Highlights

Rangeland Ecology & Management, November 2009

Managing Complex Problems in Rangeland Ecosystems

Chad S. Boyd and Tony J. Svejcar

Management of rangelands and natural resources in general has become increasingly complex. Generalized answers may not be sufficient to solve many natural resource issues. Effective partnerships between involved groups, coordinated and continuous learning about the variable nature of natural resource issues, and adaptive management are needed to effectively address complex problems. Implementation of adaptive management will involve overcoming institutional paradigms, emphasizing biological measures of success, forming strong interdisciplinary partnerships, and working within process-based ecological frameworks. We suggest that as a profession we need to have a discussion concerning the nature of complex problems and how researchers and managers can jointly address these problems.

Knowledge in Practice: Documenting Rancher Local Knowledge in Northwest Colorado

Corrine Noel Knapp and Maria E. Fernandez-Gimenez

Ranchers gain insight of natural systems through daily interaction and management of landscapes, but this knowledge has never been systematically documented and analyzed. This study relied upon interviews to understand how ranchers learn and what they learn about rangelands. We found that rancher knowledge provided site-specific information on management practices and ecological responses, and suggested potential indicators of rangeland health. Understanding what ranchers know and validating this type of knowledge may lead to more sustainable land management and effective outreach programs. It could further expand and strengthen social networks through which rancher knowledge is shared and on which the social sustainability of ranching communities depend.

Understanding Change: Integrating Rancher Knowledge into State-and-Transition Models

Corrine Noel Knapp and Maria E. Fernandez-Gimenez

State-and-transition models (STMs) represent our current understanding of vegetation change on ecological sites. However, rancher knowledge has rarely been integrated into these models. This project used interviews to create STMs based on rancher knowledge. We found that rancher knowledge is valuable for providing management histories, identifying management-defined states, and providing critiques related to the spatial resolution and scale of current STMs. Incorporating local knowledge into STM development may increase communication between researchers and ranchers, potentially yielding more management-relevant research and more structured ways to document and learn from the evolving experiential knowledge of ranchers.

Geospatial Assessment of Grazing Regime Shifts and Socio-Political Changes in a Mongolian Rangeland

Temuulen Tsagaan Sankey, Joel Brown Sankey, Keith T. Weber, and Cliff Montagne

Drastic changes have occurred in Mongolia's grazing lands associated with the transition from the socialist collective to the current system of privately owned herds. Grazing pressure has more than tripled, and herd distribution has changed from a few spatially-clustered large herds of sheep to numerous smaller herds of multiple species. Rangeland biomass decreased from the collective to the post-collective periods. The decrease was correlated with changes in the grazing management system and increased stocking density. Low biomass is uniform throughout the study site and may be further reduced without formal rangeland management or well organized grazing plans by the local herding households.

Influence of Livestock Grazing and Climate on Pinyon Pine (*Pinus edulis*) Dynamics

Nichole N. Barger, Henry D. Adams, Connie Woodhouse, Jason C. Neff, and Gregory P. Asner

We examined the role of historic livestock grazing and past climate in regulating pinyon recruitment and growth over the last century in pinyon–juniper woodland. No differences in pinyon density or basal area were observed between grazed and ungrazed sites. According to stand age structure, pinyon recruitment across these sites was high during the early 1900s, which were decades that were consistently cool and wet—conditions that supported recruitment and growth in pinyon pines. Given climate projections of increasing temperature and extended drought periods, future regeneration of pinyon woodland may be slow. Land managers should consider this when planning future restoration treatments in persistent pinyon–juniper woodlands.

Livestock Browsing and Not Water Limitations Contribute to Recruitment Failure of *Dobera glabra* in Semi-Arid Ethiopia

Diress Tsegaye, Stein R. Moe, and Mitiku Haile

We studied the influence of shade, water, and browsing on recruitment of *Dobera glabra* (Forssk) Poir, a native food source for humans and livestock, in the semi-arid rangelands of Afar, Ethiopia. Seedlings that received neither shade nor extra water had the lowest survival. Highest seedling survival was under shade and with one watering per week. However, browsing was the major factor preventing natural recruitment. It greatly reduced seedling survival and suppressed growth of surviving seedlings. We suggest planting nursery raised seedlings in home gardens of settled pastoralists and creating grazing reserves in key range sites to increase this native food species.

Defoliation Timing Effects on Spotted Knapweed Seed Production and Viability

Katie R. Benzel, Tracy K. Mosley, and Jeffrey C. Mosley

Spotted knapweed (*Centaurea stoebe* L.), a perennial invasive forb that reproduces largely by seed, often forms new flowers after prescribed sheep grazing or mowing is applied during the bolting or flowering stage. It is unknown if these new flowers produce viable seeds by the end of the growing season. We quantified spotted knapweed response to seven timings and frequencies of defoliation. All defoliation treatments reduced bud/flower production, seed production, percent viability of seeds, and total viable seed production. However, defoliation in the late-bud/early-flower or full flower stage was more effective than defoliation in the bolting stage. Viable seed production can be maximally reduced when prescribed grazing or mowing occurs in the late-bud/early flower or full flower stages.

Effect of Simulated Browsing on Aspen Regeneration: Implications for Restoration

Bobette E. Jones, David F. Lile, and Kenneth W. Tate

We examined the effects of browsing intensity and season on annual growth of aspen (*Populus tremuloides* Michx.). Greatest growth was on suckers with no terminal leader browsed and less than 25% of biomass removed from branches. Least growth occurred when 90% of terminal leader length and 50% of branch biomass was removed. Growth was most negatively affected by browsing on terminal leaders. Growth was lowest on suckers browsed either mid-season or both early and mid-season. Conifer overstory significantly reduced sucker growth. Managers should minimize browsing on terminal leaders, mid-season browsing over consecutive years, and repeated browsing during a growing season.

Can Regeneration of Green Ash (*Fraxinus pennsylvanica*) be Restored in Declining Woodlands in Eastern Montana?

Peter Lesica

Green ash regeneration in eastern Montana woodlands may be limited by the understory of dense sod-forming exotic grasses. Herbicide application increased seedling survival after 3–4 years by about ten times compared to controls or grazed plots. Seedlings grew slowly and fertilizer slightly increased growth at one site. All coppiced trees produced basal sprouts, but sprout growth was severely curtailed by deer browsing. Coppicing could replace weakened trees with new vigorous boles and branches, but only where browsing by cattle and deer is reduced. Maintaining green ash woodlands in good condition should be given priority because restoration will be difficult.

Smoke Solutions and Temperature Influence the Germination and Seedling Growth of South African Mesic Grassland Species

Habteab M. Ghebrehiwot, Manoj G. Kulkarni, Kevin P. Kirkman, and Johannes Van Staden

The species composition of South African mesic grasslands is sensitive to fire. Germination rate and final germination percentage in three of six major grass species of these grasslands was increased by treating seeds with smoke-water and smoke-derived butenolide. In nearly all the species tested, smoke-water-treated seeds produced significantly longer shoots or roots. Some species responded more to the smoke-water and butenolide test solutions at higher temperatures. Findings from this study suggest that plant-derived smoke and its interaction with temperature may significantly influence the germination and seedling growth of the South African mesic grassland species, which can alter grassland composition.

Very-High-Resolution Panoramic Photography to Improve Conventional Rangeland Monitoring

Mary H. Nichols, George B. Ruyle, and
Illah R. Nourbakhsh

Conventional photographs used in rangeland monitoring represent a compromise between image detail and the

amount of area covered. We employed a robotic camera mount for automating camera positions and shutter release using a standard digital camera to produce high-resolution landscape panoramic pictures. These panoramas can be used for monitoring wildlife, invasive species, and riparian zones. High-resolution panoramic photography offers the ability to rapidly characterize rangeland sites at resolutions that far exceed that of traditional photography.