COMPLETION OF STATUS SURVEYS FOR THE DAKOTA SKIPPER (*Hesperia dacotae*) AND THE POWESHIEK SKIPPER (*Oarisma poweshiek*) IN MINNESOTA

with data on the Regal Fritillary (*Speyeria idalia*)

Final Report
submitted to the Minnesota Nongame Wildlife Program
January 28, 1995

Dennis Schlicht
Iowa Lepidoptera Project
Center Point, Iowa

Mike Saunders
Iowa State University
Ames, Iowa

TABLE OF CONTENTS

ABSTRACT

During late June and July of 1993 and 1994, a survey of 60 prairie areas in Minnesota was conducted for three prairie obligate butterfly species. These species were: Hesperia dacotae (Skinner), the Dakota Skipper; Oarisma poweshiek (Parker), the Poweshiek Skipperling; and Speyeria idalia (Drury), the Regal Fritillary. The Dakota Skipper is a candidate for listing under the Endangered Species Act by the U.S. Fish and Wildlife Service and is listed as Threatened in Minnesota.

To insure that fieldwork would begin at the time of the emergence of H. dacotae, records were consulted to determine that date, and reconnaissance surveys were made beginning June 24 (175), 1993 and June 28 (179), 1994 on known population sites until it emerged. Both H. dacotae and O. poweshiek were found on July 5 (186), 1993 and S. idalia was first seen on July 8 (189), 1993. In 1994 all three species were found on June 29 (180). Weather and flooding permitting, surveying continued through July 18, 1993 (199) and July 12 (193), 1994. Fifty four of the 60 listed prairies were visited in 1993, but because several prairies had multiple parts and weather created less than ideal conditions, 69 visits were accomplished. During the 1994 season 41 prairies were sampled, most were revisits from 1993.

The sites were prioritized by previous records for these butterflies and by prairie quality. H. dacotae was found in 4 of 19 sites on which it had previously been recorded and in 3 new sites for a total of 7 of 63 prairies. In 1994 it was found on 3 sites, one of which was new. O. poweshiek was found in 11 of 19 sites on which it had been recorded and in 13 new sites for a total of 25 of 63 prairies. S. idalia was found in 15 of the 63 prairies.

Due to unusual weather and extensive flooding, both butterfly and human activities were not normal in 1993. Populations, when found, were very small and often very restricted on the site. In 1994 the weather was more normal and the season early in the north but the same trends were evident. During 1994 H. dacotae was not found on 2 of the 1993 sites.

ACKNOWLEDGEMENTS

Richard Baker of the Minnesota Natural Heritage and Nongame Wildlife Program at the Department of Natural Resources was the coordinator of this research. His help and advice in making it run smoothly are appreciated. Robert Dana was instrumental in the identification and location of the sites as well as with help on logistics in the most unusual summer of 1993. Thanks also to David Cuthrell, formerly of North Dakota State University, Ed Brekke-Kramer and John Schladweiler of the Minnesota Department of Natural Resources, the staff at Blue Mounds State Park and Brian Winter of the Nature Conservancy for their assistance in getting this project off to a good start. We are also greatful for the assistance in editing provided by Jim Messina.

I would also like to acknowledge the support of the Minnesota Nongame Wildlife Tax Checkoff through the Minnesota Department of Natural Resources, Nongame Wildlife Program for their foresight in supporting this project.

INTRODUCTION

In the past 150 years the plight of the tallgrass prairie has been systematic destruction for agriculture and development. Today, it ceases to function as a biome with the interaction of species and genetics beyond relatively small portions. For the most part, the flora and fauna of the prairie still exist, albeit not to the same extent, and diversity. With the loss of most of the mammalian herbivores, the interaction of insects and plants on the tallgrass prairie are the primary ecological links. The dynamics of disturbance events is now radically different than it was on the primal prairie biome. Attempts at man-made disturbance are arguably less effective and perhaps even destructive to the natural diversity of the prairies invertebrates.

Prairie obligate butterflies have suffered the same fate as the rest of the prairie fauna and at the end of this century are at a watershed in their survival. Information is needed about where they live, how they live and what needs to be done (or not done) to insure their future. This project was undertaken in response to that challenge.

While the Dakota Skipper (Hesperia dacotae, Skinner) was named from Iowa and South Dakota material, it is assumed extirpated from Iowa, even though it was last on a protected prairie. Isolated populations remain in the Dakotas, Manitoba and Minnesota on portions of both large and small prairies. It is listed as Threatened in Minnesota and is a Federal Category 2 candidate species. The Poweshiek Skipperling (Oarisma poweshiek, Parker) has about the same range but shifted south into Iowa (17 sites in 1993). It also seems to be subject to losses even though it is on protected sites. It is a Special Concern species in Minnesota and is attracting attention at the federal level (Coffin and Pfannmuller, 1988). The Regal Fritillary (Speyeria idalia, Drury) has suffered severe losses in the eastern part of the country in the last few years and is also a Federal Category 2 candidate species. It has become clear to many of us that Minnesota's populations will be crucial to its longterm survival. It too has attracted some federal inquiries.

Objectives

The broad goal of this project was to gather the information necessary to determine the present distribution of the Dakota Skipper and the Poweshiek Skipperling in Minnesota. This goal was pursued through the following objectives:

1. Identify locations needing initial or updated surveys and prepare maps.
2. Survey priority sites for presence of these species.
3. Collect voucher specimens of the target species at each location.
4. Prepare a final report with documentation of site conditions.
5. Provide recommendations regarding appropriate federal status and management needs.

(excerpted in part from this projects proposal)

METHODS

This survey of Minnesota prairies was conducted during June and July of 1993 and 1994. Organizational work with site selection was accomplished by the Nongame Wildlife Program of the Minnesota Department of Natural Resources. The principal surveyor was Dennis Schlicht of the Iowa Lepidoptera Project in Center Point, Iowa 1993-4), and the co-surveyor was Micheal Saunders, a student at Iowa State University in Ames, Iowa (1993).

The first task accomplished by the Minnesota DNR staff was to identify locations that needed initial or updated surveys. A review was conducted of historical records of butterflies from prairie sites to identify records that were older than four years. It was then necessary to identify high-quality and low-quality prairies for which there are no butterfly records. Regional, local and site maps were provided, in most cases, for each prairie. Site maps were marked with loop transects placed to sample the highest quality habitat.

Sites were prioritized in three groups. The first priority sites (sites 1-19) had skipper records for one or the other species. The second priority sites (20-45) had no skipper records but are high quality habitat. Third priority sites (46-60) had no records and were thought to be of lesser quality.

Due to cool, wet conditions, and therefore a late season in 1993, determination of an emergence date was a problem. Past records indicated that June 23 (174) would have been a likely emergence date for H. dacotae. Reconnisance surveys were conducted at Hole-in-the-Mountain Prairie in Lincoln County and Prairie Couteau Prairie in Pipestone County on both June 24 (175, Julian date) and July 1 (182). No target species were found on either date. Purple coneflowers (Echinacea sp.) were also not open. A third trip on July 5 (186) yielded H. dacotae at Hole-in-the-Mountain but not at Prairie Couteau. The survey was started in earnest on July 6 (187) and concluded on July 18 (199).

The 1994 survey was begun on June 28 (179), with the first H. dacotae found on June 29 (180) and the last see on July 6 (187). By the time I arrived at the Clay County prairies the H. dacotae season seemed to be over as none were found on the Felton complex of prairies. It appeared that the Felton area was dryer than either north or south.

Butterfly nomenclature follows Miller and Brown (1981) and Ferris (1989). One exception is for the Northern Pearl Crescent where each current author lists a different name. I have here resurrected the old name selenis (W. Kirby) to distinguish this subspecific entity. Photographs were taken of many sites, often to document the effects of particular management regimes. Current weather as well as the nature of the season were documented. The time on site often varied due to weather and flooding. During 1993, it rained some time or other on 9 of the days out and many areas were standing in water. Sometimes butterflies were still flying on flooded prairies.

Travel routes were plotted to hit the most high priority sites with the least driving. We were also conscious of the possibility of the season being more advanced in the north, so some more southerly sites were picked up later in the survey. At each site the DNR marked transect was followed if it was deemed appropriate (it usually was). Different habitat types were explored when present. Special efforts were made to identify and survey Dakota Skipper habitat. All species seen were recorded. Voucher specimens for each of the target species were collected when possible. They have been curated either during the survey or later at the Iowa Lepidoptera project collection in Center Point, Iowa. They will be deposited in the Bell Museum of Natural History at the discretion and through the arrangements of the Nongame DNR staff.

RESULTS

Dakota Skipper

1993

Of the 19 first priority sites, the Dakota Skipper (Hesperia dacotae, Skinner) was found on 4. These included 3 parts of the Felton complex (#3), the Sanke property along Chanarambie Creek (#11), Lundblad Prairie (#12) and Glacial Lakes State Park (#16). It was also found on 2 prairies in the second priority group. These were Chippewa Prairie (#22) and Tympanuchus Wildlife Management Area (#37).

1994

Of the 19 first priority sites, the Dakota Skipper (Hesperia dacotae, Skinner) was found on 2. These include the Sanke property along Chanarambie Creek (#11) and Galcial Lakes State Park (#16). It was also found on one second priority site, Pankratz Prairie. It could not be found at the Felton Complex or Lundblad Prairie.

There is nearly continous Dakota habitat on sections 31, 6, and 5 of the Felton complex of prairies (#3) and they were found throughtout in 1993. Five searches were made in these sections. The site on the NW 1/4 of Section 36 was bordered on the west and north by a drainage ditch (moat) and was inaccessable with recent heavy rains (1993). I did not get onto the B bar B property or did not find the proper Section 18 site, as I was in a fen in 1993. A check of Section 18 in 1994 lead to the location of some promising habitat but no butterflies. Several days need to be appropriated to this complex and the preserves to the east but they were not on the 1994 list and H. dacotae could not be found in two visits. The 1993 season was last and the 1994 season was early.

Only one ridge had Dakota on the Sanke property near Chanarambie Creek (#11) in 1993, but they were not there in 1994. The ridge is just north of the 1650 foot elevation as printed on the topographic map in Section 3. It was not found on the first hill north of the house on the east side of the section, where it had been found before. One female was found in 1994 just northwest of the Sanke property.

One female Dakota was seen on the northeast corner of Lundblad Prairie (#12) in 1993 but none were found in 1994. The habitat was not consistent with typical Dakota habitat on other sites and the quality was lower than expected. This site was not as seasonally advanced as the hill prairies surveyed on the same day.

Glacial Lakes State Park (#16) has vast areas of grasslands but little quality prairie. H. dacotae was found on only part of one ridge that had an old road cut around it. The transect was enlarged to cover more of the ridge to the east.

Chippewa Prairie (#22) had healthy populations of Dakota in 1993, as well as many other butterflies species. It was the only prairie with all three target species in 1993. On Tympanuchus Wildlife Management Area (#37), there is a slight rise that snakes through the center of the tract. This rise had the only purple coneflowers in the area and they attracted a precarious population of the Dakota Skipper.

Pankratz Prairie yielded one female dacotae in 1994. It was also on slight rise on an otherwise flat prairie.

A total of 36 were seen in the two years combined.

Poweshiek Skipperling
1993
Oarisma poweshiek (Parker) was found on 9 of the 19 first priority sites. It was not found within the top 4 sites on the list, however. Three sites had significant numbers of Poweshiek: Staffanson Prairie (#5), Roscoe Prairie (#17) and Glynn Prairie (#51). These were also normal as far as numbers of other butterfly species. However, most other sites with Poweshiek had very small populations of the species. One exception was Glynn Prairie (#51) is full of red clover and brome but had normal numbers of butterflies. At Chippewa Prairie (#22) there is an unimproved roadway that acts to separate the butterfly communities in terms of composition and abundance. For example all of the Poweshieks were found on the north side of the road. Storden 21 Hill Prairie (#25) is also in highly degraded but it had more Poweshiek individuals than many of the much better prairies.

1994
Oarisma poweshiek (Parker) was found on 6 of the 12 first priority sites checked. One was found on Audubon Prairie in 1994 but not in 1993. Staffanson had many fewer than 1993, while Prairie Marshes, Chanarambie Creek and Sioux Nation had many more. The Ordway and Glacial Lakes populations were still small. At Prairie Marshes there were 7 in two visits (63 minutes) on the burned north portion and 22 on the unburned south portion in two visits totaling 42 minutes.

More than 425 were seen in the two years combined.

Regal Fritillary
1993
The first Speyeria idalia (Drury) was seen on July 8 (189) at Jeffers Petroglyphs (#1). It was seen in far less numbers than that H. dacotae, with the only healthy population found at Chippewa Prairie (#22)(Table 1). Only 8 prairies, 5 of which are First Priority, held the Regal Fritillary.

1994
The first S. idalia was seen on June 29 (180). The largest population was at Ordway Prairie with 12. It was seen on only 9 prairies in 1994 even though the conditions were much better than 1993.

A total of 63 were seen in the two years combined.

TABLE 1 TARGET SPECIES SUMMARY
1993 POWESHIEK AND DAKOTA SKIPPER SURVEY

#	Site	Number Sighted H. dacotae	O. poweshiek	S. idalia
First Priority				
1	Jeffers Petroglyphs			1
2	Audubon Prairie			
3	Felton Complex	10		4
4	Iron Horse Prairie			
5	Staffanson Prairie		100+	1
6	Sangl WMA		1?	
7	Regal Meadow		3	
8	Salt Lake WMA			
9	Prairie Marshes WMA		1	
10	Shaefer Prairie		3	
11	Chanarambie Creek,Sanke	2	1	
12	Lundblad Prairie	1		
13	Agassiz Dunes			
14	Ordway Prairie		10	3
15	Pembina Trail			
16	Glacial Lakes Park	4	2	
17	Roscoe Prairie		100+	1
18	Foxhome Prairie			
19	Sioux Nation WMA		6	
Second Priority				
20	Red Rock Ridge Prairie			
21	Tauer Prairie			
22	Chippewa Prairie	10	4	12
23	Expandere WMA		5	
24	Mountain Lake Prairie			
25	Storden 21 Hill Prairie		8	
26	Hythecker Prairie			
27	Kasota Prairie			
28	Rush Lake WMA		17	
29	Santee Prairie		7	
30	Cartney WMA			
31	Wild Indigo Prairie			
32	Sandpiper SNA			
33	Goose Lake			
34	Dugdale			
35	Pankratz Prairie Kertsonville WMA			
36	Malmburg Prairie			
37	Tympanuchus WMA	2		
38	Swedes Forest			
39	Blue Mounds Park			
40	Anna Gronseth Prairie			
41	Kettledrummer Prairie			
42	Town Hall Prairie			
43	Western Prairie North			
44	Cottonwood River			2
45	Miller Prairie			

		H. dacotae	O.poweshiek	S. idalia
Third Priority				
46	Prairie WMA/WPA			
47	Private Prairies			
48	Kilen Woods State Park			
49	Antelope Hills			
50	Yellow Bank Hills			1
51	Glynn Prairie		25	
52	Wapeton Prairie			
53	Wabun WMA		2	
54	Neal WMA			
55	Private Prairies			
56	Syre WMA			
57	Ottertail Prairie			
58	Crookston Prairie N			
59	Liberty WMA			
60	Ulen Prairie			
Total Sites		6	16	8
Total Number		29	295+	25

TABLE 2

TARGET SPECIES SUMMARY
1994 MINNESOTA PRAIRIE BUTTERFLY SURVEY

Site #	Name	Number Sighted H. dacotae	O. poweshiek	S. idalia
2	Audubon Prairie		1	
3	Felton Complex	0		
4	Iron Horse Prairie			
5	Staffanson Prairie		17*	4*
9	Prairie Marshes WMA		23	1
10	Shaefer Prairie			
11	Chanarambie Creek	1	25	10
12	Lundblad Prairie		4	
14	Ordway Prairie		3	12
15	Pembina Trail			
16	Glacial Lakes S.P.	5	5	1
19	Sioux Nation WMA		16	
25	Storden 21 Hill Prairie		8	2
27	Kasota Prairie			
29	Santee Prairie		9	
29.1	Wambach WMA		12	
30	Cartney WMA			
32	Sandpiper SNA			
33	Goose Lake Prairies			
35	Pancratz WMA	1		
35	Kertsonville WMA			
39	Blue Mound S.P.			
40	Anna Gronseth Prairie			
40.1	Wasmuth WMA			
41	Kettledrummer Prairie			
42	Town Hall Prairie			
43	Western Prairie North		1	
45	Miller Prairie			
46	Prairie WMA/WPA		1	1
50	Yellow Bank Hills			2
54	Neal WMA			
56	Syre WMA			
57	Ottertail Prairie SNA			
59	Liberty WMA			
60	Ulen Prairie		1	
61	Lazarus Creek		5	5
62	RW 22, Selborn			
63	Zimmerman		1	
Total Sites		4	16	9
Total Number		7	132	38

* via Swengel, not on this years list.

TABLE 3 TARGET SPECIES SUMMARY
1993-94 POWESHIEK AND DAKOTA SKIPPER SURVEY

#	Site	Number Sighted 93, (94) H. dacotae	O. poweshiek	S. idalia
First Priority				
1	Jeffers Petroglyphs			1
2	Audubon Prairie		(1)	
3	Felton Complex	10,(0)		4
4	Iron Horse Prairie			
5	Staffanson Prairie		100+,(17)*	1,(4)*
6	Sangl WMA		1?	
7	Regal Meadow		3	
8	Salt Lake WMA			
9	Prairie Marshes WMA		1,(23)	(1)
10	Shaefer Prairie		3	
11	Chanarambie Creek,Sanke	2,(1)	1,(25)	(10)
12	Lundblad Prairie	1	(4)	
13	Agassiz Dunes			
14	Ordway Prairie		10,(3)	3,(12)
15	Pembina Trail			
16	Glacial Lakes Park	4,(5)	2,(5)	(1)
17	Roscoe Prairie		100+	1
18	Foxhome Prairie			
19	Sioux Nation WMA		6,(16)	
Second Priority				
20	Red Rock Ridge Prairie			
21	Tauer Prairie			
22	Chippewa Prairie	10	4	12
23	Expandere WMA		5	
24	Mountain Lake Prairie			
25	Storden 21 Hill Prairie		8,(8)	(2)
26	Hythecker Prairie			
27	Kasota Prairie			
28	Rush Lake WMA		17	
29	Santee Prairie		7,(9)	
29.1	Wambach WMA		(12)	
30	Cartney WMA			
31	Wild Indigo Prairie			
32	Sandpiper SNA			
33	Goose Lake			
34	Dugdale			
35	Pankratz Prairie	(1)		
35.1	Kertsonville WMA			
36	Malmburg Prairie			
37	Tympanuchus WMA	2		
38	Swedes Forest			
39	Blue Mounds Park			
40	Anna Gronseth Prairie			
40.1	Wasmuth			
41	Kettledrummer Prairie			
42	Town Hall Prairie			
43	Western Prairie North		(1)	
44	Cottonwood River			2
45	Miller Prairie			

		H. dacotae	O.poweshiek	S. idalia
Third Priority				
46	Prairie WMA/WPA		(1)	(1)
47	Private Prairies			
48	Kilen Woods State Park			
49	Antelope Hills			
50	Yellow Bank Hills			1,(2)
51	Glynn Prairie		25	
52	Wapeton Prairie			
53	Wabun WMA		2	
54	Neal WMA			
55	Private Prairies			
56	Syre WMA			
57	Ottertail Prairie			
58	Crookston Prairie N			
59	Liberty WMA			
60	Ulen Prairie		(1)	
61	Lazarus Creek		(5)	(5)
62	RW 22 Selborn			
	Zimmerman		(1)	
TOTAL SITES		6,(3)	16,(16)	8,(9)
TOTAL COMBINED		7	25	15
TOTAL NUMBERS 93 and 94		36	427+	63

- via Swengel, not on 1994 list.

TABLE 4 SITE SUMMARY
POWESHIEK AND DAKOTA SKIPPER SURVEY

#	Site	County	Status	Year	
First Priority					
1	Jeffers Petroglyphs	Cottonwood	done	93	
2	Audubon Prairie	Clay	done	93, 94	*
3	Felton Complex	Clay	recheck	93, 94	
4	Iron Horse Prairie	Dodge	done	93, 94	
5	Staffanson Prairie	Douglas	done	93, 94	
6	Sangl WMA	Jackson	drop	93	
7	Regal Meadow	Kandiyohi	done	93	
8	Salt Lake WMA	Lac Qui Parle	drop	93	
9	Prairie Marshes WMA	Lyon	done	93, 94	
10	Shaefer Prairie	McCloud	done	93, 94	
11	Chanarambie Creek,Sanke	Murray	done	93, 94	
12	Lundblad Prairie	Murray	done	93, 94	
13	Agassiz Dunes	Polk	recheck	93	
14	Ordway Prairie	Pope	done	93, 94	
15	Pembina Trail	Polk	done	93, 94	
16	Glacial Lakes Park	Pope	done	93, 94	
17	Roscoe Prairie	Stearns	done	93	
18	Foxhome Prairie	Wilkin	drop	93	
19	Sioux Nation WMA	Yellow Medicine	done	93, 94	
Second Priority					
20	Red Rock Ridge Prairie	Brown	done	93	
21	Tauer Prairie	Brown	drop	93	
22	Chippewa Prairie	Chippewa	done	93	
23	Expandere WMA	Cottonwood	done	93	
24	Mountain Lake Prairie	Cottonwood	done	93	
25	Storden 21 Hill Prairie	Cottonwood	done	93, 94	
26	Hythecker Prairie	Dodge	drop	93	
27	Kasota Prairie	Le Seur	done	93, 94	
28	Rush Lake WMA	Mahnomen	done	93	
29	Santee Prairie	Mahnomen	done	93, 94	
30	Cartney WMA	Mower	done	93, 94	
31	Wild Indigo Prairie	Mower	drop	93	
32	Sandpiper SNA	Norman	done	93, 94	
33	Goose Lake	Pennington	done	93, 94	
34	Dugdale	Polk	drop	93	
35	Pankratz Prairie	Polk	done	93, 94	
35.1	Kertsonville WMA	Polk	done	93, 94	
36	Malmburg Prairie	Polk	drop	93	
37	Tympanuchus WMA	Polk	done	93	
38	Swedes Forest	Redwood	drop	93	
39	Blue Mounds Park	Rock	done	93, 94	
40	Anna Gronseth Prairie	Wilkin	done	94	
41	Kettledrummer Prairie	Wilkin	drop	93, 94	
42	Town Hall Prairie	Wilkin	done	94	
43	Western Prairie North	Wilkin	done	93, 94	
44	Cottonwood River	Brown	done	93	
45	Miller Prairie	Traverse	done	94	

Third Priority

46	Prairie WMA/WPA	Big Stone	recheck	93, 94
47	Private Prairies	Clay	recheck	
48	Kilen Woods State Park	Jackson	done	93
49	Antelope Hills	Lac Qui Parle	drop	93
50	Yellow Bank Hills	Lac Qui Parle	done	93, 94
51	Glynn Prairie	Lyon	done	93
52	Wapeton Prairie	Lyon	drop	93
53	Wabun WMA	Mahnomen	done	93
54	Neal WMA	Norman	done	93,94
55	Private Prairies	Norman	recheck	
56	Syre WMA	Norman	done	93, 94
57	Ottertail Prairie	Ottertail	drop	93, 94
58	Crookston Prairie N	Polk		with # 15
59	Liberty WMA	Polk	done	93, 94
60	Ulen Prairie	Clay	done	94

done= conditions and flight times were such that I have high confidence that species present were found.

DISCUSSION

During 1993 the weather was a dominant force in our efforts to complete this survey. Prior to the beginning of the survey, southwest Minnesota had above average rainfall and cool temperatures. The result was that the season was 10-15 days late as judged by emergence of butterflies and the maturity of nectar sources. The populations of most butterfly species were low. For example, the reconnisance surveys at Prairie Couteau yielded very few butterflies of any species (see data sheets following # 60). At that site, rains had been so heavy that the ash from spring burns was washed to the bottom of the hills and piled into drifts of small unburned pieces of grass. The burned portions had no duff on site, only bare soil without the usual invertebrate community. Between the visits on June 24 (175), July 1 (182), and July 5 (186), more heavy rains occured with extensive flooding in the region.

Central Minnesota was not as wet early in the 1993 season but large storms moved through during the survey period. The southern half of Chippewa Prairie (#22) had been flattened by a storm prior to July 18 (199). The prairie plants were flat and there were few insects in that portion. Chippewa was the only prairie with all three target species and it had good populations of other butterflies (1993). Had the storm moved down the length of the prairie instead of across it, the Dakota Skipper population would have been in jeopardy.

In the north region, there were also heavy rains between the 13th and the 15th of July, 1993. Many roads were flooded or washed out and many of the prairies were ponded in as much as 6 inches of water. It was noted that much of this water washed in from agricultural land and that aerial spraying was going on even over the standing water. Drainage ditches between the roadways and prairies were usually impassable. The phenology was not as far behind in the north.

Even though species diversity was low and populations were small on most prairies in 1993, there were prairies that were normal on both criteria. It seemed anomalous but in the midst of these low numbers, Chippewa Prairie (#22), Staffanson Prairie (#5), Roscoe Prairie (#17), Sandpiper SNA (#32) and Glynn Prairie (#51) seemed normal. At the other extreme, many prairies were ecologically non-functioning as far as prairie obligate butterflies were concerned. These included: Prairie Couteau, Sangl WMA (#6), Wapeton Prairie (#52), Mountain Lake Prairie (#24), Tauer Prairie (#21), Sioux Nation WMA (#19), Salt Lake WMA (#8), Foxhome Prairie (#18), Kettledrummer Prairie (#41), Agassiz Dunes (#13), Pankratz WMA (#35), Prairie Marshes WMA (#9) and Jeffers Petroglyphs (#1). It would seem that there is enough evidence to account for the low numbers by considering weather events, but the normal prairie counts were scattered across the region among the poor prairie counts. From this evidence we believe that many of the prairie obligate species are already stressed and this summer's weather only made it worse.

During the 1994 survey the weather was more normal. There were no previous flooding conditions this season. Southwest and central Minnesota seemed to have normal phenology. Northwestern areas however were dry and the phenology was apparently early. Drainage ditches that were flooded last year were dry to the bottom this year. At the Felton comlex of prairies the purple coneflowers were fully open but there were no Dakota Skippers to be found. This, even though the survey date was 14 days earlier that in 1993, during what is believed to be prime flight period.

Prairies which exhibited high numbers and good diversity in 1994 were; Iron Horse Prairie (4), Staffanson (5), Prairie Marshes (9), Chanarambie Creek (11), Ordway Prairie (14), Glacial Lakes State Park (16), Kasota Prairie (27), Cartney WMA (30) and Goose Lake Prairies. Many other sites had very low diversity and small populations.

There was a marked difference in the diversity and numbers of butterflies when comparing Pankratz (35) and Kertsonville (35.1) which are adjacent prairies (Table 5) in 1994. We can only surmise that differences in historical use patterns and/or management regimes account for these differences.

Table 5 Differences in Two Adjacent Prairies, Polk Co.

Prairie	Diversity (species)		Number per Hour	
	1993	1994	1993	1994
Pankratz	2	6	5.2	17.9
Kertsonville	7	9	29	51.1

There were also remarkable differences in the two management units on Prairie Marshes WMA on June 30, 1994. The north portion is good prairie and was managed this year by fire. The south portion was poor prairie and was not treated this year. Two surveys were completed, first with one investigator and the second with two.

Table 6 Differences in Managent Units at Prairie Marshes WMA
June 30, 1994
Butterflies per Hour

	Survey 1	Survey 2
North Unit	63	46
South Unit	200	130

In light of the conditions during 1993 and the lack of target species at the Felton complex and Pembina Trail in 1994, our challange is clear. We must have prairie invertebrate populations that can not only withstand the effects of isolation, agricultural influences, management practices designed for plant communities alone and the lack of grazers, but also the extremes of natural conditions. It is important to know how well the existing populations survive the extremes of the summer 1993 alone as well as long term hazards.

Prairies marked as "done" (Table 4), are sites where on the day and time of the survey, weather conditions were good enough that any emerged species should have been flying. Further surveys may be in order on these sites, but the species in question were not evident. Prairies marked "drop" are not appropriate habitat or are in such poor condition that the surveyors do not believe that the species will be found. Prairies marked "recheck" are sites that could not be surveyed, were not surveyed or where conditions were not good enough to conclude the absence of a species.

In the field, prairies were judged as to their apparent quality. High quality, refers to prairies dominated by native species and without signs of human impact. Low quality prairies were judged to be dominated by alien species and/or had signs of human impact. Medium quality sites were between high and low in character.

As stated in the methods section, in order to be sure the Dakota Skipper (Hesperia dacotae) flight had started, we did not begin the survey until they emerged on a prairie known to have them (July 5, 1993 (186) Hole-in-the-Mountain). On the last day of surveying, July 18, 1993 (199) Dakota was still flying at Chippewa Prairie (#22). During 1994 it flew from June 29 (180) to July 6 (187) for this survey. The first Poweshiek Skipperling (Oarisma poweshiek) was captured on July 6, 1993 (187) and they were still flying on the 18th of July. During 1994 it was found from June 29 (180) to July 7 (188). The first Regal Fritillary (Speyeria idalia) was sighted on July 8, 1993 (189) and they were also still out on July 18 (199). During 1994 it was found in the same span as Poweshiek.

Isolation is the factor that makes the management of these species crucial. Mistakes or miscalculations of the effects of any form of management, including lack of management, on any stage of the life cycle of prairie obligate invertebrates could be devastating to their survival in the prairie biome. Recolonization is the safety valve for this problem, but recolonization is probably possible only at the Felton complex of prairies, the prairies northeast of Mahnomen, the prairies between Crookston and Fertile, the prairies around Syre, and possibly Chanarambie Creek. In light of this isolation, each site must be managed as if it were the only prairie in the state or the last place, as it were, for each of these species.

With the Dakota Skipper not present in Illinois, Wisconsin, Iowa or Nebraska, but only limited to parts of the Dakotas and Minnesota on isolated prairies or groups of prairies its range does not represent much of the original tall-grass biome. Even more troubling is the poor showing of Dakota individuals in 1991 in Kittson County, Minnesota, with 3 isolated prairies (Cuthell, 1991) and only 7 prairies or complexes in 1993-4 (of the 19 former records checked), plus the small list of site records that weren't on the list to be checked this year. Also during 1993 Swengel found it on only 7 prairies (counting the Felton complex as one) (Swengel, 1993).

Proposals for Future Research

1. Due to the 7 of 19 results for 1993-4 it would seem crucial to survey the other "known" Dakota sites that were not in this survey. This should include the prairie bluffs along the Minnesota River northwest of Mankato to the North Dakota border.
2. Trial-run the survey techniques from Selbys work at Prairie Couteau.
3. Repeat a survey simular to this one on Atrytone arogos and Hesperia ottoe.
4. Research needs to be started on the possiblity of re-establishing Dakota Skipper on prairies where it has been lost.

Concerns for Prairie Obligate Insects

1. 1993-4 populations were very small, putting restricted species on the edge of extripation for some sites.
2. 1993's weather has altered the phenology of these insects with unknown outcomes for the viability of these populations.
3. The true status of these species is still in question due to the above circumstances.
4. The number of sites on which these species were found in 1993-4 was much reduced from the historical record or expected outcomes.
5. Most populations for Hesperia dacotae were restricted to very small portions of the habitat available.
6. Oarisma poweshiek was found in 25 of 61 sites checked and was not found in a large number of apparently appropriate habitats.
7. Speyeria idalia was only found in 15 places and 5 of those were represented by a single individual.
8. On many sites the whole appropriate habitat was managed in a single unit, reducing the possible diversity to its simplest denominator.

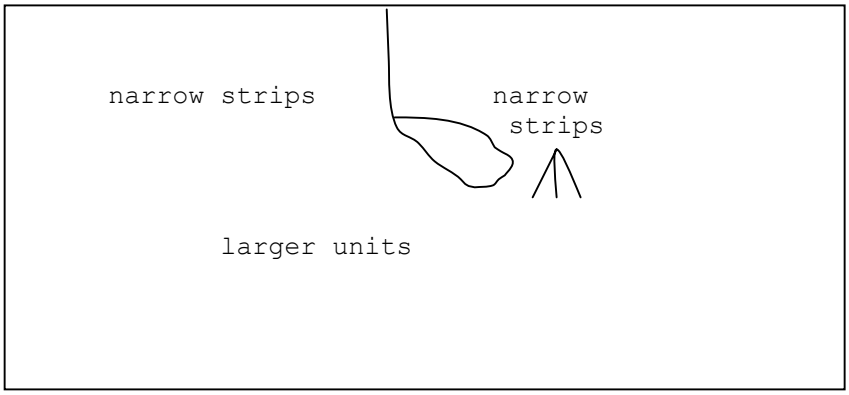
RECOMMENDATIONS

1. Identification and mapping of critical areas within each prairie site.
2. Due to the low populations we propose a moratorium on any large scale management on Dakota habitat for 1994, and until populations can be proven to be stable.
3. Development of management practices to protect these rare animals rather than plants which are not rare on the site.
4. Manage small patches with critical problems such as thistles.
5. Manage on a scale that is smaller than the smallest critical habitat.
6. Plan so that plants will be available in all stages of their life cycle at any one time as invertebrates need all stages from new sprouts to dead standing stems.
7. Burn in 5-10 year cycles, no more than 3 year cycles. Use other management options as well as fire.
8. Manage with a compelling reason or objective.
9. Randomize your management as to type, time, and placement.
10. Do not burn or mow adjacent units in consecutive years. For one unit to re-establish populations in another unit, the populations need more than one year to recover.
11. Burn in long narrow strips across the prairie each year from different sides, depending on wind direction. This will maximize perimeter and patchiness.
12. Determine responsibility for the protection of rare animals on prairies and other native biomes, with regulatory agencies empowered to supervise and enforce that protection. Discourage independent, autonomous action by local managers by the creation of performance evaluation criteria that reward enhanced biodiversity and discourage reduction or loss of rare species.
13. Calculate the actual area on which these species can be found within each prairie. For example the fact that Dakota at Glacial Lakes State Park, is on 10 acres of 1800 total, should not be construed to mean that this is an 1800 acre Dakota Skipper preserve.
14. Don't make up burns if they are missed because of weather or time. When accidental fires burn part of an area don't also burn the unit prescribed for that year.
15. Don't reburn patches that the fire misses, this is a natural characteristic of prairie fires.
16. If a fire is started and it burns poorly and covers only a portion of the unit, consider that to be the management for the year.
17. A management summary/history should be compiled for each site which documents management practices, problems, alien species, threatened or endangered species, exceptional climatic events and adjacent land uses. This management summary should include the goals and objectives of management, the techniques employed to accomplish these goals, and the results obtained in relation to the goals. This management summary should be updated semi-annually and collected for review, evaluation, and recommendation by a panel representing government, preservation organizations, academia and concerned private parties.
18. To fulfill the final objective of this project, and based on the evidence at hand, we recommend that these three species be moved up to provide more protection, on the both State and Federal lists.

SITE RECOMMENDATIONS

1. Jeffers Petroglyphs

Divide the northern part into more units without set borders and the south half into 2 or 3 units. Grazing is out of the question while the site is open to the public, but it would be a good site to showcase bison on the southern part of the property or on a expanded site. Hand remove woody growth; it wouldn't take long.



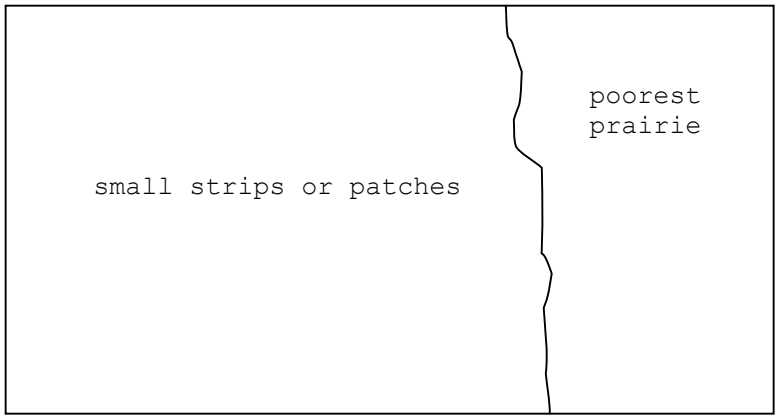
2. Audubon Prairie

The Dakota habitat is in the SE of Sec. 32 east of the creek. This area must be treated as if it were a single isolated Dakota site. It cannot all be in the same burn unit as it was this year. Whether or not a population survives, this parcel must be divided into at least 4 parts and treated diversely. Strip burns from the southwest to the northeast would be appropriate. This site is too sensitive to rely on only fire. Hand remove brush. Light grazing for a week or two each summer would add patch diversity to the site.

3. Felton complex

This site seems unusually homogeneous probably from haying. Mixed management would provide for more patchiness and more security for Dakota. Aspen should be managed without impacting a whole site. Problem areas lend themselves to mowing here. (See proposals)

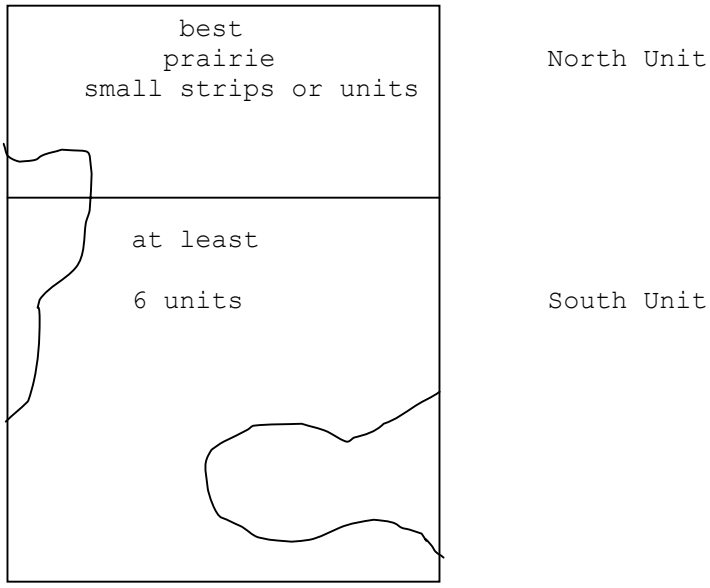
5. Staffanson Prairie
One of the best in the state, very diverse. (How has it come down to us so with so much more insect diversity than many of the others?) Use narrow strip burns very infrequently; mow problem part occasionally and hand remove brush. It will be a challange to see if we can preseve this diversity for another hundred years.



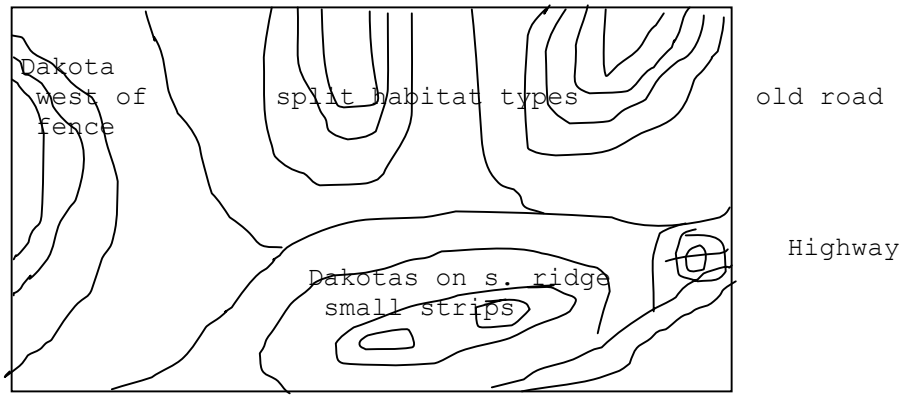
6. Sangl WMA
Reverse the management. Burn the old field and not the isolated prairie remnants. Keep the equipment for planting corn out of the prairies.

7. Regal Meadow
Treat the woody encroachment without losing diversity by not using large units.

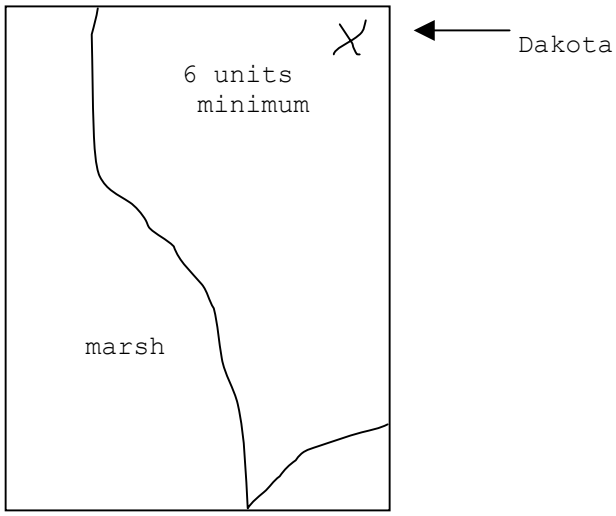
9 Prairie Marshes
With the diverse topography on this site, be sure that the management units are smaller than the habitat patches. There is not a woody problem, so don't manage the whole as though there was.



11. Chanarambie Creek, Sankey Bros.
A grazed prairie with good diversity, although it has not been grazed lately. All Dakotas were on one ridge. Manage using small patches on the south ridge.



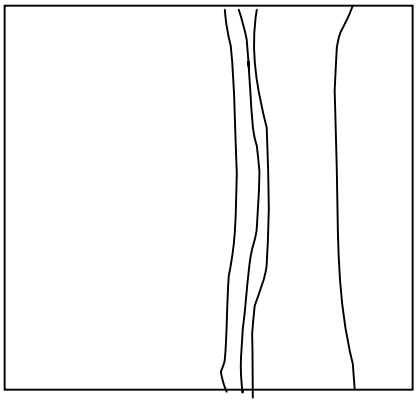
12. Lundblad Prairie
Dakota was near the NE corner. The prairie at this site is homogenous. Make at least 6 units and don't burn adjacent units.



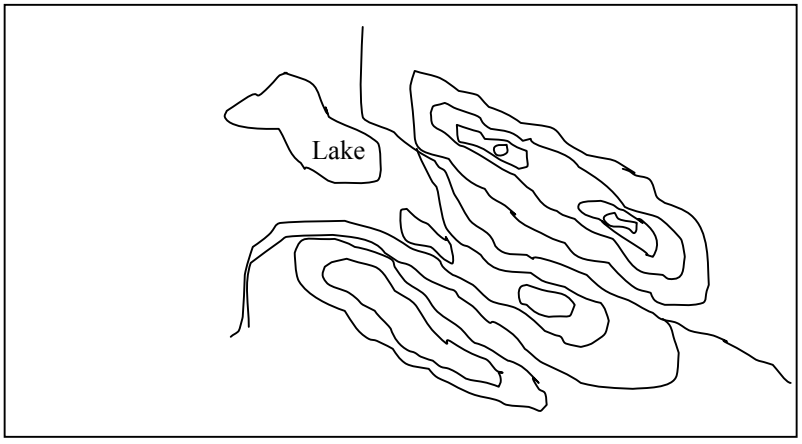
13. Agassiz Dunes
This site has been over simplified by the use of large fire units. Large patches of Prostrate Juniper have been damaged and are replaced by poison ivy and aspen. The aspen has been stimulated to resprout with excess fire as is their nature. Fire is not killing the aspen. Use many strip fires that follow across the site. Don't burn the aspen or you will have a mini forest that will cover much of the site. Control aspen sprouts with hand application of herbicides and keep the large stands from spreading in that manner.

14. Ordway Prairie
This site has a lot of natural patchiness. Management units should not include whole patches. Randomize management times. Sumac clones are especially bad in the east.

15. Pembina Trail, North Unit
This site was burned in a single unit with almost nothing left unburned. Use strips that cross habitat types. The 1993 burns caused extensive recruitment of sweet clover in 1994.



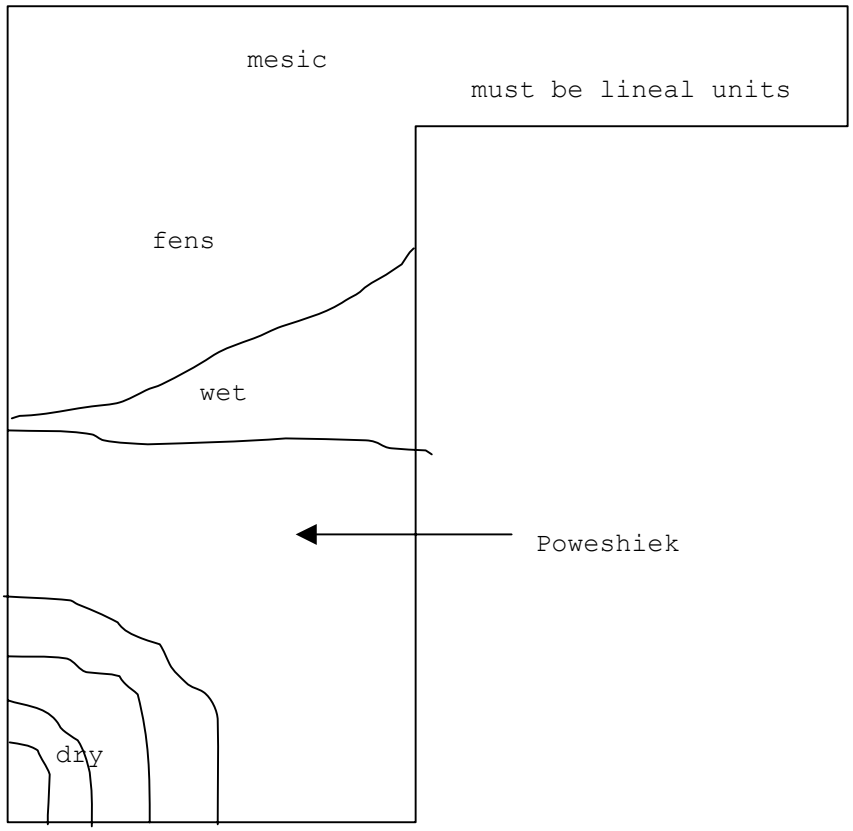
16. Glacial Lakes State Park
The Dakotas are in a very small portion of the Park. That one ridgetop must be treated as though it is an isolated patch. Use very narrow strip burns and burn as early as possible.



18. Foxhome and Kettledrummer Prairies
These prairies are very homogenous and could use more patchy management to increase heterogeneity.

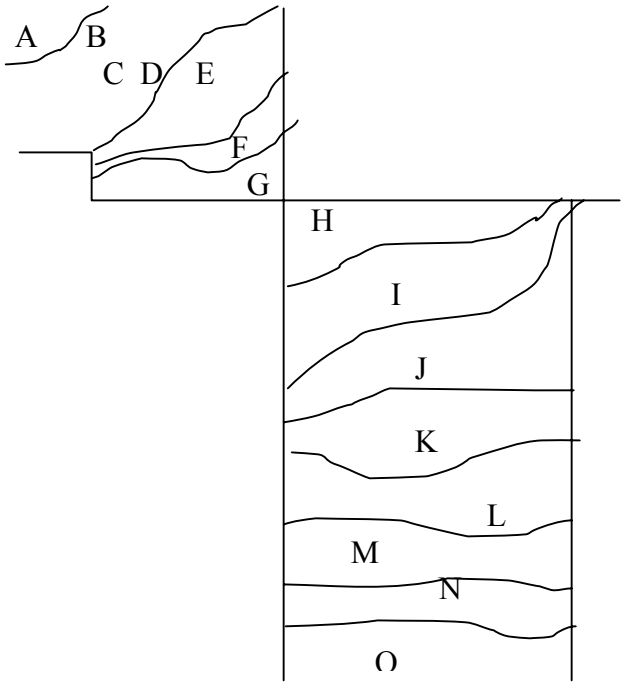
19. Sioux nation WMA

While this prairie is quite diverse and even has habitat regions, it is managed by burning only in two parts. The north half had been burned in total and had low insect numbers, whereas the south half had not been burned and had many more insects. Poweshiek was restricted to a rise in the center of the south unit. Manage in at least 6 parts per habitat unit. There is not a large woody problem. There are several fens which hold even more scarce elements and should never be burned in total.



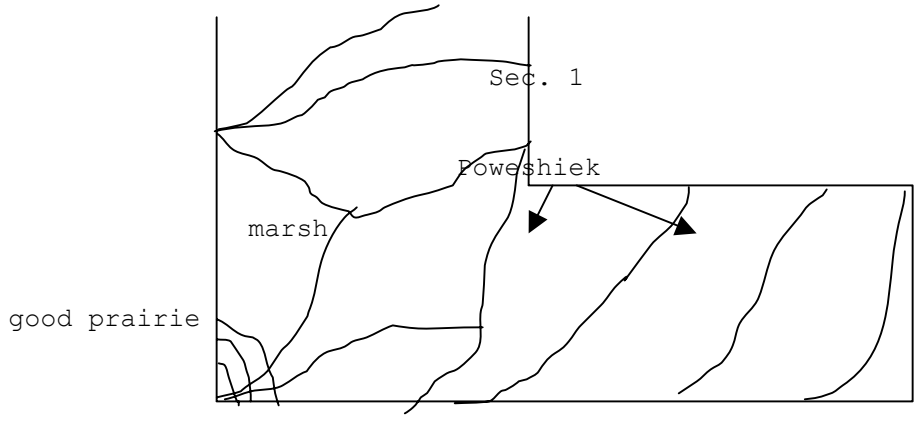
20. Red Rock Prairie
A homogeneous prairie, diversify management types, times and units to increase heterogeneity throughout the ridge.

22. Chippewa Prairie
Also a homogeneous prairie that would benefit from more patchy management. There was a big difference in the butterflies on either side of the road, which was probably caused by recent management. Use at least 6 units on either side of the road. Mowing could be used here but there was not a woody problem.



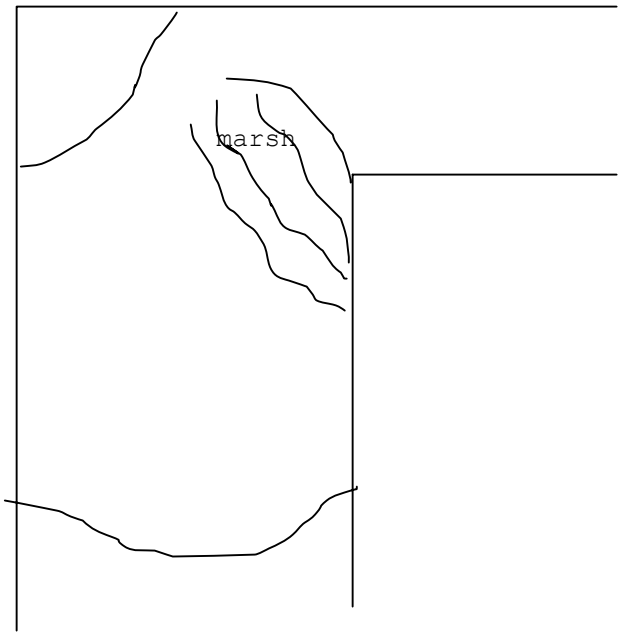
Never burn E and F the same year
or in consequitive years.
Example:
Year 1 burn or mow
A,D,G,J
Year 2 no management
Year 3 burn or mow
B,E,H,K
Year 4 no management
Year 5 burn or mow
C,F,I,L
Year 6 no management
Recycle

23. Expandere WMA
The north unit was diverse and had good numbers of butterflies. Spilt the main part into 5 parts. There is a good piece of prairie in the SW corner, split and burn one part ever three years.



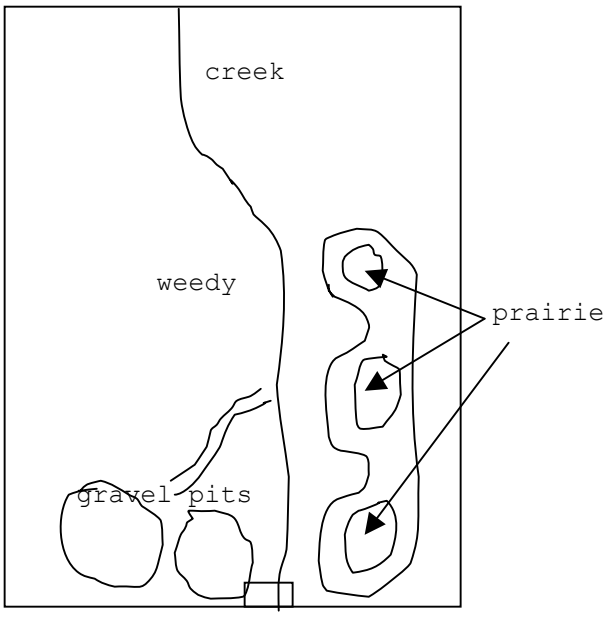
24. Mountain Lake Prairie

This prairie had no prairie obligates. Encourage them by dividing it into multiple units managed with mowing, grazing, hand removal of the woody plants and fire.



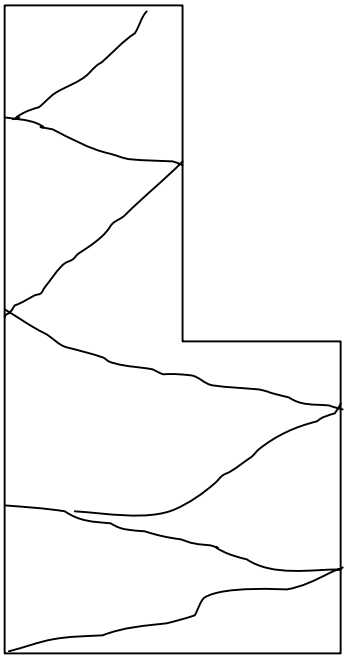
25. Storden 21

There are several good prairie hillsides on the east side of the stream. Manage in strips from west to east, with several strips per hillside patch. There is danger of fire getting into weeds and brush on private property to the east.



Manage the strips then the spaces between them 1 of 3 every other year.

28. Rush Lake WMA
Great prairie, keep it diverse by using multiple units and methods. Mow where you can.

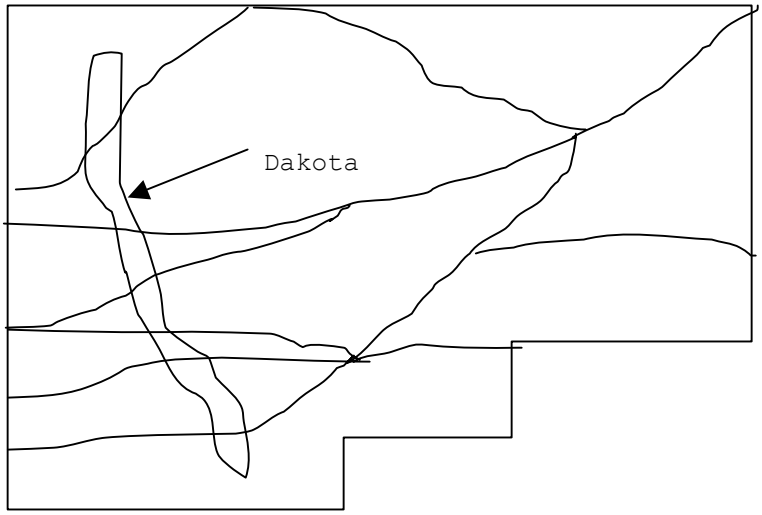


29. Santee and Wambach WMA
Manage as Rush Lake WMA above.

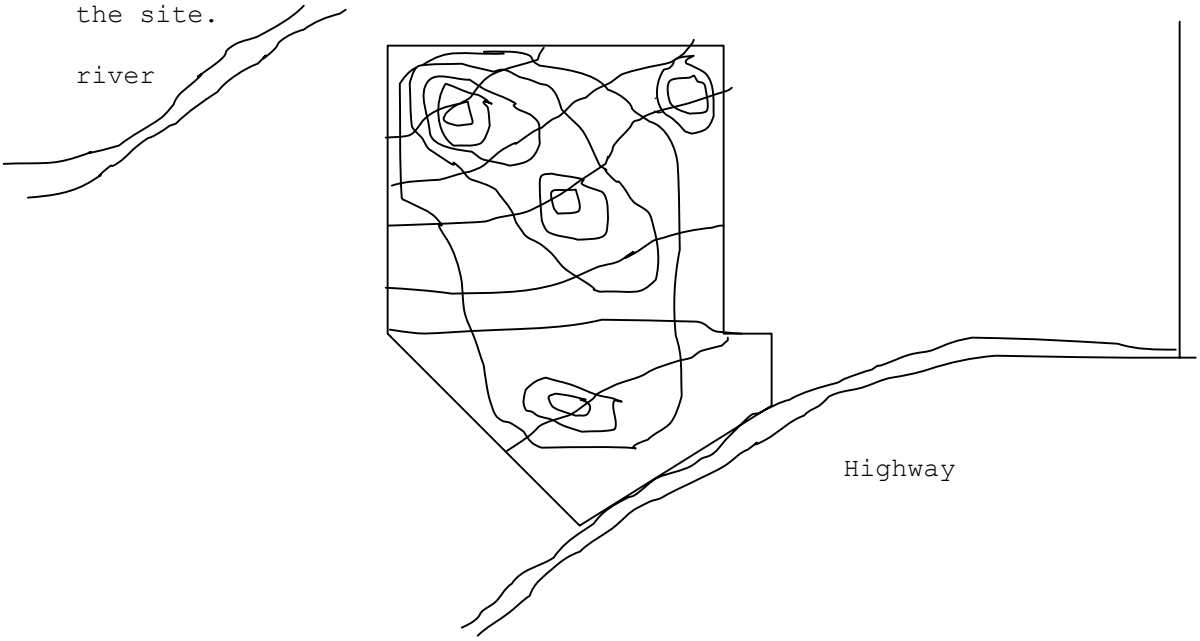
33. Goose Lake
Grazing has kept most of the aspen in check, continue with mowing in irregular patches.

35. Kertsonville/Pankratz
These areas are generally diverse albeit on a larger scale than most prairies. Pankratz is the least diverse of the two. Attempt to use 5-6 units on each and mix management. Prairie chicken populations might be helped with diverse leafhopper populations sequencing through the season and the area.

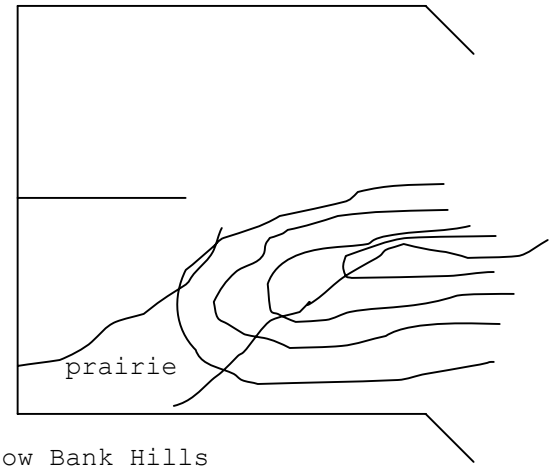
37 Tympanuchus WMA
The slight rise in the center that runs north-south is the critical habitat. It must not be put in one burn unit and needs as many units crossing it as possible.



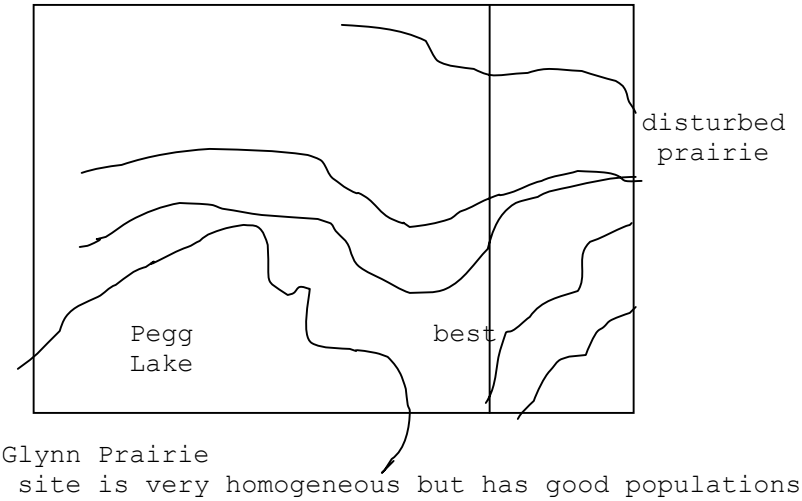
44. Cottonwood River Sec. 33
The SW 1/4 of Section 33 has both diverse topography and biota. There is isolation of habitat types within the site, so management needs to be conducted on a scale that is smaller than the natural patches. Use at least 8 units that cross most habitat types by running linearly from the SW to the NE. Split the SW facing slope several times and split the hilltops. Curtail the ATV use on the site.



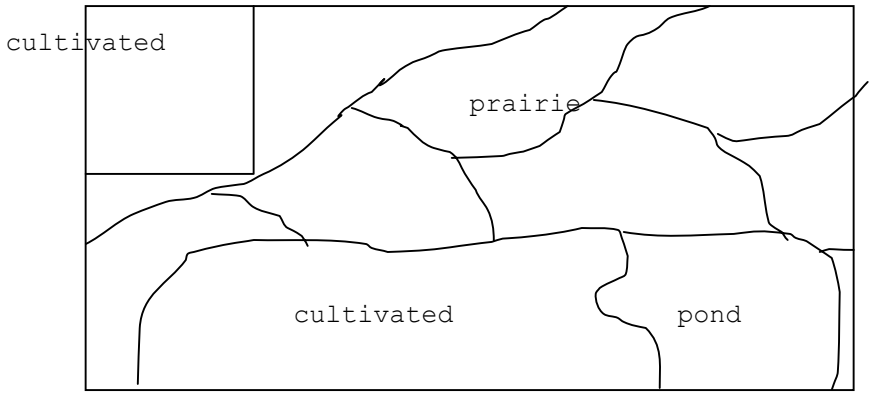
48. Kilen Woods State Park
Diversify the area by running multiple units up the slopes in fan shapes.



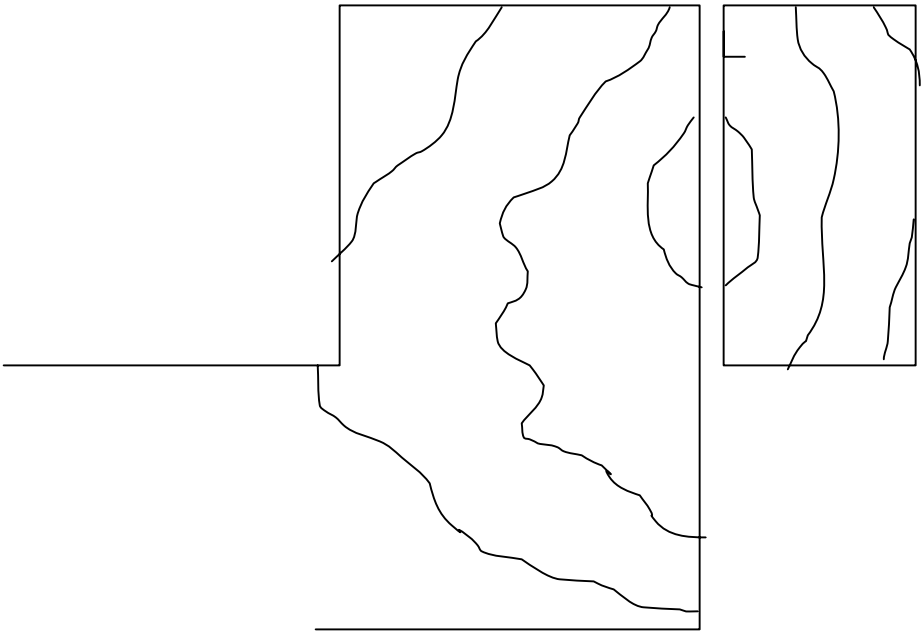
50. Yellow Bank Hills
This site has good diversity and patchiness. Management units should split ridges, hills, swails and the disturbed prairie on the east side.



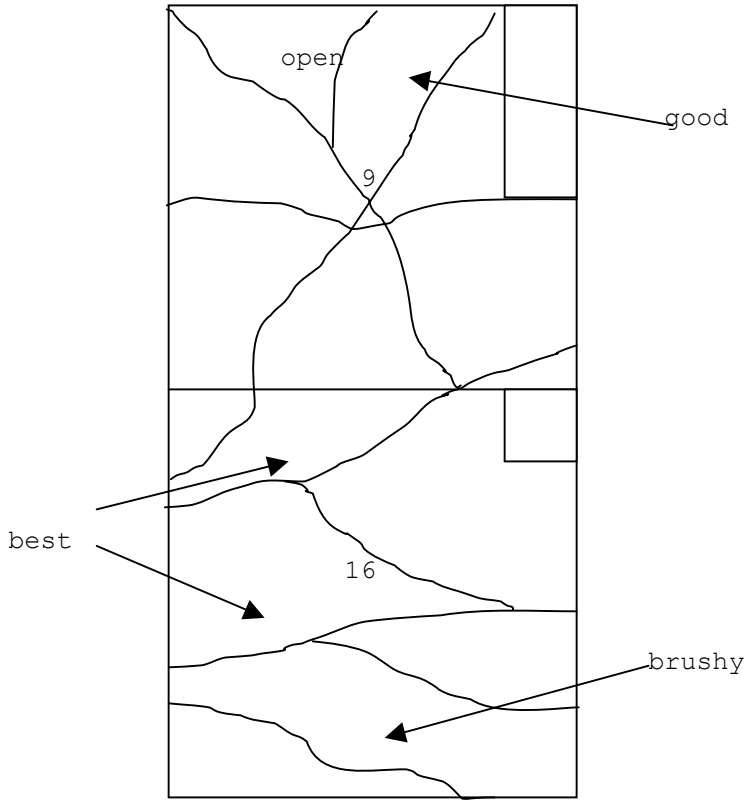
51. Glynn Prairie
This site is very homogeneous but has good populations of butterflies. Increase diversity by using multiple management types on multiple units. This site lends itself to mowing and light grazing. It would be an excellent model prairie to attempt to increase diversity.



53. Waubun WMA
Good diversity, don't simplify by using large units. Use 5 units on the west part and 4 on the east side.



59. Liberty WMA
There is low diversity in Section 9, use multiple patches. Survey for wetland shrubs like sage willow and plan units to prevent their loss to management. Manage the west side of Section 16 with east-west units.



LITERATURE CITED

Coffin, B. and L. Pfannmuller. 1988. Minnesota's Endangered Flora and Fauna. University of Minnesota Press, Minneapolis, 389pp.

Dana, R. 1991. Conservation Management of the Prairie Skippers Hesperia dacotae and Hesperia ottoe (Basic Biology and Threat of Mortality During Prescribed Burning in Spring), University of Minnesota, St. Paul, Minnesota, 63pp..

Ferris, C.D. 1989. Supplement to: A Catalogue/Checklist of the Butterflies of America North of Mexico. The Lepidopterists' Society Memior No. 3. 103 pp.

Kirby, Peter. 1992. Habitat Management for Invertebrates:. Royal Society for the Protection of Birds, Bedfordshire, 150pp.

Miller, L.D. and F. M. Brown. 1981. A Catalogue/Checklist of the Butterflies of America North of Mexico. The Lepidopterists' Society Memior No. 2. 280 pp.

New, T.R., 1991, Butterfly Conservation. Oxford University Press, Oxford, 224pp.

Opler, P.A. and G. Krizek. 1984. Butterflies East of the Great Plains, Johns Hopkins University Press, Baltimore, 294pp.

Opler, P.A. and V. Malikul. 1992. A Field Guide to Eastern Butterflies. Houghton Mifflin, Boston, 396pp.

Swengel, A.D. 1993. Research on the Community of Tallgrass Prairie Butterflies 1988-1993, Unpublished, Baraboo, Wisconsin, 137pp.

Wendt, K.M. 1984. A Guide to Minnesota Prairies. Natural Heritage Program. Minnesota Department of Natural Resources, 71pp.

APPENDIX A AVAILABLE UPON REQUEST… PLEASE SEE CONTACT INFO ON THE DNR REPORTS WEBSITE

APPENDIX B

Condition Scale

Preliminary Report, Status Survey....August 2, 1993

Budget and Expenses

STATUS SURVEYS FOR HESPERIA DACOTAE AND OARISMA POWESHIEK
IN MINNESOTA 1993
Preliminary Report August 2, 1993

#	site	county	target sp.	# sp.	notes
1	Jeffers Petroglyph	Cottonwood	idalia	5	west half burned
2	Audubon Prairie	Clay		6	all dacotae habitat burned this year
3	Felton complex	Clay	dacotae idalia	4	most stable site private=public in quality
4	Ironhorse Prairie	Dodge		8	lots of nectar
5	Staffanson Pr.	Douglas	poweshiek idalia	7	not burned, normal # of butterlies, top Q
6	Sangl WMA	Jackson	poweshiek	7	sighting only, burned all dacotae habitat
7	Regal Meadow	Kandiyohi	poweshiek	6	no regals
8	Salt Lake WMA	Lac Qui Parle		1	no native prairie
9	Prairie Marshes	Lyon	poweshiek	5	good dacotae habitat
10	Shaefer Prairie	McCloud	poweshiek	5	woody invasion
11	Chanarambie Ck	Murray	dacotae poweshiek	6	one south ridge only
12	Lundblad Prairie	Murray	dacotae	2	heavy with red clover
13	Agassiz Dunes	Polk		1	no prairie obligates est. 80% burn May 5. All dacotae habitat seen was burned, no leadplant beetles or leafhoppers* as seen on other unburned units, prostrate juniper is beening replaced by poison ivy. (* my names) aspen not impacted by fire but sprouts stimulated.
14	Ordway Prairie	Polk	poweshiek idalia	6	best on ridge facing parking lot (west) nothing in east and south areas. Past extensive burns.
15	Pembina Trail	Polk		5	North side completely burned this year, west half too wet for these species. Not even wood nymphs in burn. South good prairie on beach after 1/4 mile.
16	Glacial Lakes	Pope	dacotae poweshiek	5	All dacotae on part of one small ridge.
17	Roscoe Prairie	Stearns	poweshiek idalia	10	good site poweshiek 100+
18	Foxhome Prairie	Wilkin		1	all burned, location wrong in guide.
19	Sioux Nation WMA	Yellow Med	poweshiek	8	N. half total burn w/ low #. S. half unburned w/ higher # poweshiek on S. half
20	Red Rock Ridge	Brown		5	poor prairie, walked whole ridge, 2 people drop
21	Tauer Prairie	Brown			
22	Chippewa Prairie	Chippewa	dacotae poweshiek idalia	10	top prairie, poweshiek only north of road (?) S. 1/3 flat from storm
23	Expandere WMA	Cottonwood	poweshiek	5	best SW corner,SE site destroyed.pow.center N
24	Mountain Lake	Cottonwood		4	no prairie obligates all burned, little woody problem, 8 trees

25	Storden 21	Cottonwood	poweshiek	4	E of creek, W facing hills, not burned
26	Hythecker Prairie	Dodge		6	no nectar, dry areas burned
27	Kasota Prairie	Le Seur		8	recheck for dacotae
28	Rush Lake WMA	Mahnomen	poweshiek	4	poweshiek most common
29	Santee & Wambach	Mahnomen	poweshiek	5	poweshiek on both no burn
30	Cartney WMA	Mower		4	no nectar, ponded
31	Wild Indigo SNA	Mower		6	poor quality
32	Sandpiper SNA	Norman		5	ponded, good #'s
33	Goose Lake Pr.	Pennington		2	diverse,light graze prairie-fringed orchid
34	Dugdale WMA	Polk		1	all appropriate habitat burned (South)
35	Kertsonville/Pancratz	Polk		7	diverse, prairie chicken, recheck
36	Malmburg Prairie	Polk		2	not diverse
37	Tympanuchus WMA	Polk	dacotae	2	on slight rise, risky
38	Swedes Forest	Redwood			habitat not appropriate check bluffs N. of river
39	Blue Mounds S.P.	Rock		4	little good prairie
40	Gronseth-Wasmuth	Wilkin		0	poor quality, ponded
41	Kettledrummer	Wilkin		1	homogeneous prairie no prairie butterflies
42	Town Hall Pr.	Wilkin			low, wet, ponded, poor quality
43	Western Prairie N.	Wilkin		1	rise w/ porcupine gr. and rudbeckia
44	Cottonwood River	Brown	idalia	13	recheck for pow. & dac
45	Miller Prairie	Traverse			all □mud□ roads, couldn't get there
46	Prairie WMA/WPA	Big Stone		1	big trouble. almost solid with thistles, prairie seems to have been planted to corn for wildlife then abandond, small patch sw of pond.
47	Private Prairies	Clay			Did not visit, heavy rain, out of time and money to wait around.
48	Kilen Woods	Jackson		4	not much prairie habitat
49	Antelope Hills	Lac Qui Parle		2	blue grass w/ coneflower drop
50	Yellow Bank Hills	Lac Qui Parle	idalia	7	looks good for dacotae but most hilltops burned
51	Glynn Pr.	Lyon	poweshiek	3	poweshiek common, check management, lots of brome 4 red clover
52	Wapeton Pr.	Lyon		2	poor prairie, small only the hill is not under water
53	Wabun WMA	Mahnomen	poweshiek	8	good prairie, not burn
54	Neal WMA	Norman		2	poor pr. to wet/low brushy
55	Private Pr.	Norman			3mi S Gary covered w/ sweet clover, 2 mi west ponded, brushy recheck Section 35 prairie
56	Syre WMA	Norman		0	poor habitat, ponded
57	Ottertail SNA	Ottertail		1	poor prairie, low, wet
58	Crookston Pr.	N. Polk	see 15		
59	Liberty WMA	Polk		6	not appropiate habitat NE burned this year NE,SW better prairie
60	Uhlen Pr,	Clay			Ponded, recheck

Prairie Couteau Pipestone south unit burned in total this year, no dacotae as of July 5, few other insects.

Hole in the Mountain Lincoln Not burned this year, Had dsacotae as of July 5 with many other insects.

Data from D. Schlicht and M. Saunders, July, 1993.

Dennis Schlicht
1108 First Ave, R.R. 1
Center Point, IA
52213

1993 MINNESOTA SKIPPER SURVEY

Dennis Schlicht & Mike Saunders

Quarter Section Data

#	Site	Insect	Section	Quarter
3	Felton Complex	dacotae	31	S 1/4 *
3	-----	-----	6	N 1/4
3	------	idalia	31	S 1/4
3	Blazing Star	dacotae	5	NE
3	----	idalia	5	NE
3	Bicentennial	dacotae	5	SW
3	----	idalia	5	SW
5	Staffanson	poweshiek	18	NW & NE
5	Staffanson	idalia	18	NW & NE
7	Regal Meadow	poweshiek	16	NE
9	Prairie Marshes	poweshiek	1	NW
9	-------	-------	36	S of SW
10	Shaefer	poweshiek	34	SE
11	Chanarambie Creek	dacotae	3	SE
11	----	poweshiek	3	SE
12	Lundblad	dacotae	1	NW
14	Ordway	poweshiek	19	SW
16	Glacial Lakes	dacotae	24	NW
16	---	poweshiek	24	NE
17	Roscoe	poweshiek	35	NW
19	Sioux Nation	poweshiek	17	SW
22	Chippewa	dacotae	1	NW
-	--	-	12	SW
-	--	-	35	SE
-	--	poweshiek	35	SE
-	--	idalia	1	NW
-	--	-	12	SW
-	--	-	35	SE
23	Expandere	poweshiek	1	SW
-	--	-	1	SE
25	Storden 21	poweshiek	21	SW
28	Rush Lake	poweshiek	17	SW
29	Wambach	poweshiek	12	NW
-	Santee	--	6	SW
37	Tympanucus	dacotae	28	NW
44	Cottonwood	idalia	33	SW
50	Yellow Bank Hills	idalia	4	NE
51	Glynn	poweshiek	7	NE
53	Waubun	poweshiek	28	SW

* Felton Section 31 and 6 are half sections.

BUDGET AND EXPENSES

Total project funding $8.000.

Funding for Mike Saunders $1,300.

Funding for Dennis Schlicht $6,700.

Expenses for Dennis Schlicht

Mileage	4,392 mi @ .28=	$1,229.76	Gas and oil $205.66
Food		$245.66	
Lodging		$606.25	
Permits		$12.00	
Supplies		$290.60	
Telephone		$100.09	
Misc.		$36.00	
Total		$2,520.36.36	= $132.65/day in the field 19 days including travel
Remainder		$4,179.64	

Labor 416.25 hr = $10.04/hr for Dennis Schlicht