

HIGHLIGHTS

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Perception and Management of Spatio-Temporal Pasture Heterogeneity by Hungarian Herders

Zsolt Molnar

The author documented the traditional knowledge of Hungarian herders in the Hortobágy saline steppe. Herders have a nuanced knowledge of seasonal and yearly variations of forage quality and quantity. They perform strong and planned, but often opportunistic, herding practices. Reciprocal learning and continuous communication between the herder, his driving dogs, and livestock strongly influence grazing pattern. Herders manage and improve different habitats within their pastures differently, by grazing, manuring, burning, or manual removal of spiny weeds. The reintroduction of some old herding techniques (opportunistic pasture use, grazing of marshes, and burning) would be needed for better management and conservation of these steppes.

Herder Observations of Rangeland Change in Mongolia: Indicators, Causes, and Application to Community-Based Management

Retta A. Bruegger, Odgarav Jigjsuren, and Maria E. Fernández-Giménez

Local observations of ecological change are important in developing tools for rangeland management and filling in gaps where quantitative data are lacking. The majority of Mongolian herders asked about rangeland change reported increases in undesirable plant species, declines in species richness, and the disappearance or decreasing abundance of desirable species. These observations may serve as an early warning of rangeland change, provide insights into causes of change, and could help direct management. The challenge herders face is applying their knowledge to management at appropriate scales to avoid further undesirable change. To do this effectively requires higher-level institutional support.

Evaluation of Landscape-Level Grazing Capacity for Domestic Sheep in Alpine Rangelands

Atle Mysterud, Yngve Rekdal, Leif Egil Loe, Michael Angeloff, Ragnhild Mobæk, Øystein Holand, and Geir-Harald Strand

Balancing the number of grazing animals with plant resources is a core issue in grazing management. We present a method to evaluate grazing capacity on open rangelands at the landscape level. It combines information from regional sampling surveys and a land cover map derived from satellite-based measures of reflectance values. The method identified several overgrazed areas in a controversial region in Norway. Our study provides a first step toward development of a grazing capacity evaluation to achieve a sustainable management of sheep on alpine ranges in the Northern Hemisphere.

Feed Intake and Performance of Sheep Grazing Semiarid Grassland in Response to Different Grazing Systems

Uta Dickhoefer, Jun Hao, Britta M. Bösing, Lijun Lin, Martin Gierus, Friedhelm Taube, and Andreas Susenbeth

Grazing systems affect biomass production, forage quality, and animal productivity. In the steppe of Inner Mongolia we compared sheep performance on pastures that were grazed season-long each year to pastures that were grazed or hayed in alternate years. Organic matter intake, digestibility of ingested feed, and live weight gains were not different between the two grazing systems. However, 4 years may be too short to clearly establish grazing system effects on herbage and thus, animal performance, especially under dry conditions. Long-term alternation of grazing with haying might enhance revenues and ecological sustainability when compared to the common practice of continuous grazing at very high stocking rates.

Near Infrared Spectroscopy and Fecal Chemistry as Predictors of the Diet Composition of White-Tailed Deer

Pierre-Olivier Jean, Robert L. Bradley, Marie-Andrée Giroux, Jean-Pierre Tremblay, and Steeve D. Côté

Overbrowsing by white-tailed (*Odocoileus virginianus*) deer on Anticosti Island (Canada) prompted us to develop efficient methods for estimating their foraging patterns. We tested the ability of near infrared (NIR) spectra of feces and of fecal chemical properties to predict diet composition of different individuals. Neither method could predict specific forage types in the diets, but both successfully predicted the amount of coniferous browse. These results suggest that fecal NIR spectra or fecal chemical properties could be used to estimate the annual variation in diets within a given home range, or to determine diet quality during winter.

Human Infrastructure and Invasive Plant Occurrence Across Rangelands of Southwestern Wyoming, USA

D. J. Manier, C. L. Aldridge, M. O'Donnell, and S. J. Schell

Public and private rangelands have many values and uses, and the accumulation of infrastructure for accessing these lands and resources may affect rangeland conditions. To elucidate potential indirect effects of human infrastructure on rangelands in southwestern Wyoming, we assessed the distribution of invasive plants based on the combination of environmental conditions and proximity to anthropogenic features. We found strong correlations between invasive plants and infrastructure. However, all models were improved by inclusion of additional environmental predictors, and not all species distributions displayed anticipated distance-decay relations. Understanding these relations can help managers target species and activities that potentially degrade rangeland conditions.

Evaluating a State-and-Transition Model Using a Long-Term Dataset

Anthony T. Perlinski, Ginger B. Paige, and Mitchel P. McClaran

State-and-transition models describe ecological responses to natural and anthropogenic disturbances, yet they often lack analytical testing to support described vegetation community dynamics, thresholds, or state changes. We combined ordination and permutation multivariate analysis of variance to examine vegetation data structure and identify thresholds and state changes over a 52-year period on an ecological site. We identified a threshold associated with species invasion and a short-term change associated with a restoration pathway. These results allowed us to identify a temporal scale for thresholds to be approached and crossed and provided a mea-

surable indicator (i.e., percentage of change in species cover) of when a threshold had been crossed.

Long-Term Vegetation Change Provides Evidence for Alternate States in Silver Sagebrush

Emily Kachergis, Monique E. Rocca, and Maria E. Fernández-Giménez

We described long-term vegetation change in a silver sagebrush (*Artemisia cana* ssp. *viscidula*) mountain park using 57 years of monitoring data collected by the US Forest Service. Managers historically sprayed broadleaf herbicides to reduce sagebrush and the perennial forb mule-ears (*Wyethia amplexicaulis*), both unpalatable to livestock. We found that spraying had the desired effects of reducing sagebrush and mule-ears while also increasing native grasses. However, effects were short-term, as sagebrush recovered and grasses decreased again over time. In addition, the nonnative pasture grass timothy (*Phleum pratense*) increased to become a dominant grass on all sites. We demonstrate the utility of long-term monitoring data for updating rangeland management decision-making tools.

Vegetation Responses to Pinyon-Juniper Treatments in Eastern Nevada

Louis Provencher and Julie Thompson

Cost-effective tree-removal treatments are needed to reduce the cover of single-leaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) and increase native herbaceous cover in sagebrush. In 2006, two pinyon and juniper reduction method experiments were initiated in eastern Nevada's black sagebrush. By 2010, chaining or bulldozing imitating chaining, followed by mastication, showed the highest ecological return on investment for improving perennial grass and decreasing tree cover, whereas feller-buncher and lop-pile-burn treatments had the lowest ecological return on investment. Land managers should reconsider smooth chaining, albeit politically unpopular, for cost-efficient and rapid restoration of large, tree-encroached sagebrush-dominated landscapes.

Root Biomass and Distribution Patterns in a Semi-Arid Mesquite Savanna: Responses to Long-Term Rainfall Manipulation

R. J. Ansley, T. W. Boutton, and P. W. Jacoby

Expansion of woody plants in grasslands is facilitated by root system adaptation to climatic extremes. We quantified root biomass and distribution of honey mesquite (*Prosopis glandulosa*) following a long-term rainfall manipulation experiment in the southern Great Plains. Long-term drought increased mesquite coarse (>0.08 inch diameter) root mass and root-

to-shoot mass ratio, whereas long-term irrigation increased mesquite fine-root mass, but did not increase total root mass compared to the control. The increase in belowground biomass during extended drought suggests an important mechanism by which woody plant encroachment into grasslands may alter belowground carbon stocks under climate change scenarios predicted for this region.

Knapweed Hay as a Nutritional Supplement for Beef Cows Fed Low-Quality Forage

David W. Bohnert, Roger L. Sheley, Stephanie J. Falck, and Arthur A. Nyman

Russian knapweed (*Acroptilon repens*) is comparable to alfalfa as a protein supplement for beef cows consuming low-quality forage. Although knapweed is slower to digest, cow weight gain and body condition scores were the same between mid-estation beef cows offered alfalfa and those offered knapweed along with their straw maintenance diet. Using knapweed as a nutritional supplement can help solve two major production problems: managing an invasive weed and providing a feedstuff that reduces a bottleneck in livestock production systems.

Estimating Sagebrush Biomass Using Terrestrial Laser Scanning

Peter J. Olsoy, Nancy F. Glenn, and Patrick E. Clark

Aboveground biomass is traditionally estimated with field techniques such as destructive and point-intercept sampling,

but these techniques can be expensive and time consuming. A new biomass estimation method using volume derived by terrestrial laser scanning three-dimensional point clouds was compared with destructive samples. The accuracy of the terrestrial laser scanning method was comparable to field methods, is efficient, and provides a comprehensive dataset that can be used for other biophysical measurements. This emerging remote sensing method is aptly suited where rapid, accurate, repeat, and extensive sagebrush biomass estimates are needed.

Combustion of Cattle Fecal Pats Ignited by Prescribed Fire

J. Derek Scasta, John R. Weir, David M. Engle, and J. D. Carlson

Cattle fecal pats readily ignite, are a common source of spot fires, and harbor dung-dependent livestock parasites. We assessed how fecal pat characteristics, fuel load, and fire weather variables influenced fecal pat combustion after 10 prescribed fires in Oklahoma. The proportion of individual pats burned varied highly across fires, ranging from 2% to 98%. Fecal pat condition, 10-hour time-lag dead fuel moisture, and fuel load explained the greatest variation of pat combustion. Our results demonstrate that combustion of pats can be minimized or maximized to meet a variety of ecological and production goals, such as reducing livestock parasites.

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