Managing Drought and Water Scarcity in Vulnerable Environments:

Creating a Roadmap for Change in the United States

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Drought doesn't get respect!

It's the Rodney Dangerfield of natural hazards!

- Drought commonly affects >30% of the nation
- Annual impacts $6-8 billion (FEMA; 1995 $$)
- Increasing vulnerability
- $30 billion in drought relief since 1988
- Crop insurance payments more than $10 billion from 1996-2005

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Mission: **To lessen societal vulnerability to drought by promoting planning and the adoption of appropriate risk management techniques.**

Conference Goals

- To create an integrated, interactive, future-oriented forum for understanding and improving our management of drought and water scarcity in the U.S.
- To stimulate national debate through the publication and wide distribution of a science- and policy-based discussion document, i.e. “Roadmap for Change.”

Participatory meeting

Engaging the broad range of stakeholders

- Plenary sessions
- World Café
- Breakout sessions
- Poster sessions
- Discussion/brainstorming sessions

Agriculture

- Livestock
- Range/pasture
- Row & specialty crops

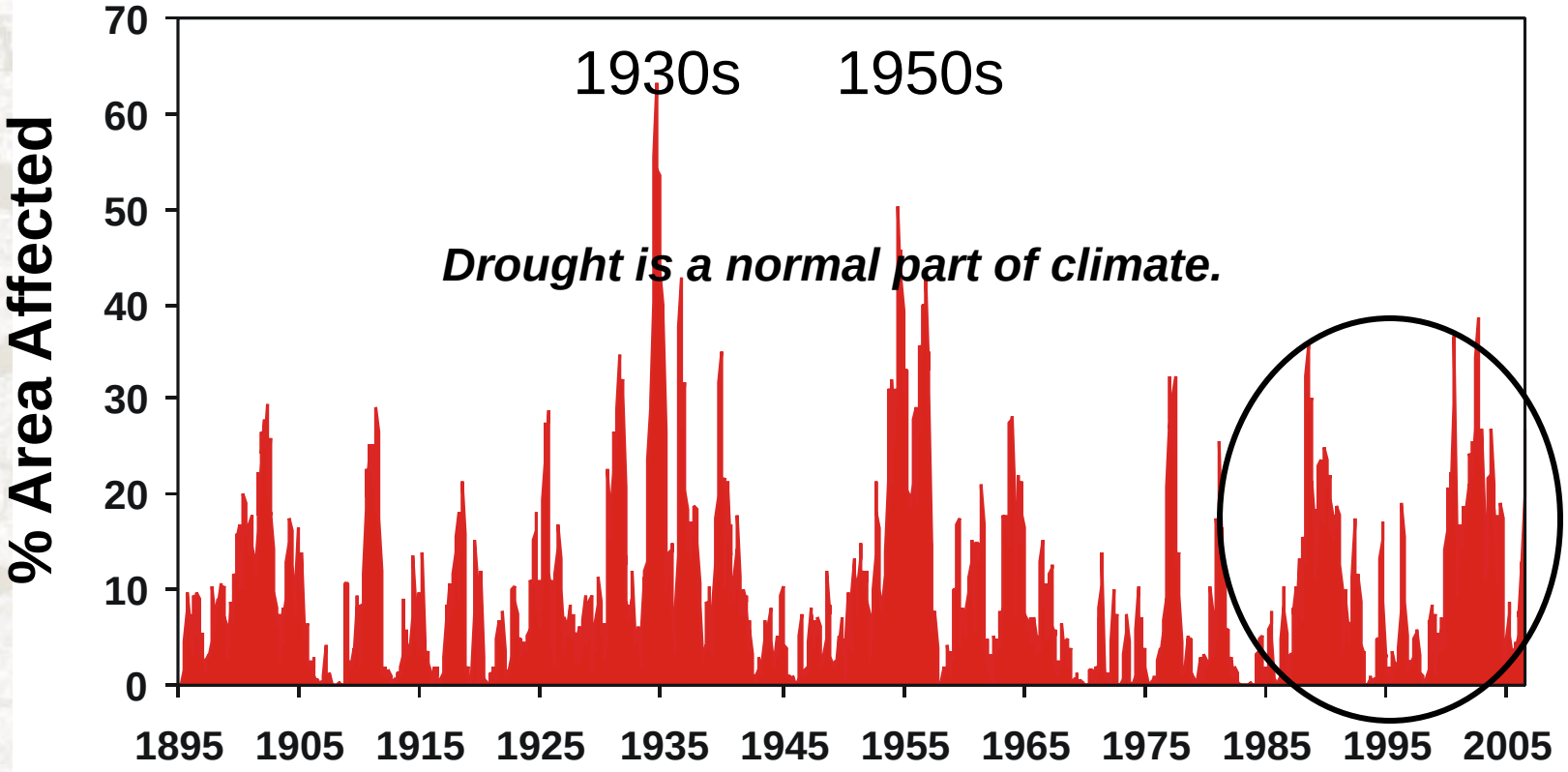
8. 13. 2002

SLOW
NO
WAKE

NO Water
NO Life!

Percent Area of the United States in Severe and Extreme Drought

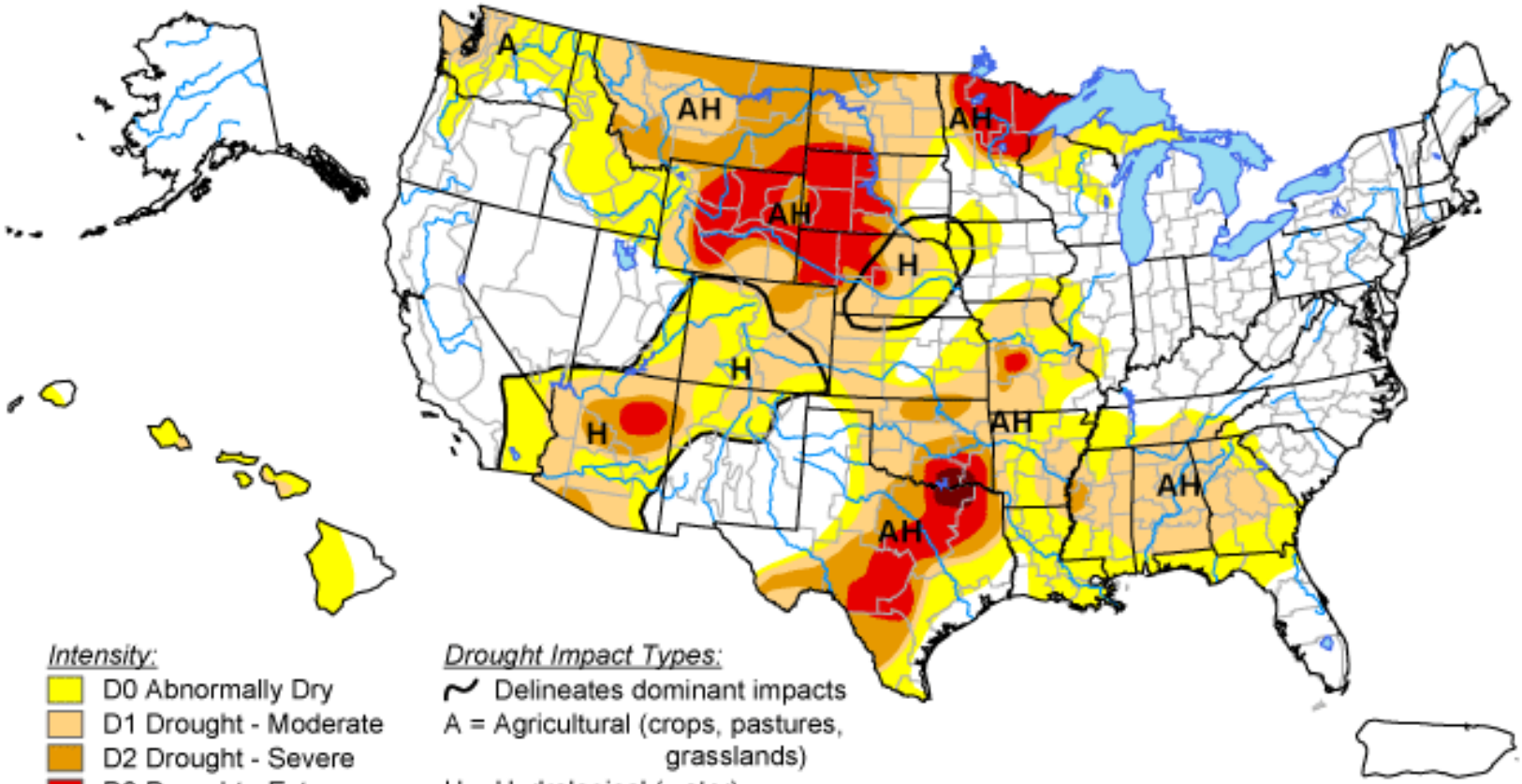
January 1895–June 2006



Based on data from the National Climatic Data Center/NOAA

U.S. Drought Monitor

September 19, 2006
Valid 8 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
A = Agricultural (crops, pastures, grasslands)
H = Hydrological (water)

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

http://drought.unl.edu/dm

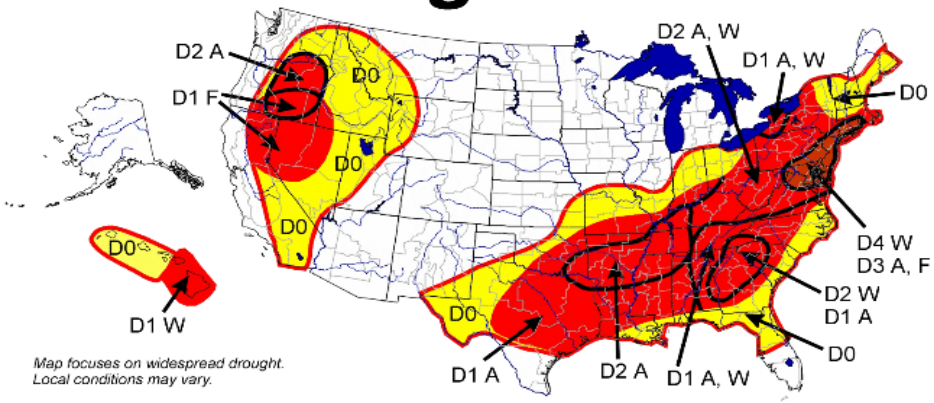
Released Thursday, September 21, 2006

Author: Ned Guttman/Liz Love-Brotak, NOAA/NESDIS/NCDC

National Drought Mitigation Center

August 24, 1999

U.S. Drought Monitor



Map focuses on widespread drought.
Local conditions may vary.

- D0 Watch
- D1 Drought
- D2 Drought–Severe
- D3 Drought–Extreme
- D4 Drought–Exceptional

Drought type: used only when impacts differ

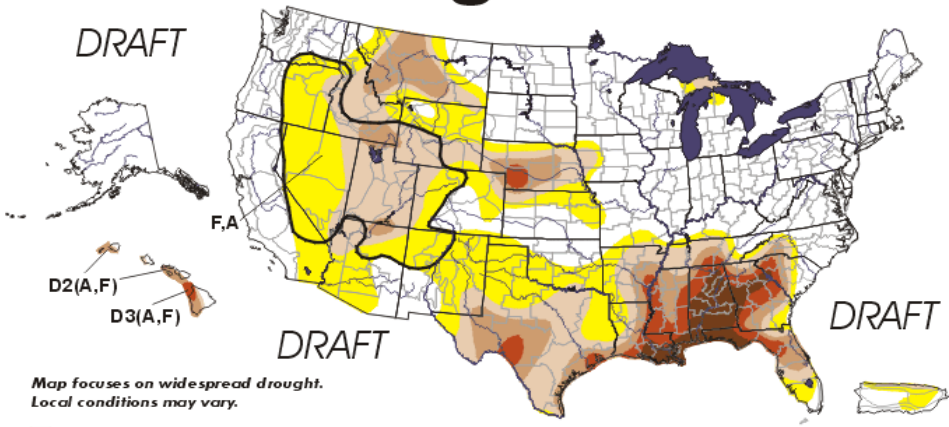
A = Agriculture
W = Water
F = Forest fire danger

Plus (+) = Forecast to intensify next two weeks
Minus (-) = Forecast to diminish next two weeks
No sign = No change in drought classification forecast

• *Updated every Thursday morning* •

August 29, 2000 Valid 8 a.m. EDT

U.S. Drought Monitor



Map focuses on widespread drought.
Local conditions may vary.

- D0 Abnormally Dry
- D1 Drought–First Stage
- D2 Drought–Severe
- D3 Drought–Extreme
- D4 Drought–Exceptional
- Delineates Overlapping Areas

Drought type: used only when impacts differ

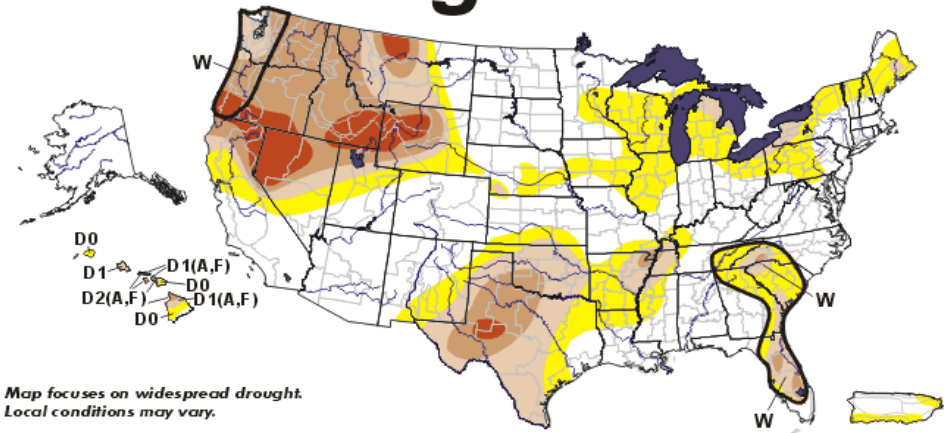
A = Agriculture
W = Water
F = Wildfire danger

See accompanying text summary for forecast statements

• *Released Thursday, August 31, 2000* •

July 31, 2001 Valid 8 a.m. EDT

U.S. Drought Monitor



Map focuses on widespread drought.
Local conditions may vary.

- D0 Abnormally Dry
- D1 Drought–Moderate
- D2 Drought–Severe
- D3 Drought–Extreme
- D4 Drought–Exceptional
- Delineates Overlapping Areas

Drought Impact Types:
A = Agriculture
W = Water (Hydrological)
F = Fire danger (Wildfires)
(No type = All 3 impacts)

See accompanying text summary for forecast statements

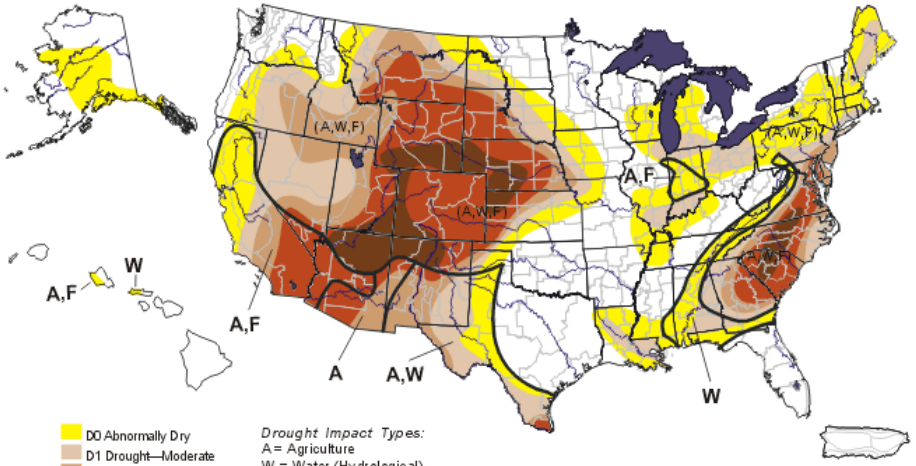
http://enso.unl.edu/monitor/monitor.html

• *Released Thursday, August 2, 2001* •

Author: *Michael Hayes, NDMC*

U.S. Drought Monitor

July 30, 2002
Valid 8 a.m. EDT



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

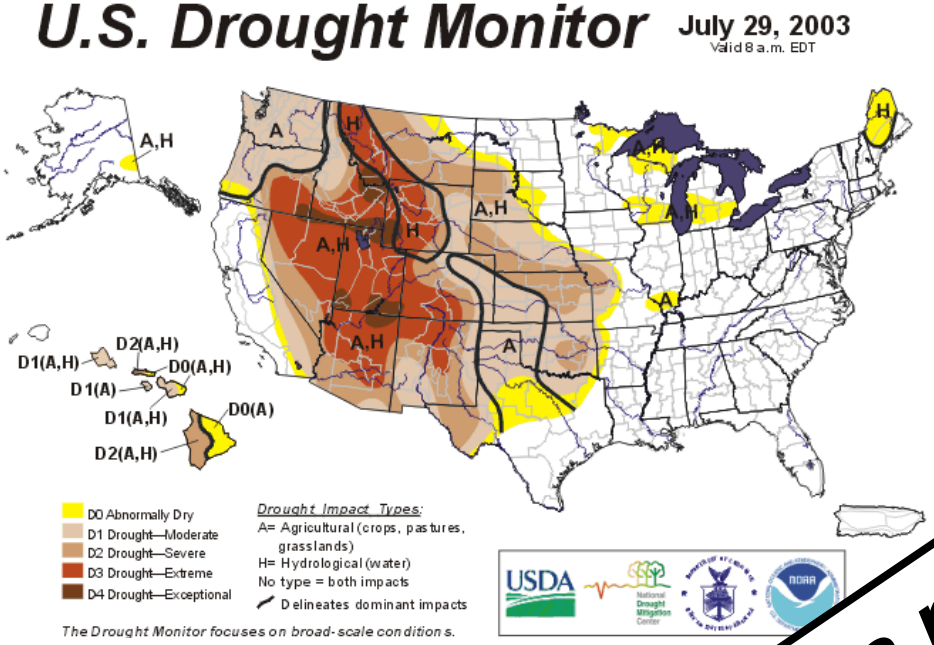
Drought Impact Types:
A = Agriculture
W = Water (Hydrological)
F = Fire danger (Wildfires)
Delineates dominant impacts
(No type = All 3 impacts)

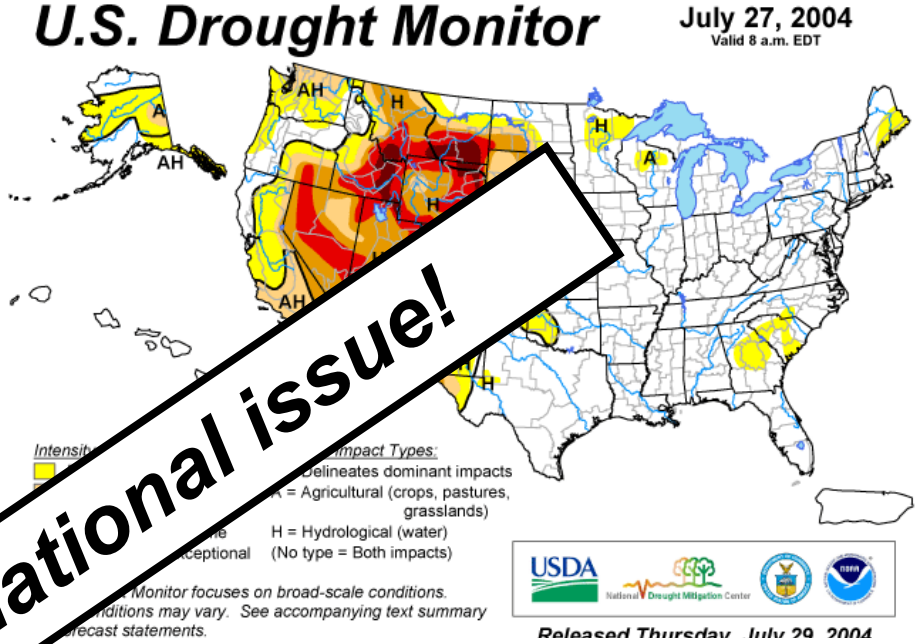
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

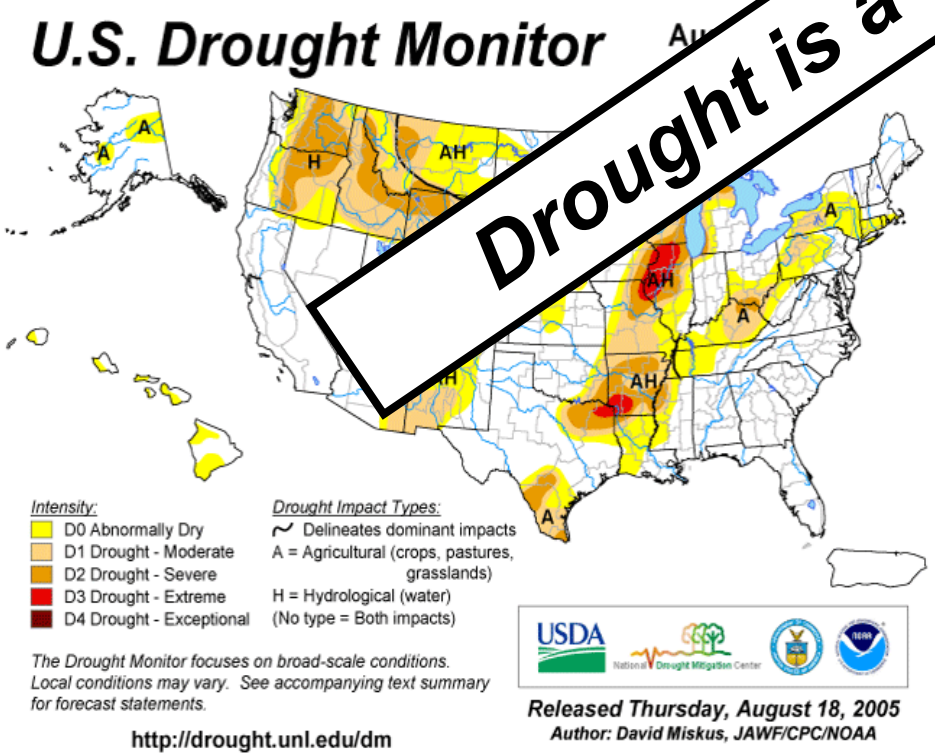
http://drought.unl.edu/dm

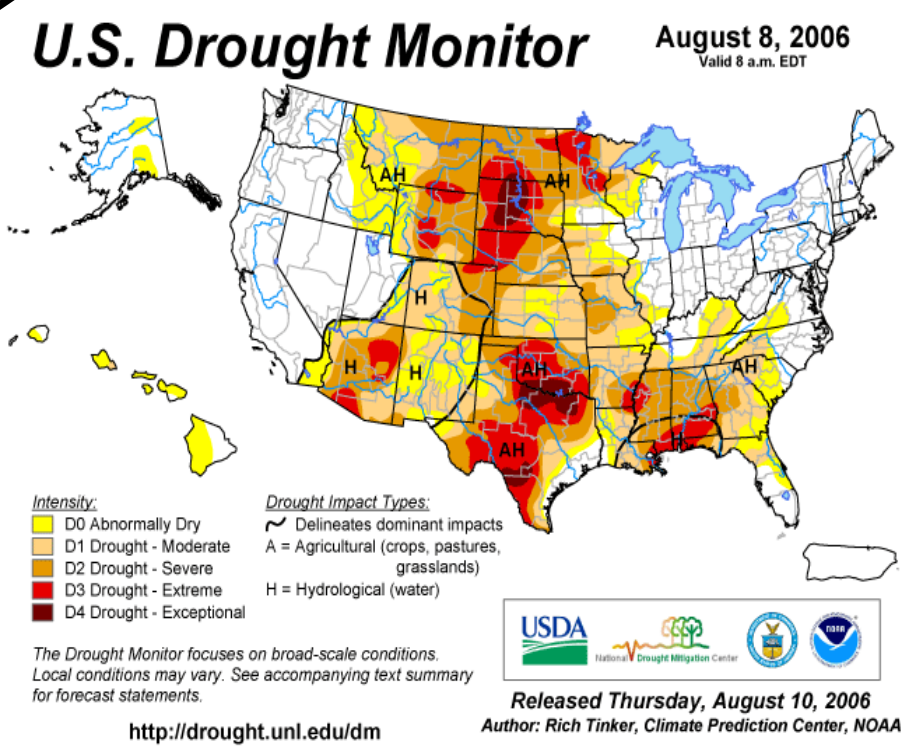
Released Thursday, August 1, 2002
Author: *Rich Tinker, CPC/NWS/NOAA*

Drought is a national issue!

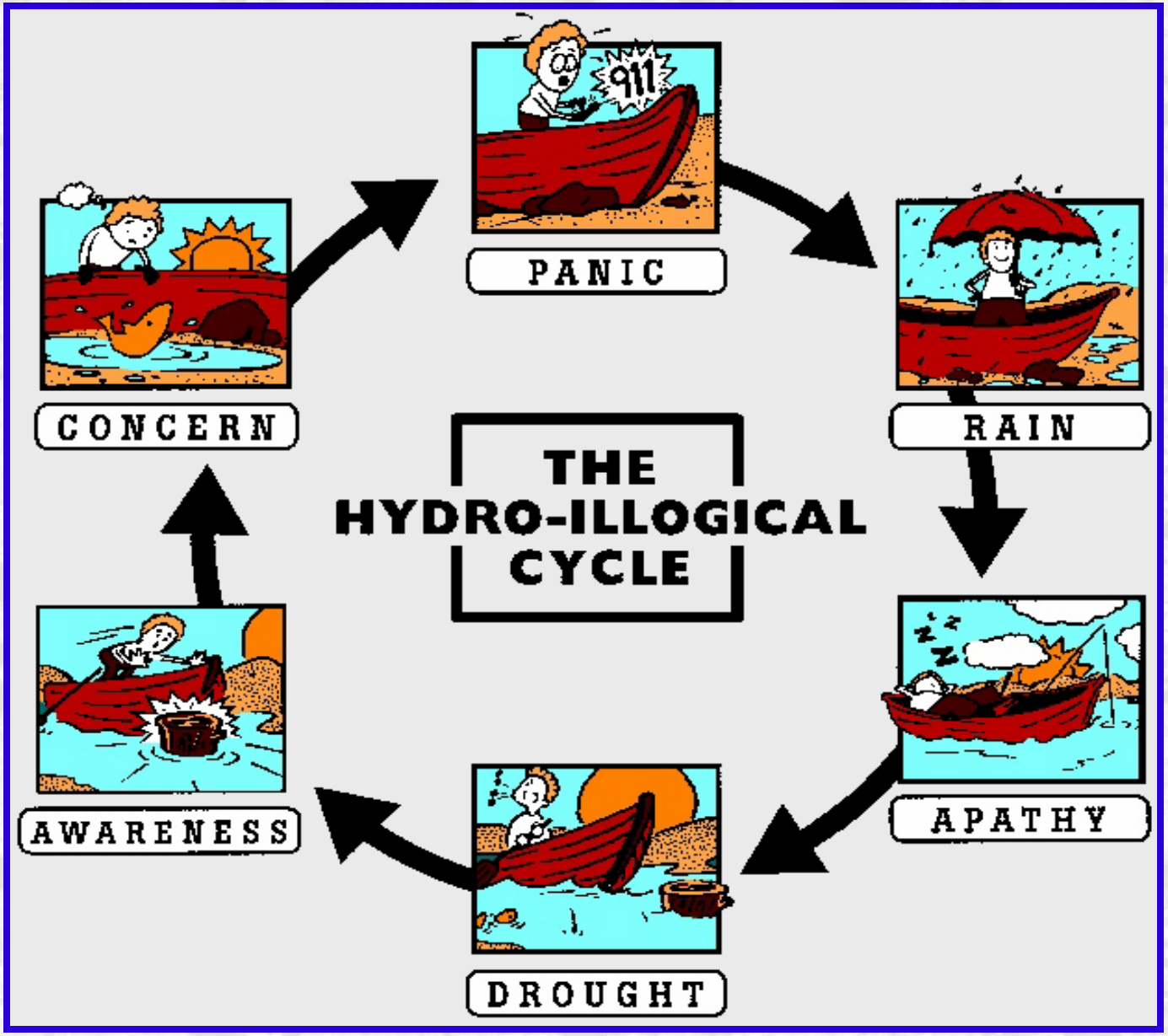








Crisis Management



How do we move from
Crisis to Risk Management?

Components of Drought Risk Management

Risk = Hazard x Vulnerability

(natural event) (social factors)

Meteorological Drought

Exposure (Static or Dynamic?)

Static or Dynamic?

What are the ‘takeaway’ messages from the conference?

‘Takeaway’ message #1

- Increase understanding of the ‘drought hazard’ and how it may be changing in frequency, severity, and duration
  - Improve monitoring/early warning and seasonal forecasts
    - NIDIS (HR 5136/S 2751)
  - Increase understanding of the causes of drought
  - Incorporate knowledge of paleoclimates in assessments of risk and planning decisions
  - Incorporate projections of climate change in assessment of risk and planning decisions

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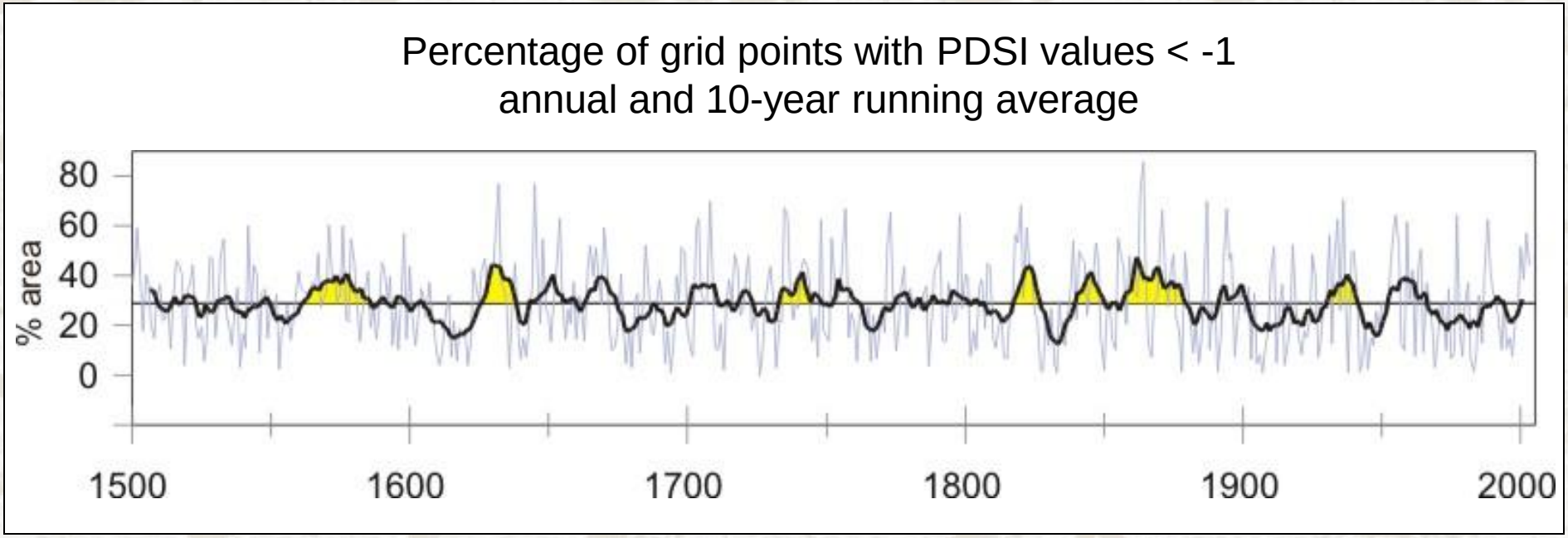
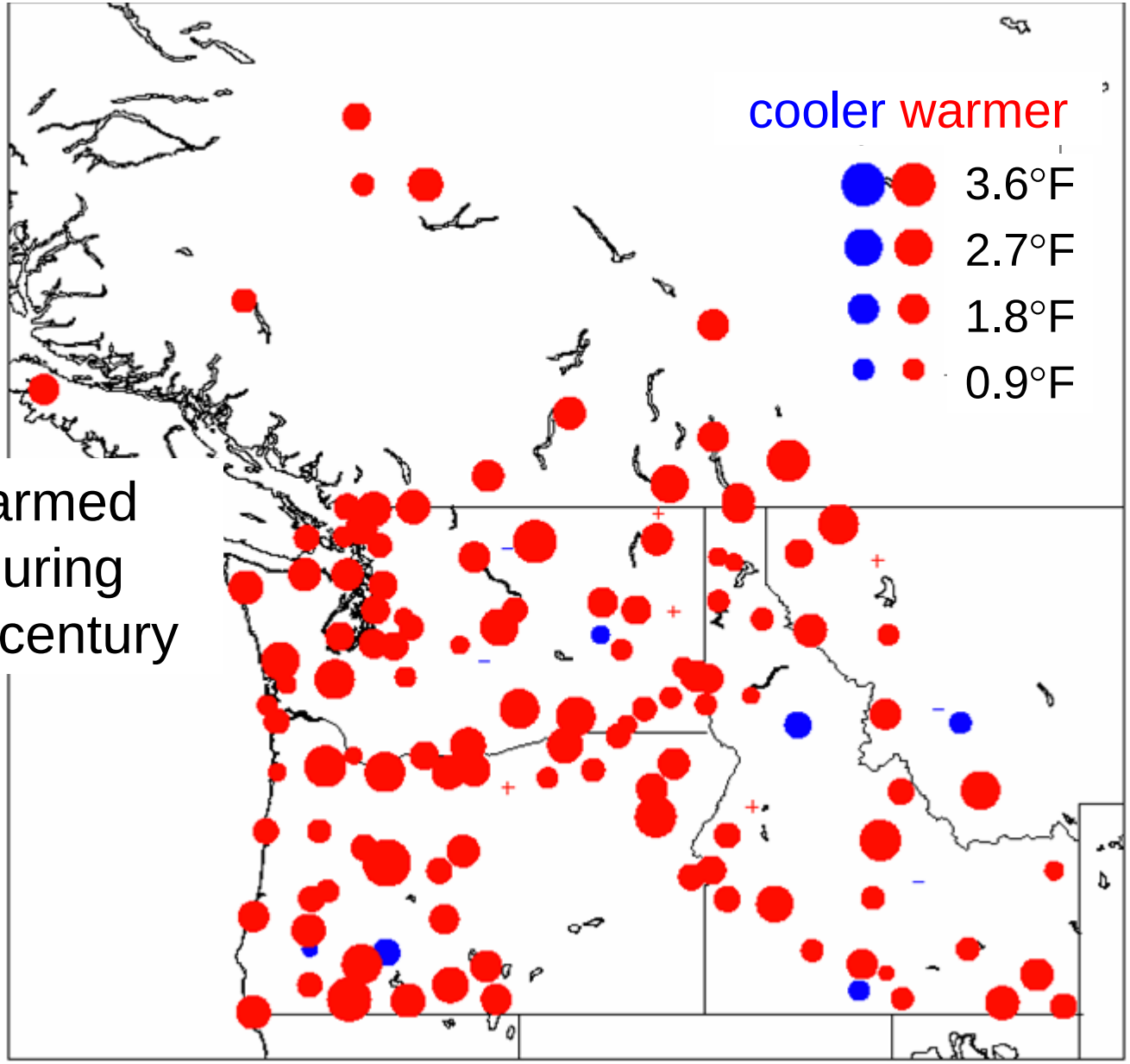
When duration of continental-scale drought is considered, a number of periods in the past show more persistent, widespread drought conditions.



Ranked non-overlapping 10-year periods with largest area under PDSI < -1

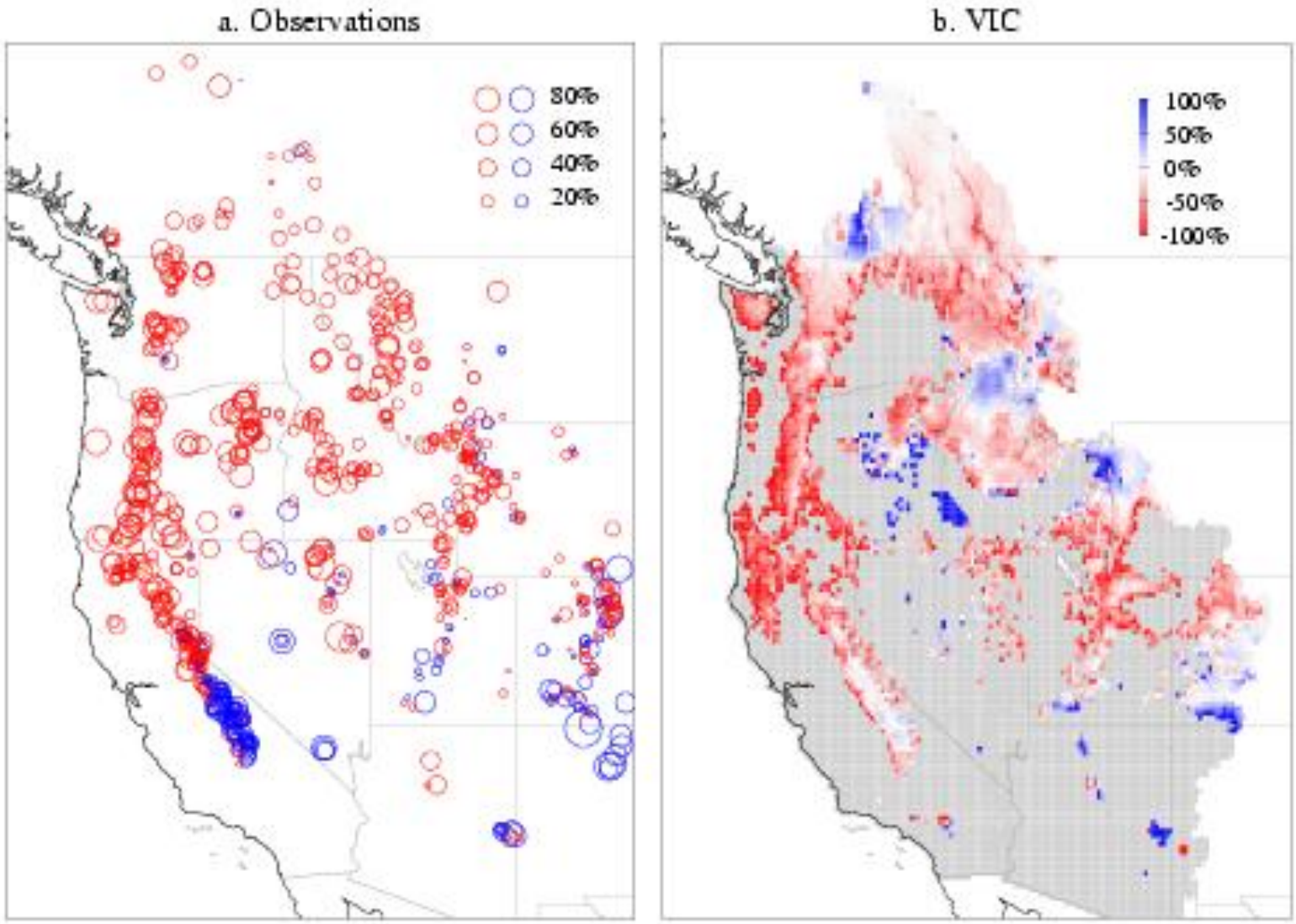
1	1855-1864
2	1623-1632
3	1816-1825
4	1839-1848
5	1735-1744
6	1571-1580
7	1931-1940

Temperature trends (°F per century) since 1920



PNW warmed **+1.5 F** during the 20th century

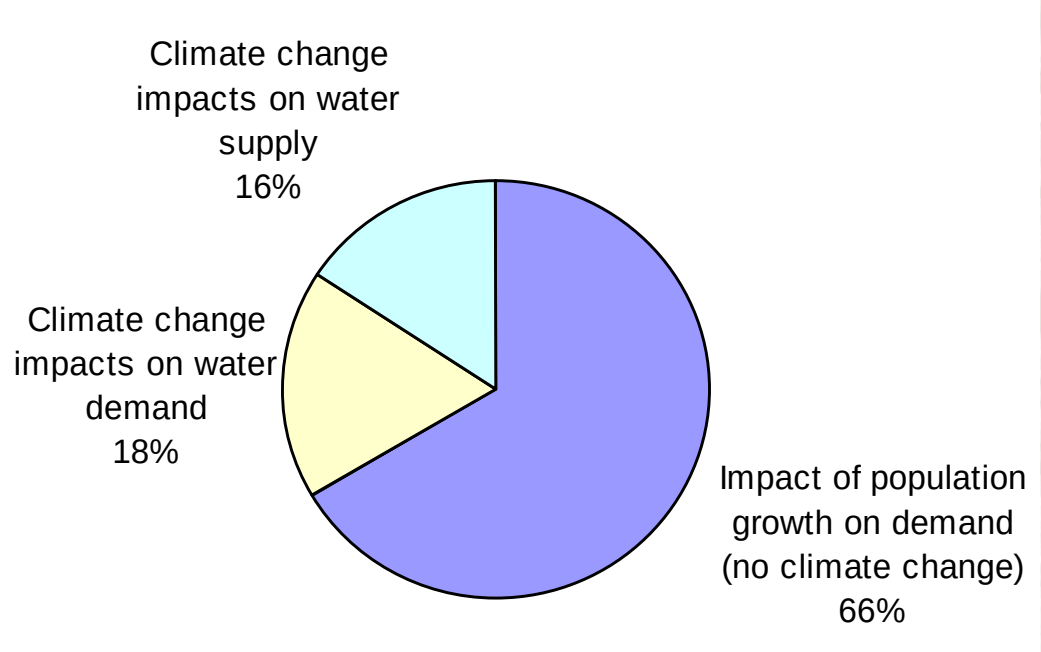
Trends in April 1 SWE 1950-1997



Mote P.W.,Hamlet A.F., Clark M.P., Lettenmaier D.P., 2005, Declining mountain snowpack in western North America, BAMS, 86 (1): 39-49

Portland, Oregon

- Portland's water needs by 2040 will increase by 60 mgd, 40 mgd from regional growth; 20 mgd from climate change impacts.



‘Takeaway’ message #2

- Improve our understanding of how societal vulnerability to drought is changing.
- Factors influencing societal vulnerability
  - Population growth/changes/migration
  - Urbanization
  - Land use changes
  - Environmental values/awareness
  - Environmental degradation
  - Government policies
  - Technology

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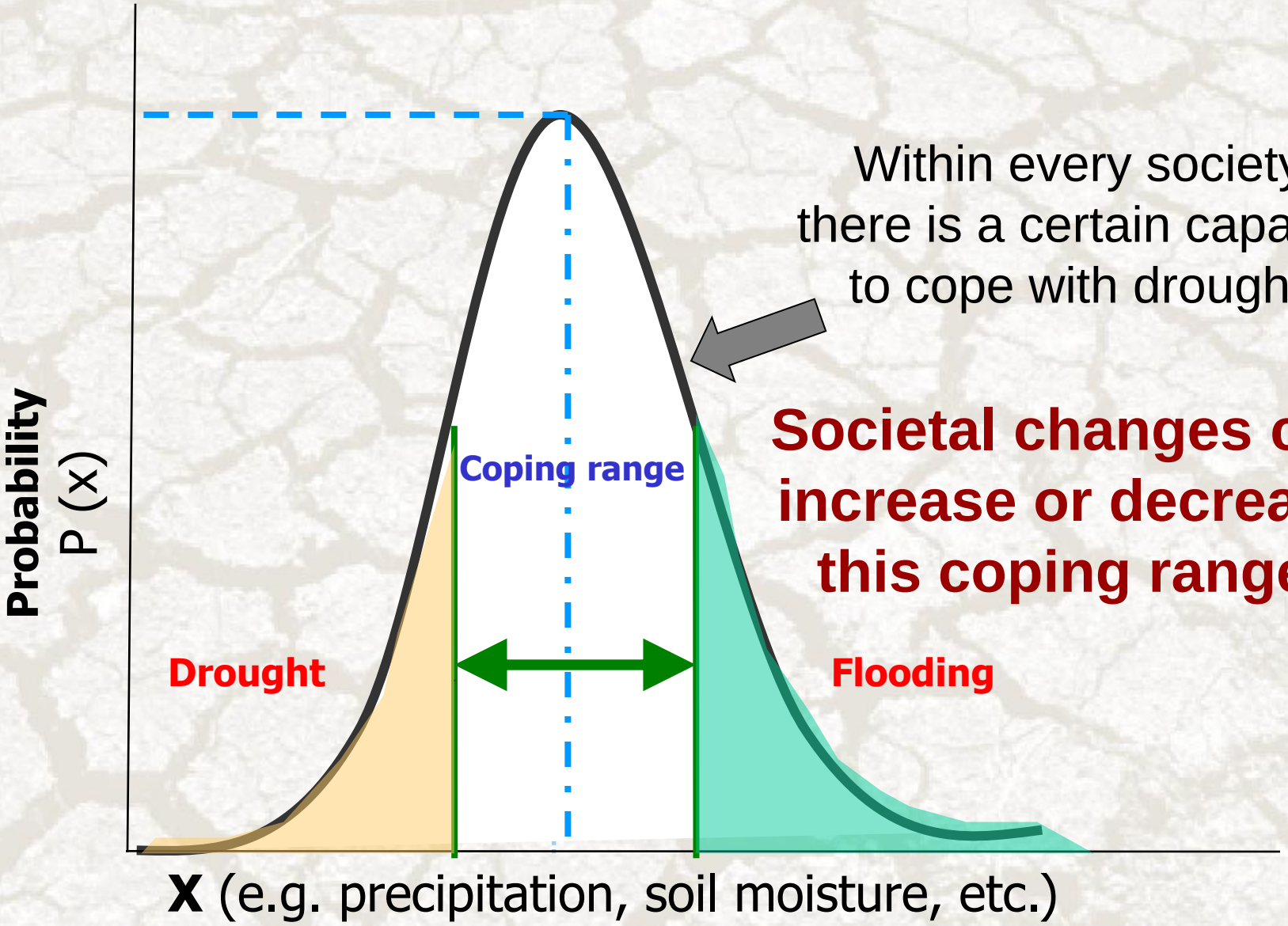
Drought vulnerability is a variable.



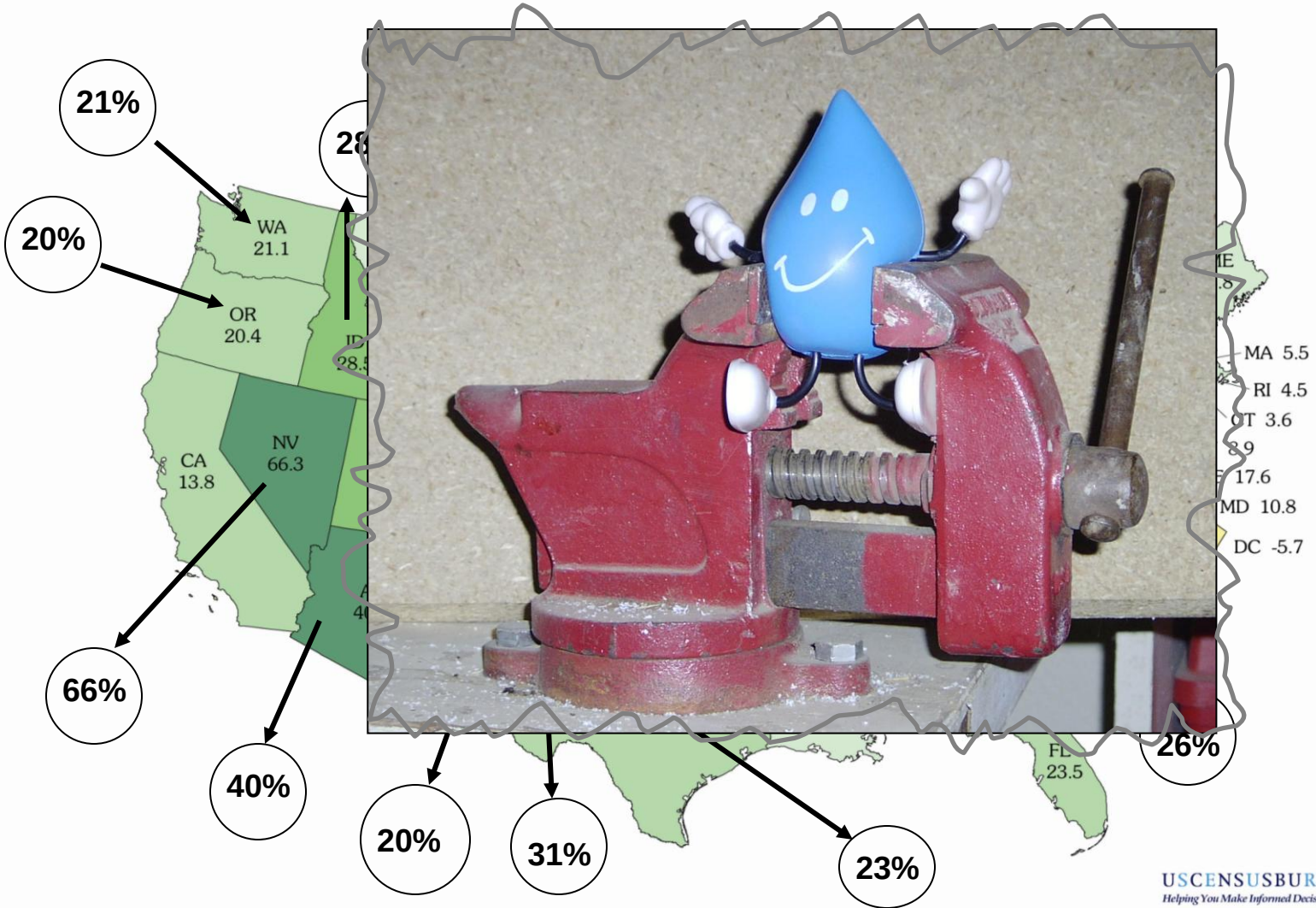
Within every society, there is a certain capacity to cope with drought.

Societal changes can increase or decrease this coping range.

Adapted from work by Barry Smit, University of Guelph

Demographic Changes: Population Has Grown Fastest in the West, Particularly in the "Public Land States"

Percent Change in Resident Population for the 48 States and the District of Columbia: 1990 to 2000



- Darker areas denote faster growth rates.

- Nevada (66%) and Arizona (40%) lead the nation.

- Intermountain states average about 30%.

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Helping You Make Informed Decisions

‘Takeaway’ message #3

- Place more emphasis on managing the risks associated with drought.
  - Improve planning and preparedness (all levels)
  - Shift resources from relief to improved monitoring/early warning, preparedness, and mitigation
  - More than $30 billion provided for drought relief since 1988
    - Relief rewards the lack of planning
    - Reinforces *status quo* for resource management
    - Must be a gradual transition to risk-based management

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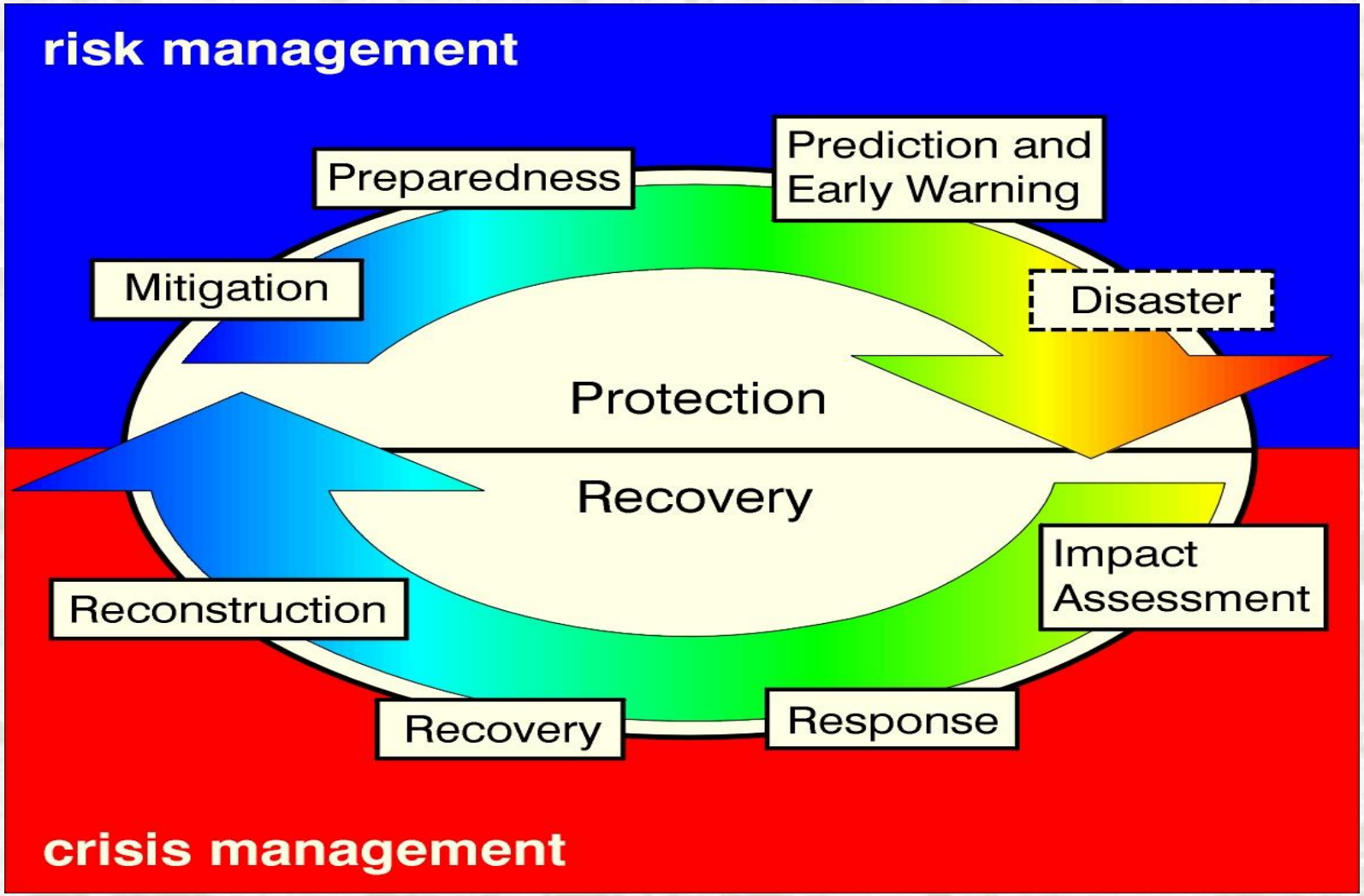
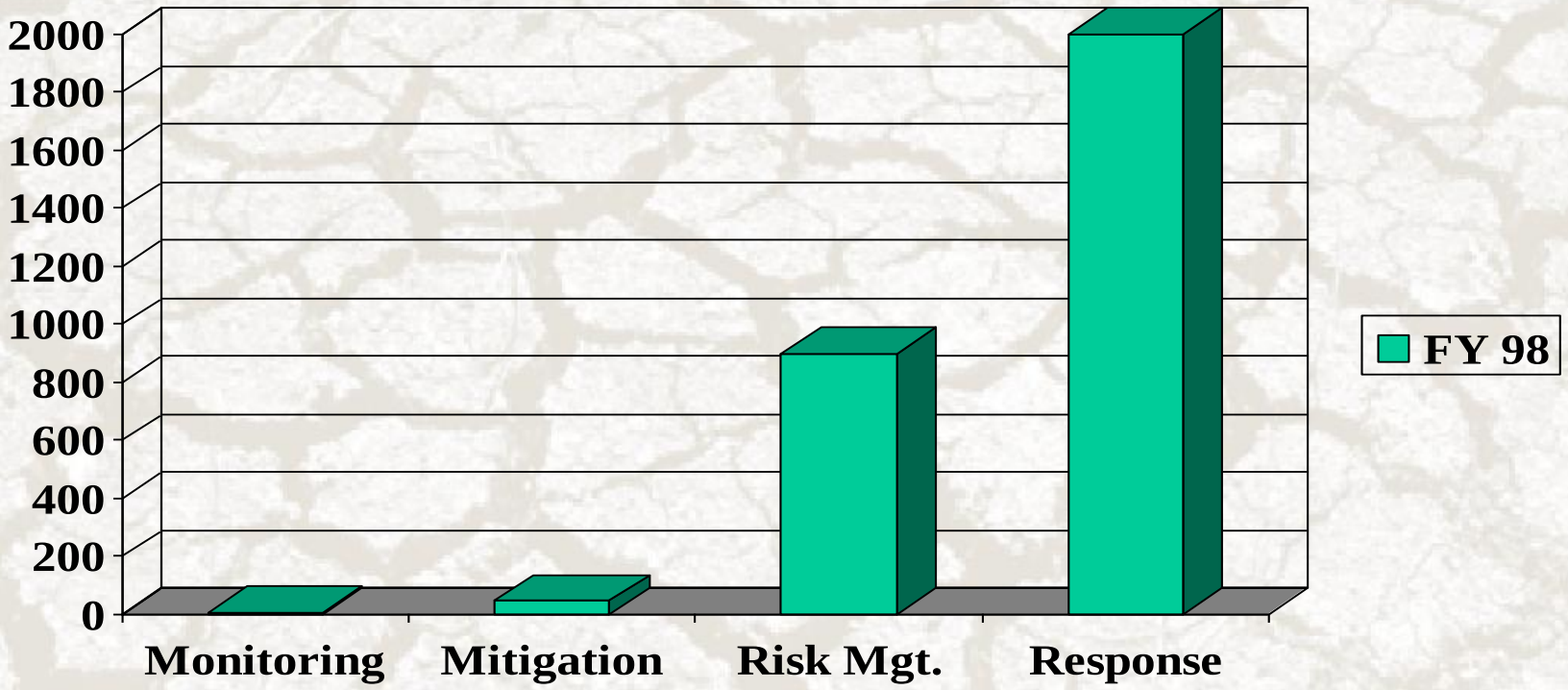
The Cycle of Disaster Management



USDA Drought Expenditures

FY 1998



‘Takeaway’ message #4

- Improve our assessment of the broad range of drought impacts.
  - No systematic assessment of impacts
  - No standardized impact assessment methodology
  - Economic impact assessment largely confined to agriculture; no assessment of social or environmental losses
- Mitigation vs. relief
    - For every $ invested in mitigation, $4 are saved in reduced impacts
    - Reduced need for government intervention in the form of drought relief

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‘Takeaway’ message #5

- Develop a national drought policy that outlines the principles for reducing societal vulnerability to drought.
  - Monitoring/early warning/prediction
  - Risk assessment
  - Planning and preparedness at all levels
    - Local, state, tribal, national
  - Improve coordination within and between levels of government
  - **GAO recommended a national drought plan in 1980**

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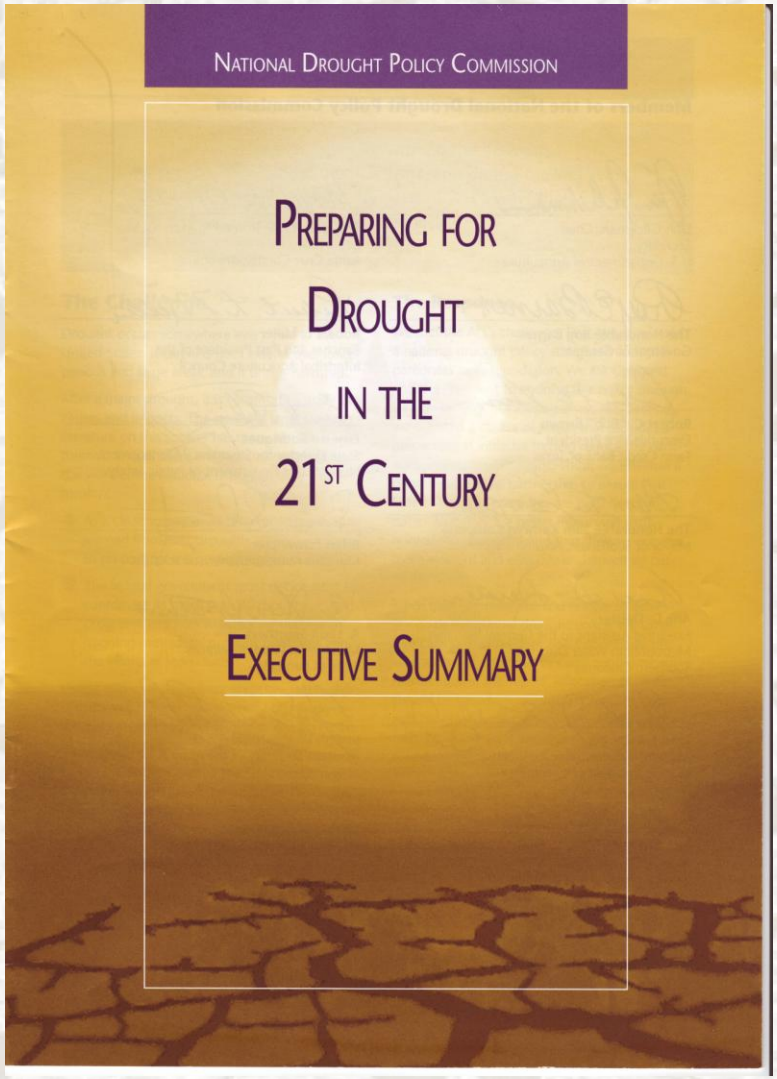
Guiding Principles of Drought Policy



Favor preparedness over insurance, insurance over relief, and incentives over regulation

Set research priorities based on potential to reduce impacts

Coordinate delivery of federal services through cooperation and collaboration with non-Federal entities

(National Drought Policy Commission, 2000)

‘Takeaway’ message #6

- Create a new ‘National Water Culture’
  - Underpinned by additional drought research, improved monitoring, mitigation, and preparedness
  - Build awareness/Education
  - Change legal and economic policies and institutions
  - Promote sustainable water management practices

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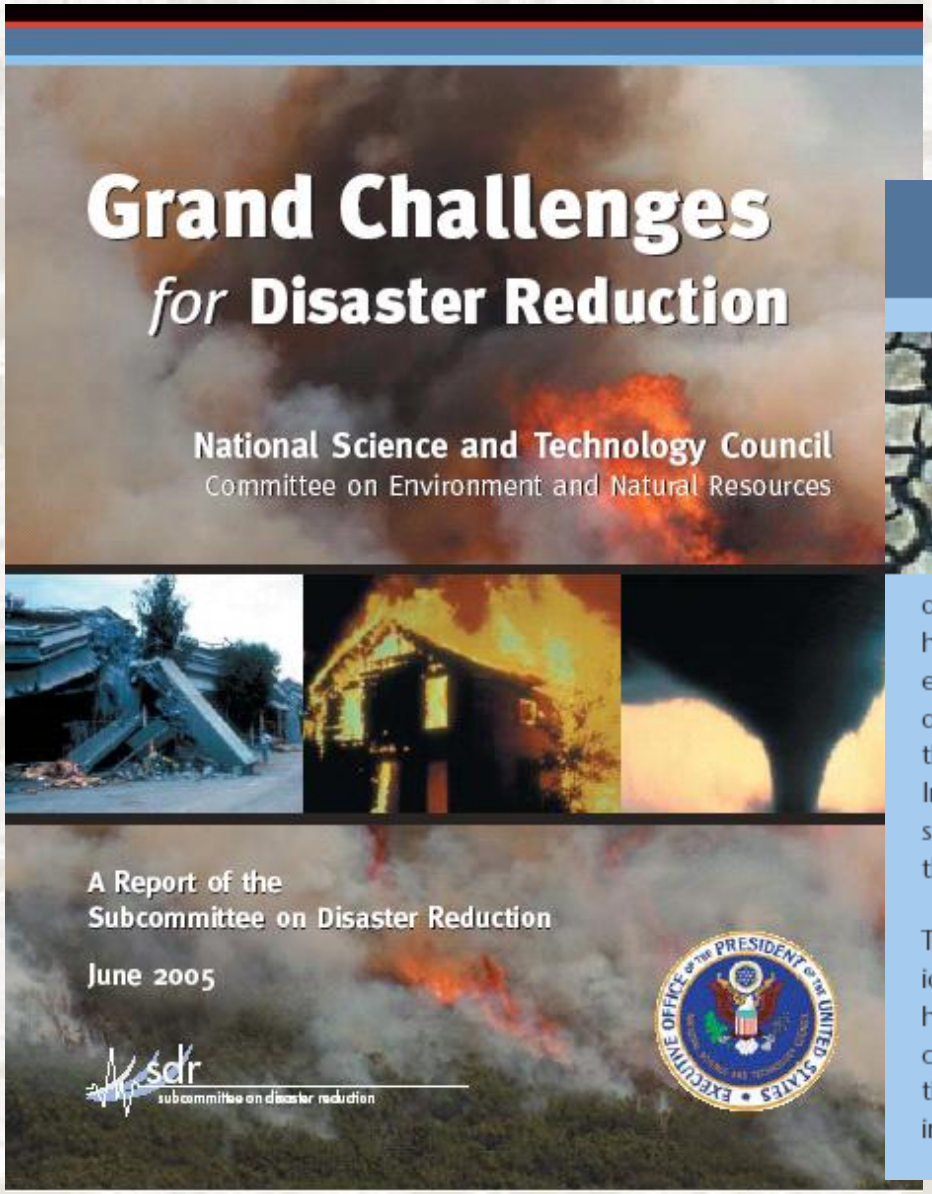
Subcommittee on Disaster Reduction



Disaster Profile: Drought

Drought is a persistent and abnormal moisture deficiency, having adverse effects on vegetation, animals, or people. Slow-onset, non-structural impacts and lack of a uniform definition make drought a unique natural hazard. Compared to all natural hazards, droughts are, on average, the leading cause of economic losses. The estimated cost of the 1988–1989 drought was $39 billion nationwide and was, at the time, the greatest single year hazard-related loss ever recorded.[21] In 2004, many Western states experienced their fifth consecutive year of drought and one of the worst droughts of the past century.

The slow onset of drought over space and time can only be identified through the continuous collection of climate and hyrodologic data. To enhance decisions and minimize costs, drought warning systems must provide credible and timely drought risk information including drought monitoring and prediction products.

Where do we go from here?

- Transcribe the notes/contributions from participants and speakers
- Finalize outline the ‘Roadmap for Change’
- Prepare document
- Distribute to Congress, OSTP, federal agencies, governors, state legislatures and stakeholders (Spring, 2007)

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Thanks!

Visit the NDMC

drought.unl.edu

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