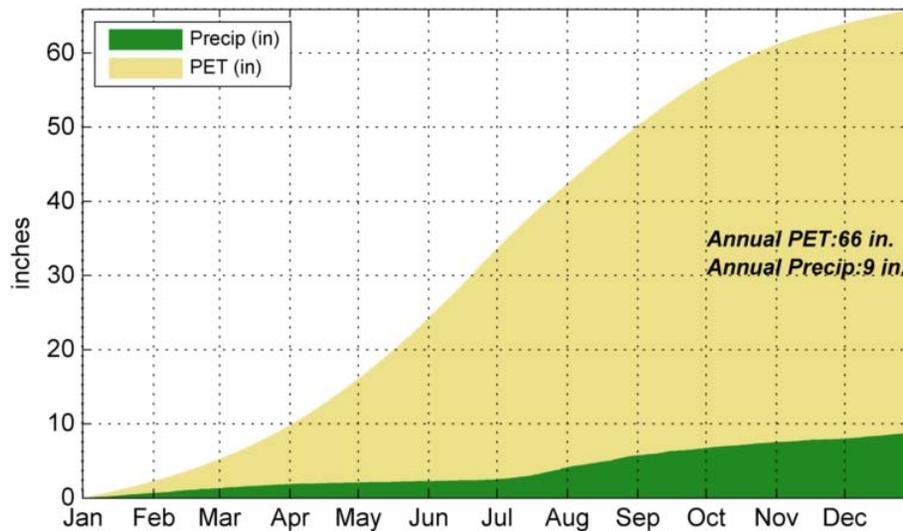
Gregg Garfin, The University of Arizona



SAFFORD AGRICULTURAL CENTER, (1948-2012)
Average Daily Precipitation and Potential Evapotranspiration (PET)

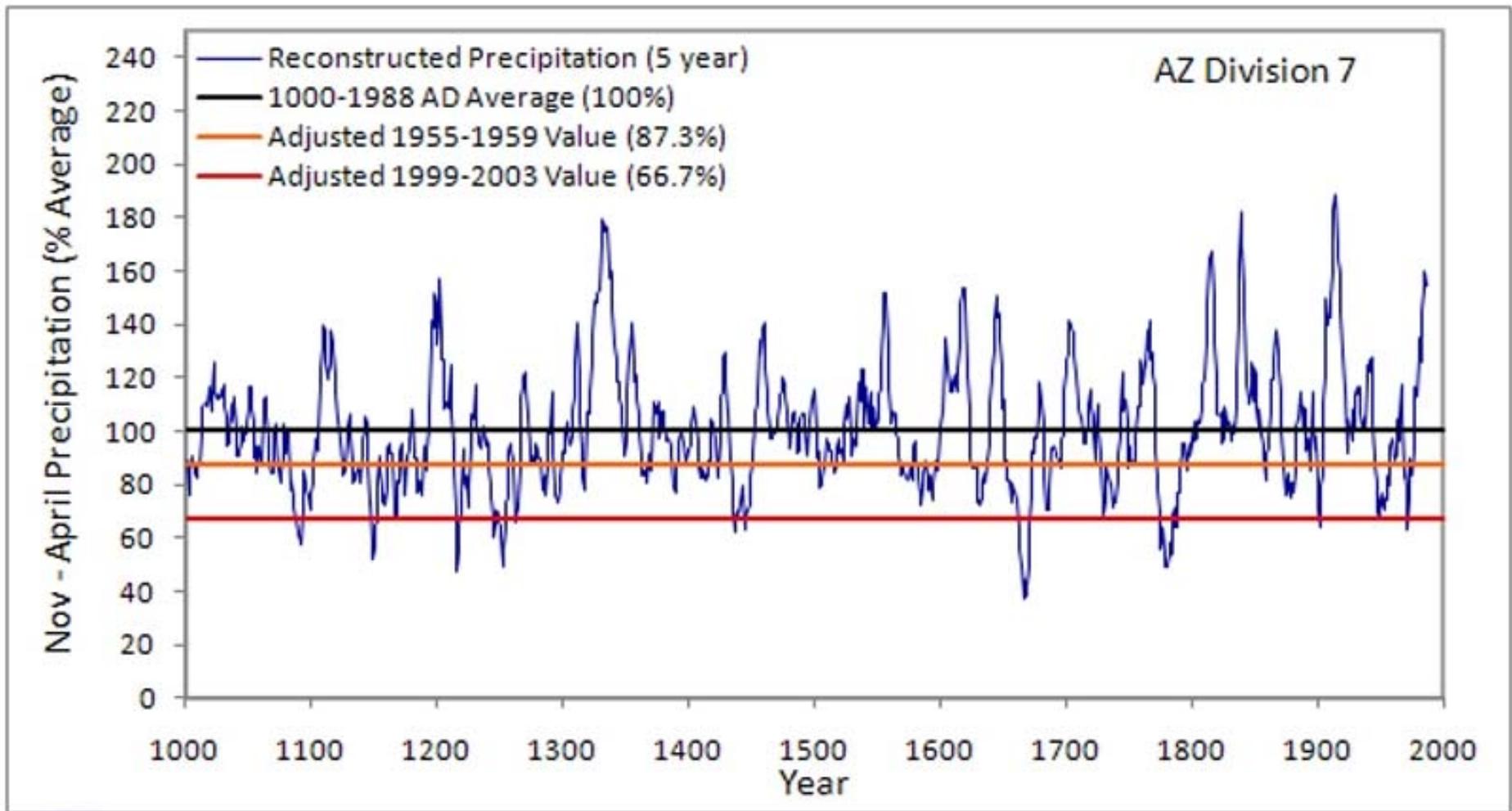


Cumulative Daily Precipitation and Potential Evapotranspiration (PET)



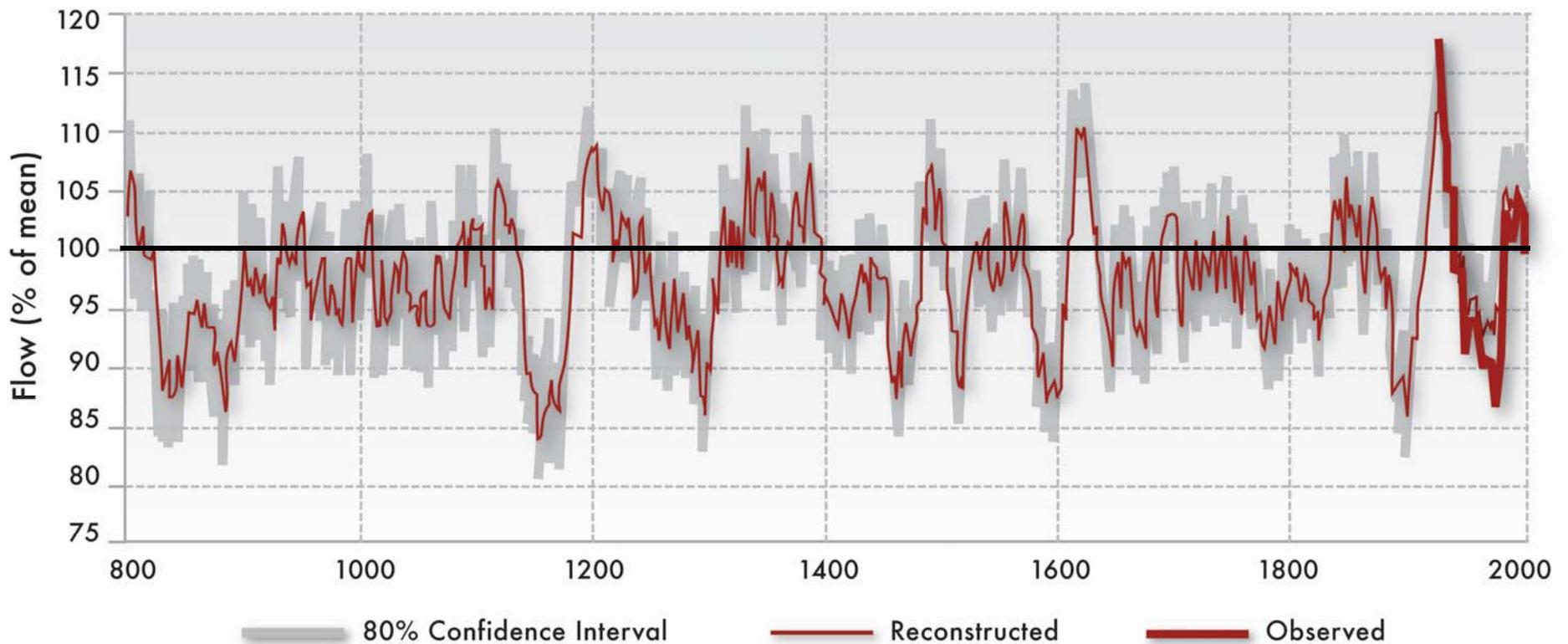
Climate of Safford

Figure, courtesy of
Dr. Michael Crimmins
Univ. of Arizona



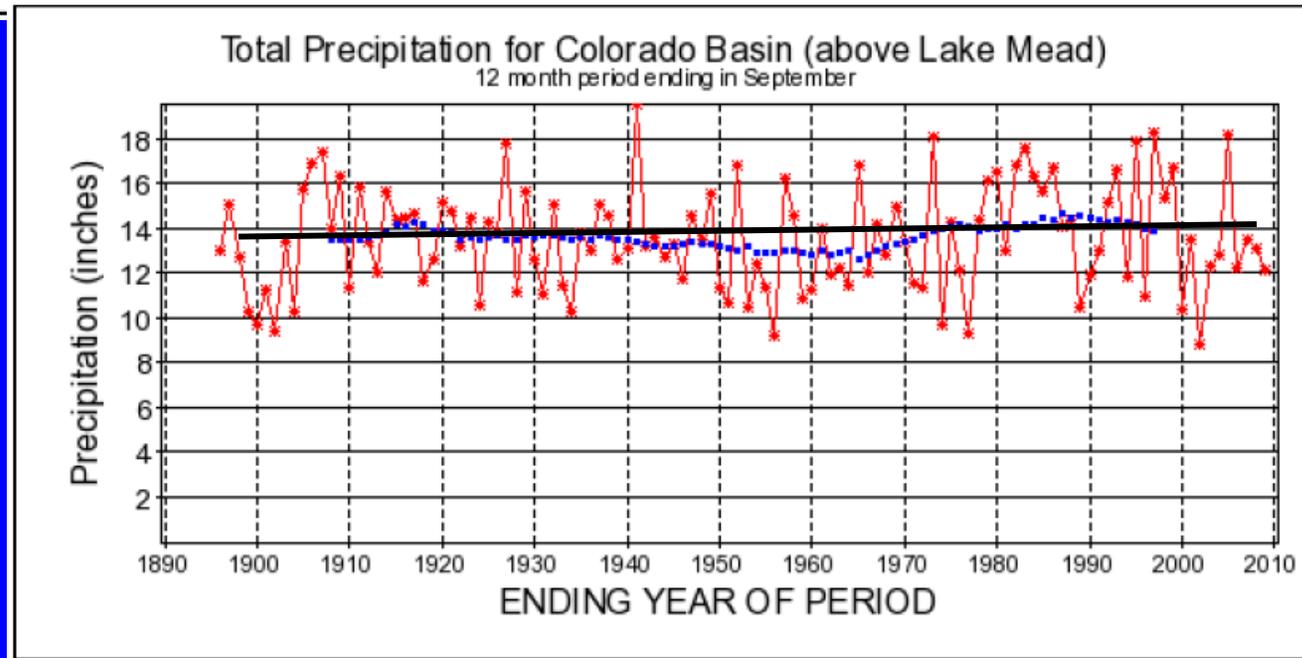
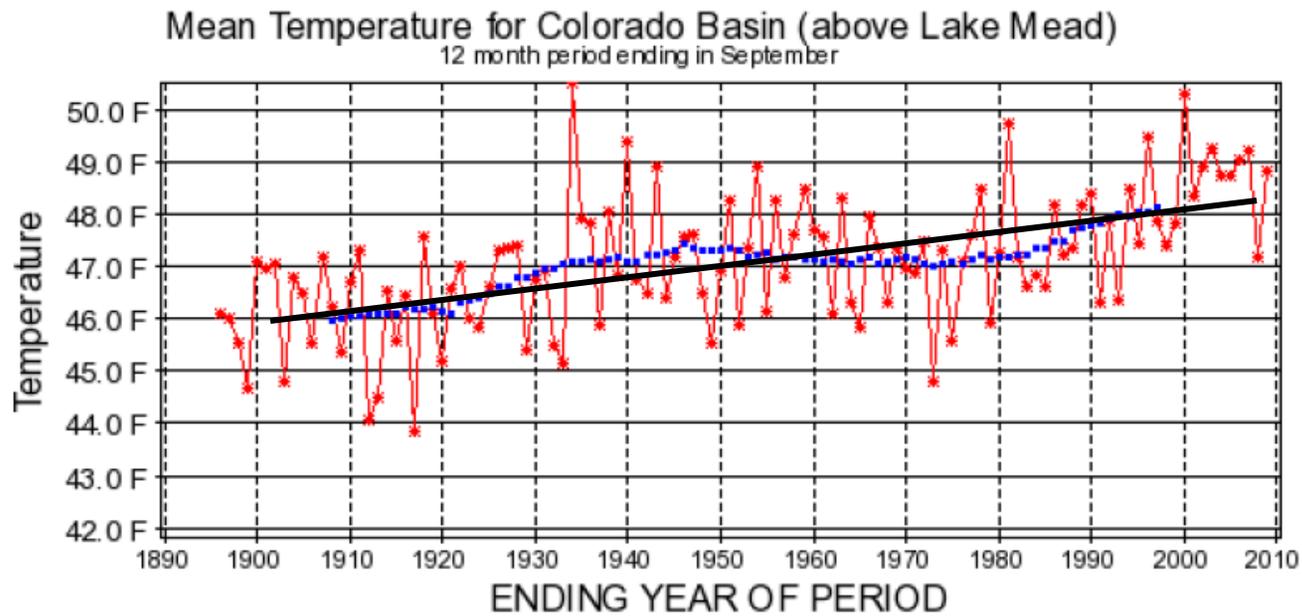
Southeastern AZ Winter Precipitation 1000-1988

Tree-Ring Reconstruction from Ni, F., T. Cavazos, M. K. Hughes, A. C. Comrie, and G. Funkhouser. 2002. Cool-Season Precipitation in the Southwestern USA Since AD 1000: Comparison of Linear and Nonlinear Techniques for Reconstruction. International Journal of Climatology 22:1645-1662 – via <http://climas.arizona.edu/paleoclimate-tool>



Colorado River Streamflow 762-2005

Figure adapted from Meko, D., C. A. Woodhouse, C. A. Baisan, T. Knight, J. J. Lukas, M. K. Hughes, and M. W. Salzer. 2007. Medieval drought in the Upper Colorado River Basin. *Geophysical Research Letters* **34**.
http://swcarr.arizona.edu/sites/default/files/ACCSWUS_Ch4_Fig5_0.jpg





**Horseshoe 2 Fire
Chiricahua Mountains, 2011**

azstarnet.com

Aspen Fire, Tucson, AZ - 2003

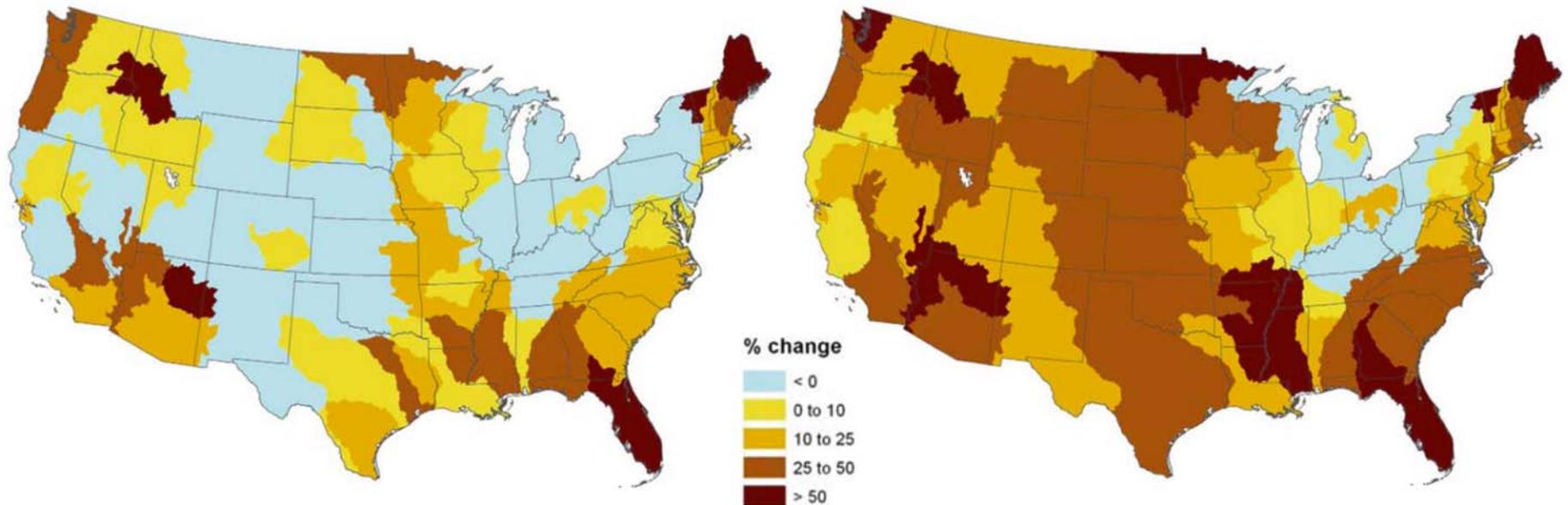




Projected Change in Water Withdrawals 2005-2060

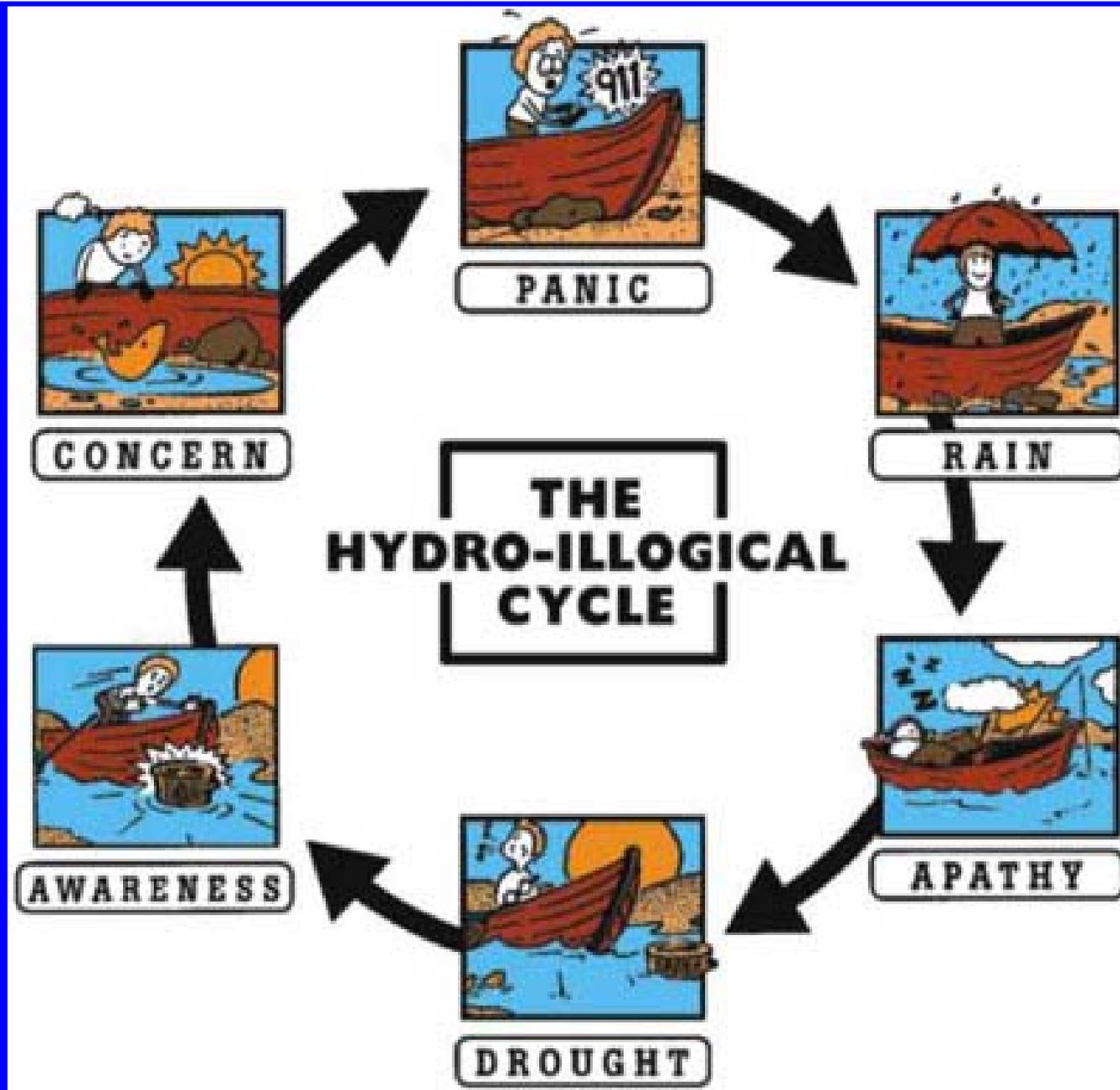
(a) Without Climate Change

(b) With Climate Change



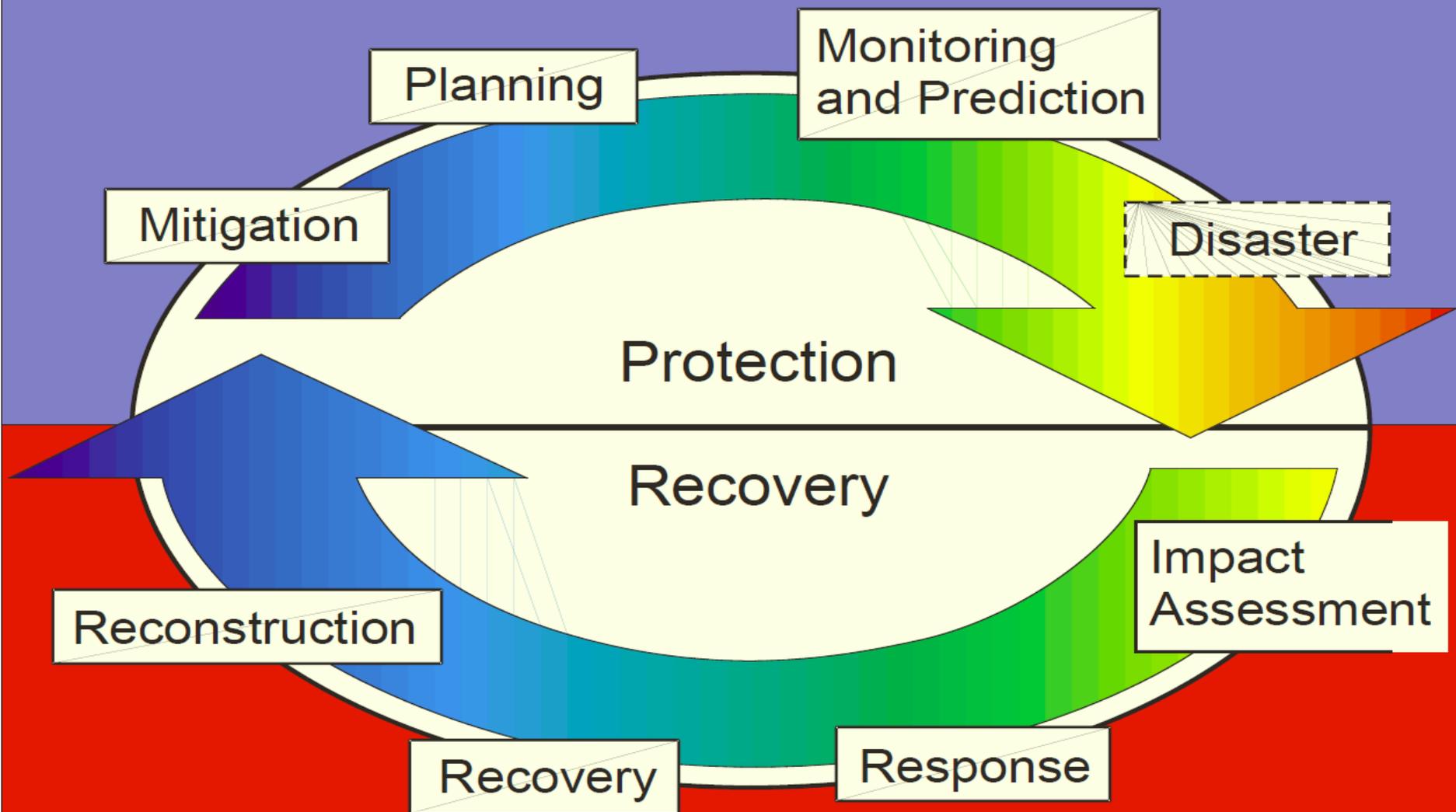
+80% in population
+245% in personal income
3% total water demand incr.
50% U.S. = demand increase

Add in A1B emissions
26% total water demand incr.
90% U.S. = demand increase



National Drought Mitigation Center

risk management



crisis management

National Drought Mitigation Center

Vulnerability = Exposure * (Sensitivity – Adaptive Capacity)

Arizona Drought Preparedness Plan

OPERATIONAL DROUGHT PLAN

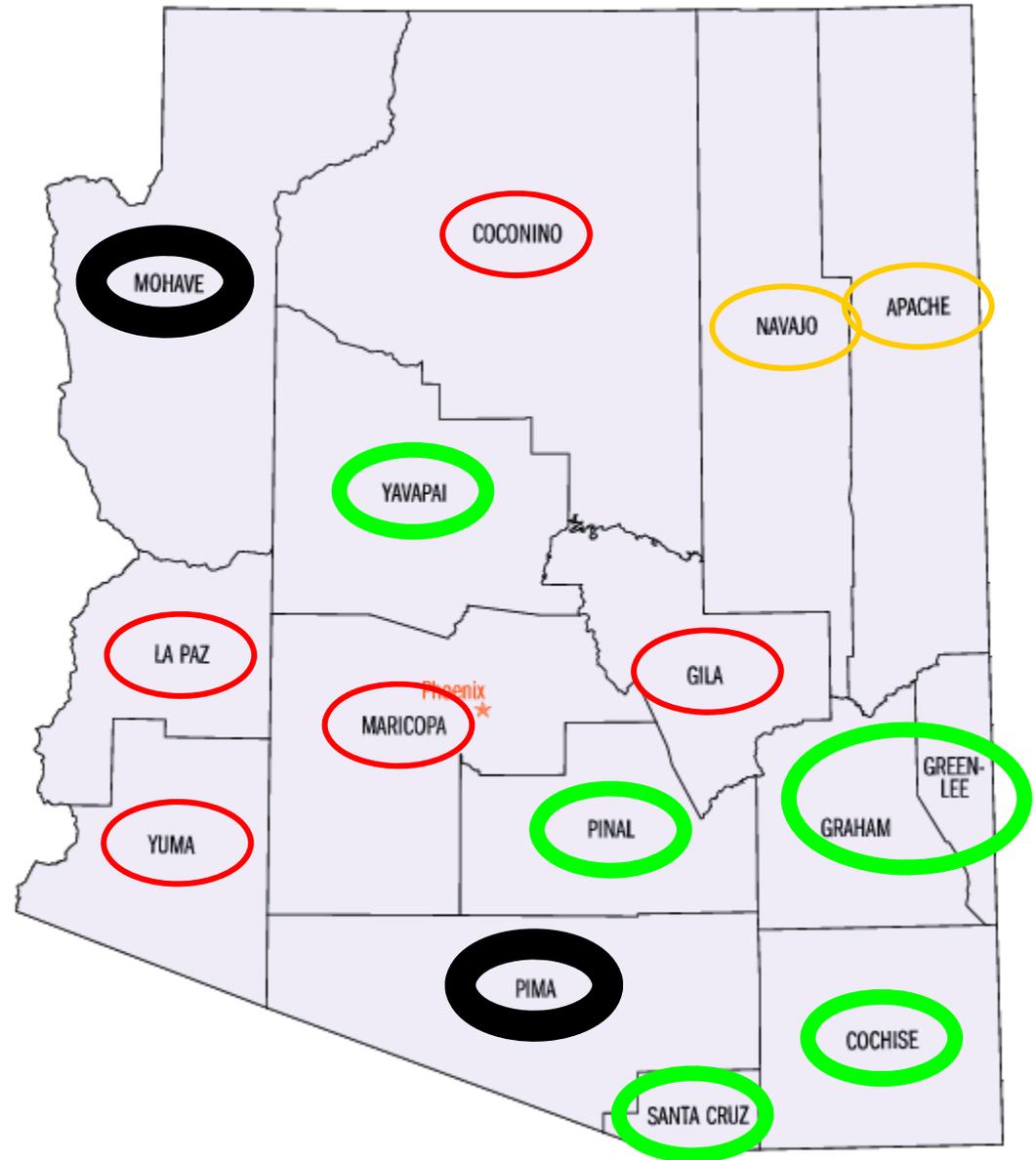


Governor's Drought Task Force
Governor Janet Napolitano

October 8, 2004

<http://www.azwater.gov/AzDWR/StatewidePlanning/Drought/ADPPlan.htm>

Local Drought Impact Groups (LDIGs)



ORDINANCE NO. 2014- ____

**AN ORDINANCE OF PIMA COUNTY, ARIZONA RELATING TO DROUGHT:
AMENDING PIMA COUNTY CODE CHAPTER 8.70 DROUGHT RESPONSE PLAN
AND WATER WASTING ORDINANCE, SECTIONS 8.70.020 (A)(D)(J)
DEFINITIONS; 8.70.040 (B(7))(D(1)(3))DROUGHT STAGES-REQUIRED
DROUGHT CONSERVATION MEASURES; 8.70.050 (B) TABLE 8.70.050
DECLARATION OF DROUGHT STAGE.**

WHEREAS, pursuant to A.R.S § 11-251.05, the Pima County Board of Supervisors is authorized to adopt, amend and repeal all ordinances necessary or proper to carry out the duties, responsibilities and functions of the County which are not otherwise limited by §11-251 or any other law or in conflict with any rule or law of the State of Arizona; and

WHEREAS, pursuant to A.R.S section 45-401, the State of Arizona declares it is necessary to conserve, protect and allocate the use of groundwater resources; and

WHEREAS, pursuant to A.R.S § 11-251(17), the Pima County Board of Supervisors is authorized to adopt provisions necessary to preserve the health of the County; and

WHEREAS, the Board of Supervisors has determined the need to amend certain sections of Chapter 8.70 Drought Response Plan and Water Wasting Ordinance,

BE IT ORDAINED BY THE BOARD OF SUPERVISORS OF PIMA COUNTY, ARIZONA:

SECTION 1. That Pima County Code, Chapter 8.70, Sections 8.70.020, 8.70.040 and 8.70.050 are amended to read as follows:

8.70.020 Definitions.

- A. "Arizona Drought Monitoring Report" means the long-term drought status report issued by the Arizona Department of Water Resources' Monitoring Technical Committee (MTC), created by the Governor's Drought Task Force, which is responsible for gathering drought, climate, and weather data and disseminating that information to land managers, policy-makers, and the public. The MTC determines drought conditions based on monitoring data, tracks changes in weather and physical conditions, forecasts likely future conditions, and provides early detection of changes in drought severity. The MTC will also assess local area impact assessment information provided by the Pima County Local Drought Impact Group citizens throughout the state.
- B. "Department" means the Pima County Health Department.
- C. "Director" means director of the health department.
- D. "Pima County Local Drought Impact Group" "~~Drought Monitoring Committee~~" means a drought monitoring and assessment group comprised of individuals skilled in monitoring climate, area water supplies, ecosystems, and economic and social impacts as a result of drought and facilitates the role of a Local Area Impact Assessment Group prescribed in the Arizona Drought Preparedness Plan.

30022 / 00128990 / v 1

Vulnerability Assessment In Drought Mitigation



**Pima County
Regional Wastewater Reclamation Department
Water Resources Unit**

April 2014

Good!

- State
 - Monitoring Committee
 - Interagency Coordinating Group
- Agencies, Water Providers, Municipalities
 - Attention to long-term water supplies
- County
 - Regular meetings
 - Updated plan
 - Vulnerability assessment
 - Consideration of changing background conditions

Barriers

- Enforcement and follow through
 - E.g. community water system plan **quality**
- Emphasis on monitoring to the near exclusion of other factors
 - Little or no consideration of adaptive capacity
 - No substantial update of plans
 - They typically make only minor changes, such as updating the terminology and methods to better reflect current practices, or updating the list of agencies with drought-related responsibilities

Barriers

- Lack of explicit connection between water resources planning and drought planning
- Water rights and laws complicate drought policy
- Lack of explicit consideration of megadrought
- Little capacity within ADWR
 - Little or no post-drought assessment
 - Little investment in new monitoring
 - Little investment in new planning and coordination → compartmentalization
- Impact of development is not explicitly considered
- Lack of explicit consideration of the intersections between energy-water-land use

Opportunities

- No crisis
 - Time to assess adaptive capacity, upgrade plans, review past droughts, conduct economic studies
- Lessons from other states
- Expectation of a new normal of severe and prolonged drought
- Consideration of incentives and disincentives in Comprehensive Plans
 - Retrofit efficient fixtures
 - Conventional construction ↔ LID
- Western Governors' Association attention to drought and Federal attention to climate change

Opportunities



NACSP: North American Climate Services Partnership



Environment
Canada Environnement
Canada



CONAGUA
COMISIÓN NACIONAL DEL AGUA
SERVICIO METEOROLÓGICO NACIONAL



FOCUS AREA 1: Rio Grande-Rio Bravo (RGB) Regional Pilot Area

Description: To develop and deliver drought-based climate services in order to assist water resource managers, agricultural interests, and other constituents within the basin as they respond to future drought events and build capacity to respond to other climate extremes.

Objective 1.1 Observations and Monitoring: Assess and enhance the distribution and quality of regional observational climate networks

Objective 1.2 North American Drought Monitor: Improve the overall awareness and effectiveness of this product in the RGB

Objective 1.3 Outlooks and Forecasts: Enhance collaboration on existing operational climate outlook and prediction products

Objective 1.4 Drought Impacts: Enhance the ability of North America to monitor and report on impacts from drought

North American Drought Monitor

July 31, 2014

Released: Wednesday, August 13, 2014

<http://www.ncdc.noaa.gov/nadm.html>

Analysts:

Canada - Trevor Hadwen
Brianna Kelly
Mexico - Reynaldo Pascual
Adelina Albanil
U.S.A. - Brad Rippey
Michael Brewer*

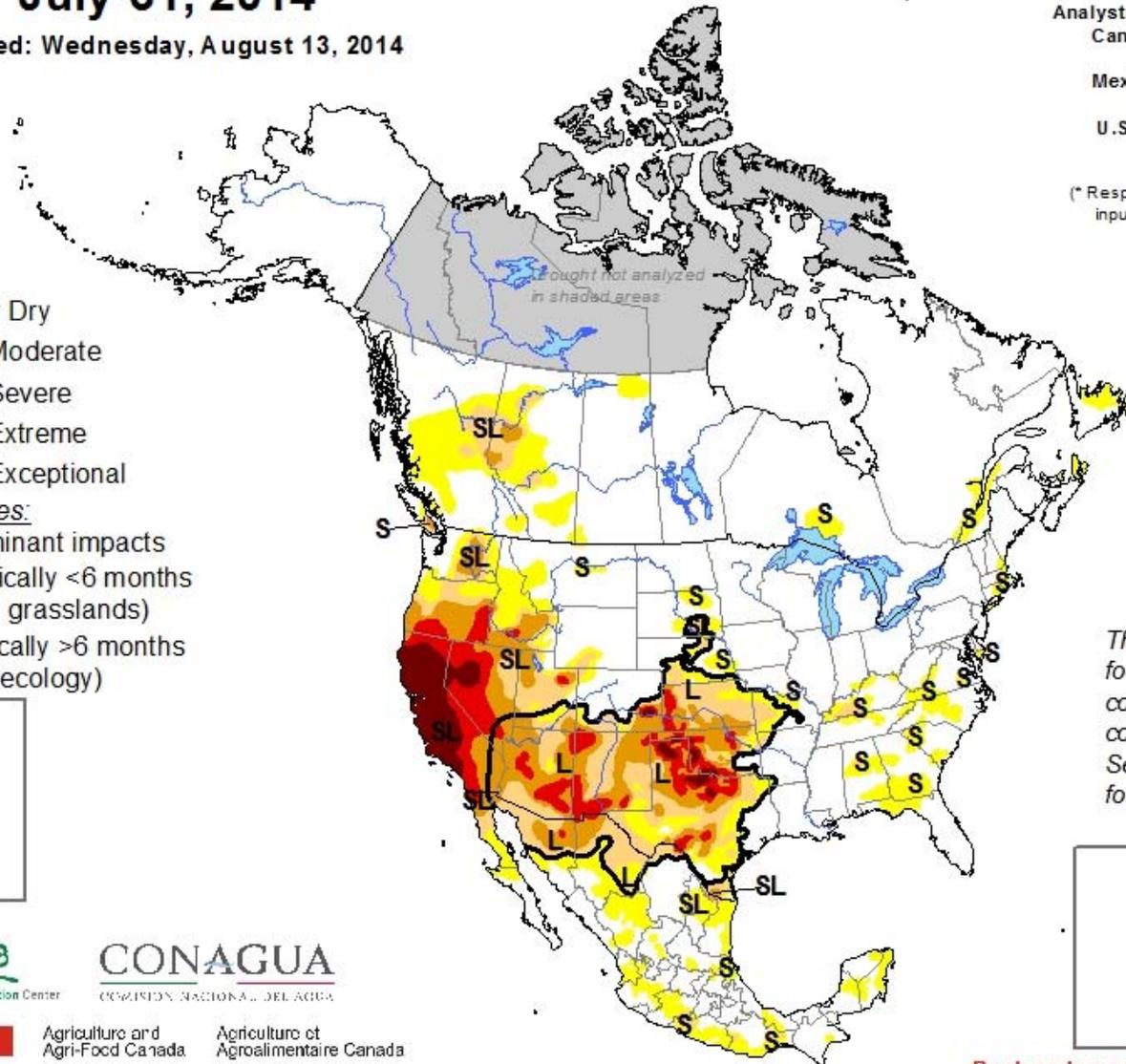
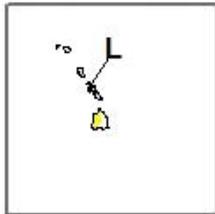
(* Responsible for collecting analysts' input & assembling the NA-DM map)

Intensity:

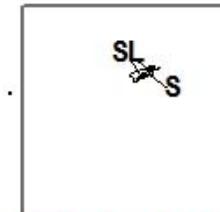
-  D0 Abnormally Dry
-  D1 Drought - Moderate
-  D2 Drought - Severe
-  D3 Drought - Extreme
-  D4 Drought - Exceptional

Drought Impact Types:

-  Delineates dominant impacts
- S = Short-Term, typically <6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months (e.g. hydrology, ecology)



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text for a general summary.

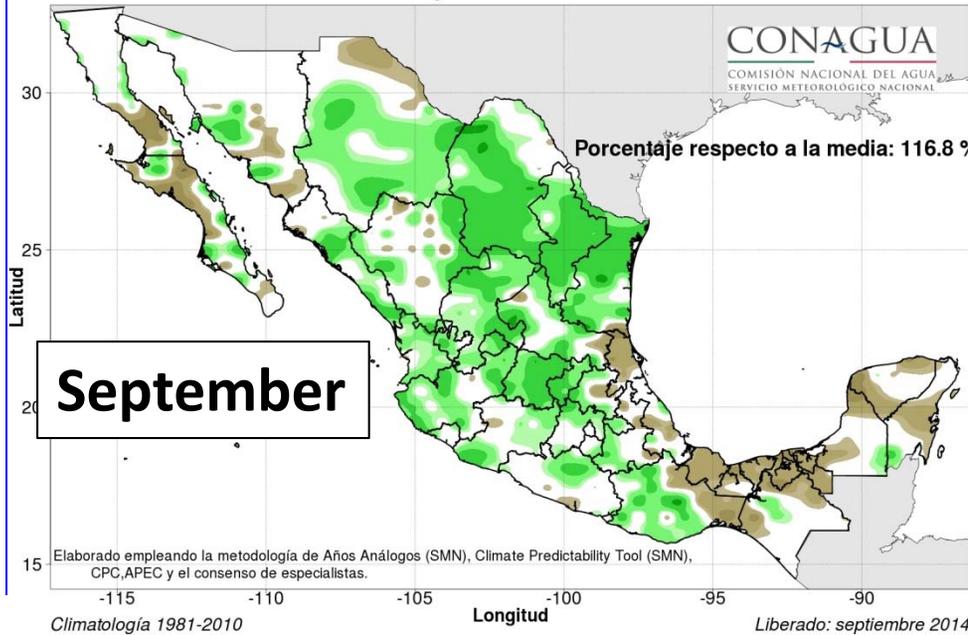


Regions in northern Canada may not be as accurate as other regions due to limited information.

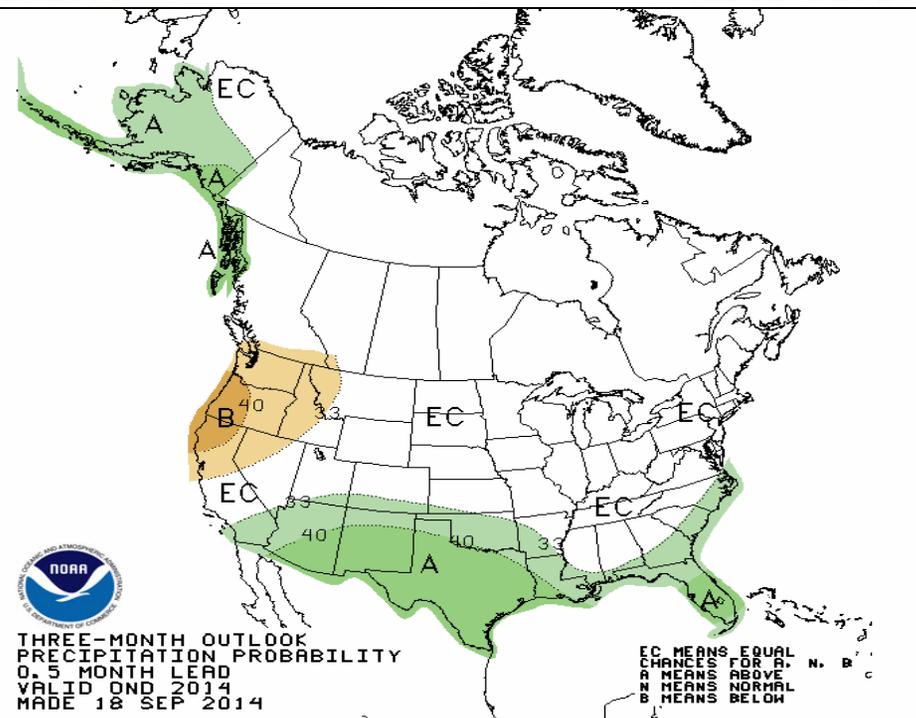
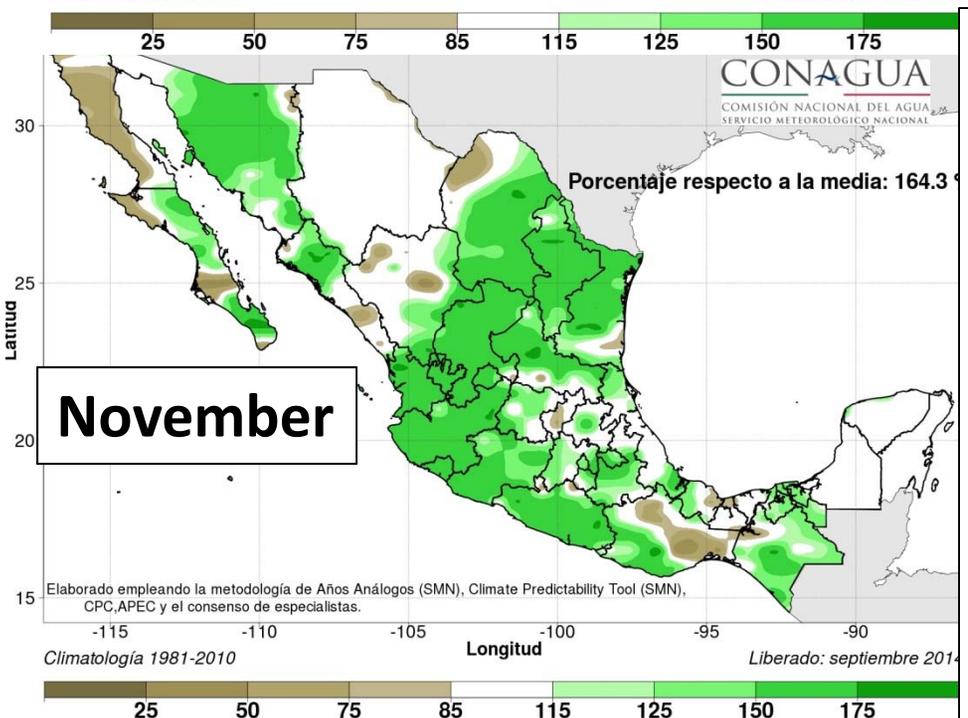
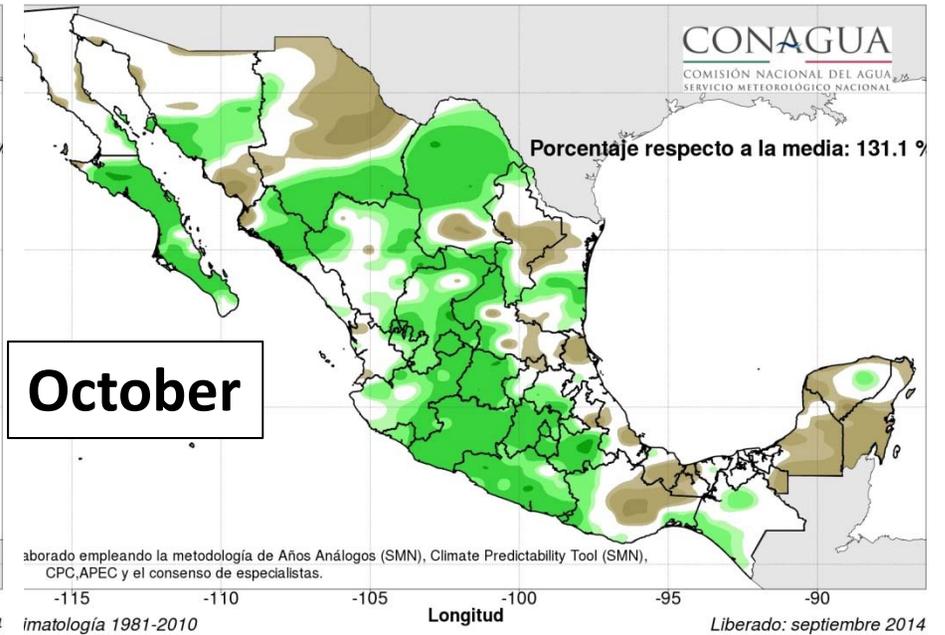


Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada
Environment Canada
Environnement Canada

**Anomalia (% de la normal)
septiembre 2014**



**Anomalia (% de la normal)
octubre 2014**





<http://cpo.noaa.gov/AboutCPO/AllNews/TabId/315/ArtMID/668/ArticleID/111446/Scenario-Planning-for-Climte-Adaptation-workshop-along-the-USMexico-border.aspx>

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and
Institute of the Environment
The University of Arizona
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520-626-4372

