

HIGHLIGHTS



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Successional Transitions and Management of a Phosphorus-Limited Shrubland Ecosystem

Zalmen Henkin, No'am G. Seligman, and Imanuel Noy-Meir

The decline of traditional pastoral systems has highlighted the problem of managing shrub encroachment on successional shrublands in the Mediterranean region. We studied shrub and herbaceous cover in a burned area in response to phosphate application and chemical shrub control. Without herbicide, shrub cover reached its preburn level within 5 years, but with herbicides, it had not yet reached the preburn level after 17 years. Phosphate application did not influence shrub cover but increased herbaceous vegetation cover. Appropriate use of grazing, shrub control, and phosphate amelioration can develop open woodlands with herbaceous understory with a wide range of ecological services.

Ecosystem Water Use Efficiency in a Semiarid Shrubland and Grassland Community

William E. Emmerich

Water use efficiency (WUE), net carbon uptake per water lost, is higher in C_4 grasses than C_3 shrubs. We measured evapotranspiration and CO_2 fluxes at a shrub and grass site in southeastern Arizona. Two different methods were used to evaluate ecosystem WUE. Results indicated that the grass-dominated ecosystem was between 1.4 and 1.6 times more water use efficient than the shrub-dominated ecosystem. Mean annual growing season precipitation and evapotranspiration were similar in the two ecosystems, but the higher WUE of the grassland system enabled it to take up more carbon during the growing season than the shrub ecosystem.

Effect of Phosphate Fertilization on Flooding Pampa Grasslands (Argentina)

Adriana M. Rodríguez, Elizabeth J. Jacobo, Pablo Scardaoni, and Victor A. Derejibus

We evaluated the effect of phosphate fertilization on the production and relative contribution of legumes and grasses

of native and old tall fescue (*Festuca arundinacea* Schreb.) grasslands managed under rotational grazing. Two fertilization programs (66 and 29 kg $P\cdot ha^{-1}$ supplied as rock phosphate and/or mono-ammonium phosphate) and a nonfertilized control were performed. In native grassland, phosphate fertilization increased aboveground net primary productivity (ANPP) of C_3 annual grasses and legumes; therefore, annual ANPP under 66 kg $P\cdot ha^{-1}$ doubled ANPP of nonfertilized treatment. Phosphate fertilization did not increase total annual ANPP of old tall fescue grassland but it did increase ANPP of legumes.

Grazing and Burning Japanese Brome (*Bromus japonicus*) on Mixed Grass Rangelands

K. R. Harmoney

Japanese brome has invaded the central and northern Great Plains and negatively impacted native vegetation and grazing animals. Annual prescribed spring burning and annual early spring grazing were compared to measure effects on Japanese brome density and native vegetation composition. Annual spring burning and spring grazing were equally effective in limiting Japanese brome density compared to the idle control. However, Japanese brome was present even after five years of annual burning and intense early spring grazing, which indicates the difficulty of eradicating Japanese brome from ecosystems where it has become naturalized.

Decreasing Forage Allowance Can Force Cattle to Graze Broom Snakeweed (*Gutierrezia sarothrae*) as a Potential Biological Control

Michael H. Ralphs, Randy D. Wiedmeier, and Jeffrey E. Banks

Although overgrazing is a principal cause for the increase in broom snakeweed, prescriptive grazing can provide the means of controlling it. Cattle were confined to narrow grazing lanes and moved each day, and forage was limited to 24%–75% of their intake requirement. Cattle grazed 62%–95% of snakeweed plants and utilized 50%–85% of its

biomass, without adversely affecting their health or body condition. Cattle can be an effective biological control by confining them to small areas and limiting alternative forage to force them to graze snakeweed.

Bluebunch Wheatgrass Response to Spring Defoliation on Foothill Rangeland

Tracy K. Brewer, Jeffrey C. Mosley, Daniel E. Lucas, and Lisa R. Schmidt

Spring elk grazing can reduce forage availability for wildlife or livestock in summer and harm forage resources on foothill rangeland. Early spring defoliation of bluebunch wheatgrass (*Pseudoroegneria spicata* [Pursh] A. Love) did not affect leaf height, plant yield, or inflorescence production in summer on either site. However, late spring defoliation adversely affected bluebunch wheatgrass plants in summer when grazed for 2–3 successive years on the foothill grassland and sagebrush steppe sites. Managers should carefully monitor bluebunch wheatgrass stubble height immediately after ungulate grazing in May on foothill rangeland and make appropriate adjustments to maintain the sustainable production of bluebunch wheatgrass.

Effects of Fire Frequency and Intensity on Mesquite in an Arizona Grassland

Carl E. Bock, Linda Kennedy, Jane H. Bock, and Zach F. Jones

Attempts to control velvet mesquite with fire usually have failed, perhaps due to insufficient fuels and lack of repeated burning. We measured fire damage and 5 years of postfire recovery for mesquite trees in Arizona grasslands differing in wildfire history and presence vs. 34-year absence of livestock. Mesquite mortality was 18% in ungrazed areas burned twice in 15 years, 1% in ungrazed areas burned once, and 0% in grazed sites. Repeated fires likely could have prevented the historic spread of mesquite, but probably could be used to control mesquite today only in areas with abundant fine fuels.

Short-Term Effects of Burning Wyoming Big Sagebrush Steppe in Southeast Oregon

Kirk W. Davies, Jonathan D. Bates, and Richard F. Miller

We quantified the impact of fall burning on shrub and herbaceous production and cover, vegetation diversity, soil water content, soil nitrogen and carbon, and soil organic matter in Wyoming big sagebrush communities. Total vegetation production and cover were greater in the control than burned treatment. However, greater herbaceous production and cover in the burned than unburned treatment suggests resources became available to herbaceous vegetation with burning. Annual exotic grass cover and production did not

increase with burning. Herbaceous vegetation can be increased with prescribed burning of Wyoming big sagebrush communities without exotic annual grass invasion.

Large-Scale Aerial Images Capture Details of Invasive Plant Populations

Dana Blumenthal, D. Terrence Booth, Samuel E. Cox, and Cara E. Ferrier

Locating and measuring invasive weed populations across large areas is key to understanding, monitoring, and managing rangeland invasions. We tested a novel approach that uses a lightweight airplane, flying at 100 m altitude, to rapidly collect high resolution images, each representing 48.5 m² of mixed-grass prairie. From these images we were able to efficiently and reliably measure small patches and even individual plants of the invasive forb Dalmatian toadflax. These results suggest that such high-resolution aerial imagery could be used to obtain detailed measurements of many invasive weed populations.

A Fence Design for Excluding Elk Without Impeding Other Wildlife

Kurt C. VerCauteren, Nathan W. Seward, Michael J. Lavelle, Justin W. Fisher, and Gregory E. Phillips

Concentrated herbivory by elk can degrade vegetative communities and alter ecosystem processes. Woven wire fence can exclude other, nontarget animals. We designed a simple fence that excluded elk, but maintained access for other species. We monitored effectiveness with trackplots, animal-activated cameras, and changes in aspen stem height and density. Our fence excluded elk, but allowed other animals access. After 1 year of protection, mean aspen stem height increased in the enclosure, but stem density changed little. Our fence design excluded elk and has potential for protecting a variety of resources.

Will Molasses or Conditioning Increase Consumption of Spotted Knapweed by Sheep?

Travis R. Whitney and Bret E. Olson

The spread of the invasive, Eurasian spotted knapweed (*Centaurea maculosa* Lam.) across the northwestern United States would be reduced if livestock regularly consumed it. We determined if white-face yearling ewes conditioned for 12 days to fresh-cut spotted knapweed, with or without molasses, would increase their use of it during a 5-day field trial and/or a 4-day drylot trial. Conditioning yearling ewes to spotted knapweed, with or without molasses, did not significantly increase consumption of this invasive plant, possibly because sheep inherently graze spotted knapweed only to a certain extent, or we did not use enough spotted knapweed during conditioning.

Influence of Fire on Black-Tailed Prairie Dog Colony Expansion in Shortgrass Steppe

David J. Augustine, Jack F. Cully, Jr., and Tammi L. Johnson

Management of black-tailed prairie dogs can affect both livestock and biodiversity in semiarid rangelands. We examined the influence of prescribed burns on prairie dog colony expansion in shortgrass steppe, and found the mean rate of expansion was twice as high for colonies expanding into burned compared to unburned grassland. However, under the dry conditions during our study, expansion rates of unburned colonies were highly variable. Our results indicate burns can ensure that an individual colony expands rapidly, but burning had only minor effect on the overall colony complex because a portion of the unburned colonies also expanded rapidly.

Extent of Stem Dieback in Trembling Aspen (*Populus tremuloides*) as an Indicator of Time-Since Simulated Browsing

Allan W. Carson, Roy V. Rea, and Arthur L. Fredeen

In the absence of direct observation, determining when plant shoots are cropped by ungulates is difficult to assess. We investigated the utility of using stem dieback as a means of determining when the shoots of aspen stems were clipped (simulated browsing). Although stem dieback itself was not a reliable indicator of when it was that shoots were clipped, calculating the ratio of dieback along the stem to what was available for dieback, allowed for an accurate assessment of time-since browsing. The technique provides a reliable assessment tool for managers interested in mapping seasonal browse use by domestic and wild ungulates.

Digital Photography: Reduced Investigator Variation in Visual Obstruction Measurements for Southern Tallgrass Prairie

Ryan F. Limb, Karen R. Hickman, David M. Engle, Jack E. Norland, and Samuel D. Fuhlendorf

Managing landscapes with structural heterogeneity is critical for wildlife populations; however, traditional visual obstruction techniques used to measure vegetation structure are subject to high observer variability. We developed a digital image method to measure visual obstruction and compared it to the Robel pole and Nudds' coverboard methods. The digital method was a robust technique with the lowest observer variation along the gradient of vegetation structure tested. Research programs that utilize seasonal field technicians and are subject to high annual turnover could benefit from implementing use of the digital image method to obtain more reliable data and to reduce sampling effort.

Saltcedar Water Use: Realistic and Unrealistic Expectations

M. Keith Owens and Georgianne W. Moore

Saltcedar (*Tamarix* spp.) is a widespread invasive plant found in riparian corridors and floodplains in 16 western states. Popular press articles widely report that each individual saltcedar tree can use as much as 200 gallons per day. We use 3 lines of evidence—peer-reviewed scientific literature, sap flux rates and sap wood area, and potential evaporation rates—to demonstrate the improbability that saltcedar, or any other woody species, can use this much water per tree on a daily basis. A more realistic estimate of maximum daily water use derived from sap flux measurements would be less than 32.2 gallons.