

Nevada Society for Range Management Suggested Reading: September 2015

Abstracts of Recent Papers on Range Management in the West

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Nevada Section of the Society for Range Management Suggested Reading September 2015

Dahlgren, David K., et al. 2015. "Greater Sage-Grouse and Range Management: Insights from a 25-Year Case Study in Utah and Wyoming." *Rangeland Ecology & Management* 68(5):375-382.

<http://www.bioone.org/doi/full/10.1016/j.rama.2015.07.003>

Abstract

Conservation of sagebrush (*Artemisia* spp.) systems is one of the most difficult and pressing concerns in western North America. Sagebrush obligates, such as greater sage-grouse (*Centrocercus urophasianus*; hereafter sage-grouse), have experienced population declines as sagebrush systems have degraded. Science-based management is crucial to improve certainty in range management practices. Although large-scale implementation of management regimens within an experimental design is difficult, long-term case studies provide opportunities to improve learning and develop and refine hypotheses. We used 25 years of data across three large landscapes in northern Utah and southwestern Wyoming to assess sage-grouse population change and corresponding land management differences in a case study design. Sage-grouse lek counts at our Desert Land and Livestock (DLL) study site increased relative to surrounding populations in correspondence with the implementation of small-acreage sagebrush treatments designed to reduce shrub cover and increase herbaceous understory within a prescriptive grazing management framework. The higher lek counts were sustained for nearly 15 years. However, with continued sagebrush treatments and the onset of adverse winter conditions, DLL lek counts declined to levels consistent with surrounding areas. During summer, DLL sage-grouse broods used plots of small, treated sagebrush mosaics more than untreated reference sites. We hypothesize that sagebrush treatments on DLL increased availability of grasses and forbs to sage-grouse, similar to other studies, but that cumulative annual reductions in sagebrush may have reduced availability of sagebrush cover for sage-grouse seasonal needs at DLL, especially when extreme winter weather occurred.

Pierson, Frederick B., et al. 2015. "Short-Term Impacts of Tree Removal on Runoff and Erosion From Pinyon-and Juniper-Dominated Sagebrush Hillslopes." *Rangeland Ecology & Management* 68(5):408-422.

<http://www.bioone.org/doi/full/10.1016/j.rama.2015.07.004>

Abstract

Tree removal is often applied to woodland-encroached rangelands to restore vegetation and improve hydrologic function, but knowledge is limited regarding effects of tree removal on hydrologic response. This study used artificial rainfall and overland flow experiments (9–13 m²) and measures of vegetation and ground cover to investigate short-term (1–2 yr) responses to tree removal at two woodland-encroached sites. Plots were located under trees (tree zone) and in the intercanopy (shrub-interspace zone, 75% of area). Before tree removal, vegetation and ground cover were degraded and intercanopy runoff and erosion rates were high. Cutting and placing trees into the intercanopy did not significantly affect vegetation, ground cover, runoff, or erosion 1 yr posttreatment. Whole-tree mastication as applied in this study did not redistribute tree mulch within the intercanopy, but the treatment did result in enhanced herbaceous cover and hydrologic function in the intercanopy. Fire removal of litter and herbaceous cover increased tree-zone runoff and erosion under high-intensity rainfall by 4- and 30-fold at one site but had minimal impact at the other site. Site response differences were attributed to variability in burn conditions and site-specific erodibility. Burning had minimal impact on shrub-interspace runoff and erosion from applied high-intensity rainfall. However, 1 yr postfire, erosion from concentrated overland flow experiments was 2- to 13-fold greater on burned than unburned tree-zone and shrub-interspace plots and erosion for burned tree zones was 3-fold greater for the more erodible site. Two yr postfire, overland flow erosion remained higher for burned versus unburned tree zones, but enhanced intercanopy herbaceous cover reduced erosion from shrub-interspace zones. The net impact of burning included an initial increase in erosion risk, particularly for tree zones, followed by enhanced herbaceous cover and improved hydrologic function within the intercanopy. The overall results suggest that erosion from late-succession woodlands is reduced primarily through recruitment of intercanopy herbaceous vegetation and ground cover.

Brabec, Martha M., et al. 2015. "Challenges of Establishing Big Sagebrush (*Artemisia tridentata*) in Rangeland Restoration: Effects of Herbicide, Mowing, Whole-Community Seeding, and Sagebrush Seed Sources." *Rangeland Ecology & Management* 68(5):432-435.

<http://www.bioone.org/doi/full/10.1016/j.rama.2015.07.001>

Abstract

The loss of big sagebrush (*Artemisia tridentata* Nutt.) on sites disturbed by fire has motivated restoration seeding and planting efforts. However, the resulting sagebrush establishment is often lower than desired, especially in dry areas. Sagebrush establishment may be increased by addressing factors such as seed source and condition or management of the plant community. We assessed initial establishment of seeded sagebrush and four populations of small outplants (from different geographies, climates, and cytotypes) and small sagebrush outplants in an early seral community where mowing, herbicide, and seeding of other native plants had been experimentally applied. No emergence of seeded sagebrush was detected. Mowing the site before planting seedlings led to greater initial survival probabilities for sagebrush outplants, except where seeding also occurred, and these effects were related to corresponding changes in bare soil exposure. Initial survival probabilities were > 30% greater for the local population of big sagebrush relative to populations imported to the site from typical seed transfer distances of ~ 320–800 km. Overcoming the high first-year mortality of outplanted or seeded sagebrush is one of the most challenging aspects of postfire restoration and rehabilitation, and further evaluation of the impacts of herb treatments and sagebrush seed sources across different site types and years is needed.

Gurney, C. M., Prugh, L. R., & Brashares, J. S. (2015). Restoration of Native Plants Is Reduced by Rodent-Caused Soil Disturbance and Seed Removal. *Rangeland Ecology & Management* 68(4):359-366.

<http://www.bioone.org/doi/full/10.1016/j.rama.2015.05.001>

Abstract

Granivory and soil disturbance are two modes by which burrowing rodents may limit the success of native plant restoration in rangelands. This guild of animals has prolific effects on plant community composition and structure, yet surprisingly little research has quantified the impact of rodents on plant restoration efforts. In this study, we examined the effects of seed removal and soil disturbance by the giant kangaroo rat (*Dipodomys ingens*) on native plant restoration in a California rangeland. Using experimental exclosures and stratifying restoration plots on and off rodent-disturbed soil, we assessed the individual and combined effects of seed removal and soil disturbance on seedling establishment of four native plant species. Across all species, biotic soil disturbance by kangaroo rats reduced seedling establishment by 19.5% (range = 1–43%), whereas seed removal reduced seedling establishment by only 6.7% (range = 4–12%). Rates of seed removal across species weakly paralleled kangaroo rat dietary preferences. These results indicate the indirect effects of burrowing rodents such as kangaroo rats on native seedling establishment via changes in soil properties may rival or exceed the direct effects of seed removal.

Kessler, K. C., Nissen, S. J., Meiman, P. J., & Beck, K. G. (2015). Litter Reduction by Prescribed Burning Can Extend Downy Brome Control. *Rangeland Ecology & Management* 68(4):367-374.

<http://www.bioone.org/doi/full/10.1016/j.rama.2015.05.006>

Abstract

Downy brome (*Bromus tectorum* L.) is a highly successful invasive species primarily because it fills an open niche in native plant communities. It also produces large amounts of litter over time. We hypothesized that removing accumulated litter with a prescribed burn before applying herbicides would improve herbicide efficacy, extending the duration of control. In January 2012, two downy brome-infested sites were burned. In March 2012, postemergent applications of glyphosate, imazapic, and tebuthiuron were made in a split-plot design. Above-ground biomass was collected at 6, 18, and 27 months after treatment (MAT) to evaluate treatment effects. In nonburned areas, all herbicide treatments were similar to the control 27 MAT; however, burning combined with imazapic or tebuthiuron reduced downy brome biomass 27 MAT by $81\% \pm 4.6$ SE and $84\% \pm 19.3$ SE, respectively. Remnant species responded positively to burning and herbicide treatments. Native cool-season grass biomass increased after burning whereas native warm-season grass biomass increased following tebuthiuron treatments. The impact of litter on imazapic and tebuthiuron availability was also evaluated. Herbicide interception increased in a linear relationship with increasing litter. For every $50 \text{ g} \cdot \text{m}^{-2}$ increase in litter there was a 7% increase in the amount of herbicide intercepted, meaning that 75% of the applied herbicide was intercepted by $360 \text{ g} \cdot \text{m}^{-2}$ of litter. A simulated rainfall event of 5 mm, 7 days after application, removed a significant amount of herbicide. This indicates that in sites with surface litter, timely precipitation could be critical for herbicide efficacy; however, when burning was used to remove litter and was followed by herbicides with residual soil activity, downy brome control was extended. Due to downy brome's relatively short seed viability in the soil, extending herbicide efficacy to several years could help to reduce the soil seed bank.

Hamilton, T., Burritt, E. A., & Villalba, J. J. (2015). Assessing the impact of supplements, food aversions, and silica on medusahead (*Taeniatherum caput-medusae* (L.) Nevski) use by sheep. *Small Ruminant Research*, 124, 45-54.

<http://www.sciencedirect.com/science/article/pii/S0921448815000413>

Abstract

We explored in sheep (1) the impact of supplements on medusahead intake and preference, (2) whether medusahead is aversive, and (3) if silica inhibits food intake. Groups of lambs ($n = 8$) were individually penned and randomly assigned to 4 supplementation treatments: beet pulp:barley (70:30) (High Energy; HE), alfalfa:soybean meal (60:40; High Protein; HP), a choice of HE and HP (CHOICE), or no supplement (Control). After supplementation all animals had *ad libitum* access to medusahead in early reproductive – Trial 1, late reproductive – Trial 2, and thatch – Trial 3 phenological stages. On the last day of each trial, lambs had choices between medusahead and tall fescue hay. Lambs in HE tended to ingest ($P < 0.10$; Trial 1) or marginally ($P < 0.05$; Trial 2) consumed more medusahead than lambs in Control but intake values were low for all groups. Lambs in HE, HP and CHOICE showed greater intake of and preference for medusahead thatch than Control lambs during preference tests of Trial 3 ($P < 0.05$). Lambs in HE, HP, and CHOICE ate more feed and had greater ADGs than Control lambs ($P < 0.05$). In Trial 4, three groups of lambs ($n = 10$) were fed beet pulp and then received intraruminal infusions of: (1) tall fescue hay (4 g/kg BW), (2) lithium chloride (LiCl; 150 mg/kg BW), and (3) medusahead (4 g/kg BW). Medusahead infusions did not reduce intake of beet pulp relative to infusions of tall fescue hay ($P > 0.10$), whereas infusions of LiCl conditioned a food aversion ($P < 0.05$). In Trial 5, three groups of lambs ($n = 10$) were fed: (1) alfalfa, (2) alfalfa-2.5% Silica, and alfalfa-4.5% Silica. Lambs in Group 2 had the lowest intake of alfalfa ($P < 0.05$). Our research suggests that supplements can increase preference for thatch by sheep but their influence on intake and preference is only marginal for the other phenological stages tested. Our results also suggest that food aversions do not explain the low palatability of the weed, which may be better understood by the high concentrations of silica in its tissues.

Walker, S. C., Anderson, V. J., & Fugal, R. A. (2015). Big Game and Cattle Influence on Aspen Community Regeneration Following Prescribed Fire. *Rangeland Ecology & Management* 68(4):354-358.

<http://www.bioone.org/doi/full/10.1016/j.rama.2015.05.005>

Abstract

Aspen (*Populus tremuloides* Michx.) is a major component of Intermountain forest ecology and relies on periodic disturbance, such as prescribed fire, to perpetuate. On the Manti-LaSal National Forest in central Utah, both big game and cattle depend on forage growing on forested lands, which has contributed to intense conflict. Understanding the effects of browsers on recently burned aspen stands is critical to managing the regeneration of these communities. This study measured the effects of cattle and big game foraging on regenerating aspen communities. Three study sites were selected from a 142-ha prescribed burn conducted in an aspen-conifer stand on the Ferron District of the Manti-LaSal National Forest in 1989. Each of the three study sites was subdivided into four areas and randomly assigned one of the following treatments: big game and cattle exclusion (No Use), big game exclusion (Cattle Use), cattle exclusion (Big Game Use), and open access (Dual Use). Vegetation was sampled in 1991–1994, 1999, and 2005. Density, biomass, height, nested frequency, and cover of aspen suckers were measured. Nested frequency and cover were measured for all other species encountered. Aspen cover, density, and biomass showed a significant year-by-treatment interaction ($P < 0.05$). Aspen and understory regeneration responded similarly to No Use, Cattle Use, and Big Game Use. Dual Use resulted in lower ($P < 0.05$) aspen regeneration and more annual, weedy species in the understory. In 2005, Dual Use aspen cover (4%) was lower ($P < 0.05$) than the other three treatments: Big Game Use (25%), Cattle Use (31%), and No Use (34%). Controlled burning to regenerate aspen will be most successful under light stocking rates for both big game and cattle to allow suckers to develop beyond the browse line (> 2 meters).

Batchelor, J. L., Ripple, W. J., Wilson, T. M., & Painter, L. E. (2015). Restoration of Riparian Areas Following the Removal of Cattle in the Northwestern Great Basin. *Environmental management*, 55(4), 930-942.

<http://link.springer.com/article/10.1007/s00267-014-0436-2>

Abstract

We assessed the effects of the elimination of livestock in riparian systems at Hart Mountain National Antelope Refuge in southeastern Oregon, 23 years after the removal of cattle grazing, using 64 photos taken before grazing was removed compared with later retake photos. Two methods were used for this assessment: (1) a qualitative visual method comparing seven cover types and processes and (2) a new quantitative method of inserting digital line transects into photos. Results indicated that channel widths and eroding banks decreased in 64 and 73 % of sites, respectively. We found a 90 % decrease in the amount of bare soil ($P < 0.001$) and a 63 % decrease in exposed channel ($P < 0.001$) as well as a significant increase in the cover of grasses/sedges/forbs (15 % increase, $P = 0.037$), rushes (389 % increase, $P = 0.014$), and willow (388 % increase, $P < 0.001$). We also assessed the accuracy of the new method of inserting digital line transects into photo pairs. An overall accuracy of 91 % (kappa 83 %) suggests that digital line transects can be a useful tool for quantifying vegetation cover from photos. Our results indicate that the removal of cattle can result in dramatic changes in riparian vegetation, even in semi-arid landscapes and without replanting or other active restoration efforts.

Davies, K. W., Collins, G., & Boyd, C. S. (2014). Effects of feral free-roaming horses on semi-arid rangeland ecosystems: an example from the sagebrush steppe. *Ecosphere*, 5(10), art127.

<http://www.esajournals.org/doi/full/10.1890/ES14-00171.1>

Abstract

Feral horses (*Equus caballus*) are viewed as a symbol of freedom and power; however, they are also a relatively unmanaged, non-native grazer in North America, South America, and Australia. Information about their influence on vegetation and soil characteristics in semi-arid rangelands has been limited by confounding effects of cattle (*Bos taurus*) grazing and a lack of empirical manipulative studies. We compared vegetation and soil surface characteristics in feral horse grazed areas and ungrazed exclosures at five sagebrush (*Artemisia*) steppe sites in northern Nevada. Horse grazed areas had lower sagebrush density and plant diversity, greater soil penetration resistance, and lower soil aggregate stability than ungrazed areas. Herbaceous cover and density generally did not differ between grazed and ungrazed treatments, with the exception of heavily grazed sites in which perennial grass cover was reduced. The cumulative effect of feral horses on soil characteristics suggests that they may affect the ecological function of semi-arid rangelands by increasing the risk of soil erosion and potentially decreasing availability of water for plant growth. The two-fold increase in sagebrush density with horse exclusion suggests that feral horses may limit sagebrush recruitment and thereby negatively impact Greater Sagegrouse (*Centrocercus urophasianus*) and other sagebrush associated wildlife. The effects of feral horses on sagebrush and other semi-arid ecosystems should be considered when developing conservation plans for these ecosystems and associated wildlife.

Tzankova, Z. (2015). Controlling an invasive plant at the edge of its range: towards a broader understanding of management feasibility. *Biological Invasions*, 17(1), 507-527.

<http://link.springer.com/article/10.1007/s10530-014-0747-5>

Abstract

Invasion biologists often think about feasibility of weed control in purely ecological terms, while land managers' feasibility definitions are further informed by social, policy, and institutional considerations. We use the case of cheatgrass (*Bromus tectorum*) in the Eastern Sierra Nevada in California to examine the origins and practical significance of differences between scientific and managerial definitions of feasibility. A serious invasive weed and a major ecological threat to the region, cheatgrass in the Eastern Sierra still exists in the kinds of low-density patches that are technically amenable to containment through active management. Yet land managers in this region dominated by public land are not using active management. We conducted a study of the reasons for the apparent disconnect between management potential and management realities, combining semi-structured interviews of public land managers in the region with analysis of the policy and institutional landscape in which land managers operate. We found that managers are concerned about cheatgrass impacts on the region but face a number of barriers to the deployment of useful spread prevention techniques. The de-prioritization of cheatgrass, which is not listed as a noxious weed under either California or federal law, along with resource constraints exacerbated by such policy de-prioritization form one important set of barriers. Certain substantive and procedural requirements of federal and state environmental law form another barrier: they can limit swiftness and flexibility of managerial action and make managers more hesitant to launch such action; they also provide a venue for public opposition to herbicide-based management or directly restrict managers' access to useful herbicide treatments. We end with some thoughts on increasing the feasibility of cheatgrass control in eastern California. Many of these are broadly relevant to improving invasion management on public lands.