30 Stewart Ave.
Sioux City, IA 51104
3 August 1996

Kristine L. Askerooth
United States Department of the Interior
Fish and Wildlife Service
Tewaukon National Wildlife Refuge
9754 143-1/2 Avenue SE
Cayuga, ND 58013-9754

Dear Kristine,

Here is the revised final report of the North Dakota surveys. I corrected all the points that you marked and several others which I found on my own, coming back to it after several weeks. The only substantive one that I would mention is that the Regal Fritillary I found at Tewaukon was on the south side of Pool #3.5 rather than Pool #3, according to a Tewaukon NWR map that I have come across. I corrected the problem in the text; you might want to correct it on the aerial (I wrote Pool #3 on the pool itself.). The actual site marked is correct, but the pool is mislabeled. Since I surveyed the edge of both pools and they are both on the aerial, I did not change the section heading or aerial legend.

I hope these changes make it useful in planning future management and acquisition. For your information, I have sent Ron Royer two of last year's Hesperia dacotae, and some Oarisma Poweshiek and one of the Poanes viator from this year's survey for final confirmation and curation in North Dakota collections. I do not anticipate a change in identification, however.

If you have any questions or concerns, please let me know as soon as possible at (712) 258-2588 or 274-5426.

This letter should also serve as my bill. The second half of the $2600 is payable when you have accepted the report as corrected.

Sincerely,

Tim Orwig

Butterfly Surveys in Southeastern North Dakota: 1996

by Tim Orwig
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July 1996

for
United States Department of the Interior
Fish and Wildlife Service
Tewaukon National Wildlife Refuge
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Introduction and Methods

The goal of this study was to inventory butterflies and skippers on a number of wetland prairie sites in southeastern North Dakota, and pinpoint the location and abundance of the Dakota Skipper (Hesperia dacotae), Powesheik Skipper (Oarisma powesheik), Regal Fritillary (Speyeria idalia), and other rare butterflies. The sites inventoried are under the control of the U.S. Fish and Wildlife Service in three counties: Ransom, Richland, and Sargent. These surveys covered some sites previously inventoried (Orwig 1995), and some new sites.

Surveys in 1996 began on July 1 and concluded on July 10, when rainstorms and cloudy conditions moved in. As in the 1994 and 1995 North Dakota surveys, survey technique entailed walking transects of sites and recording the presence of species by quarter section, and exact locations of rare species. As suggested by Brown (1972), edge areas between habitats were also surveyed. If populations of Dakota Skippers were located, the habitat they occupied was to be mapped and population size estimated using techniques outlined by Pollard (1977), Thomas (1983), and Gall (1985), and standardized by Royer (1996). However, as only one individual was sighted, this was impractical. Presence in each section was confirmed by netting and releasing specimens, or occasionally by vouchering questionable specimens for later identification to species. Twenty-eight specimens were vouchered this year. Most voucher specimens remain in the collection of the author, although some will be forwarded to Dr. Ronald Royer at Minot State University for curation in North Dakota collections. The author's reference collection will eventually be deposited in a public research collection.

This report will document the results of the survey, with sites grouped into four areas, and detail sightings of rare species. It will also make preliminary recommendations on management for sites with rare species. In each site species list, rare species are printed in boldface type. An appendix will show locations of rare butterfly sightings on site maps. For sites covered in both 1995 and 1996, species lists at the end of this report tally sightings from both years. Species names throughout this report follow Royer (1988), the standard reference for North Dakota.

Results and Discussion

Overall, the most significant finding in this survey is that four of the eight habitat-restricted butterfly and skipper species identified as rare in North and South Dakota (Royer and Marrone 1992a-d) are present on the prairies south of Stacks Slough Waterfowl Production Area. The Dakota Skipper was confirmed at one site where it was first discovered last year (Orwig 1995): Hartleben Prairie #3 (Stacks Slough WPA). The Powesheik Skipper was confirmed at Hartleben Prairie #1 and #3, and also found in Hartleben #2 and another contiguous grassland tract. Additionally, the Powesheik was discovered at four other sites: Aaser Prairie WPA, Tewaukon National Wildlife Refuge, Krause WPA, and Gunness WPA. Single individuals of the Regal Fritillary were documented at Aaser Prairie WPA and Tewaukon National Wildlife Refuge. A further discovery was another skipper rare in North Dakota, the Broad-winged Skipper (Poanes viator), at both Hartleben Prairie and Aaser Prairie WPA.

Because of the cold winter and extensive snowfall, coupled with a cool cloudy spring, emergence for many summer butterfly species was delayed in North Dakota as much as in 1995, another late year. Unlike 1995, weather throughout the survey period, with a couple of exceptions, was ideal for surveying; days were either clear and sunny (if cool), or warm and cloudy. Most of the days found some skipper species up and flying at each site. Although negative results (not finding a particular species at a site on a particular day) are inconclusive, we do know that two of the targeted rare species should have been flying through most of the survey days. The Dakota Skipper was flying at Glacial Lakes State Park in central Minnesota (within 100 miles of the eastern sites) on June 30, and several slightly-worn female Dakotas were observed there on July 1. Royer (pers. comm.) noted the emergence of Dakota Skippers on several sites in central North Dakota on July 1, and in other areas of the state by July 5. The first Powesheik individuals were sighted on July 1; the population showed good numbers on July 7 and had begun to decline on July 10. The Regal Fritillary and Broad-winged Skipper, however, may not have emerged in North Dakota until the second week of surveys, although Regals were flying in extreme southeastern South Dakota on June 29.

Although rare species were documented this year, none of the sites had both the numbers of rare species and the acreage to indicate a secure population. The status of the Dakota Skipper on these sites is still quite insecure. Besides the small numbers at Hartleben (4 in 1995, 1 in 1996), the potential habitat there is very small, a single ridge probably less than 15 acres in area. The outlook for the other three rare species on Hartleben is more optimistic, since they are also present over a mile away on Aaser Prairie WPA, and the intervening habitat is still grassland. The Hartleben-Aaser-Stacks Slough corridor has the potential to support a large population of these three rare species. Royer (pers. comm.) believes it may be the most significant remaining North Dakota butterfly habitat under Fish and Wildlife Service protection. The Service should continue its efforts to acquire the intervening grazing and hay land, or work with the present landowners to encourage good management practices.

Altogether, these 1996 surveys documented 1082 individuals of 30 species of butterfly in southeastern North Dakota. Four of the records, indicated by an *, are possible county records.

Further surveys for the presence of these rare species in southeastern North Dakota are warranted. Good quality prairie sites, whatever the ownership, should be identified and

surveyed. While the potential for more Dakota Skipper sites is not high, there should be more sites containing the Powesheik and Broad-winged Skippers and the Regal Fritillary, given the numbers of marshes and wet prairies still remaining in the three counties. Considering its contiguity to the Stacks Slough sites, the Hankinson unit of the Sheyenne National Grasslands should be surveyed. Additional sites are likely on the native prairies within the former Sisseton and Wahpeton Indian Reservation and other sites on the Prairie Coteau. Considering the current condition of most of the Sheyenne National Grassland prairies, sites there are not likely to maintain populations of these rare butterflies much longer, although neighboring private lands such as Brown's Ranch still hold some hope. In southeastern North Dakota, overgrazing, succession, leafy spurge infestation, aerial herbicide treatments for leafy spurge, and conversion of grasslands to cultivation continue to reduce the acres which might support these native butterfly species.

Site Records

Sites surveyed are grouped into four areas, generally following priority ranking: Stacks Slough Waterfowl Production Area (Hartleben, Aaser, Prochnow), Tewaukon National Wildlife Refuge (Krause WPA, LaBelle Creek, Pool 4), Gunness WPA, and McGill WPA.

1. Stacks Slough Waterfowl Production Area, Richland County

A. Hartleben Prairie Several days were spent surveying sites bordering Stacks Slough WPA. Stacks Slough WPA is north of State Hwy. 11 between Hankinson and Lidgerwood in Richland County. Hartleben Prairie #1-3 is in the W1/2 of the NW1/4 of Sec. 16 (Hartleben #1 & 2) and the S 1/2 of the NE 1/4 of Sec. 17 (Hartleben #3) T130N, R50W (Map #1). The area is a high-quality native prairie hayfield that floods frequently. The two areas with highest elevation are the best butterfly habitat: Sec. 16 north of the double railroad bed (Hartleben #1) and Hartleben #3. All three areas contain deathcamas, buckbrush, wood lily, and showy milkweed, while Hartleben #3 also has black-eyed susan, yarrow, prairie turnip, wild rose, leadplant, silverleaf scurfpea, horsetail, and larkspur. Hartleben #3 has white ladyslipper orchid, while Fish and Wildlife Service personnel have transplanted western prairie fringed orchid from a prairie set to be destroyed by a private landowner into Hartleben #1. Both areas have some spurge problems, although the spurge is more widespread in Hartleben #1, around an area broken for alfalfa. The site was surveyed three times: July 1, July 7, and July 10. Deathcamas, whose bloom cycle often coincides with the flight of the Dakota Skipper in North Dakota, was close to full bloom on July 1, past full bloom on July 7, and nearly done blooming on July 10. Surveys on July 1 took place 4:00 to 6:15; wind from the west at 5 mph, 20% overcast, 82 degrees. Surveys on July 7 took place 12:15 to 6:00; wind from the west 5-20 mph, no overcast, 74 degrees. Surveys on July 10 were not conducted formally, but observations were made from 1:00 to 2:40; winds from the south 10-20 mph, 77 degrees, with overcast starting at 15% and advancing to 80%.

Hartleben #1

July 1 (4:00-4:25, 6:00-6:15)

4	Polites mystic	Long Dash
15	Clossiana selene	Silver-bordered Fritillary
5	Clossiana bellona	Meadow Fritillary

July 7 (12:15-12:40, 4:25-6:00)

69	**Oarisma powesheik**	**Powesheik Skipper**
1	Polites themistocles	Tawny-edged Skipper
8	Polites mystic	Long Dash
1	Colias philodice	Common Sulphur
8	Clossiana selene	Silver-bordered Fritillary
1	Cercyonis pegala	Common Wood Nymph

The Powesheiks were found here during systematic surveys on my return through this section, from 4:25-6:00. They were flying briskly through the areas with higher elevation and shorter grass, indicated on the map by shading. Powesheiks in larger groups like this tend to fly in a less-directed, more erratic path than those which are more dispersed. **Two additional Powesheiks** had crossed the trail and fence and were patrolling through the grasses in the recovering overgrazed grassland to the north, the SW1/4 of the SW 1/4 of S 9, T130N, R50W.

July 10 (1:00-2:15)

On a walk through the prairie with Kristine Askerooth, we observed a Red Admiral (Vanessa atalanta) and about **30 Powesheik Skippers**. These were not mapped.

Hartleben #2

July 7 (3:40-4:25)

2	**Oarisma powesheik**	**Powesheik Skipper**
1	Polites mystic	Long Dash
1	Clossiana selene	Silver-bordered Fritillary
1	Satyrodes eurydice	Northern Eyed Brown

These two Powesheiks were patrolling at the end of the cattails, just east of the sign on the abandoned railbed marking the eastern boundary of #2, but still on government land. Most of this tract is under water or too wet to support any forbs for nectar.

Hartleben #3

July 1 (4:25-6:00)

1	**Oarisma powesheik**	**Powesheik Skipper**
2	Polites themistocles	Tawny-edged Skipper
6	Polites mystic	Long Dash
7	Clossiana selene	Silver-bordered Fritillary
1	Phyciodes tharos	Pearly Crescentspot
4	Coenonympha inornata	Inornate Ringlet
1	Danaus plexippus	Monarch

July 7 (12:40-3:40)

2	**Oarisma powesheik**	**Powesheik Skipper**
1	**Hesperia dacotae**	**Dakota Skipper**
3	Polites themistocles	Tawny-edged Skipper
4	Polites mystic	Long Dash
1	**Poanes viator**	**Broad-winged Skipper**
1	Papilio polyxenes	Black Swallowtail
5	Colias philodice	Common Sulphur
1	Hyllolycaena hyllus	Bronze Copper
1	Clossiana selene	Silver-bordered Fritillary
2	Cercyonis pegala	Common Wood Nymph
1	Danaus plexippus	Monarch

At 2:25, a single Dakota Skipper female was flushed and flew to a perch on a wood lily, where it was netted. Because the species had been vouchered previously from this site, it was released. The Broad-winged Skipper was patrolling the abandoned railbed just east of the fence. The Powesheiks found in this section were both visiting black-eyed susans.

July 10 (2:20-2:40)
On a walk through the prairie with Kristine Askerooth, we observed a **single Powesheik Skipper**. Although no **Regal Fritillaries** were sighted on Hartleben #3 this year, Askerooth noted that Regals were very common on the site in late July of 1995, and are likely to fly in numbers later than the skipper flight times.

Hartleben #4
This is a former farmstead surrounded by severely degraded brome sandhills pasture, 75% of which is infested with leafy spurge. One of the spurge beetles, Cwzalena lacertosa, has been released on the site. Mixed in are a few remnant prairie plants: buckbrush, skeleton plant, showy milkweed, sage, and needleandthread. Sedges are present around the artesian well on the south border. There is very little nectar on the site, except common milkweed, yarrow, and woolly verbena. Scattered throughout the site are numerous cottonwoods and Russian olive trees. While I surveyed, two bald eagles circled overhead. The survey was conducted on July 10 from 9:10-11:30; wind from the SE 5-10 mph, 5% overcast, and 63 degrees.

1	Polites themistocles	Tawny-edged Skipper
2	Atrytone logan	Delaware Skipper
2	Colias philodice	Common Sulphur
1	Speyeria cybele	Great Spangled Fritillary
2	Phyciodes tharos	Pearly Crescentspot
2	Nymphalis antiopa*	Mourning Cloak
2	Basilarchia arthemis	White Admiral
6	Basilarchia archippus	Viceroy
25	Cercyonis pegala	Common Wood Nymph

B. Prochnow WPA Prochnow WPA (NW1/4 of the SW1/4 S8 T130N R50W) is extensively infested with leafy spurge (70%). It is frequently inundated. Although there are a few stalks of deathcamas in the northeastern corner, the site has few forbs and almost no nectar. In a survey on July 2, from 9:10-10:15 (0% overcast, 77 degrees) the following species were observed:

1	Ancyloxypha numitor	Least Skipper
1	Polites mystic	Long Dash
3	Hyllolycaena hyllus	Bronze Copper
1	Lycaeides melissa	Melissa Blue
13	Clossiana selene	Silver-bordered Fritillary
2	Satyrodes eurydice	Northern Eyed Brown
3	Coenonympha inornata	Inornate Ringlet

C. Aaser WPA The two halves of Aaser are very different.
Aaser #1 (N1/2 of the SE1/4 S12, T130N R51W) This site is an old prairie pasture on rocky dry glacial till, with several patches of leafy spurge. It has porcupine grass and a number of forbs: sage, pasture sage, false gromwell, scarlet gaura, silverleaf scurfpea, and extensive patches of buckbrush. A survey of the site on July 2, from 2:20 to 4:20 (10% overcast, 81 degrees), yielded the following species:

3	Polites themistocles	Tawny-edged Skipper

6	Polites mystic	Long Dash
1	Pontia protodice	Checkered White
1	Artogeia rapae	European Cabbage Butterfly
4	Hyllolycaena hyllus	Bronze Copper
1	Phyciodes tharos	Pearly Crescentspot
1	Cercyonis pegala	Common Wood Nymph

The site seemed more promising than the list would indicate.

Aaser #2 (SE1/4 of the SE1/4 S12 T130N, R51W, and SW1/4 S7, T130N, R50W; Map #2) This year I entered Aaser #2 from the west and encountered some of the better prairie on the site. Aaser #2 is very low, and some of those areas are inaccessible in wet years like 1995. I surveyed this site twice. The first survey, on July 2, did not locate rare species, despite good weather. However, a second survey on July 10, under much worse conditions, yielded three rare species. This site generally has white prairie clover, prairie turnip, silverleaf scurfpea, wood lily and deathcamas, with clover overseeded in section 12, the driest part of the site. This small corner has the easiest access and has probably been hayed in midsummer. Although this corner is lush, there were no rare skippers. However, section 7 is a sedgy meadow with white prairie clover, deathcamas, wood lily, spiked lobelia, horsetail, and white milkweed.

July 2 (11:10-2:00; 5% overcast, 79 degrees)

8	Polites themistocles	Tawny-edged Skipper
5	Polites mystic	Long Dash
1	Colias philodice	Common Sulphur
1	Lycaeides melissa	Melissa Blue
2	Clossiana bellona	Meadow Fritillary
1	Phyciodes tharos	Pearly Crescentspot
4	Satyrodes eurydice	Northern Eyed Brown
3	Coenonympha inornata	Inornate Ringlet

July 10 (11:50-12:45; wind S 10-20 mph, 10% overcast, 75 degrees)
Section 12 only

3	Colias philodice	Common Sulphur
1	Harkenclenus titus	Coral Hairstreak
1	**Speyeria idalia**	**Regal Fritillary**
1	Clossiana bellona	Meadow Fritillary
3	Cercyonis pegala	Common Wood Nymph

The Regal Fritillary flushed from the grass and flew out over the slough.

July 10 (3:00-5:30; wind from the S 10-20, 80-95% overcast, 77 degrees)
Section 7 only

2	**Oarisma powesheik**	**Powesheik Skipper**
1	Polites mystic	Long Dash
3	**Poanes viator**	**Broad-winged Skipper**
1	Colias philodice	Common Sulphur
2	Satyrodes eurydice	Northern Eyed Brown
17	Cercyonis pegala	Common Wood Nymph

The Powesheiks were flushed in the middle of the sedge meadow. The two Broad-winged Skippers were sighted on the old north-south fenceline which cuts across the west end of the section, and a third was flushed in the cattails at the edge of the slough to the north.

Management Recommendations for the Stacks Slough WPA Area

Because this site harbors four rare species of butterflies, special management considerations should be followed. As always, the previous management history of the site should be documented; apparently late-season haying was the only management of Hartleben #1-3, and Aaser #2 in many years. McCabe (1981) has recommended late-season haying for Dakota Skipper sites. Moffat & McPhillips (1993) note that haying may have reduced populations of Dakota Skipper at some sites. The F&WS should continue its current practice of cutting back on the frequency of that haying and leaving at least six inches of stubble. For the Dakota Skipper ridge at Hartleben #3, the haying regime could be reduced to haying only the north or south half of this ridge in any particular year. Royer and Marrone (1992c) indicate that the Powesheik Skipper "appears to be resilient under some haying regimes."

The current efforts to convert the cropland owned by F&WS to prairie in Sections 9 and 16, T130N R50W, Brightwood Twp., is a good step. It should introduce more nectar sources to the site, particularly in upland grasslands situations which are so rare around Stacks Slough. Only Aaser #1 would currently seem to have the upland habitat to support an additional population of Dakota Skippers. But the Dakota might eventually be able to spread to new prairie areas on Hartleben #1. The expansion into neighboring habitat by the recovering population of Powesheik Skippers on Hartleben #1 (from 17 individuals in 1995 to 69 in 1996) gives particular hope for this management technique.

Questions of overall habitat size and barriers to dispersal are very important at this site. Because the two halves of Hartleben with good butterfly habitat (#1 & #3) are completely separated by inundated habitat, a path and two railroad beds, they must be treated as separate sites and managed individually. While Regals can obviously cross the railroad beds and wet areas without problems, the more restricted Powesheik and (and especially the Dakota) may not be able to. Schlicht found that butterflies were unable to cross chain link fences at Big Sand Mound in southeast Iowa, and seemed unable to cross a road at Glacial Lakes in Minnesota (pers. comm.). Research by Ehrlich and others on butterflies inhabiting serpentine barrens in California indicates that some habitat-restricted species are very sedentary and unlikely to move far. Yet the fact that the F&WS controls nearly 5 sections total of continuous habitat here gives this area special priority as a refugium with long-term potential to preserve these rare species. While the F&WS must be responsive to demands for multiple land uses, the presence of these four butterfly species and two orchid species should make preserving biodiversity the top management priority for Stacks Slough WPA.

Although encroachment by woody plants on these sites would be detrimental, fire is not recommended as a management tool for the Dakota Skipper (Royer & Marrone 1992b) generally, and should be weighed carefully on Hartleben #1, Hartleben #3, and Aaser #2, because of their small size and isolation. Historically prairie fire was used by pioneers and economic entomologists to control or destroy insect populations. Because of isolation from nearby prairie of significant quality, natural cycles of recolonization of a burned area by insects from the surrounding prairie no longer work; the populations will have to survive on site in spite of fire. The decision not to use fire at all on the ridge where the Dakota still remains at Hartleben #3 is a sound one. There is no concern over woody succession on this ridge. Any isolated prairie should be divided into smaller management units if fire is used, and should be burned on an extreme long-term rotation. The practice of using patchy "fingering" fires on small portions of Hartleben #1 seems to have been

beneficial. Because of the surrounding wetlands, fire may not have been a significant part of the natural ecosystem at Stacks Slough, except in years of drought. Aaser #1 and Hartleben #2 should also be subdivided if fire is used. However, larger scale fire might be used on Prochnow and Hartleben #4.

All three high-quality sites (Hartleben #1 & 3, Aaser #2) have small but significant leafy spurge infestation problems. These should be handled swiftly but very carefully by wick application of herbicide. The area of heaviest infestation in Hartleben #1, for example, is also the center of the Powesheik population. Blanket-spraying spurge management is likely to destroy the forbs which adults need for nectar sources without completely eradicating the problem. This may have been what happened under private control on Hartleben #4 and Prochnow. The heavy spurge infestation on these last two sites is certainly a matter of some concern. Finally, if the patches on Aaser #1 continue to spread, they will choke out a potentially very valuable habitat.

2. Tewaukon National Wildlife Refuge, Sargent County

A. Krause Waterfowl Production Area Krause WPA is on the northeast corner of Tewaukon National Wildlife Refuge in Sargent County (E1/2 of NE1/4 of Sec. 5 and NW1/4 of Sec. 4, T129N, R53W, Kingston Twp.; Map #3), and includes most of Krause Slough. Surveys took place twice, on July 4 and July 9. The site is a prairie pasture which has been heavily grazed in the past, but is being restored through fire and other management techniques. Prairie plants found on the site include buckbrush, scarlet gaura, silverleaf scurfpea, sage, prairie turnip, leadplant, larkspur, needleandthread, porcupine grass, hoary puccoon, locoweed, Canada anemone, buffalo bean, wild rose, false gromwell, yarrow, and purple coneflower. The site does have invasive brome, particularly in the SE1/4 of the NE 1/4 of S5. Other invasive species include alfalfa and thistle, particularly around the edges of the numerous potholes on the site. Leafy spurge infestation rate is low, at about 5%. The NE 1/4 of the NW 1/4 of S4 is an old crop field which has been seeded to natives; because there were very few nectar sources in this area, I did not survey it much. The staff at Tewaukon NWR have observed the **Regal Fritillary** at Krause WPA in past years, although it was not observed during my visits.

Section 5

4 July 1996 (9:00-11:45, S wind 5-15, 10% overcast, 70 degrees, after an overnight rain)

2	Polites themistocles*	Tawny-edged Skipper
23	Polites mystic	Long Dash
3	Colias philodice	Common Sulphur
1	Hyllolycaena hyllus	Bronze Copper
1	Epidemia helloides*	Purplish Copper
1	Lycaeides melissa	Melissa Blue
1	Basilarchia archippus	Viceroy
7	Satyrodes eurydice	Northern Eyed Brown
11	Coenonympha inornata	Inornate Ringlet
7	Cercyonis pegala	Common Wood Nymph
1	Danaus plexippus	Monarch

9 July 1996 (3:10-5:10, N wind 10, 10% overcast, 73 degrees)

22	Polites mystic	Long Dash
22	Colias philodice	Common Sulphur

9	Hyllolycaena hyllus	Bronze Copper
1	Nymphalis antiopa	Mourning Cloak
8	Satyrodes eurydice	Northern Eyed Brown
63	Cercyonis pegala	Common Wood Nymph
1	Danaus plexippus	Monarch

Section 4

4 July 1996 (12:10-1:35, S wind 14, 10% overcast,79 degrees)

5	Ancyloxypha numitor	Least Skipper
1	**Oarisma powesheik**	**Powesheik Skipper**
1	Polites themistocles	Tawny-edged Skipper
9	Polites mystic	Long Dash
1	Artogeia rapae*	European Cabbage Butterfly
4	Colias philodice	Common Sulphur
2	Hyllolycaena hyllus	Bronze Copper
3	Lycaeides melissa	Melissa Blue
1	Satyrodes eurydice	Northern Eyed Brown
5	Coenonympha inornata	Inornate Ringlet
1	Cercyonis pegala	Common Wood Nymph
2	Danaus plexippus	Monarch

The single Powesheik was patrolling a small clearing of buckbrush and brome on the edge of the native prairie, within a few feet of the old road that bisects this quarter section. The old field seeded to natives is across the path. Nothing in this area seemed particularly conducive to the presence of Powesheik.

9 July 1996 (5:10-6:00, N wind 10, 10% overcast, 73 degrees)

1	Polites themistocles	Tawny-edged Skipper
2	Polites mystic	Long Dash
7	Colias philodice	Common Sulphur
16	Cercyonis pegala	Common Wood Nymph

Krause WPA was probably the lushest and most diverse site, botanically, of any that I visited this year. The presence of two rare butterfly species on the site makes it an important one. Yet despite two extensive surveys during good weather, there is little evidence of significant populations of either of these species. In fact, they may have come into the site from nearby grasslands, although none of the neighboring grassland looks particularly promising. The resulting management question is a very interesting one. Are the low numbers indicative of remnant populations which have been severely affected by overgrazing and fire management, or are they populations from nearby grasslands migrating back in to take advantage of the much improved, lusher prairie which has been reestablished on the site? Since this site is not completely isolated, it is impossible to say. Certainly, now that the prairie has begun to respond to various management techniques, it seems reasonable to begin to subdivide and increase the number of fire management units and reduce the burn frequency, particularly on the northern part of Section 5. Whatever the history of these rare species on this site, their long-term survival will depend on very conservative fire management, possibly combined with some late-season haying where practical.

B. LaBelle Creek, Tewaukon NWR (E1/3 NW1/4 S5, T129N, R53W)

This site, the east bank of LaBelle Creek, contains some dry bluff prairies and a wet meadow, although the extent of the prairie is small. Most of the area east of the bluff has

been tilled. The prairie does contain porcupine grass and needleandthread, wild rose, larkspur, scarlet gaura, buckbrush, purple coneflower, silverleaf scurfpea, leadplant, Canada anemone, sage, and skeleton plant. No rare butterflies were sighted. A survey on July 4 (2:00-4:15, S wind 5 mph, 15% overcast, 85 degrees) netted the following species:

7	Ancyloxypha numitor	Least Skipper
2	Polites themistocles	Tawny-edged Skipper
5	Polites mystic	Long Dash
6	Glaucopsyche lygdamus	Silvery Blue
3	Phyciodes tharos	Pearly Crescentspot
1	Basilarchia arthemis	Red-spotted Purple
2	Basilarchia archippus	Viceroy
2	Satyrodes eurydice	Northern Eyed Brown
4	Coenonympha inornata	Inornate Ringlet
5	Cercyonis pegala	Common Wood Nymph

This site should have yielded more species. Possibly it will serve as a recolonization site for species which may be holding on at other prairies on the refuge.

C. Pool 4, Tewaukon NWR (N1/2 SE1/4 S28, T130N, R54W)
This site, on the north bank of the Wild Rice River, is a steep southerly facing bank. It is mostly brome, with a few prairie plants: leadplant, buckbrush, wild rose, scarlet globe mallow, sage, silverleaf scurfpea, Canada anemone, larkspur, and purple coneflower. The site was burned this spring. No rare butterflies were sighted. A survey on July 4 (4:30-6:00, S wind 5 mph, 40% overcast, 85 degrees) yielded the following species:

21	Polites mystic	Long Dash
1	Atrytone logan	Delaware Skipper
1	Artogeia rapae	European Cabbage Butterfly
3	Hyllolycaena hyllus	Bronze Copper
2	Glaucopsyche lygdamus	Silvery Blue
4	Lycaeides melissa	Melissa Blue
7	Coenonympha inornata	Inornate Ringlet
4	Cercyonis pegala	Common Wood Nymph

I surveyed two other sites on Tewaukon NWR which were not in the original contract. They yielded some interesting records of single individuals:
D. White Lake, Tewaukon NWR (S1/2 S34 and SE1/4 S35, T130N, R54W) I surveyed this site in two parts on July 9. This site has brome and alfalfa, but also has wild rose, silverleaf scurfpea, buckbrush, sage, leadplant, purple coneflower, and Canada anemone. There was no spurge here except in the road ditch. From 9:05 to 11:30 (no overcast, W winds 5 mph), the following species were seen in section 34, in a walk around West White Lake:

1	**Oarisma powesheik**	**Powesheik Skipper**
1	Polites mystic	Long Dash
2	Atrytone logan	Delaware Skipper
19	Colias philodice	Common Sulphur
16	Hyllolycaena hyllus	Bronze Copper
1	Glaucopsyche lygdamus	Silvery Blue
3	Lycaeides melissa	Melissa Blue
64	Cercyonis pegala	Common Wood Nymph
1	Danaus plexippus	Monarch

The Powesheik Skipper was found on a dry hill to the southeast of East White Lake, just west of the section line. This xeric prairie was burned this spring, and contained blooming

skeleton plant. Because of this discovery, I returned to this point and surveyed to the east, in section 35, from 11:40-12:15 (5% overcast, NW winds 15-20):

3	Polites mystic	Long Dash
1	Colias philodice	Common Sulphur
4	Cercyonis pegala	Common Wood Nymph

E. Pool 3, Tewaukon NWR (S1/2 S27, T130N, R54W; north bank of the Wild Rice River) This fire-managed prairie has brome but no leafy spurge. Prairie plants found on this site are buckbrush, sage, larkspur, Canada anemone, silverleaf scurfpea, leadplant, and purple coneflower. On July 9, from 1:05 to 2:00 (5% overcast, NW winds at 5 mph, 73 degrees), I surveyed around the edge of Pool #3.5 in the southeast quarter of the section (Map #4).

6	Polites mystic	Long Dash
3	Colias philodice	Common Sulphur
1	Colias eurytheme	Orange Sulphur
1	Hyllolycaena hyllus	Bronze Copper
4	Lycaeides melissa	Melissa Blue (including a mated pair)
1	**Speyeria idalia**	**Regal Fritillary**
47	Cercyonis pegala	Common Wood Nymph

From 2:10-2:50, I surveyed the dry bluffs above the Wild Rice River in the southwest quarter of the section.

1	Polites themistocles	Tawny-edged Skipper
2	Polites mystic	Long Dash
5	Atrytone logan	Delaware Skipper
1	Artogeia rapae	European Cabbage Butterfly
4	Colias philodice	Common Sulphur
5	Hyllolycaena hyllus	Bronze Copper
1	Glaucopsyche lygdamus	Silvery Blue
1	Nymphalis antiopa	Mourning Cloak
67	Cercyonis pegala	Common Wood Nymph
1	Danaus plexippus	Monarch

Management Recommendations for the Tewaukon NWR Area

Tewaukon National Wildlife Refuge has two rare species of butterflies, the Regal Fritillary and the Powesheik Skipper. Both are present at Krause WPA, and single individuals of each species have been found in other areas of the refuge at several miles distance. Further biological surveys should be done on refuge lands and on the adjoining state lands. As noted above in the discussion of Krause WPA, the question remains whether these small numbers are surviving on site or migrating in from nearby prairies. Refuge personnel have the somewhat conflicting tasks of reviving degraded prairies and maintaining butterfly populations. But the amount of grassland which the Refuge protects--enough to sustain populations of these butterflies long term-- makes the careful balancing of these priorities worth the effort.

3. Gunness Waterfowl Production Area, Richland County

Gunness Waterfowl Production Area is four quarter sections 2 miles south of Hankinson. I surveyed this site on two days. The southern 3/4 of the site (E1/2 S2, NE1/4 S11,

T129N, R50W), was surveyed on July 3 (9:30-2:00) under 100% overcast. This site is overgrazed prairie with buckbrush and wood lily. It is a diverse habitat, with extensive sloughs and potholes, upland savanna, lake shore, and old field. Spurge infestation is 10%. There are a few stalks of deathcamas in a small prairie between the slough and a wooded spot in the SW1/4 of the SE1/4 of section 2. Although this site is rough, it did contain one Powesheik Skipper; I had hoped to resurvey it in better weather before the rains moved in on July 11. The Powesheik was on a slight slope next to the slough in the NE1/4 of section 2 (Map #5)

1	**Oarisma powesheik**	**Powesheik Skipper**
6	Polites mystic	Long Dash
1	Lycaeides melissa	Melissa Blue
3	Clossiana selene	Silver-bordered Fritillary
21	Phyciodes tharos	Pearly Crescentspot
3	Satyrodes eurydice	Northern Eyed Brown

I returned to Gunness WPA on July 5 and surveyed the northern 1/4 (SE1/4 S35, T130N, R50W). The site has invasive brome and leafy spurge (5%). This site is much better-looking prairie than that to the south, and contains porcupine grass, needleandthread, wild rose, sage, deathcamas, leadplant, wood lily, buckbrush, black-eyed susan, showy milkweed, silverleaf scurfpea, Canada anemone, and larkspur. Conditions were ideal for the survey (9:30-12:30; no clouds, S wind 10-15, 75 degrees), but no rare butterflies were found.

1	Polites themistocles	Tawny-edged Skipper
8	Polites mystic	Long Dash
1	Artogeia rapae	European Cabbage Butterfly
1	Colias philodice	Common Sulphur
2	Clossiana selene	Silver-bordered Fritillary
2	Phyciodes tharos	Pearly Crescentspot
2	Cercyonis pegala	Common Wood Nymph

4. McGill Waterfowl Production Area, Ransom County

McGill WPA is rocky glacial-till prairie around potholes in extreme southwestern Ransom County (E1/2 SW1/4 S29, N1/2 S32, T133N, R58W). This prairie has been overgrazed and overseeded with brome, but contains no leafy spurge. Prairie plants found include buckbrush, sage, pasture sage, Canada anemone, false gromwell, scarlet gaura, wild rose, leadplant, silverleaf scurfpea, showy milkweed, and wood lily. Section 29 has more alfalfa on the uplands, but also has two nice prairie ridges at the northeast and northwest corners of the wetland, with gray-headed prairie clover, white prairie clover, and purple coneflower. I surveyed both sections on July 8. Section 32 (10:10-1:00; 95% overcast, WNW winds 15 mph, 70 degrees) yielded this list:

1	Polites themistocles	Tawny-edged Skipper
37	Polites mystic	Long Dash
2	Atrytone logan	Delaware Skipper
4	Colias philodice	Common Sulphur
5	Hyllolycaena hyllus	Bronze Copper
1	Glaucopsyche lygdamus	Silvery Blue
1	Basilarchia archippus	Viceroy
25	Cercyonis pegala	Common Wood Nymph

The afternoon survey on Section 29 (1:30-2:45; 95% overcast, WNW winds 15-20 mph, 72 degrees) yielded fewer species:

4	Polites mystic	Long Dash
1	Lycaeides melissa	Melissa Blue
18	Cercyonis pegala	Common Wood Nymph
1	Danaus plexippus	Monarch

Conclusion

Management issues will continue to get more complicated with the spread of leafy spurge and the great pressures put on North Dakota prairies by grazing. As more prairies in southeastern North Dakota are converted to farming, these pressures will only increase. Beyond these basic issues, there are still the complicated issues of the effects of fire management on prairie invertebrates such as rare butterflies.

These surveys give a good overview of a critical period in North Dakota history. Decisions made now in Bismarck and Washington will set the course for rare species like these butterflies. I do hope that future researchers will be able to continue studying these butterflies.

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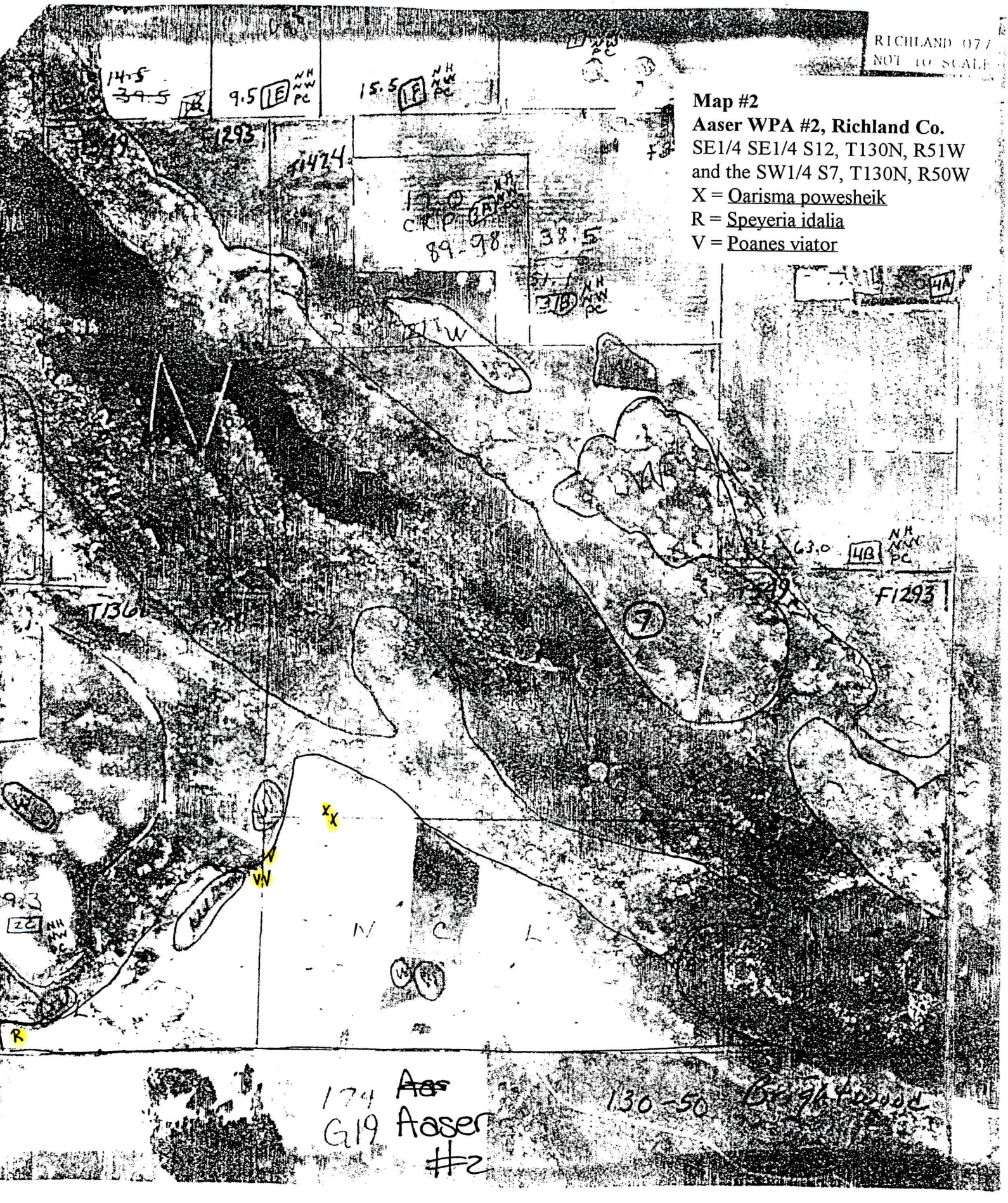
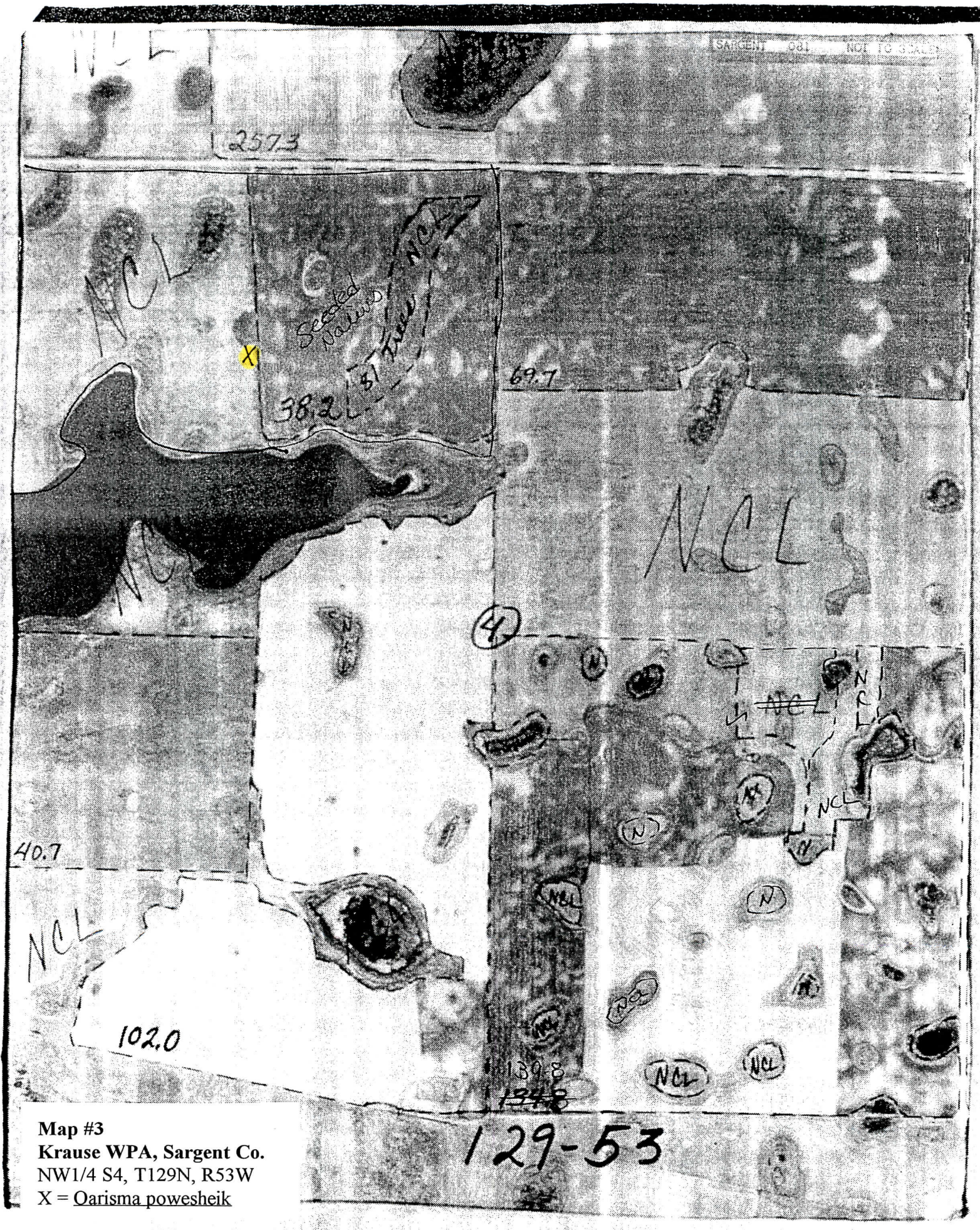
Map #1
Hartleben Prairie, Richland Co.
NE 1/4 S17 and the W1/2 of the NW1/4 S16, T130N, R50W
Shading indicates areas with dense distribution of Powesheiks July 7 & 10.
O = Oarisma powesheik, 1 July
X = Oarisma powesheik, 7 July
P = Oarisma powesheik, 10 July
V = Poanes viator
H = Hesperia dacotae, 7 July

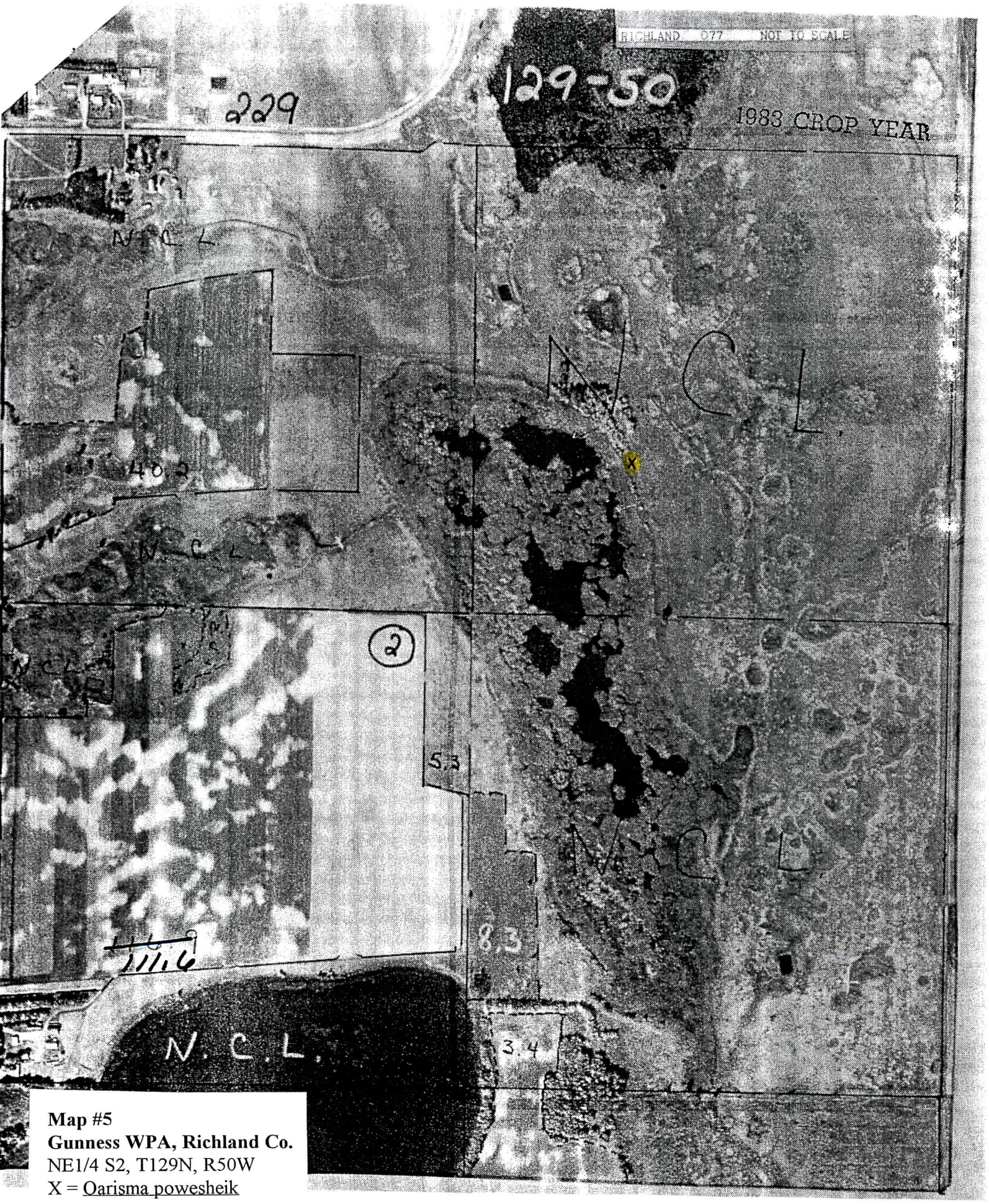


Map #2
Aaser WPA #2, Richland Co.
SE1/4 SE1/4 S12, T130N, R51W
and the SW1/4 S7, T130N, R50W
X = Oarisma powesheik
R = Speyeria idalia
V = Poanes viator



Map #3
Krause WPA, Sargent Co.
NW1/4 S4, T129N, R53W
X = Oarisma powesheik


NCL
SARGENT 051 NOT TO SCALE
29.9 (11)
NCL
T1647
Lot 6 of 2
121-54
LOT 5 of 2-129-54
NCL
NCL
NCL



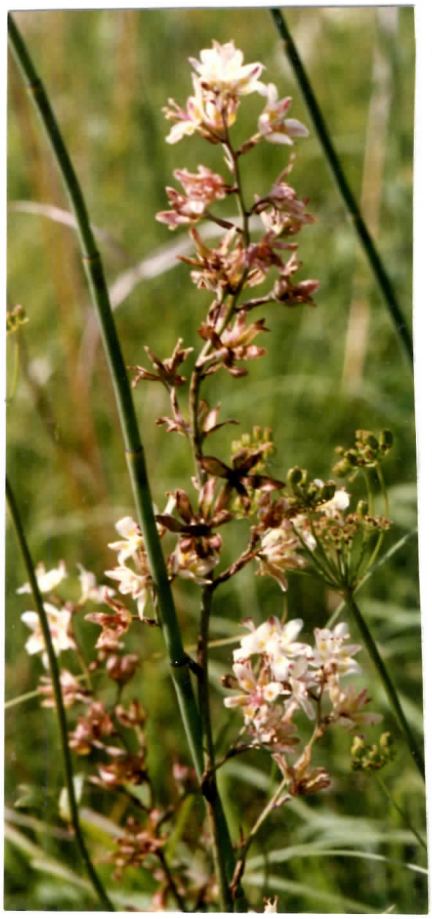
Map #5
Gunness WPA, Richland Co.
NE1/4 S2, T129N, R50W
X = Oarisma powesheik

Illustrations: Hartleben Prairie
A. Deathcamas, commonly in bloom during the flight period of the Dakota Skipper.

B. Western prairie fringed orchid transplanted to the site.

C. Silver-bordered fritillary nectaring.

D. Powesheik Skipper perched low in grasses.

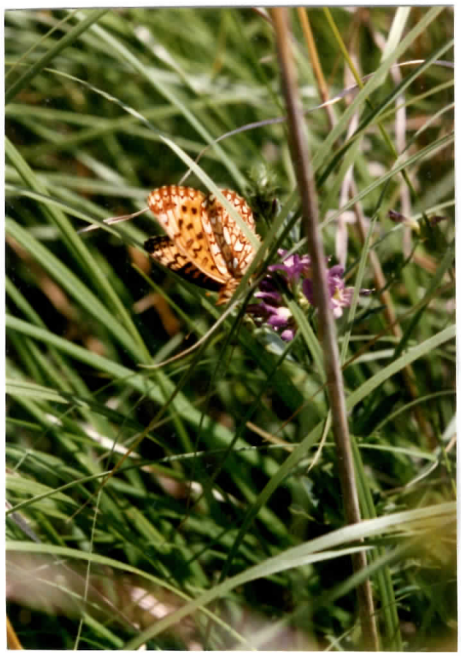


A.



B.

C.



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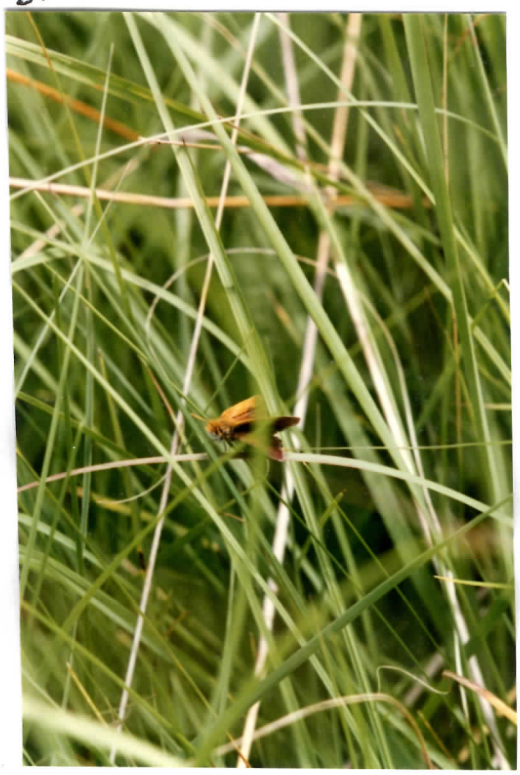

Table 1
Butterflies Recorded at Hartleben Prairie 1-4, Hankinson, North Dakota, 1995-1996

Scientific Name	Common Name
Oarisma powesheik	Powesheik Skipper
Hesperia dacotae	Dakota Skipper
Polites peckius	Peck's Skipper
Polites themistocles	Tawny-edged Skipper
Polites mystic	Long Dash
Atrytone logan	Delaware Skipper
Poanes viator	Broad-winged Skipper
Papilio polyxenes	Black Swallowtail
Colias philodice	Common Sulphur
Colias eurytheme	Orange Sulphur
Hyllolycaena hyllus	Bronze Copper
Speyeria cybele	Great Spangled Fritillary
Speyeria idalia	Regal Fritillary
Clossiana selene	Silver-bordered Fritillary
Clossiana bellona	Meadow Fritillary
Phyciodes tharos	Pearly Crescentspot
Nymphalis antiopa	Mourning Cloak
Vanessa atalanta	Red Admiral
Basilarchia arthemis	White Admiral
Basilarchia archippus	Viceroy
Satyrodes eurydice	Northern Eyed Brown
Coenonympha inornata	Inornate Ringlet
Cercyonis pegala	Common Wood Nymph
Danaus plexippus	Monarch

Table 2
Butterflies Recorded at Aaser Prairie 1-2, Hankinson, North Dakota, 1995-1996

Scientific Name	Common Name
Oarisma powesheik	Powesheik Skipper
Polites themistocles	Tawny-edged Skipper
Polites mystic	Long Dash
Poanes viator	Broad-winged Skipper
Pontia protodice	Checkered White
Artogeia rapae	European Cabbage Butterfly
Colias philodice	Common Sulphur
Hyllolycaena hyllus	Bronze Copper
Harkenclenus titus	Coral Hairstreak
Lycaeides melissa	Melissa Blue
Speyeria idalia	Regal Fritillary
Clossiana selene	Silver-bordered Fritillary
Clossiana bellona	Meadow Fritillary
Phyciodes tharos	Pearly Crescentspot
Satyrodes eurydice	Northern Eyed Brown
Coenonympha inornata	Inornate Ringlet
Cercyonis pegala	Common Wood Nymph

Table 3 WPA
Butterflies Recorded at Krause ~~WMA~~, Cayuga, North Dakota, 1995-1996

Scientific Name	Common Name
Ancyloxypha numitor	Least Skipperling
Oarisma powesheik	Powesheik Skipper
Polites themistocles	Tawny-edged Skipper
Polites mystic	Long Dash
Artogeia rapae	European Cabbage Butterfly
Colias philodice	Common Sulphur
Hyllolycaena hyllus	Bronze Copper
Epidemia helloides	Purplish Copper
Glaucopsyche lygdamus	Silvery Blue
Lycaeides melissa	Melissa Blue
Speyeria idalia	Regal Fritillary
Nymphalis antiopa	Mourning Cloak
Basilarchia archippus	Viceroy
Satyrodes eurydice	Northern Eyed Brown
Coenonympha inornata	Inornate Ringlet
Cercyonis pegala	Common Wood Nymph
Danaus plexippus	Monarch

Table 4
Butterflies Recorded at Tewaukon National Wildlife Refuge, Cayuga, North Dakota, 1995-1996 (Including Krause ~~WMA~~)
WPA

Scientific Name	Common Name
Ancyloxypha numitor	Least Skipperling
Oarisma powesheik	Powesheik Skipper
Polites themistocles	Tawny-edged Skipper
Polites mystic	Long Dash
Atrytone logan	Delaware Skipper
Artogeia rapae	European Cabbage Butterfly
Colias philodice	Common Sulphur
Colias eurytheme	Orange Sulphur
Hyllolycaena hyllus	Bronze Copper
Epidemia helloides	Purplish Copper
Glaucopsyche lygdamus	Silvery Blue
Lycaeides melissa	Melissa Blue
Speyeria idalia	Regal Fritillary
Phyciodes tharos	Pearly Crescentspot
Nymphalis antiopa	Mourning Cloak
Basilarchia arthemis	Red-spotted Purple
Basilarchia archippus	Viceroy
Satyrodes eurydice	Northern Eyed Brown
Coenonympha inornata	Inornate Ringlet
Cercyonis pegala	Common Wood Nymph
Danaus plexippus	Monarch