Science to Solutions

Patch-Burn Grazing Creates Habitat Diversity

LESSER PRAIRIE-CHICKEN INITIATIVE

In Brief: Patch-burn grazing creates a grassland mosaic with structural and compositional diversity. Recent research assessed the effects of patch-burn grazing on habitat selection by female lesser prairie-chickens. Researchers found that, throughout the year, females chose vegetation patches where the combined effects of fire and grazing produced vegetation characteristics that matched their changing seasonal needs. Researchers have also found that patch-burn grazing yields good livestock performance. By providing grassland mosaics, patch-burn grazing offers a successful strategy to significantly improve both lesser prairie-chicken habitat and livestock production.

Lesser prairie-chickens need grasslands rich in structural and compositional diversity (Hagen and Giesen 2005). Past studies have shown that patch-burn grazing creates this kind of diversity (Fuhlendorf and Engle 2001) and that patch-burned grasslands benefit livestock productivity by stabilizing weight gain in the face of rainfall fluctuations (Allred et al. 2014). Recent research in western Kansas is the first to show how lesser prairie-chickens use a patch-burn-grazed landscape to meet their changing seasonal habitat needs—clear evidence of the benefits of patch-burn grazing for lesser prairie-chicken conservation.

Male lesser prairie-chicken on a lek (mating display area) within the patch-burn grazing study area. The lek site had been burned just three days earlier. Photo: Jonathan Lautenbach.

The research team, led by Jonathan Lautenbach of Kansas State University, addressed two central questions: How does patch-burn grazing influence grassland composition and structure? How do lesser prairie-chickens use the mosaic that patch-burn grazing creates?

The results showed that patch-burn grazing creates vegetative diversity and that female lesser prairie-chickens use all of the patch types created in a patch-burn grazing mosaic. Specifically, females selected greater time-since-fire patches (>2-years post-fire) for nesting, 2-year post-fire patches during the spring lekking season, 1- and 2-year post-fire patches during the summer brooding period, and 1-year post-fire units during the nonbreeding season.

Fire and Grazing: Historic Tag-Team of Disturbances

Historically, a natural trio of forces—climate, fire, and grazing—acted together to shape prairie vegetation. Ignited by Plains Indians and lightning, fire killed encroaching woody plants and prompted the vigorous re-sprouting and germination of prairie vegetation. This succulent new growth of grasses and forbs attracted herds of large herbivores, which selectively grazed the recently burned area. The resulting landscape was a mosaic of burned areas scattered among grassland patches of varied ages since burning.

Most current range management in the Great Plains decouples fire and grazing. When fire is over-applied (for example, by burning entire pastures), livestock don't have the choice between burned and unburned prairie, and a uniform grassland structure results. On the other end of the management spectrum, fire suppression also reduces grassland structural and species diversity. Grassland uniformity reduces drought resiliency, which decreases livestock productivity (Allred et al 2014). Uniformity also negatively impacts grassland wildlife, particularly grassland birds, since some species require varying vegetation structure across the landscape to complete their life cycles.

Further, without regularly occurring fires, fire-intolerant woody plants encroach, significantly reducing both livestock forage and grassland wildlife habitat (see LPCI's Science to Solutions #1 on redcedar encroachment and #3 on mesquite encroachment).

What is Patch-Burn Grazing?

Patch-burn grazing is a range management system in which land managers annually burn only a portion of each pasture, rather than the entire pasture (as is done in conventional prescribed burning). A single patch-burned pasture will have vegetation of varied ages—from newly burned to >2 years old. Livestock select where they want to graze within the pasture. They typically concentrate grazing in the lush growth of recently burned areas, recoupling the fire-grazing interaction that historically shaped grassland plant composition and structure.

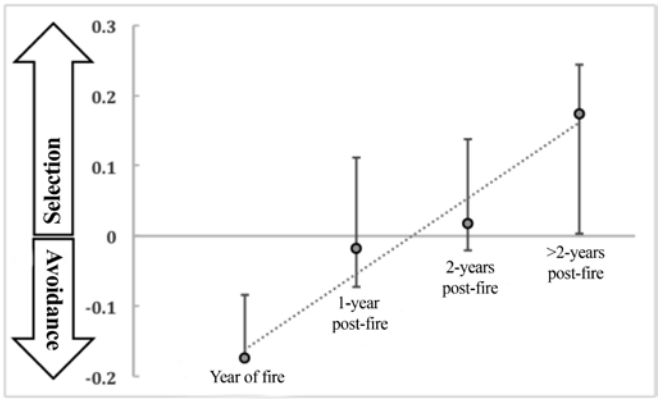


Figure 1: Selection and avoidance of different time-since-fire patches for nest sites by female lesser prairie-chickens in south-central Kansas, 2014-2016.

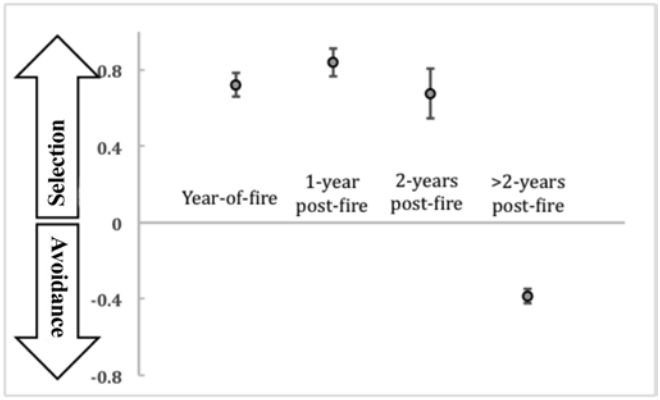


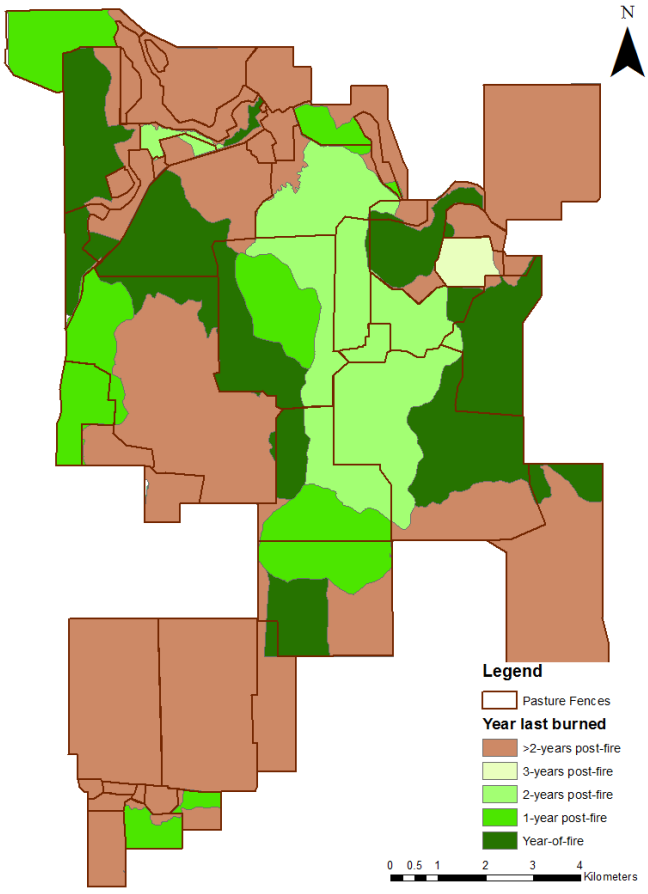
Figure 2: Selection and avoidance of different time-since-fire patches during the post-nesting season (brooding and non-brooding females after either a successful or failed nest during the summer) in south-central Kansas, 2014-2016.

The Study Site

Within the lesser prairie-chicken's occupied distribution in the southern Great Plains, prescribed fire has only recently gained footing as a management tool, and patch-burn grazing is seldom used. One notable exception is the site of Lautenbach's research—the Hashknife Ranch in south-central Kansas.

Here, rancher Ed Koger has used patch-burn grazing as a core management strategy for more than a decade. Koger burns 1/4 - 1/3 of each pasture most years, as site conditions allow, so the entirety of each pasture is burned every 3 – 4 years. Within those pastures, livestock select where they graze. Lautenbach's team assessed 17 pastures averaging 1,730 acres each, 8 of which were managed using patch-burn grazing and 9 of which were grazed without prescribed fire.

Patch-burn grazing creates structural and compositional diversity within pastures. Lesser prairie-chickens select patches that suit their seasonal habitat needs. Photo: Sandra Murphy.



Map of study site, showing the mosaic of vegetative patches created by patch-burn grazing.

Implications for Range Management

The Natural Resources Conservation Service-led Lesser Prairie-Chicken Initiative (LPCI) provides funding assistance to farmers and ranchers to voluntarily improve habitat for lesser prairie-chickens while increasing ranch productivity and sustainability. Lautenbach's study, funded in part by LPCI, helps identify which management strategies are most effective in benefitting bird and herd.

Past research has shown the clear benefits of patch-burn grazing on livestock productivity. Specifically, cattle in pastures with two or more patches gained weight independent of rainfall, indicating that patch-burn grazing helps buffer climatic variation and stabilizes livestock productivity—a critically important attribute in the drought-prone southern Great Plains (Allred et al. 2014). Also, research shows that, while both conventional prescribed burning and patch burning reduce wildfire fuels and redcedar encroachment, patch-burning does so while maintaining habitat for grassland-dependent wildlife (Starns et al. 2017).

Lautenbach's study adds to that evidence of the combined benefits of patch-burn grazing for livestock and wildlife, specifically showing that lesser prairie-chickens use the diverse patchwork to meet their needs for nesting, brood-rearing, and over-wintering.

The findings show that the scale and configuration of prescribed burns really matter. During the study, no females were observed nesting in year-of-fire patches, which lack thermal and hiding cover. Creating a mosaic of grassland patches of varied age-since-fire (rather than conventional whole-pasture burning) is a crucial part of the conservation equation.

To achieve the combined conservation strategies of removing redcedar and increasing grassland heterogeneity, Lautenbach's research team recommends implementing prescribed fire in a patch-burn grazing system with a 4-6 year burn interval for any given patch.

The researchers note that their study was conducted in the eastern portion of the lesser prairie-chicken's distribution. Regional differences in rainfall, soil types, and vegetation, create four different eco-regions, across the lesser prairie-chicken's occupied distribution in the southern Great Plains. Within these ecoregions the recommended fire return interval will change, with areas receiving less rainfall having a greater fire return interval (e.g. 7-10 years for any given patch).

Many grassland-dependent wildlife species need the heterogeneous conditions created by patch-burn grazing, including upland Henslow's sparrows (left, photo: Dominic Sherony) and sandpipers (right, photo: Johnath).

Creating a mosaic of grassland patches is crucial to prairie-chicken conservation.

A 300-acre patch-burn treatment on the Hashknife Ranch, site of the Lautenbach et al research. Photo: Sandra Murphy.

Source

Lautenbach, J.D., D. Haukos, J.M. Lautenbach and C. Hagen. 2017. In preparation. Influence of patch-burn grazing on lesser prairie-chicken habitat selection in Kansas.

Additional Resources

Allred, B. W., J. D. Scasta, T. J. Hovick, S. D. Fuhlendorf, and R. G. Hamilton. 2014. Spatial heterogeneity stabilizes livestock productivity in a challenging climate. Agriculture, Ecosystems, and Environment 193:37-41

Fuhlendorf, S. D., and D. M. Engle. 2001. Restoring heterogeneity on rangelands: ecosystem management based on evolutionary grazing patterns. Bioscience 51:625-632

Hagen, C. A., and K. M. Giesen. 2005. Lesser Prairie-Chicken *(Tympanuchus pallidicinctus).* In A. Poole, editor. The Birds of North America Online. The Cornell Lab of Ornithology, Ithaca, New York.

Starns H.D., S.D. Fuhlendorf, R.D. Elmore, D. Twidwell, E.T. Thacker, and T.J. Hovick. 2017. Patch-Burning Reduces Fuels and Benefits Prairie-Chicken Conservation.

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Learn More

The Lesser Prairie-Chicken Initiative, led by the USDA's Natural Resources Conservation Service, is a partnership-based, science-driven effort that uses voluntary incentives to proactively conserve America's western rangelands, wildlife, and rural way of life.

To learn more, visit **www.lpcinitiative.org.**