



By Matt Germino

# Browsing the Literature

For the August 2022 content of Browsing the Literature, I have papers prepared by Dr. Jason Karl's students in the University of Idaho's Science Synthesis and Communications course: Brian Anderson, Kevin Brown, Jimmy Cargill, Craig Cochran, Joseph Connolly, Jake DiBello, Kristen Dymmel, Kinsey Freeman, Lily Hodgson, Darcy MacLeod, Emiliano McLane, Keenan O'Rourke, Jonathan Pangburn, JB Playfair, Dani Privat, Abbie Van Raden, Erica Uhor, Laura Victor, Tony Vorwald, and Will Woods. These entries are from papers published from November 2021 to May 2022.

-Matt Germino, [mgermino@usgs.gov](mailto:mgermino@usgs.gov), July 6, 2022

## **Weather explains differences in sagebrush-obligate songbird nest success under various grazing regimes**

Schroeder, V.M. et al. 2022. *Global Ecology and Conservation*. 34: p. e02010. <https://doi.org/10.1016/j.gecco.2022.e02010>.

Conserving biodiversity in modern rangelands is a balance between agriculture practices and ever-varying weather patterns brought about by climate change. This article presents the impacts of temperature and precipitation on nest survival of the Brewer's and sagebrush sparrow, two sagebrush obligate songbirds in the dormant season, in rotational and non-grazed areas of the sagebrush steppe. Weather impacts nesting survival of sagebrush obligate songbirds more than grazing. Moderate livestock grazing does reduce vegetation, but it did not affect nest survival.

## **Large-scale fire management restores grassland bird richness for a private lands ecoregion**

Roberts, C.P. et al. 2022. *Ecological Solutions and Evidence*. 3(1): p. e12119. <https://doi.org/10.1002/2688-8319.12119>

Woody plant encroachment drives losses in grassland bird diversity. A Private/Public partnership sought to increase fire use to benefit productivity and biodiversity in Loess Canyon, Nebraska, USA. Tree encroachment declined and grassland bird richness increased in areas burned vs. unburned. A focus on preventing tree encroachment into existing grassland areas can be more effective than attempting to restore converted areas.

## **The elevational ascent and spread of exotic annual grass dominance in the Great Basin, USA**

Smith, J. T. et al. 2022. *Diversity and Distributions*. 28: pp. 83–96. <https://doi.org/10.1111/ddi.13440>.

Expansion of exotic annual grass-dominated vegetation communities in the Great Basin, USA was quantified over a 30-year period using remote sensing technology. More than an 8-fold increase in annual grass dominance was observed between 1990 and 2020 with an estimated one-fifth of the Great Basin dominated by annual grasses in 2020. Dominance is shifting toward higher elevations and more north-facing aspects, consistent with predicted effects of climate change.

### ***Asclepias* dynamics on US rangelands: implications for conservation of monarch butterflies and other insects**

Spaeth, K. E., Jr. et al. 2022. *Ecosphere*. 13(1): e03816. <https://doi.org/10.1002/ecs2.3816>

Milkweed species across the western United States have their highest density between latitude N35-40 and longitude W95-100. These mid-latitude plains on non-federal lands may be incidental in conservation efforts for the monarch butterfly, which was listed in December 2020 as a candidate for protection under the Endangered Species Act of 1973. Milkweed dominance is highly associated with well-drained mollisol soils having low organic matter content.

### **Effects of patch-burn grazing and rotational grazing on grassland bird abundance, species richness, and diversity in native grassland pastures of the Midsouth USA**

Lituma, C.M. et al. 2022. *Agriculture, Ecosystems & Environment*. 324: 107710. <https://doi.org/10.1016/j.agee.2021.107710>

To aid in the recovery of grassland bird populations as well as manage for livestock production, conservation groups and government agencies have worked to create sustainable grazing practices under the “working lands conservation” framework with the goal of converting non-native pastures to native warm season grasses. Looking at private pasture lands in Kentucky and Tennessee, the researchers examined how two potential treatments, rotational grazing (ROT) and patch-burn grazing (PBG), could be used to affect grassland-associated bird species abundance, diversity and richness. Instead, they found landscape variables were the primary influencer of relative abundance, possibly due to habitat disturbances that prompted species specific recolonization. When accounting for site-specific variables, additional study might reveal grazing and fire could be useful tools in creating a disturbance model aimed at producing early successional grasslands and restoring grassland bird populations.

### **Silvopasture in the USA: A systematic review of natural resource professional and producer-reported benefits, challenges, and management activities**

Smith, M.M. et al. 2022. *Agriculture, Ecosystems & Environment* 326: 107818. <https://doi.org/10.1016/j.agee.2021.107818>.

Silvopasture is the management of trees, forage, and livestock on the same land. In a systematic review of this practice from 53 studies, the benefits reported by natural resource managers and adopters were diversification of income, increase in shade and forage, and ecosystem services. Challenges identified for expanding silvopasture included a lack of information, financial incentives for adoption, and demonstration sites.

### **Rotational grazing increases purple prairie clover frequency in the rangeland plant communities under semi-arid environment**

Zhao, T., Iwaasa, A.D. 2022. *Canadian Journal of Plant Science*. CJPS-2021-0141. <https://doi.org/10.1139/CJPS-2021-0141>

As the environment changes rapidly, the connection between grazing strategies and environmental factors is becoming increasingly important. A 10-year study was conducted to monitor the effects of deferred rotational (DR) and continuous grazing (CG) on purple prairie clover (PPC) under different environmental conditions. Under DR, PPC frequencies had a positive correlation with increasing temperature and the overall increase in the frequency of PPC was 22.86% more than in CG plots. Therefore, practicing DR grazing can increase the resiliency of rangelands in the face of environmental changes.

### **Monitoring climate impacts on annual forage production across U.S. semi-arid grasslands**

Poděbradská, M. et al. 2021. *Remote Sensing*. 14: 4. <https://doi.org/10.3390/rs14010004>

This paper examined the effect of the changing climate on forage production across the arid grasslands of the Midwest to the Rocky Mountains. This study used remote sensing data in conjunction with soil characteristics, vegetation type, long-term climate, and topography to examine which factors were most important to predicting forage production. The inter-annual variability of forage production was researched to help land managers make informed decisions for stocking rates and other livestock issues on these rangelands.

### **Basis risk in the pasture, rangeland, and forage insurance program: Evidence from California**

Keller, J.B. and Saitone, T.L. 2022. *American Journal of Agricultural Economics*. p. ajae.12282. <https://doi.org/10.1111/ajae.12282>.

This publication looks at the Pasture, Rangeland, and Forage Insurance Program (PRFIP) and the probability of residual, or basis, risk due to the prevalence of this program, and programs like it, to utilize weather indices as a predictor of loss. The study utilizes remote sensing, forage yield estimates, and historic rainfall index data to assess the ability of these programs to mitigate weather related forage production risk over 62.7 million acres of rangeland in California. The study revealed that a significant portion of the program participants would not receive any indemnity payment, and of those who would be paid, 36% would not receive sufficient payment to cover the forage related losses.

### **Investigation of the effects of the conversion of forests and rangeland to cropland on fertility and soil functions in mountainous semi-arid landscape**

Kooch, Y. et al. 2022. *CATENA*. 210: p.105951. <https://doi.org/10.1016/j.catena.2021.105951>

Soil fertility and microbial functions were analyzed using soil samples in the semi-arid, mountainous, ecosystem of northern Iran. Two natural vegetation covers were compared, forest and rangeland, with two croplands that were converted from natural vegetation thirty years ago. Results concluded conversion to cropland from forest and rangeland decreased soil function, such as dissolved organic matters and particulates, by nearly half, due to factors such as increased soil temperature, decreased soil moisture and organic input. This

study highlights the importance of preserving natural vegetation in semi-arid environments to maintain soil health and fertility.

### **Rangeland degradation in Mongolia: A systematic review of the evidence.**

Sainnemekh, S. et al. 2022. *Journal of Arid Environments*. 196: 104654. <https://doi.org/10.1016/j.jaridenv.2021.104654>

Analysis of rangeland studies across Mongolia showed that the lack of an accepted definition for degradation exacerbates the lack of an accepted methodology for assessment. Standardized methods of assessment can combine with conceptual models for adaptive management. The data show that most studies focus on the steppe, yet there is no differentiation in analysis of drivers of degradation across ecoregions. Future studies should consider ecological zones to quantify the importance of different drivers, with adaptive management driven by ecoregion-specific monitoring with an accepted methodology, such as Green Gold or NAMEM assessments.

### **A geomorphometric model to determine topographic parameters controlling wildfires occurrence in tropical dry forests**

Quesada-Román, A., Vargas-Sanabria, D. 2022. *Journal of Arid Environments*. 198. <https://doi.org/10.1016/j.jaridenv.2021.104674>

Many factors contribute to wildfire risk, but topography may be the most significant in determining where fires occur in tropical dry forests in Costa Rica. Geomorphic data was compared with fire occurrence data for the last 23 years. Flatter, lower elevation terrain was found to be more likely to have higher fire occurrences. Topography's control of accessibility may be the key consideration for land managers when determining wildfire risk in tropical dry forests.

### **Grassland rehabilitation significantly increased soil carbon stocks by reducing net soil CO<sub>2</sub> emissions**

Abdalla, K., Mutema, M., Chivenge, P., Everson, C., Chaplot, V. 2022. *Soil Use and Management*. sum.12790. <https://doi.org/10.1111/sum.12790>

In South Africa, net soil CO<sub>2</sub> emissions were measured for common restoration practices of degraded grasslands. Rotational grazing reduced emissions compared to free grazing, while livestock enclosure with fertilization and annual burning did not. Soil CO<sub>2</sub> gross emissions and soil organic carbon both increased under free grazing, for a decrease in net emissions of 17%. Of the four practices, rotational grazing also produced the most significant increase in aboveground biomass.

### **Revegetation of native desert plants enhances food security and water sustainability in arid regions: Integrated modeling assessment**

Abdullah, M.M. et al. 2022. *Science of the Total Environment*. 806: 151295. <https://doi.org/10.1016/j.scitotenv.2021.151295>

Through an integrated food security and water model, researchers explored revegetating 10% of the arid State of Kuwait's rangelands to meet the populations increased live-

stock consumption and to decrease water demands. The model created two scenarios and made comparisons between natural grazing and providing four different irrigation regimes to increase vegetation productivity in the revegetated area. While the authors initial use of this model does not solve the country's food security and water sustainability issues, it does provide mitigation measures.

### **Fire increases soil nitrogen retention and alters nitrogen uptake patterns among dominant shrub species in an Arctic dry heath tundra**

Xu, W., Elberling, B. and Ambus, P.L. 2022. *Science of The Total Environment*. 807: p. 150990. <https://doi.org/10.1016/j.scitotenv.2021.150990>.

Climate change has impacted the Arctic tundra region greatly over the past 50 years, especially the frequency and severity of wildfires. This study focused on the chemical changes (i.e., nitrogen levels) in the soils due to the increased fire occurrence, and how these adaptations impact the flora composition in the Arctic. Changes in this region have a cascading and multifaceted range of potential impacts both locally and globally due to the carbon storage and feedback cycle roles of high latitude regions.

### **High-density grazing in southern Africa: Inspiration by nature leads to conservation?**

Franke, A.C. and Kotzé, E. 2022. *Outlook on Agriculture*. p. 003072702210750. <https://doi.org/10.1177/00307270221075060>.

High density grazing is a rangeland management action used to mimic a natural phenomenon to reestablish vegetation and ease climate change. The average farmer will not use a high density grazing system and most grazing management systems are far from natural situations. High density grazing is not necessarily the best rangeland management tool. The results of this management practice being superior are inconclusive.

### **Landscape openness, not patch size or grassland amount, drives area sensitivity of songbirds in northern tall-grass prairies**

McDonald, L. and Koper, N. 2022. *Landscape Ecology*. 37:951-967. <https://doi.org/10.1007/s10980-022-01408-w>

Open cover amount models are best fit to indicate habitat use of focal grassland birds in Southern Manitoba, Canada. These results contradict the impression that habitat amount or patch size influences species sensitivity. Increased grassland bird decline and these results warrant additional conservation and restoration of small grassland patches within open landscapes.

### **Riparian vegetation composition and diversity shows resilience following cessation of livestock grazing in north-eastern Oregon, USA**

Kauffman, J.B. et al. 2022. *PLoS One*. 17(1), p.e0250136. <https://doi.org/10.1371/journal.pone.0250136>

Domestic livestock grazing is one of the highest land use activities on public land in the western U.S. Livestock graz-

ing has been linked to the degradation of riparian areas and the first step to its restoration is the removal of domestic grazers. This study shows that vegetative species diversity increased in riparian areas following the cessation of livestock grazing. This study's findings also imply that the cessation of grazing on riparian areas can aid in bank stabilization, increased ground water infiltration, decreased exotic species abundance, and more suitable habitat for salmonoid fish species.

**Vegetation, water infiltration, and soil carbon response to Adaptive Multi-Paddock and Conventional grazing in Southeastern USA ranches**

Apfelbaum, S.I. et al. 2022. *Journal of Environmental Management*. 308: p. 114576. <https://doi.org/10.1016/j.jenvman.2022.114576>.

Paired allotment comparison of Adaptive Multi-Paddock grazing and Conventional Grazing of beef cattle in the southeastern U.S. showed increases in water retention, carbon sequestration at 1m soil depth, vegetation cover percentage, and total vegetation biomass on Multi-Paddock sites.

**Monitoring the available forage using Sentinel 2-derived NDVI data for sustainable rangeland management**

İleri, O., and Koç, A. 2022. *Journal of Arid Environments*. 200(May): 104727. <https://doi.org/10.1016/j.jaridenv.2022.104727>.

Researchers in the semi-arid Bozdag Rangelands of Central Anatolia, Turkey compared ground sampling field data with remote sensing Sentinel-2A derived NDVI data looking at forage quality and yield at the north, south, and summit areas of the mismanaged rangelands. The monitoring took place during the 2017 and 2018 grazing seasons to estimate the production of the available forage. Researchers investigated the crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), and digestible dry matter (DDM) of the available forage at each site using the two data collecting methods. These efforts were mainly to provide better accuracy of remote sensing estimations that are important for indicating forage quality and yield. They found woody tissues had negative effects on the accuracy of the remote sensing by creating reflections in the lower resolutions. During the dry season, the remote sensing data were more accurate when compared to the field data when using at least a 10 m resolution.