By Matt Germino

Browsing the Literature

The first set of articles I will review for this column is a diverse array of literature from throughout 2017 or early 2018. In future editions, I look forward to interviews with other scientists and managers for their opinions on the most recent and impactful literature from focal themes in rangeland science.

New rangeland science book:

Rangeland systems: processes, management, and challenges. Briske, D.D. (ed). 2017. Springer International. 661 p. https://link.springer.com/book/10.1007%2F978-3-319-46709-2 (OPEN ACCESS).

This edited book is global in scope and contains 17 chapters organized into three themes: 1) conceptual advances to management and policy, 2) implications of the advances, and 3) challenges confronting rangelands in the 21st century.

A special journal issue:

Special issue: translational ecology. 2017. ***Frontiers in Ecology and the Environment*** 15. http://esajournals.onlinelibrary.wiley.com/hub/issue/10.1002/fee.2017.15.issue-10/ (OPEN ACCESS).

This issue includes a variety of articles exploring the needs for and ways to integrate science and management. The articles are relevant to any discipline, such as rangeland science, that seeks to integrate science and practice.

Adapting management:

Nutritional and greenhouse gas impacts of removing animals from US agriculture. White, R., and M.B. Hall. 2017. ***Proceedings of the National Academy of Sciences*** 201707322. http://www.pnas.org/content/114/48/E10301.full.pdf (OPEN ACCESS).

The authors conclude that "this assessment suggests that removing animals from US agriculture would reduce agricultural GHG emissions, but would also create a food supply incapable of supporting the US population's nutritional requirements."

Climate change effects on rangelands and rangeland management: affirming the need for monitoring. McCollum, D.W., J.A. Tanaka, J.A. Morgan, J.E. Mitchell, W.E. Fox, K.E. Maczko, L. Hidinger, C.S. Duke, and U.P. Kreuter. 2017. ***Ecosystem Health and Sustainability*** 3: e01264. http://onlinelibrary.wiley.com/doi/10.1002/ehs2.1264/full (OPEN ACCESS).

The authors compare potential impacts of climate shifts, including uncertainty, between the Southwestern United States and Northern Great Plains and highlight differences in resilience and management needs for information. This is among the first papers on rangeland ecology and management in this new journal, launched jointly by the Ecological Societies of America and China.

Doomed to collapse: why Algerian steppe rangelands are overgrazed and some lessons to help land-use transitions. Martínez-Valderrama, J., J. Ibáñez, G. Del Barrio, F.J. Alcalá, M.E. Sanjuán, A. Ruiz, A. Hirche, and J. Puigdefábregas. 2018. ***Science of the Total Environment*** 613:1489–1497. https://doi.org/10.1016/j.scitotenv.2017.07.058.

The authors simulate different ways that livestock grazing can be manipulated to influence the abundance of a foundational perennial (alpha grass) that is apparently key to the sustainability of these African landscapes.

New tools or approaches in restoration:

Low-cost grass restoration using erosion barriers in a degraded African rangeland. Kimiti, D.W., C. Riginos, and J. Belnap. 2017. ***Restoration Ecology*** 25:376–384. http://onlinelibrary.wiley.com/doi/10.1111/rec.12426/full.

In sub-Saharan Africa, a variety of low-cost and simple erosion barriers were tested over 3 years, such as trenching, berming, nylon mesh sacks of plant litter, use of megafauna dung, and adding seed to treatments. Adding desirable grass seed was effective in reducing soil exposure and erosion, particularly when the seed was placed in trenches next to existing plant patches.

Restoration islands: a tool for efficiently restoring dryland ecosystems? Hulvey, K.B., E.A. Leger, L.M. Porensky, L.M. Roche, K.E. Veblen, A. Fund, J. Shaw, and E.S. Gornish. 2017. ***Restoration Ecology*** 25:S124–S134. http://onlinelibrary.wiley.com/doi/10.1111/rec.12614/full.

Restoration of dry rangelands is challenging, and a focus on establishment success in patches within landscapes is increasingly emphasized. These authors provide a framework for the application of restoration islands and considerations for how to attain management goals with them. This article is part of a special issue entitled "Beyond conceptual frameworks – Emerging approaches to successful restoration."

Livestock and wildlife effects and responses:

Pattern in Greater Sage-grouse population dynamics correspond with public grazing records at broad scales. Monroe, A.P., C.L. Aldridge, T.J. Assal, K.E. Veblen, D.A. Pyke, and M.L. Casazza. 2017. ***Ecological Applications*** 27:1096–1107. http://onlinelibrary.wiley.com/doi/10.1002/eap.1512/pdf.

Across 743 leks in Wyoming, the abundance of male sage grouse was positively related to grazing in some circumstances, but negatively related in other settings. The differences relate to the timing of grazing and site productivity.

Livestock activity increases exotic plant richness, but wildlife increases native richness, with stronger effects under low productivity. Eldridge, D.J., M. Delgado-Baquerizo, S.K. Travers, J. Val, I. Oliver, J.W. Dorrough, and S. Soliveres. 2017. ***Journal of Applied Ecology***. In Press. http://onlinelibrary.wiley.com/doi/10.1111/1365-2664.12995/full.

Across eastern Australia, grazing by cattle, sheep, kangaroos, and rabbits was most impactful in low-productivity sites. Livestock increased exotic plant richness in low-productivity sites and decreased native plant richness in more productive sites. Rabbit impacts were only evident in moderately productive sites, and kangaroo herbivory had minimal effects. Implications for livestock grazing in sites that differ in productivity are discussed.

Grazing moderates increases in C3 grass abundance over seven decades across a soil texture gradient in shortgrass steppe. Augustine, D.J., J.D. Derner, D. Milchunas, D. Blumenthal, and L. Porensky. 2017. ***Journal of Vegetation Science*** 28:562–572. http://onlinelibrary.wiley.com/doi/10.1111/jvs.12508/pdf.

In shortgrass steppe, C3 perennial grasses and sub-shrubs have been increasing relative to C4 grasses, perhaps reflecting recovery from severe drought in the 1930s and increased CO_2 in air. Increases occurred on both livestock-grazed and ungrazed (exclosure) areas, and the effects were not modulated by soil textural changes.

Seasonality constraints to livestock grazing intensity. Fetzel, T., P. Havlik, M. Herrero, and K.H. Erb. 2017. ***Global Change Biology*** 23:1636–1647. http://onlinelibrary.wiley.com/doi/10.1111/gcb.13591/pdf.

Fetzel et al. explore ecological limits to grazing intensity in the context of food security as the world's population increases. For the focal year of 2000, the authors estimate that livestock grazing was below site potential on 39% of the earth's grasslands. See also a response letter (to the editor) by Irisarri et al. (2017) in the same journal pointing out that the gap between observed and potential grazing intensity across the globe is smaller than Fetzel et al. estimated if one first considers the efficiency of livestock consumption of annual net primary productivity separately from efficiency of production per unit consumed.

Taxonomic and functional vegetation changes after shifting management from traditional herding to fenced grazing in temperate grassland communities. Koch, M., B. Schröder, A. Günther, K. Albrecht, R. Pivarci, and G. Jurasinski. 2017. ***Applied Vegetation Science*** 20:259–270. http://onlinelibrary.wiley.com/doi/10.1111/avsc.12287/full.

As land ownership and jurisdiction becomes more fragmented over time, herding over large areas tends to be replaced by fencing and change in grazing patterns. In Germany, fencing livestock caused minor floristic changes in wet meadows, highlighted by an increase in grasses, whereas dry meadows had a stronger response marked by greater functional diversity of species and increases in species with competitive growth strategies.

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