Patch-Burn Grazing Effects on Cattle Performance: Research Conducted in a Working Landscape

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On the Ground

- Patch-burn grazing is a range management strategy that might be able to simultaneously optimize livestock production objectives and wildlife habitat objectives.
- We compared patch-burn grazing to a traditional range management strategy in multiple pastures, representing a variety of land ownership and management histories, dispersed across a relatively large geographic area. Our results likely represent what land managers could expect if they adopted patch-burn grazing in similar situations.
- We found that cattle performance in pastures managed with patch-burn grazing did not differ from that found in pastures managed with a traditional range management strategy. This suggests that land managers who adopt patch-burn grazing in our study region might be able to maintain levels of cattle performance they are accustomed to. Simultaneously, they might also be able to achieve wildlife habitat objectives that might not have been possible with the application of traditional range management strategies.
- More research and trials of patch-burn grazing in other regions and vegetation types will further help land mangers determine if patch-burn grazing is a range management strategy that could be useful when applied to their unique circumstances.

Keywords: livestock production, range management, wildlife habitat.

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Range mangers have traditionally sought to manipulate the distribution of grazing animals so that moderate levels of grazing animal impacts on vegetation, soil, and water resources are evenly distributed across management units.[1,2] In contrast to traditional range management practices, patch-burn grazing uses fire to concentrate grazing animals, and their associated impacts, on vegetation, soil, and water resources, in a portion (patch) of a management unit that has recently burned.[3] With patch-burn grazing, other patches within the same management unit that have not recently burned experience reduced levels of grazing animal activity and impact corresponding to the length of time since the last occurrence of fire. The contrasting levels of grazing animal impact within the management unit can generate patches of vegetation that differ markedly in plant species composition and structure (Fig. 1).

Whereas the traditional model of range management (even distribution of moderate animal impact) might optimize sustainable livestock production objectives, it might not be sufficient for the maintenance of plants and animals that require habitat conditions different from those created by moderate grazing animal impact, i.e., species whose habitat needs are best provided by heavily- or lightly-impacted rangelands.[4–6] Additionally, some rangeland wildlife species require markedly different habitats at different times during their life cycle. If entire landscapes are managed with similarly moderate levels of grazing animal impact, evenly distributed across all management units within the landscape, such landscapes might not provide sufficient habitat for all portions of those species' requirements.

The ability of rangelands to provide habitat for wildlife and enhance biodiversity values will often depend on the ability of land managers to simultaneously optimize objectives associated with those values and objectives associated with livestock production. Additionally, integrating fire into range management is warranted for livestock production, bio-

Figure 1. A cow–calf herd in a patch-burn grazing pasture. Contrast the vegetation in the recently burned patch where the cattle are grazing (patch-burned in February, photo taken in April of the same year) with the vegetation patch in the upper left of the photo that had not been burned in at least a year.

diversity, and ecosystem maintenance purposes.[6] Although patch-burn grazing has previously been shown to result in animal performance that is equal or superior to that resulting from traditional range management practices, those results are from a limited number of studies.[7–9] Widespread adoption of patch-burn grazing on lands where livestock production is a primary objective will in part require a substantial body of evidence assuring livestock producers that livestock production will not be compromised by its adoption. Furthermore, this body of evidence will need to be generated from a variety of locations and vegetation types in order for its general applicability to be considered reliable.[10] Finally, although results of a management practice such as patch-burn grazing might be evident in a highly controlled research setting, in order for it to be adopted by private livestock producers those results must also be evident when the management practice is applied to working landscapes such as ranches.

A Research Opportunity in a Working Landscape

We assessed the effects of patch-burn grazing on cattle performance as part of a larger study examining the influence of patch-burn grazing on several variables representing livestock and biodiversity values.[11] We worked in multiple pastures, representing a variety of land ownership and management histories, dispersed across a relatively large geographic area (four counties). Some pastures were owned by the same individuals or families that managed the cattle herds utilizing those pastures, some pastures were owned by absentee landowners and were grazed by cattle owned and managed by local livestock producers, and some pastures were located on Wildlife Management Areas owned by the state of Nebraska but grazed by cattle owned and managed by local livestock producers. The private lands pastures had a long history of being used for cattle grazing, whereas pastures in the Wildlife Management Areas had a varied history of being hayed, burned, or rested.

The private landowners in our study largely represented individuals with an interest in range management practices that could simultaneously maintain or enhance range condition, livestock productivity, and wildlife habitat objectives. Many of these individuals had previously participated in habitat restoration projects, such as tree clearing and prescribed burning, that were cost-shared by the Nebraska Game and Parks Commission (NG&PC) and the Northern Prairies Land Trust (NPLT). All private landowners whose pastures were included in this study entered into contracts that specified cattle stocking rates and prescribed burning schedules in exchange of further cost-share funds. During our study, all prescribed burning at our study sites was conducted by the livestock producers and land managers responsible for each site. Because our study sites were owned and managed by different individuals or organizations, we were unable to conduct our research in a manner comparable to what is possible in well-controlled studies utilizing long-established research pastures. Regardless, our results are informative because our study likely approximated conditions that would be experienced by other landowners and livestock producers who are considering patch-burn grazing on lands they own and manage.

Study Sites and Study Design

Our study sites were characterized by tallgrass prairie or, in some instances, areas that had previously been cropland but had long since been planted to or recolonized by native grasses and forbs characteristic of tallgrass prairie. Predominant grasses included big bluestem (*Andropogon gerardii* Vitman), little bluestem (*Schizachyrium scoparium* [Michx.] Nash), Indiangrass (*Sorghastrum nutans* [L.] Nash), smooth brome (*Bromus inermis* Leyss.), and Kentucky bluegrass (*Poa pratensis* L.). Our study pastures ranged in size from 72–168 acres (average, 103 acres). In the six pastures that were managed with patch-burn grazing (hereafter PBG pastures), approximately one-third of each pasture was burned in the spring of each successive year of our 3-year study (2009–2011; Fig. 2). In the seven pastures managed in a traditional manner that strives to evenly distribute grazing animals across the management unit (hereafter TRAD pastures), the entire pasture was burned in the spring during the first year of the study (2009) but was not burned in subsequent years (2010 and 2011).

We sought to stock all PBG and TRAD pastures at a moderate stocking rate throughout the duration of our study (see online supplemental material at http://dx.doi.org/10.2111/RANGELANDS-D-13-00079.s1). Prior to the first grazing season (2009), stocking rates were determined using USDA Natural Resources Conservation Service estimates of forage productivity (1,500–5,000 pounds/acre) for the major soil types of each pasture and productivity estimates were adjusted downward to account for the presence of woodlands where forage was presumably limited. Our study pastures were stocked with cow–calf herds (with a bull present during