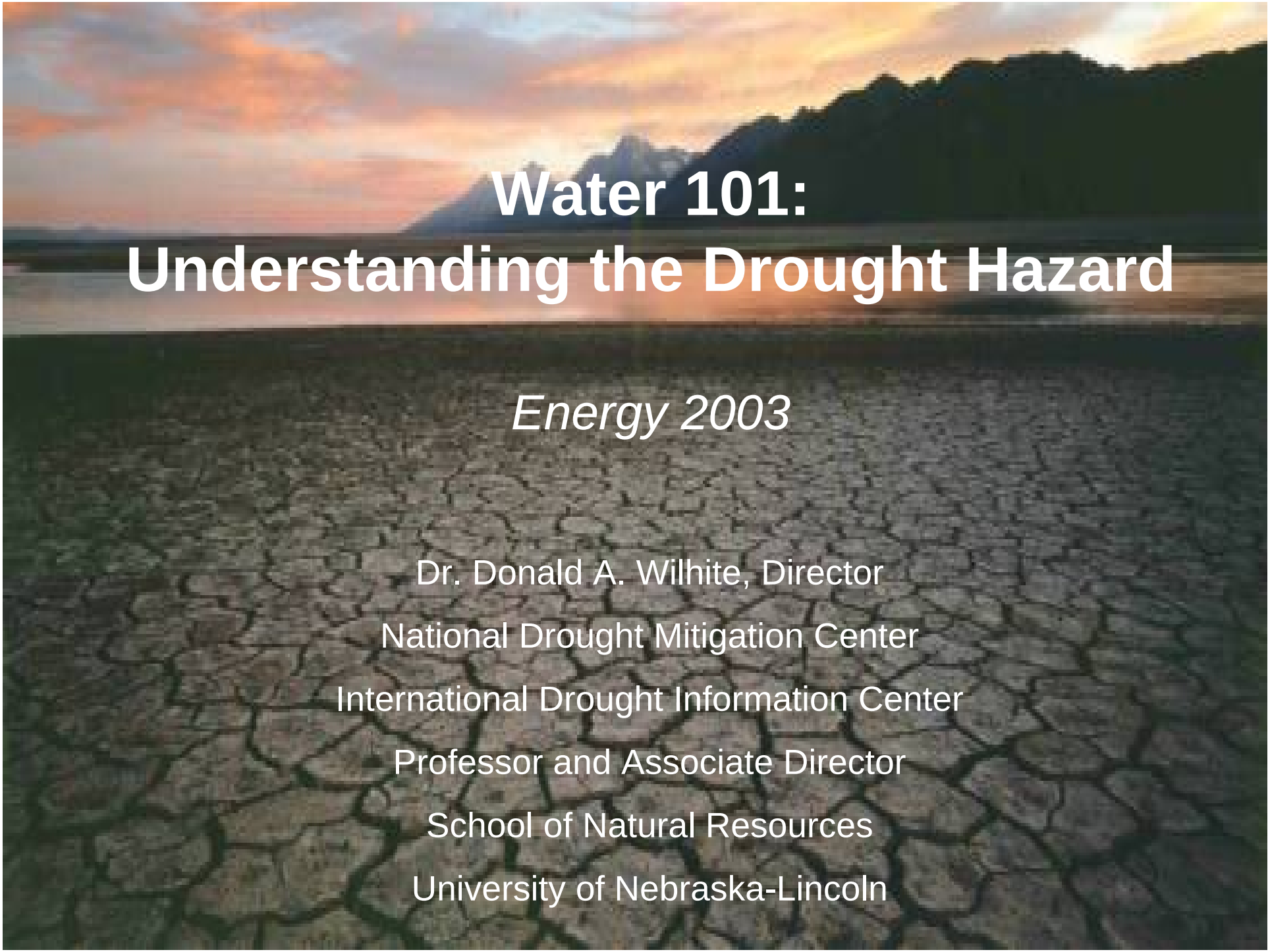

Water 101:
Understanding the Drought Hazard

Energy 2003

Dr. Donald A. Wilhite, Director

National Drought Mitigation Center

International Drought Information Center

Professor and Associate Director

School of Natural Resources

University of Nebraska-Lincoln

Presentation Outline

- Drought Concepts and Status
- Crisis vs. Risk Management
  - Hazard
  - Vulnerability
- National Drought Mitigation Center
  - Mission and Activities
- Drought Planning and Policy
  - Status
  - National Drought Preparedness Act of 2003
- Conclusions

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Drought: a deficiency of precipitation from expected or "normal" that, when extended over a season or longer period of time, is insufficient to meet the demands of human activities and the environment.

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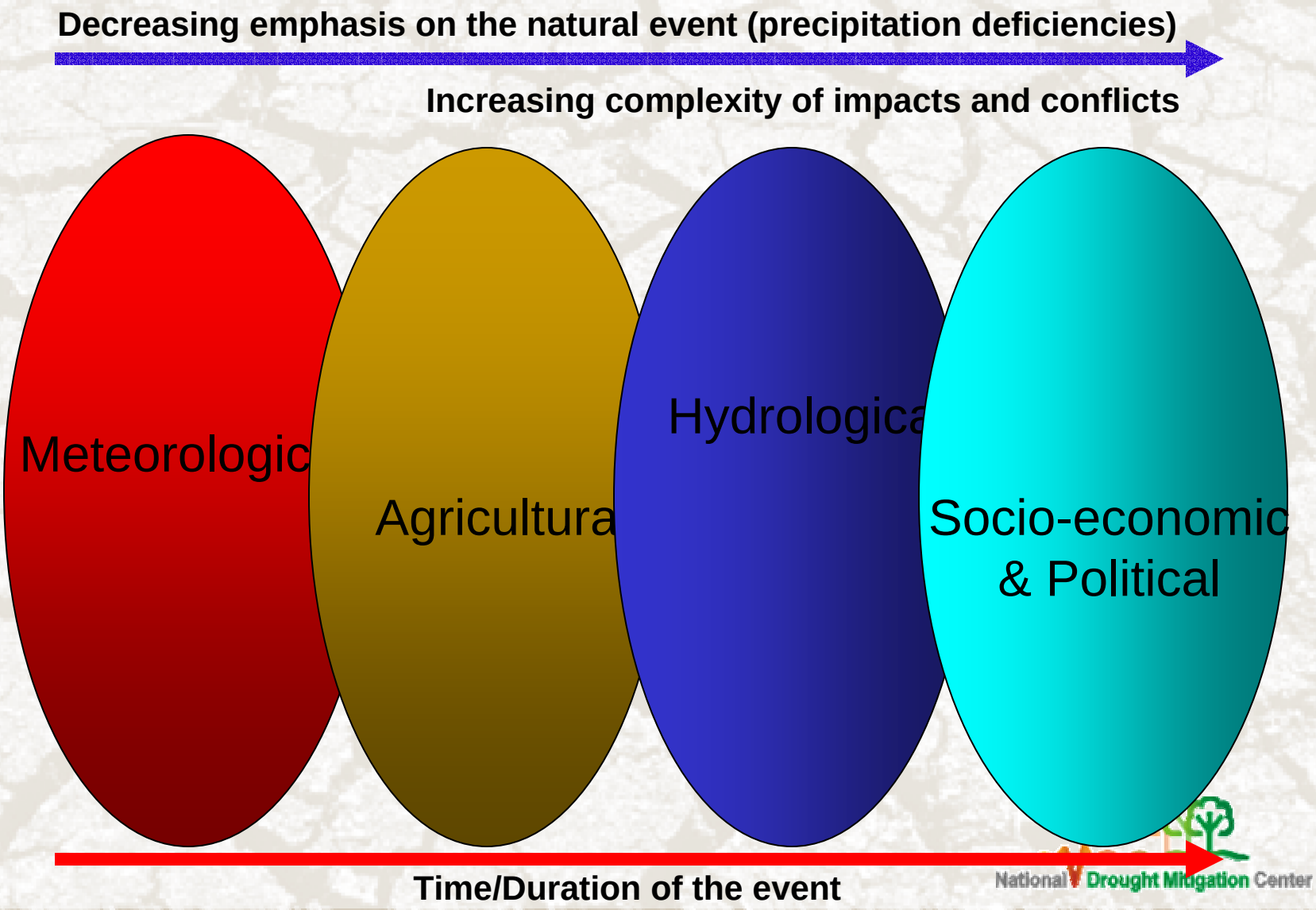
Natural and Social Dimensions of Drought



Why the Recent Interest in Drought in the U.S.?

- Single and **multi-year** severe droughts
  - Intensity and duration
  - Western and eastern U.S.
- Spatial extent—40 to 50% of U.S.
- Complexity of impacts → Vulnerability
  - Agriculture, energy, transportation, urban water supply, recreation/tourism, fires, environmental, social
  - Conflicts between water users
  - Water restrictions (agricultural and urban)
- Trend toward drought mitigation planning
- Media coverage

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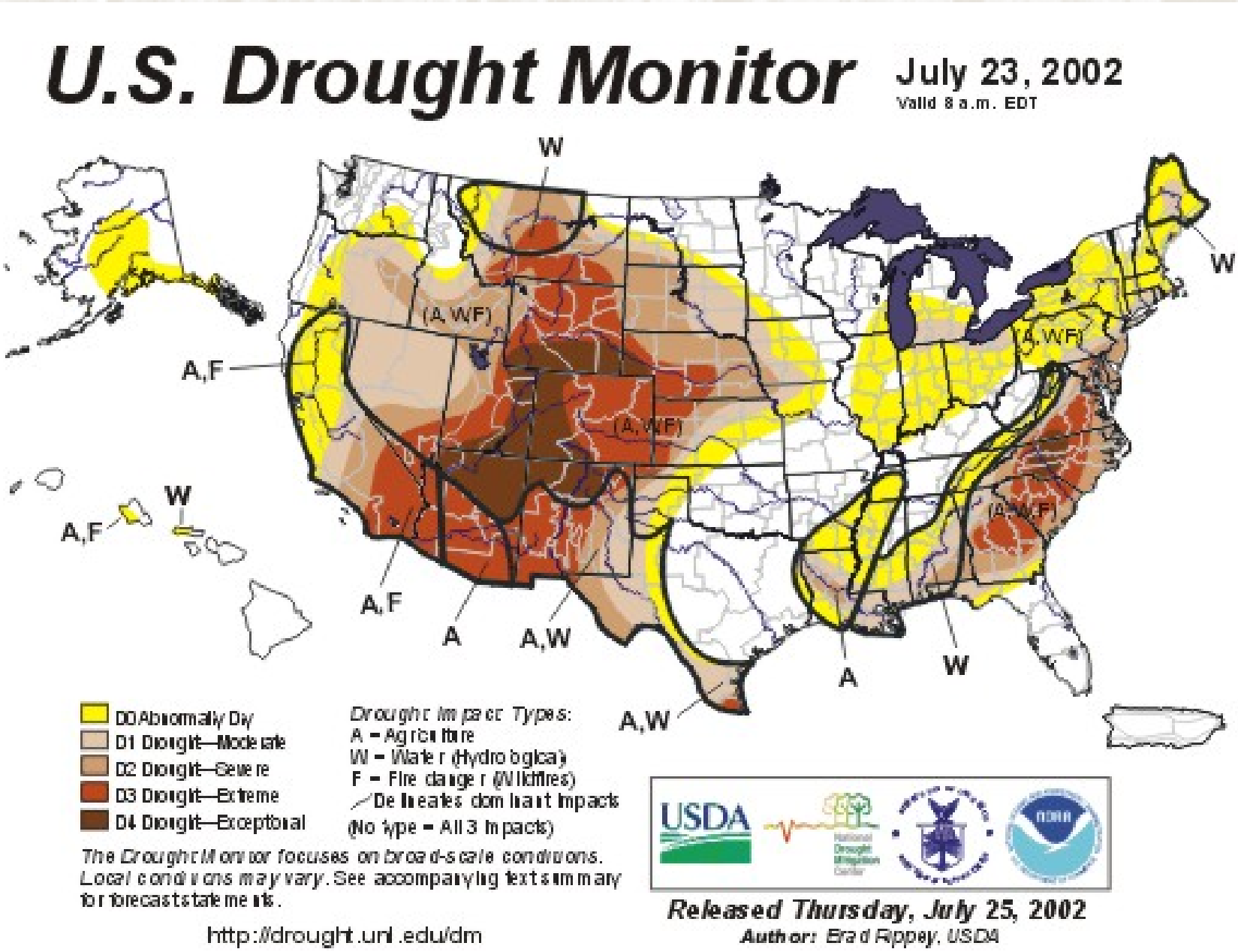

http://drought.unl.edu/dm

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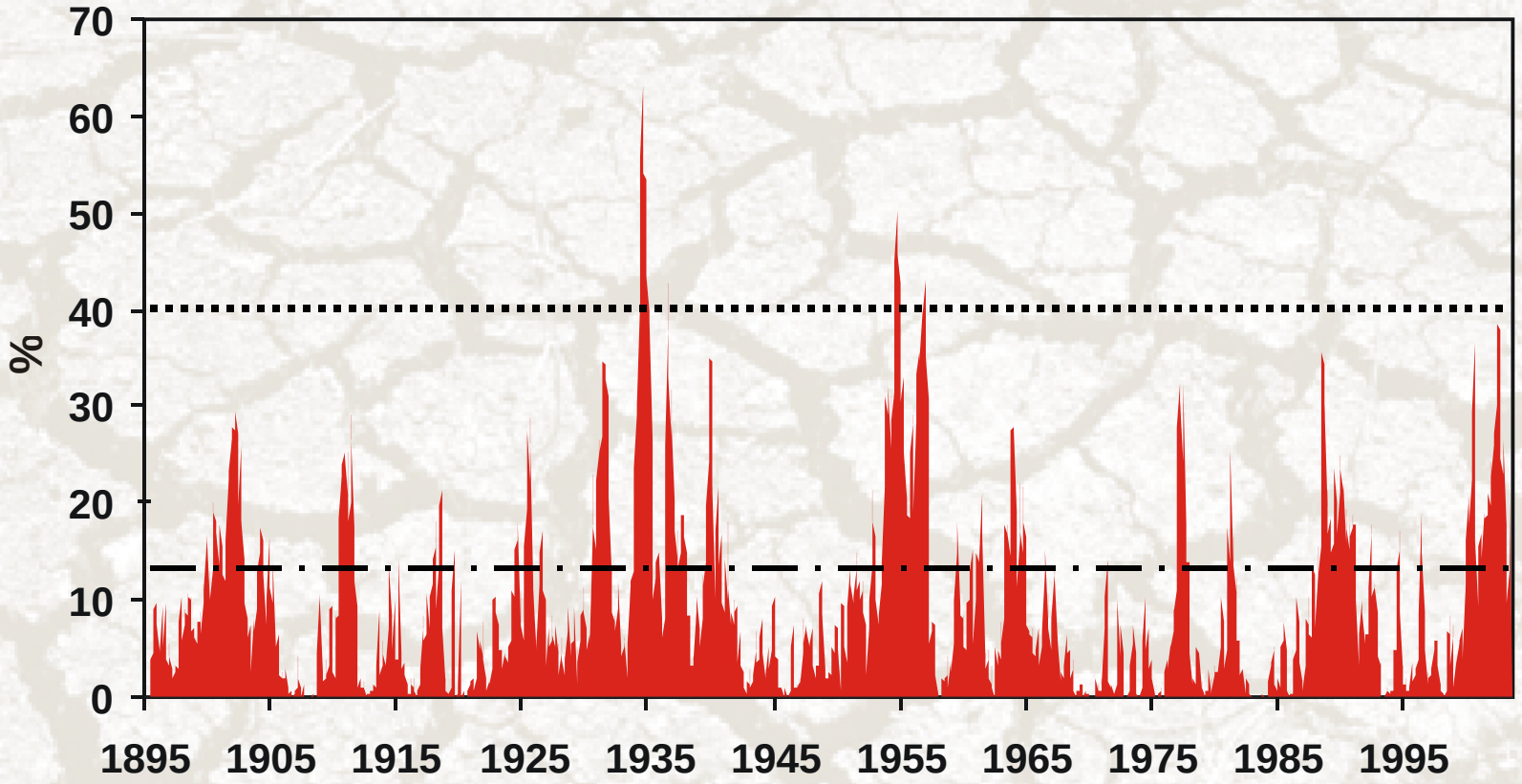
Percent Area of the United States in Severe and Extreme Drought

January 1895–July 2003



Based on data from the National Climatic Data Center/NOAA

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Common Types of Drought Impacts

- Economic
  - Agriculture, Tourism and recreation, Ener
- Social
  - Stress and health, Public safety, Cultural values, Aesth
- Environmental
  - Animal/plant, Wetlands, Water qua

2002 Drought Losses
$20-30 Billion

Estimate
Losses/costs
1999
$6-8 billion

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What are the key issues?

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Drought differs from other natural hazards

- Slow-onset, creeping phenomena (early warning systems, impact assessment, response)
- Absence of universal definition (leads to confusion and inaction)
- Severity is best described through multiple indicators and indices (early warning systems)
- Impacts are non-structural and spread over large areas (makes assessment and response difficult; mitigation actions less obvious)
- **RESULT**, progress on drought preparedness has been slow

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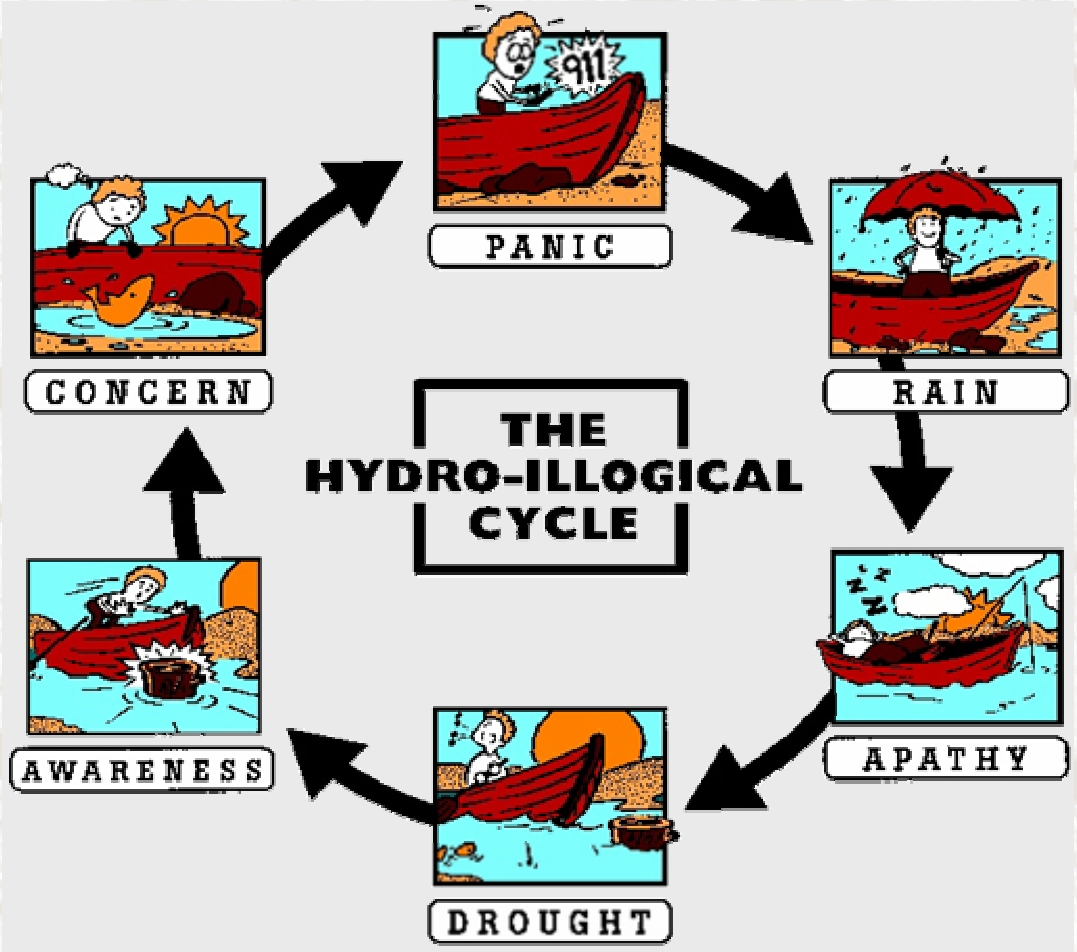
Characteristics of Crisis Management

- reactive, post-impact
- poorly coordinated
- untimely
- poorly targeted
- ineffective
- decreases self-reliance → greater vulnerability



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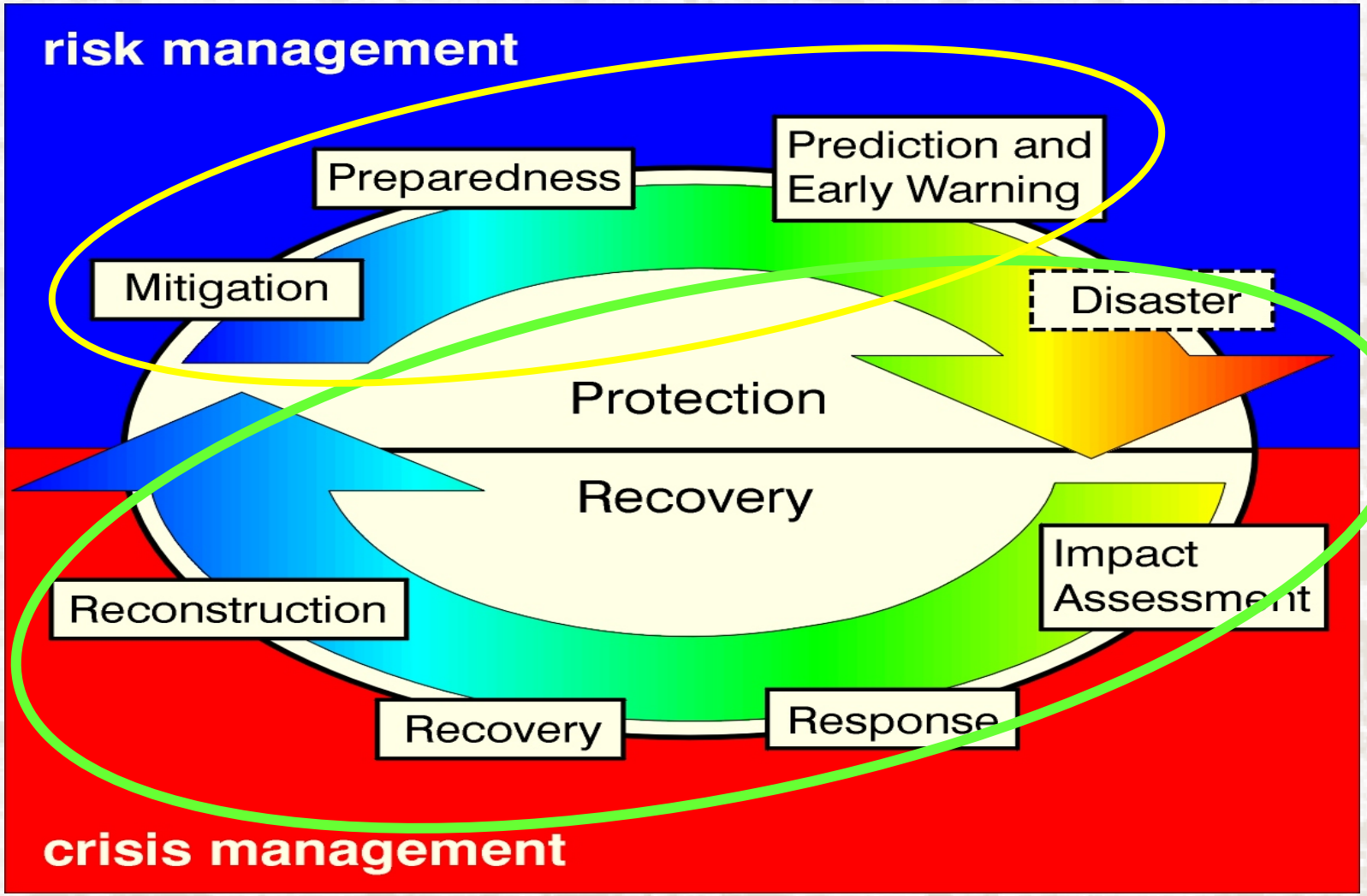
The Cycle of Disaster Management



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Components of Drought for Risk Management

Risk = Hazard x Vulnerability

(natural event) (social factors)

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Components of Drought for Risk Management

Hazard

(natural event)

Meteorological drought

- Severity or magnitude
  - Intensity and Duration
- Frequency—probabilities
- Spatial extent
- Trends
  - Historical
  - Future projections
  - Impacts

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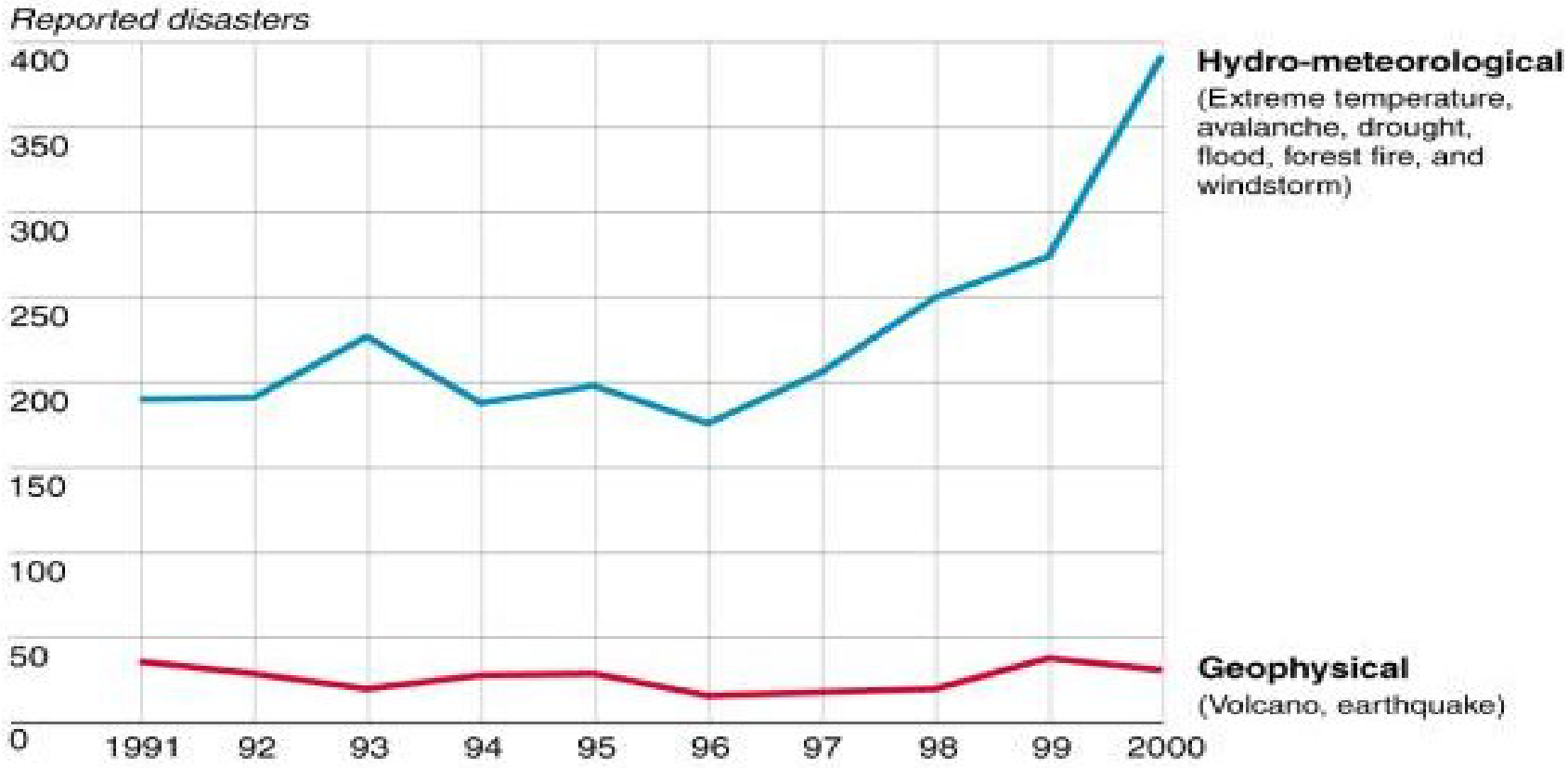
Number of Natural Events



Note: Includes all natural disasters declared by national authorities in OECD and non-OECD countries, regardless of their severity.

Source: Center for Research on the Epidemiology of Disasters.

Components of Drought for Risk Management

Vulnerability

(social factors)

- Population growth
- Population shifts
- Urbanization
- Technology
- Land use practices
- Environmental degradation
- Water use trends
- Government policies
- Environment awareness

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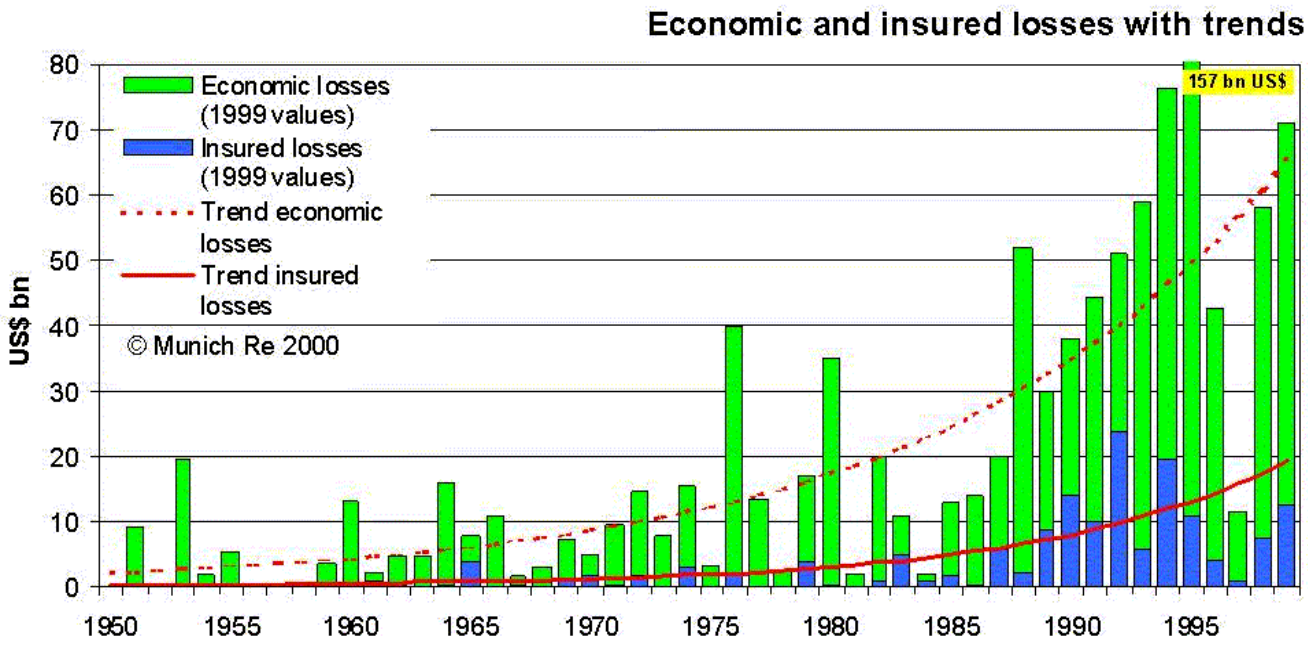
Great Natural Disasters 1950 - 1999

Far exceeding 100 deaths and/or US$ 100m in claims



Münchener Rück
Munich Re

Economic Loss Estimates Caused by Drought During 2002

State	Estimate	Sector	Comments
Colorado	$1.1 billion $640 million $460 million	Agriculture Crop losses Livestock	
	$1.7 billion $200 million $800,000	Tourism Outfitters Fishing licenses	Summer only
Kansas	$1.4 billion $1.1 billion $300 million	Agriculture Crop losses Livestock	
Missouri	$460 million	Agriculture	
Montana	$2.0 billion $150 million	Agriculture Crop losses	RMA payments
Nebraska	$1.2 billion	Agriculture	
North Carolina	$398 million	Agriculture	Crop losses
	$15-20 million	Municipalities	Water revenues

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Economic Loss Estimates Caused by Drought During 2002

State	Estimate	Sector	Comments
South Carolina	$84 million	Agriculture	Crop losses
	$526 million $276 million $250 million	Timber Annual forest growth loss Southern pine beetle loss	
South Dakota	$1.4 billion $311 million $123 million $92 million	Agriculture Crop losses Corn losses Wheat losses	 RMA payments RMA payments RMA payments
	$23 million	Environmental	Missouri River
Utah	$250 million	Agriculture	
Wyoming	$14 million $4 million $2.8 million	Crop losses Sugar beet losses Forage losses	
	$1.8 million $161,538	Wildfire suppression Timber value loss	

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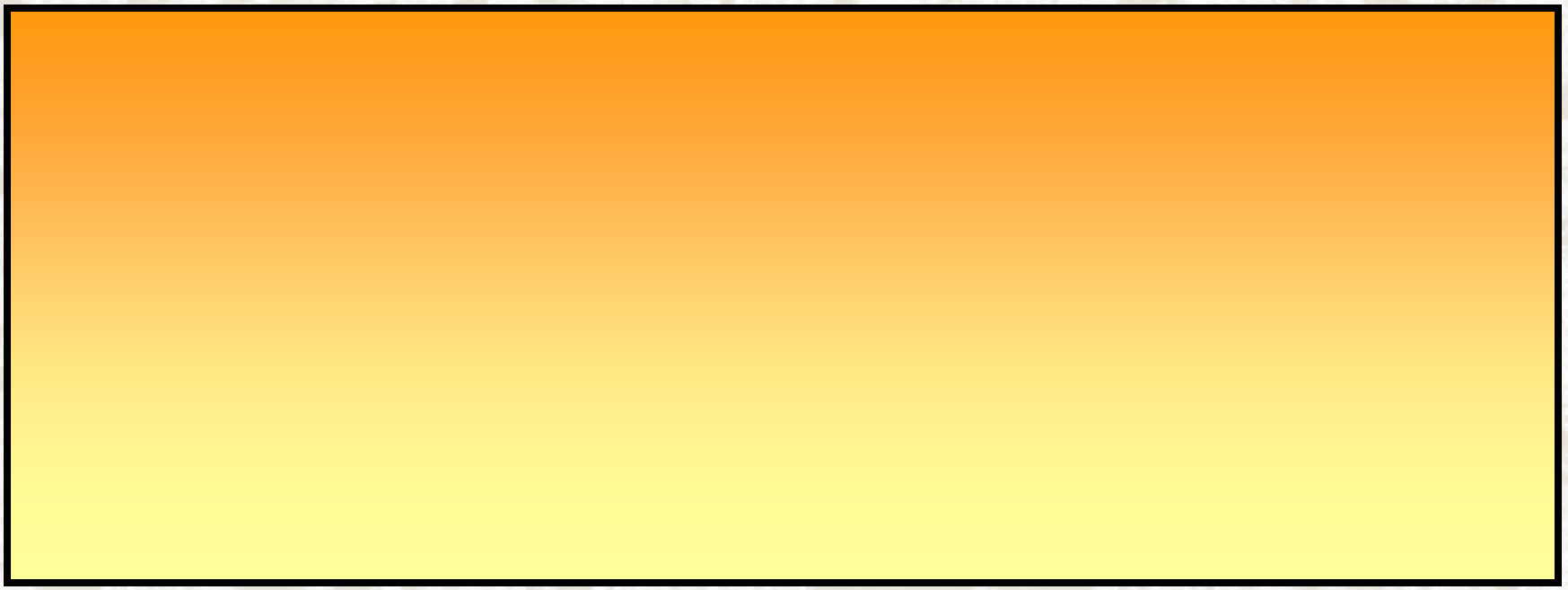

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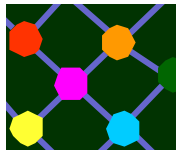
Principal Activities of the NDMC

Integrated Climate/Water Monitoring System

- Standardized Precipitation Index (SPI)
- NDMC “Drought Watch” section of web site
- U.S. Drought Monitor (USDA, NOAA, NDMC), 5 million hits 2002
- Collaboration with other agencies

Drought Information Clearinghouse

- Electronic textbook/portfolio
- User hits (4 million hits in 2001)
- User hits more than 10 million in 2002
- 10% of sessions from international users



Research

- Drought indices and drought risk assessment tools
- Use of climate information in decision making
- Drought planning methodologies
- Risk/Vulnerability assessment

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National Drought Mitigation Center

University of Nebraska–Lincoln

The National Drought Mitigation Center (NDMC) helps people and institutions develop and implement measures to reduce societal vulnerability to drought. The NDMC, based at the University of Nebraska–Lincoln, stresses preparation and risk management rather than crisis management.

What is Drought?	*An overview of drought • Climographs • Historical Palmer Drought Index maps and graphs • Drought and El Niño • The Dust Bowl*
Planning for Drought	*How (and why) to plan for drought • The 10-Step Planning Process • Directory of drought planning contacts*
Monitoring Drought	*How to select monitoring tools • The SPI, the U.S. Drought Monitor, and links to tools elsewhere on the web*
Understanding Your Risk	*Understanding drought's impacts • Current and historical drought impacts in the United States and around the world*
Mitigating Drought	*Putting a drought plan together • Existing drought plans and studies • Drought mitigation tools/initiatives • Water conservation*

About the NDMC
Contact Information
What's New
Site Map
Search the Site
Drought Network News
Publications

http://drought.unl.edu

Quick Links!

For Media

Other Drought-related Sites

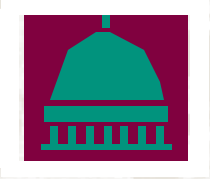
U.S. Drought Monitor

Interim National Drought Council

Principal Activities of the NDMC

Drought Planning Activities

- Facilitate drought plan development
- Inform officials on drought planning and risk assessment methodologies
- Provide technical assistance on drought monitoring, indices, triggers, mitigation actions
- Review and evaluate drought plans



Advise Policy Makers

- Federal and state agencies
- Regional and national initiatives
- White House Office of Science and Technology Policy
- U.S. Congress
- International organizations
- Foreign governments

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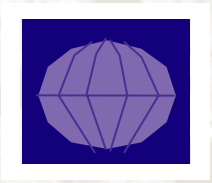
Principal Activities of the NDMC

Workshops and Seminars

- Regional drought contingency planning workshops
- National/regional conferences
- International training seminars
- International conferences



International Drought Mitigation Activities

- Country drought planning projects
- Country and regional projects
- International initiatives
- Regional networks on drought preparedness
- *Drought Network News*

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Progress in Drought Planning: U.S. States

- Before early 1980s, states relied on federal government for assistance
- First state drought plans in early 1980s
- Emphasis on response planning from early 1980s to 1995
- Recent state plans in response to severe drought—shifting emphasis to risk management
- 35 states with drought plans; 4 states developing plans

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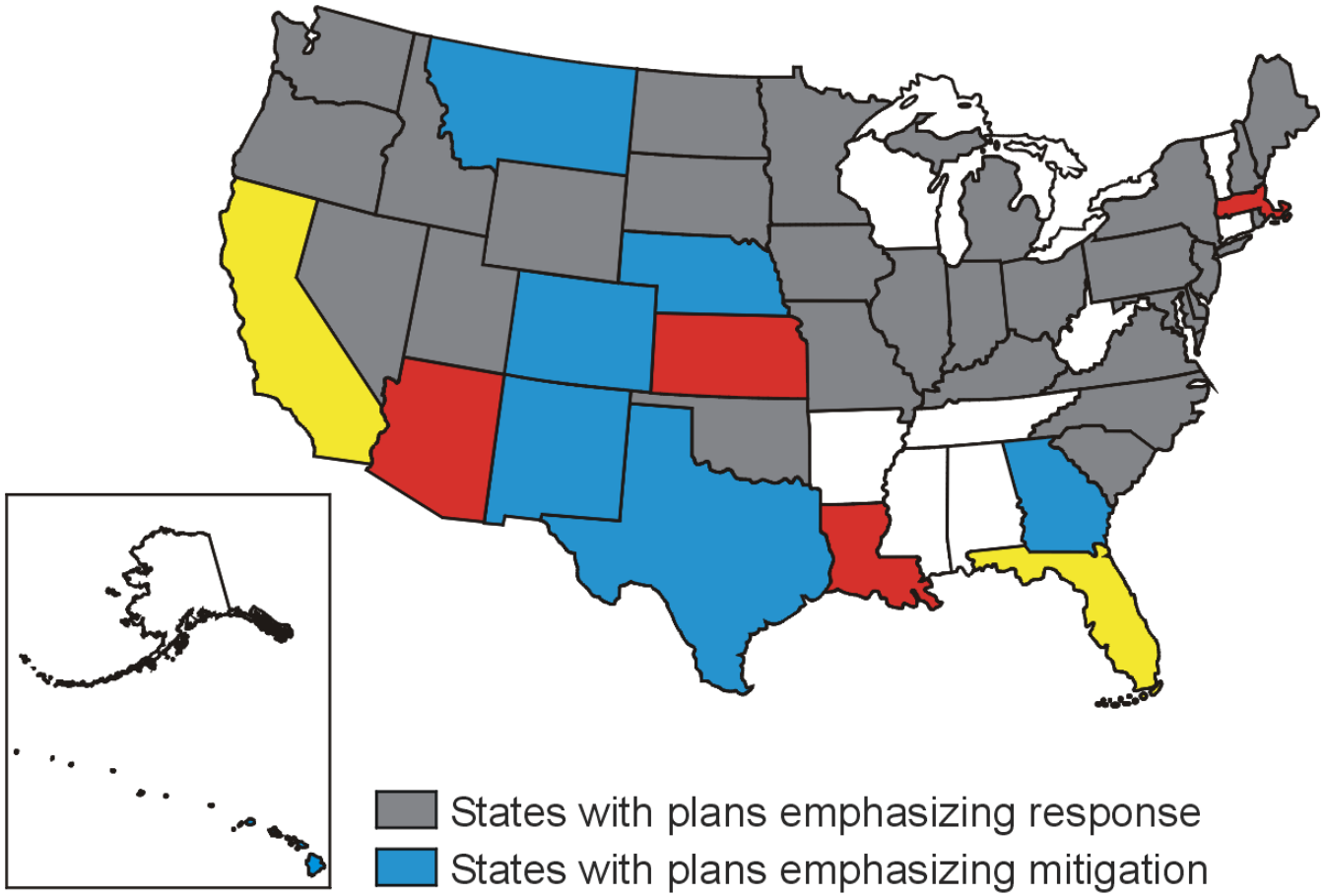
Status of State Drought Planning

April 2003



- States with plans emphasizing response
- States with plans emphasizing mitigation
- States developing long-term plans
- States delegating drought planning to local authorities
- States without drought plans

10-Step Drought Planning Process

- generic process, adaptable
- based on collective experiences of U.S. states and other countries
- risk management emphasis through application of mitigation actions
- steps are sequential but intended as a "checklist"
- component of integrated water resources management plan

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Moving toward Drought Risk Management: Components of Drought Mitigation Plans

- Monitoring, early warning, and prediction
  - Climate indices and indicators, water supply assessments, forecasts, delivery and feedback systems
  - Foundation of a DEWS
- Risk and impact assessment
  - Who and what is at risk and why
- Mitigation and response
  - Pro-active programs and actions to reduce risks
  - Safety net/programs

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Potential Drought Mitigation Actions

- Monitoring and assessment
- Legislation and public policy
- Water augmentation/reuse
- Public awareness/education
- Technical assistance to local areas

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Potential Drought Mitigation Actions

- Demand reduction/water conservation
- Water use conflict resolution
- Drought planning
- Emergency response (but more proactive and not in conflict with policy objectives)

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National Drought Preparedness Act of 2003

- Emphasis on risk management
- Improving drought preparedness at the local, state, tribal and federal level of government
- Enhancing coordination within the federal government
- Improving the nation's drought monitoring system

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Conclusions

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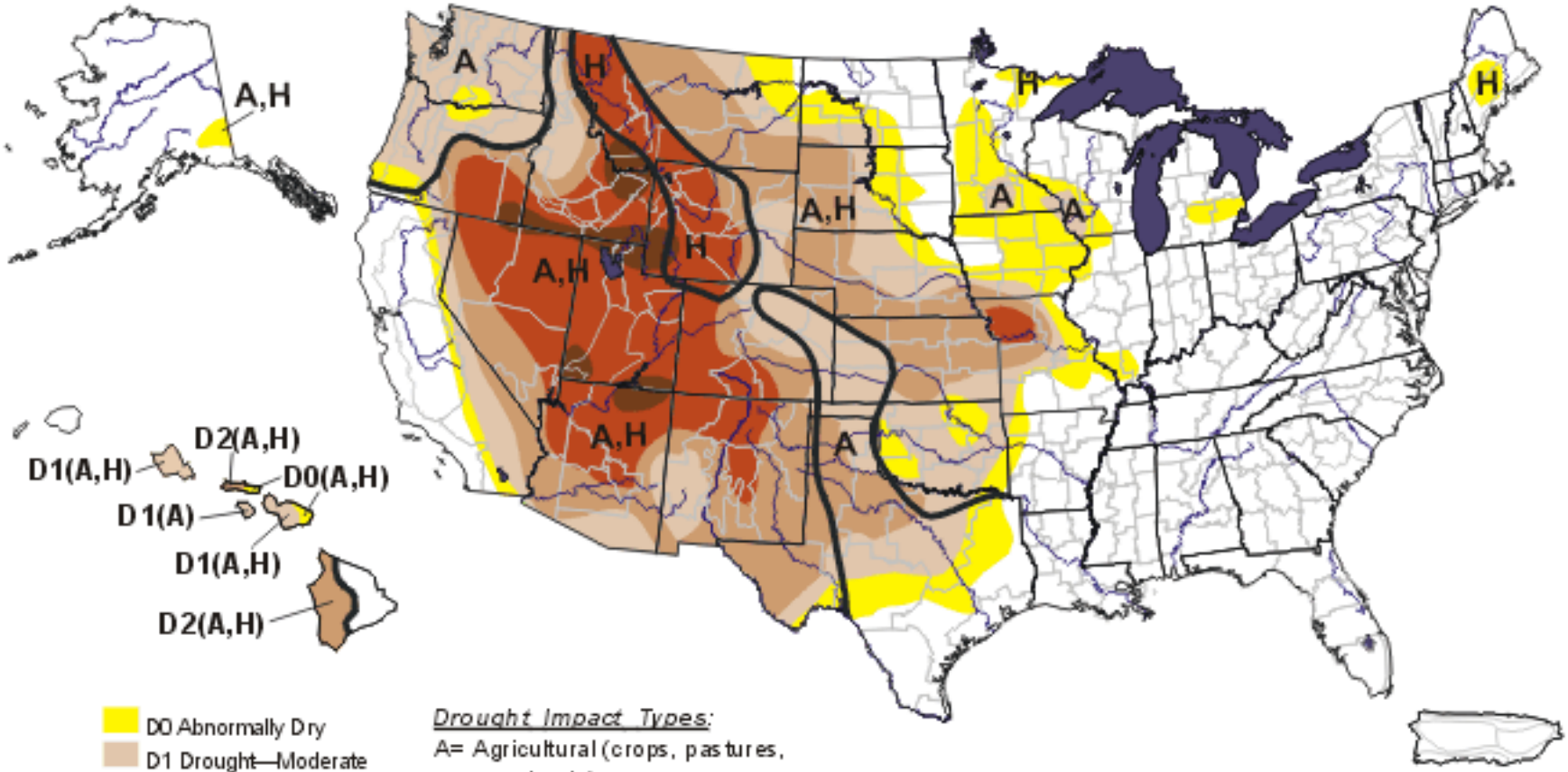
U.S. Drought Monitor

August 12, 2003
Valid 8 a.m. EDT



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

Drought Impact Types:
A= Agricultural (crops, pastures, grasslands)
H= Hydrological (water)
No type = both impacts
Delineates dominant 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

USDA · National Drought Mitigation Center · NOAA

Released Thursday, August 14, 2003

Author: *Douglas Le Comte, NOAA/CPC*

Droughts . . .

- will continue to occur
- may increase in frequency and severity
- will result in greater economic, social, and environmental impacts
- increase demand for water resources
- result in greater conflicts between water users
- are challenging society to reexamine water allocations, compacts, and water rights
- require mitigation planning in order to reduce the impacts of future episodes

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Thanks for your attention!

Visit the NDMC
http://drought.unl.edu

dwilhite2@unl.edu

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