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

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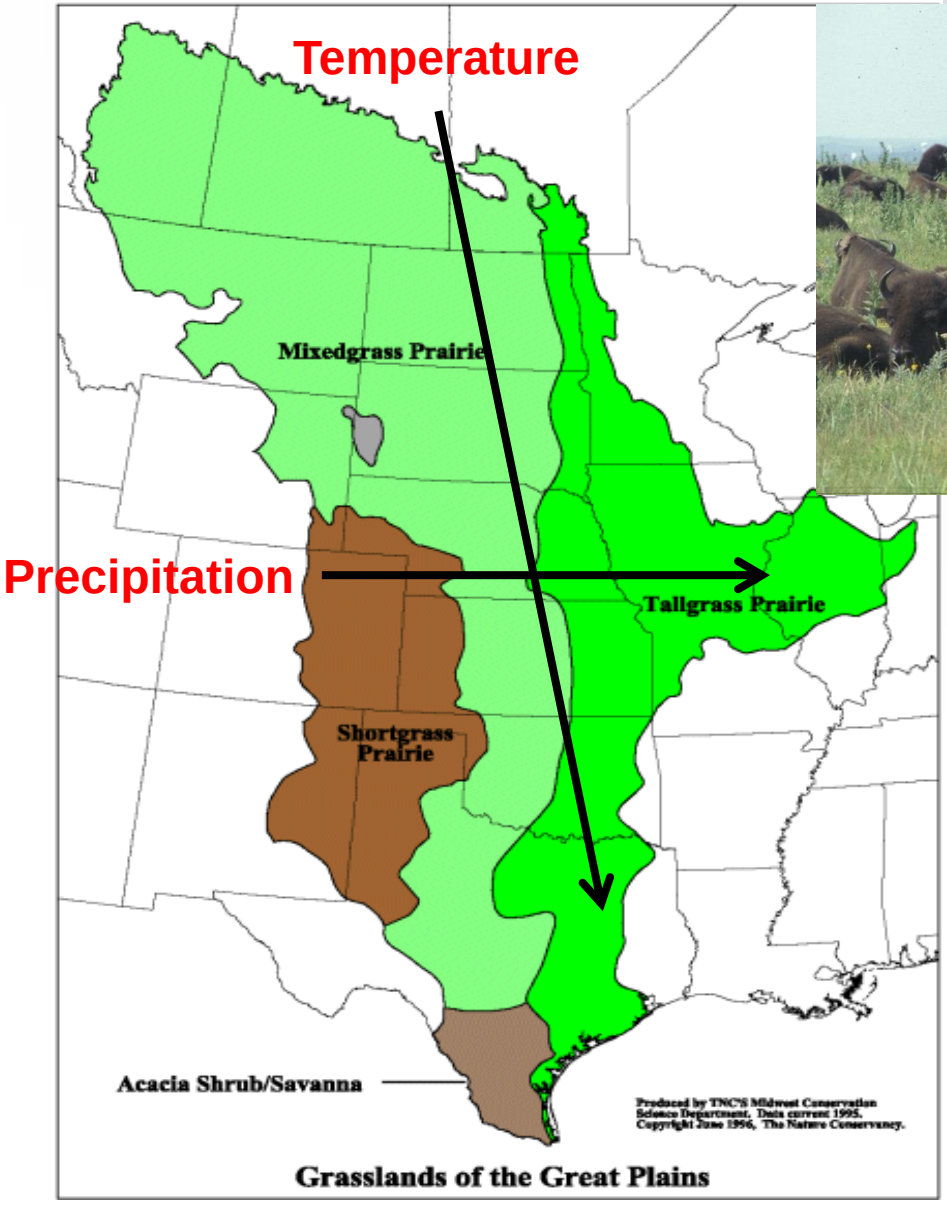
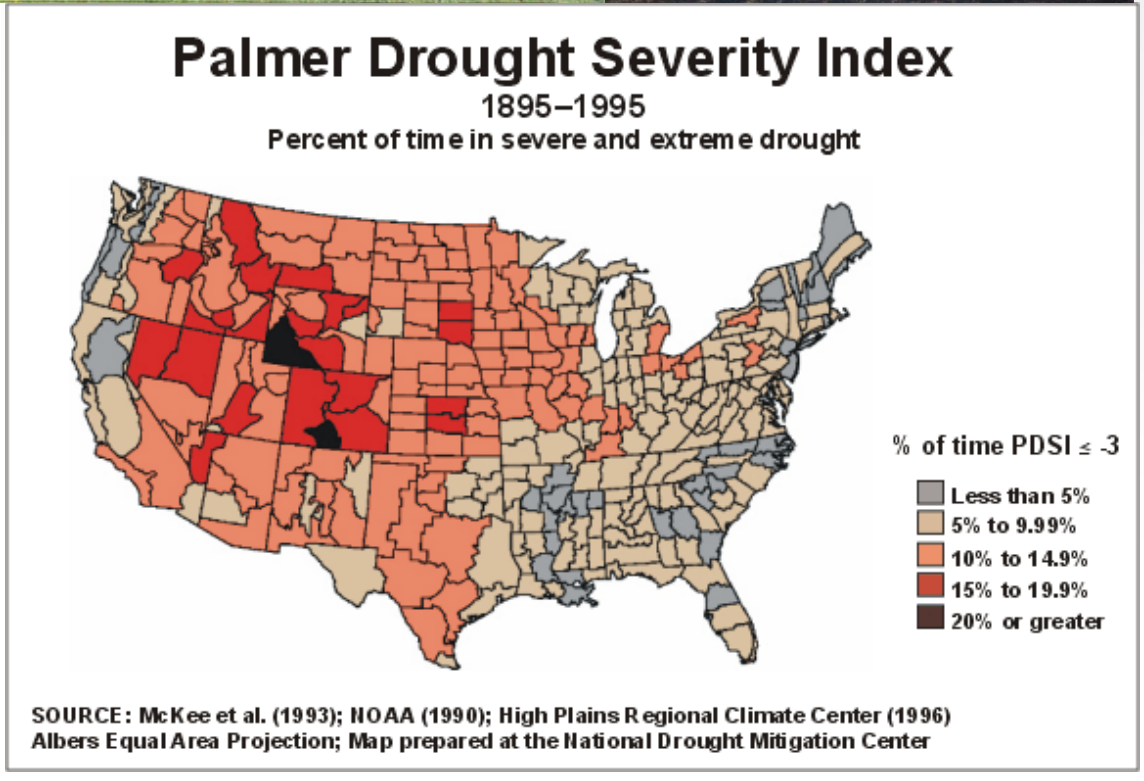
USDA

United States Department of Agriculture

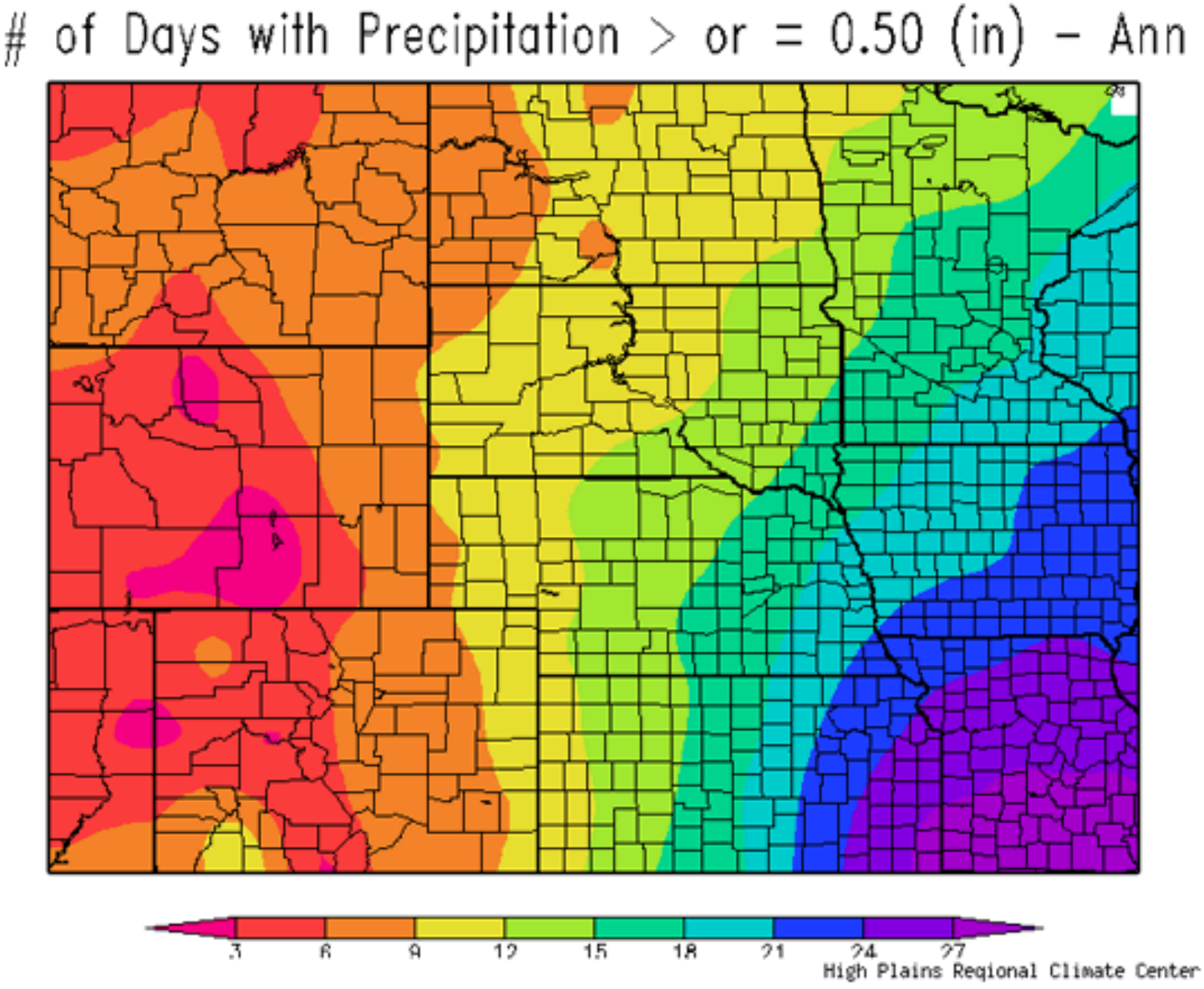
Northern Great Plains Ecosystems

Grazing X drought X fire interactions



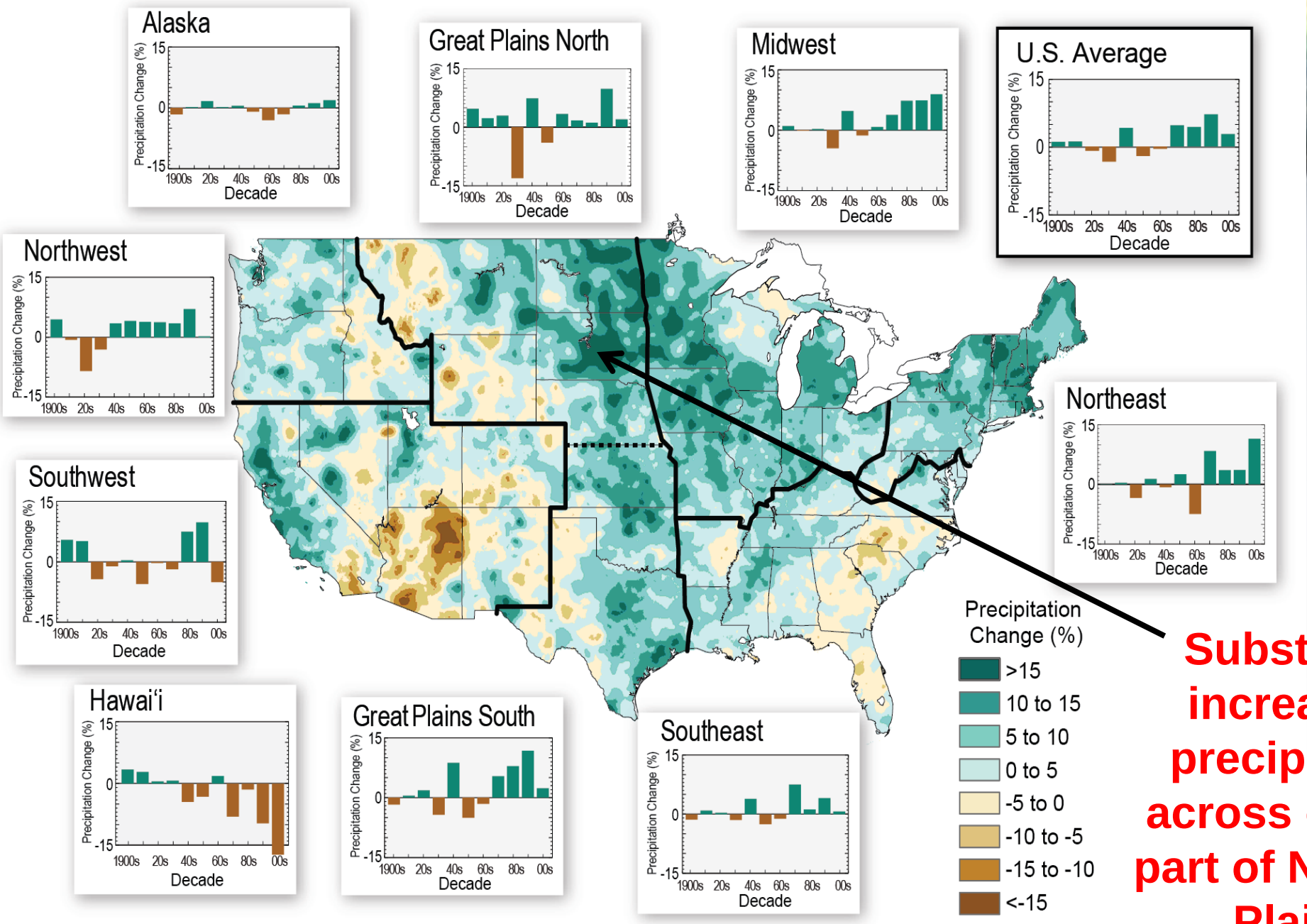


Precipitation Gradient



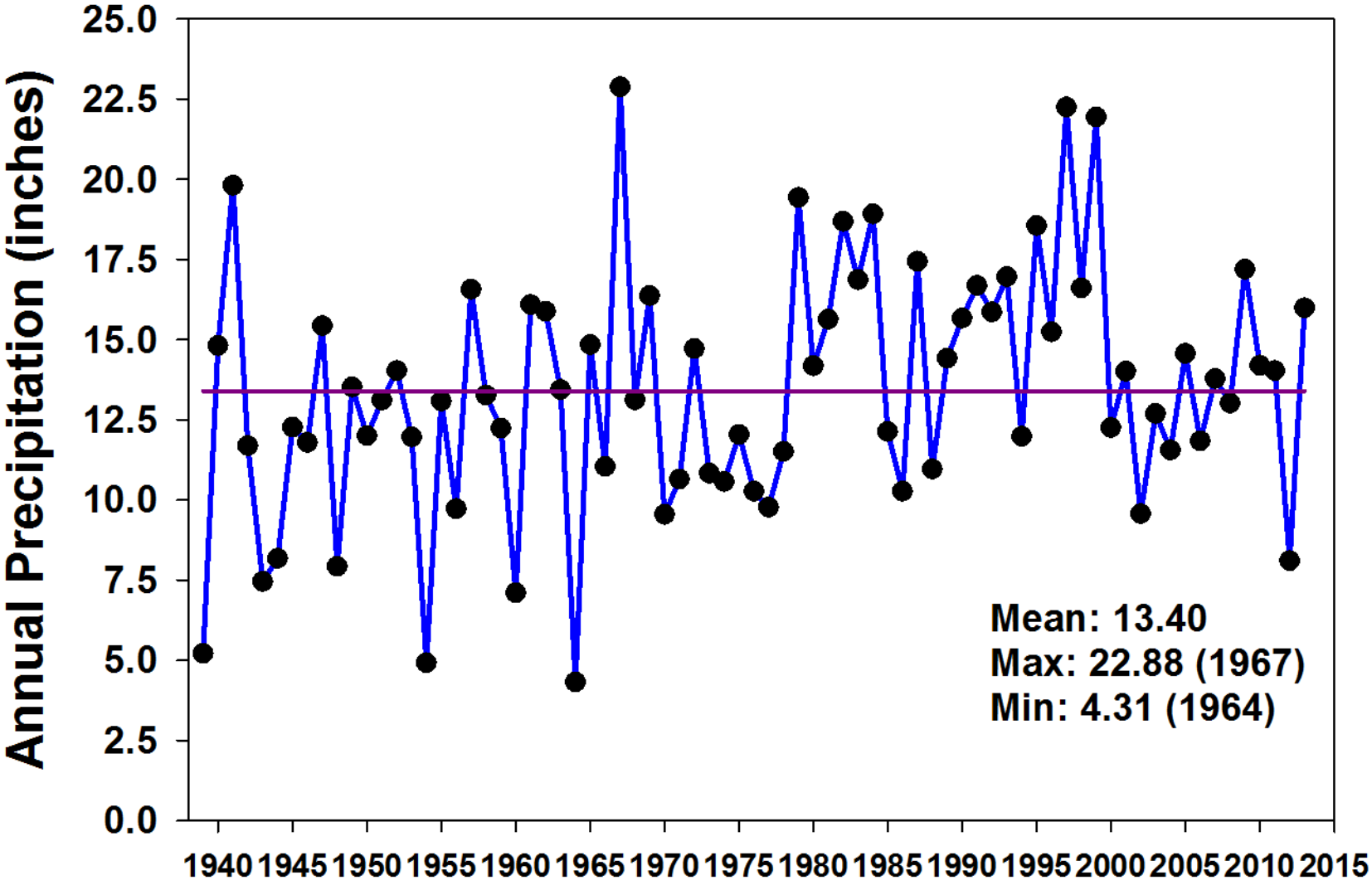
East-west precipitation gradient is substantial (from 3 to 24 days of precipitation with >0.5 inch in about 800 miles).

Precipitation change (from 1991) relative to 1900-1960



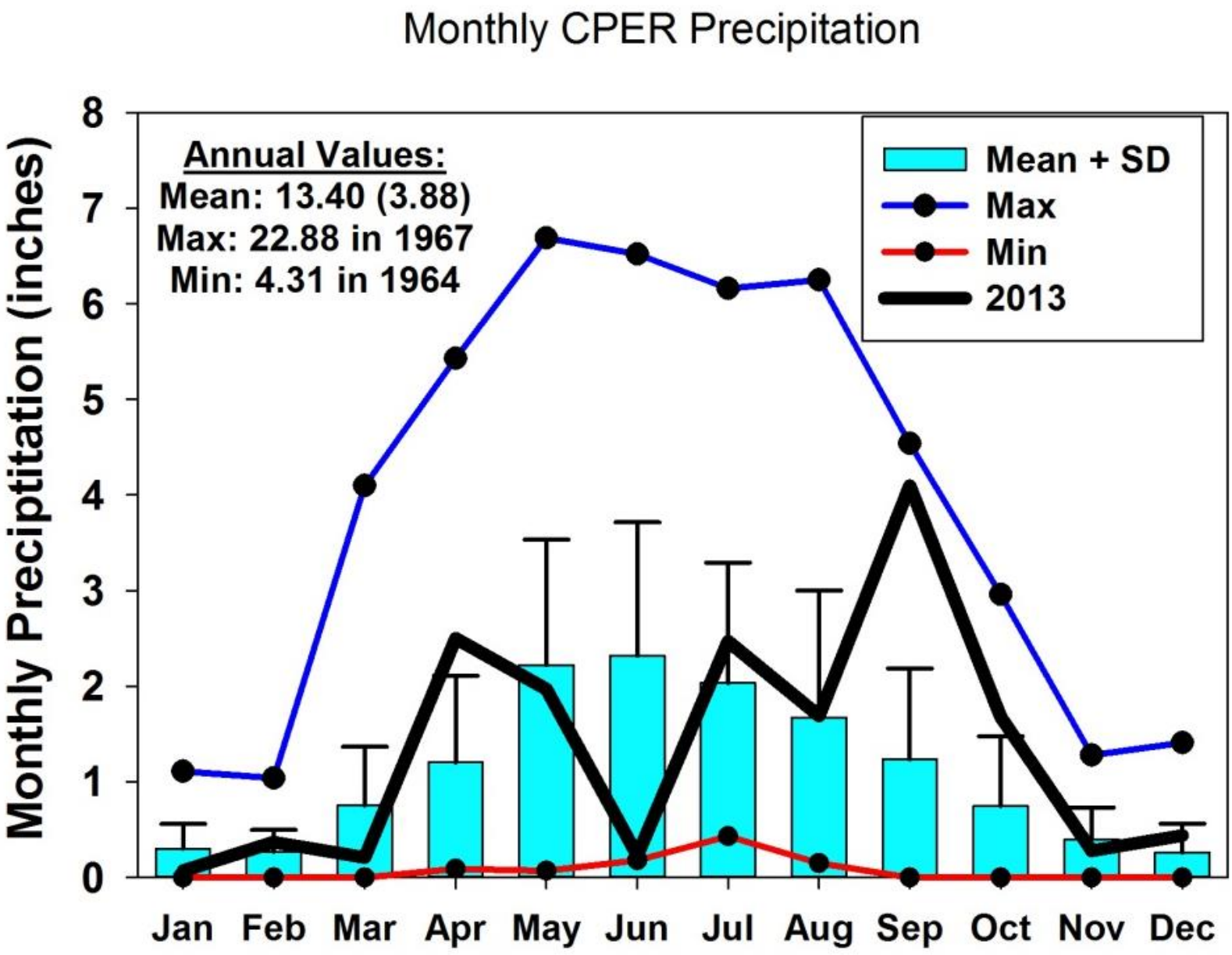
Substantial increase in precipitation across eastern part of Northern Plains.

Inter-annual Precipitation



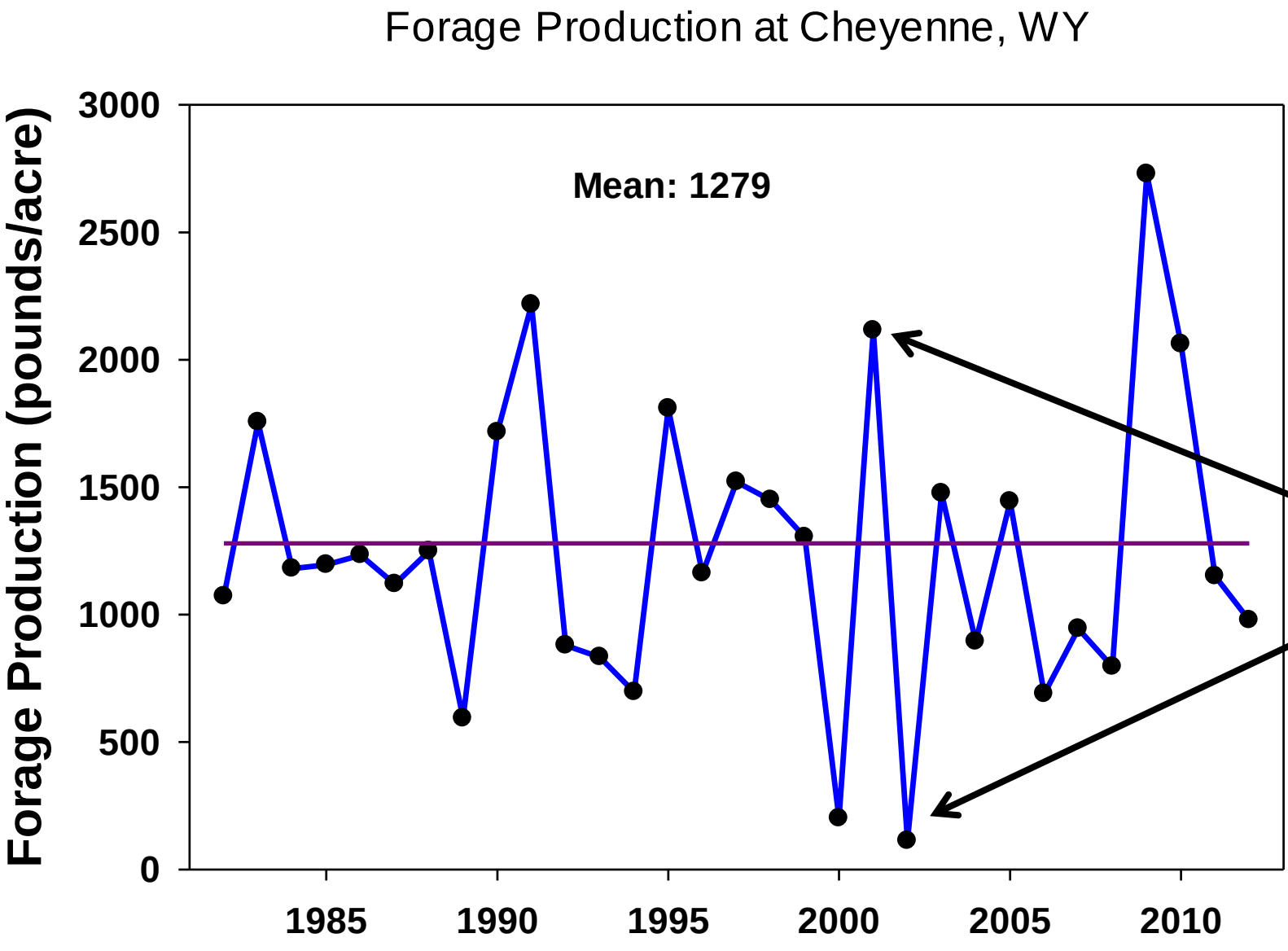
High inter-annual variability in precipitation in Northern Plains (data from north-central Colorado).

Intra-annual Precipitation



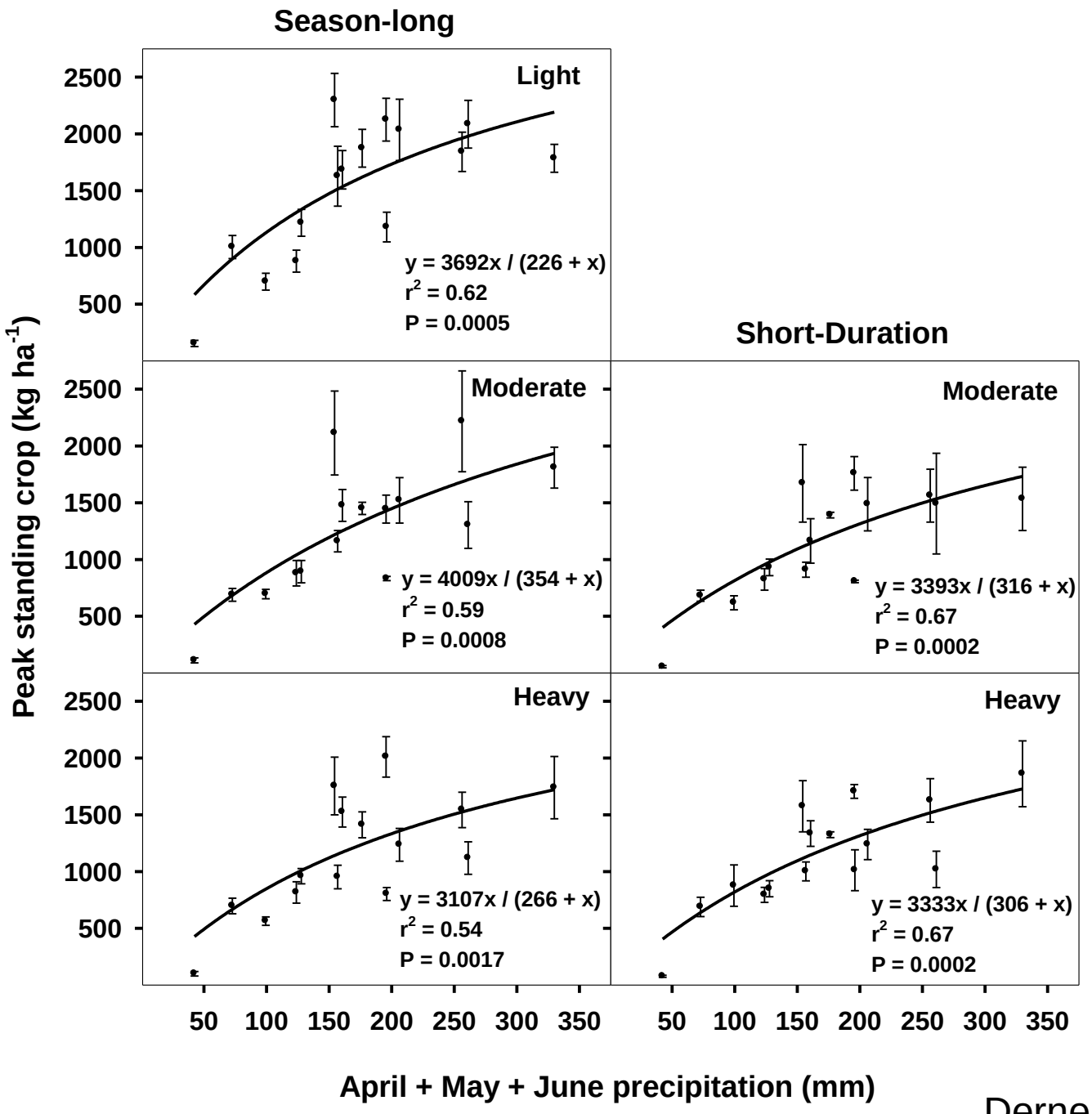
High intra-annual variability in precipitation in Northern Plains (data from north-central Colorado).

Forage Production Variability



Difficulty for ranchers is matching this forage production variability with animal management flexibility across years.

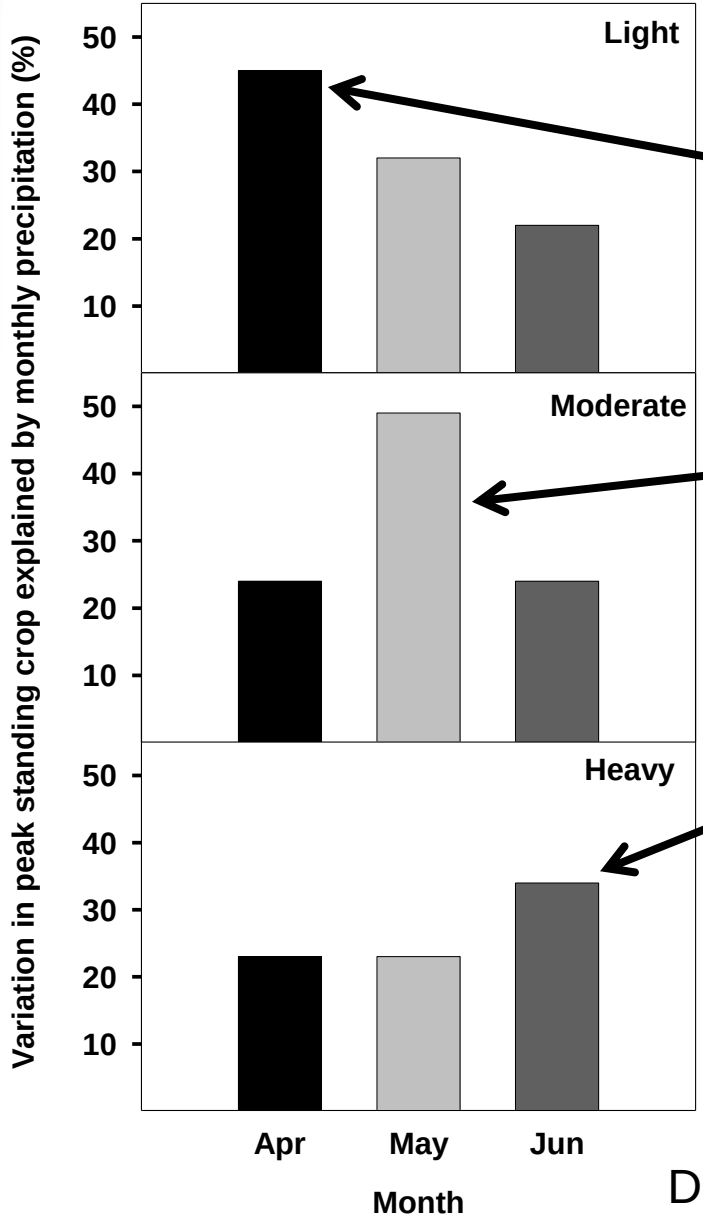
Predictive Forage Relationships



Decent predictive relationships between forage production and spring precipitation in Northern Plains, but forecasting current spring precipitation remains problematic.

Derner and Hart 2007, REM

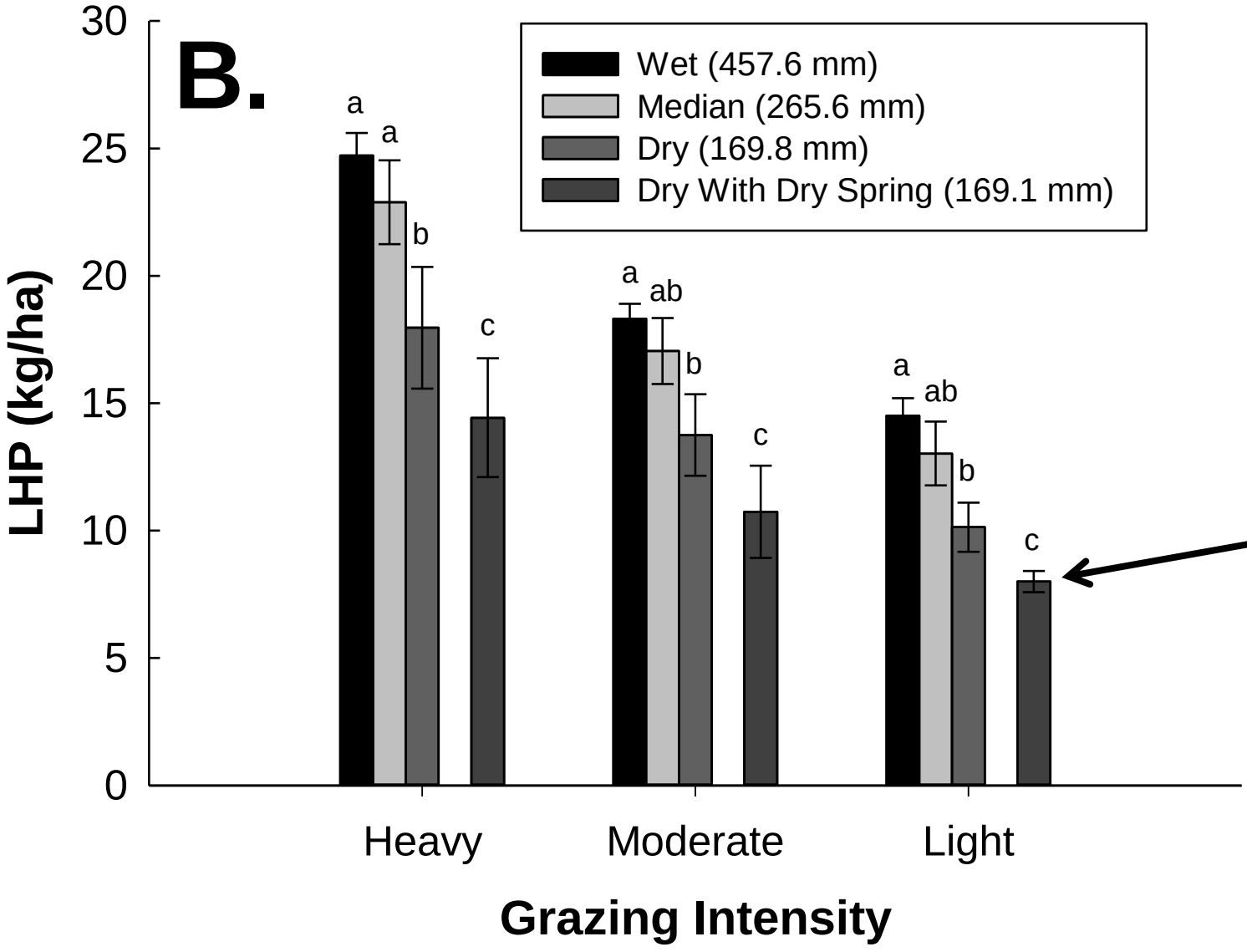
Precipitation Importance: Management



Importance of timing of spring precipitation for forage production in the Northern Plains depends on prior history of grazing management.

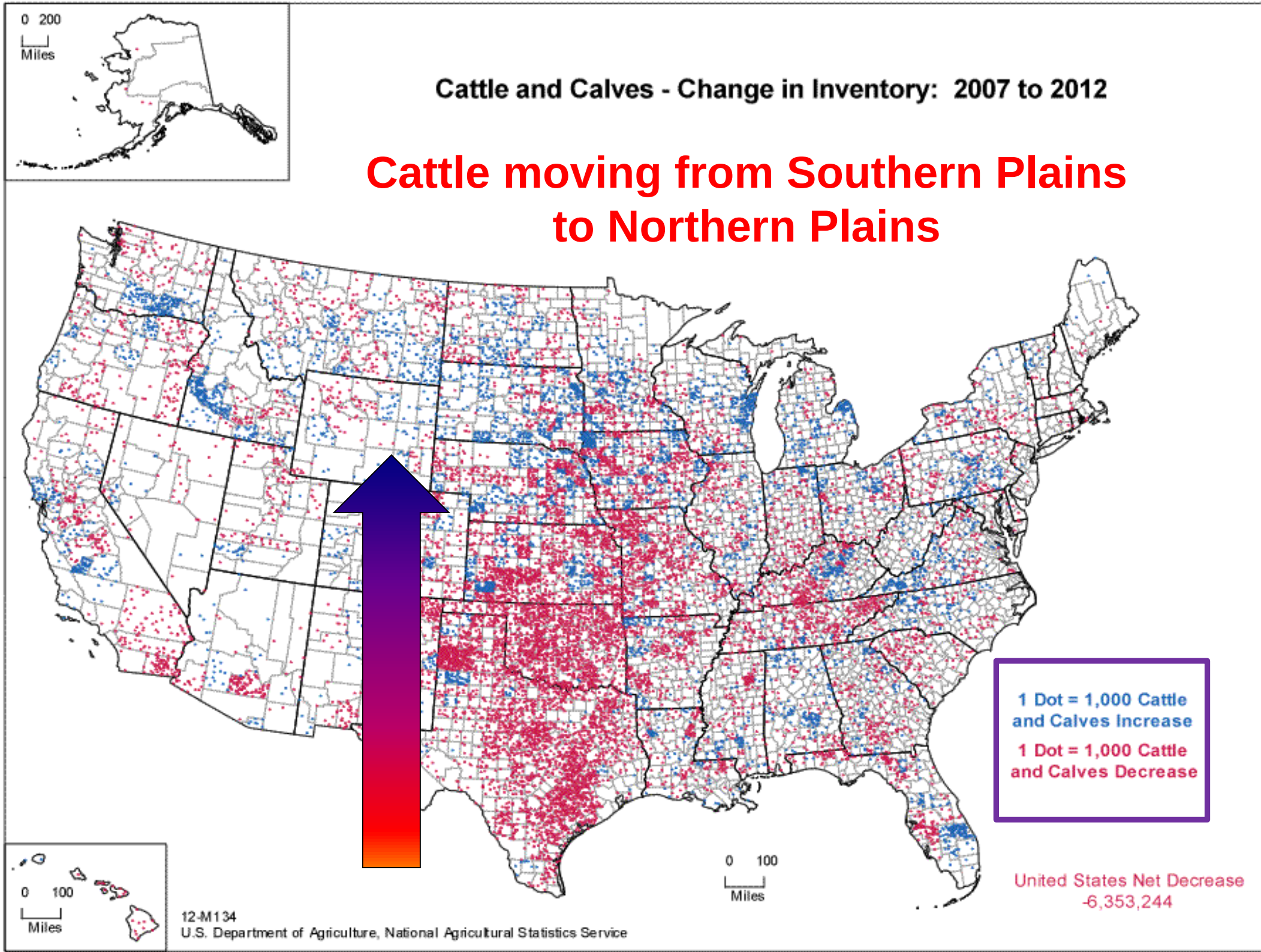
Derner and Hart 2007, REM

Livestock Production: Precipitation



Dry springs more influential on livestock production than wet years across grazing management strategies.

Derner et al, in review


0 200
Miles
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
0 100
Miles
United States Net Decrease
-6,353,244
0 100
Miles
12-M134
U.S. Department of Agriculture, National Agricultural Statistics Service
2012 Census of Agriculture

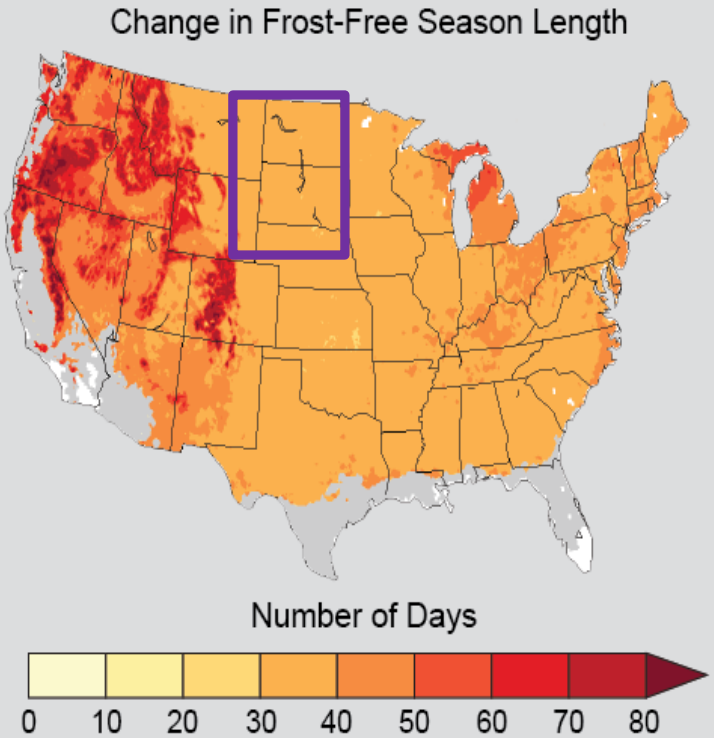
Adaptive Management

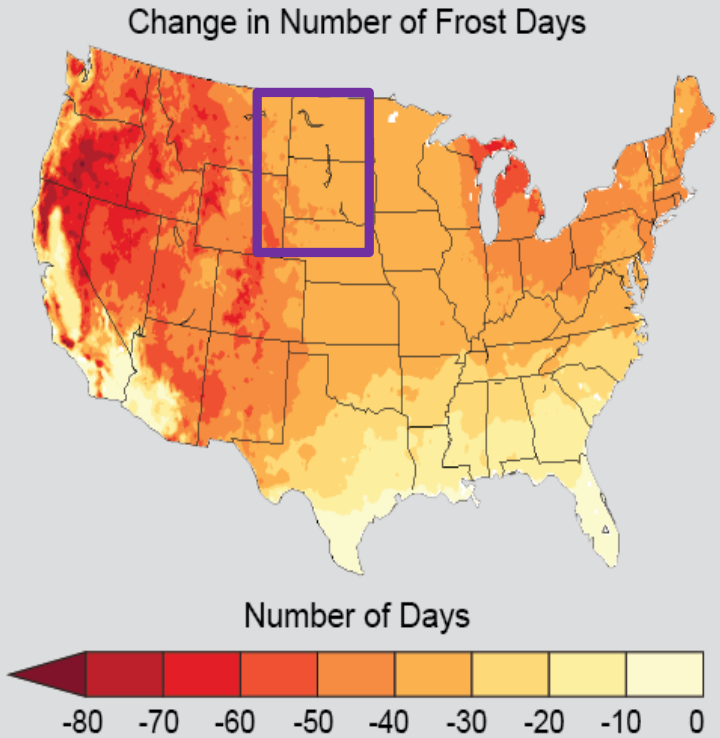
- **Enterprise flexibility in stocking rates, time/season of grazing, type/species of animal and rest to achieve desired outcomes in landscape**

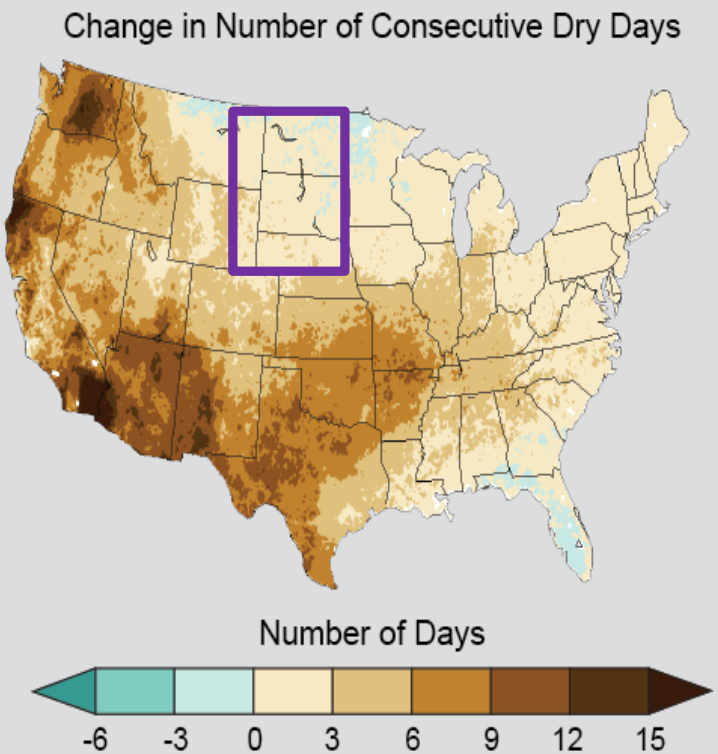
- **Flexible stocking with *high quality precipitation forecasts* could double economic returns**
    - **Torell et al. *2010 Rangeland Ecology and Management* 63:415-425.**

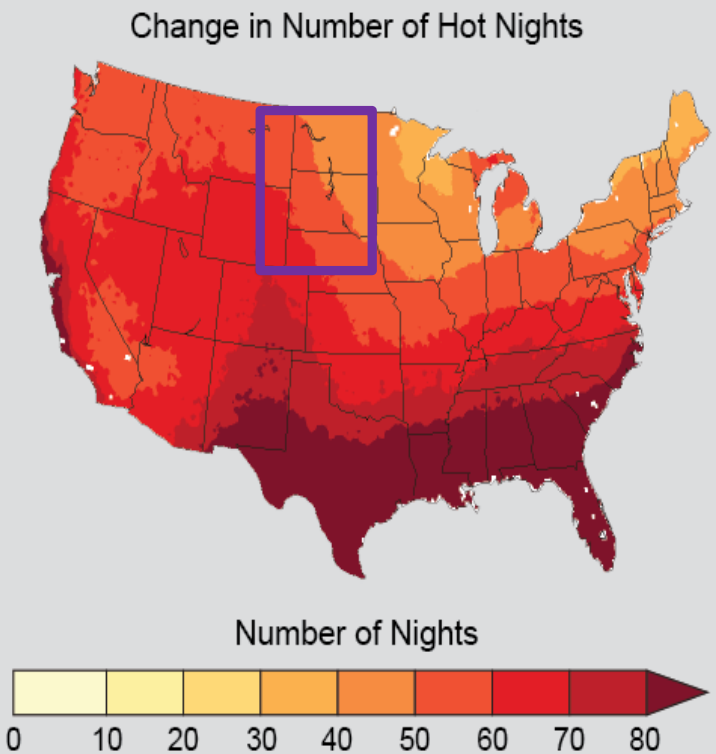
Recent/Projected Climatic Changes

Third National Climate Assessment:
Droughts, Deluges and Extreme Events

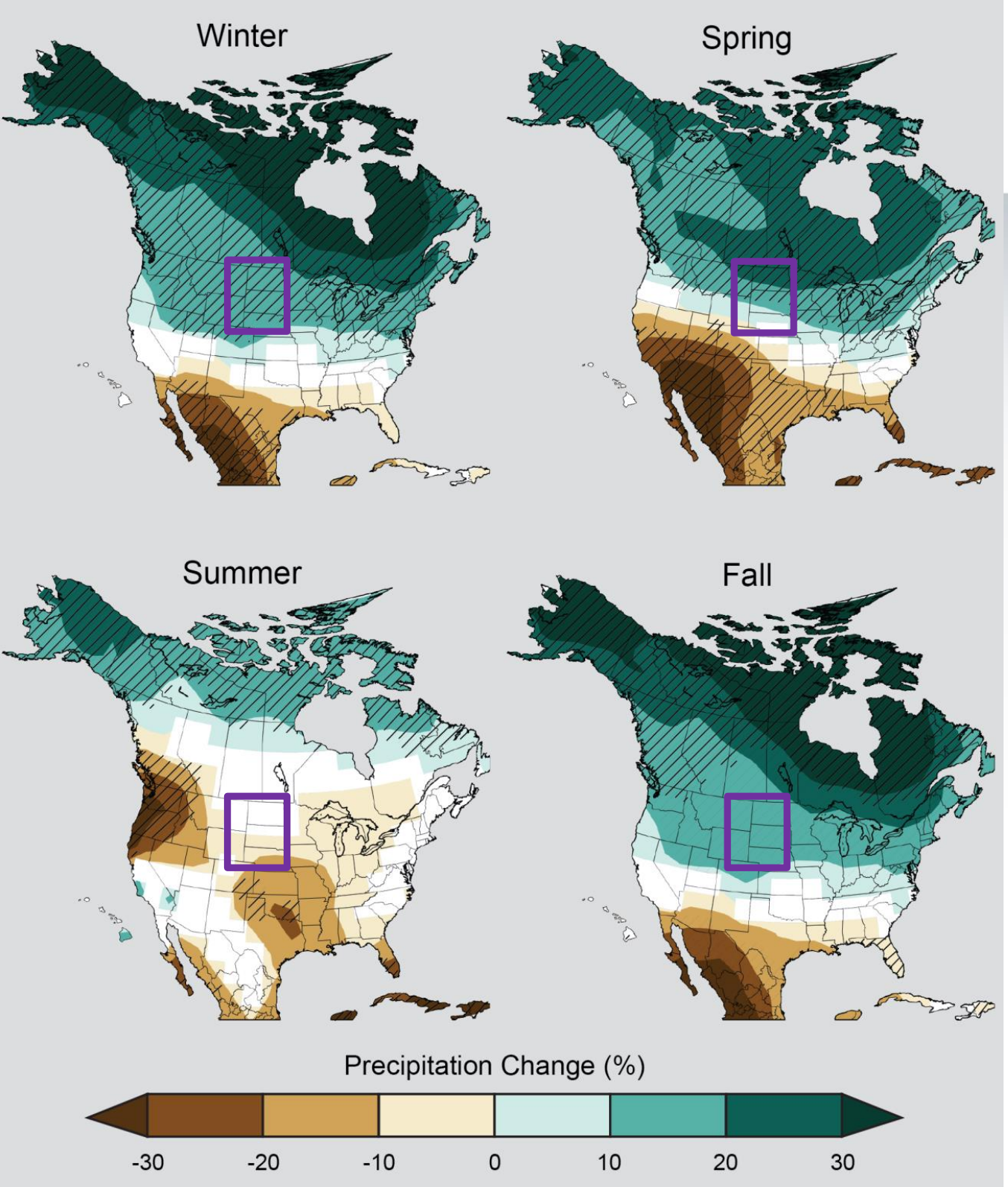




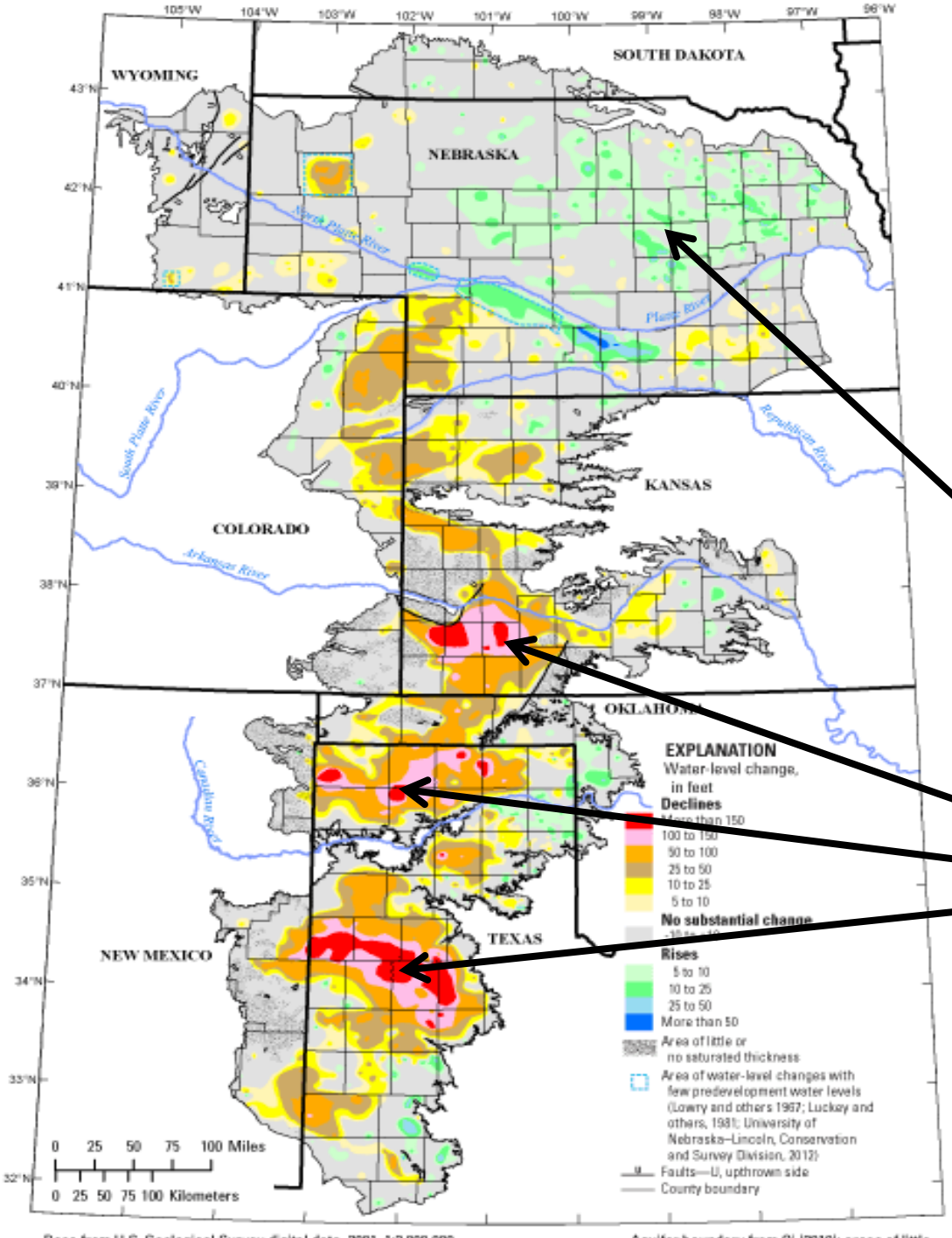




Longer and warmer growing seasons, with warmer nights, but not drier in Northern Plains.



Northern Plains expected to have wetter winters, springs, and falls, and slightly drier summers.



Base from U.S. Geological Survey digital data, 2001, 1:2,000,000
Albers Equal-Area Conic projection
Standard parallels 29° 30' and 45° 30', central meridan -101°
North American Datum of 1983 (NAD 83)

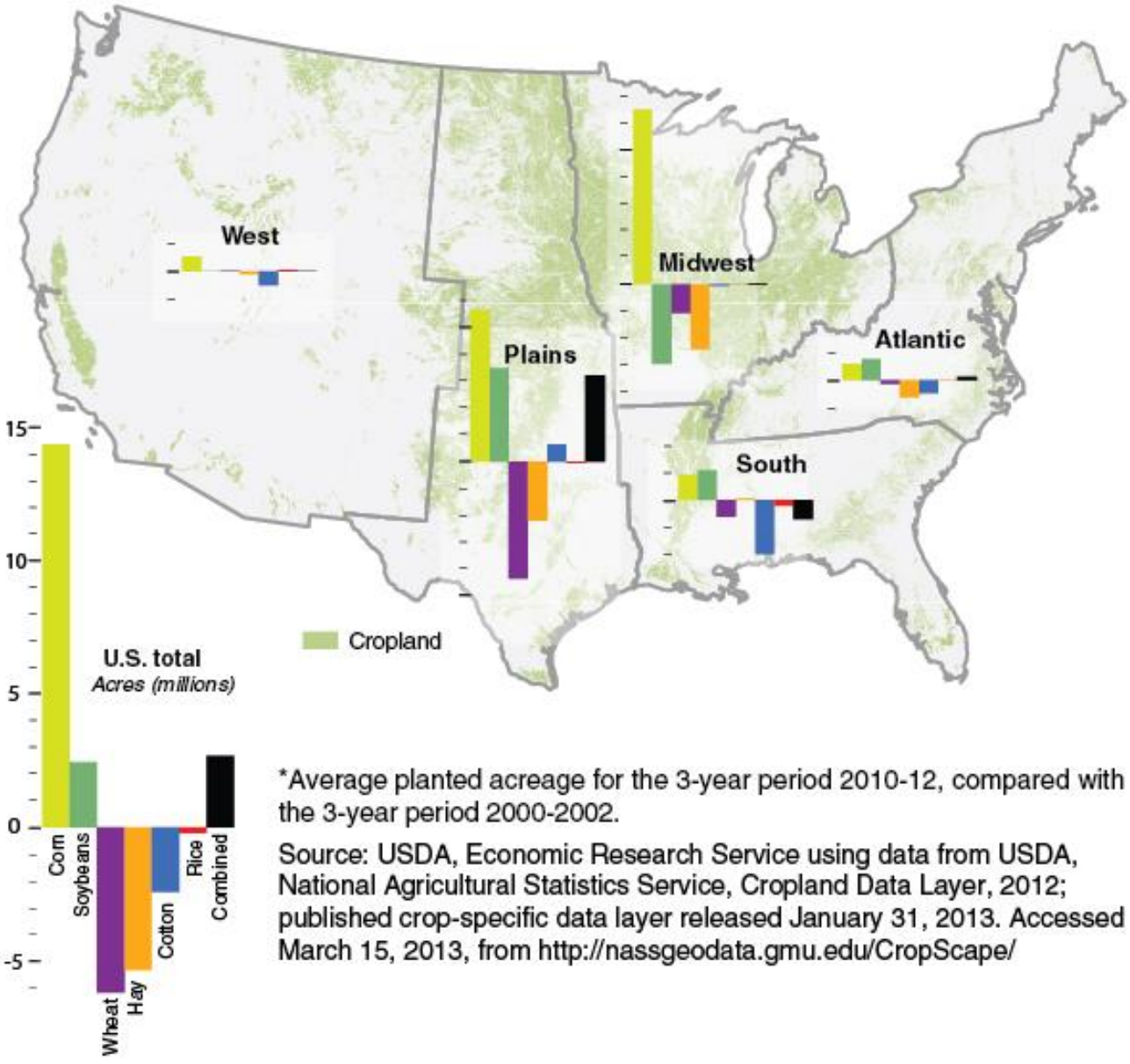
Aquifer boundary from Qi (2010); areas of little or no saturated thickness and faults from Gutentag and others (1984) and Cederstrand and Becker (1999a, 1999b)

Water table depth changes in Ogallala aquifer from predevelopment to 2011.

Slight increases in Nebraska.

Substantial declines in western Great Plains.

Acreage patterns have changed considerably since the early 2000s, dominated nationally and regionally by expanding corn acreage*



*Average planted acreage for the 3-year period 2010-12, compared with the 3-year period 2000-2002.

Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, Cropland Data Layer, 2012; published crop-specific data layer released January 31, 2013. Accessed March 15, 2013, from http://nassgeodata.gmu.edu/CropScape/

Expanding corn and soybean acreage, with less wheat and hay in the Plains states.

Midwest also has expanding corn acreage.

Figure 1. Change in Corn Acres by County from 2006 to 2012.

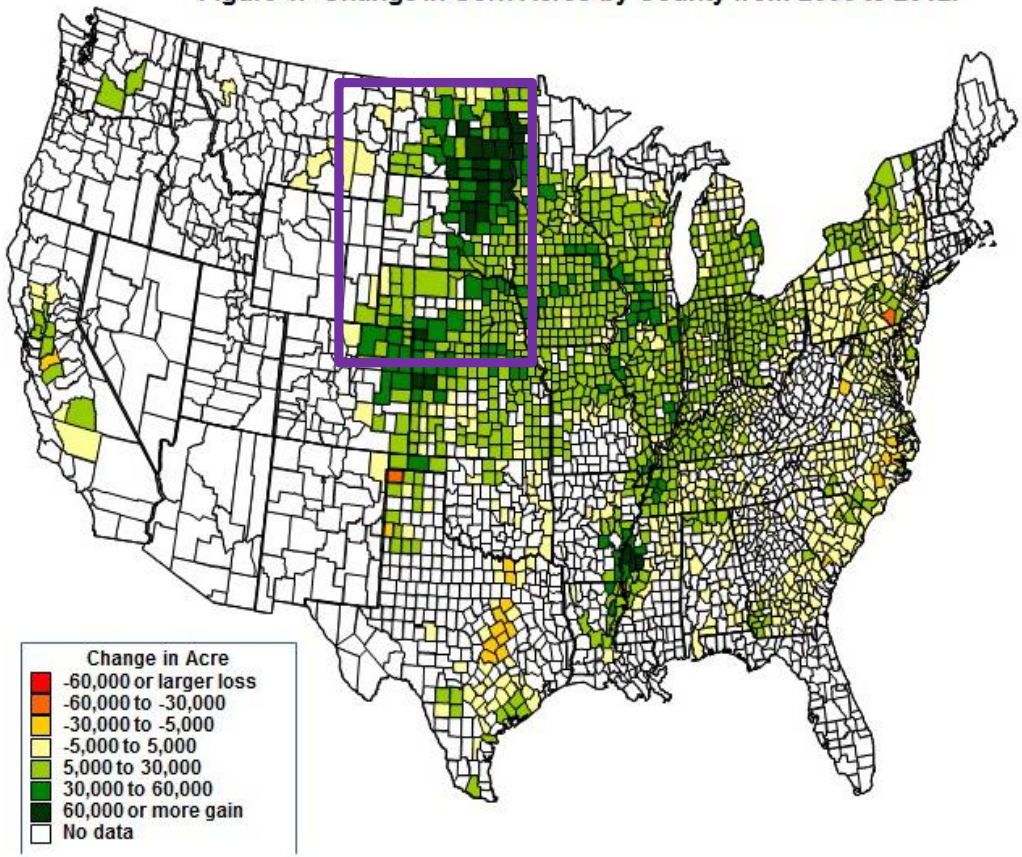


Figure 2. Change in Soybean Acres by County from 2006 to 2012.

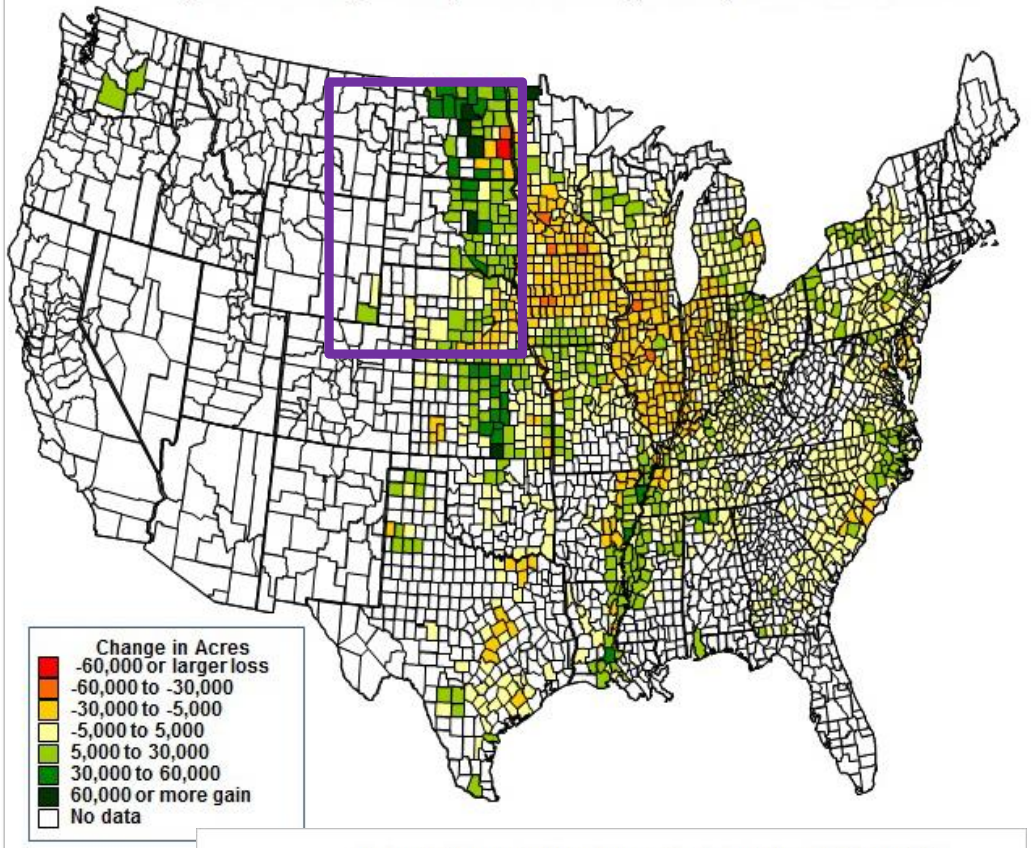
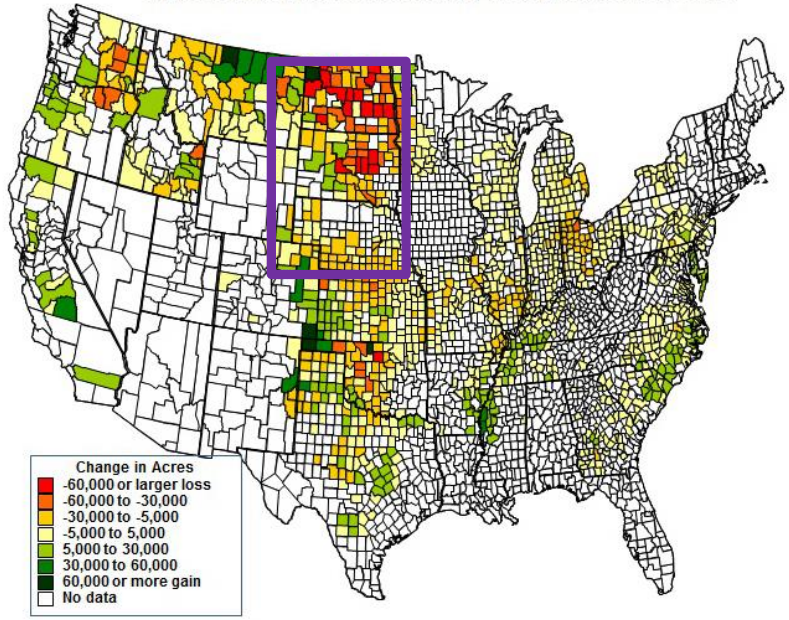


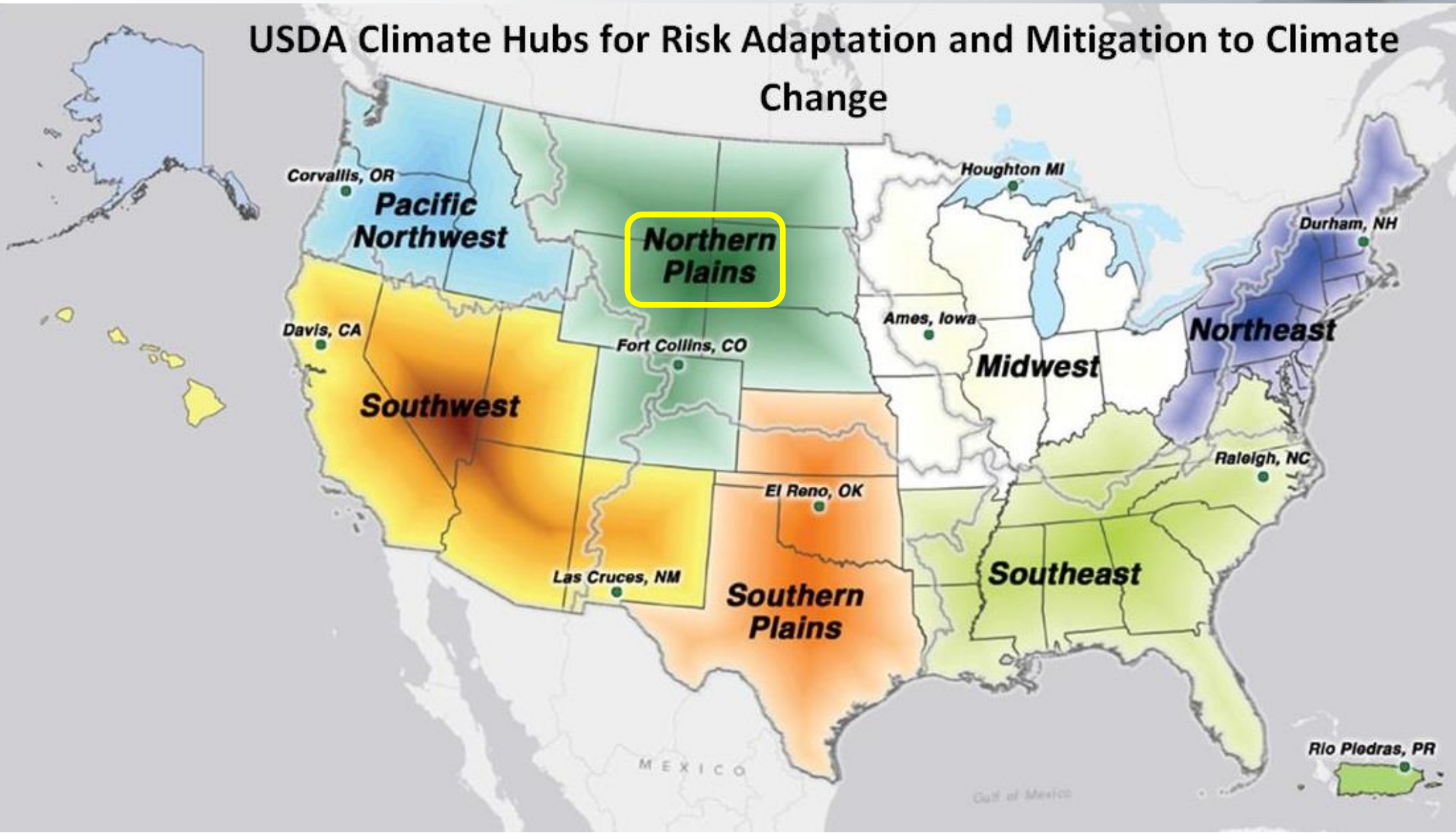
Figure 3. Change in Wheat Acres by County from 2006 to 2012.



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

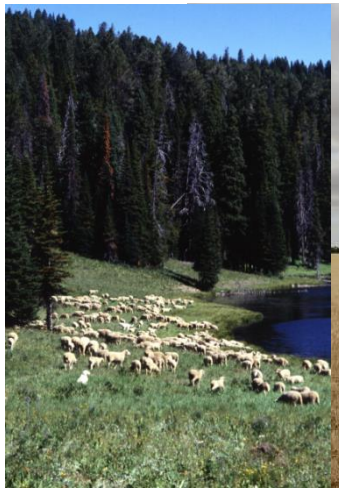


Key Thrust

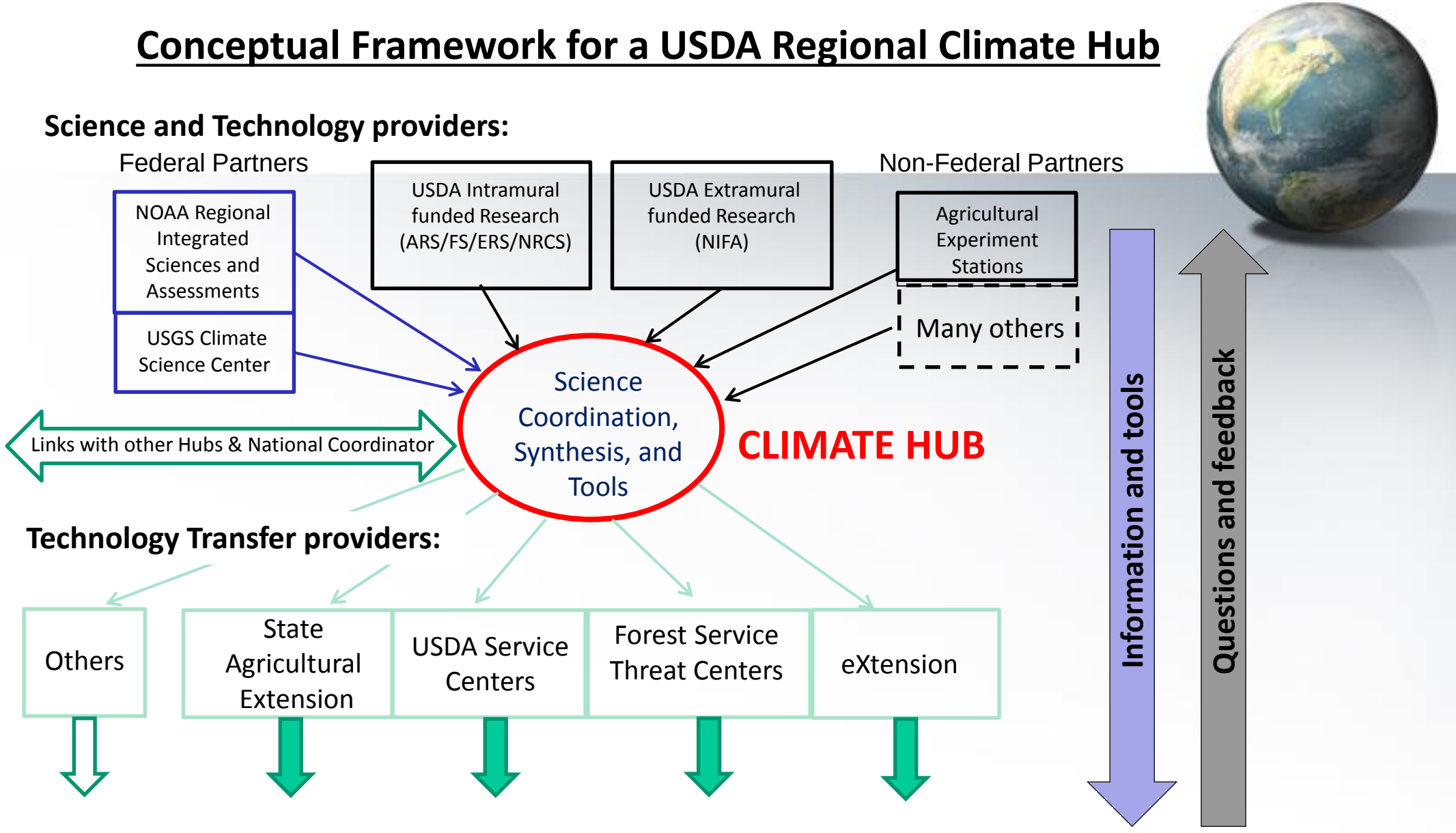
- The Hub will deliver <u>science-based knowledge and practical information</u> to **farmers, ranchers, and forest landowners** that will help them to adapt to weather variability by ***coordinating*** with local and regional partners in Federal and state agencies, NGO's, private companies, and Tribes.

Key Approach

- Conduct the transfer of <u>information, tools and management practices</u> to **agricultural producers** to enhance ***decision making*** with weather variability for reduction of enterprise risk and increased resilience of working lands.



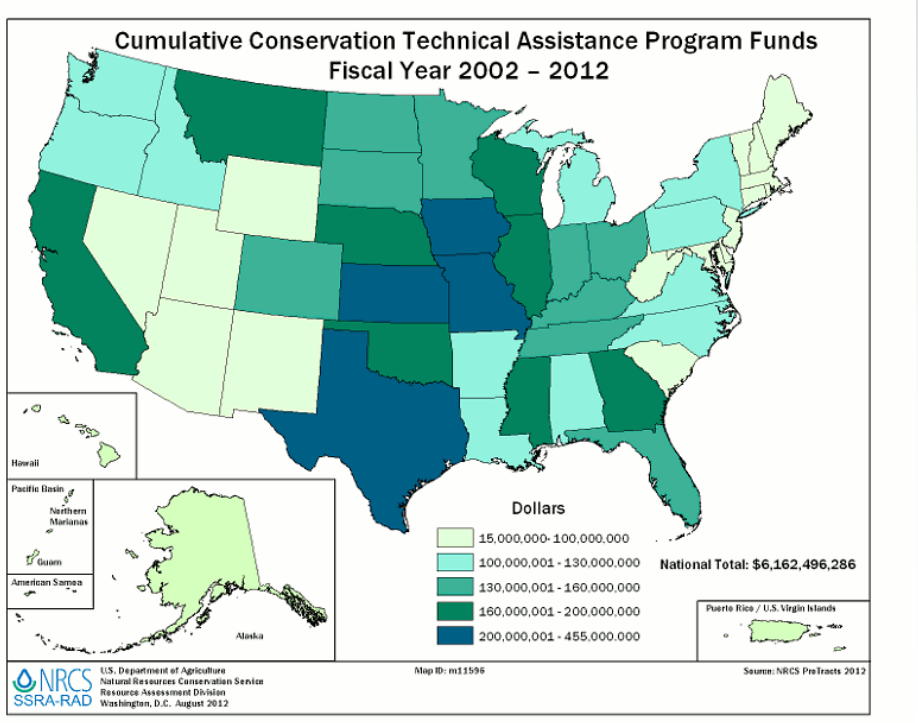
Conceptual Framework for a USDA Regional Climate Hub

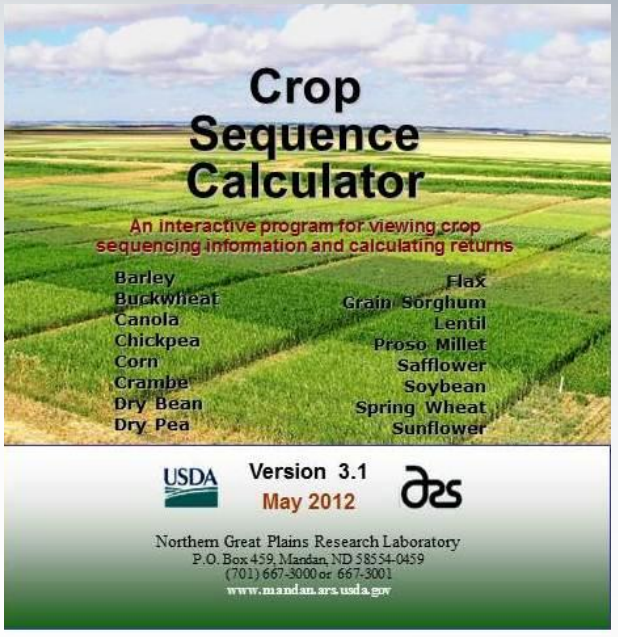


Stakeholders and Stakeholder groups: Farmers / Ranchers / Forest Managers
Tribes / State Land Managers / Federal Land Managers /
Landscape Conservation Cooperatives/ Others

Regional Climate Hubs Will Provide:

Technical Support and Decision Tools





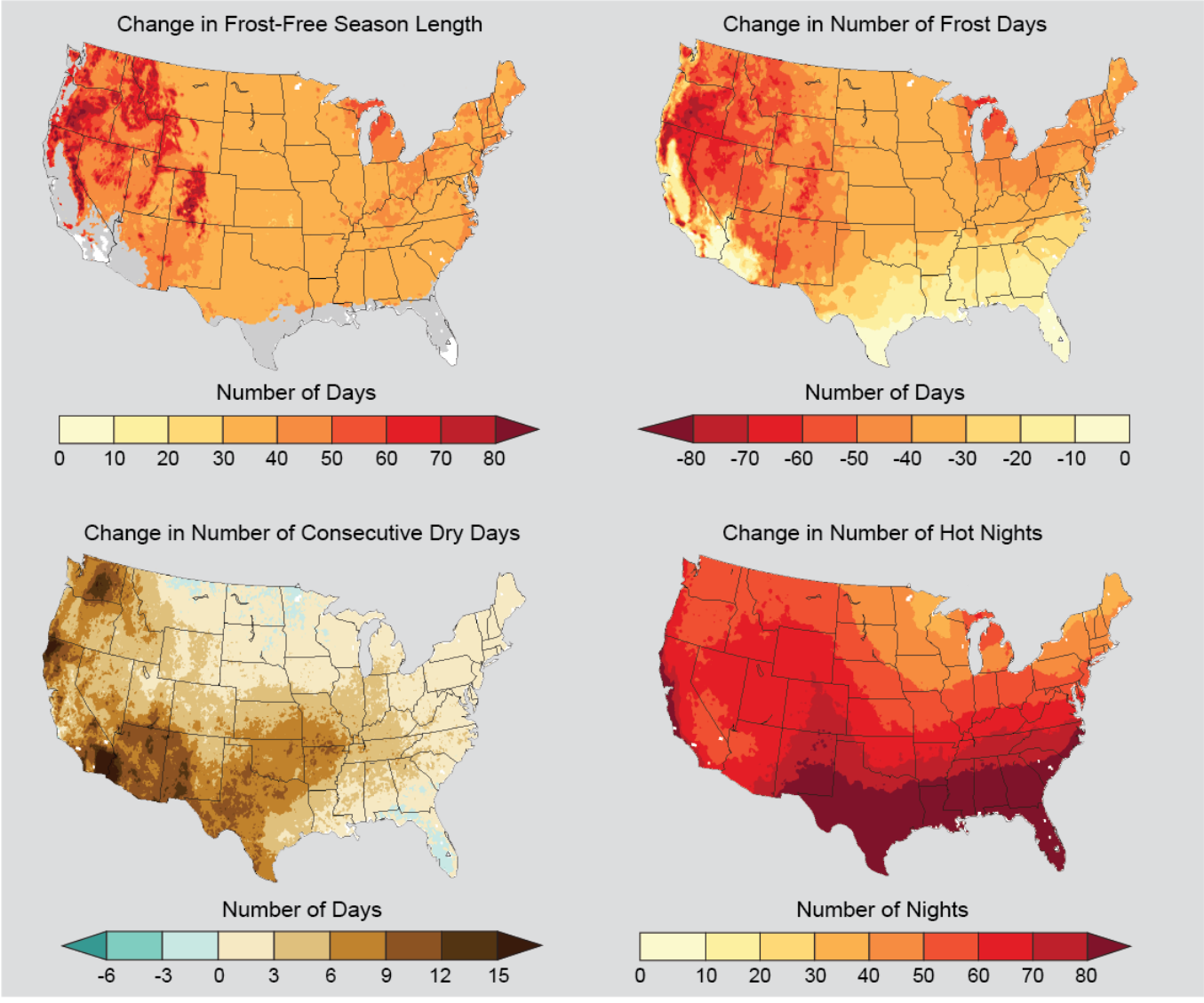
CLIMATE CHANGE RESOURCE CENTER

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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