Effects of Prairie Restoration Using Fire and Grazing Regimes on the Butterfly Community of Iowa's Loess Hills

Principal Investigators: Diane M. Debinski
Rolf R. Koford
James R. Miller
Student Investigator: Jennifer Vogel (M.S.)
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Goals and Objectives:

- Evaluate how grazing and burning management regimes affect butterfly species richness and abundance.
- Determine whether butterfly eggs or early instar larvae can survive a burn.
- Assess whether *S. idalia* butterfly populations within a 0.5-5 km^2 area management unit within the Loess Hills prairie can recover within one or two years after a prescribed burn.
- Provide recommendations on best management practices for prairie restoration based on the results of this study combined with relevant information from the literature.

Progress:

Both total and habitat-specialist (prairie-dependent) butterfly abundance were highest on prairies that were managed with grazing and burning, and lowest on those that were only burned. Butterfly species richness did not differ significantly among any of the management types. Responses of individual butterfly species to management practices were variable. In the best predictive models, both habitat-specialist and total butterfly abundance were negatively associated with the percent cover of bare ground, total butterfly abundance was positively associated with the percent cover of forbs, and habitat-generalist butterfly abundance was positively associated with floral resources. Areas managed with fire, grazing, or a fire/grazing combination all maintained equally species rich, yet compositionally different butterfly communities.

Total butterfly abundance and habitat-specialist butterfly abundance were positively correlated with the time (in months) since burn. The percent cover of warm season grasses and bare ground decreased while the cover of cool season grasses, forbs, and litter depth increased with time since burn. We used Path Analysis to evaluate the relative contributions of the direct effect of time since fire and the indirect effects of time since fire through changes in vegetation composition on butterfly abundance. For habitat-specialist species, path models highlighted the importance of the indirect effects of fire on habitat features (such as increases the cover of bare ground) and how these indirect effects may influence butterfly abundance after a fire. Recovery times for butterfly populations after prescribed fires in our study are potentially longer than those previously reported. Because fire return intervals on managed prairie remnants are often less than 5 years, information on recovery times for habitat-specialist insect species are of great importance.

Caterpillar sweep net surveys were conducted in the spring of 2006 on recently burned and nearby unburned sites to assess post-fire survival. Sweep net samples conducted on reconstructed sites did not contain butterfly caterpillars, whereas those conducted on remnant sites did contain caterpillars. Preliminary analyses reveal that on remant sites, there were no differences in butterfly caterpillar abundance between the burned and unburned sites.

A Master's thesis has been filed and two manuscripts from this work have been submitted for publication in peer-reviewed journals. Results from this project were presented at the North American Prairie Conference in July of 2006.

Future Plans:

Statistical analyses on caterpillar sweep net data will be continued durning the fall of 2006. Additional statistical analyses and revisions of manuscripts will occur in spring, 2007.