

# Highlights

*Rangeland Ecology & Management*, September 2011



## **Wildfire and Invasive Plants in American Deserts: A Special Feature**

Mark Wetz, Linda Coats-Markle, and Narayanan Rang

The Society for Range Management (SRM) hosted a special conference to organize information required to manage the challenges posed by invasive plants and wildfire. This special feature of *Rangeland Ecology & Management* contains five papers from this conference, which provide a detailed synthesis of the scientific literature on the interactions and impacts of wildfire and invasive plants on North American deserts. We hope that this information provides solutions to more effectively assess current impacts of wildfire and invasive plants, and offers management strategies to minimize future impacts.

## **Resistance to Invasion and Resilience to Fire in Desert Shrublands of North America**

Matthew L. Brooks and Jeanne C. Chambers

Plant invasions into desert shrublands have altered presettlement fire regimes and placed many native species at risk. Resistance to invasion and resilience to fire differ among desert regions in response to spatial and temporal patterns of productivity, ecological memory, severity and frequency of disturbance, and feedbacks among invasive species and disturbance regimes. Strategies for preventing or managing invasive plant–fire regime cycles in desert shrublands include 1) assessing ecological condition and the probability of an altered fire regime, 2) understanding ecological thresholds associated within invasion resistance and fire resilience, and 3) prioritizing management activities based on these factors.

## **Fire, Plant Invasions, and Erosion Events on Western Rangelands**

Frederick B. Pierson, C. Jason Williams, Stuart P. Hardegree, Mark A. Wetz, Jeffry J. Stone, and Patrick E. Clark

Altered fire regimes associated with plant community transitions across western U.S. rangelands cause amplified

runoff and erosion, which increase the risk of damage to soil and water resources, property, and human lives during extreme events. We synthesize what is known about fire impacts on rangeland hydrology and erosion on semiarid rangeland and xeric forested sites. We suggest that postfire hydrologic vulnerability be considered in a framework that predicts hydrologic response for a range of potential storms and site susceptibilities, and that identifies the hydrologic response magnitudes at which damage to values-at-risk are likely to occur.

## **Impacts of Fire and Invasive Species on Desert Soil Ecology**

Edith B. Allen, Robert J. Steers, and Sara Jo Dickens

Fires have become more frequent in North American deserts because of invasive grasses, causing loss of native shrubs, decreased species diversity and productivity, and conversion to exotic grassland. Biological, chemical, and physical properties of desert soils may recover slowly from the impacts of fire during postfire succession, but changes are permanent under persistent invasive species. If shrubs do not recover after fire, there may be further impacts from erosion of nutrients in shrub “fertile islands.” Managers using fire as a tool to control desert invasives must do so judiciously to avoid eliminating shrubs and further increasing invasive species.

## **Economic and Social Impacts of Wildfires and Invasive Plants in American Deserts: Lessons From the Great Basin**

Mark W. Brunson and John Tanaka

We reviewed the research assessing the effects of desert wildfires and plant invasions on humans, focusing on the Great Basin. Economic analyses show that ranchers have adapted their management to account for invasive grasses, but fires can lead to bankruptcy. New strategies are needed to protect economic viability in the face of changing

invasion-wildfire cycles. Exurban residential development influences not only patterns of invasion and wildfire but also public sentiment regarding fire, fuel, and weed management options for both public and private lands. Strategies to influence public opinion must account for both ecological and social transformations.

### **Climate Change in Western US Deserts: Potential for Increased Wildfire and Invasive Annual Grasses**

John T. Abatzoglou and Crystal A. Kolden

Climate change is hypothesized to be a driver promoting invasions of annual grasses across rangelands of the western United States through directly impacting biophysical processes during establishment and by fostering conditions conducive to large wildfires. Climate scenarios for the mid-21st century suggest widespread changes in critical, higher-order climate patterns such as the extent of the freeze-free season, frequency of wet winters, and high fire danger across the semiarid western United States. Modeling these changes along with projections of potential vegetation change can help land managers identify native landscapes at risk of conversion in a changing climate.

### **New Rangeland Residents in Wyoming? A Survey of Exurban Landowners**

Rachel D. Mealar, Paul J. Meiman, Ann L. Hild, David T. Taylor, and Jennifer S. Thompson

Rapid conversion of rural land to exurban development and the ensuing impacts on natural resources have been well documented, but information about exurban landowners is lacking. To address this knowledge gap, we surveyed exurban landowners in six Wyoming counties and documented demographic characteristics, motivations, knowledge, and attitudes about natural resources and land management. Most respondents had knowledge about, and interest in, invasive species, water quality, landscaping, and gardening, but more than half of them had never looked for land management information. Information from this study can be used to strengthen the development and delivery of educational programs.

### **Land-Use Legacies and Vegetation Recovery 90 Years After Cultivation in Great Basin Sagebrush Ecosystems**

L. R. Morris, T. A. Monaco, and R. L. Sheley

The land-use legacies from cultivation have not been widely studied in sagebrush ecosystems of the Great Basin even though nearly a half million hectares of rangeland were dry farmed and abandoned in the early 1900s. We examined the differences in canopy cover of shrubs, grasses, and forbs between paired sets of historically dry-farmed land and

adjacent, never-cultivated areas across three ecological sites. We found that recovery from cultivation varies by growth form, species, and ecological site. Sagebrush and forb cover, in particular, may take more than a century to recover. These results have direct implications for describing ecological site conditions.

### **Estimating Aboveground Net Primary Production in Grasslands: A Comparison of Nondestructive Methods**

Kerry M. Byrne, William K. Lauenroth, Peter B. Adler, and Christine M. Byrne

Aboveground net primary production (ANPP) is an important ecosystem property that is measured by clipping live plant biomass in grasslands. We assessed the accuracy and precision of three nondestructive techniques to estimate ANPP as supplements to the traditional method of biomass harvest. We found that although the point frame technique explained the highest proportion of the variability in biomass at both sites, the radiometer technique, although less accurate, could achieve a desired precision for lower labor costs. The radiometer and point frame methods will be a useful tool for grassland ecologists and rangeland managers who desire fast, nondestructive estimates of ANPP.

### **Defoliation Effects on Herbage Production and Root Growth of Wet Meadow Forage Species**

Jerry D. Volesky, Walter H. Schacht, Ann E. Koehler, Erin Blankenship, and Patrick E. Reece

Root growth is important to the competitive ability of plants, and understanding how herbage defoliation affects root growth has implications for development of grazing or haying management strategies. We evaluated effects of defoliation intensity and frequency on aboveground production and root characteristics of three wet meadow species. In general, defoliation intensity and frequency had little effect on aboveground production or root growth of Nebraska sedge or birdsfoot trefoil, but more frequent (5 times) defoliation of slender wheatgrass reduced root weight, length, and surface area. Abundant soil moisture in meadows likely buffers negative effects of defoliation.

### **Contrasting Observation- and Transect-Based Models of Cattle Distribution on Lincoln National Forest, New Mexico**

Heather Halbritter and Louis C. Bender

Perceptions of cattle distribution are often based upon qualitative observations of cattle movement, which may not reflect true habitat correlates. We compared distribution models of cattle built from observation data to models built from randomized transect data. Key habitat correlates in models differed between data sets; observation-based models

showed positive associations with open cover types and areas closer to roads, where observations are most likely to occur and where most perceived grazing conflicts exist. In contrast, transect-based models showed positive associations with more cover types and predicted much broader distribution throughout the landscape and higher overall probabilities of cattle presence.

### **Comparison of Unmanned Aerial Vehicle Platforms for Assessing Vegetation Cover in Sagebrush Steppe Ecosystems**

Robert P. Breckenridge, Maxine Dakins, Stephen Bunting, Jerry L. Harbour, and Sera White

Two unmanned aerial vehicle (UAV) platforms, fixed-wing and helicopter, were used to collect imagery to assess vegetation cover in sagebrush steppe ecosystems. This paper discusses the process for collecting and analyzing imagery to estimate percent cover for six different vegetation types and to locate sage grouse decoys. UAV results were compared against field measurements to assess accuracy. The results from both UAV platforms show good agreement for assessment of bare ground. For a high degree of accuracy a helicopter UAV would be preferred. A fixed-wing system is better to assess broad-scale landscape-level changes.

### **Understory Vegetation and Ponderosa Pine Abundance in Eastern Oregon**

Craig A. Carr and William C. Krueger

Understanding the effects of ponderosa pine encroachment on growth of understory vegetation is important for developing restoration practices that incorporate understory recovery. Our research described relationships among ponderosa pine abundance, environmental conditions beneath the canopy, and understory species composition and draws inferences

with respect to restoration potential. Understory species composition, diversity, and abundance were inversely related to ponderosa pine occupancy and influenced primarily by light availability beneath the canopy. Restoration practices that reduce pine occupancy should promote conditions favorable to desired understory vegetation; however, understory recovery may be constrained by species loss or invasion of more competitive understory vegetation.

### **Condensed Tannin in Drinking Water Reduces Greenhouse Gas Precursor Urea in Sheep and Cattle Urine**

Scott L. Kronberg and Mark A. Liebig

Ingestion of small amounts of condensed tannin by ruminants may provide benefits, including reduction of ammonia and nitrous oxide emissions by reducing urine urea excretion. Providing grazing ruminants with forages containing condensed tannin is difficult because these species often do not grow well in many regions. An alternative may be to provide condensed tannin in their drinking water. Trials conducted with sheep and cattle found that small amounts of condensed tannin in drinking water can reduce their urine urea excretion.

**Rebuttal** (*Jeffrey Rust and Dale Earl*) and **Response** to “Disturbance to Surface Lithic Components of Archaeological Sites by Drill Seeding,” *Rangeland Ecology & Management* 64:171–177 (*Neal M. Bryan, Val Jo Anderson, and Rachel Fugal*).

Viewpoints are exchanged on the potential disturbance and loss of archeological information when surface lithic sites are treated with drill seeding. Considerations for preserving archeological sites in areas requiring potential rangeland restoration are discussed to identify an objective solution for rangeland application.