Testing the Use of Patch-Burn Grazing to Provide Habitat for Species of Greatest Conservation Need

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Duration: October 2010 to September 2012
Funding Source(s): Iowa Department of Natural Resources (DNR), State Wildlife Grant

Goals and Objectives:

- Conduct controlled experiments to test the effects of patch-burn grazing on species distribution patterns of butterfly taxa in the Grand River Grasslands.
- Quantify the response of grassland-obligate and Species of Greatest Conservation Need (SGCN) butterflies to changes in vegetation structure and composition.

Progress:

This project built on an experiment that began in 2006 that was designed to compare plant, insect, and bird responses to three types of grassland management in Grand River Grasslands of southern Iowa: 1) patch-burn graze, 2) graze-and-burn, and 3) burn-only. It focused on examining butterfly responses to each of the three treatments during the second three-year burn cycle. All treatment variables remained the same as in the first three-year burn cycle with the exception of stocking rate, which was reduced in 2010 compared to previous years. Twelve pastures, four of each treatment type, served as study sites in our efforts to assess the effectiveness of patch-burn grazing in improving habitat for grassland Species of Greatest Conservation Need (SGCN). Pastures ranged in size from 38 to 84 acres and were located at the IA DNR's Ringgold and Kellerton Wildlife Management Areas, on properties owned by The Nature Conservancy, on private properties in Ringgold County, Iowa, and at the Missouri Department of Conservation's Pawnee Prairie Preserve in Harrison County, Missouri. The three treatments were defined as follows: 1) *patch-burn graze:* burning of spatially distinct patches within the pasture and free access by cattle, 2) *graze-and-burn:* free access by cattle and burning of the entire pasture, and 3) *burn-only:* burning of the entire pasture but no grazing (typical management for protected lands in the region). Each of the three treatments was burned on a three year fire-return-interval. Patch-burn graze pastures and graze-and-burn pastures were stocked annually from May 1 until October 1 at an average rate of 0.7 animal-unit months per acre beginning in 2010. Burn-only pastures were not fenced. No fertilizers or herbicides were applied in the pastures during the study.

Conclusions and Recommendations:

Since 2007, the degraded grassland remnants have become more similar to the high quality remnants, both with respect to the vegetation and the butterfly communities. Numerous years of intense grazing prior to our treatments were probably more responsible than fire history for the low numbers of SGCN butterflies in these sites. Thus, the reduction of stocking rate is probably the largest factor contributing to the recovery of these pastures. The trend in SGCN butterflies observed within our study pastures has shown improvement over time. Only one SGCN butterfly species (regal fritillary) was seen in our experimental pastures from 2007 to 2009, whereas four SGCN butterfly species were observed during 2010 to 2012 (regal fritillary, two-spotted skipper, zebra swallowtail, and Edwards' hairstreak). In addition, three other SGCN butterflies were observed in the vicinity of our experimental pastures during 2010-2012 (wild indigo duskywing, zabulon skipper, and byssus skipper). Two of the most abundant prairie-specialist butterfly species (common wood nymph and regal fritillary) appear to be resilient to negative effects of dormant-season fire in this system and with the appropriate landscape context (i.e., substantial amounts of unburned habitat remaining within 300 m of patch boundaries). We hypothesize that landscape context (i.e., the amount of grassland surrounding a particular site) should be considered when developing burn plans because a prairie specialist (Edwards' hairstreak) might have been extirpated from a graze-and-burn site in 2012 due to a large, complete burn. Although this may be considered weak evidence of causality, taking a precautionary perspective with fire and SGCN butterflies is advisable.

Before conducting this study, we hypothesized that we would find greater patch contrast within patch burn-graze tracts attributable to lower stature in the most-recently burned patch and grazer avoidance of the unburned patches. Secondly,

we hypothesized that greater patch contrast would lead to greater abundance of prairie sensitive butterflies in patch-burn graze pastures. However, during 2010-2012 we found little difference in patch contrast among the three treatment groups. This may account for the less-than-positive response we observed with respect to butterfly abundance within the patch-burn graze treatment. In essence, we were not able to test the patch-contrast hypothesis. Pre-treatment (2006) values of vegetation characters remained important predictors of butterfly abundance in 2010-2012, evidence of the importance of land-use legacies. Common wood nymph abundance was positively associated with proportion of native plant cover. Regal fritillary abundance was positively associated with grass cover within 300 m of the perimeter and *negatively* associated with pre-treatment time since fire. Post-treatment vegetation variables associated with abundance of common wood nymphs included vegetation height (positive effect) and tall fescue canopy cover (negative effect). For regal fritillary abundance these variables included vegetation height and warm-season grass cover (both with positive effects) and tall fescue cover (negative effect). From the vegetation perspective, the greatest difference between remnant and degraded sites was in the cover of tall fescue, which was much more abundant on degraded sites. Our recent analyses have also specifically highlighted the significance of butterfly milkweed (*Asclepias tuberosa*) as a preferred nectar source for several SGCN butterflies. This nectar source has occurred in relatively low density, but appears to be increasing over time in pastures where grazing intensity has been reduced. It will be an important species to monitor in the future and in the context of each of the management treatments. We recommend *Asclepias tuberosa* as a key indicator plant species to monitor in assessing grassland recovery. The monitoring is easy and straightforward given the showy nature of its inflorescence.