

Drought and Implications for Public Health

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Innovations in Collaborative Modeling
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Michigan State University



UNIVERSITY OF
Nebraska
Lincoln



Heartland Center
for Leadership Development

Outline

- Drought Overview
- Drought Planning Overview
- Assessment Framework
- Case studies and examples

Organizational Partnership



What is drought?

- Drought is a **persistent** and **abnormal** moisture deficiency having adverse impacts on a well-defined sector.
- Traditionally classified by impacts to a sector
 - Agricultural
 - Hydrological
 - Meteorological
 - Socioeconomic

Hydrological Drought Impact Chain

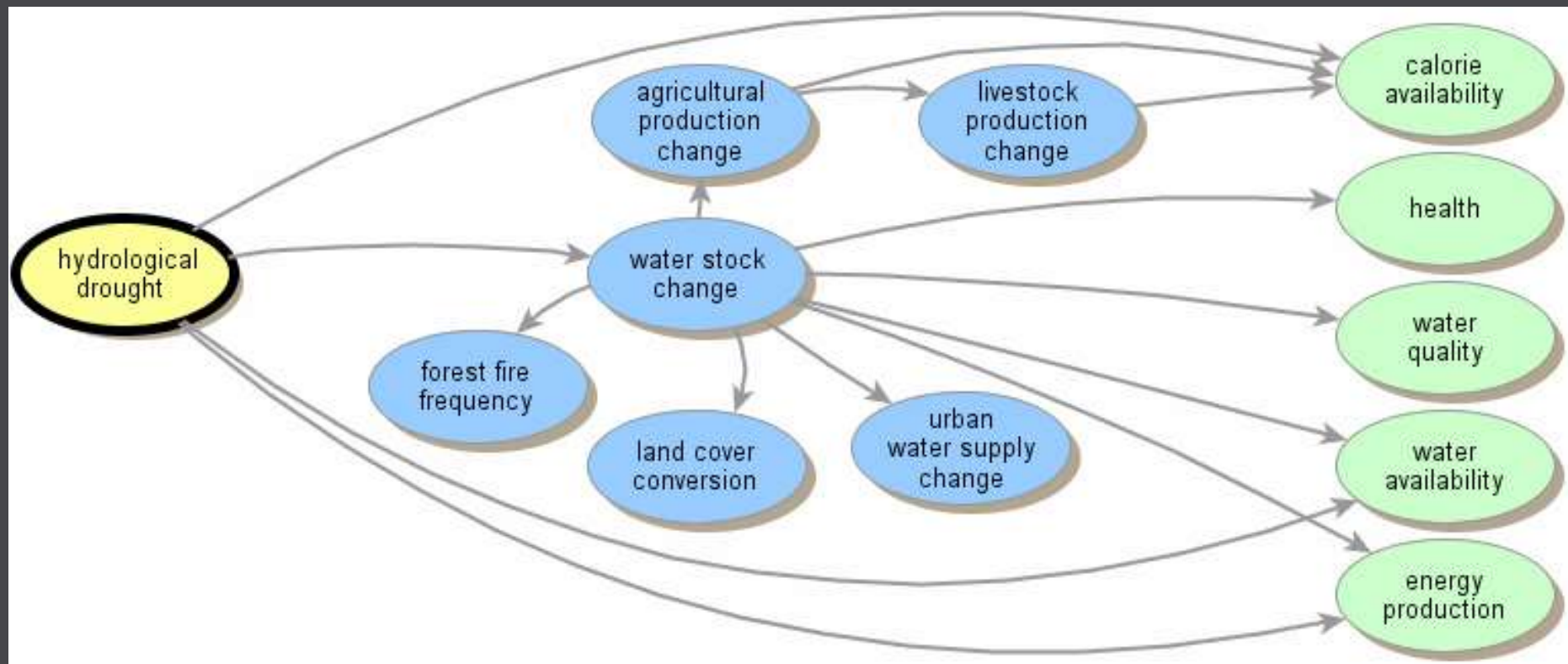
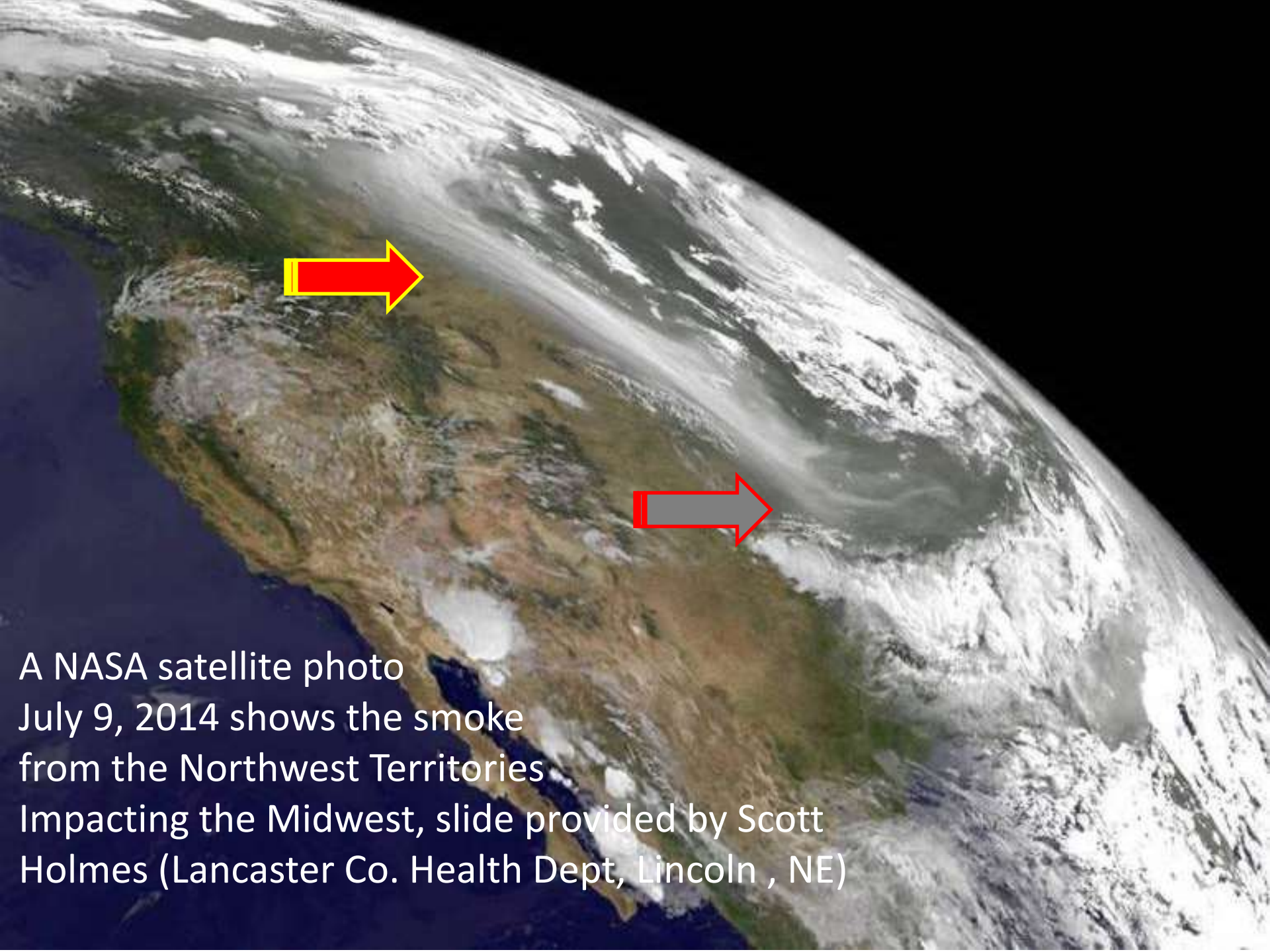




Photo by John McColgan, Selway Bitterroot National Forest,
provided by Scott Holmes (Lancaster Co. Health Dept,
Lincoln , NE)



A NASA satellite photo July 9, 2014 shows the smoke from the Northwest Territories Impacting the Midwest, slide provided by Scott Holmes (Lancaster Co. Health Dept, Lincoln , NE)

CLIMATE CHANGE IMPACTS IN THE UNITED STATES

Chapter 9 Human Health: Climate Change Impacts in the U.S.: The Third National Climate Assessment - Key Messages (provided by Scott Holmes (Lancaster Co. Health Dept, Lincoln , NE)

- 1. Climate change threatens human health and well-being in many ways, including impacts from increased extreme weather events, wildfire, decreased air quality, threats to mental health, and illnesses transmitted by food, water, and disease-carriers such as mosquitoes and ticks. Some of these health impacts are already underway in the U.S.**
- 2. Climate change will, absent other changes, amplify some of the existing health threats the nation now faces. Certain people and communities are especially vulnerable, including children, the elderly, the sick, the poor, and some communities of color.**
- 3. Public health actions, especially preparedness and prevention, can do much to protect people from some of the impacts of climate change. Early action provides the largest health benefits. As threats increase, our ability to adapt to future changes may be limited.**
- 4. Responding to climate change provides opportunities to improve human health and well-being across many sectors, including energy, agriculture, and transportation. Many of these strategies offer a variety of benefits, protecting people while**

CLIMATE CHANGE AND HUMAN HEALTH

Photo credits

AIRWAY DISEASES

Asthma, allergies, and airway diseases affect a person's ability to breathe. In the U.S. alone, 50 million people suffer from some type of airway disease. Asthma is the second-leading cause of chronic illness among children.

While airway diseases often run in families, certain environmental conditions, such as poor air quality, can make them worse. People can limit these effects by reducing their exposure to disease triggers such as pollutants, allergy-causing particles called allergens, and stress. However, this may become more difficult with climate change's effects.



What Could Go Wrong?

What Can We Do?



The Big Picture

Airway Diseases

Developmental Disorders

Mental Health Disorders

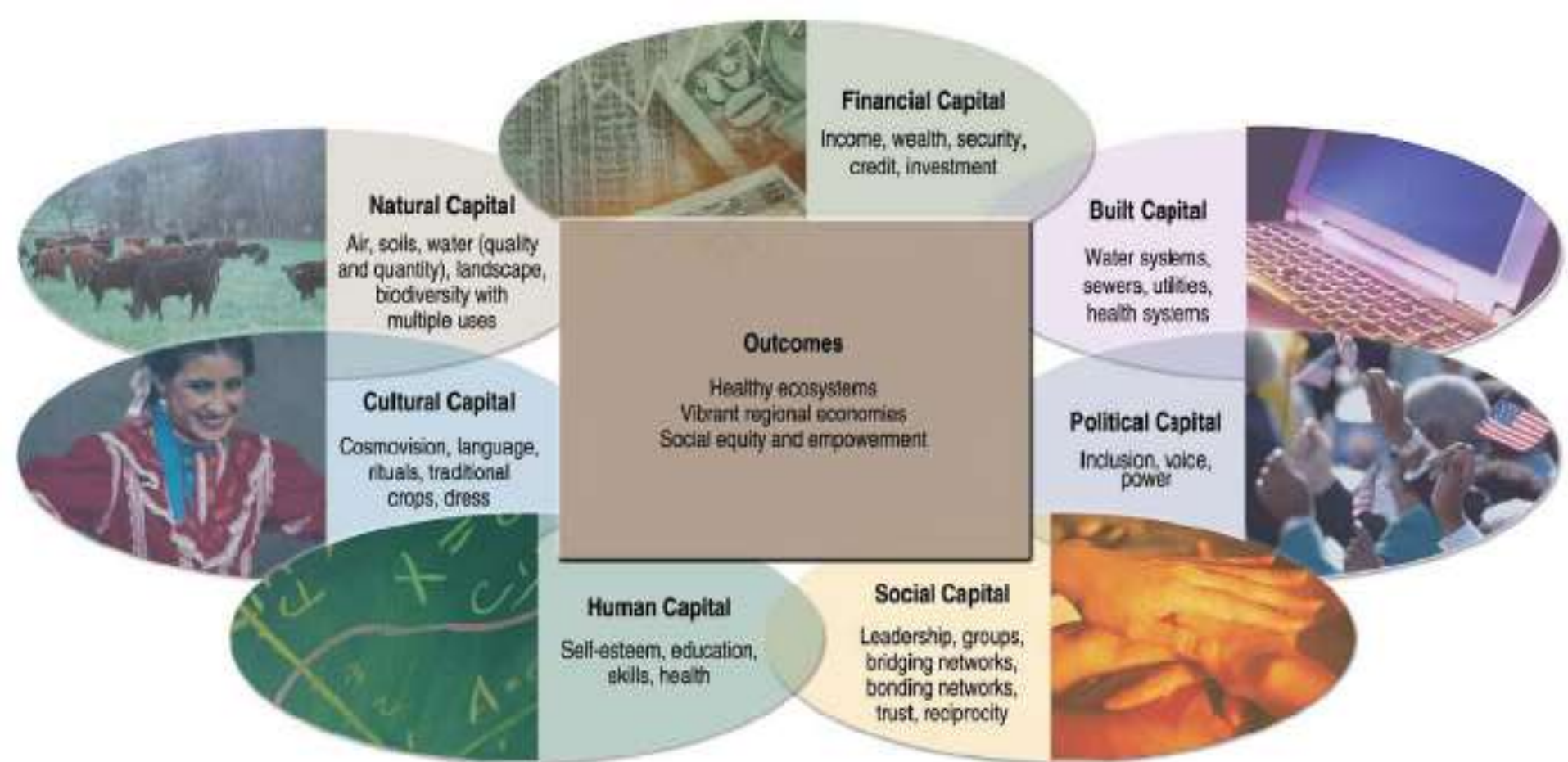
Vectorborne Diseases

Waterborne Diseases



Adapted from "A Human Health Perspective: On Climate Change" by the National Institute of Environmental Health Sciences © 2011 WGBH Educational Foundation. All Rights Reserved.

Slide provided by Scott Holmes (Lancaster Co. Health Dept, Lincoln , NE)



Community Capitals Framework

Due to the highly diverse nature of drought impacts, it follows that the CCF would naturally lend itself to drought planning and mitigation efforts.



Mitigation & Response Programs

- Pro-active programs and actions to reduce risks
- Safety net/programs

Risk & Impact Assessment

- Who is at risk & why?

Monitoring, Early Warning, & Prediction

- Foundation of a drought mitigation plan
- Indices/Indicators tied to impacts & triggers

Successful Drought Mitigation Plan

CCF can fit into the entire process of drought planning by adding a solid & holistic approach to all components of a plan

**Developing a
Planning
Committee Using
the
Community Capitals**

Financial Capital

Potential Committee Members:

Representatives of
infrastructure development
groups, banks, endowments,
and funding agencies

Built Capital

Telecommunications systems
Utilities, industrial parks, main
street, business locations, etc.

Political Capital

Potential Committee Members:

Elected and appointed officials and
those with whom they work
Congressional delegation staff
Representatives of political groups

Social Capital

Potential Committee Members:

Representatives of clubs and organizations
People with links to outside resources
People who know many people
in the community

Human Capital

Potential Committee Members:

Facilitator, Educator (K-12), Trainers,
Representatives of service agencies, and
their customers
Economic Developer and their partners

Natural Capital

Potential Committee Members:

Representatives of parks and recre-
ation, watershed, nature groups, and
those who use the resources
Farmers, ranchers, and others who
make a living off the land and their
customers and suppliers

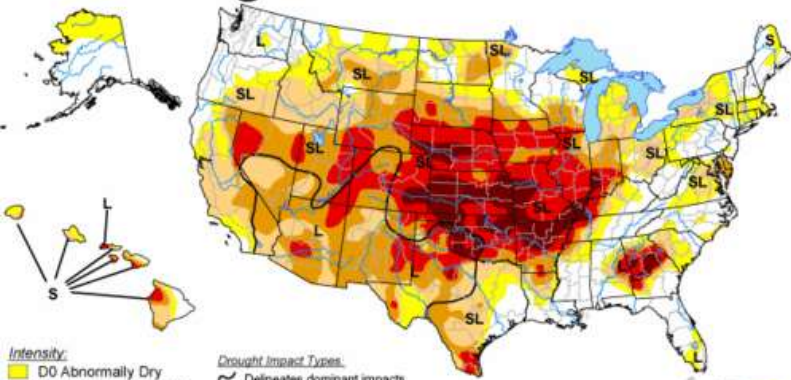
Cultural Capital

Potential Committee Members:

Representatives of cultural and religious groups
Representatives of museums and
historical associations and their support base.

U.S. Drought Monitor

August 21, 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.

Released Thursday, August 23, 2012

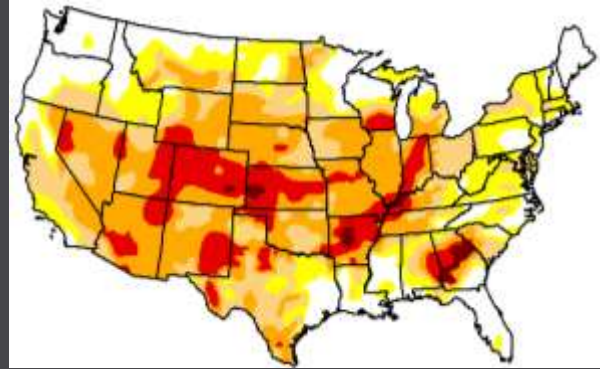
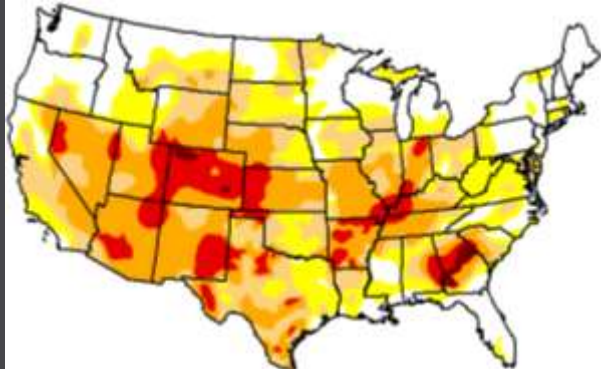
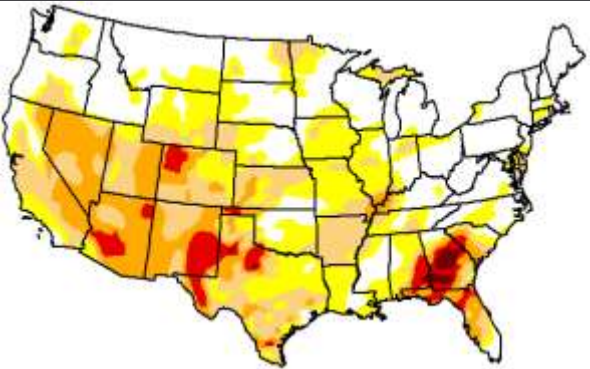
Author: Michael Brewer/Liz Love-Brotak, NOAA/NESDIS/NCDC

<http://droughtmonitor.unl.edu/>



CCF & Drought Impacts

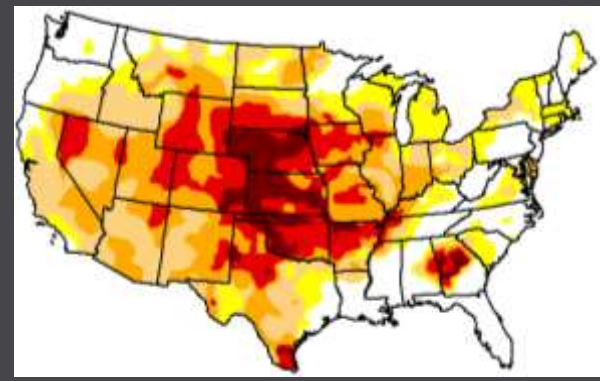
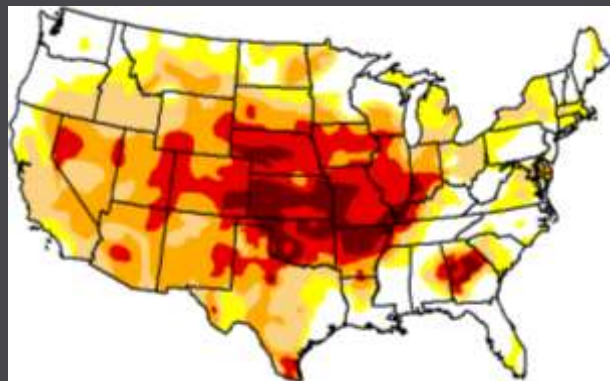
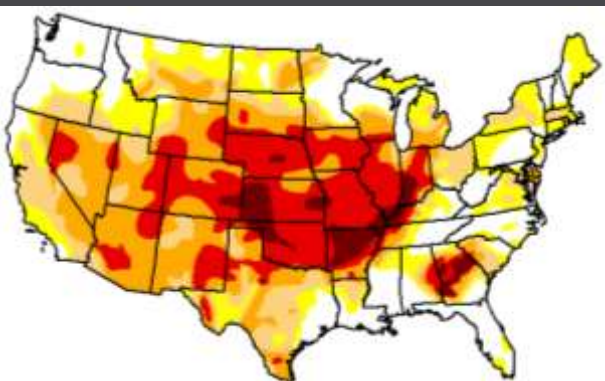




June 5, 2012

July 3, 2012

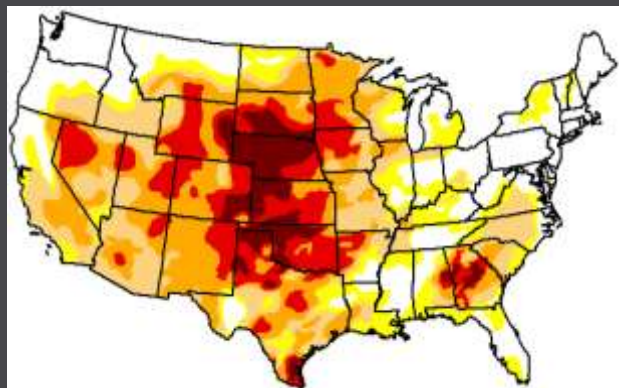
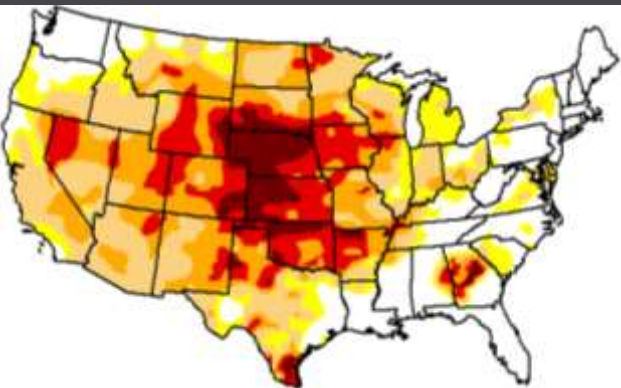
July 17, 2012



August 7, 2012

August 21, 2012

September 4, 2012



October 2, 2012

December 5, 2012

Intensity:

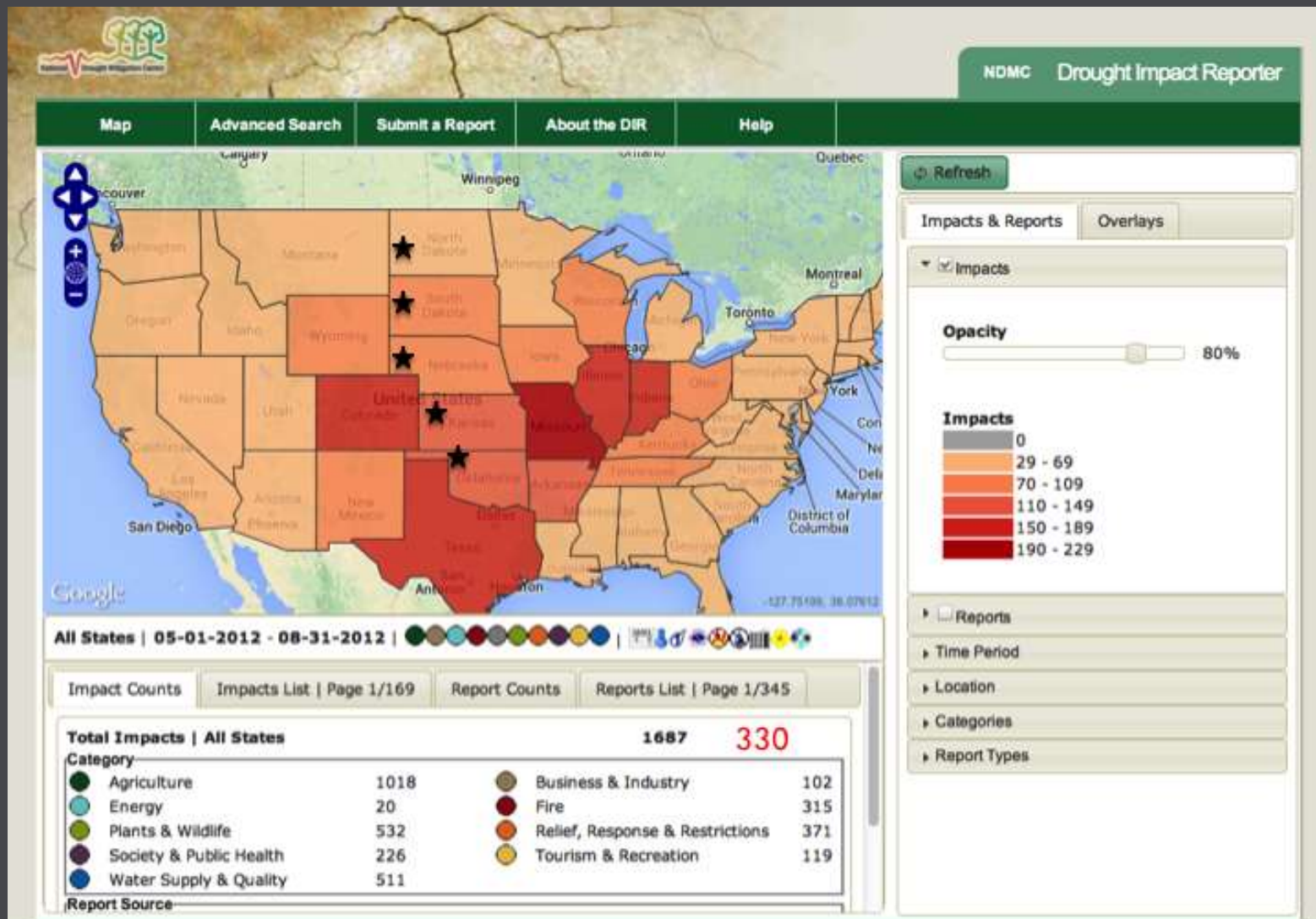
- | | |
|---|--|
|  D0 Abnormally Dry |  D3 Extreme Drought |
|  D1 Moderate Drought |  D4 Exceptional Drought |
|  D2 Severe Drought | |

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

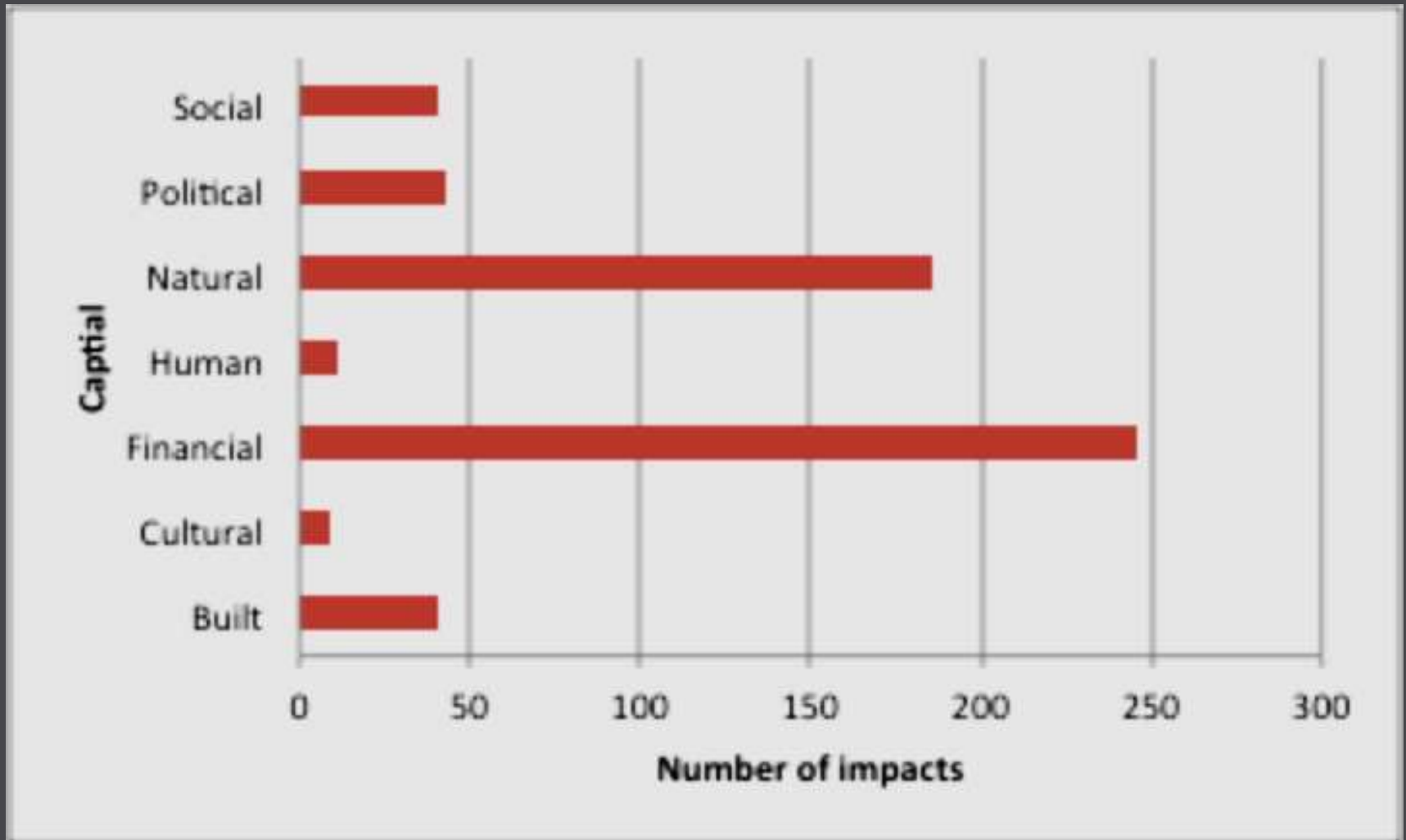


<http://droughtmonitor.unl.edu/>

Impact Analysis: 2012 Drought



Overview of Results



Drought Impacts and Community Capitals

Human Capital

- **Increased respiratory illness**
- **Increased heat-related ambulance calls**
- **Increased spider bites (brown recluse)**
- **Farmers less optimistic**
- **Increased anxiety in ethanol business**

Social Capital

- Voluntary water reductions
- **Increased public awareness and media efforts**
- **Increased demands on volunteer fire and rescue**
- Working extra overtime repairing water mains

Cultural Capital

- 4th of July fireworks cancelled
- Closed swimming pools
- American Farm Bureau held national day of prayer
- **Decreased hunting opportunities**

Drought Impacts and Community Capitals

Natural Capital

- Decline in rangeland grass production
- Trees susceptible to pests/disease
- Algae blooms in ponds
- Blowing dirt
- Grass fires
- Wildlife deaths

Financial Capital

- Decreased crop yields
- Increased water and energy rates
- Reduced revenue from water sales
- Remove menu items (elk & buffalo)
- Closed ethanol plant
- Increased firefighting expenses

Drought Impacts and Community Capitals

Built Capital

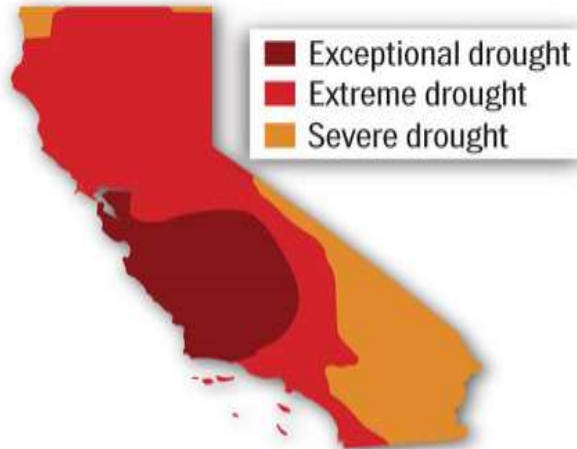
- Wells shut down
- Power outages
- Shifts and cracks in foundations
- Closed roads (fire)
- Homes destroyed in wildfires

Political Capital

- Activation of water restrictions
- State of Emergency declarations
- Improvements to USDA programs
- Opening of CRP lands for grazing
- Federal Drought Aid

Drought and poverty

DROUGHT INTENSITY



POVERTY



*Percentage below the poverty line

*Poverty thresholds in 2012: \$23,283 for family of four. \$11,945 individual under 65.

62%

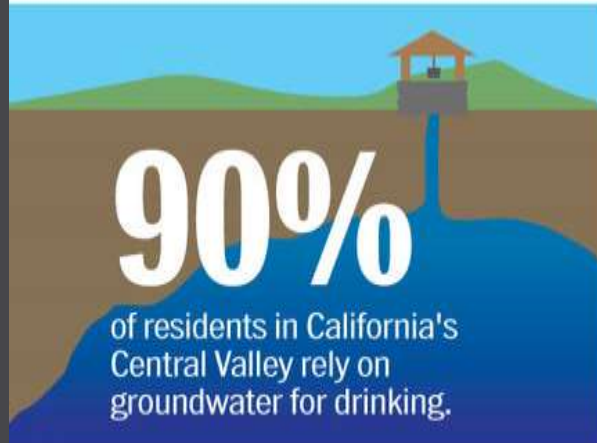
of migrant workers work in drought-affected areas

Texas cattle ranchers are experiencing lowest cattle and calve levels since 1867



90%

of residents in California's Central Valley rely on groundwater for drinking.



The water of **1.5 million**

Californians is unsafely contaminated each year



SOURCES: droughtmonitor.unl.edu, www.nytimes.com, American Community Survey, www.ers.usda.gov, California Department of Public Health

DESERET NEWS GRAPHIC

Drought and Poverty

Google Calendar | National Weather Service | Impacts Advanced Search - D... | +

public.droughtreporter.unl.edu/advancedsearch/impacts.aspx | kovacs colloquium

- 0 in Water Restriction
- 0 in National Weather Service
- 0 in Other Agency
- 0 in Hawaii
- 0 in Legacy

page 1 of 1 | viewing 1 - 1 of 1

- [1. See impact detail](#)
- [2. List of associated reports](#)
- [3. See detail on associated reports](#)

Threat of Valley fever requires relocation of high-risk inmates from prisons in the San Joaquin Valley in California

Dates of Impact: 2013-04-29 to unknown

Summary:
Thousands of high-risk inmates must be removed from the Avenal and Coalinga prisons in the San Joaquin Valley, due to the increasing incidence of Valley fever, caused by an airborne fungus. The order is complicated by the fact that California prisons are already overcrowded and the Department of Corrections and Rehabilitation is to reduce the state prison population by 9,000 inmates by December 2013.

Valley fever cases are highest in Arizona (70 percent of cases) and California (25 percent), according to the Centers for Disease Control and Prevention. Most incidences of Valley fever occur in the central San Joaquin Valley, with the highest rates of illness at the Avenal and Coalinga prisons, where the disease contributed to the deaths of 24 inmates between 2006 and 2011. Fresno Bee (Calif.), April 29, 2013

Affected Area(s): Fresno County, CA, Coalinga, CA, Kings County, CA, Avenal, CA

Categories:
 Society & Public Health

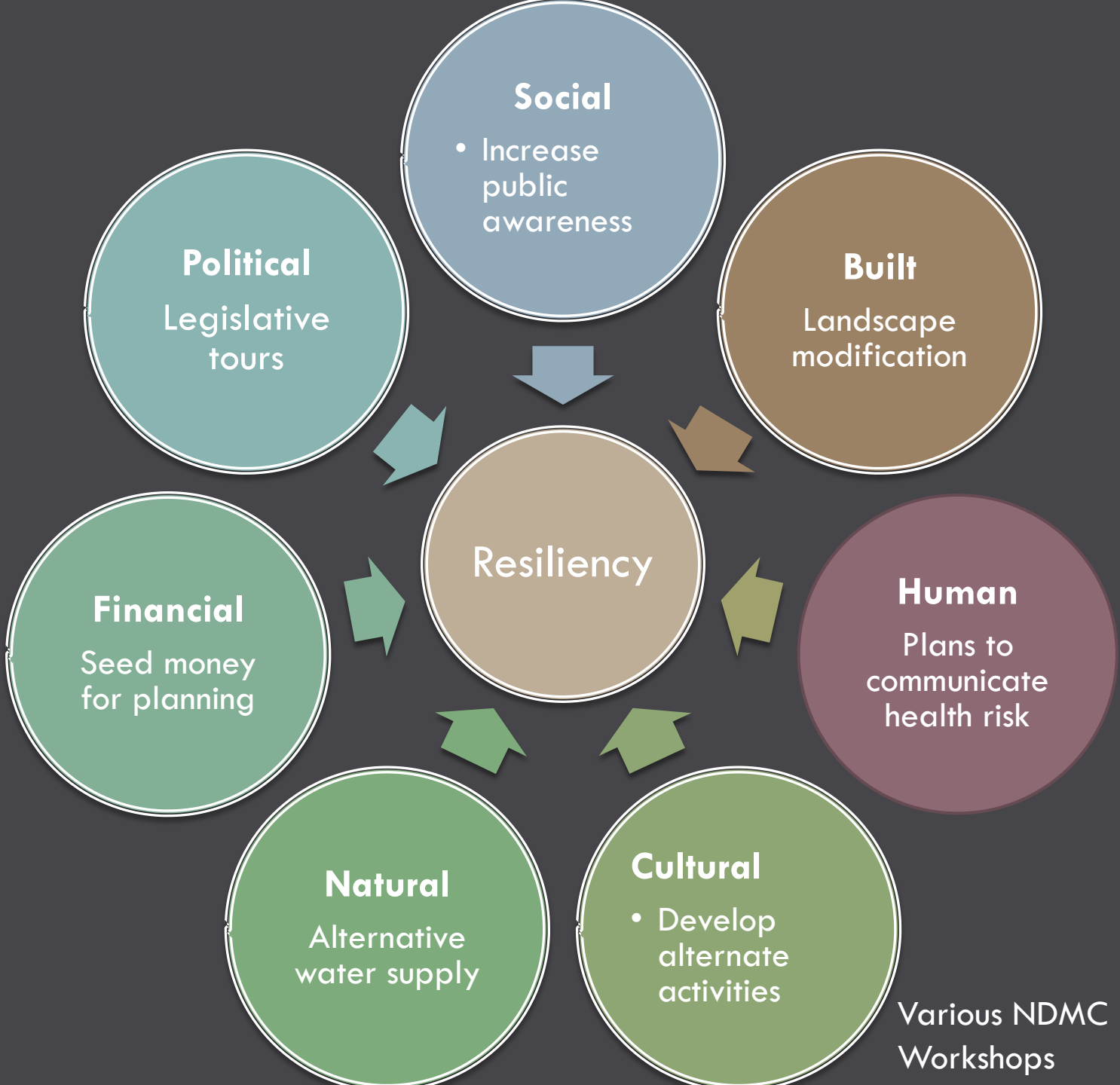
Sources: Media

- Media Valley fever response: Vulnerable inmates ordered out of Avenal, Coalinga prisons - Fresno Bee (CA)**
Dates of Report: 2013-04-29 to 2013-04-29
Publication Date: 2013-04-29
Summary:
Affected Area(s): Arizona, California
Categories: Society & Public Health
Source: Fresno Bee
Url: http://www.fresnobee.com/2013/04/29/3278285/valley-fever-spurs-call-to-close.html#storylink=omni_popular

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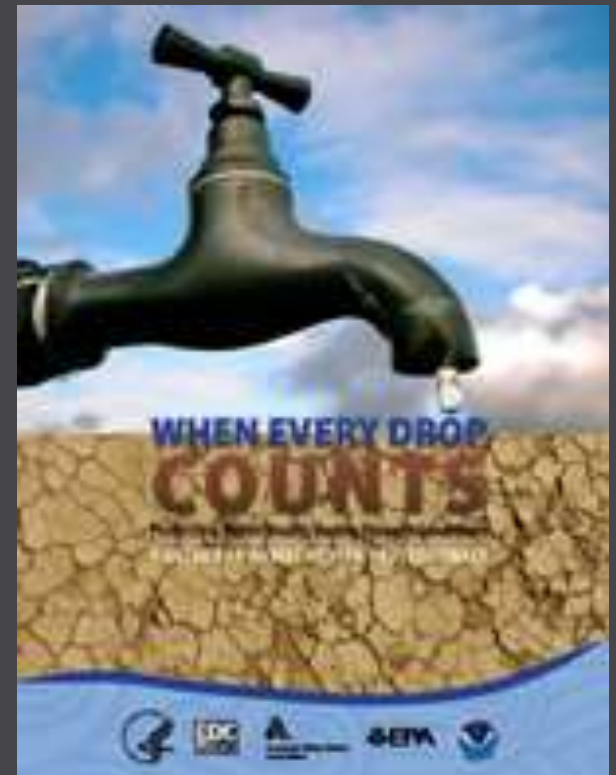
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Drought Planning Strategies



Centers for Disease Control

- <http://www.cdc.gov/nceh/ehs/publications/drought.htm>
- <http://www.cdc.gov/nceh/drought/>



Conclusions & Future Research

- Drought impacts all capitals & these need to be considered in the planning process
 - ▣ Identify committee members & stakeholders carefully using the CCF model
 - ▣ Assess risk & develop mitigation and response strategies by various techniques and processes such as systems analysis
 - ▣ Understand impacts by more research in indicators and thresholds related to health

Feedback regarding areas of need:

- Methods of analysis & the ability to make correlations between drought hazard and community level capital formation (empirical results), data categories should show (or not show) long-term adaptive capacity
- Need to bring out the theory of CCF or just find ways to use it as tool (within a Drought Vulnerability Resilience Index /Drought Exercises & Assessment Processes)

New Opportunities

□ Drought Tournaments



Figure 1: Players in the IDT examine environmental data and collaborate to develop drought management plans. Referee Mike Hayes provides the team with feedback.



Thank you

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