



**Earth System Research Laboratory**

*SCIENCE, SERVICE & STEWARDSHIP*

## **Integrating Observations and Models to Improve Decision Support: Developing Early Warning Systems**



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*NOAA Earth System Research Laboratory*

*ESRL Dedication and Open House*

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# Droughts: Why do we care?

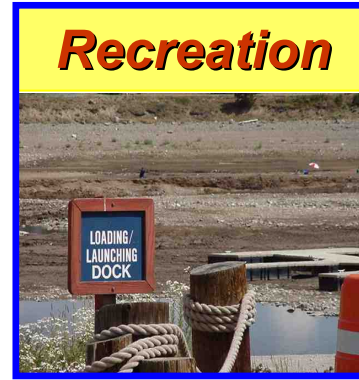
Droughts are more than simply climate phenomena. They have profound social, environmental, and economic impacts.



North Platte river  
May 22, 2002  
Mean flow - 1310 cfs  
Observed - 0

... the last rains came gently, and they did not cut the scarred earth ... the sky grew pale and the clouds that had hung in high puffs for so long in the spring were dissipated.

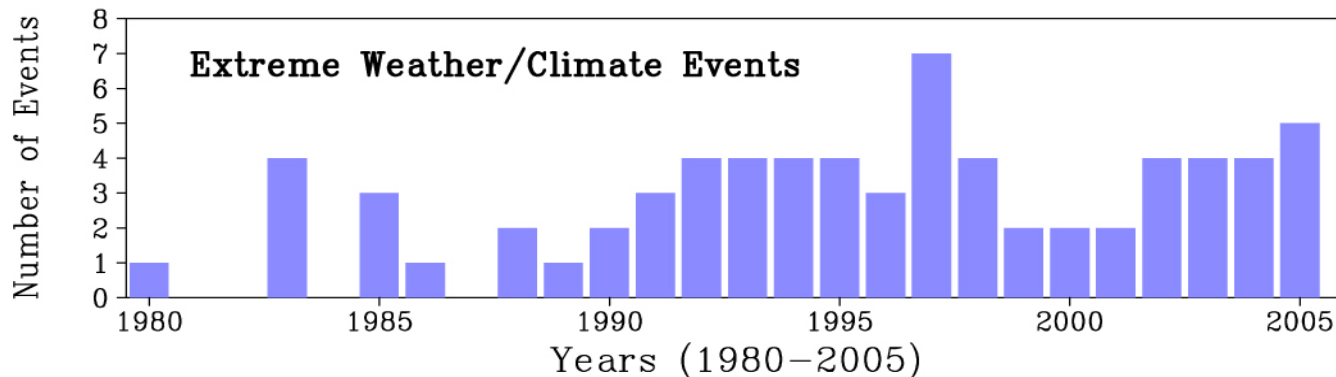
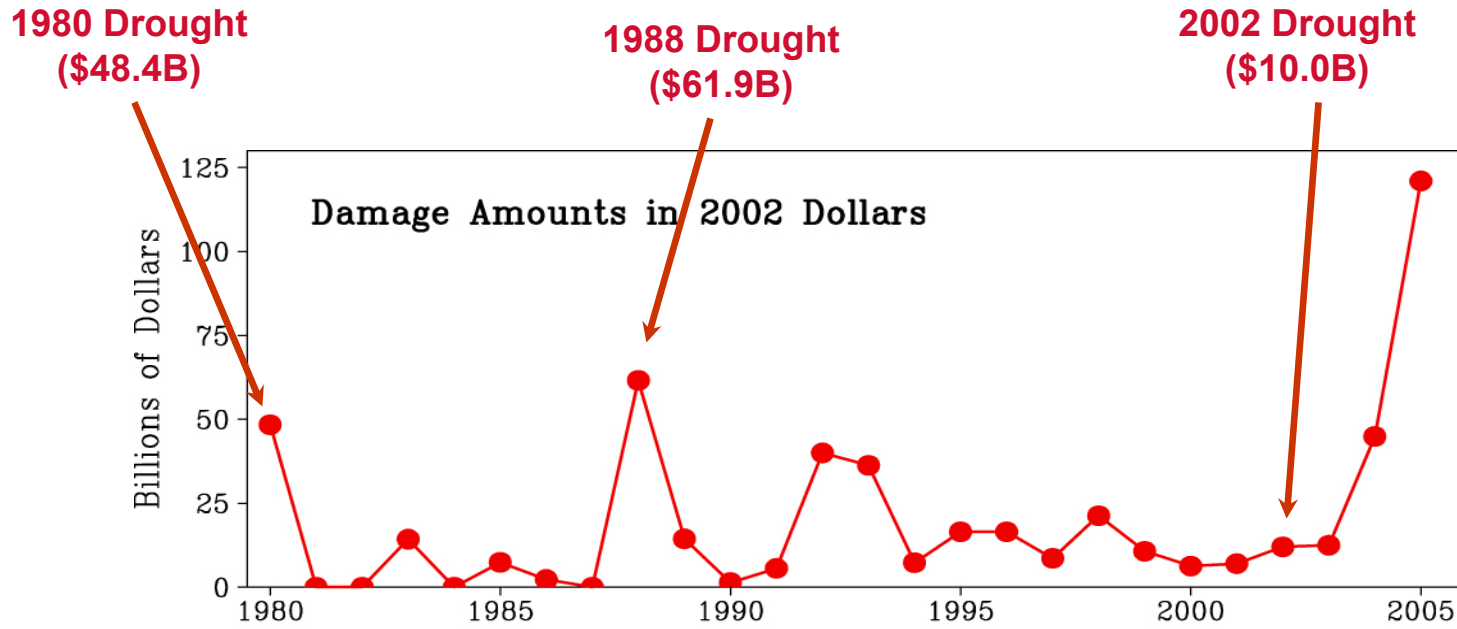
*John Steinbeck, Grapes of Wrath.*





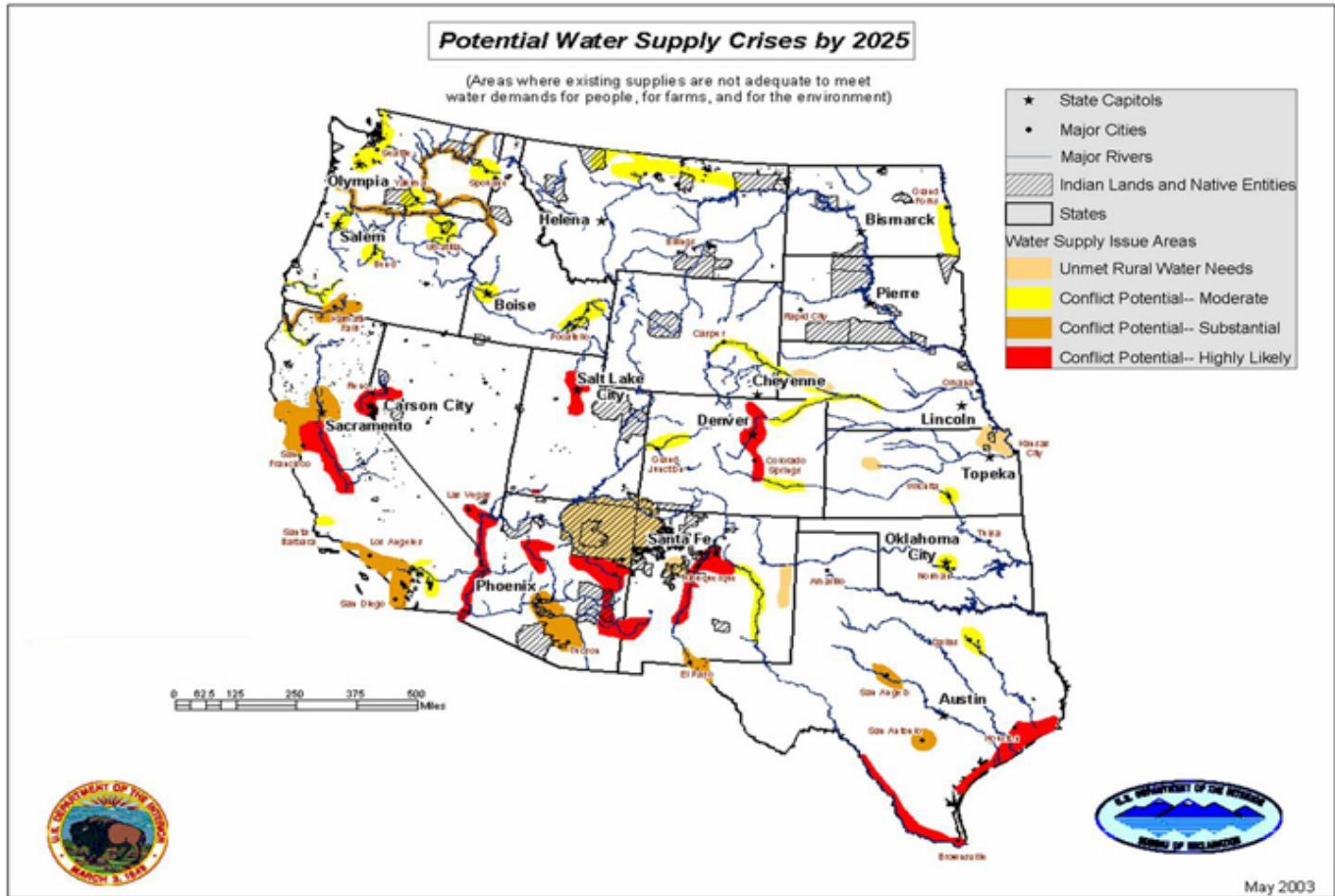
# A bottom line issue

Although determining the full economic impacts of drought is difficult, annual losses in the USA are estimated to be several billion dollars.





# Potential Western water supply crises and conflicts by 2025 (US DOI)



Interior Department analysis of potential water supply crises and conflicts by the year 2025 based on a combination of technical and other factors, including population trends and potential endangered species needs for water.

*Note: There is an underlying assumption of a statistically stationary climate.*



# National Integrated Drought Information System (NIDIS)

**“Creating a National Drought Early Warning System”**

**NIDIS Goal: To enable the Nation to move from a reactive to a more proactive approach to droughts.**

- The Western Governors’ Association (WGA) spearheads a report providing the vision and recommendations for developing NIDIS.
- NOAA is recommended to be the lead agency for coordinating NIDIS implementation.
- NOAA creates a NIDIS Program Office, housed at ESRL, to coordinate NIDIS activities within NOAA and with federal, state, and local partners.

Creating a Drought Early Warning System for the 21st Century  
The National Integrated Drought Information System

Western Governors’ Association • June 2004



# Why Now?

*"Whiskey is for Drinking and Water is for Fighting"* - Mark Twain.

*"Water is life"* - Wallace Stegner.

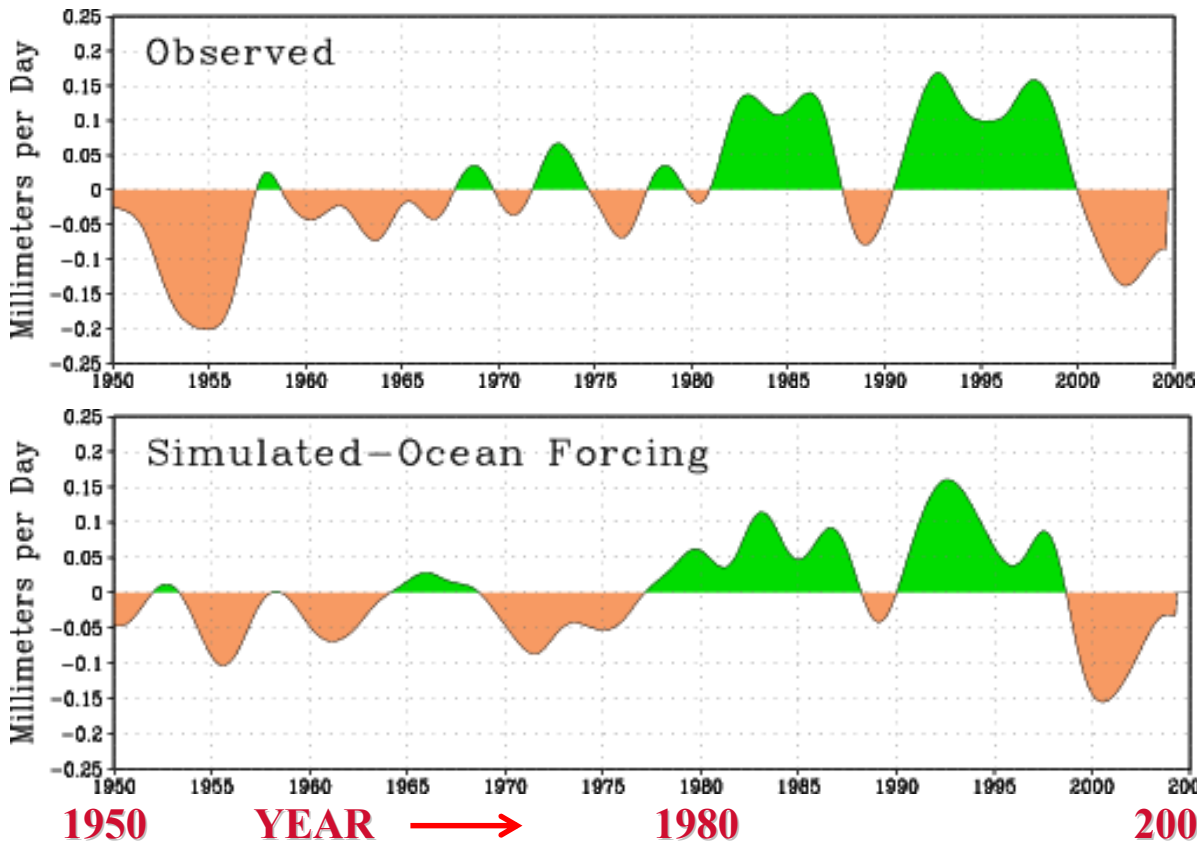
❑ **There are growing concerns for the sustainability of water resources to meet future demands.**

- *Increasing public and media attention.*
- *Recognition of secondary impacts of drought.*
- *Concerns over how to best manage water resources and plan for the future.*



# One Research Example: Steps Toward Developing Better Drought Forecasts

- Improve initial analysis of atmosphere, ocean, and land conditions.
- Advance forecast capabilities on weekly to decadal scales.
- Increase understanding of relationships between climate variations and impacts
- Provide forecasts of impact-relevant variables and changes in drought severity

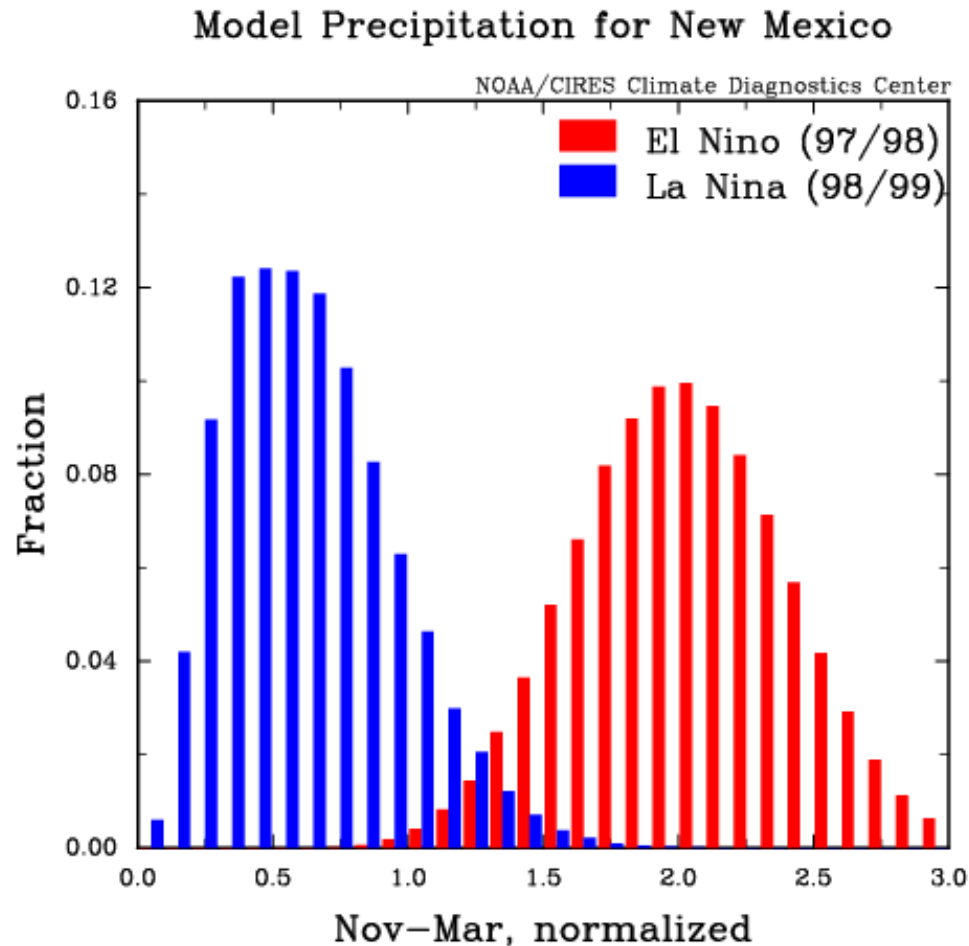


**Western US  
Observed Rainfall  
1950-2004**

**Improving  
Prospects  
for Drought  
Forecasts**

**Climate Model Rainfall  
Forced Only by  
Ocean Conditions  
1950-2004**

# Effects of El Niño on Rainfall



- Conditions in the tropical Pacific-Indian Oceans provide a key source for climate forecast skill: “The Perfect Ocean for Drought” in 2002.
- Climate forecasts are intrinsically probability forecasts.





# ESRL Contributions to Developing NIDIS

**What We Do:** *Observe, Explain, Predict, Communicate, Assess, Evaluate.*

- Develop observational capabilities, from paleoclimate to state-of-the art monitoring.
- Explain causes for observed droughts.
- Advance weather and climate forecast skill, from days to decades.
- Develop and provide new drought information products for decision support.
- Assess and evaluate uses and effectiveness of the information we provide.

**Why:** *To enable the Nation to better anticipate, prepare for, and respond to droughts.*

**Who We Work With:** *Federal, state, and local partners.*

Western Governors' Association, Other NOAA, National Drought Mitigation Center, USDA (NRCS, USFS), USGS, NASA, National Interagency Fire Center, Regional Councils, State and Municipal Agencies, Native American tribes, Universities, Regional Integrated Science and Assessment Projects, State Climatologists, private sector.



# System Relationships and Products

