HIGHLIGHTS

Rangeland Ecology & Management, March 2013

Seed and Seedling Ecology (Special Feature)

Variation in Timing of Planting Influences Bluebunch Wheatgrass Demography in an Arid System

Chad S. Boyd and Jeremy J. James

We examined the influence of planting timing (September, October, November, or December) on bluebunch wheatgrass (*Pseudoroegneria spicata*). Germination was high (up to 80%) for September and October planting and occurred in fall/winter, whereas later plantings had reduced germination, mainly in spring. Seedling emergence was low (5–15% of germinated seeds), and establishment of emergent seedlings was up to twice as high for November- and December-planted plots (up to approximately 75%). Timing of and performance at critical stages of seedling development were affected by planting date and suggest the potential for managers to exploit multiple temporal windows of opportunity for seedling establishment.

Hydrothermal Assessment of Temporal Variability in Seedbed Microclimate

Stuart P. Hardegree, Corey A. Moffet, Gerald N. Flerchinger, Jaepil Cho, Bruce A. Roundy, Thomas A. Jones, Jeremy J. James, Patrick E. Clark, and Frederick B. Pierson

Restoration practices in the western United States are often ineffective because low rainfall makes it difficult to establish plants from seed. We developed a methodology to produce a numerical index of seedbed microclimate that accounts for the moderating effects of soil on seedbed temperature and moisture. This index can be used to evaluate historical field plantings or in conjunction with long-term weather forecasts to select among alternative fall-planting management options. Indices of this type could greatly increase the efficiency

of field planting by shifting resources to restoration scenarios that have a much higher probability of success.

Freezing Stress Influences Emergence of Germinated Perennial Grass Seeds

Chad S. Boyd and Jarod A. Lemos

In sagebrush rangelands, fall-seeded perennial bunchgrasses can germinate before winter onset but fail to emerge in spring. We evaluated freezing tolerance of germinated but nonemergent bluebunch wheatgrass (*Pseudoroegneria spicata*) seedlings. Eventual seedling density was dramatically reduced (at least fourfold) with freezing during early, mid, or late postgermination stages; these effects occurred within 2 days of frozen soil conditions. Germination timing may be critical to emergence and establishment of fall-planted bluebunch wheatgrass. Altering timing of planting to a later calendar date could reduce the amount of germination before frozen soil conditions in winter and subsequent freeze mortality of germinated seeds.

Disturbances Impact on Longevity of Grass Seeds, Semi-Arid South African Rangeland

H. A. Snyman

The influence of disturbances (blocked seed rain, tillage, and fire) on seed density, species richness, and seed longevity for a semi-arid rangeland were quantified over a 5-year period. Seedling emergence of decreaser grass species ceased after only 4 years of parent plants not producing seed. Tillage stimulated seedling emergence in the field but decreased emergence in the seeds germinated in a watered greenhouse. Increaser and decreaser species responded differently to fire, depending on whether they germinated in the field or in the greenhouse. Species composition, abundance, and longevity of the seeds in the seed bank influence the dynamics of plant communities following disturbances.

Soil Seed Banks of the Exotic Annual Grass *Bromus rubens* on a Burned Desert Landscape

Benjamin S. Jurand and Scott R. Abella

The exotic annual grass red brome provides fuels for wildfires that are affecting native shrub communities throughout the Mojave Desert. This study explores how the presence of fire affects the abundance of exotic seeds in the soil. A survey of the soil revealed that red brome seeds were dominant, even in areas that had burned recently, and some burned areas had more-abundant red brome in the open spaces between shrubs than was the case in unburned areas. Although red brome can be reduced greatly immediately after fire, the species can rebound and dominate the seed bank within 5 years.

Reproductive Effort and Seed Establishment in Grazed Tussock Grass Populations of Patagonia

Gabriel Oliva, Marta Collantes, and Gervasio Humano

We studied sexual reproduction in *Festuca gracillima*, a tussock grass that produces abundant seed but rarely regenerates through seedlings. Predispersal losses reduced viable seed production; postdispersal losses reduced the seed bank, and seedlings had 95% mortality in the first year. Up to 5% of resources were used for sexual reproduction in favorable years, resulting in 1–3 new seedlings per square meter per year. Competition may block final establishment in these grasslands. Grazing does not appear to interfere in any stage of seed reproduction. Seed production may not maintain population numbers, but it could enhance genetic variation and enable dispersal and recolonization of disturbed areas.

Impact of Native Grasses and Cheatgrass (*Bromus tectorum*) on Great Basin Forb Seedling Growth

Hilary Parkinson, Cathy Zabinski, and Nancy Shaw

Reestablishing native communities that resist exotic weed invasion is a high priority for restoration in sagebrush ecosystems. We conducted a greenhouse experiment to assess the seedling growth of native forb species when grown alone or in the presence of one of two native bunchgrasses or an exotic annual grass, cheatgrass (*Bromus tectorum*). Native bunchgrasses did not reduce the biomass of any forb, whereas forb biomass was reduced by 50–90% when grown with cheatgrass. Understanding native forb interactions with native grasses and cheatgrass will aid land managers in selecting effective seed mixes and making better use of costly seed.

Stand Establishment and Persistence of Perennial Cool-Season Grasses in Intermountain West and Central and Northern Great Plains

Joseph G. Robins, Kevin B. Jensen, Thomas A. Jones, Blair L. Waldron, Michael D. Peel, Craig W. Rigby, Kenneth P. Vogel, Robert B. Mitchell, Antonio J. Palazzo, and Timothy J. Cary

The choice of appropriate plant materials is a large determinant of the success of revegetation projects. To better understand the establishment and persistence of perennial, cool-season grass species, we completed a meta-analysis of establishment and persistence data collected from 34 field studies in the Intermountain and Great Plains regions. We found significant differences among species for both establishment and persistence. Most of the species possessed relatively poor establishment and persistence at sites receiving less than 310 mm (8.25 inch) annual precipitation. These results provide empirical data to help land managers select species most appropriate for revegetation on specific sites.

Standard Articles

Does *Kochia prostrata* Spread From Seeded Sites? An Evaluation From Southwestern Idaho, USA

Erin C. Gray and Patricia S. Muir

Purposeful introductions of exotic species following wildfire are common on western US rangelands, although the ecological effects of such introductions are often poorly understood. We sampled *Kochia prostrata* after fire rehabilitation and greenstrip seedings in southwestern Idaho, which ranged from 3–24 years since seeding. *Kochia prostrata* spread to unseeded areas on 89% of sampled sites; distances of the farthest individual from the seeding boundary were greater than previously reported, and we found no evidence that plant-community composition affected its spread. The ability of the species to spread into various community types should be considered when selecting planting sites.

Using Experience and Supplementation to Increase Juniper Consumption by Three Different Breeds of Sheep

Jess R. Anderson, Cody B. Scott, Charles A. Taylor, Jr., Corey J. Owens, James R. Jackson, Diana K. Steele, and Richard Brantley

We determined whether sheep would consume redberry juniper and compared intake among different breeds. Ram-

bouillet, Suffolk, and Dorper-cross lambs were fed redberry juniper daily along with a basal diet for 31 days. In a second trial, one-half of the lambs were also fed a 36% protein supplement to determine whether supplementation improved juniper consumption. Intake of juniper was similar among breeds. In addition, protein supplementation did not affect juniper consumption. Lambs increased intake of juniper over the days of feeding. Collectively, our results suggest that sheep will readily consume juniper after feeding on the plant in individual pens.

Intermediate Periodicities in Juniper Consumption and Sampling Strategies to Estimate the Diet of Free-Grazing Goats

J. W. Walker, D. F. Waldron, E. S. Campbell, C. A. Taylor, Jr., C. J. Lupton, and S. Landau

Diet selection is not constant, and it is well documented that variation occurs in both short and long cycles. Intermediate periodicities are not well understood or documented. We conducted a 2-year study to describe the intermediate-term periodicities in percentage of juniper (*Juniperus* spp.), a chemically defended browse plant, in goat diets. Goats varied their consumption by 12–14 percentage units during 9 day cycles in the dormant season to 7-day or 8-day cycles in the growing season. Sampling strategies to determine herbivore diets should consider cyclic variations.

Understanding Mediterranean Pasture Dynamics: General Tree Cover vs. Specific Effects of Individual Trees

José Manuel De Miguel, Belén Acosta-Gallo, and Antonio Gómez-Sal

The influence of dispersed trees on pasture floristic composition was investigated in a Mediterranean rangeland in Central Spain. Grasslands beneath and away from 91 tree crowns were sampled at different topographical positions. Tree influences occurred at two spatial scales: across the landscape, tree cover contributed to minimize the influence of environmental conditions typical of semiarid environments, whereas, at the scale of individual trees, pasture composition was related with the specific livestock activities conducted under

each tree. We conclude that both scales are necessary to understand the role of dispersed trees for the management of these rangelands.

Livestock Grazing Impacts on Herbage and Shrub Dynamics in a Mediterranean Natural Park

J. L. Riedel, A. Bernués, and I. Casasús

The reduction of livestock farming in many European mountain areas in recent decades has resulted in large changes in land use. We analyzed the potential effects of livestock disappearance in the pastures of a natural park located in a Mediterranean mountain area. Grazing exclusions were compared with adjacent control areas grazed at moderate-to-low stocking rates over a 5-year period. Both herbaceous and shrub biomass increased in nongrazed exclusions, but shrub encroachment also occurred in grazed areas, although to a lesser extent. We concluded that further reductions in livestock grazing pressure should be avoided to prevent a negative impact on landscape quality.

Are Early Summer Wildfires an Opportunity to Revegetate Exotic Annual Grass-Invaded Plant Communities?

Kirk W. Davies, Aleta M. Nafus, and Dustin D. Johnson

Medusahead-invaded plant communities need to be revegetated to increase livestock forage production and improve wildlife habitat. We evaluated whether early summer wildfires and fall drill seeding could be used as a treatment combination to decrease medusahead (*Taeniatherum caput-medusae*) and increase perennial vegetation. Perennial grass cover and density increased and medusahead decreased with this treatment. Medusahead density was still high 3 years after treatment, suggesting that additional treatments may be needed to be fully successful. However, it appears that early summer wildfires may provide an opportunity to reduce the cost of integrated programs to revegetate medusahead-invaded plant communities.

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