Climate Impacts on Ranching, Farming and Natural Resources in the Northern Plains

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Northern Great Plains Ecosystems
Grazing X drought X fire interactions

Temperature

Precipitation

Grasslands of the Great Plains

Palmer Drought Severity Index
1895–1995
Percent of time in severe and extreme drought

SOURCE: McKee et al. (1993); NOAA (1990); High Plains Regional Climate Center (1996)
Albers Equal Area Projection; Map prepared at the National Drought Mitigation Center
Precipitation Gradient

East-west precipitation gradient is substantial (from 3 to 24 days of precipitation with >0.5 inch in about 800 miles).
Substantial increase in precipitation across eastern part of Northern Plains.
High inter-annual variability in precipitation in Northern Plains (data from north-central Colorado).
Intra-annual Precipitation

High intra-annual variability in precipitation in Northern Plains (data from north-central Colorado).
Forage Production at Cheyenne, WY

Forage Production Variability

Forage Production at Cheyenne, WY

Mean: 1279

Difficulty for ranchers is matching this forage production variability with animal management flexibility across years.
Decent predictive relationships between forage production and spring precipitation in Northern Plains, but forecasting current spring precipitation remains problematic.

Derner and Hart 2007, REM
Importance of timing of spring precipitation for forage production in the Northern Plains depends on prior history of grazing management.
Livestock Production: Precipitation

Dry springs more influential on livestock production than wet years across grazing management strategies.
Cattle and Calves - Change in Inventory: 2007 to 2012

Cattle moving from Southern Plains to Northern Plains

1 Dot = 1,000 Cattle and Calves Increase
1 Dot = 1,000 Cattle and Calves Decrease

United States Net Decrease -6,353,244
Adaptive Management

• Enterprise flexibility in stocking rates, time/season of grazing, type/species of animal and rest to achieve desired outcomes in landscape

• Flexible stocking with high quality precipitation forecasts could double economic returns
Recent/Projected Climatic Changes

Third National Climate Assessment: 
*Droughts, Deluges and Extreme Events*
Longer and warmer growing seasons, with warmer nights, but not drier in Northern Plains.
Northern Plains expected to have wetter winters, springs, and falls, and slightly drier summers.
Water table depth changes in Ogallala aquifer from predevelopment to 2011.

Slight increases in Nebraska.

Substantial declines in western Great Plains.
Expanding corn and soybean acreage, with less wheat and hay in the Plains states. Midwest also has expanding corn acreage.
Substantial acreage increases of corn and soybeans in eastern North and South Dakota, at expense of wheat and grassland/hayland.
Irrigation has increased stability of crop production, but concerns with aquifer declines and changes in timing/amounts of snowfall runoff, are leading to efforts to get more “crop per drop”.
Assist Ranchers, Farmers and Forest Land Managers with Decision-making
Key Thrust

• The Hub will deliver science-based knowledge and practical information to farmers, ranchers, and forest landowners that will help them to adapt to weather variability by coordinating with local and regional partners in Federal and state agencies, NGO’s, private companies, and Tribes.
Key Approach

• Conduct the transfer of information, tools and management practices to agricultural producers to enhance decision making with weather variability for reduction of enterprise risk and increased resilience of working lands.
Conceptual Framework for a USDA Regional Climate Hub

Science and Technology providers:
- Federal Partners
  - NOAA Regional Integrated Sciences and Assessments
  - USGS Climate Science Center
  - USDA Intramural funded Research (ARS/FS/ERS/NRCS)
  - USDA Extramural funded Research (NIFA)
- Non-Federal Partners
  - Agricultural Experiment Stations
  - Many others

Technology Transfer providers:
- Others
- State Agricultural Extension
- USDA Service Centers
- Forest Service Threat Centers
- eXtension

Stakeholders and Stakeholder groups: Farmers / Ranchers / Forest Managers
Tribes / State Land Managers / Federal Land Managers / Landscape Conservation Cooperatives/ Others
Regional Climate Hubs Will Provide:

Technical Support and Decision Tools

http://www.fs.fed.us/ccrc/
Regional Climate Hubs Will Provide:

Assessments/Forecasts

Projected Changes in Key Climate Variables Affecting Agricultural Productivity

Clear need for reliable weather forecasting on time scales relevant for agricultural decision making (3-6 months to several years).

Third National Climate Assessment
Regional Climate Hubs Will Provide:

**Outreach/Education**

Conduct retrospective/prospective efforts to garner feedback from agricultural producers.
Questions?

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