SLIDES: Is There a Dust Bowl in Our Future?: Projections for the Eastern Rockies and Central Great Plains

Dennis Ojima

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Is There a Dust Bowl in Our Future?
Projections for the Eastern Rockies and Central Great Plains.

Water, Climate and Uncertainty Conference
Boulder, CO

11 June 2003

Dennis Ojima
SHORT ANSWER:
YES
LONG ANSWER:
WHEN?
HOW BIG?
OVER WHAT REGION?
GIVEN HUGE UNCERTAINTIES

WHAT SHOULD WE DO?
COPING STRATEGIES

• USE AVAILABLE SCIENCE INFORMATION
  - Theory
  - Techniques
  - Facts

• UNDERSTAND VULNERABILITIES
  - Inter-relationships
  - Current Constraints
  - Current Strategies

• MULTI-SECTORAL PERSPECTIVE
CASE IN POINT

CENTRAL GREAT PLAINS
CLIMATE CHANGE IMPACT ASSESSMENT
Key Questions

• Do people worry about climate change?
• What are the current concerns about climate variability and change?
• What do people need to know that isn’t already known about climate change (future research)?
OUR APPROACH

• What We Know
• Concerns
• Develop Scenarios
• Evaluate Suite of Responses
• Coping Strategies
Platte River Basin, Colorado

Precipitation

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<td>1993</td>
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<td>2000</td>
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Average Temperature

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<td>2000</td>
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CREATING SCENARIOS

• LOOK TO THE PAST
• CRITICAL CHARACTERISTICS OF INTEREST
• APPLY "WHAT IF"
• USE HYPOTHEORIZED TRAJECTORIES
Middle Boulder Creek

Eastern Colorado

(Source: Woodhouse et al., 2002)
ESTES PARK AVERAGE TEMPERATURE

Scenario Data

Climate changes

Observed Data

Deltas
Assessment Process

• Identify vulnerabilities and opportunities related to climate change
• Gather information from and provide information to stakeholders
• Run stakeholder-defined analyses
• Assess future coping strategies
Land Use

• Agriculture and livestock major land uses

• Major human transformation of land

• Fewer, larger operations - increase in high-tech operations
CURRENT STRESSES

• Climate Variability
• Global Market Changes
• Decline In Rural Infrastructure
• Loss Of Biodiversity/Invasive Species
• Urban And Exurban Expansion
• Air And Water Pollution
• Water Competition
• N Deposition
Factors in Land Use Decision Making

- **Land** - Soil, moisture, and knowledge of the land
- **Family** - Family priorities
- **Economy** - Input costs, commodity prices, and credit
- **Environment** - Personal environmental concerns and conservation/rotation practices
- **Risk** - Reducing risk
- **Operation** - Equipment and labor availability
- **Policies** - Government support policies
- **Community** - Community pressures

(Bohren and Knop)
Source: Woodhouse and Overpeck, 1998
### GCM Scenario for the Great Plains

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<th>2030</th>
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<th>2090</th>
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Winter Snowpack (Northern Great Plains)

<table>
<thead>
<tr>
<th>Year Period</th>
<th>Snowpack (mm)</th>
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<td>1961-1990</td>
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<td>2030 CCC</td>
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<td>2030 Had</td>
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<tr>
<td>2090 Had</td>
<td>10</td>
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Extreme Rainfall (>50mm) in 24 hrs.

* sum of grid cells over each year where an extreme rainfall event occurs
Number of Hot Day Events (Great Plains)

- 1961-1990
- 2030 CCC
- 2030 Had
- 2090 CCC
- 2090 Had

number of events

- 0
- 2
- 4
- 6
- 8
- 10
- 12

- 32 C
- 38 C
- 41 C
Potential Impacts

- Modified vulnerability of farm/ranch families to climate and market stresses
- Crop and livestock production modified
- Water use competition impacted
- Water quality changed
- Expansion of weeds, pests, and diseases
- Change plant-animal communities
- Fire and storm patterns altered
High Plains (Ogallala) Aquifer Decline

Drummond USGS
1997 Irrigation vs. Historical Average (1974-97)
Coping Strategies

- Better preparation for extreme events
- Flexible Management Strategies
- Diversification of practices to take advantage of opportunities/reduce vulnerabilities
- Increased Efficiency of Water Storage Areas
- Increasing soil organic matter to increase water holding capacity
- Participation in policy discussions
- Develop better communication at all levels
What Have We Learned

• *Seasonal changes* to snowmelt will impact water storage and delivery systems

• *Soil carbon management* is critical to coping with climate change - seen as "win-win" situation

• *Technological and information transfers* do not always reach the stakeholders
Conclusions

- impacts on natural systems cannot be looked at without also looking at impacts on social systems
- “WIN-WIN” solutions are feasible
- vulnerability of currently stressed sectors in the great plains will be exacerbated
- change in extreme events and variability in climate will affect livelihood more than monotonic change in climate
- extra-regional forces exacerbate vulnerability to climate change