Co-developing rangeland ecohydrological indicators to balance livestock production and conservation in a changing climate

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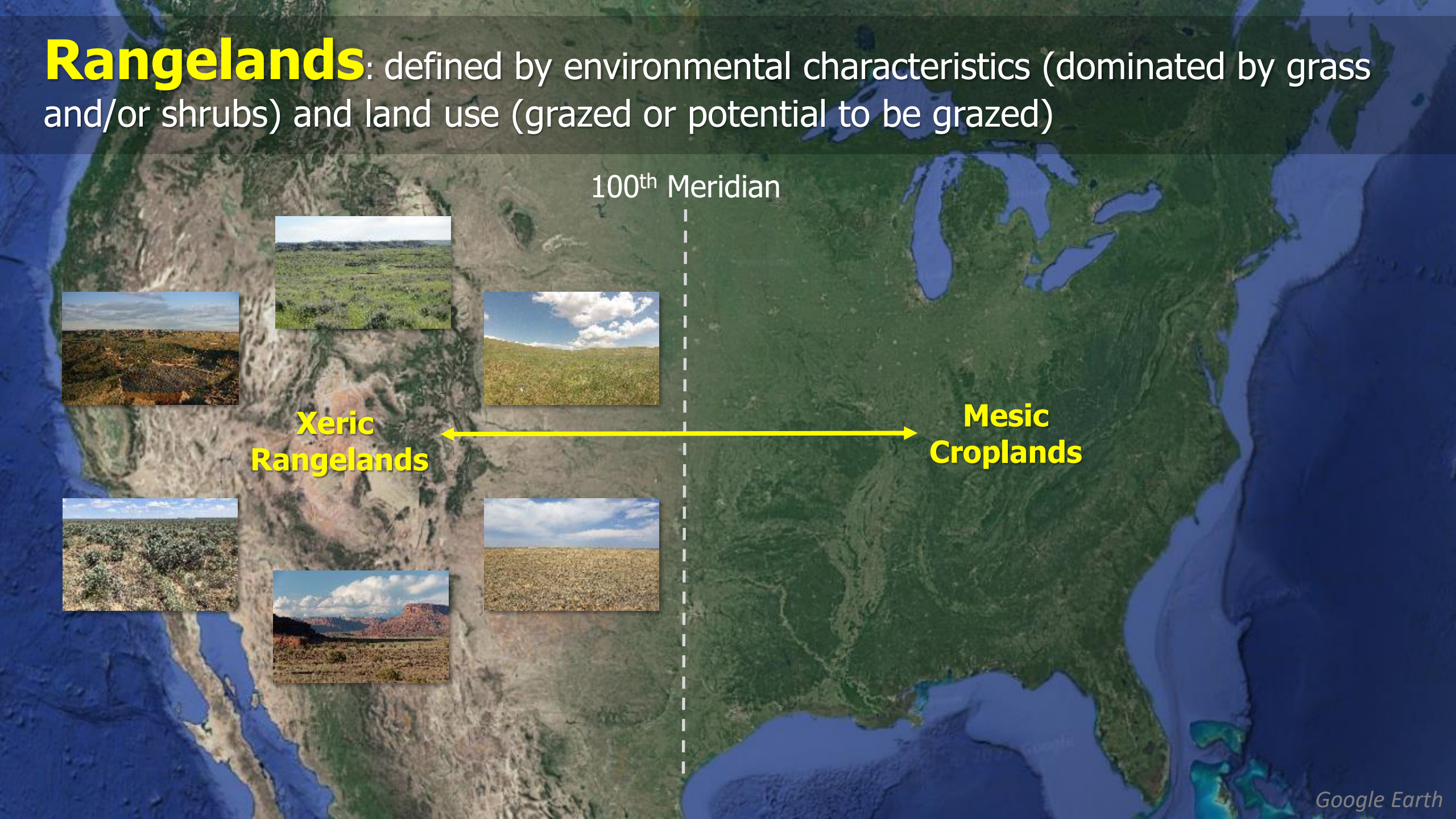
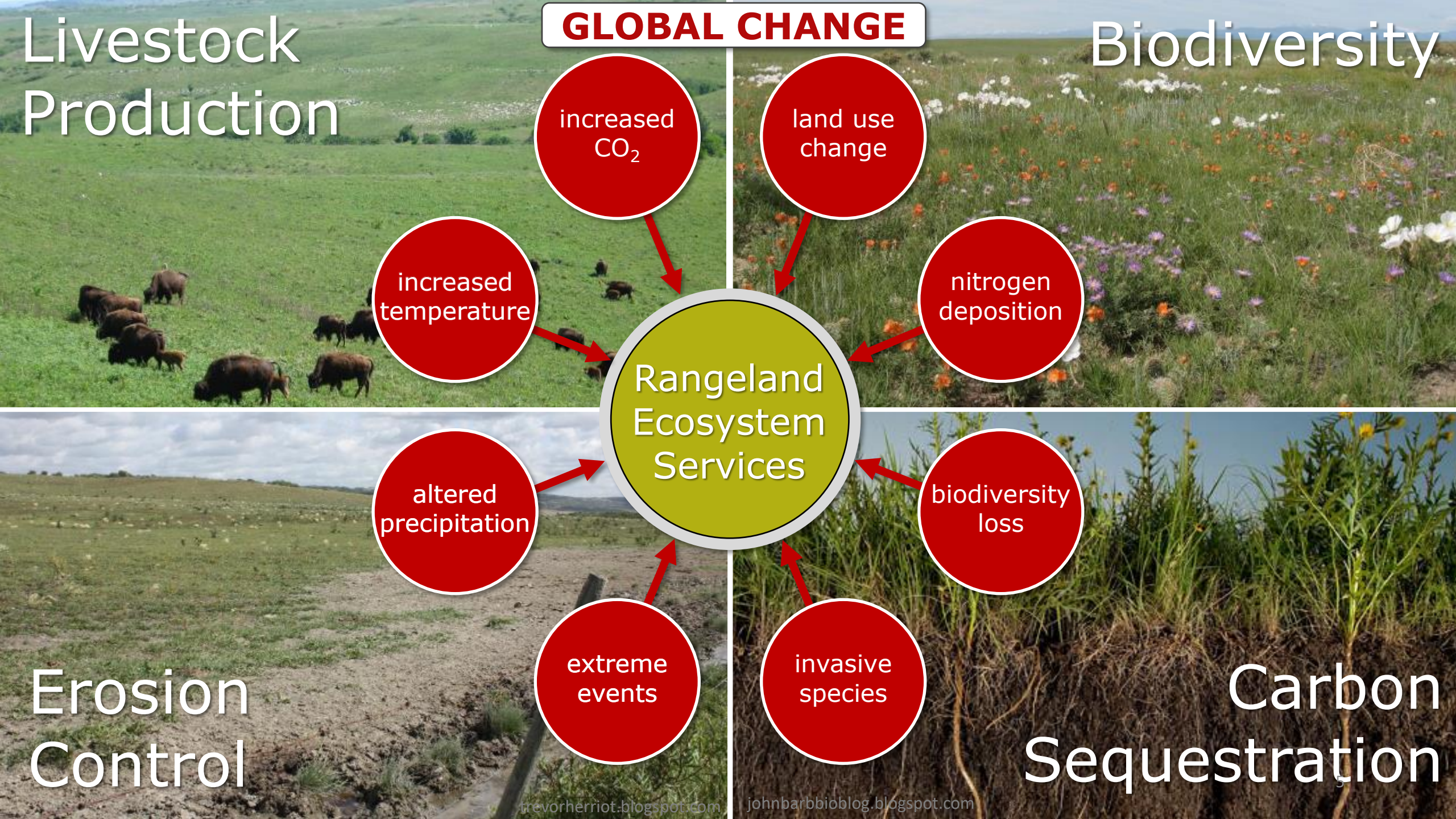
Montreal, CA

Rangelands: defined by environmental characteristics (dominated by grass and/or shrubs) and land use (grazed or potential to be grazed)



Environmental monitoring
Management tools
NPK
James Baltz

Environmental monitoring
Management tools


GLOBAL CHANGE
Livestock Production
Biodiversity
Erosion Control
Carbon Sequestration
increased CO_2
land use change
increased temperature
nitrogen deposition
Rangeland Ecosystem Services
altered precipitation
biodiversity loss
extreme events
invasive species
trevorherriot.blogspot.com
johnbarbbioblog.blogspot.com

How to balance livestock production and other ecosystem services with global change?

Central Plains Experimental Range

6,280 ha

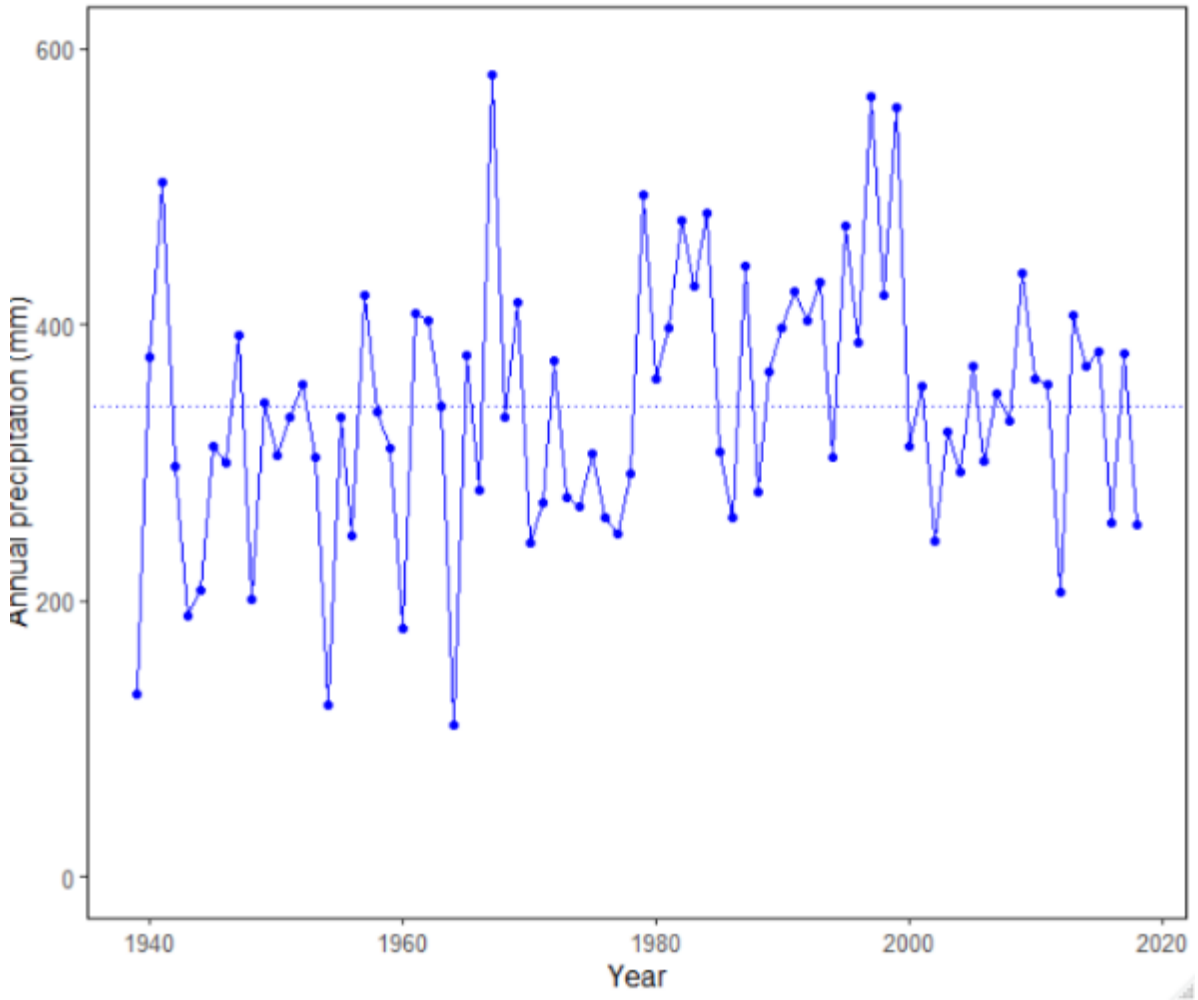
Long Term Agroecosystem Research network

Google Earth

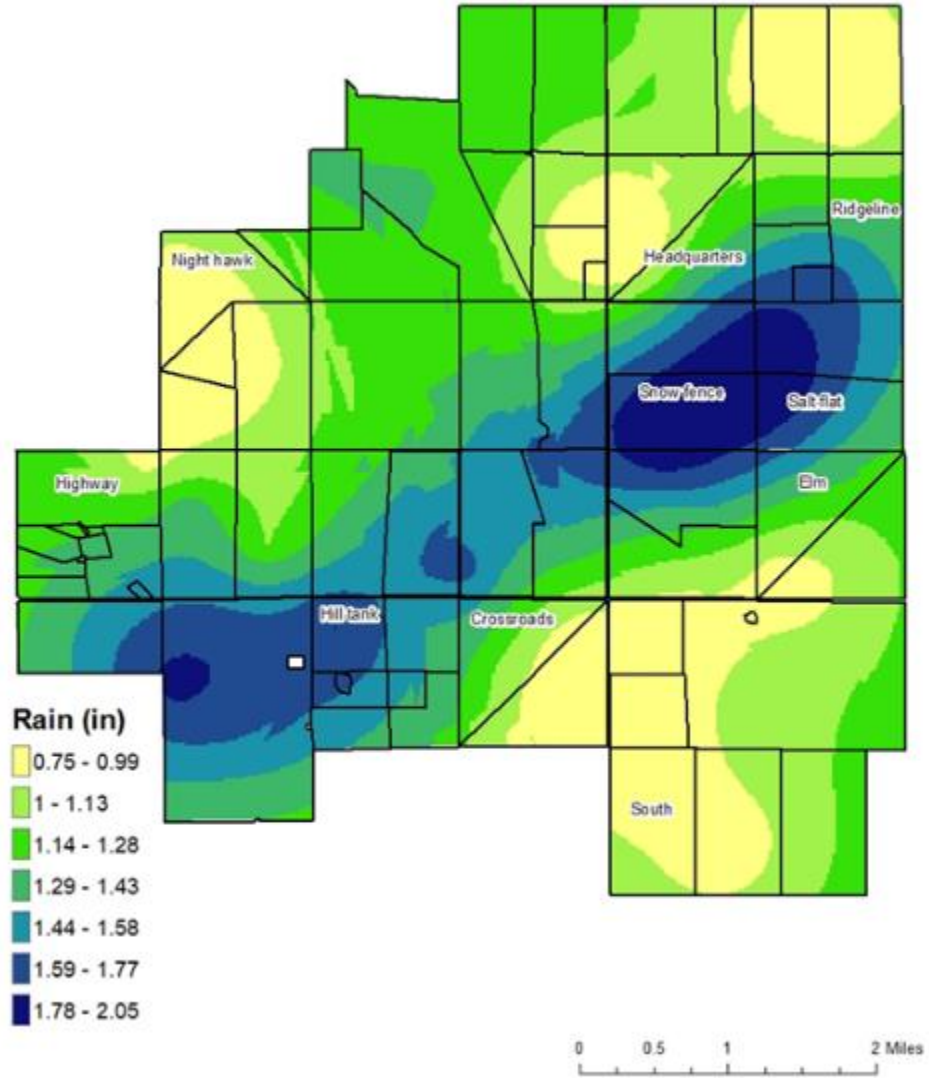
What are the **challenges** to producers and land managers?

1. Precipitation variability

Temporal variability



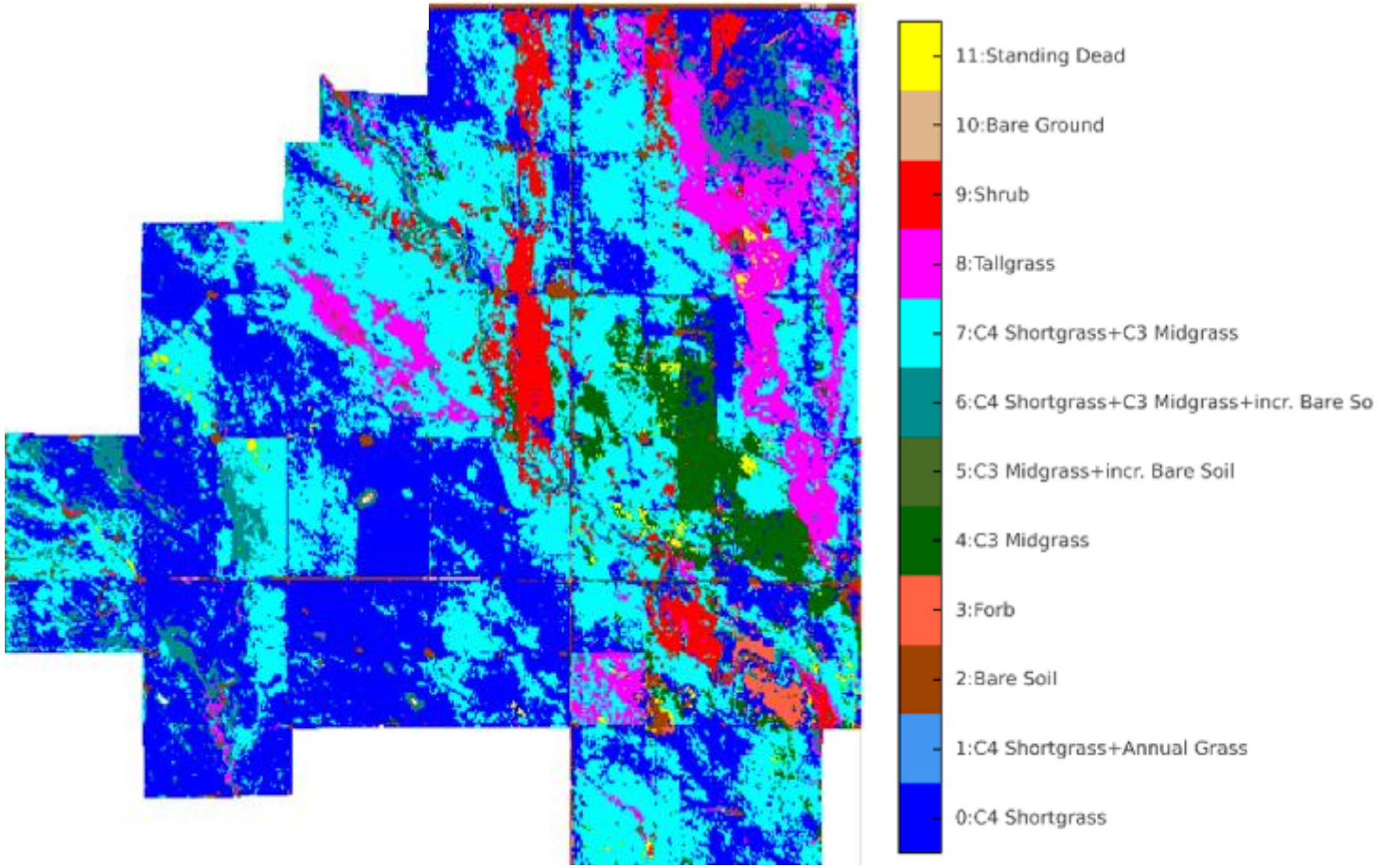
Spatial variability



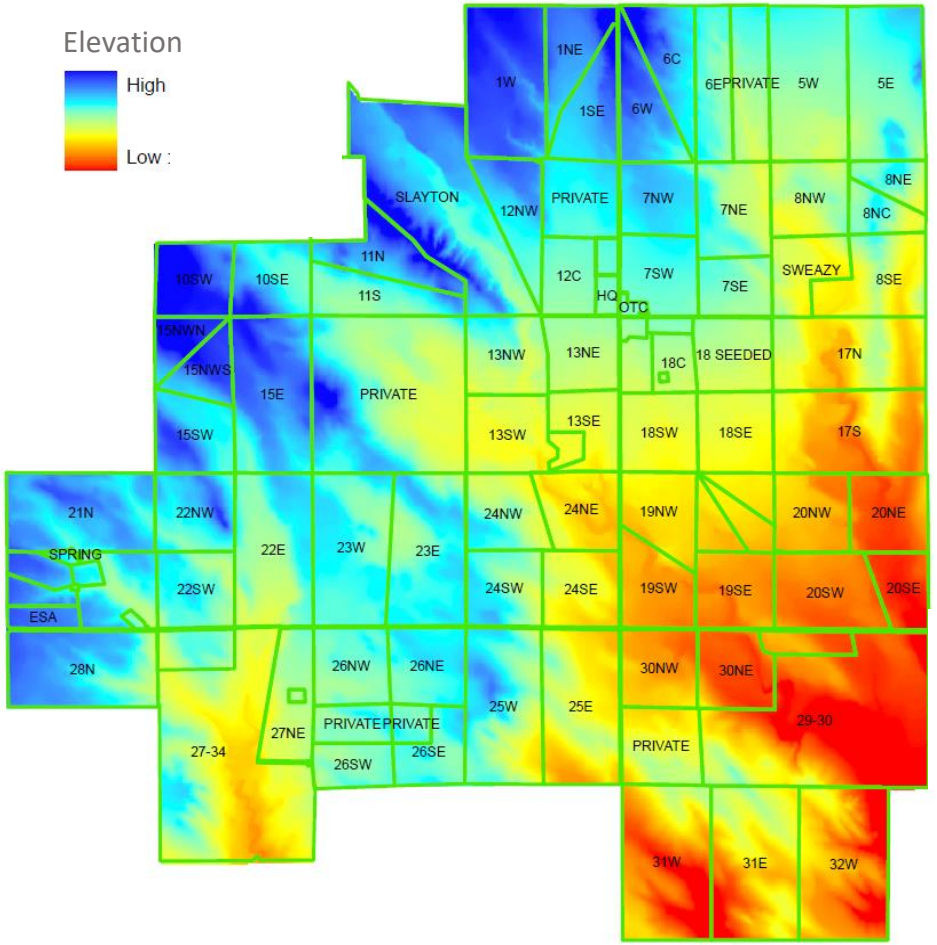
What are the **challenges** to producers and land managers?

2. Landscape heterogeneity

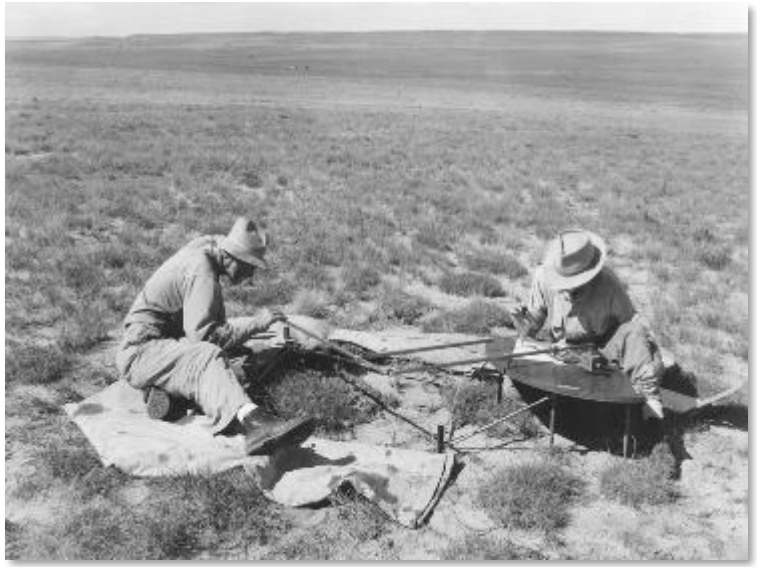
Plant community heterogeneity

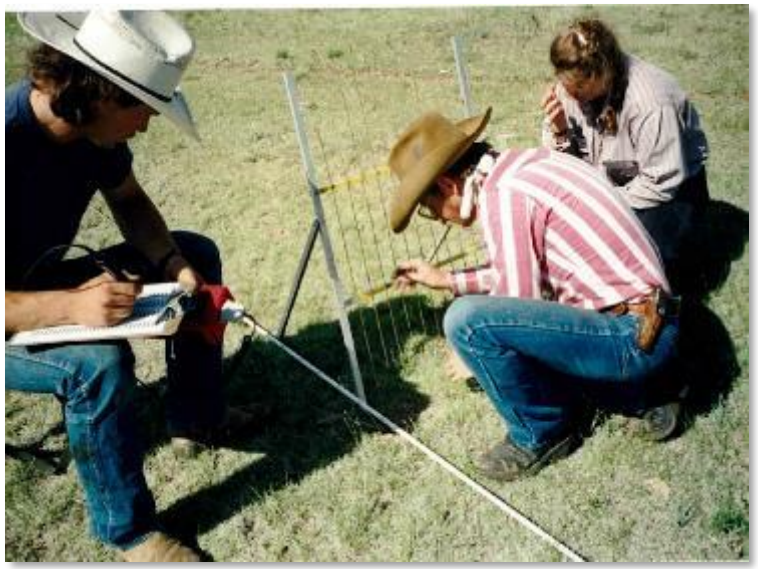


Topoedaphic variability



Gaffney et al 2021





2013

1939 Central Plains Experimental Range **2023**

Stakeholders

CARM

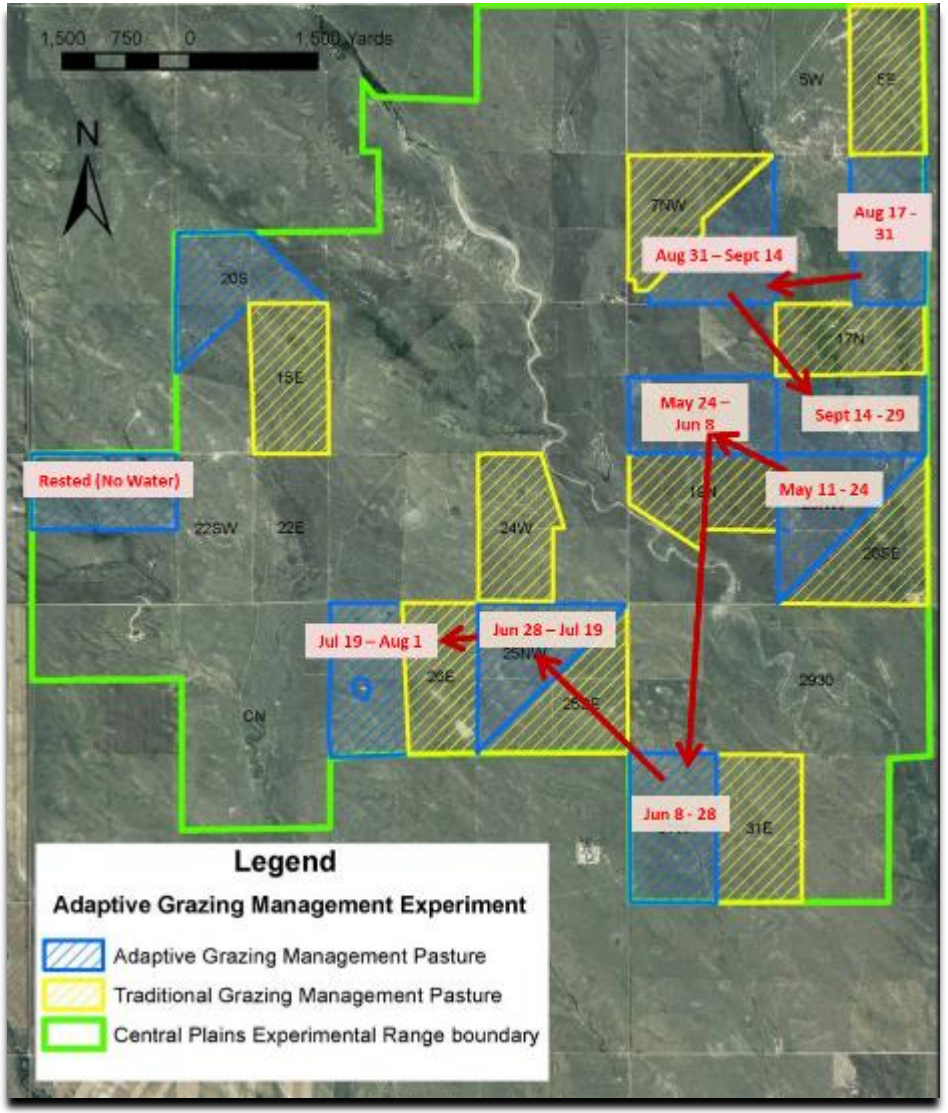
Collaborative Adaptive Rangeland Management

Scientists

Wilmer et al. (2019)

Stakeholders

Rotational Grazing

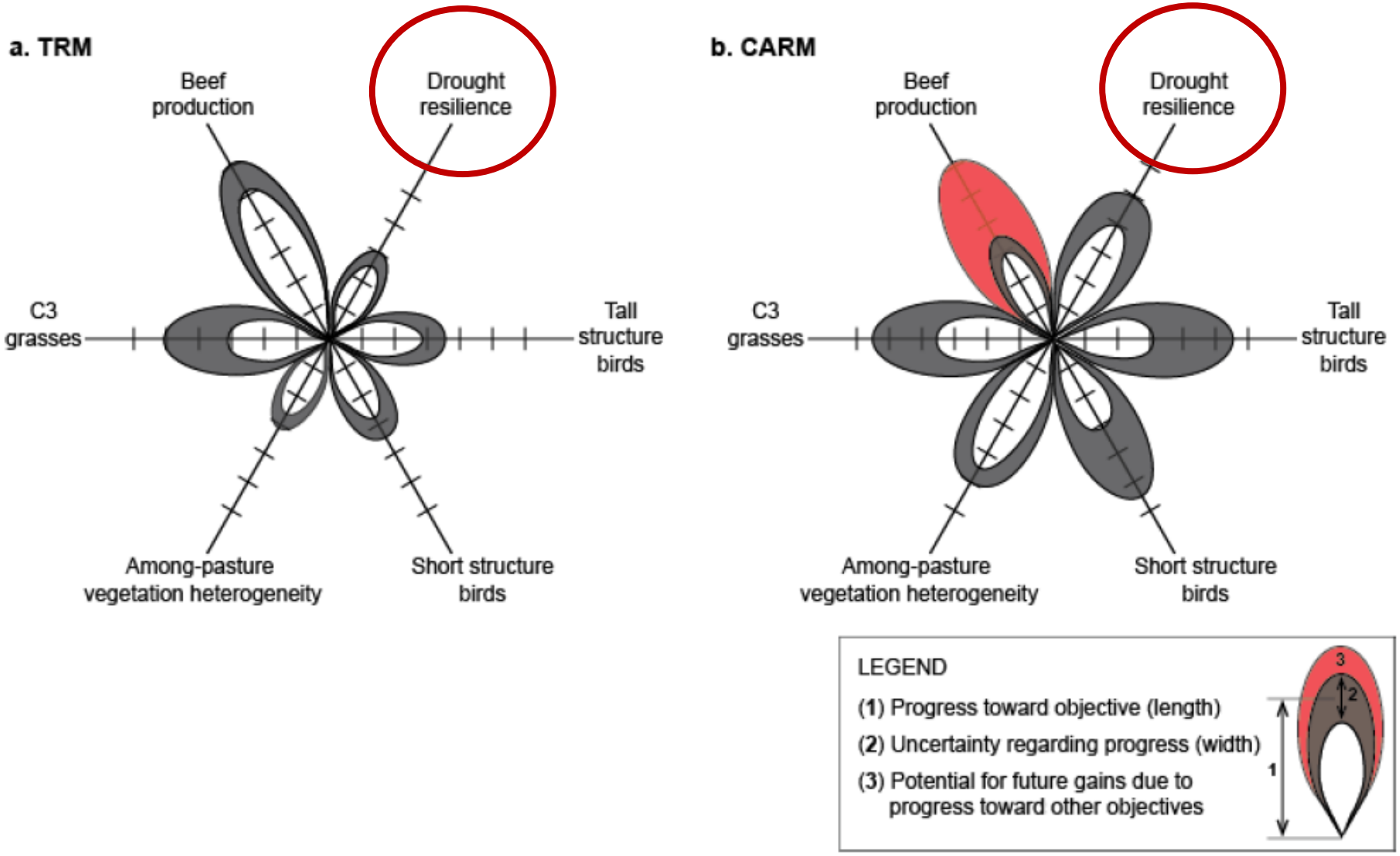


Objectives

- Profitable ranching
- Vegetation heterogeneity
- Bird diversity
- Social learning

Stakeholder-hypothesized

management tradeoffs



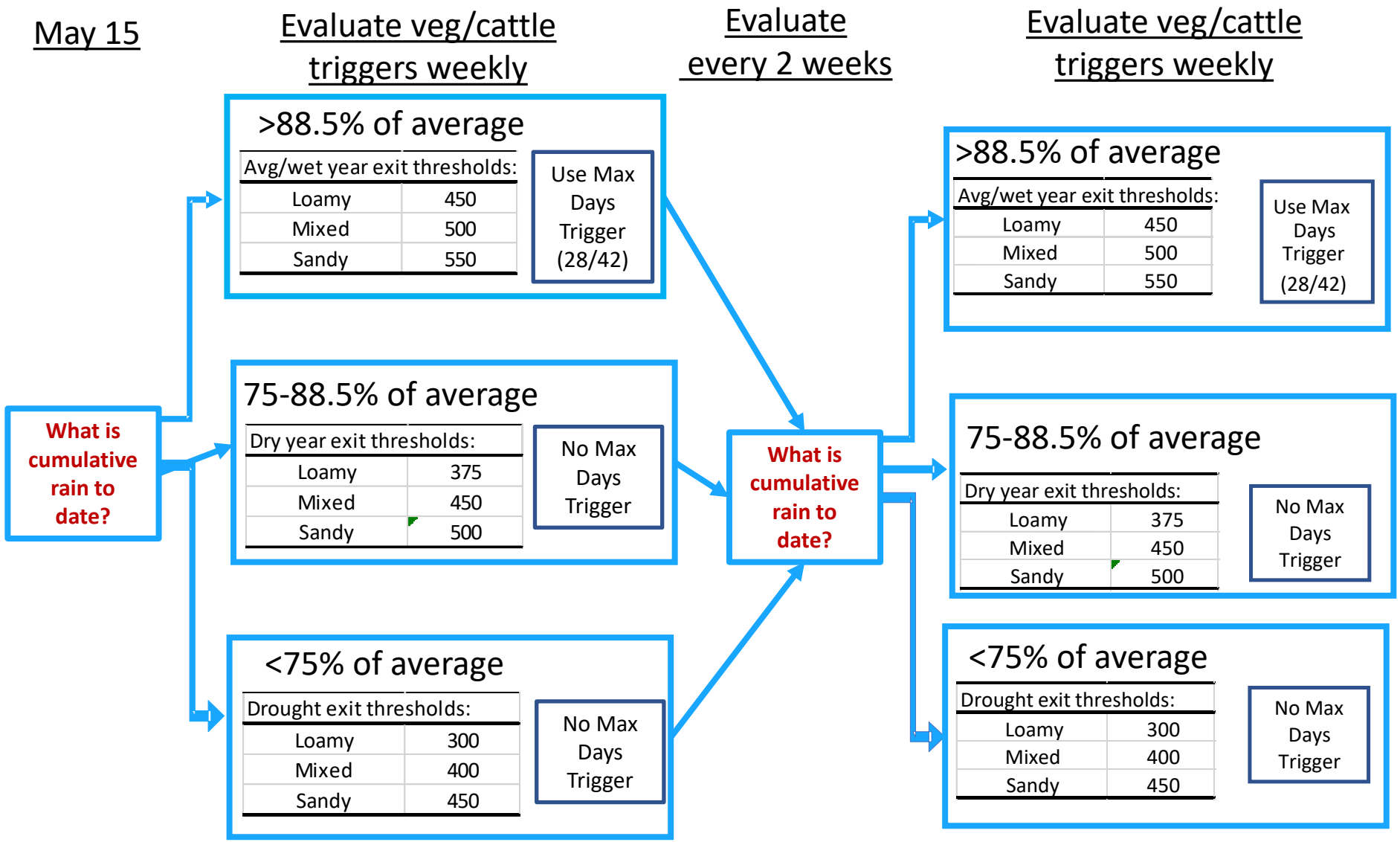
Fernandez-Gimenez et al., 2019

1930's Dust Bowl

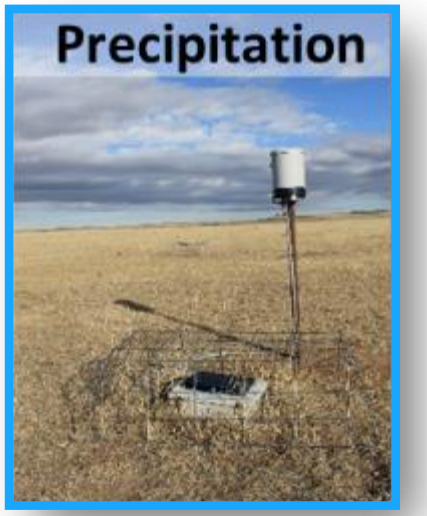
Drought Management Plans

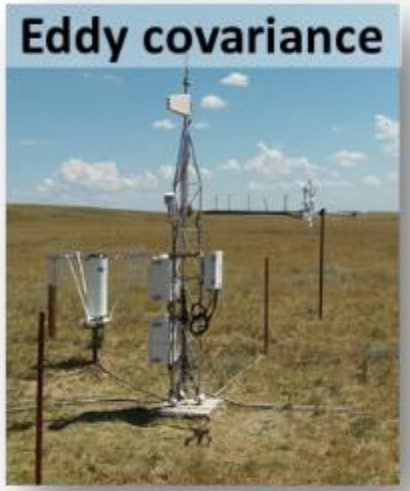
- Adaptive rotation = flexibility
- Rested pastures = "grass banking"
- Defined climate triggers
- Near real time environmental monitoring

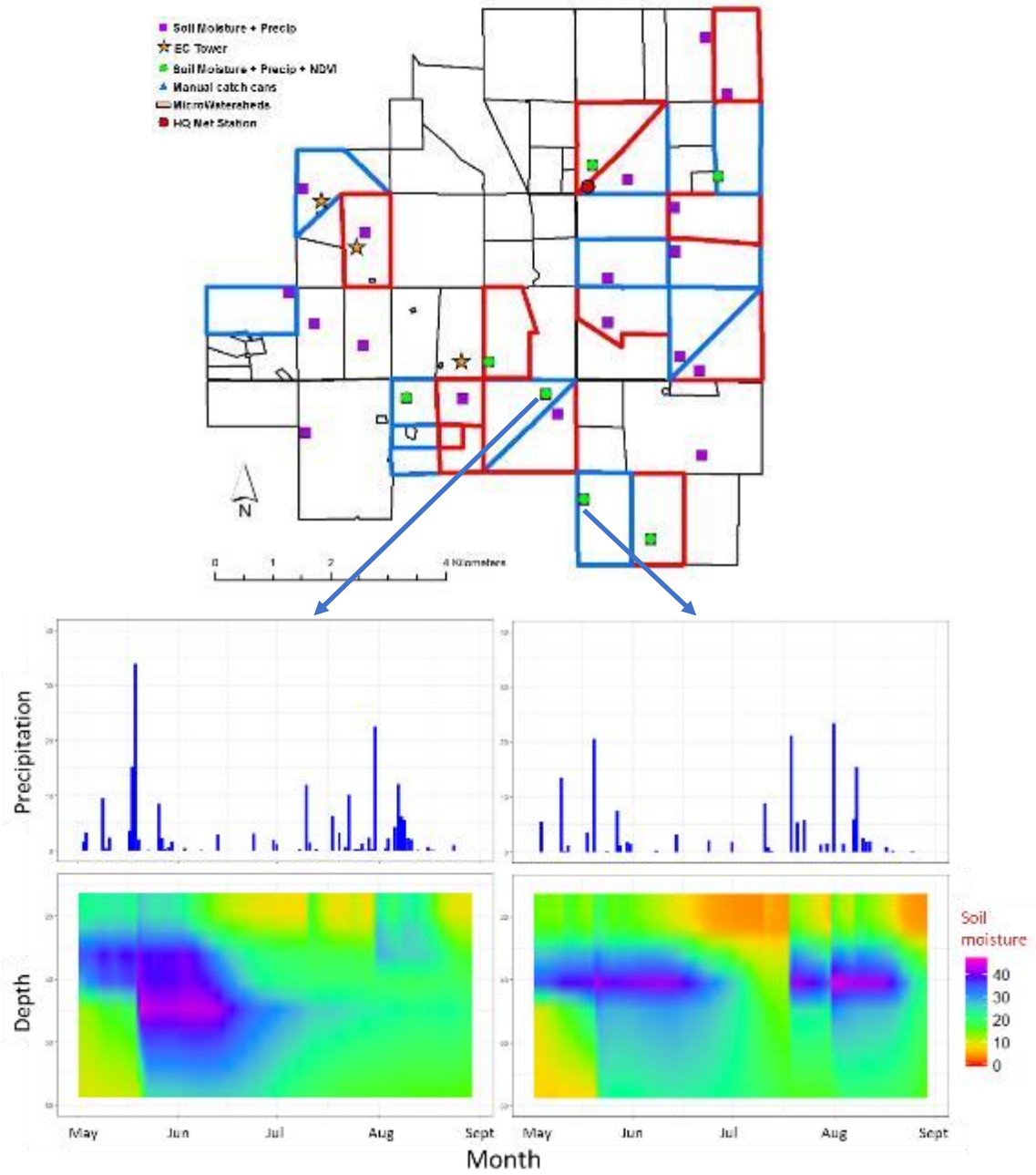
Stakeholder-defined **drought triggers**



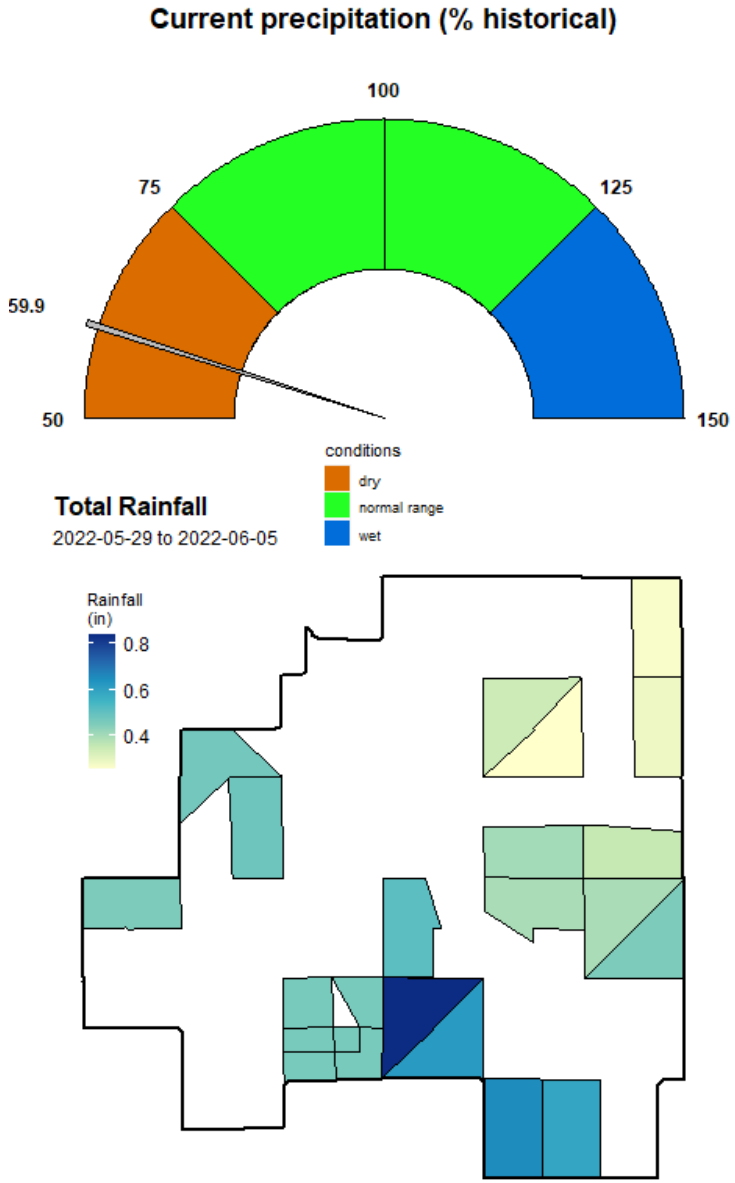
Ground-based **environmental sensors**

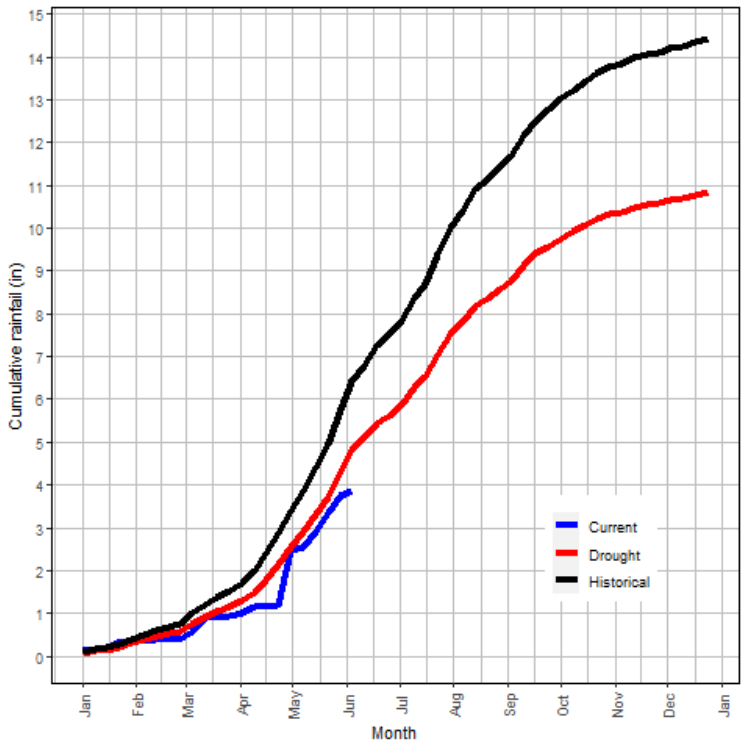


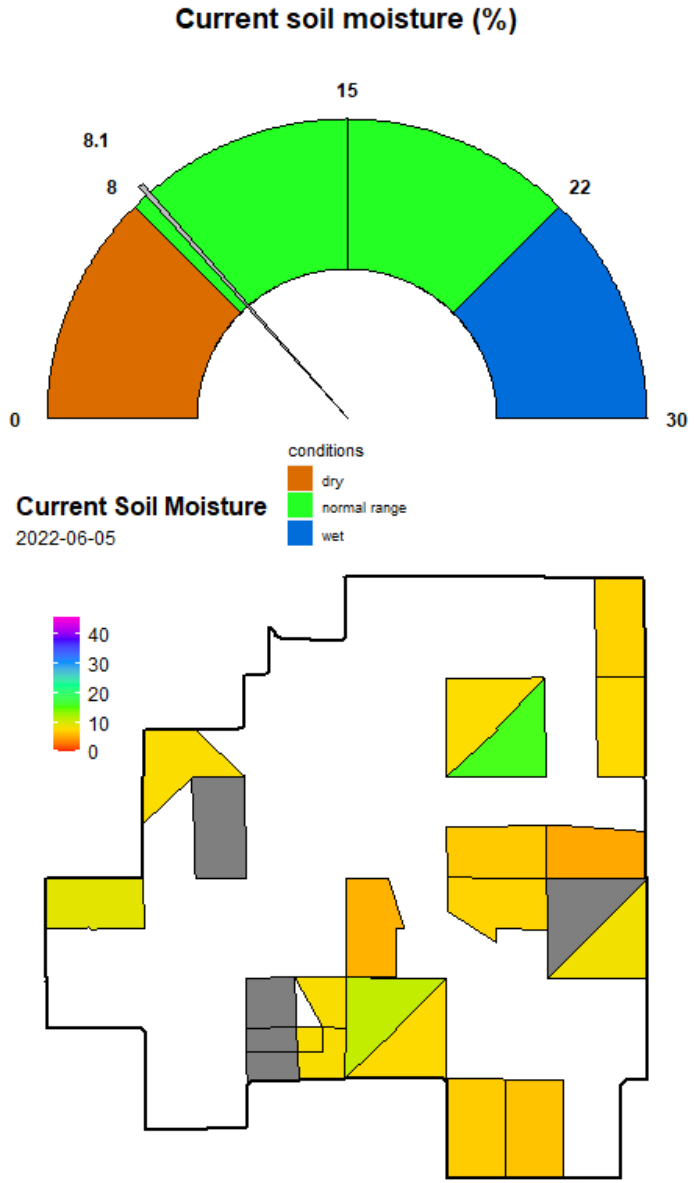




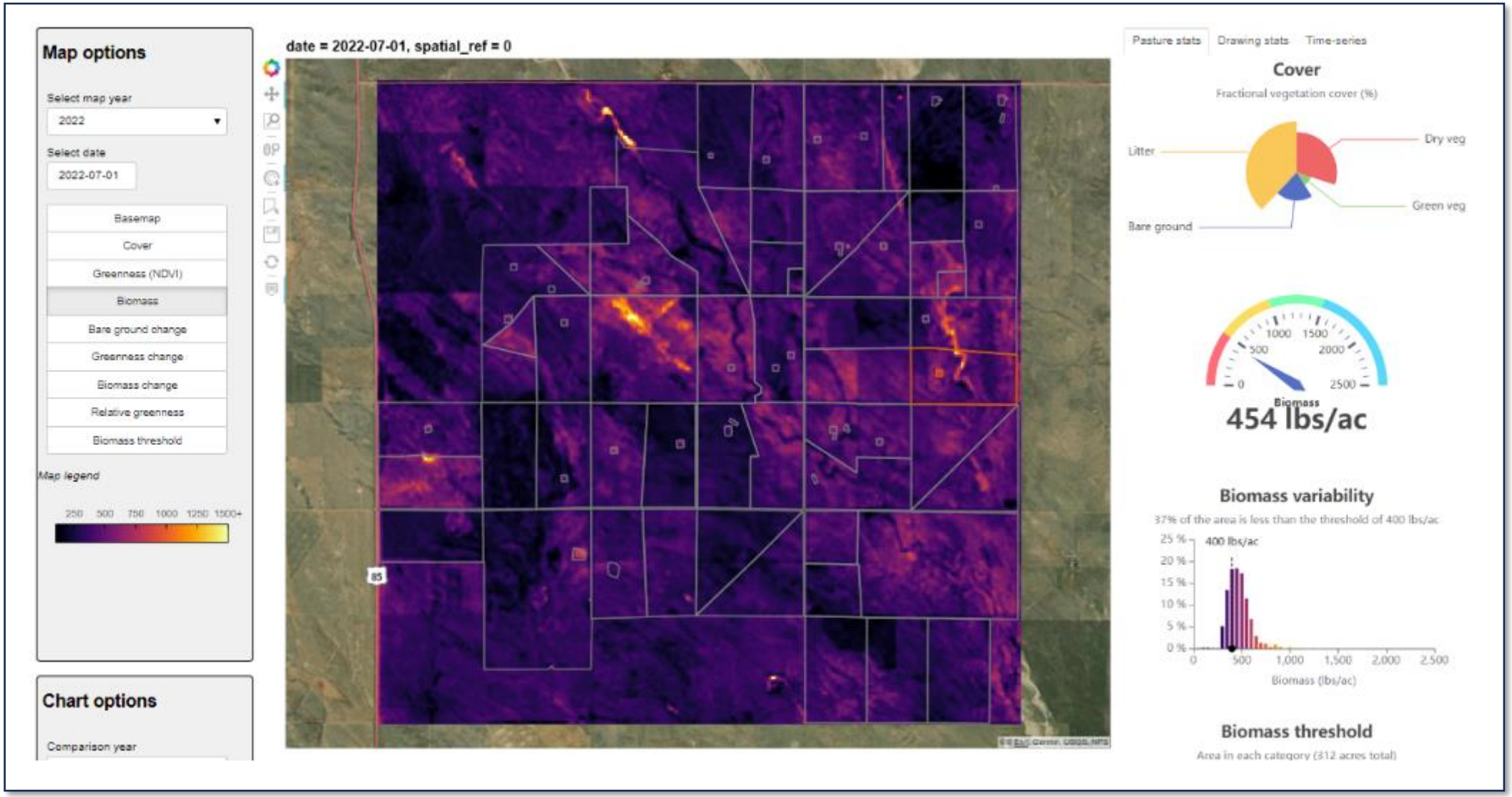
Decision support tools to inform adaptive rangeland management



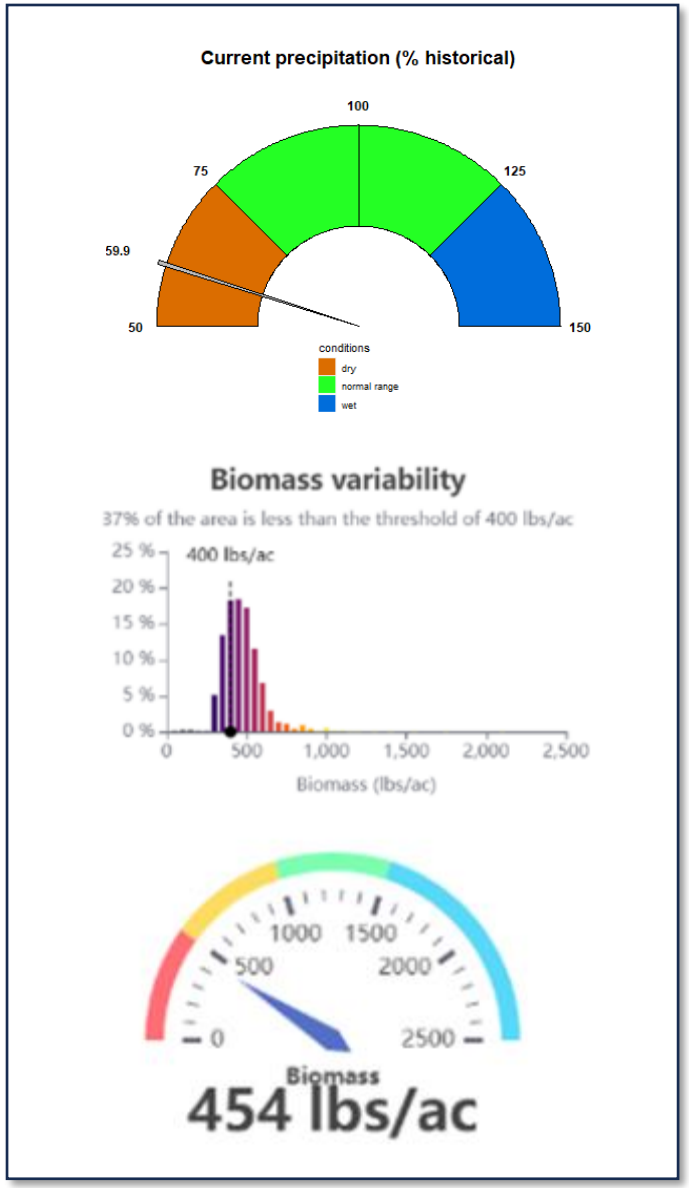




Decision support tools to inform adaptive rangeland management



Science-informed **adaptive decision-making**



2022 Drought Management

Scientists

Stakeholders

CARM **Co-production**

Scientists

Learned about the patterns and processes driving water variability

Rapidly adapt livestock production to changing environmental conditions

Learned how to create user-friendly indicators to enhance decision-making

Stakeholders

Thank You

Contact: David.Hoover@usda.gov

CARM Stakeholders:

FOREST SERVICE U S DEPARTMENT OF AGRICULTURE

NRCS Natural Resources Conservation Service

COLORADO STATE EXTENSION

Bird Conservancy of the Rockies

The Nature Conservancy

DNR COLORADO State Land Board

EDF ENVIRONMENTAL DEFENSE FUND® Finding the ways that work

Crow Valley Livestock Cooperative