

HIGHLIGHTS

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Detecting the Influence of Best Management Practices on Vegetation Near Ephemeral Streams With Landsat Data

Matthew Rigge, Alexander Smart, Bruce Wylie, and Kendall Vande Kamp

Various best management practices have been implemented on rangelands with the goal of reducing livestock impacts to riparian areas, but their effectiveness often goes unmeasured. We evaluated the effects of installing off-stream water and cross fencing on commercial-scale pastures in the northern mixed-grass prairie. A series of 30-m Landsat images and the Normalized Difference Vegetation Index were used to track the spatial and temporal changes in riparian vegetation cover. The patterns of in-channel vegetation cover among pastures suggested that off-stream water and cross fencing likely altered grazing distribution by decreasing the preferential use of riparian and in-channel areas.

A Comparison of Satellite-Derived Vegetation Indices for Approximating Gross Primary Productivity of Grasslands

Yu Zhou, Li Zhang, Jingfeng Xiao, Shiping Chen, Tomomichi Kato, and Guangsheng Zhou

Satellite-derived vegetation indices have been widely used to approximate gross primary productivity (GPP) for grasslands, but their performance has not been rigorously evaluated. We compared the performance of nine vegetation indices for approximating grassland GPP in northern China using satellite observations from MODIS and GPP data from eddy covariance flux towers. Our results demonstrated that overall Enhanced Vegetation Index is the best predictor of GPP, whereas Soil-adjusted Vegetation Index exhibits the best correlation with GPP in spring when canopy is sparse. Our study provides useful insights on the selection of vegetation indices for the approximation and modeling of grassland GPP.

Livestock Management Strategy Affects Net Ecosystem Carbon Balance of Subhumid Pasture

Lawrence G. Oates and Randall D. Jackson

Climate change mitigation services from ecosystem carbon accumulation might be warranted for subhumid pastures. However, when all transfers of carbon are not considered, misconceptions can occur regarding how management strategy affects net ecosystem carbon balance (NECB). We estimated NECB under four livestock management practices typical of the north central United States. Management strategy did influence NECB by differentially affecting the ratio of net primary production to soil respiration. On short temporal and small spatial scales, net primary production and soil respiration were the primary regulators of NECB. However, to accurately determine NECB, it is necessary to account for all fluxes and cross pasture boundary transfers of carbon.

Spatial and Temporal Variability in Aboveground Net Primary Production of Uruguayan Grasslands

Anaclara Guido, Ramón Díaz Varela, Pablo Baldassini, and José Paruelo

Accounting for spatial and temporal variability of grassland aboveground net primary production (ANPP) is a prerequisite for sustainable management of grazing systems. We analyzed the spatial and temporal variability of ANPP in Uruguayan grasslands during 2000–2010 using remote sensing. ANPP varied spatially among geomorphological units, increasing from the north and midwest of Uruguay to the east and southeast. Although ANPP peaked in spring across all geomorphological units, there were distinct differences in temporal trends throughout 2000–2010. Remote sensing techniques can provide critical baseline data to calculate the risk of forage shortage and then explore management actions.

Different Root and Shoot Responses to Mowing and Fertility in Native and Invaded Grassland

Vasiliki G. Balogianni, Scott D. Wilson, Brenda M. Vaness, Andrew S. MacDougall, and Bradley D. Pinno

Understanding root responses of semiarid grasslands to mowing and soil fertility could aid the management of invasive species such as crested wheatgrass (*Agropyron cristatum*). We subjected grasslands in northern Montana to 5 years of mowing at two nitrogen levels, and followed root responses with minirhizotrons. Roots length was significantly greater beneath areas occupied by crested wheatgrass, but was unaffected by mowing and nitrogen addition on both native- and crested-wheatgrass invaded grasslands. Because most production and competition in grasslands occurs below ground, mowing might not be a successful tool for reducing crested wheatgrass root length, regardless of soil fertility.

Yield Response of Needle-and-Thread and Threadleaf Sedge to Moisture Regime and Spring and Fall Defoliation

Ann E. Koehler, W. Douglas Whisenhunt, Jerry D. Volesky, Patrick E. Reece, Thomas L. Holman, and Lowell E. Moser

To help managers determine when to begin and end grazing of cool-season-dominated semiarid rangelands, we measured subsequent-year yield of spring and fall clipped needle-and-thread (*Hesperostipa comata*) and threadleaf sedge (*Carex filifolia*) under two fall moisture regimes. Subsequent-year yield of needle-and-thread was not affected by defoliation under average precipitation conditions; however, it was reduced following heavy late spring defoliation during a drought year. Subsequent-year yield of threadleaf sedge was not affected by defoliation in either year. Given the difficulty of predicting when drought will occur, avoiding heavy late-spring grazing in needle-and-thread-dominated pastures in consecutive years would be prudent.

Semiarid Rangeland Is Resilient to Summer Fire and Postfire Grazing Utilization

Lance T. Vermeire, Jessica L. Crowder, and David B. Wester

Understanding plant response to grazing following summer fire can help reduce ecological and financial risks with wildfire. Plots of northern mixed prairie were burned in August, followed by 0%, 17%, 34%, or 50% grazing utilization the following growing season. Root, litter, and above-ground biomass were measured before fire, and immediately and 1 year after grazing. Late June and early July grazing the year after fire, with up to 50% utilization, did not af-

fect total productivity the year after grazing. However, fire can temporarily reduce standing dead vegetation and total forage availability, and initial stocking rates might need to be lowered.

Improving Restoration of Exotic Annual Grass-Invaded Rangelands Through Activated Carbon Seed Enhancement Technologies

Matthew D. Madsen, Kirk W. Davies, Daniel L. Mummey, and Tony J. Svejcar

Application of preemergent herbicide can control annual weeds but can also damage seeded species. We evaluated a new seed enhancement technology that is designed to allow seeding concurrently with high rates of preemergent herbicide. Designated as “herbicide protection pods” (HPPs), a rectangular pod is formed from a dough mixture containing seed, activated carbon, and other additives. Our results indicate that the HPP produces a microenvironment within the soil that minimizes herbicide uptake to the seeded species, while herbicide controls invasive weeds outside of this zone. This restoration approach may improve seeding success rates of perennial grasses in annual weed-dominated systems.

Monitoring of Livestock Grazing Effects on Bureau of Land Management Land

Kari E. Veblen, David A. Pyke, Cameron L. Aldridge, Michael L. Casazza, Timothy J. Assal, and Melissa A. Farinha

Public land management agencies monitor conditions and trends of rangelands throughout the western United States. We asked range scientists how they would prioritize rangeland monitoring activities, and compared that to the type of grazing-related data available across Bureau of Land Management (BLM) lands. The most commonly available monitoring data were livestock number and season of use, followed by photo points, utilization, and vegetation trend data. Of the allotments that identified livestock grazing as a problem, only 27% had all of these data types. There is need for more monitoring of BLM rangelands, which will require commitment at multiple institutional levels.

Influence of Experience on Browsing Sagebrush by Cattle and Its Impacts on Plant Community Structure

Charles A. Petersen, Juan J. Villalba, and Frederick D. Provenza

Fashioning management regimes where livestock learn to use sagebrush as forage in fall and winter, to reduce costs of feeding hay and to increase grasses and forbs, is an alternative to costly mechanical and chemical methods of rejuvenating sagebrush-steppe. Pregnant cows with calves, bred yearling

heifers, and first-calf heifer/calf pairs learned to eat sagebrush; experienced animals ate more sagebrush and lost less weight, or gained more weight, than naive animals throughout our 3-year study. Fall grazing reduced sagebrush, and prevailing moisture regimens affected how quickly—within one to two growing seasons—production and cover of grasses and forbs increased.

Rangeland Health Assessment: A Useful Tool for Linking Range Management and Grassland Bird Conservation?

Allison E. Henderson and Stephen K. Davis

Large-scale loss of prairie, coupled with declines in grassland bird populations, require an understanding of how livestock production affects bird habitat selection. We assessed whether components of the Saskatchewan Rangeland Health Index, vegetation structure, vegetation structure heterogeneity, and plant community composition were good predictors of bird abundance. Vegetation structure, structural heterogeneity, and plant composition variables were present in top-ranking models for abundance of eight, three, and two bird species,

respectively. Although rangeland health was a poor predictor of bird abundance, structural components of the index can be used to guide grazing management for grassland bird habitat.

Short- and Long-Term Influence of Brush Canopy Cover on Northern Bobwhite Demography in Southern Texas

Stephen J. DeMaso, Fidel Hernández, Leonard A. Brennan, Nova J. Silvy, William E. Grant, X. Ben Wu, and Fred C. Bryant

The influence of habitat on the long-term demographic performance of wildlife has been largely ignored. We evaluated the influence of brush canopy cover (5%, 11%, and 32%) on the short-term (5 years) and long-term (100 years) demographic performance of northern bobwhite (*Colinus virginianus*) through a field study and simulation model. Bobwhite density, survival, and reproduction did not differ among brush canopy cover classes in the short term, but they did in the long term. Managers need to be aware that decisions based on short-term data can lead to ineffective or incorrect outcomes.