By Matt Germino

Browsing the Literature

For this edition of Browsing the Literature, I uncovered the most recent papers with the "rangeland" search term in Google Scholar. Many papers revealed were published in journals other than *Rangelands* or *Rangeland Ecology and Management*, and were published since the last edition or are in press and have DOI numbers. Also, two authors informed me of new papers they have coming out, which I always invite. Please forward the citations to me for the most recent papers by you, your colleagues, or any other new rangeland papers that have a DOI number. Contact Matt Germino, mgermino@usgs.gov.

Rangeland vulnerability to state transition under global climate change. C.L. Wonkka, D. Twidwell, B.W. Allred, C.H. Bielski, V.M. Donovan, C.P. Roberts, and S.D. Fuhlendorf. 2019. *Climatic Change* 24:1–20.

Climate change forecasts and species distribution models were used to create a vulnerability index for rangelands of the western United States. The probability of climate shifting to outside the current climate envelope of each rangeland vegetation type was greatest in Texas, and the area bound by the northwest Great Plains, eastern Kansas, and Rocky Mountains.

Adaptive variation, including local adaptation, requires decades to become evident in common gardens. M.J. Germino, A.M. Moser, and A.R. Sands. 2019. *Ecological Applications* 29(2):e01842. https://doi.org/10.1002/eap.1842.

In two common gardens of Wyoming Big Sagebrush planted in Idaho and Utah with populations from around the Western United States, local adaptation was not evident until ~10 years after planting, and differences in survival among populations were not stable until about 20 years after planting. Seed transfer from source populations to restoration sites, often across hundreds of kilometers and large elevation differences, is common in rangelands and must be guided by seed zone guidelines. The common-garden data used to parameterize seed zone models, in addition to informing climate vulnerability assessments, likely underestimates the amount of adaptive variation, and specifically location adaptation, in dominant rangeland species.

Spatial distribution modelling of plant functional diversity in the mountain rangeland, north of Iran. Z. Jafarian, M. Kargar, R. Tamartash, and S.J. Alavi. 2019. *Ecological Indicators* 97:231–238.

In the floristically diverse, montane rangelands of Lasem, Iran, species' functional traits, such as specific leaf area and leaf dry matter, predicted community patterns best when they were aggregated as a weighted mean index or as a divergence index, but not when they were combined in a functional evenness index.

Estimating the basis risk of rainfall index insurance for pasture, rangeland, and forage. J. Yu, M. Vandeveer, J.D. Volesky, and K. Harmoney. 2019. *Journal of Agricultural and Resource Economics* 44:129–193.

Drought is an important risk factor for ranchers, and losses may be covered by insurance ranchers may hold; the insurance products are increasingly the "indexed" type in which indemnities are based on area-yield and sometimes rainfall or vegetation indices. The relationship between forage yield and monthly precipitation was used to estimate a rainfall index and "basis" risk for ranches in Kansas and Nebraska. Basis risk is the "uninsured risk that results from imperfect correlations between individual outcomes and insurance indices." This study compared the contribution of nonprecipitation and rainfall-index risks with overall basis risk. Using local precipitation information surprisingly led to only 5% to 9% less basis risk, meaning that there would be little benefit establishing local precipitation gauges to help with gauging drought risks and losses.

Advances in Methods

Extending the osmometer method for assessing drought tolerance in herbaceous species. R.J. Griffin-Nolan, T.W. Ocheltree, K.E. Mueller, D.M. Blumenthal, J.A. Kray, and A.K. Knapp. 2019. *Oecologia* 189:353–363.

Plant water status is a fundamental measurement in rangelands due to the importance of water deficit. Measurement of osmotic potential of hydrated leaves or other tissues in the lab after field collection is a relatively convenient, simple way to estimate parameters such as the turgor loss point. The method can allow measurement of many plants, enabling studies of how resistance to turgor loss (i.e., wilting) varies in time, space, or among taxa. The utility of the method was in question for grasses, but these authors show to the contrary that the osmometer method can indeed be reliably used to estimate turgor loss point for grasses.

Note: The following article was recommended by Steve Hanser, who is the national Sagebrush Ecosystem Specialist for the US Geological Survey:

Assessing lek attendance of male greater sage-grouse using fine-resolution GPS data. G.T. Wann, P.S. Coates, B.G. Prochazka, J.P. Severson, A.P. Monroe, and C.L. Aldridge. 2019. *Population Ecology* (in press). https://doi.org/10.1002/1438-390X.1019.

Counts of males displaying on breeding grounds are the primary data used to assess population trends in lekking grouse species. GPS telemetry data from grouse over 5 years and 8 sites in Nevada were used to estimate lek attendance rates. Average timing of peak attendance occurred in mid-April but varied from mid-March to mid-April throughout the study period, and the peak timing appeared to be affected by winter precipitation amounts. These findings suggest that flexible timing of monitoring is important to accurately assessing population abundance from lek observations.

The Science of Collaboration in Rangeland Management

Framework for a collaborative process to increase preparation for drought on US public rangelands. J. Brugger, K. Hawkes, A. Bowen, and M. McClaran. 2018. *Ecology and Society* 23(4):18.

A framework and underlying theory for designing and evaluating collaborative decisions on drought preparation is presented. The framework uses the "protection motivation theory" and the "health action process approach" from psychology. A trial application of this framework across an elevation from desert rangeland to forest in Arizona is described.

How community-based rangeland management achieves positive social outcomes in Mongolia: a moderated mediation analysis. T. Ulambayar and M.E. Fernández-Giménez. 2019. *Land Use Policy* 82:93–104.

Community-based rangeland management had greater access to information, leadership, knowledge transfer, and rule structure, and correspondingly better and more proactive management practices than where rangeland management was not community based.

Soil, Fire, and Grazing in Rangelands

Portable wind tunnel experiments to study soil erosion by wind and its link to soil properties in the Fars province, Iran. E. Sirjani, A. Sameni, A. A. Moosavi, M. Mahmoodabadi, and B. Laurent. 2019. *Geoderma* 333:69–80.

Wind tunnel experiments in 20 different arid and semiarid rangelands of Iran confirmed a negative power relationship between wind erosion rate and soil surface gravel cover, the mean weight diameter of soil particles, clay, moisture contents, and soil organic carbon.

Testing rangeland health theory in the Northern Great Plains. K.O. Reinhart, M.J. Rinella, R.C. Waterman, M.K. Petersen, and L.T. Vermeire. 2019. *Journal of Applied Ecology* 56:319–329.

Stability of soil aggregates are routinely measured to assess rangeland health, and its cause–effect relationships to key processes and landscape factors are of interest. Stability of small but not large aggregates were less in grazed plots compared with ungrazed (control) plots. Herbicide spraying and sometimes mowing also reduced aggregate stability. Aggregate stability varied among plant communities, but, counter to expectations, was not related to infiltration rates. The authors suggest that reduced infiltration resulting from grazing was due to plant community shifts and not aggregate stability.

Grasses and grazers in arid rangelands: impact of sheep management on forage and non-forage grass populations. G.R. Oñatibia and M.R. Aguiar. 2019. *Journal of Environmental Management* 235:42–50.

In long-term studies on the Patagonian steppe of Argentina, moderate sheep grazing did not lead to depletion of native grasses, whereas greater stocking rates decreased the population density and plant size of nonpreferred compared with preferred species. Rest from grazing enhanced growth of forage grasses in wet years.

Response of vegetation cover to climate variability in protected and grazed arid rangelands of South Australia. X. Long, H. Guan, R. Sinclair, O. Batelaan, J.M. Facelli, R.L. Andrew, and E. Bestland. 2019. *Journal of Arid Environments* 161:64–71.

Antecedent precipitation was a better predictor of satellite estimates of greenness (Normalized Difference Vegetation Index [NDVI]) than was total water storage estimated by the Gravity Recovery and Climate Experiment sensor. NDVI was reduced by grazing and drought, especially by their combination.

Digital soil mapping for fire prediction and management in rangelands. M.R. Levi and B. Bestelmeyer. 2018. *Fire Ecology* 14:11–22.

The amount of rangeland area identified from 2011 National Land Cover Dataset that intersected with the US Monitoring Trends in Burn Severity database revealed increasing burned area from 1984 to 2015. Interestingly, this method of estimating rangeland resulted in a greater estimate of rangeland extent in the United States than previously reported (3.7 Mkm^{-2} of rangeland in the continental United States and Alaska combined). To highlight the role of soils in fire ecology, the authors present 1) a conceptual framework explaining why soil information can be useful for fire models, 2) a comprehensive suite of literature examples that used soil property information in traditional soil surveys for predicting wildfire, and 3) specific examples of how more detailed soil information can be applied for pre- and postfire decisions.

Postwildfire seeding to restore native vegetation and limit exotic annuals: an evaluation in juniper-dominated sagebrush steppe. K.W. Davies, J.D. Bates, and C.S. Boyd. 2019. *Restoration Ecology* 27:120–127.

Seeding native perennial species increased perennial grass by 4× and mountain big sagebrush cover from nearly 0–24% cover on six sites that had juniper but had burned. Exotic annual grass cover was considerably reduced by seeding perennials. Seeding perennial species reduced exotic annual grass and annual forb cover and density.

Short-term responses of darkling beetles (Coleoptera: Tenebrionidae) to the effects of fire and grazing in savannah rangeland. J.E. Reinhard, K. Geissler, and N. Blaum. 2019. *Insect Conservation and Diversity* 12:39–48.

In the Kalahari Desert of Namibia, biomass of darkling beetles and species composition measured in pitfall traps were not affected by the main effects of grazing exclusion or burning in a factorial experiment, but beetle diversity was reduced by grazing after fire.

Organic amendment additions to rangelands: a meta-analysis of multiple ecosystem outcomes. K. Gravuer, S. Gennet, and H.L. Throop. 2019. *Global Change Biology* 25:1152–1170.

In a meta-analysis of nearly 100 studies worldwide, organic amendments, such as sludge, compost, or manure, provided some environmental benefits, such as increased soil fertility, plant productivity, or improved soil hydrology, but also increased concentrations of soil lead and runoff or emissions of nitrate, phosphorus, and carbon. Longer-term studies as well as ones addressing impacts to plant communities are needed.

Grazing and aridity reduce perennial grass abundance in semi-arid rangelands – Insights from a trait-based dynamic vegetation model. M. Pfeiffer, L. Langan, A. Linstädter, C. Martens, C. Gaillard, J.C. Ruppert, S.I. Higgins, E.I. Mudongo, and S. Scheiter. 2019. *Ecological Modelling* 395:11–22.

Annual and perennial grass traits were parameterized in the Dynamic Global Vegetation Model, and the model was used to evaluate grazing effects in South Africa. Productivity and abundance of perennial grasses were reduced by heavy grazing, especially when also droughted in the simulations. Recovery following grazing exclusion required 2 to 15 years.

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