



RANGELAND RESOURCES RESEARCH UNIT



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Mission

To develop new knowledge of ecological processes in semi-arid rangeland ecosystems, and incorporate this knowledge into management practices which address production and conservation goals.

Vision
Sustained rangeland services (including aesthetics, biodiversity, carbon storage, clean water, forage, habitat, nutrient cycling) in a changing world.

Research Areas

The Rangeland Resources Research Unit addresses production and conservation issues on semi-arid rangeland ecosystems through evaluation of management practices, science-based monitoring, invasive species research, and determining influences of global climate change on structure and function of these systems.

Management of Rangeland Ecosystems for Production and Conservation

Semi-arid rangelands have traditionally been managed for livestock production by grazing at moderate intensity to maximize livestock gain, maintain individual animal performance, and prevent long-term ecosystem degradation. Increasingly, however, land managers are in need of sound science to support management strategies that address a diverse array of objectives including livestock production and conservation goals.

Livestock can function as ecosystem engineers, either alone or in combination with other natural disturbances, to alter spatial and temporal heterogeneity of vegetation composition and structure at local and landscape scales. Research is examining the effects of a variety of management practices including:

- Effects of prescribed burning alone and in combination with livestock grazing
- Interactive effects of prairie dogs and livestock grazing
- Effects of very intensive livestock grazing during spring and summer

Our studies are measuring the effects of these different management practices on vegetation structure and composition at multiple spatial scales, and the consequences for both livestock production and wildlife habitat suitability.



Monitoring

Sustaining rangelands and the ecological services they provide depends on accurate information about the "health" of ecological processes.

Research has:

- Developed the world's highest-resolution aerial photography and methods to economically sample thousands of rangeland sites
- Developed software and accurate measurement methods for photographic sampling
- Demonstrated effectiveness of new monitoring methods across 6 western states in cooperation with BLM, universities, and private industry

Research continues to refine and improve these tools while using them to investigate effects of grazing, fire and energy development on sagebrush and shortgrass rangelands and watersheds, riparian and aquatic habitat, weeds, sage-grouse habitat and populations, and other resource concerns.



Invasive Species

Achieving economically-viable weed control on rangelands requires understanding and treating the causes of weed invasion.

Unfortunately, no one knows which processes are most important in driving weed invasion. Research focuses on the following likely causes of invasion:

- High water or nitrogen availability – due to disturbance or climate change
- Energy release – due to the loss of specialized enemies, such as insects and diseases, by non-native species
- Evolution of non-native species – due to enemy release or novel environments
- Investigates management strategies that influence invasive species:
 - Influence of fire on invasion in shortgrass steppe
 - Management of soil nitrogen availability to prevent invasion
 - Monitoring rangeland invaders with aerial imagery



Global Climate Change

Evidence is mounting that greenhouse gas emissions cause global warming and changes in precipitation. It is uncertain how global climate change is going to affect the ecology, productivity and sustainability of semi-arid rangelands. It is of imminent importance to understand how semi-arid rangelands will respond to global climate change. We are conducting research to evaluate the effects of elevated atmospheric CO₂ and warming on:

- Plant productivity, species composition, and forage quality
- Greenhouse gas emissions (CO₂, CH₄, and N₂O) and soil carbon storage as part of the ARS' national Greenhouse Gas Reduction through Agricultural Carbon Enhancement Network (GRACENet)
- Nutrient cycling
- Establishment and performance of invasive species

This research will help develop management strategies for coping with climate change, and provide information for policy makers on the consequences of climate change.



For more information visit: <http://rrru.ars.usda.gov>