

The Decline of the Arogos Skipper (*Atrytone arogos*) at Prairie Coteau in Pipestone County, Minnesota

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In 1986, Prairie Coteau Scientific and Natural Area, Pipestone County, Minnesota was purchased by the Minnesota Department of Natural Resources and moved from management by grazing to a regime of fire management with some mechanical removal of weedy plants. Butterfly surveys were carried out on transects across the 133 ha. in 1988, 1989, and 1990 by Gerald Selby. The Arogos skipper *Atrytone arogos* was found and recorded along those transects. Follow-up surveys were completed in 1995, 1996 and 2000 by this investigator, at which time encounters with the species had dropped from a high of 48 on two days near the peak of the flight period in 1990 to zero in 1995, two in 1996 and two in 2000. There is, therefore, concern that *Arogos* populations will not be viable on this prairie through the next decade.

INDEX DESCRIPTORS: Arogos skipper, *Atrytone arogos*, Prairie Coteau SNA, prairie butterflies, prairie.

Our remaining prairie sites with their extensive invertebrate fauna have survived to our time by grazing/haying regimes. Changes in the management regime from virgin prairie to pasture or hay land surely caused changes in the invertebrate faunal composition. However, as of the middle of the 1900s, all of the known tallgrass prairie butterflies survived on many remnants. Associated with the time frame of the change from grazing/haying to fire-based management, several prairie butterflies have been extirpated from sites under private or governmental preservation and even from states, while other species are in decline (Schlicht and Orwig 1992).

While fire management is widely applied, few investigations have been done to determine the effects of management on true prairie obligate invertebrates before the management was applied, and fewer yet for a long time span. Some researchers have investigated insects, often mostly generalist prairie species on portions of relic sites, but studies were conducted after fire had already been applied in previous years. Therefore, they investigated an already fire influenced or modified fauna. This investigation does not accomplish the goal of pre-management monitoring, but it does provide population monitoring over a relatively long span of years for the Arogos skipper.

BACKGROUND

The Arogos skipper (*Atrytone arogos iowa*) is one of a contingent of prairie obligate butterflies of the tallgrass prairie biome. Prairie obligate butterflies are restricted to various native prairie plants for larval food and use plant structure or the ground thatch for diapause position and for hibernacula. These species are now restricted to isolated prairie remnants, and, therefore, with few exceptions, are not able to re-colonize if they are extirpated from a site.

The Arogos skipper was first described as *Hesperia iowa* by Scudder in 1868 using type specimens from Denison and New Jefferson, Iowa. The current designation is *Atrytone arogos* (Boisduval and LeConte) or *Atrytone arogos iowa* (Scudder) (Miller and Brown 1981). It is a small (2.7 cm) tan skipper with a dark border above and unmarked tan below. This species lives in part of a temporal sequentially on sites with other prairie obligate butterflies. It follows

the Poweshiek Skipperling (*Oarisma poweshiek*) in apparent phenological displacement (Schlicht and Orwig 1992). It is believed to use big bluestem (*Andropogon gerardi*) as a larval foodplant. The fourth stage larvae hibernate in silken tubes in the leaf litter (Opler and Krizek 1984), and they are therefore vulnerable to fire throughout their life cycle. The Arogos skipper is rare and in decline throughout its range, as are many other prairie butterflies (Glassberg 1999, Orwig and Schlicht 1999). Populations in Atlantic coastal states of a different subspecies are small, and some populations are apparently extirpated. Those states, New Jersey and Virginia for example, list the subspecies as threatened or endangered. It is a special concern species in Minnesota and Iowa.

METHODS

The first surveys at Prairie Coteau were done in 1988, 2 years after grazing ceased and fire management started on the south unit. Also, surveys were initiated for the remainder of the site the same year (G. Selby, pers. comm). During the summers of 1988 and 1989, Gerald Selby undertook an ambitious project to conduct "(1) general surveys for all butterfly species present at Prairie Coteau during each of the major flight periods, (2) to produce distribution maps for selected rare butterflies, and (3) population monitoring for *Hesperia dacotae* and other rare butterflies which were flying during its flight period" (G. Selby, 1989 unpublished). His 1990 project included ecological studies and response to management (Selby 1990). Both studies involved surveys for *A. arogos*.

Prairie Coteau Scientific and Natural Area (SNA) is a 133 ha dry hill prairie in Pipestone County, Minnesota (Township 108 North, Range 44 West, parts of Sections 29 and 32), that was first acquired, in part, in 1986. The soils are stony glacial till with some loess on the flatter high areas. Mesic to wet prairie elements, including butterflies, are found on lower areas. The site had a large hay field in the center, and most was grazed in the past (Fig. 1).

Selby placed transects every 100 m across the site and walked the transects every few days, identifying and counting each species that was within 5 m of the line or ahead of the single observer. Surveys

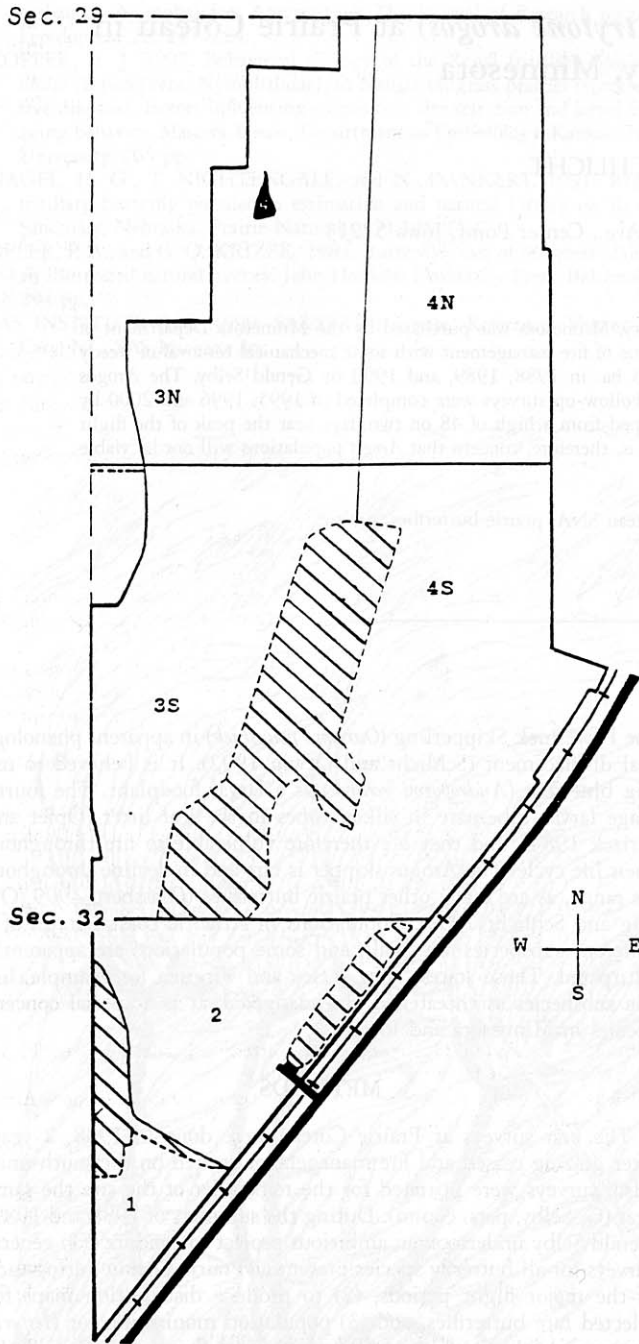


Fig. 1. Prairie Coteau SNA, Pipestone County, Minnesota (former cropland stippled, units are labeled) (from Selby 1990).

were conducted from 22 June to 13 July, 1988; 26 June to 17 July, 1989; and 23 May to 30 July, 1990 between 0900 and 1700 hours local time. Encounters were logged and recorded on maps.

In 1995, I began a two yr project which included Prairie Coteau SNA. In an effort to have data that could be compared to Selby's baseline work, I used his transects and protocol at Prairie Coteau SNA. The site was visited on 27 June 1995, 6 July 1995, 11 July 1995, 5 July 1996, 10 July 1996, and 15 July 1996 by one observer. Observations were done between 1000 and 1800 hours at tempera-

Table 1. Calendar day comparison for *Atrytone arogos* at Prairie Coteau SNA.

Year	Date/Dates	Number of <i>arogos</i>
1988	July 11 + 13*	9
1989	July 13 + 14*	46
1990	July 12 + 13*	48
1995	July 11	0
1996	July 15	2
2000	July 13	2

* Selby 2 day surveys to cover the site once.

Table 2. Comparison of data pair transect surveys for *Atrytone arogos* at Prairie Coteau SNA.

	1988	1989	1990	1995	1996	2000
6(27-28)	1			0		
6(29-30)		1				
7(1-2)		1	1			
7(3-4)		5	3			
7(5-6)	12	6	6	0	0	
7(7-8)	4	27				
7(9-10)		46			0	
7(11-12)	7	37	6	0		
7(13-14)		46	42			2
7(15-16)		40	39		2	
7(17-18)		2	10			
7(19-20)						
7(21-22)						
7(23-24)			21			
7(24-26)						
7(27-28)			16			

tures between 21° and 35° C, wind speeds below 23 kph, with cloud cover up to 90% if the temperature was above 26° C.

Another survey was made on 13 July 2000 with two observers following Selby's transects. The weather was within the described parameters, and recent management was recorded.

RESULTS

During the 1988 field season, Selby recorded 24 *Arogos* skippers on his transects. The first was seen on 22 June and his last on 11 July when he stopped surveying. In 1989, he surveyed later and saw a total of 211. The first individuals were seen on 5 July and the last on 17 July, his last survey day. During 1990, he counted and mapped 144 individuals, the first on 2 July and the last on 28 July.

The survey results in 1995-1996 were very different. In 1995, the first survey was on 27 June, probably too early for *Arogos* skippers, but the same day that Selby saw his first in 1988. However, none were seen. On 6 July and 11 July none were seen either, but the 11 July date should have been during the beginning of peak abundance. In 1996 no specimens were seen on 5 or 10 July, but two were seen on 15 July. That date should have been a peak abundance day (Table 2). Frank Olsen and I surveyed on 13 July 2000 during peak flight time and counted two individuals.

A comparison of the closest single calendar date in the flight period eliminates the variable of Selby's more frequent surveys (Table

1). Note that Selby took two days to cover the site, hence the two dates. The later three years reflect a whole survey in a single day.

DISCUSSION

While there are differences in how the data were collected for each investigator and between investigators, the data were compelling. From Selby's (1988) first year to his second, he changed the number of transects from three to five in his unit 2. This could account for some of the increase from 1988 to 1989, but not for all of it. That is because the number of butterflies increased by 879% whereas the number of transects only increased by 66%. The 1995 survey followed Selby's transects throughout, but 1996 and 2000 were modified, in part, to spend more time in the critical habitat and not in the low, wet areas.

It can be inferred that there are tremendous annual variations in this population. Concern is here expressed that low populations, whether periodic or permanent, put this species at serious risk of extirpation. While we do not have pre-fire data, we do have data from early in the fire management regime for this site. If the current trend continues, little time remains to begin a recovery program because between the time grazing ended and the implementation of fire as a management tool began, the number of Arogos skipper individuals on Prairie Coteau has been in a precipitous decline. Grazing has been replaced by fire management, which certainly destroys nearly all invertebrates above ground. Metzler (1998) stated that "in Ohio, (as well as in the rest of the tall-grass prairie biome) fires for management purposes are used either in the early spring or late autumn following a hard frost, sometimes on an annual basis. Such use of fire does not mimic natural phenomena, thereby putting insects, which are vulnerable to fires, at risk." Therefore, the effect of fire must be examined closely in this decline.

Unpublished information forwarded by the Minnesota Department of Natural Resources showed that the critical native prairie area of the south unit (Selby's Unit 2) was partially burned in 1986, 1987, 1988, 1990, 1991 and 1995. It was also totally burned in 1993, 1997 and 1999. Surprisingly, (because it would seem that fire would be applied somewhat equally throughout the site), the adjacent east side (4S) unit was only burned in 1996. During that 14 years there was one accidental fire through the north end of the property and no natural fires even though lightning must have been present in an area of this size.

An illustration of the effect of the recent application of fire was evident in 2000. The south unit (Unit 2) where Selby had his highest counts was all burned in 29 September 1999. On 13 July 2000 it had many fewer prairie butterfly individuals than did the adjacent east unit (Selby's 4S unit). For example the south, most recently burned unit, had two Regal Fritillaries (*Speyeria idalia*) in 129 minutes of observation (0.015 individuals per minute), while the unburned east unit had 23 in 41 minutes of observation (0.56 individuals per minute), which is 37 times greater. There are no boundaries between the two units, and there appeared to be much more nectar available in the south unit.

Observations that butterfly populations are negatively impacted by fire are not new to this study. Arogos skipper populations are favored by idling, grazing and haying (Swengel 1997, Swengel and Swengel 1997, Swengel and Swengel 1999) and harmed by fire (Swengel 1996). The Dakota Skipper (*Hesperia dacotae*), another prairie species found on this site, has been shown to be negatively impacted by fire by Dana (1991) and has been lost from several sites under fire management, two of which are Cayler Prairie in Iowa and, after five continuous years of fire (1983–7), Pipestone Monument in Minnesota (Becker 1989).

Recommended management techniques that can be used to pre-

serve prairie invertebrate biodiversity have been discussed at various forums for the past decade (Dana 1991, Schlicht 1993, Hamilton 1994). Many of these techniques would lend themselves to the situation at Prairie Coteau. The data presented here suggest an urgency for their application.

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