USDA Agricultural Research Service Grazinglands Research Laboratory

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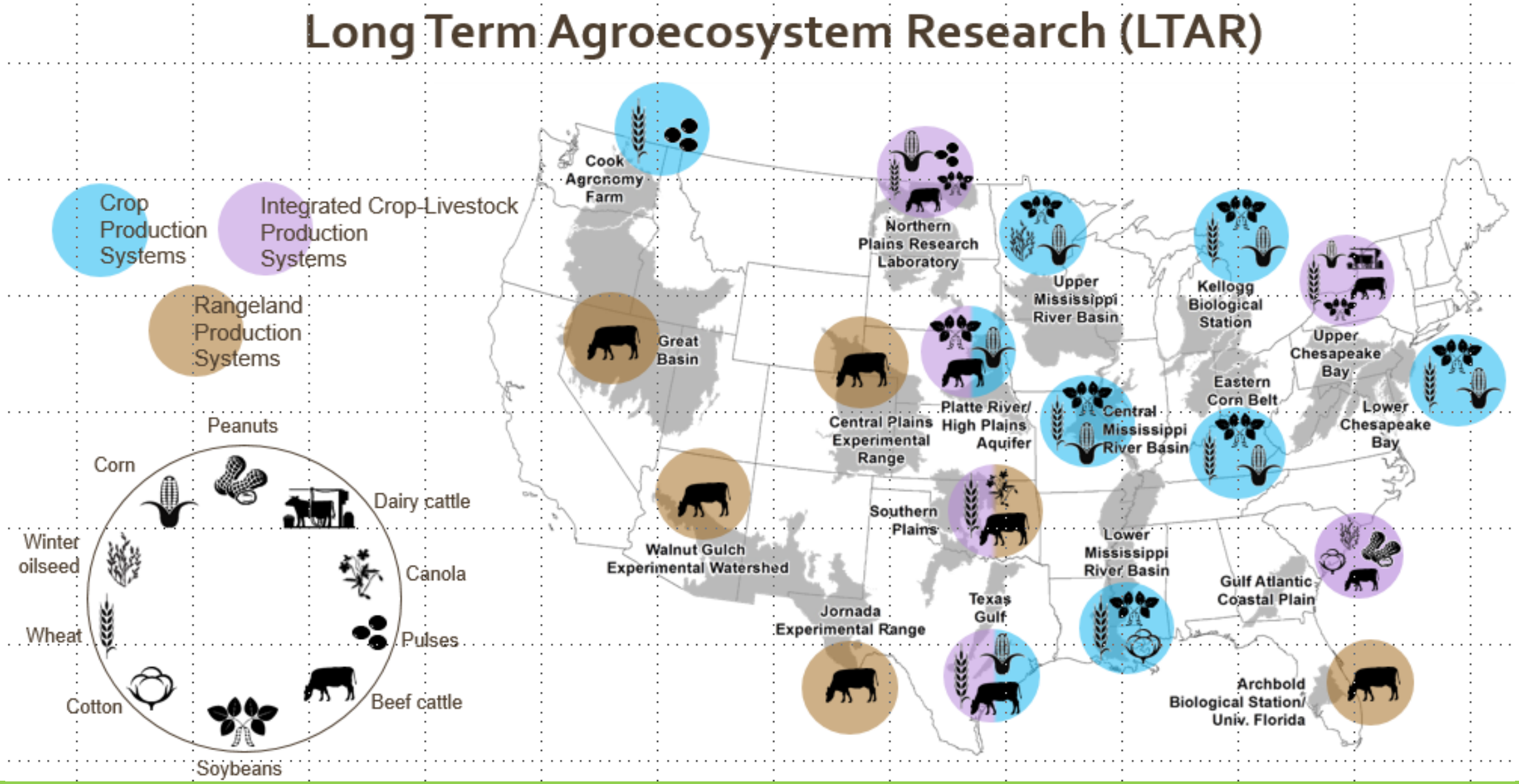
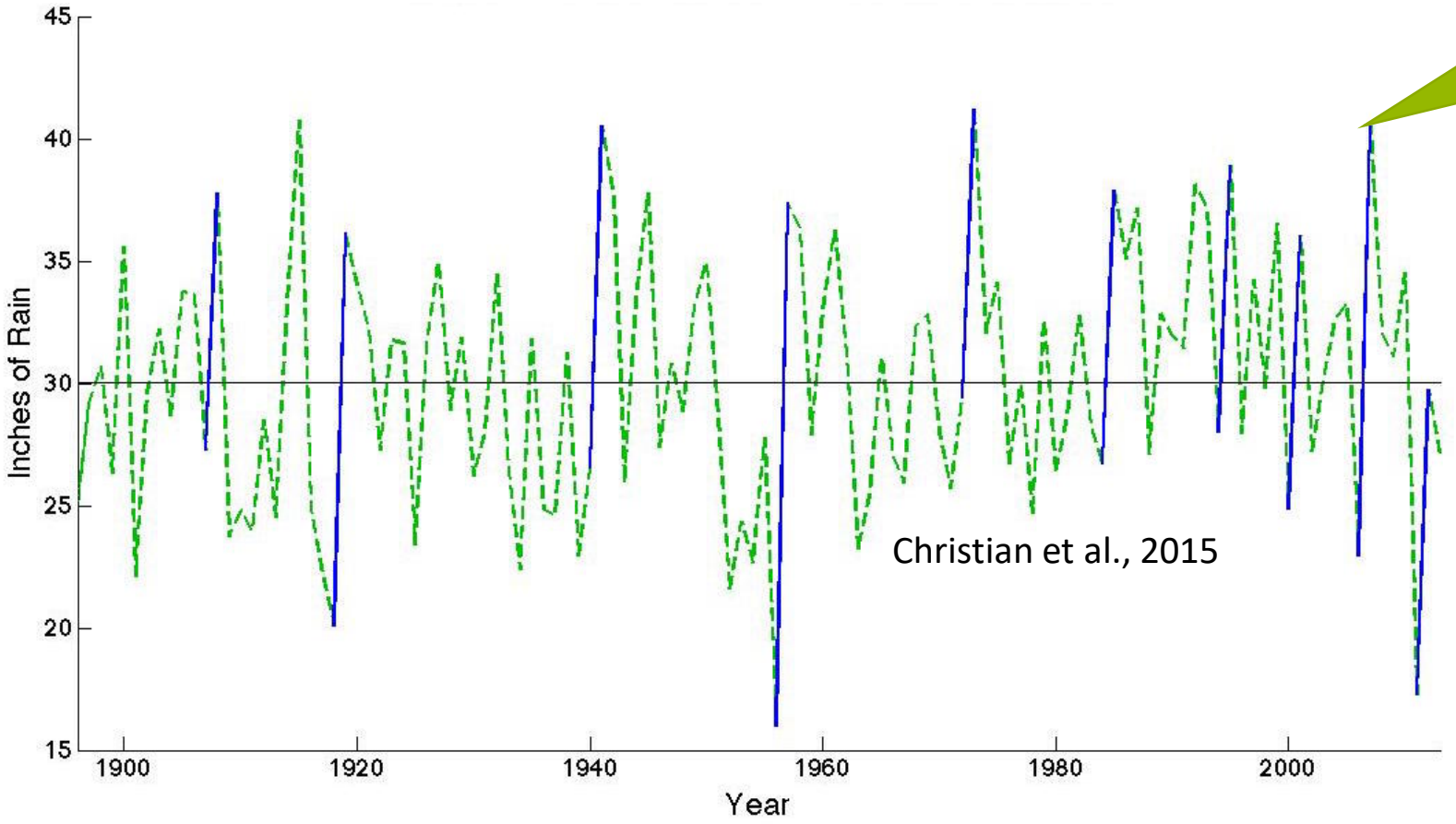
USDA – LTAR


Long Term Agroecosystem Research (LTAR)
Crop Production Systems
Integrated Crop-Livestock Production Systems
Rangeland Production Systems
Peanuts
Corn
Dairy cattle
Winter oilseed
Canola
Wheat
Pulses
Cotton
Beef cattle
Soybeans
Cook Agronomy Farm
Northern Plains Research Laboratory
Upper Mississippi River Basin
Kellogg Biological Station
Great Basin
Central Plains Experimental Range
Platte River/ High Plains Aquifer
Central Mississippi River Basin
Eastern Corn Belt
Upper Chesapeake Bay
Lower Chesapeake Bay
Walnut Gulch Experimental Watershed
Southern Plains
Lower Mississippi River Basin
Gulf Atlantic Coastal Plain
Jornada Experimental Range
Texas Gulf
Archbold Biological Station/ Univ. Florida

Southern Plains LTAR focus is on beef-grazing systems

- Land use in Southern Plains is dominantly rangeland and grassland.
- Largest income to producers is from beef cattle.
  - Cow-calf production and stocker grazing are both important
  - Ranches and farms range from very small to very large
- Forage base includes native pastures, introduced pastures, and winter wheat.

Dipole Occurrences in Southern Great Plains



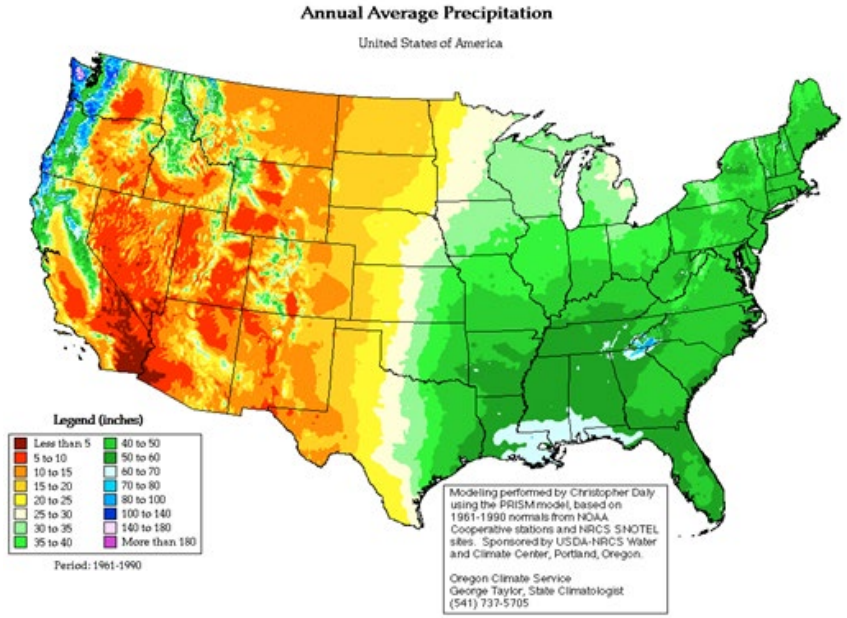
LTAR Southern Plains

Targeted Issues:

- Diversification and sustainable intensification of beef cattle and wheat production
- Efficient use of water, improved soil health, resilience to climate stressors
- Sustain multitude of ecosystems services and rural lifestyle amenities

Geographic Area:

- Highly variable with strong E-W precipitation gradients; N-S temperature gradients.
- Mixed agricultural land use for dominantly beef cattle & wheat production
- Northern Texas to Central Kansas
- Population: size, cultural makeup, distribution



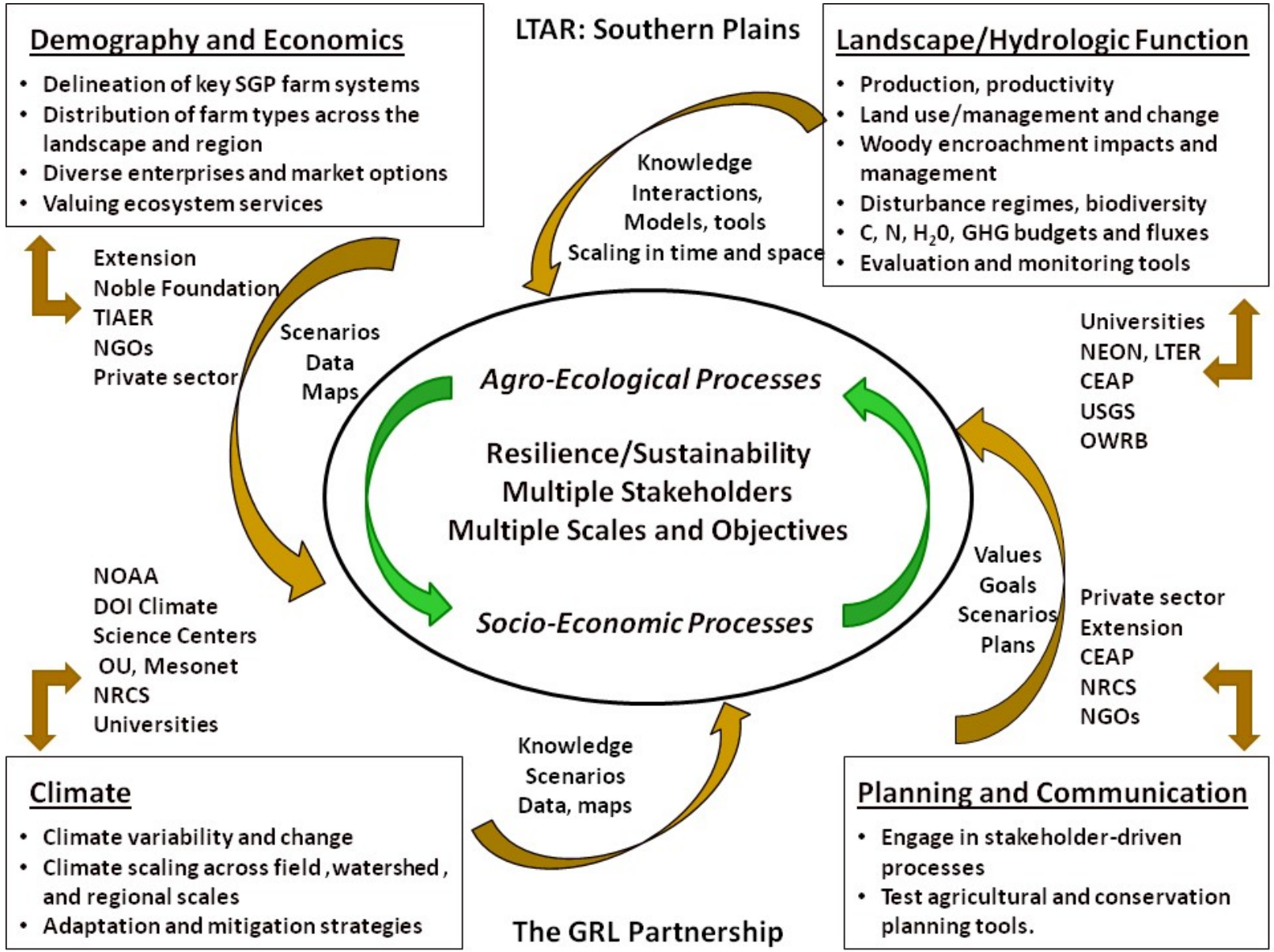
LTAR Southern Plains

- **Lead organization USDA-ARS Grazinglands Research Laboratory**
- **Partners**
  - Oklahoma State University, Kansas State University, Texas A&M University, University of Oklahoma, Noble Research Institute, Tarleton State University, ARS at Bushland, Texas and Woodward, Oklahoma
  - USDA Southern Plains Climate Hub
  - Oklahoma Conservation Districts Association & Oklahoma Conservation Commission, USDA Natural Resources Conservation Service
- **Integration of natural and social science**
  - We participate in the LTAR Human Dimensions work group, building from social science related to barriers to adoption that was part of a related NIFA-funded Grazing CAP project.

LTAR Southern Plains Case Study

- **Stakeholder Engagement Strategies:**
  - The laboratory works with a wide array of producer groups and Extension or conservation professionals as well as individual producers. In particular the Southern Plains Soil Health partnership provides input into research needs.
  - We interact with early-adopter producers to observe successful practices implemented on their farms and engage in on-farm research to quantify soil impacts of management systems.
  - We explored producer attitudes about climate through surveys by university collaborators.
  - We engage next-generation researchers - graduate students and post docs - into long term studies and systems approaches to research
  - Partnership with K-12 STEM educators to build agricultural and science literacy
  - We share information in multiple ways: field days, workshops, fact sheets, websites

LTAR Southern Plains



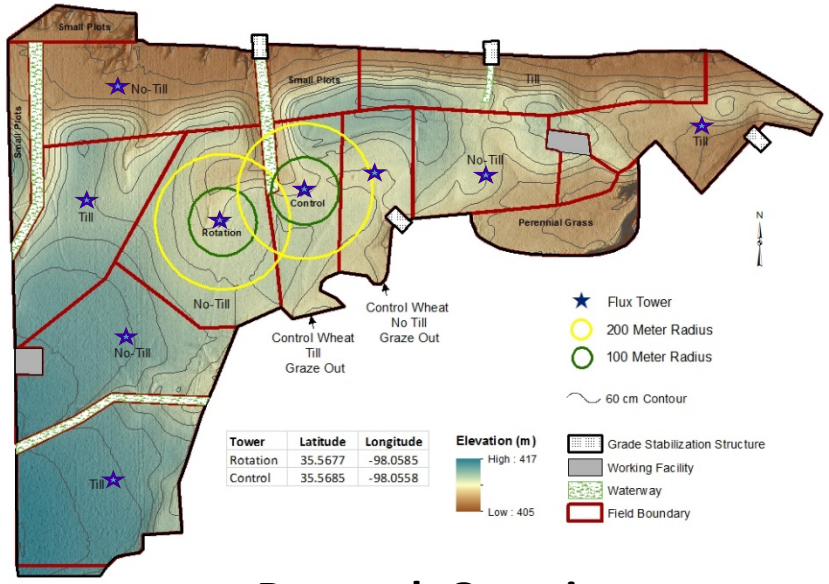
LTAR Southern Plains Common Experiment

Business as Usual Concerns:

Continuous graze-out, winter wheat and beef cattle, conventional management

- Low productivity
- Degraded soil - erosion, low SOM.
- Low biological and economic diversity.
- Weed and pest pressure

Cropland Common Experiment



Aspirational Goals:

Winter Wheat/Canola rotation with beef cattle grazing, no-till & integrated pest management (IPM)

- Increased productivity
- Improved soil quality
- Biological & economic diversity
- Reduced input costs

Research Questions

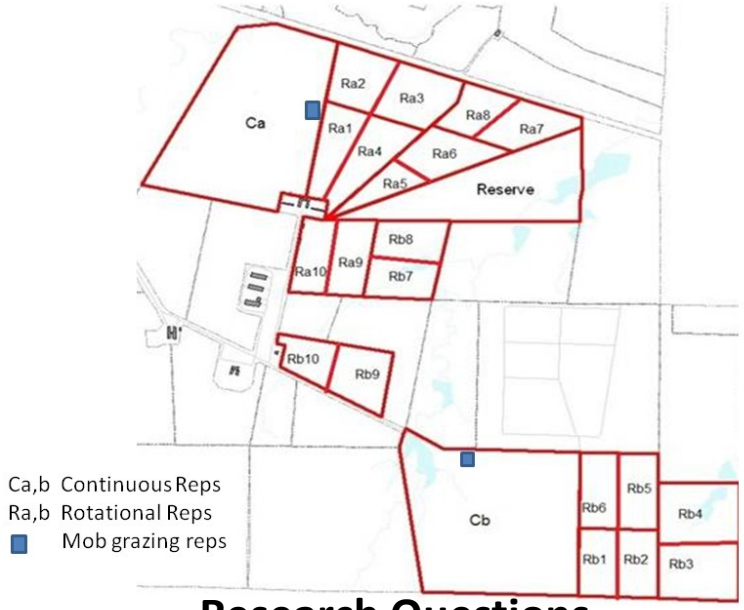
- Can productivity, soil fertility and water quality be enhanced through diversification and reduced disturbance?
- Can inputs be reduced while increasing multi-year productivity?
- Does soil health improve with aspirational system?
- Does diversified rotation increase pollinator and beneficial insect diversity?
- What combination of reduced disturbance, diversification, IPM, and grazing confer sustainability?
- Does increased field-scale productivity increase local economic opportunities?
- How does agricultural productivity and sustainability sustain regional recreational and educational opportunities?

LTAR Southern Plains Common Experiment

Grassland Common Experiment

Business as Usual Concerns

Native grasslands are central to biodiversity as well as a important forage for beef cattle production. These grasslands are challenged by land use change, overgrazing, fragmentation, and woody species encroachment.



Aspirational Goals

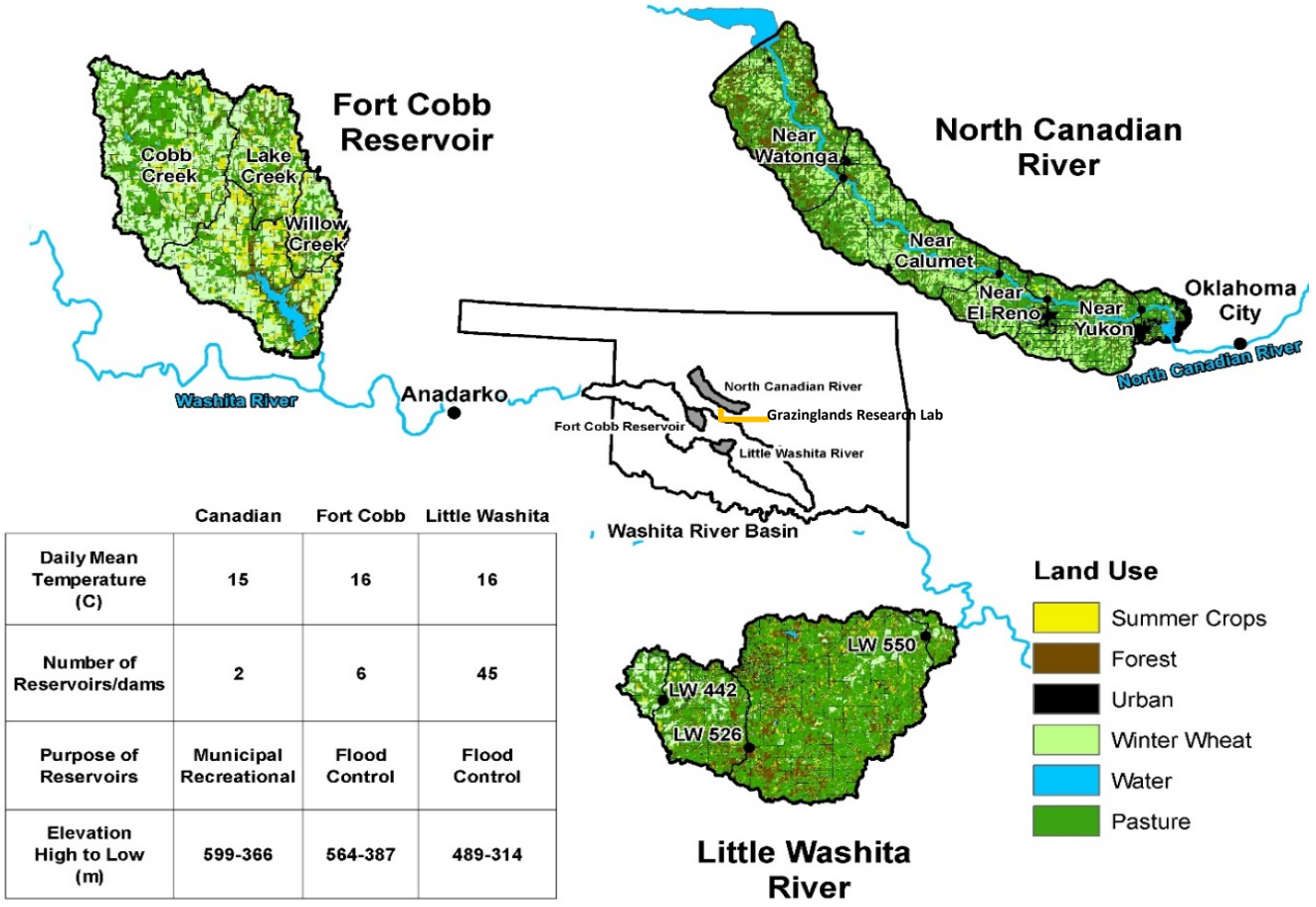
We are conducting numerous studies to address sustainability challenges, including 1) rotational versus continuous grazing 2) native prairie versus monoculture tall grass pasture, and 3) fire impacts.

Research Questions

- How do grazing duration and rest period affect plant and soil biodiversity, water use efficiency, soil carbon and nutrients?
- Is animal performance impacted by rotational grazing?
- How does fire affect plant biodiversity, forage quality, and ANPP?
- How does grazing management affect plant and soil biodiversity, soil carbon and nutrients, GHG emissions, and water quality?
- How does the mosaic of native prairie, improved pasture, and cropland maintain regional biodiversity and economic stability? What is the economic and cultural values of grassland diversity for regional agro-tourism and recreation?
- What is the role of fire in maintaining biodiversity? Can prescribed burning acceptability be increased?

LTAR Southern Plains

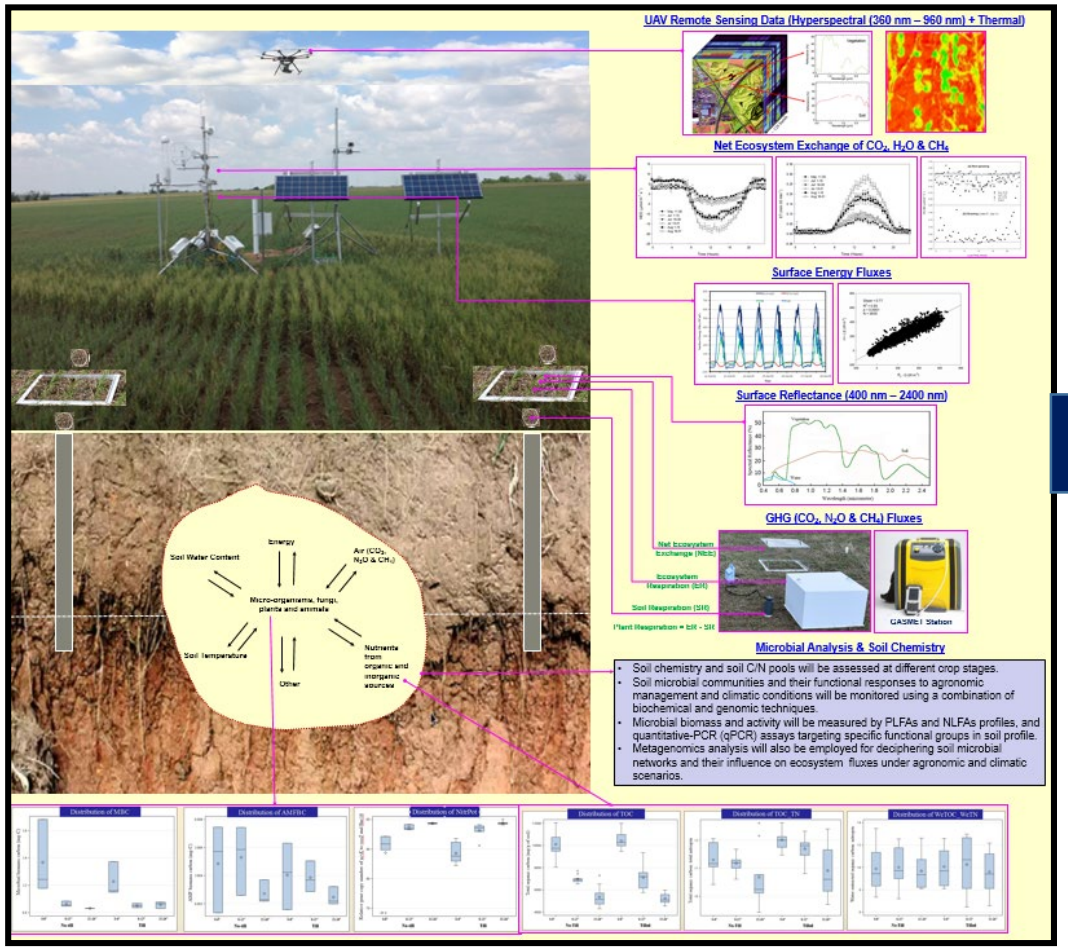
Long-Term Watershed Research

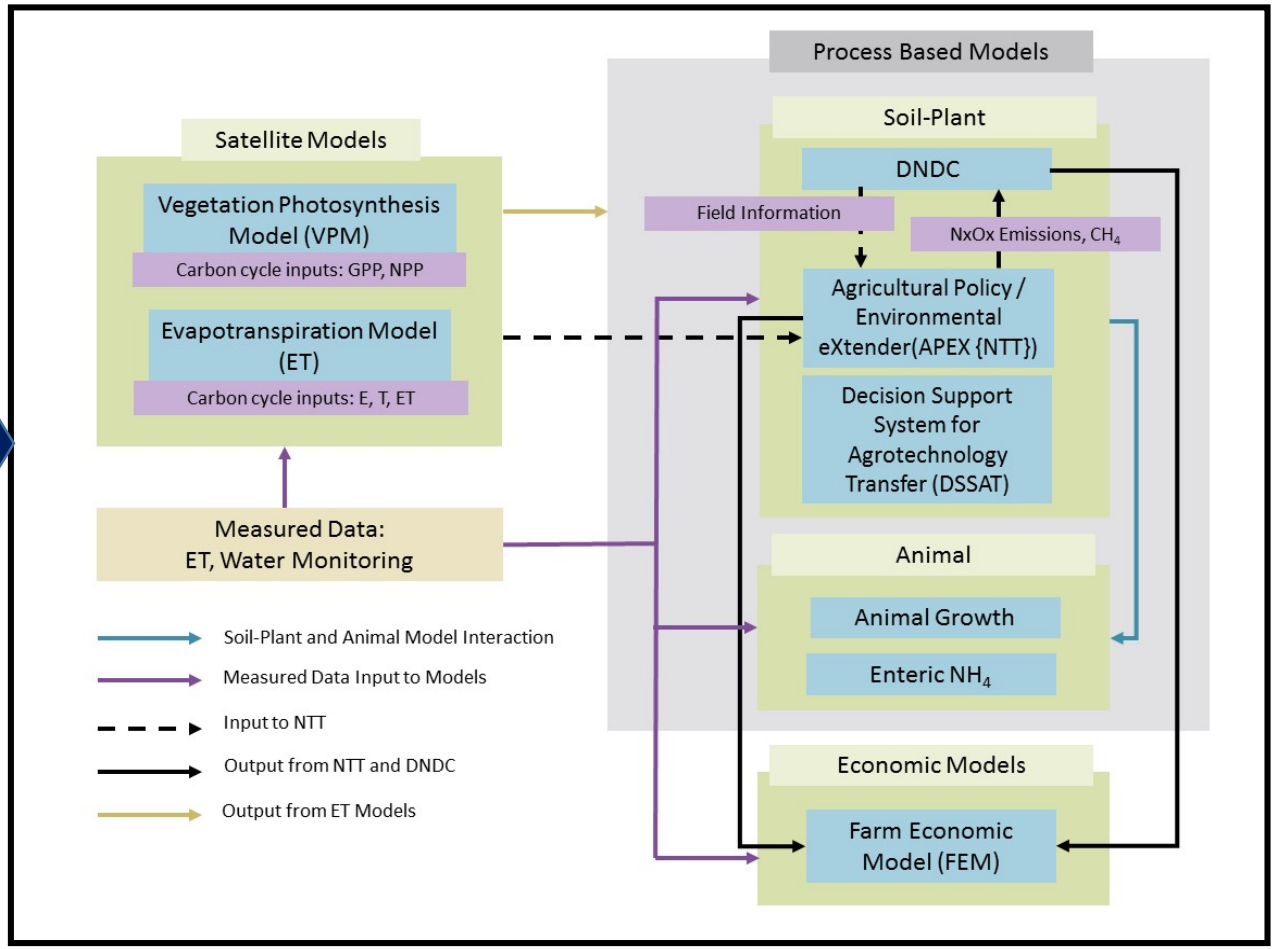


	Canadian	Fort Cobb	Little Washita
Daily Mean Temperature (C)	15	16	16
Number of Reservoirs/dams	2	6	45
Purpose of Reservoirs	Municipal Recreational	Flood Control	Flood Control
Elevation High to Low (m)	599-366	564-387	489-314

- Quantify effects of land use, management, and climate on water resources.
- Quantify hydrologic impact of woody encroachment into native grassland.
- Develop tools for optimal placement of conservation practices on the land surface and stream channels.
- Improve model algorithms for irrigation systems.

Integrated Flux Measurement Systems and Models





LTAR Southern Plains

- **Results:**
  - Success in **research** was realized through incorporating new areas of science and multiple university partners to better understand the processes in long-term agroecosystem management systems which provides the basis for improving management to optimize multiple ecosystem services. In particular, a talented pool of post-doctoral researchers and graduate students are adding depth and breadth to our research portfolio.
  - Success in **engagement** has been realized in partnership with the USDA Southern Plains Climate Hub and the NIFA-funded Grazing CAP project through a regional producer-led soil health movement as well as robust partnerships with Extension specialists across the regional states.
  - Challenges to **implementation** included, first of all, the extended federal hiring freezes that left our team thin in critical skills and disciplines while trying to grow our program. Success in **implementation** was realized through leveraging the LTAR capacity to attract competitive funding from multiple sources, new partnerships across diverse disciplines and universities, and strong cross-unit integration at the location.

LTAR Southern Plains

- **Future Directions:**
  - ARS's Beef Sustainability Grand Challenge
  - Rumen genomics
  - Soil genomics
  - Telecoupling across regions and commodities