

# HIGHLIGHTS

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## **Social Associations and Dominance of Individuals in Small Herds of Cattle**

Norman R. Harris, Douglas E. Johnson, Neil K. McDougald, and Melvin R. George

A series of six daylight observations was made each summer and again each winter over two years to map cattle distribution on a California foothill pasture. During daylight hours, small herds of cows containing between 14 and 16 animals were scan sampled and videotaped every 15 minutes. Association software, ASSOC1, was used to analyze animal positions to determine cattle subgroups and herd units. Older animals, up to 16 years of age, were generally dominant over younger animals and subgroups tended to be composed of animals of similar age. Incorporating knowledge of cattle social behavior should improve management of cattle on the range.

## **GPS Error in Studies Addressing Animal Movements and Activities**

David C. Ganskopp and Dustin D. Johnson

Although GPS collars are now the standard for quantifying movements and activities of medium to large animals on rangelands, their accuracy for determining distances animals travel had not been evaluated. We tested for individual unit, time, and distance effects on collars moved over surveyed plots and found records accumulated a preponderance of false travel when collars were immobile. We assessed 4 methods for removing perceived travels when collared cattle were inactive and successfully extracted distance accumulations with 80% to 90% certainty. Findings will benefit those studying animal distribution and behavior in extensive environments with GPS collars.

## **Remote Sensing and the Rancher: Linking Rancher Perception and Remote Sensing**

Rex J. Rowley, Kevin P. Price, and Jude H. Kastens

Unique solutions are required to meet the yield measurement needs of a forthcoming, federally sponsored crop insurance program for rangeland/pasture. Using satellite

imagery, we derived a proxy relative yield measurement for forage, and evaluated how ranchers might accept it through a survey of a group of producers. At the ranch scale, rancher perception was not highly correlated with the satellite indices, but higher correlations were observed when data were aggregated to county and study area levels. Results provide some support for using satellite data in a national rangeland/pasture insurance program, an important new risk mitigation tool for ranchers.

## **Costs and Losses Imposed on California Ranchers by Yellow Starthistle**

Alison J. Eagle, Mark E. Eiswerth, Wayne S. Johnson, Steve E. Schoenig, and G. Cornelis van Kooten

Yellow starthistle (YST, *Centaurea solstitialis* L.) is the most widespread noncrop weed in California. A survey was administered to California cattle ranchers to investigate YST infestation rates, loss of forage quantity and value, and YST control efforts. Total losses of livestock forage value due to YST on private land in California are estimated at \$7.65 million per year, with ranchers' out-of-pocket expenditures on YST control amounting to \$9.45 million per year. Together, these losses amount to the equivalent of 6%–7% of the total annual harvested pasture value for the state and represent a constraint on California's livestock grazing sector.

## **Revegetating Russian Knapweed (*Acroptilon repens*) Infestations Using Morphologically Diverse Species and Seedbed Preparation**

Jane M. Mangold, Clare L. Poulsen, and Michael F. Carpinelli

Establishing desirable, competitive plants is essential for enduring management of Russian knapweed-infested rangeland and pastures. We sprayed Russian knapweed (*Acroptilon repens*) with glyphosate; prepared a seedbed by burning, tilling, or leaving untreated; and seeded with alfalfa, Siberian wheatgrass, pubescent wheatgrass, or a combination of the three. Tilling generally reduced Russian knapweed density and resulted in the best establishment of seeded species.

Seeding alfalfa decreased reinvasion of Russian knapweed by about 50%–60% at one site. Shallow tilling followed by drill seeding desirable forbs and grasses might provide the best results for those revegetating Russian knapweed-infested pastures and rangeland.

### **Postfire Invasion Potential of Rush Skeletonweed (*Chondrilla juncea*)**

Cecilia Lynn Kinter, Brian A. Meador, Nancy L. Shaw, and Ann L. Hild

In sagebrush steppe ecosystems of the Intermountain West, the current cheatgrass-wildfire cycle could be an intermediate step that facilitates secondary invasions of exotic perennials such as rush skeletonweed (*Chondrilla juncea*). We contrast recently burned and paired unburned sites on the Snake River Plain, Idaho, for seed banks, seedling emergence, and new rosettes derived from root buds. Given equal seed availability, recently burned field soil and sterilized field soil supported greater seedling emergence than unburned field soil. Because of its ability to sprout, we anticipate that even a few isolated seedlings on burns can potentially lead to rush skeletonweed dominance on new sites.

### **A Basis for Relative Growth Rate Differences Between Native and Invasive Forb Seedlings**

Jeremy J. James and Rebecca E. Drenovsky

The ability of invasive plants to achieve higher relative growth rates (RGR) than their native counterparts has been widely documented, but the mechanisms allowing invasives to achieve higher RGR are poorly understood. The objective of this study was to determine the basis for RGR differences between native and invasive forbs that have widely invaded nutrient-poor soils of the Intermountain West. A high degree of variation in RGR, specific leaf area, and leaf area ratio observed in native forbs suggested that the ability to design weed-resistant plant communities can be improved by managing for specific functional traits as opposed to functional groups.

### **Seed Germination Strategies of *Desmostachya bipinnata*: A Fodder Crop for Saline Soils**

Salman Gulzar, M. A. Khan, and Xiaojing Liu

Rapid consumption of good quality water for domestic, agricultural, and domestic usages has put serious constraints on existing resources. Brackish/seawater needs to be utilized to ease pressure on fresh water. We have studied the seed germination responses of halophytic fodder grass (*Desmostachya bipinnata*) to light, temperature, and salinity. Seeds could tolerate high salinity and temperature during storage in soil and during germination under 12 h photoperiod. Our field experiments indicated that *D. bipinnata* is an excellent

fodder grass which could be produced with brackish water irrigation. Successful germination at high salinity and temperature could be useful to get this grass established quickly.

### **Mapping Mesquite (*Prosopis*) Distribution and Density Using Visual Aerial Surveys**

Rieks D. van Klinken, Damian Shepherd, Rob Parr, Todd P. Robinson, and Linda Anderson

Mapping the distribution and abundance of invasive plants is a high priority, but establishing cost-effective and practical techniques at appropriate scales remains elusive. We describe and test a visual, aerial technique to map a large mesquite (Leguminosae: *Prosopis* spp.) population in Australia. Our technique was relatively cost-effective (\$0.39 USD/ha) and was very effective at detecting mesquite at very low densities, but it was not as effective at quantifying mesquite into broad cover classes. Visual aerial survey techniques offer considerable potential as an intermediate between highly quantitative remote sensing and spatially-constrained ground-based surveying.

### **The Spatial Patterns of Functional Groups and Successional Direction in a Coastal Dune Community**

Rusty A. Feagin and X. Ben Wu

Is succession a spatial process? We show that functional groups, and their associated spatial patterns, drive the direction of succession in a beach-sand dune community. We found evidence that the spatial pattern of the plants at one time exerted an influence on the pattern of the plants at a later time, based on their functional traits, thereby influencing the direction of sand dune succession. This ecosystem is a classical example of facilitation for ecologists, at risk from global sea-level rise and hurricanes, and an important rangeland resource that is being restored around the world.

### **Optimal Sampling Designs for Monitoring Plant Frequency**

John S. Heywood and Michael D. DeBacker

An efficient way to estimate the abundance of a plant species is to record its frequency of occurrence in plots of fixed size. This study used Monte Carlo simulations to identify the plot size that maximizes statistical power for detecting changes in plant density when abundance is measured as plant frequency. Although the optimal plot size is very sensitive to local variations in plant density, in most cases a plot that yields an observed frequency of 50% will yield nearly maximal power. Thus, statistically efficient sampling designs to monitor the density of key rangeland species can be established without prior knowledge of spatial heterogeneity.

## Grazing Land Reform in New Zealand: Background, Mechanics, and Results

Ann Brower

This article briefly reviews the legal and administrative anatomy of a complicated and politically explosive process of land reform on New Zealand's South Island. The majority of the reformed land has been freed from pastoral constraints, but at a seemingly unnecessary cost to the public of NZ\$18.2 million. Also, on a key indicator of biodiversity protection, the Crown is failing to protect the most critical habitat while successfully protecting the scree and glacier which require little protection. The article concludes that a similar land reform policy idea is not likely to achieve legislative success elsewhere, because interest group opposition would be too intense.

## Toxic Alkaloid Concentrations in *Delphinium nuttallianum*, *Delphinium andersonii*, and *Delphinium geyeri* in the Intermountain Region

Dale R. Gardner and James A. Pfister

Low larkspurs (*Delphinium nuttallianum*, *D. andersonii*) and plains larkspur (*D. geyeri*) often are fatal to cattle grazing on

western North American rangelands. This study examined toxic alkaloid concentrations in these larkspur species. Toxic alkaloids were typically found in sufficient concentrations (i.e., above 3 mg·g<sup>-1</sup>) in low and plains larkspurs to poison cattle, and concentrations often did not significantly decline during the growing season. Livestock producers should be aware that the risk to grazing cattle can remain high until these plants are dormant.

## Number of Samples Required for Estimating Herbaceous Biomass

Michio Tsutsumi, Shiro Itano, and Masae Shiyomi

We simulated virtual plant communities based on the gamma distribution to clarify the relationships between the precision of estimating herbaceous biomass and the number of samples, sampling density, spatial heterogeneity of the biomass, and the sampling procedures. We concluded that: 1) In less-heterogeneous grasslands, good precision of estimation can be obtained with small number of samples, and it is useful to employ ranked set sampling. The cutting method, as well as nondestructive methods, is practical; and 2) Estimation for heterogeneous grassland requires a large number of samples, and it is not useful to employ ranked set sampling.