

Habitat Management Plan for Butterfly Species at Effigy Mounds National Historical Site

Submitted to:

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1.0 Introduction

The National Park Service of the United States (NPS) has three primary objectives: the protection of cultural, historical, and biological resources. The desire to protect biological resources in NPS units other than national parks is motivated by two major factors. The first is a realization that protecting a cultural or historical site usually requires the maintenance or re-creation of the historical environment. This requires that a healthy ecosystem or habitat be maintained as it was at the time of interest. The second reason revolves around the growing understanding of the importance of each federally-managed site to maintaining and conserving the nations biological diversity (Falkner & Stohlgren 1997).

In order to adequately protect the biological resources present at NPS units, managers must first obtain baseline data and information on the species present. These data can then be utilized to determine what management actions should be taken to protect species present at a unit. Management actions might also be undertaken to improve the suitability of habitat in the context of encouraging extirpated endemic species to recolonize a unit. Through long term monitoring of these biological resources, an assessment of the effectiveness of management actions can be undertaken, and revisions or adjustments to the management plan can be made.

This report presents findings from a two year study of butterfly species at the Effigy Mounds Historical Site, Iowa. The report is intended to provide baseline data on butterfly species present at the national battlefield, and present management options for preserving and protecting the butterfly fauna present on three habitat types within the monument. Management options developed in this report include consideration of a variety of factors beyond simply considering the needs of the butterfly species. These other factors include budget considerations, the role of the unit as a historical site, and the ecological requirements of the plant community. Management options are focused on preserving three specific butterfly guilds which have experienced declines since European settlement: prairie obligate, grassland specialist species, and savanna specialist species.

Species richness and relative density information were gathered for the goat prairies and the restored prairies. All sites were surveyed during the summer months of 1997 and 1998. Additional prairie remnants were also surveyed in the surrounding counties to establish a regional baseline database. The additional surveys allow for general comparisons concerning the presence or absence of individual species.

2.0 Methods

2.1 General Methodology

Butterfly species richness and relative density data were recorded using line transect surveys similar to Thomas (1983). Transects 5 m wide by 50 m long were surveyed by one observer walking at a constant pace of 10 m per minute. The observer identified all individuals to species; individuals that could not be identified in flight were captured using a butterfly net. Nomenclature for all species is according to Scott (1986). Each transect was surveyed six times during a visit. During the 1997 and 1998 summer flight period, two observers gathered data for each area.

In 1997 and 1998, the goat prairies were surveyed once in early summer (late May to early June), and again in mid-summer (mid-July to early August) to maximize the probability of sampling species with different emergence dates. The restored prairie was surveyed in mid-summer in 1997, and early summer and mid-summer in 1998.

Butterfly species were classified into six guilds: prairie obligates, grassland specialists, savanna species, woodland species, wetland specialists, and open habitat species. Classification was based on published sources (Scott 1986; Opler & Malikul 1992; Panzer et al. 1995; Swengel 1996; Schlicht & Orwig 1997). Prairie obligate species are those species that are tightly linked to remnant prairies that have not been degraded. Grassland specialist species are prairie species that can tolerate moderate amounts of disturbance, but would not be found in completely altered areas such as residential lawns or parks. Savanna species are species that prefer savanna type habitat with open woodlands and grassland understory. Woodland species are preferentially found in wooded habitats, although some will be found traveling through open habitats. Wetland/fen specialist species are restricted to wetland areas such as fens. Open habitat species are species that can be found in any open area, including residential yards, rangeland, and edge habitats.

Certain minimum weather standards were required for a survey to be conducted; the temperature had to be over 18°C, and cloud cover <70%. If cloud cover was over 70% then a minimum temperature of 23°C was required for a survey to be conducted. Surveys were not conducted on days when wind gusts were over 30 kph, or if winds were consistently over 20 kph. All surveys were conducted between the 0900 and 1730 hrs.

2.2 Site Specific Information

2.2.1 Goat Prairies

These very small patches of remnant prairie are scattered along hillsides. The remnant patches of prairie are located among a mixed stand of closed canopy woodland. In 1997, six transects were placed on goat prairies. In 1998, two additional transects were surveyed in addition to the six already present. The sites have a moderate diversity of

native forb and grass species, but low percent covers of these plant types. Exotic grass and forb species do not appear to be a problem on the goat prairies.

2.2.2 Restored Prairie

The restored prairie in the northern unit was surveyed for butterfly species. The restored prairie had a variety of forb species present and had good nectar resources available for butterfly species. In 1997, two transects were placed 50 m apart. In 1998, two additional transects were added to the two already present. The two additional transects were placed so that they were 50 m from each other and the two original transects.

3.0 Butterfly Survey Results

3.1 General Findings

A total of 55 species were observed in the 7 sites surveyed (Table 1). Six prairie obligate species were observed in the region, but no prairie obligate species were observed in more than two prairies. The most common savanna species in the region, the silver spotted skipper (*Epargyreus clarus*), was also found at the historical site. Effigy Mounds goat prairies had five savanna specialist butterfly species, which is slightly higher than the other six prairies surveyed.

3.2 Goat Prairies

Twenty-five species were observed in the goat prairies during the two year survey. Nine of these species were open habitat generalists, one was a grassland specialist, one prairie obligate was observed, five savanna specialist were observed, and nine woodland species were observed. The prairie obligate regal fritillary (*Speyeria idalia*) was observed in low densities. The black veined skipper (*Atrytone logan*) was the only grassland specialist observed. One open habitat generalist, the great spangled fritillary (*Speyeria cybele*), was observed in moderate densities. One woodland species was observed in moderate densities, the banded hairstreak (*Satyrrium calanus*). All five savanna specialist species were observed in low numbers.

3.3 Restored Prairies

Nineteen butterfly species were observed in the restored prairie. Thirteen open habitat generalist species were observed. The open habitat generalist eastern-tailed blue (*Everes comyntas*) was observed in high densities. Three other species were observed in moderate densities: the monarch (*Danaus plexippus*), the great spangled fritillary, and the pearl crescent (*Phyciodes tharos*). All other species were observed in low densities. One prairie obligate butterfly was observed in the restored prairie, the byssus skipper (*Problema byssus*).

4.0 Management Recommendations

4.1 Goat Prairies

4.1.1 General Recommendation

The goat prairies are extremely small and isolated areas. Consequently they have very low numbers of grassland or prairie obligate butterflies. However, the sites appear to be suitable for savanna specialist species which require both the open understory and woody vegetation. The approach most likely to benefit unique and declining species should focus on savanna specialist species.

4.1.2 No Active Management

This option is suitable for maintaining the short term status quo. However, it will not increase the size of these sites, or improve the habitat quality for savanna specialist species. Long-term persistence of the goat prairies would be unlikely under this management option.

4.1.3 Recommended Option -- Low Intensity Cutting

This option would involve hand cutting or girdling of selected individual trees to keep the understory open. This method could also be utilized to help expand the size of the goat prairies. Exotic plant species should not become a problem on these areas as long as minimal impact to the soil occurs during cutting and removal of trees. Young saplings observed on the goat prairies should be removed quickly.

4.1.4 Combined Low Intensity Cutting and Burning

This option would include the cutting and girdling of individual trees as described in section 4.1.3. However, it would also include a rotational burn schedule where individual goat prairies would be burned on a rotational basis with a burn interval of 4-5 years. Burning in this case would be conducted to promote a healthy plant community. The small size of the goat prairies indicates that logistically, an entire small goat prairie would have to be burned at once. This could have negative impacts on the savanna butterfly species inhabiting that individual goat prairie. In many cases the distance to neighboring goat prairies will reduce the chance for recolonization if a population is extirpated. Increased risk of extirpation for savanna specialist species in individual goat prairies increases the overall risk of extirpation from the historical site (Levins 1970).

4.2 Restored Prairies

4.3.1 No Action Option

This option would essentially stop all active management on the site. The outcome of this option is not completely clear. Exotic plant species present on the site would likely maintain their current status or increase their percent cover. The restored prairie is providing some suitable habitat as indicated by the presence of a prairie obligate skipper.

However, it is not clear whether this one individual was a resident or not. The high numbers of open habitat generalist butterfly species indicate that this prairie is not in prime condition. This option is not recommended because it would not improve the quality of the prairie.

4.3.2 Recommended Option -- Rotational Burning

Burning could be conducted on small sections relative to the entire prairie. Burning large sections in any year would likely reduce the densities of grassland specialist butterflies that have colonized the site or could potentially colonize the site from nearby source populations. The large numbers of open habitat generalist butterfly species and very few prairie obligate or grassland species present at this site indicate that the site has not yet been restored to a high quality prairie. Burning is recommended to help restore the prairie plant community. To reduce the impact of burning on butterfly species, burning could be conducted on a three year rotational basis with approximately 1/3 of the restored prairie being burned each year (Opler 1982). Additional seeding of forb and grass species may also be beneficial.

4.3.3 Haying/Mowing

Haying or mowing is an alternative to prescribed burns. This management option appears to be the least detrimental to the majority of prairie obligate or grassland specialist butterfly populations as compared to burning (Swengel 1996, 1997). However, the quality of the prairie plant community is not currently supporting large numbers of grassland or prairie obligate butterfly species. For this reason the recommended option is prescribed burns.

5.0 General Conclusions

The goat prairies appear to support a very depauperate assemblage of grassland and prairie obligate butterfly species. However, they do appear to provide suitable habitat for savanna specialist species. Management actions should be focused on conserving the savanna specialist species because they are also of conservation concern (Panzer et al. 1995; Schlicht & Orwig 1998). The restored prairie requires active management to continue the restoration process and improve the quality of the plant community.

6.0 Literature Cited

- Falkner, M. B., and Stohlgren, T. J. 1997. Evaluating the Contribution of Small National Parks to Regional Biodiversity. *Natural Areas Journal*, 17: 324-330.
- Opler, P. A. 1981. Management of Prairie Habitats for Insect Conservation. *Natural Areas Journal*, 1: 3-6.

- Opler, P. A., and Malikul, V. 1992. A Field Guild to Eastern Butterflies. (p. 396). Boston: Houghton Mifflin Company.
- Panzer, R. 1988. Managing Prairie Remnants for Insect Conservation. *Natural Areas Journal*, 8: 83-90.
- Panzer, R., Stillwaugh, D., Gnaedinger, R., and Derkovitz, G. 1995. Prevalence of Remnant Dependence Among Prairie and Savanna inhabiting Insects of the Chicago Region. *Natural Areas Journal*, 15:101-116.
- Schlicht, D. W., and Orwig, T. T. 1998. The Status of Iowa's Lepidoptera. *Journal of the Iowa Academy of Science*, 105: 82-88.
- Scott, J. A. 1986. The Butterflies of North America (p. 584). Stanford: Stanford University Press.
- Swengel, A. B. 1996. Effects of Fire and Hay Management on Abundance of Prairie Butterflies. *Biological Conservation*, 76: 73-85.
- Swengel, A. B. 1998. Effects of Management on Butterfly Abundance in Tallgrass Prairie and Pine-Barrens. *Biological Conservation*, 83: 77-89.
- Swengel, A. B. 1997. Co-occurrence of prairie and barrens butterflies: applications to ecosystem conservation. *Journal of Insect Conservation*, 1: 131-144.
- Thomas, J. A. 1983. A Quick Method for Estimating Butterfly Numbers During Surveys. *Biological Conservation*, 27: 195-211.

Table 1. Listing of species, guild classification, and number of times each species was observed at two sites in Effigy Mounds NHS and five surrounding prairies.

COMMON NAME	SCIENTIFIC NAME							
		Effigy-Goat	Effigy-Restore	Battle Bluff	Battle hollow	Mound Prairie	Nelson Dewey	Rush Creek
Open Habitat Generalist Species								
Sachem	<i>Atalopedes campestris</i>							7
Spring Azure	<i>Celastrina argiolus</i>	9	2	1	4	1	1	4
Silvery Checkerspot	<i>Chlosyne nycteis</i>			2	37	3	5	9
Alfalfa Butterfly	<i>Colias eurytheme</i>	1	9	1	1	8		19
Clouded Sulfur	<i>Colias philodice</i>	4	8	10	8	26	11	37
Monarch	<i>Danaus plexippus</i>	7	20	4	7	3	9	3
Variegated Fritillary	<i>Euptoieta claudia</i>			2	5	15	1	1
Eastern-tailed Blue	<i>Everes comyntas</i>	15	178	3	8	1	11	25
Viceroy	<i>Limenitis archippus</i>		2	1	1			
Mourning Cloak	<i>Nymphalis antiopa</i>	4		1				
Pearl Crescent	<i>Phyciodes tharos</i>	17	22	12	48	6	1	103
Cabbage	<i>Pieris rapae</i>			1	1			10
Buckeye	<i>Precis coenia</i>		1					
Great Spangled Fritillary	<i>Speyeria cybele</i>	23	38	14	127	9	25	2
Grey Hairstreak	<i>Strymon melinus</i>		2		1			2
Red Admiral	<i>Vanessa atalanta</i>	10	1	3				1
American Painted Lady	<i>Vanessa virginiensis</i>		2			2	1	2
Broken Dash	<i>Wallengrenia egeremet</i>		1			1		1
Grassland Specialist Species								
Delaware Skipper	<i>Atrytone logan</i>	3	2	1				3
Gorgone Checkerspot	<i>Chlosyne gorgone</i>					3		
Mottled Dusky Wing	<i>Erynnis martialis</i>					8		
Little Sulfur	<i>Eurema lisa</i>			1				

Table 1 continued.

COMMON NAME	SCIENTIFIC NAME							
Grassland Specialist Species		Effigy-Goat	Effigy-Restore	Battle Bluff	Battle hollow	Mound Prairie	Nelson Dewey	Rush Creek
Coral hairstreak	<i>Harknenclenus titus</i>				5	13		1
Black Swallowtail	<i>Papilio polyxenes</i>			1			1	
Cloudless Sulfur	<i>Phoebis sennae</i>					1		
Tawny Edged Skipper	<i>Polites themistocles</i>					3		1
Little Glassy Wing	<i>Pompeius verna</i>				2			
Prairie Obligate Species								
Dusted Skipper	<i>Atrytonopsis hianna</i>			1				
Leonard's Skipper	<i>Hesperia leonardus</i>					1		
Prairie Skipper	<i>Hesperia ottoe</i>			6				13
Crossline Skipper	<i>Polites origenes</i>							24
Byssus Skipper	<i>Problema byssus</i>		1					
Aphrodite Fritillary	<i>Speyeria aphrodite</i>				11	8		
Regal Fritillary	<i>Speyeria idalia</i>	5						
Woodland Species								
Hackberry	<i>Asterocampa celtis</i>	3			1	11	7	
Tawney Emperor	<i>Asterocampa clyton</i>					73	15	
Pipevine	<i>Battus philenor</i>						1	
Common Wood Nymph	<i>Cercyonis pegala</i>			3	35	10	42	
Horace's Dusky Wing	<i>Erynnis horatius</i>			4				
Viceroy	<i>Limenitis arthemis</i>				6			
Wood Satyr	<i>Megisto cymela</i>	6		2	7	1	6	2
Milbert's Tortoiseshell	<i>Nymphalis milberti</i>			1	16	1		
Giant Swallowtail	<i>Papilio cresophontes</i>	2	11				1	
Tiger Swallowtail	<i>Papilio glaucus</i>	4	3	4	18	4	2	

Table 1 continued.

COMMON NAME	SCIENTIFIC NAME							
		Effigy-Goat	Effigy-Restore	Battle Bluff	Battle hollow	Mound Prairie	Nelson Dewey	Rush Creek
Woodland Species								
Comma	<i>Polygonia comma</i>	14						
Question Mark	<i>Polygonia interrogationis</i>	1						
Gray Comma	<i>Polygonia progne</i>	5						
Banded Hairstreak	<i>Satyrrium calanus</i>	30	1		15		1	5
Hickory Hairstreak	<i>Satyrrium caryaevorus</i>							1
Striped Hairstreak	<i>Satyrrium liparops</i>	3			1			
Savanna Specialists Species								
Olive Hairstreak	<i>Callophrys gryneus</i>	2				3		
Hoary Edge	<i>Epargyreus clarus</i>	10	11	17	142	1		1
Columbine Duskywing	<i>Erynnis lucilius</i>			8		1		2
Wild Indigo Duskywing	<i>Lethe anthedon</i>	5						
Edward's Hairstreak	<i>Satyrrium edwardsii</i>	1		2				
Northern Cloudywing	<i>Thorybes pylades</i>	1			2	1		