

# Assessing future stability of **US High Plains land-cover** integration of process modeling with Landsat, *in-situ*, modern and paleoclimate data

## Cast of Characters:



- Jonathan Overpeck, PI
- Robert Webb, Co-PI
- Alex Goetz, Co-PI
- David Schimel, Co-PI
- Gifford Miller, Co-PI
- Connie Woodhouse, Collaborator
- Jennifer Mangan, Graduate Student
- Noah Daniels, Graduate Student



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## Overview of Presentation



- Project Overview - Why??
- Defining the Full Range of Drought and Land-cover Variability
- Modeling Climate-induced Land-cover Change
- Simulating Spatially-explicit Land-cover Change
- Linking Land-cover Assessments to “Stakeholder” Needs



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## Project Overview - Why??

- Important regional land-cover (think “food”, but much more...)
- 20th-Century droughts devastating
- 100,000 km<sup>2</sup> of eolian dunes and sandsheets
- Potential for unprecedented natural disaster
  - Natural variability
  - Human-exacerbated change (e.g., land/water use, global warming)



# *Defining the Full Range of Drought and Land-cover Variability*

## Progress to Date:

- State-of-the-art review: 2000 years of drought
  - ✓ Woodhouse and Overpeck, *BAMS* 1998
  - ✓ Graduate research of Noah Daniels
- NASA/NOAA Workshop: Assessing the full range of central North America Droughts and Associated Landcover Change, Boulder, Colorado, June 2-4, 1999
- Concentrated attack on geochronology



# ***NASA/NOAA US High Plains Workshop Goals:***

- 1. Generate state-of-the-art paper describing what we know and do not know about the full range of drought and associated land-cover change**
  - Extend back ca. 7,000 years
  - Cover climate **and** land-cover change
  - Examine cause and effect (e.g., with modelers)
- 2. Define community research priorities required to develop a predictive capability**
- 3. Identify mechanisms for community coordination (e.g., geochronology capabilities, sample material/data/information sharing)**
- 4. Continue development of WWW data and information site for support of**
  - Climate change research
  - Land-cover change research
  - Climate and land-cover change assessments (i.e., with “stakeholders”)



# ***Modeling Climate-induced US High Plains Land-cover Change (J. Mangan et al.,)***

## **Progress to Date:**

- Adapted CENTURY ecosystem model for Sandhills, Nebraska study area
- Carried out CENTURY simulations
  - 20th century observed climate
  - ca. 6000 years ago
  - series of increasingly severe drought scenarios



# *Simulating Spatially-explicit US High Plains Land-cover Change (J. Mangan et al.,)*

## Progress to Date:

- Developed High Plains GIS
  - Political boundaries, fluvial, topography, land-cover, soil, climate, etc.
- Selected regions and years for multi-temporal analysis using Landsat
- Acquired Landsat scenes
- Analyzing land-cover variations for selected areas



# *Linking Land-cover Assessments to “Stakeholder” Needs*

## **Progress to Date:**

- Climate change press-conference yielded strong interest in and out of scientific community
- NASA/NOAA Workshop to bring in climate assessment community
- Linkages developed with other relevant climate change assessment programs
  - Water in the West (University of Colorado)
  - Central Great Plains (Colorado State)
  - Southwest (U. Arizona)





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## The next steps...

- Extend to southern (drier) region
- Rigorous model improvement & validation
  - versus recent spatially-explicit changes (w/Landsat)
  - versus larger range of paleo change
    - improved (coupled atmosphere-ocean) climate simulations
    - improved observations
- Assess possible future climate and land-cover change (with climate simulations, CENTURY and Landsat)

