Nevada Section Society for Range Management Suggested Reading: March 2016

Abstracts of Recent Papers on Range Management in the West

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NV-SRM Suggested Reading 3/2016

Clark, P.E., J. Lee, K. Ko, R.M. Nielson, D.E. Johnson, D.C. Ganskopp, F.B. Pierson, and S.P. Hardegree. 2016. **Prescribed fire effects on resource selection by cattle in mesic sagebrush steppe.** Part 2: mid-summer grazing. *Journal of Arid Environments* 124:398–412.

Abstract

Prescribed fire can release herbaceous forages from woody plant competition thus promoting increased forage plant production, vigor, and accessibility. Prescribe fire also consumes standing litter thereby improving forage quality and palatability. Consequently, prescribed fire is commonly considered an effective tool for manipulating livestock distribution on rangelands. Efficacy of this tool on mesic sagebrush steppe, however, has received little research attention. Beginning in 2001, resource selection by beef cows under a mid-summer (July) grazing regime was evaluated using global positioning system (GPS) collars for 2 years prior to and for up to 5 years after a fall prescribed fire was conducted on mesic sagebrush steppe in the Owyhee Mountains of southwestern Idaho, USA. Cattle selected for burned areas during the first, second, and fifth postfire years. Cattle had exhibited neutral selectivity towards these areas, during one of the two prefire years. Burning in the uplands reduced cattle use of near-stream habitats but only during the second postfire year. Differences in phenological timing of grazing may account for differences in cattle response to burning noted between this study and one conducted nearby under a spring (May) grazing regime. This is a case study and caution should be taken in extrapolating these results.

Prevey, J. S. and T.R. Seastedt. 2015**. Effects of precipitation change and neighboring plants on population dynamics of** *Bromus tectorum***.** *Oecologia* 179:765–775.

Abstract

Shifting precipitation patterns resulting from global climate change will influence the success of invasive plant species. In the Front Range of Colorado, Bromus tectorum (cheatgrass) and other non-native winter annuals have invaded grassland communities and are becoming more abundant. As the global climate warms, more precipitation may fall as rain rather than snow in winter, and an increase in winter rain could benefit early-growing winter annuals, such as B. tectorum, to the detriment of native species. In this study we measured the effects of simulated

changes in seasonal precipitation and presence of other plant species on population growth of B. tectorum in a grassland ecosystem near Boulder, Colorado, USA. We also performed elasticity analyses to identify life transitions that were most sensitive to precipitation differences. In both study years, population growth rates were highest for B. tectorum growing in treatments receiving supplemental winter precipitation and lowest for those receiving the summer drought treatment. Survival of seedlings to flowering and seed production contributed most to population growth in all treatments. Biomass of neighboring native plants was positively correlated with reduced population growth rates of B. tectorum. However, exotic plant biomass had no effect on population growth rates. This study demonstrates how interacting effects of climate change and presence of native plants can influence the population growth of an invasive species. Overall, our results suggest that B. tectorum will become more invasive in grasslands if the seasonality of precipitation shifts towards wetter winters and allows B. tectorum to grow when competition from native species is low.

Espeland, E. K. and R. Kilian. 2015**. Low-dose glyphosate does not control annual bromes in the Northern Great Plains.** *Invasive Plant Science and Management* 8:334–340.

Abstract

Annual bromes (downy brome and Japanese brome) have been shown to decrease perennial grass forage production and alter ecosystem functions in northern Great Plains rangelands. Large-scale chemical control might be a method for increasing rangeland forage production. Although fall application has been shown to be the most effective and least likely to impact co-occurring native species, spring germination of downy brome may reduce the efficacy of fall-only herbicide application. We assessed the impact of a low glyphosate dose rate (210 g ha−1) applied to rangelands in fall or in fall and spring on nontarget species and on annual brome abundance at two sites in eastern Montana over 2 yr. We tested the following hypotheses: (1) nontarget effects are greater with spring herbicide application, (2) fall and spring herbicide application are necessary for effective downy brome control, and (3) fall herbicide application is sufficient to control Japanese brome. Few nontarget effects occurred; two dicotyledonous species exhibited small increases in response to herbicide. We found that that a single fall application reduced downy brome cover and seed bank density, but after the second fall application in the following year, downy brome did not continue to show a response to herbicide. After 2 yr of fall herbicide application, Japanese brome had denser seed banks in plots where herbicide had been applied. Blanket glyphosate application on rangelands is an unreliable method for controlling annual brome invasions in the northern Great Plains.

Julie Chuong, Jared Huxley, Erica N. Spotswood,Liana Nichols, Pierre Mariotte, and Katharine N. Suding. 2016. **Cattle as Dispersal Vectors of Invasive and Introduced Plants in a California Annual Grassland.** Rangeland Ecology and Management 69(1):52-58.

Abstract

Domestic livestock can transport seeds over long distances by ingesting and then excreting seeds in their dung or by collecting seeds on their skin and fur and depositing them. These scientists quantified both methods of dispersal by cattle in the Sierra foothills rangeland of California. Forbs were more likely than grasses to be dispersed through the animal's digestive system. Invasive grasses, such as medusahead (Taeniatherum caput-medusae), were more likely to be dispersed by being carried on cattle hair. Management strategies to limit seed dispersal by livestock are needed.

Margaretta A. Bruegger, Leticia A. Varelas, Larry D. Howery, L. Allen Torell,Mitchell B. Stephenson, and Derek W. Bailey. 2016. Targeted Grazing in Southern Arizona: **Using Cattle to Reduce Fine Fuel Loads.** Rangeland Ecology and Management 69(1):43-51.

Abstract

Managing the risk of wildfire is a growing concern in the western United States. Targeted grazing, or managing livestock grazing to achieve the desired vegetation goals, is one possible way to reduce fine-fuel loads associated with wildfires. These researchers tested the efficacy of targeted cattle grazing to reduce fine-fuel loads in southeastern Arizona and used a fire model to predict how this treatment would alter fire behavior. Fuel treatments resulting from targeted grazing shortened flame lengths in the fire model, which suggested that targeted grazing could reduce fine-fuel loads enough to lower the potential cost of fighting fires.

Seth Munson, Michael C. Duniway, and Jamin K. Johanson. 2016. **Rangeland Monitoring Reveals Long-Term Plant Responses to Precipitation and Grazing at the Landscape Scale.** Rangeland Ecology and Management 69(1):76-83.

Abstract

Integrating historical rangeland monitoring data with ecologic site concepts can provide the context to understanding vegetation response to climate and land use. The authors examined how precipitation and grazing intensity influenced changes in plant species cover by ecologic sites, from 1967 to 2013, across the US Bureau of Land Management (BLM) land on the Colorado Plateau. Cool-season precipitation influenced changes in the cover of most species. The response of dominant cool-season perennial bunchgrasses to precipitation depended on the ecologic site and grazing intensity. The results of this study highlight the importance of using historical monitoring data to inform management decisions and guide future monitoring efforts.

Taylor, K. L., J. L. Beck and S. V. Huzerbazar. 2016. **Factors Influencing Winter Mortality Risk for Pronghorn Exposed to Wind Energy Development.** Rangeland Ecology and Management 69(2):108-116.

Abstract

Evaluating the influence of energy development on pronghorn (Antilocapra americana) winter mortality risk is particularly critical given that northern populations already experience decreased survival due to harsh environmental conditions and increased energetic demands during this season. The purpose of our study was to evaluate pronghorn mortality risk over 3 winters (2010, 2010–2011, 2011–2012) on a landscape developed in 2010 for wind energy production (Dunlap Ranch) in south-central Wyoming, United States. We obtained locational data and survival status of 47 adult female pronghorn captured and equipped with Global Positioning System (GPS) transmitters. Overall, 17 pronghorn died during winter seasons, with 76.4% (13) of deaths occurring during the winter with highest snow accumulation (2010–2011). Survival ($\hat{S}$) was lowest in winter 2010–2011 ($\hat{S}$ = 0.53, 90% confidence interval [CI]: 0.37–0.70) and highest in winters 2010 ($\hat{S}$ = 0.97, 90% CI: 0.92–1.00) and 2011–2012 ($\hat{S}$ = 0.91, 90% CI: 0.82–1.00). We modeled mortality risk for pronghorn using Cox's proportional hazards model inclusive of time-dependent and time-independent covariates within anthropogenic, environmental, and wind energy variable classes. Across winters, pronghorn winter mortality risk decreased by 20% with

every 1.0-km increase in average distance from major roads (hazard ratio = 0.80, 90% CI: 0.66–0.98), decreased by 4.0% with every 1% increase in average time spent in sagebrush (Artemisia spp. L.; hazard ratio = 0.96, 90% CI: 0.95–0.98), and decreased by 92% with every 1 unit (VRM × 1000) increase in terrain ruggedness (hazard ratio = 0.08, 90% CI: 0.01–0.68). Pronghorn winter survival was not influenced by exposure to wind energy infrastructure; however, pronghorn survival may be impacted by larger-scale wind energy developments than those examined in our study. We recommend wildlife managers focus on conserving sagebrush stands in designated pronghorn winter range.

Hardegree, S. P., R. L. Sheley, S. E. Duke, J. J. james, A. R. Boehm and G. N. Flerchinger. 2016. **Temporal Variability in Microclimatic Conditions for Grass Germination and Emergence in the Sagebrush Steppe.** Rangeland Ecology and Management 69(2)123-128.

Abstract

Sagebrush steppe ecosystems in the western United States are characterized by harsh environmental conditions with high annual and seasonal variability in both precipitation and temperature. Environmental variability contributes to widespread failure in establishing stands of desired species on degraded and invaded landscapes. To characterize seasonal microclimatic patterns and planting date effects on restoration outcomes, we evaluated long-term simulations of seed germination response of cheatgrass (Bromus tectorum L.), bottlebrush squirreltail (Elymus elymoides [Raf] Swezey), and Idaho fescue (Festuca idahoensis Elmer) to annual patterns of soil temperature and moisture. Extremely high annual variability in both the conditions favorable for germination and patterns of post-germination drought and thermal stress make it difficult to justify general inferences about seedbed treatment and planting date effects from individual, short-term field studies. We discuss the interpretation of individual-year and seasonal plant establishment factors and offer a mechanistic model for interpreting planting date and year effects on initial seedling establishment. Historical ranking and mechanistic descriptions of individual-year seedbed conditions may allow for expanded inferences through meta-analysis of limited-term field experiments.

Condon, L. A. and P.J. Weisberg. 2016. **Topographic Context of the Burn Edge Influences Postfire Recruitment of Arid Land Shrubs**. Rangelands Ecology and Management 69(2):129-133.

Abstract

Although fire is becoming frequent in arid lands throughout the world, little is known about the recruitment pattern of many arid land shrub species after fire. We explored topographic and edaphic correlates of post-fire recruitment for four shrub species 6 years following wildfire in central Nevada, United States. We hypothesized that the spatial pattern of shrub recruitment varies with fire-related species traits according to the topographic position of the burn edge, which correlated with post-fire seed sources. Where the burn edge fell on a ridge, the frequency of the colonizing shrub, Artemisia tridentata ssp. vaseyana, decreased with distance from the burn edge, whereas the frequency of facultative resprouting species was independent or increased with distance. Where the burn edge fell behind a ridge, there were fewer shrubs overall and a greater proportion of resprouting species. Most individuals of resprouting species were adults, suggesting immediate, fire-stimulated recruitment. Interactions among topographic position and distance from the burn edge influence the recruitment patterns of shrub species and have implications for the post-fire species assemblage that are predictable on the basis of fire-related plant traits. We demonstrate how the topographic position of the burn edge influences post-fire recovery trajectories of the shrub community.

Williams, M. I., R. K. Dumroese, D. S. Page-Dumroese, and S. P. Hardegree. 2016. **Can biochar be used as a seed coating to improve native plant germination and growth in arid conditions?** Journal Arid Environments 125:8-15.

Abstract

Direct seeding is a common large-scale restoration practice for revegetating arid and semi-arid lands, but success can be limited by moisture and temperature. Seed coating technologies that use biochar may have the potential to overcome moisture and temperature limitations on native plant germination and growth. Biochar is a popular agronomic tool for improving soil properties, such as water availability and nutrient retention and has been recently marketed, but not tested, as a seed coating. We analyzed the effect of biochar seed coating thicknesses on the germination and growth of four plant species native to western United States: mountain brome (Bromus

marginatus), prairie junegrasss (Koeleria cristata), Wyeth's buckwheat (Eriogonum heracleoides), and western yarrow (Achillea millefolium). Across different temperature and water potential treatments using environmental chambers and polyethylene glycol (PEG) solutions, biochar coating applied at different thicknesses had either a neutral or negative effect on germination for all species. In the field, biochar seed coatings slightly improved mountain brome root weight and prairie junegrass cover. Our results, alongside the high economic expense of native plant seed and direct seeding operations, suggest that biochar, by itself, may not be an appropriate seed coating for improving native plant establishment.