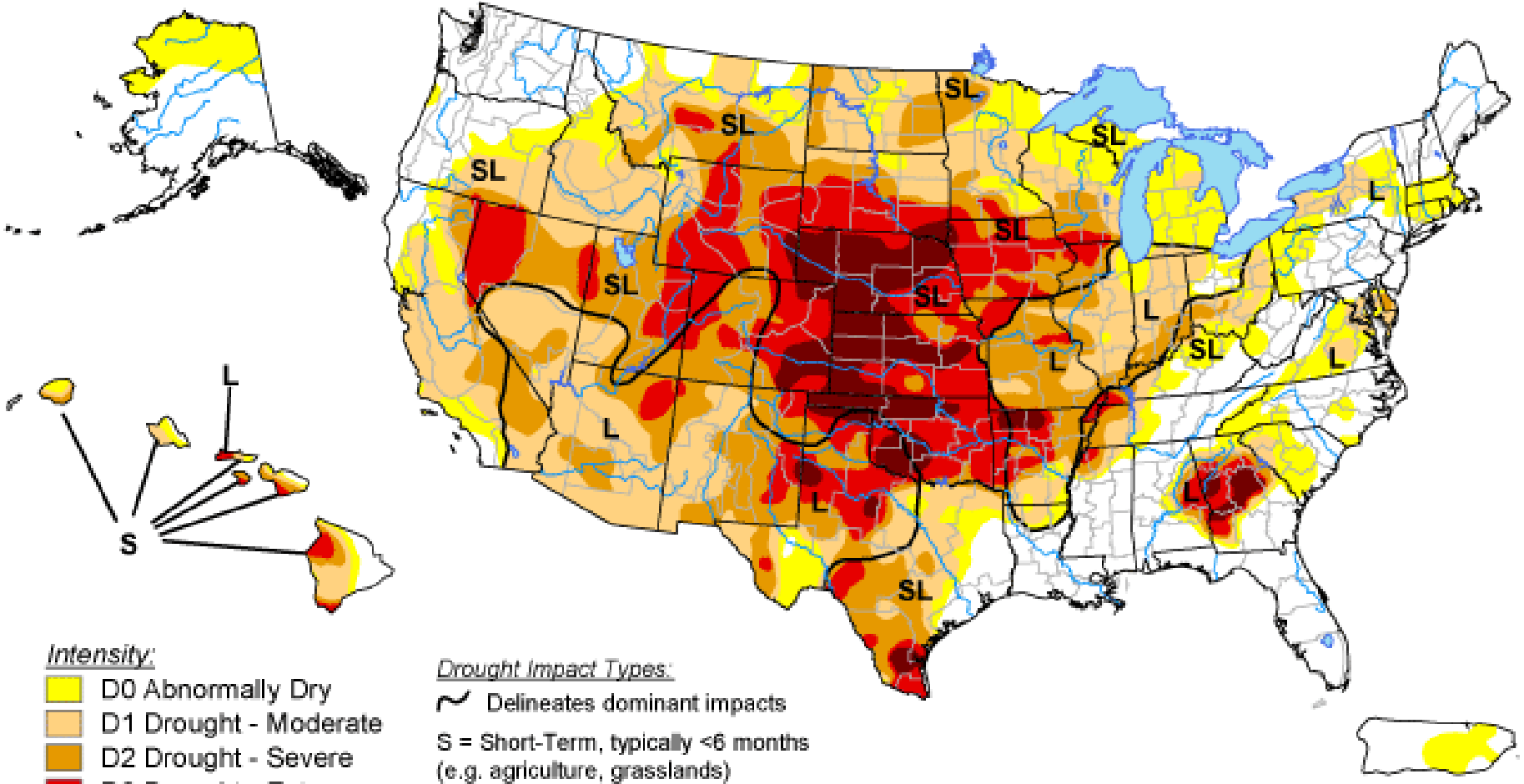
Managing Drought Risk in a Changing Climate

Donald A. Wilhite
Professor, Applied Climate Science
School of Natural Resources
University of Nebraska-Lincoln

Association of Western State Engineers – September 25, 2012

U.S. Drought Monitor

September 18, 2012
Valid 7 a.m. EDT



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)

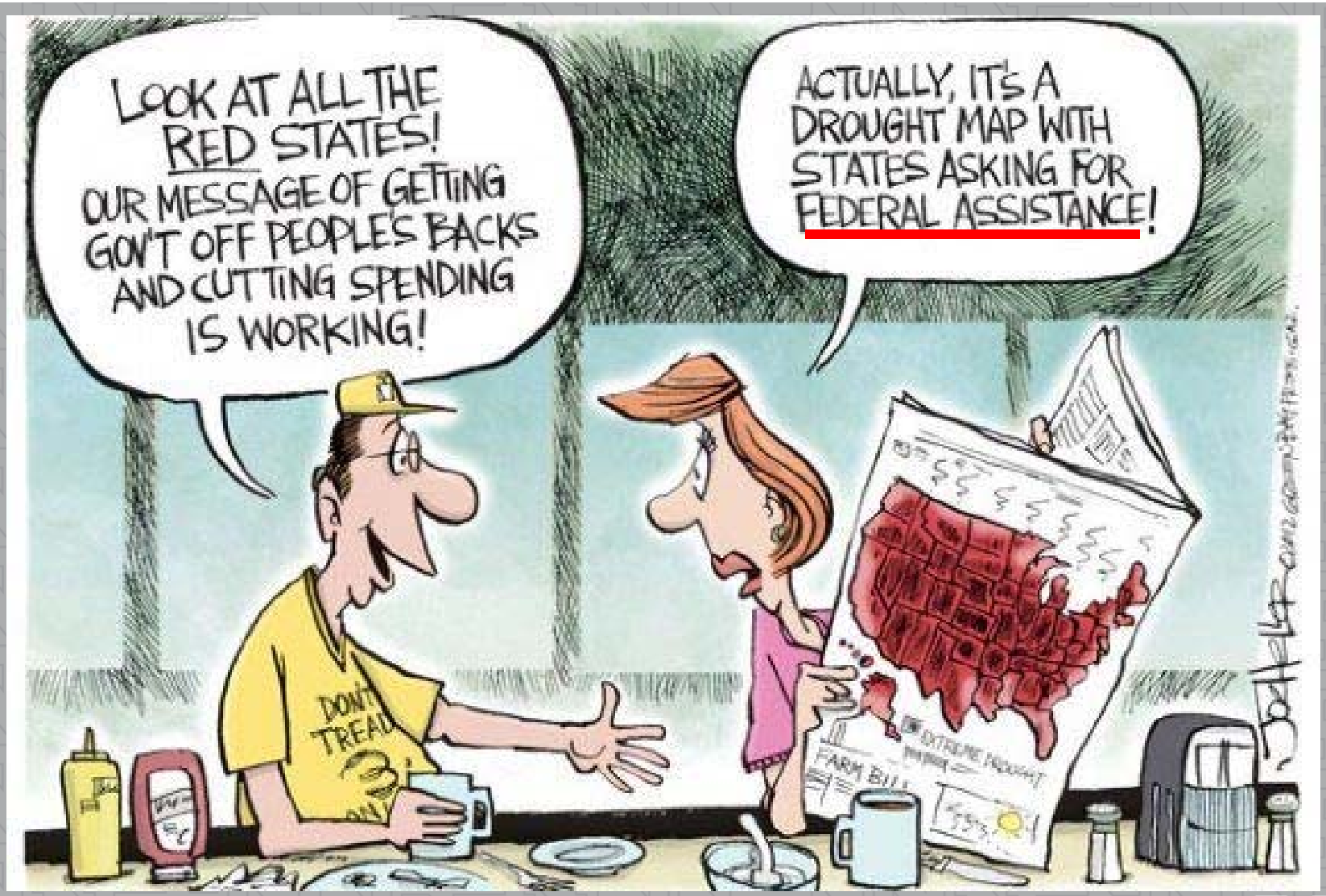
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

http://droughtmonitor.unl.edu/

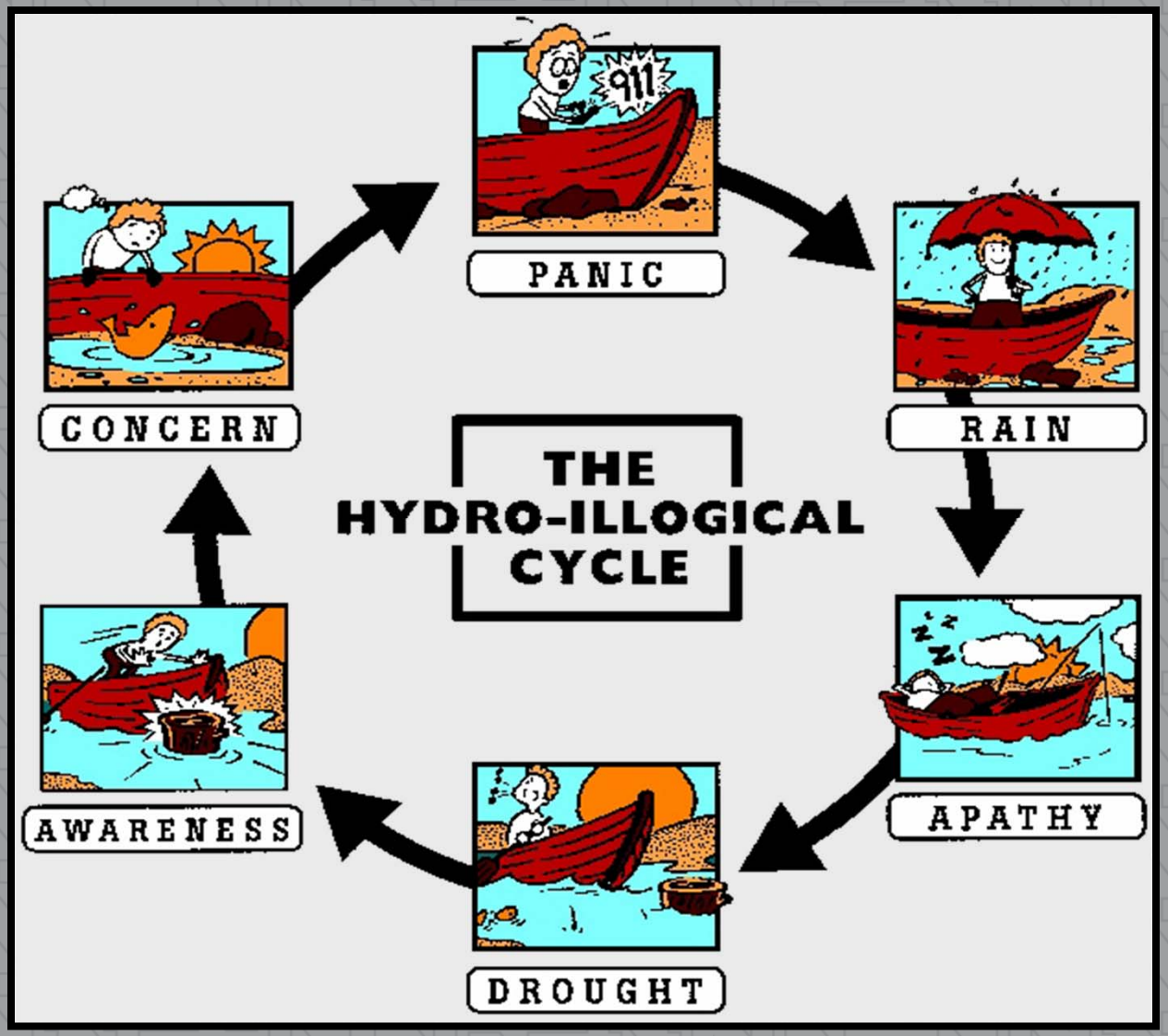
Released Thursday, September 20, 2012

Author: David Simeral, Western Regional Climate Center

The Politics of Drought



Breaking the Hydro-illogical Cycle:
An Institutional Challenge for Drought Management

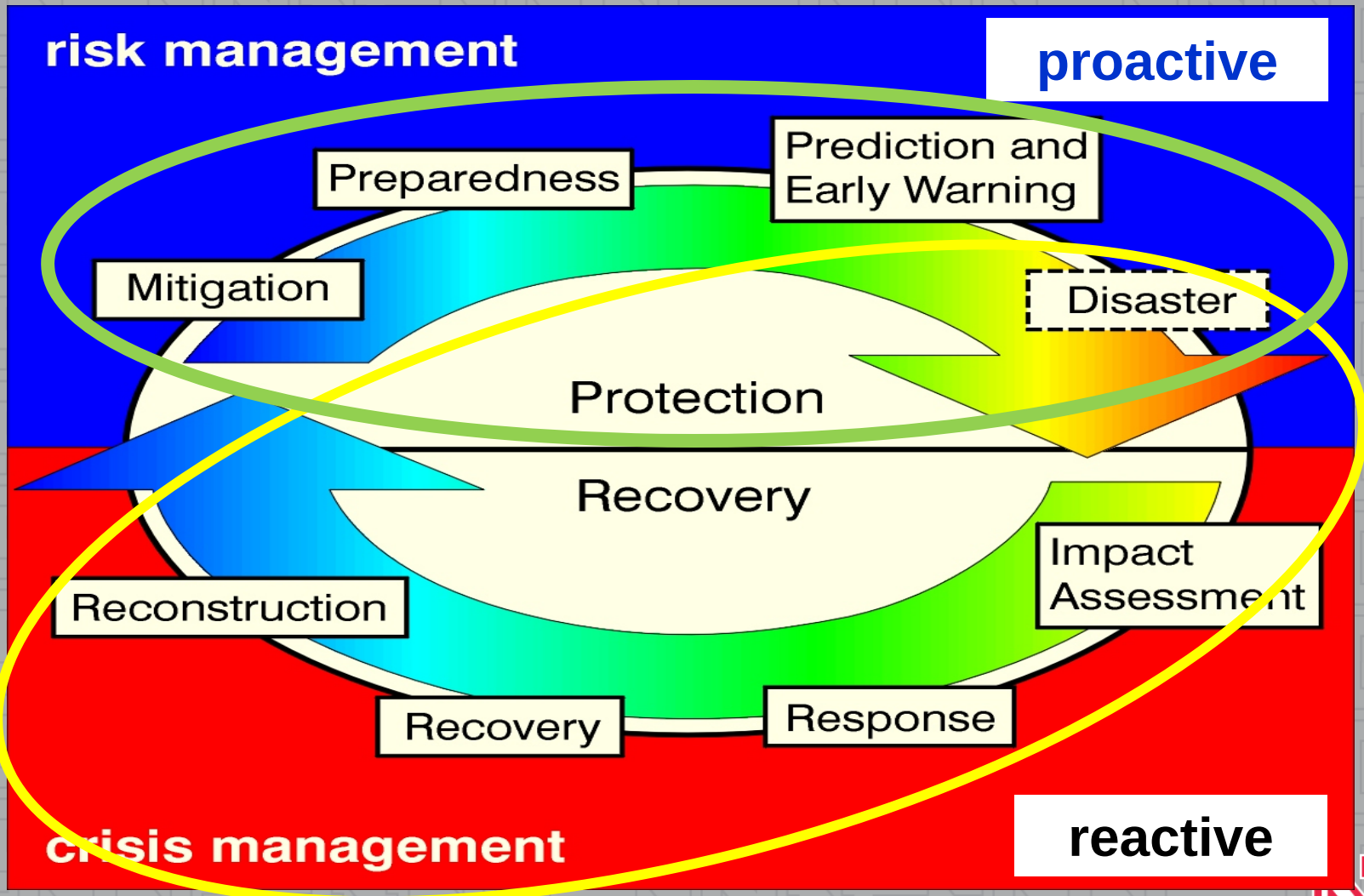


Crisis Management

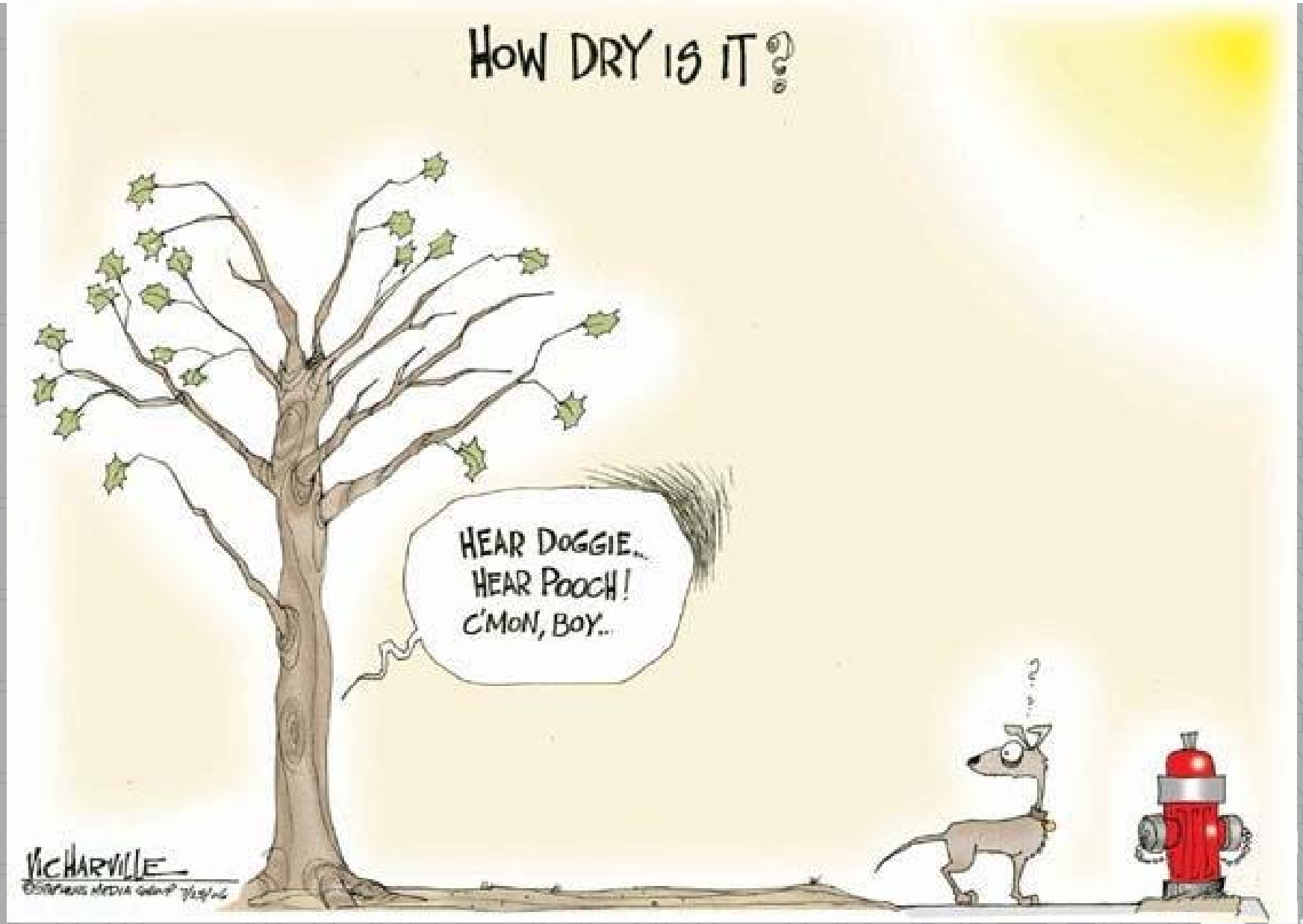
If you do what you've always done, you'll get what you've always got.

The Cycle of Disaster Management

Risk management increases coping capacity, builds resilience.



Crisis management treats the symptoms, not the causes.

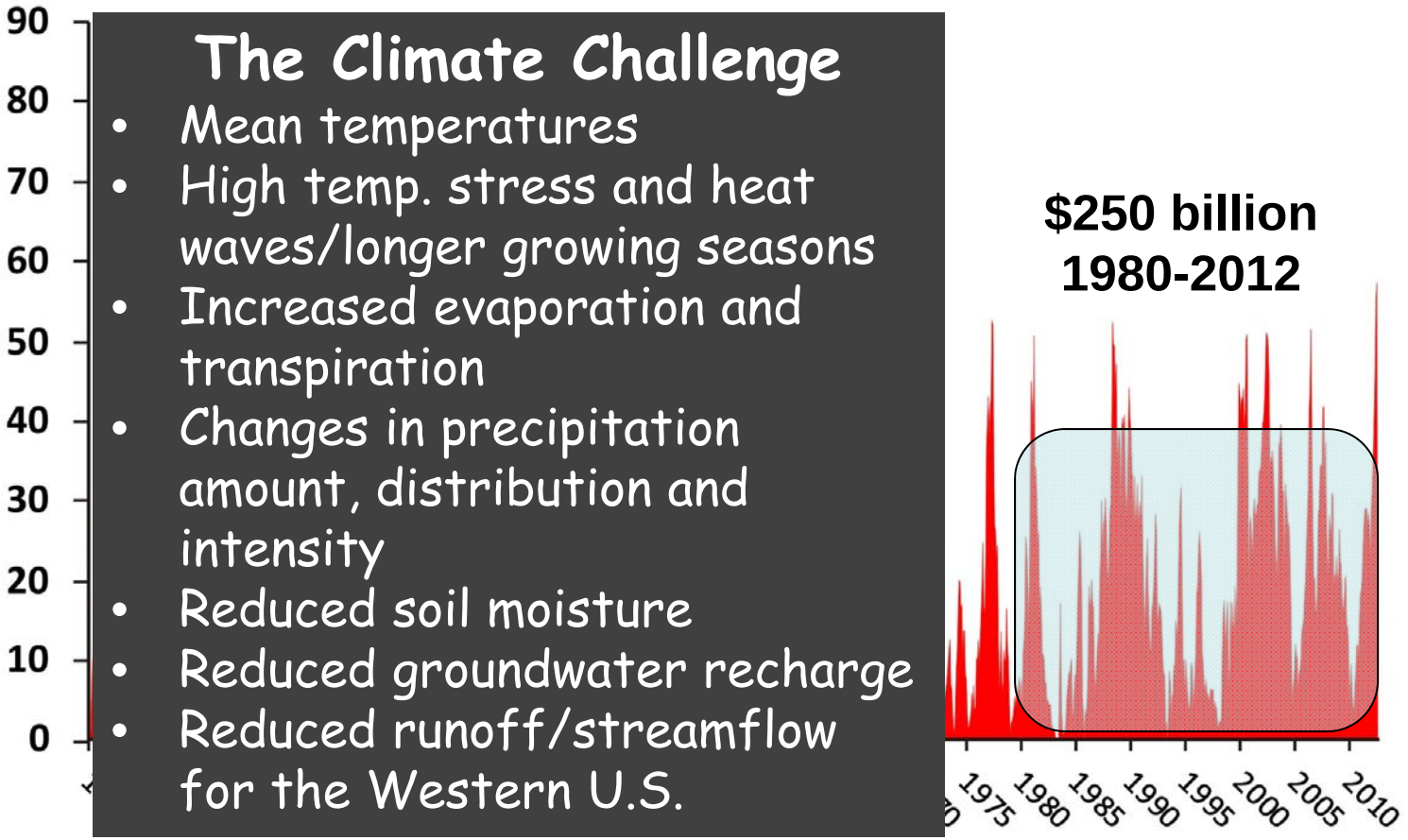

HOW DRY IS IT??
HEAR DOGGIE..
HEAR POOCH!
C'MON, BOY..
VICHARVILLE

Standard Rainguage

New Nebraska Rainguage

Percent Area of the United States in Moderate to Extreme Drought

January 1895–July 2012



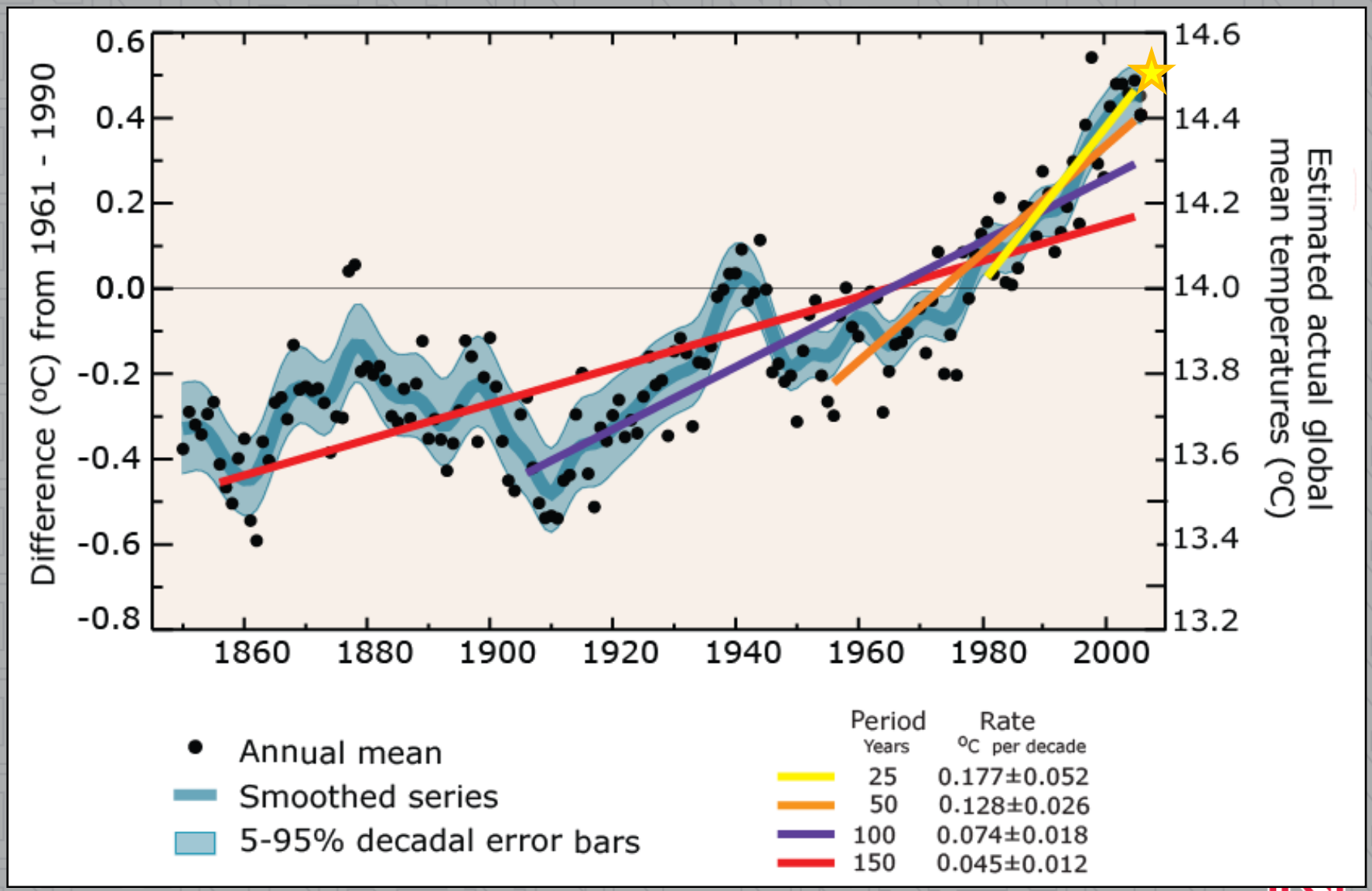
The Climate Challenge

- Mean temperatures
- High temp. stress and heat waves/longer growing seasons
- Increased evaporation and transpiration
- Changes in precipitation amount, distribution and intensity
- Reduced soil moisture
- Reduced groundwater recharge
- Reduced runoff/streamflow for the Western U.S.

$250 billion
1980-2012

Based on data from the National Climatic Data Center/NOAA

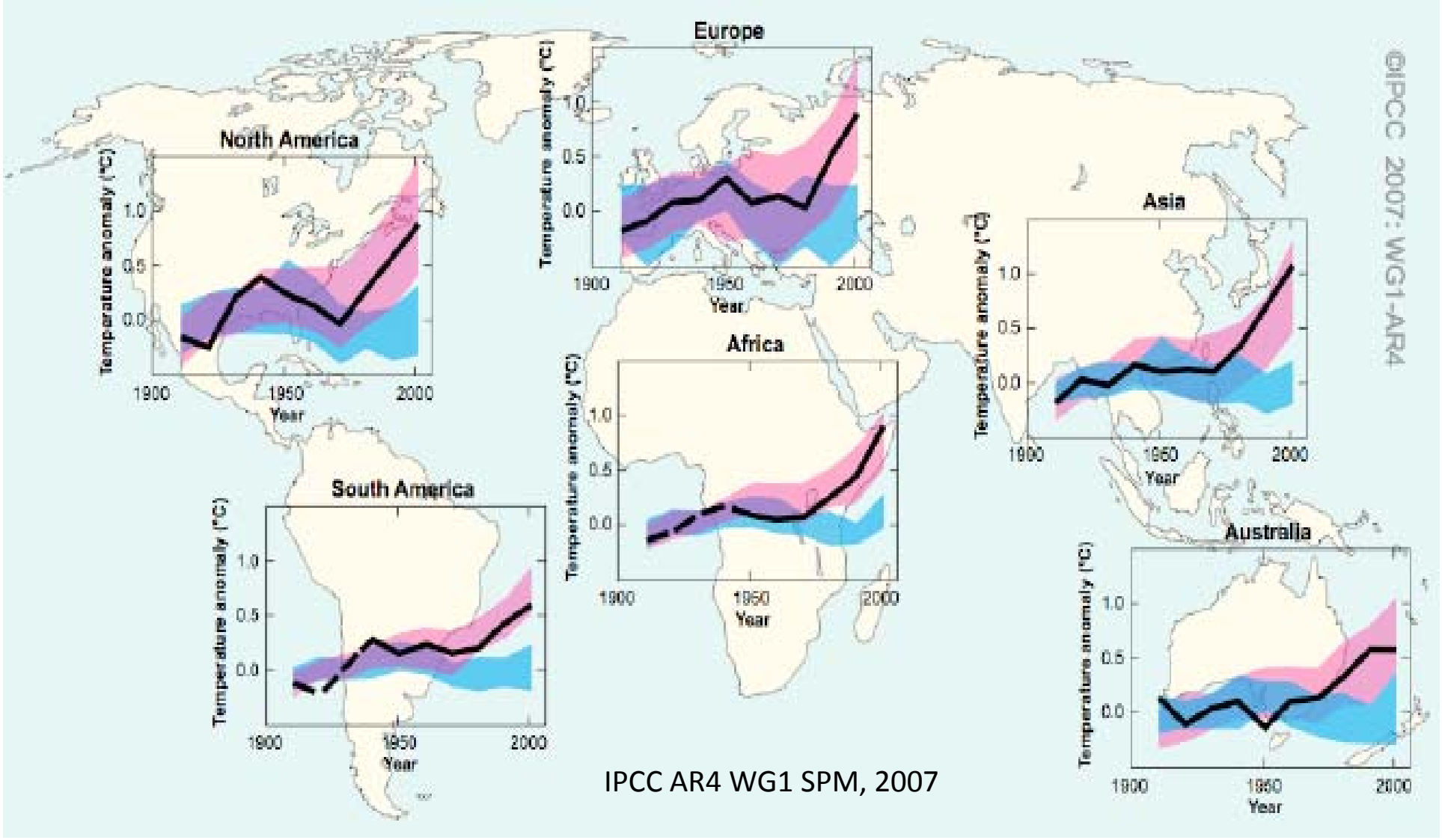
Global average temperature is rising



IPCC

SCIENTIFIC CONSENSUS:

OBSERVED CHANGE IN TEMPERATURES MATCH COMPUTER PROJECTIONS



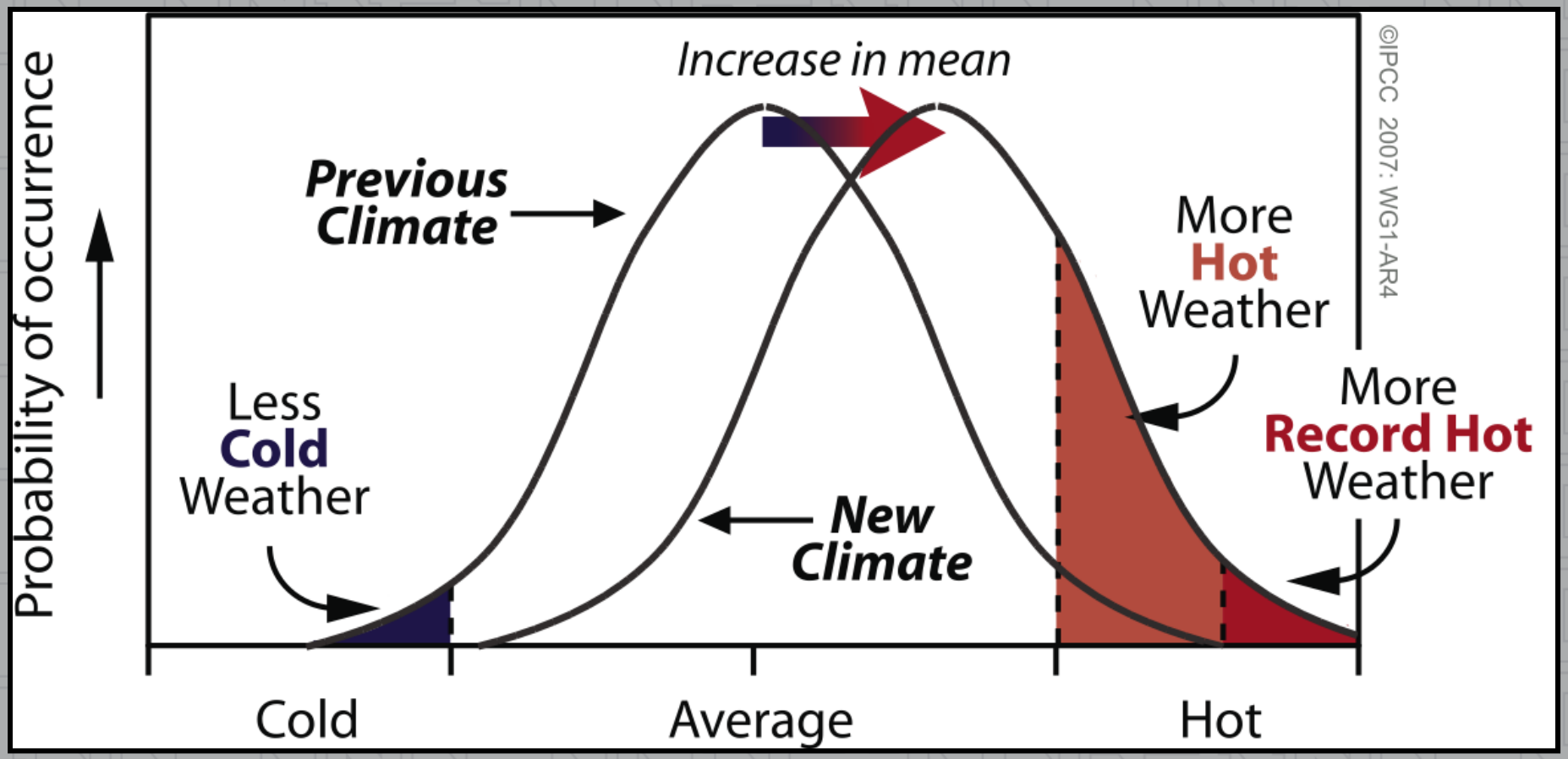
IPCC AR4 WG1 SPM, 2007

Black lines are decadally averaged observations. Blue bands are computer models with natural forcings only. Pink bands are computer models with human + natural forcings.

Seven of these indicators would be expected to increase in a warming world and observations show that they are, in fact, increasing. Three would be expected to decrease and they are, in fact, decreasing.

BAMS, 2009

Mean Temperature Increase & Impact on Extreme Temperatures



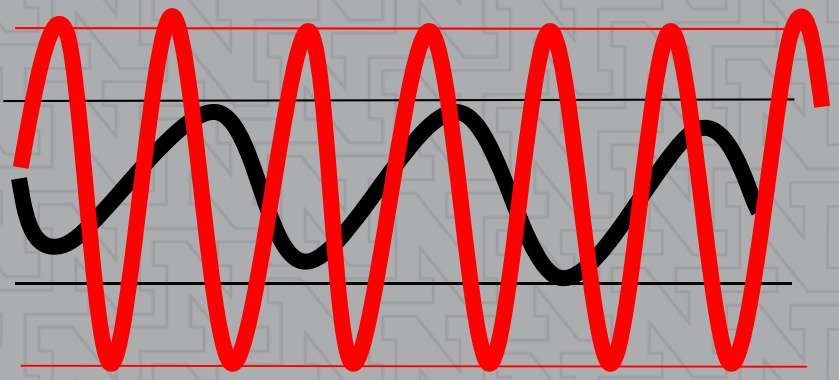
Managing for Climate Variability

Impacts of Global Climate Change:

Increased frequency of extreme weather events

Storms

Floods

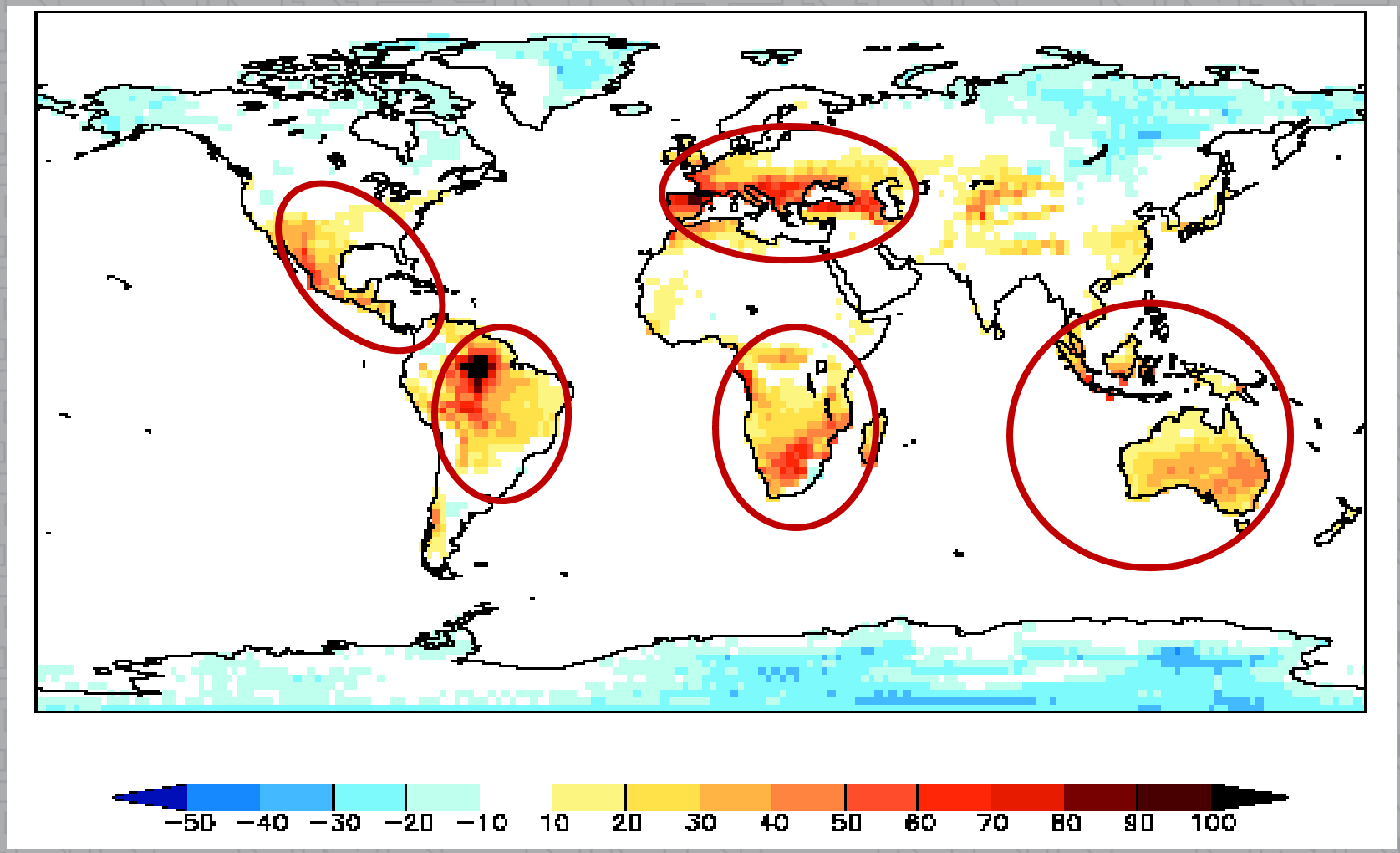


Droughts

. . . . along with heat waves, snow storms, etc.

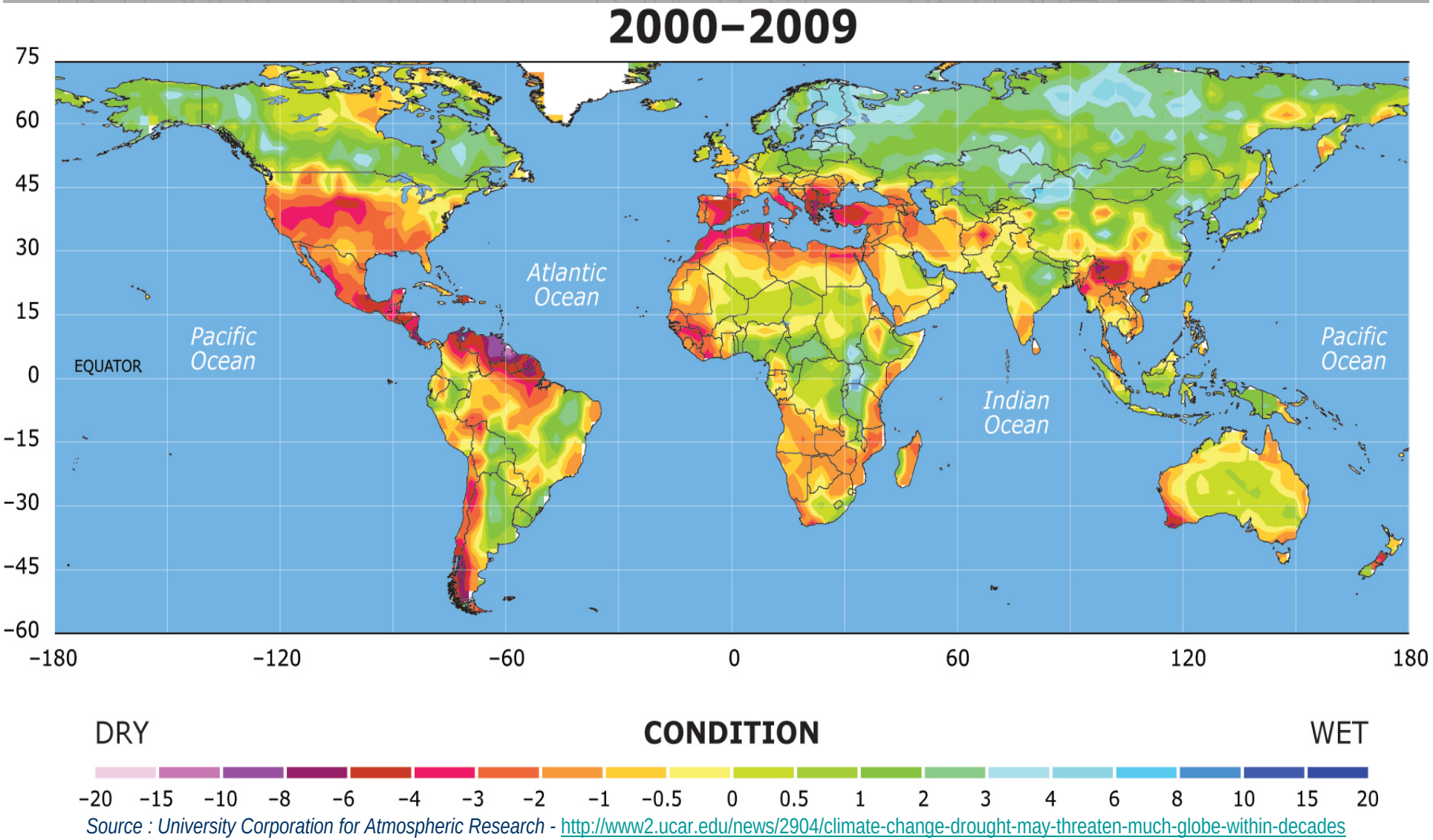
Where we're headed: Droughts

Drought projections for IPCC's A1B scenario



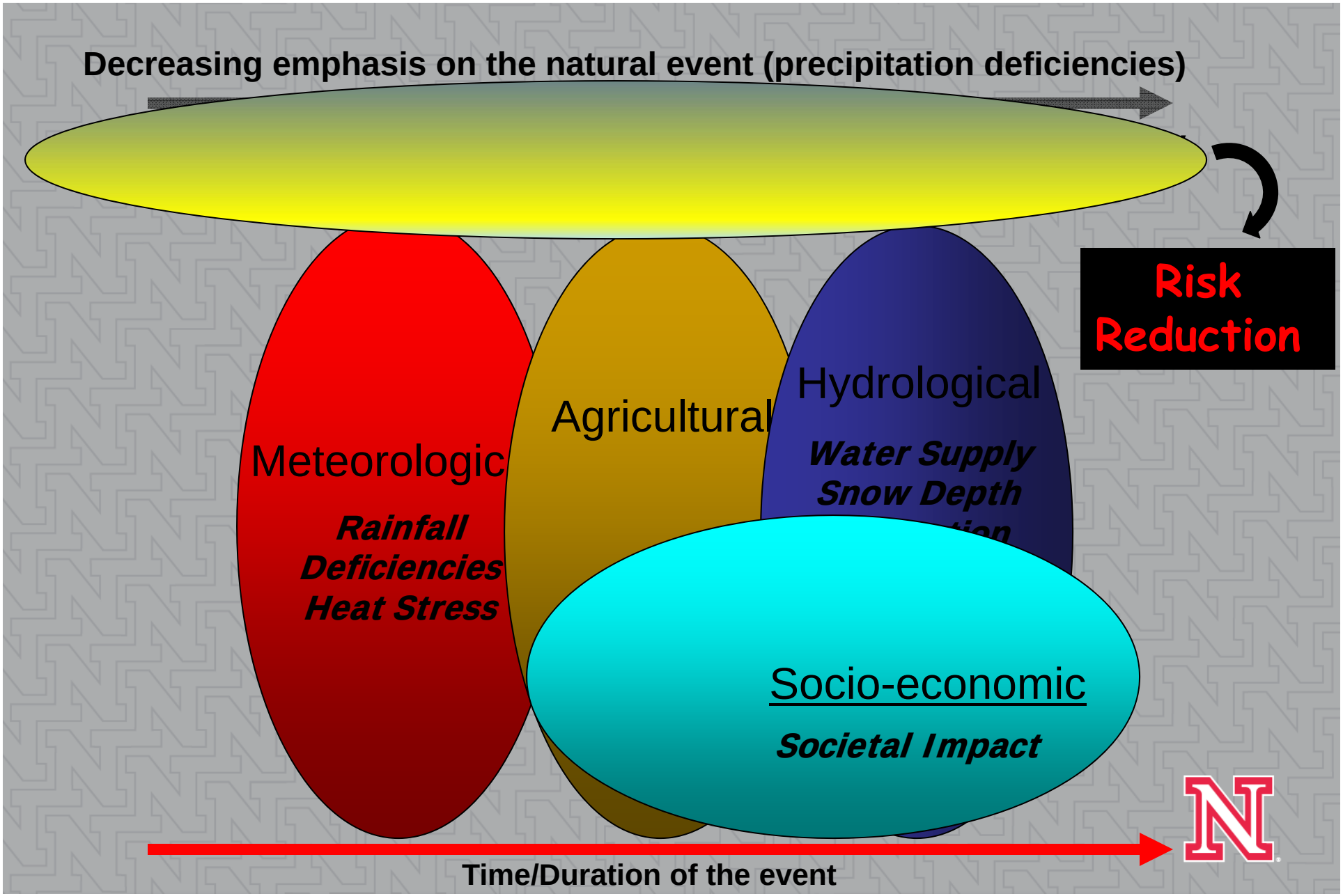
Percentage change in average duration of longest dry period, 30-year average for 2071-2100 compared to that for 1961-1990.

Global Drought Potential, 2000-2098



Source : University Corporation for Atmospheric Research - http://www2.ucar.edu/news/2904/climate-change-drought-may-threaten-much-globe-within-decades

Natural and Social Dimensions of Drought



Hazard x Vulnerability = Risk

EXPOSURE

- Severity/Magnitude
  - Intensity/Duration
- Frequency
- Spatial extent
- Trends
  - Historical
  - Future
- Impacts
- Early warning

SOCIAL FACTORS

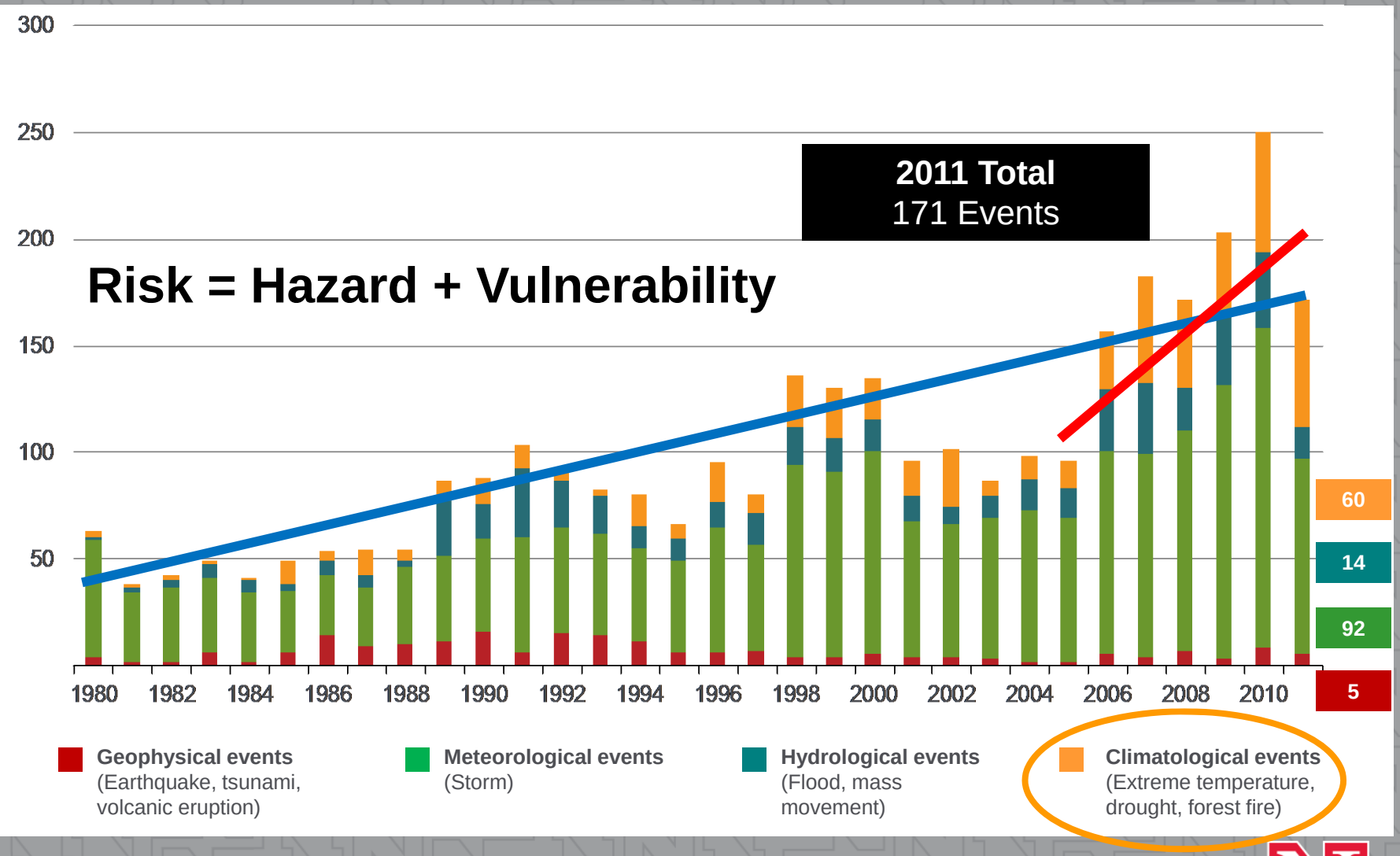
- Population growth
- Population shifts
- Urbanization
- Technology
- Land use changes
- Environmental Degradation
- Water use trends
- Government policies
- Environmental awareness

RISK

Widely adopted as the new paradigm for drought management.

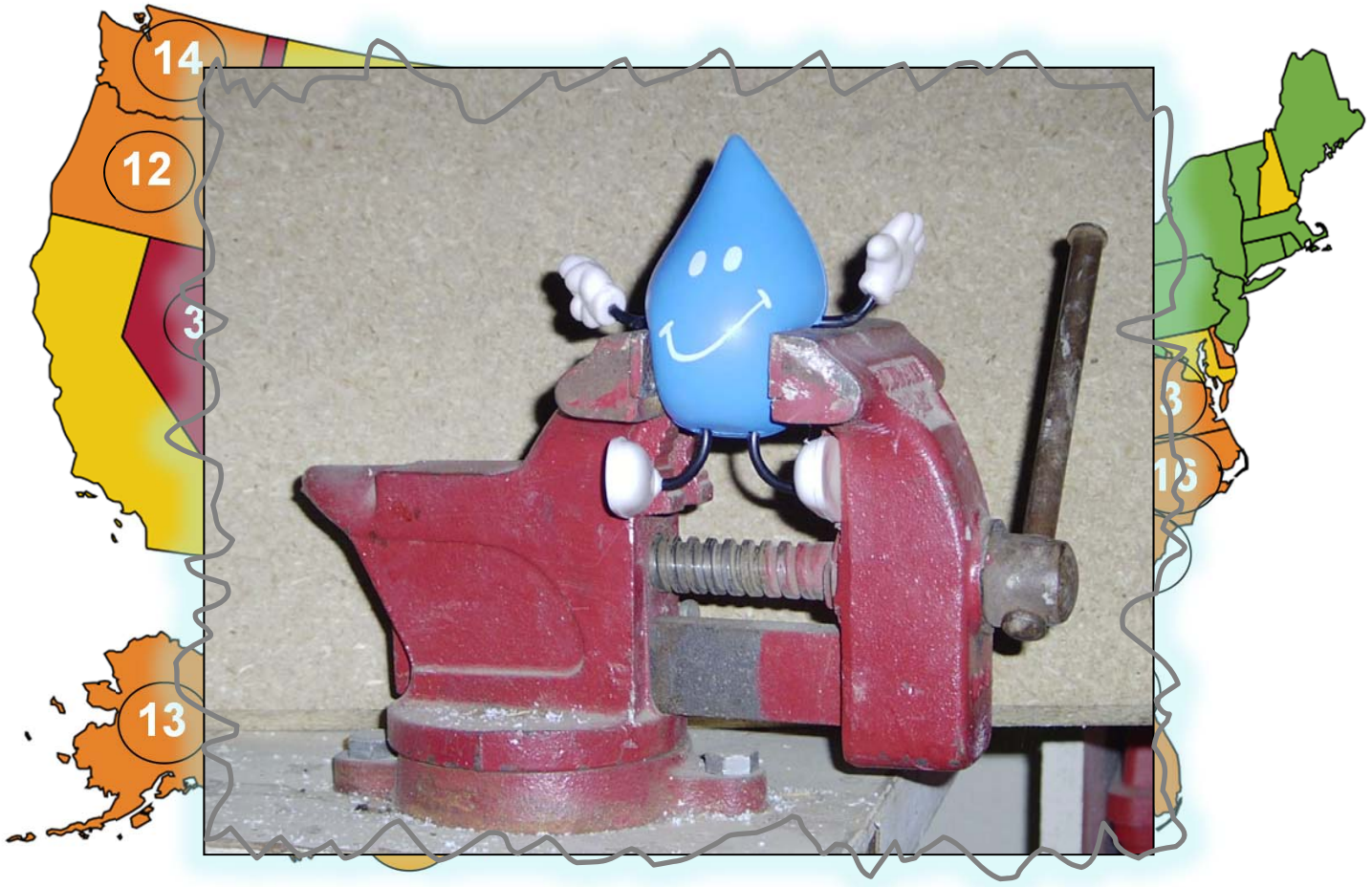
Natural Disasters in the U.S., 1980-2011

Number of Events, Annual Totals



Source: MR NatCat*SERVICE*

United States Population Growth
2000 to 2010



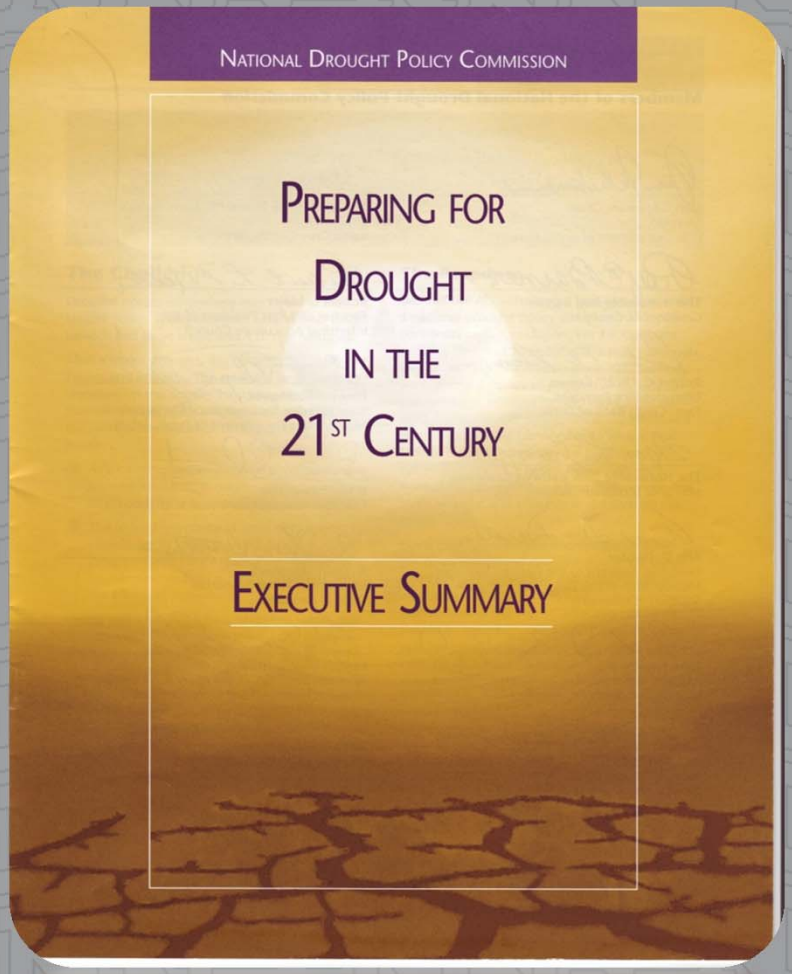
>20% >10% >5% >0% <0%

Key Elements of a Drought Mitigation Plan

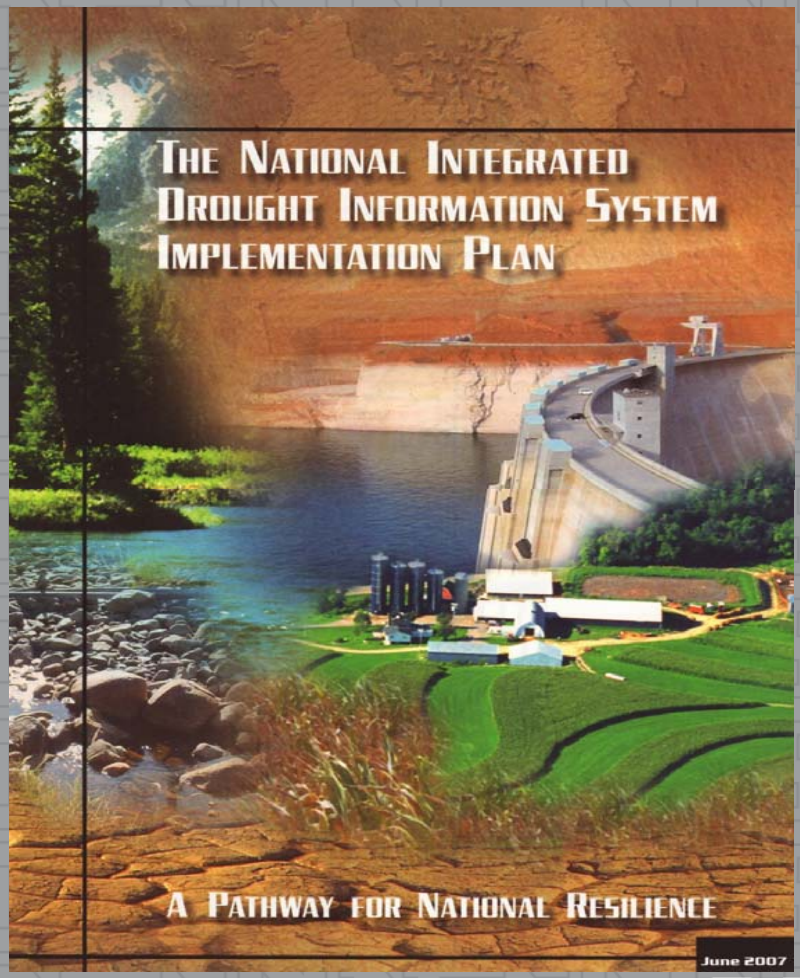
- **Monitoring, early warning and information delivery systems**
  - Integrated monitoring of key indicators
    - Precipitation, temperature, soil moisture, streamflow, snowpack, groundwater, etc.
  - Use of appropriate indices
  - Development/delivery of decision-support tools
- **Risk and impact assessment**
  - Conduct of risk/vulnerability assessments
  - Monitoring/archiving of impacts
- **Mitigation and response**
  - Proactive measures to increase coping capacity

Impact on U.S. National Drought Policy

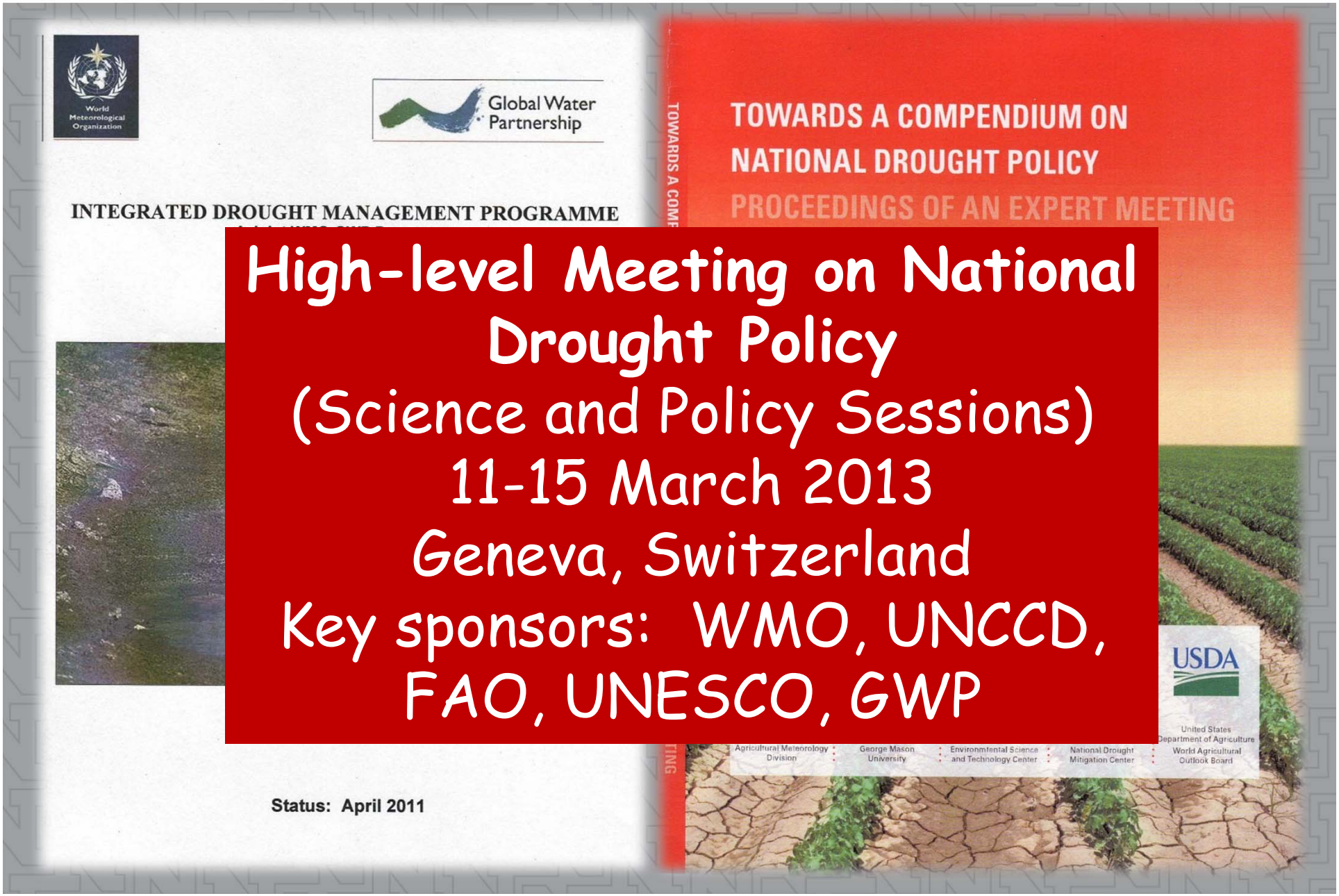
National Drought Policy Act, 1998



NIDIS, 2006



Global Initiatives—Drought Management



High-level Meeting on National Drought Policy
(Science and Policy Sessions)
11-15 March 2013
Geneva, Switzerland
Key sponsors: WMO, UNCCD, FAO, UNESCO, GWP

Takeaway Messages

- Climate is changing—climate state and climate variability.
- Extreme climate events are increasing in frequency globally, ***managing impacts critically important***.
- Improved management of climate variability today will lead to improved management of/adaptation to climate change.
- Drought preparedness planning, fully integrated with stakeholder participation, is critical to moving society from vulnerability to resilience.
- Drought preparedness planning must be integrated across spatial scales.
- Developing risk-based national drought policy '**guidelines**' are critical to reducing societal vulnerability.
- National and international initiatives are increasing momentum for changes in drought management.

Thanks for your attention!

School of Natural Resources
dwilhite2@unl.edu

University of Nebraska Lincoln