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NECTAR-SEEKING VISITS BY BUTTERFLIES IN A TALLGRASS PRAIRIE REMNANT IN EASTERN NEBRASKA

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ABSTRACT

Stolley Prairie, a tallgrass virgin prairie remnant in eastern Nebraska, was visited 20 times between May 25 and August 14, 1988. Fifty-two species of forbs were observed in bloom during this period. Twenty-seven species of butterflies were observed and 21 species made 262 nectar-seeking visits to 21 plant species. While numbers of forbs in bloom did not strongly correlate with numbers of butterflies present, peaks of butterfly occurrence appeared to follow peaks of blossom abundance. The number of plant species utilized by a species of butterfly ranged from one to nine. Plants with an abundance of nectar such as common milkweed and false sunflower were favored as nectar sources.

† † †

Since the time of European settlement in the Great Plains, the tallgrass prairie which once covered eastern Nebraska has been reduced to scattered remnants surrounded by urban, agricultural, or industrial landscapes. This reduction of area has resulted in the loss of habitat for many organisms (Boettcher et al., 1993). Until the late 1980s, however, little attention was given to invertebrate species in native prairies. All small populations in native grasslands are subject to increasing danger of extinction due to natural catastrophes such as drought, flood, and genetic deterioration. Grassland butterfly populations are particularly susceptible to local extinction due to limited habitat and host availability, poor dispersal abilities, and patchy distributions. Butterflies and other invertebrates of prairie remnants may suffer increased predation from opportunistic birds and competition from exotic insects (Panzer, 1988). In addition to these environmental stresses, butterflies are also susceptible to management practices such as burning, which can destroy eggs, larvae, and pupae on or above the soil surface. Before fragmentation, "the original scale of the prairie guaranteed that scattered chance survivors, along with individuals from beyond the burned areas, would have been available to reestablish populations." (Dana, 1986). Without burning, however, those plants which serve as food resources for larva and nectar sources for the adult butterfly become increasingly scarce.

Therefore, before any management plan can be drawn, the presence or absence of prairie invertebrates including rare species must be known. Among most butterflies, larval and adult stages have different food resources but "it is, in fact, the abundance or scarcity of adult foraging habitats, not the availability of [larval] host plants, that often regulates butterfly densities" (Clench, 1967; Opler and Krizek, 1984). The purpose of this study was to discover which butterflies were present at Stolley Prairie and which plants the adult butterflies utilized as nectar sources.

METHODS AND MATERIALS

Stolley Prairie is an 8.5-hectare virgin tallgrass prairie remnant at NW ¼, Section 15, T15N, R11E, in Douglas County, Nebraska. This tract is privately owned and is leased by the Audubon Society of Omaha. Stolley Prairie contains 165 plant species including approximately 30 of grasses and sedges and over 100 of forbs (Boettcher et al., 1993). In Boettcher's study of prairie remnants near Omaha, Stolley Prairie was found to contain 12.1% non-native species. Her studied sites ranged between 7.4 and 25% non-native taxa. Management of Stolley Prairie includes mowing in July, and burning on a prescribed schedule. The entire prairie was burned in April of 1988. However, since that date, the entire prairie has not been burned at one time.

The transect in this study covered a 4-hectare square in the south half of Stolley Prairie. The perimeter of the square was walked each time as were both diagonals, a total of about 1083 m on each visit, so that

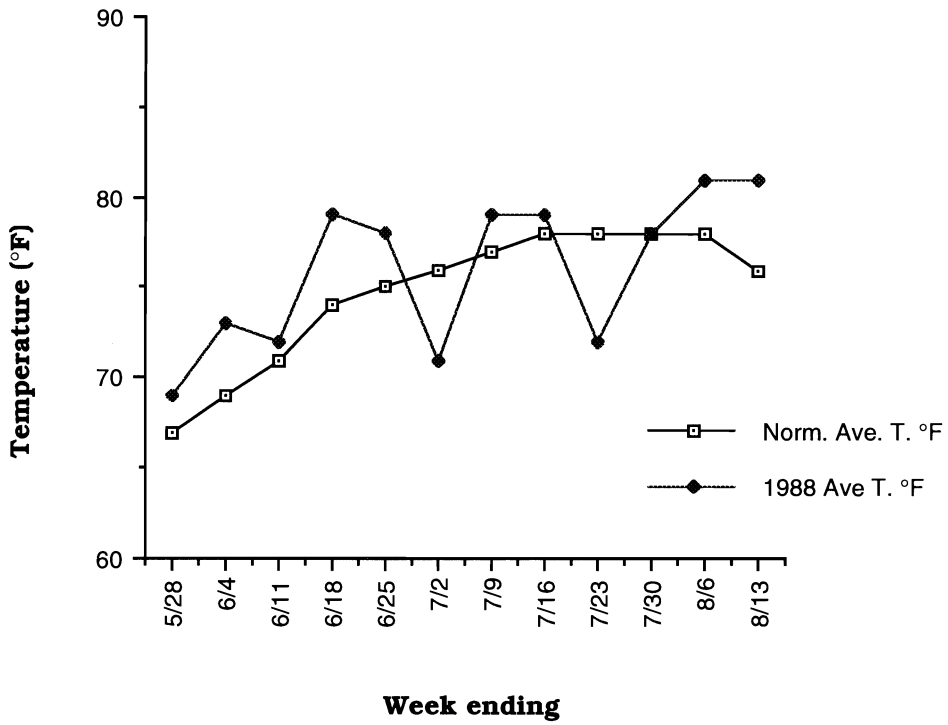


Figure 1. Normal average temperature (°F) and 1988 average temperature plotted for the weeks of this study. Data for Omaha from National Oceanic and Atmospheric Administration, National Weather Service, 1988.

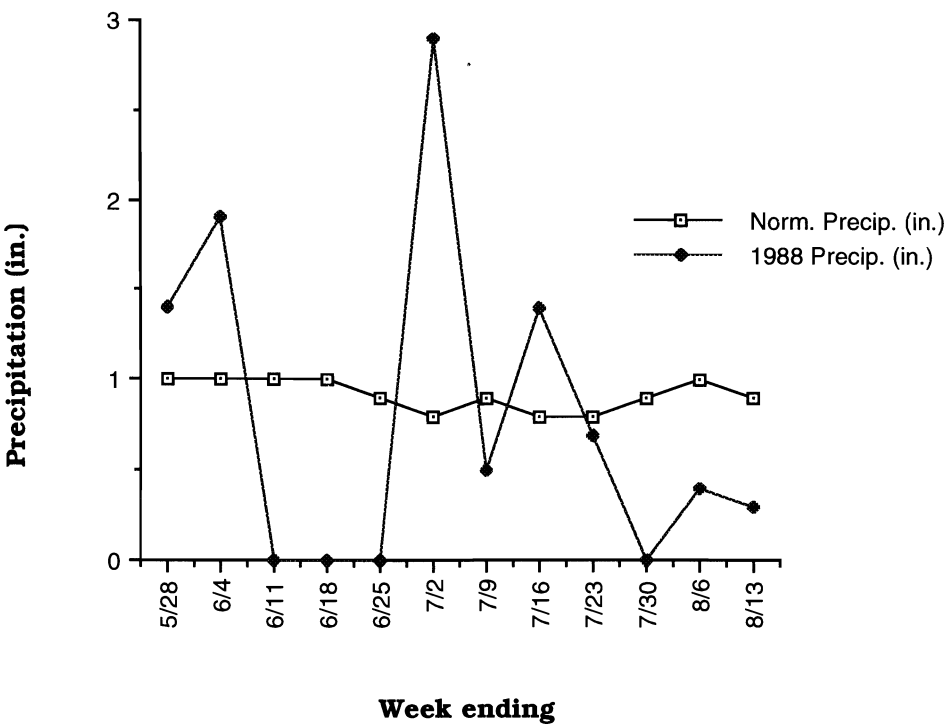


Figure 2. Normal precipitation (inches) and 1988 precipitation plotted for the weeks of this study. Data for Omaha from National Oceanic and Atmospheric Administration, National Weather Service, 1988.

nearly all parts of the area were observed. The area between the windbreak of shrubs and trees and the entrance road on the southern border was not censused in order not to count those species of butterflies that are ecotonal and ecologically tolerant of shaded conditions (Panzer, 1988). Twenty visits were made to the site between 25 May and 14 August 1988 (dates given in legend to Fig 4). Both morning and afternoon visits were made to the site, but most often the census was conducted between 11:15 a.m. and 3:00 p.m. Temperature and precipitation data for the period of the study were obtained from the National Oceanic and Atmospheric Administration, National Weather Service (1988).

All forbs in full bloom within the transect were counted. Plant species present in small numbers were counted individually while those with numbers in the hundreds were estimated by extrapolation. No count was made of grasses or sedges although they make up the majority of cover at the site. Plants were photographed but no specimens were taken, since the area has been well-studied (Boettcher et al., 1993) and voucher specimens are at the University of Nebraska at Omaha herbarium (OMA). Common and scientific nomenclature of plant species follows the Great Plains Flora Association (1986).

Butterflies were noted as in flight, resting or sunning on a plant, or actively feeding. A nectar-seeking event consisted of one butterfly feeding on one species of plant, and thus the same butterfly could account for several recorded events. An effort was made not to overestimate the total number of butterflies present, but with several in flight and on flowers, this was often difficult. All butterflies were identified by sight. No specimens were taken, but 17 of the 27 species seen were photographed. Common and scientific nomenclature for butterflies follows Opler (1992).

RESULTS

In the summer of 1988, eastern Nebraska regions experienced temperatures that were consistently above average, particularly during May and June (Fig. 1). In addition, the high temperature in June and July often hovered at or above 100 °F. Precipitation was much lower than normal in June, the last three weeks receiving no rainfall at all (Fig. 2). Dry conditions prevailed for the remainder of the summer with the exception of one period of heavy rainful during the first week of July.

Fifty-four species of plants were in bloom at Stolley Prairie during the study period (Table 1) of which 21 served as nectar sources for butterflies (Table 2, Fig. 3). The excessive heat and drought did not appear to affect the growth or blooming of these prairie species although in some cases the blooming period may have been shortened. Twenty-seven species of butterflies were seen (Table 3). The number of species of butterflies and the number of individuals present were lower than expected. In 1987, just three visits to Stolley Prairie between 20 June and 29 July yielded 23 species including six that were not seen in 1988 —Tiger Swallowtail (*Papilio glaucus*), Striped Hairstreak (*Satyrium liparops*), Coral Hairstreak (*Satyrium titus*), Reakirt's Blue (*Hemiargus isola*), Little Wood Satyr (*Megisto cymela*), and Silvery Checkerspot (*Chlosyne nycteis*)], although only the last of these is truly a prairie species (Paul Hammond, pers. comm.). The scarcity of butterflies during the summer of 1988 was noted across the Midwest; "a very hot, dry June spelled the end of normal abundance for most species for the remainder of the year" (Rosche, 1989). Extended periods of extremely high temperatures and drought conditions almost certainly caused desiccation of eggs or caused larvae to enter diapause. In addition, the burning of the entire prairie in April may have contributed to this lower total. The number of species of butterflies increased in late July and August primarily due to the appearance of ten species of Hesperiidae, the skippers. Twenty-one species of butterflies were observed in 262 nectar-seeking visits to flowers; six species were observed only in flight (Table 4).

The number of species of plants utilized as nectar sources by one species of butterfly ranged from one to nine. Eastern Tailed Blue (*Everes comyntas*) took nectar from the most plant species (nine) while Regal (*Speyeria idalia*) and Variegated Fritillaries (*Euptoieta claudia*) each fed on eight plant species. Seven butterfly species restricted their nectar-seeking to one plant species, but may have fed on other plants when I was not present.

Butterfly density does not appear to be strongly correlated with abundance of flowers blooming (r = .144). However, at least the first peak of flower abundance appears to be followed by a peak of butterfly occurrence (Figs. 4 and 5). There is even less correlation between number of nectar-seeking events and the abundance of plants which served as nectar sources (r = .119), indicating that these butterflies are selective in their choice of nectar source.

The majority of butterflies seen during this study are grassland species whose larval stages also feed in the prairie. Mourning Cloak (*Nymphalis antiopa*), Great Spangled Fritillary (*Speyeria cybele*), Red Admiral (*Vanessa atalanta*), and Gray Hairstreak (*Strymon melinus*) are visitors to the Prairie from woodland habitats in the area. Mourning Cloak and Great Spangled

Table 1. Forbs observed in my transect at Stolley Prairie, May 25 to August 14, 1988. An asterisk (*) indicates plant species which did not receive nectar-seeking visits.

Species	Blooming Period		Number in Bloom	Date of Peak Bloom
	First	Last		
Anemone canadensis * (Canada anemone)	25 May	4 Jun	3–16	4 Jun
Apocynum cannabinum (prairie dogbane)	25 May	18 Jul	2–500	15 Jun
Oxalis violacea * (violet wood sorrel)	25 May	4 Jun	19–23	25 May
Phlox pilosa (prairie phlox)	25 May	27 Jun	4–2500	15 Jun
Sisyrinchium campestre (white-eyed grass)	25 May	4 Jun	1–3	25, 28 May
Trifolium pratense (red clover)	25 May	22 Jul	1–34	13 Jun
Viola pedatifida * (prairie violet)	25 May	28 May	14–16	28 May
Baptisia lactea * (white wild indigo)	28 May	23 Jun	1–51	4 Jun
Oxalis stricta * (yellow wood sorrel)	28 May	9 Jun	1–10	4 Jun
Senecio plattensis * (prairie ragwort)	28 May	4 Jun	1–2	4 Jun
Achillea millefolium * (yarrow)	4 Jun	14 Jul	1–10	23 Jun
*Mirabilis nyctaginea** (wild four-o'clock)	4 Jun	15 Jun	9–104	15 Jun
Rosa arkansana (prairie rose)	4 Jun	18 Jul	4–127	23 Jun
Sisymbrium loeselii (tall hedge mustard)	4 Jun	10 Jul	1–3	15, 18 Jun
Asclepias syriaca (common milkweed)	9 Jun	14 Jul	2–550	20 Jun
Calystegia sepium subsp. *angulata* *	9 Jun	14 Jul	3–120	23 Jun
Delphinium virescens * (prairie larkspur)	9 Jun	23 Jun	4–10	18 Jun
Sambucus canadensis * (elderberry)	9 Jun	5 Aug	3–34	18 Jun
Asclepias amplexicaulis * (bluntleaf milkweed)	13 Jun	15 Jun	7–12	15 Jun
Euphorbia corollata (flowering spurge)	13 Jun	14 Aug	1–1100	14 Aug
Rudbeckia hirta (black-eyed Susan)	13 Jun	22 Jul	1–19	23 Jun
Verbena stricta (hoary vervain)	13 Jun	5 Aug	1–13	14 Jul
Amorpha canescens (lead plant)	15 Jun	18 Jul	3–1084	27 Jun
Echinacea angustifolia (purple prairie coneflower)	15 Jun	22 Jul	1–20	27 Jun
Psoralea argophylla (silverleaf scurf-pea)	15 Jun	27 Jun	12–98	23 Jun
Asclepias verticillata (whorled milkweed)	20 Jun	14 Aug	1–252	22 Jul
Asclepias viridiflora * (green milkweed)	20 Jun	23 Jun	2	20, 23 Jun
Cacalia plantaginea * (Indian plantain)	20 Jun	27 Jun	2–3	23 Jun
Dalea candida * (white prairie clover)	23 Jun	18 Jul	2–38	27 Jun
Heliopsis helianthoides (false sunflower)	23 Jun	14 Aug	12–1200	5 Aug
Carduus nutans (musk thistle)	27 Jun	27 Jun	1	27 Jun
Dalea purpurea * (purple prairie clover)	27 Jun	4 Jul	2	27 Jun, 4 Jul
Lilium canadense * (Turk's-cap lily)	27 Jun	27 Jun	2	27 Jun
Desmodium illinoense (Illinois tickclover)	4 Jul	2 Aug	3–92	18 Jul
Ratibida pinnata * (grayhead prairie coneflower)	4 Jul	5 Aug	1–15	26 Jul
Teucrium canadense * (American germander)	4 Jul	14 Jul	5–46	4 Jul
Abutilion theophrasti * (velvet-leaf)	10 Jul	14 Jul	2	10, 14 Jul
Potentilla arguta * (prairie cinquefoil)	10 Jul	26 Jul	16–51	18 Jul
Silphium integrifolium (rosin-weed)	10 Jul	14 Aug	14–71	11 Aug
Lactuca spp.* (wild lettuce)	14 Jul	14 Jul	6	14 Jul
Melilotus alba * (white sweet-clover)	14 Jul	5 Aug	1–2	22 Jul
Tragopogon dubius * (goat's beard)	14 Jul	14 Jul	3	14 Jul
Vernonia baldwinii (ironweed)	14 Jul	14 Aug	2–66	2 Aug
Astragalus canadensis * (Canada milk-vetch)	18 Jul	18 Jul	3	18 Jul
Solidago missouriensis (Missouri goldenrod)	18 Jul	14 Aug	1–487	11 Aug
Monarda fistulosa * (wild bergamot)	22 Jul	2 Aug	2–12	26 Jul
Silphium laciniatum * (compass plant)	22 Jul	22 Jul	1	22 Jul
Helianthus rigidus * (stiff sunflower)	2 Aug	14 Aug	3–82	14 Aug
Kuhnia eupatoriodes (false boneset)	5 Aug	14 Aug	5–23	11 Aug
Cirsium altissimum (tall thistle)	11 Aug	14 Aug	2	11, 14 Aug
Helianthus annuus * (common sunflower)	11 Aug	14 Aug	5–7	11 Aug
Solidago canadensis * (Canada goldenrod)	14 Aug	14 Aug	1	14 Aug

Fritillary were each seen on only one date, and only in flight. Sachem (*Atalopedes campestris*) comes here from the southern third of the United States. Its larvae cannot withstand winter temperatures in the Midwest, but adults disperse northward in summer (Pyle, 1981). According to Paul Hammond and Stephen Spomer (pers. comm.), Alfalfa Butterfly (*Colias eurytheme*), Monarch (*Danaus plexippus*), Variegated Fritillary, Red Admiral, and Painted Lady (*Vanessa cardui*) also do not overwinter in Nebraska, but disperse northward in summer to breed on the prairies. The only introduced species observed was the ubiquitous Cabbage Butterfly (*Pieris rapae*).

DISCUSSION

In late May, Stolley Prairie had an unbroken green appearance. Flowers in bloom at that time such as bird's foot violet (*Viola pedatifida*) and the yellow and violet wood sorrels (*Oxalis stricta*, *O. violacea*) are small, partially hidden by grasses, and scattered widely throughout the prairie. Few butterflies were seen at this time. By mid-June, prairie phlox (*Phlox pilosa*) had begun to bloom in large numbers and butterfly activity also increased. After that time, several hundred plants were in bloom at Stolley Prairie during each visit.

Butterflies are selective of the species of plants on which they take nectar (Dronamraju, 1960; Pyle, 1984; Tekulsky, 1985). Some butterflies are generalists, visiting almost any available flower, while others restrict their diet to the nectar of one or two species of plants (Klots, 1951). Despite the particular preferences of each butterfly species, flowers which serve as nectar sources have a number of shared characteristics. Color, shape of the inflorescence, length of corolla tube, taste and fragrance all play a part in attracting butterflies (Tekulsky, 1985). It is difficult to determine how much a factor color played in the selection of a nectar sources at Stolley Prairie for two reasons. First, the majority of the flowers blooming in May and June fall into the pink-violet range, and those in July and August are primarily yellow composites (Asteraceae). Secondly, butterfly vision differs from human's in that butterflies have poorer discernment of reds but their vision extends into the ultraviolet end of the spectrum, which allows them to see nectar-guide markings on petals that are not visible to humans (Rothschild, 1989). In general, butterflies at Stolley Prairie preferred flowers with an ample supply of nectar in a small space, that is, flowers in a cyme, umbel, or composite-type inflorescence. Reducing the need to fly from plant to plant would lessen the energy drain for the butterfly, and may also be a factor in reducing predation by insectivorous birds.

Table 2. Nectar Sources. A = number of nectar-seeking visits made to plant. B = number of butterfly species that took nectar at this plant. C = percent of total visits (262) by all butterflies during study.

Species		A	B	C
1.	*Amorpha canescens*	8	5	3.1
2.	*Apocynum cannabinum*	9	4	3.4
3.	*Asclepias syriaca*	84	10	32.1
4.	*Asclepias verticillata*	12	5	4.6
5.	*Carduus nutans*	1	1	0.4
6.	*Cirsium altissimum*	4	3	1.5
7.	*Desmodium illinoense*	8	2	3.1
8.	*Echinacea angustifolia*	10	3	3.8
9.	*Euphorbia corollata*	7	4	2.7
10.	*Heliopsis helianthoides*	80	15	30.5
11.	*Kuhnia eupatoriodes*	3	1	1.1
12.	*Phlox pilosa*	14	7	5.3
13.	*Psoralea argophylla*	2	2	0.8
14.	*Rosa arkansana*	1	1	0.4
15.	*Rudbeckia hirta*	1	1	0.4
16.	*Silphium integrifolium*	7	3	2.7
17.	*Sisymbrium loeselii*	1	1	0.4
18.	*Solidago missouriensis*	10	3	3.8
19.	*Trifolium pratense*	1	1	0.4
20.	*Verbena stricta*	1	1	0.4
21.	*Vernonia baldwinii*	5	4	1.9

The relationship of butterfly size to flower size also influences butterfly choice. Obviously, smaller butterflies with shorter proboscises most often choose flowers with short corolla tubes. The tiny Eastern Tailed Blue nectared on the small-flowered silver-leafed scurf-pea (*Psoralea argophylla*), Illinois tickclover (*Desmodium illinoense*) and leadplant (*Amorpha canescens*). In addition, all these plants are similar in coloration to the butterfly itself, providing camouflage that perhaps protects the butterfly from avian predation.

When factors of color, size, and shape are approximately equal, fragrance is the deciding factor in butterfly preference (Tekulsky, 1985). Common milkweed (*Asclepias syriaca*) has a strong, sweet odor that was attractive to many species of butterflies at Stolley Prairie. This plant received the most visits, 84 (32.5 % of all visits made to any flower) by the second largest number of butterfly species, during the study period. In addition to the fragrance, it has many of the characteristics of a preferred nectar source: many flowers clustered in a small space, several inflorescences on one plant, and an ample supply of nectar. The inflorescence is large enough to accommodate butterflies the size of the Monarch and Regal Fritillary. The milkweed was so popular that even partially withered flowers were still visited by butterflies. Other insects such as bees, moths,

Figure 3. Clockwise from upper left: Monarch (*Danaus plexippus*) on *Vernonia baldwinii*, Dione Copper (*Lycaena dione*) on *Apocynum cannabinum*, Variegated Fritillary (*Euptoieta claudia*) on *Asclepias syriaca*, Regal Fritillary (*Speyeria idalia*) on *Heliopsis helianthoides*, Painted Lady (*Vanessa cardui*) on *Heliopsis helianthoides*.

Table 3. Butterflies observed at Stolley Prairie, May 25 to August 14, 1988.

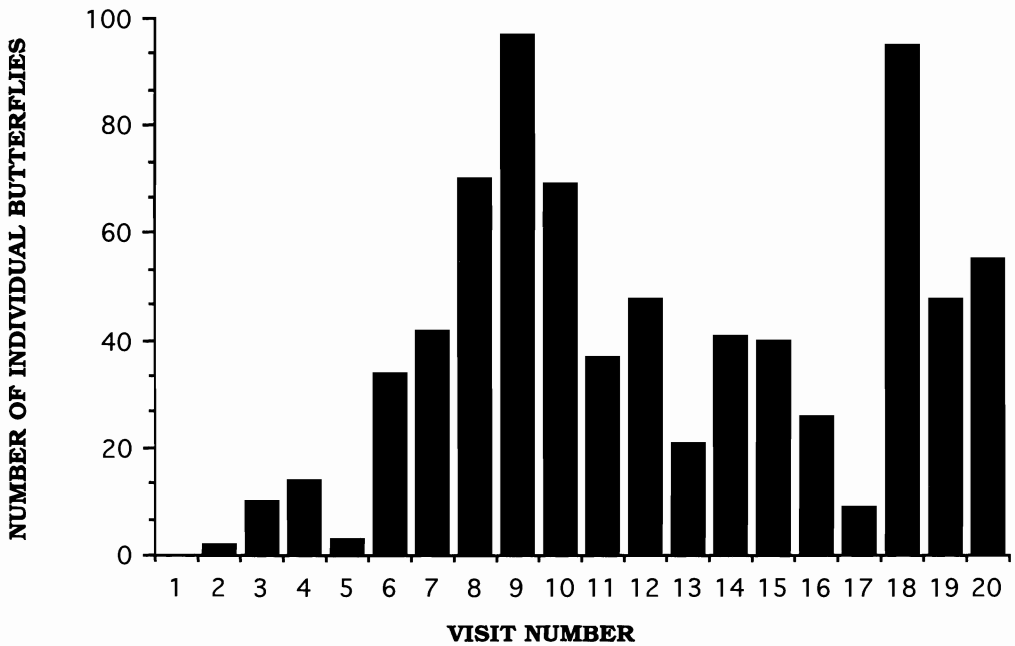
Butterfly Species	Dates Seen	Number Seen	DatePeak Number
Ancyloxypha numitor (Least Skipper)	10 July	1	10 Jul
Atalopedes campestris (Sachem)	10 July	2	10 Jul
Atrytone logan (Delaware Skipper)	5–11 Aug	1–2	11 Aug
Cercyonis pegala (Common Wood Nymph)	14 July–5 Aug	1–7	5 Aug
Colias eurytheme (Alfalfa Butterfly)	28 May–14 Aug	1–21	5 Aug
Colias philodice (Clouded Sulfur)	15 June–14 Aug	1–7	14 Aug
Danaus plexippus (Monarch)	28 May–14 Aug	1–20	5 Aug
Epargyreus clarus (Silver-spotted Skipper)	5 Aug	1	5 Aug
Erynnis sp. (Dusky Wing species)	5–14 Aug	1–2	5 Aug
Euptoieta claudia (Variegated Fritillary)	15 Jun –4 Jul;14 Aug	1–30	23, 27 Jun
Everes comyntas (Eastern Tailed Blue)	9 –18 Jun; 10 Jul–14 Aug	1–13	2, 14 Aug
Lycaena dione (Dione Copper)	15 –23 June	1–4	15 Jun
Nymphalis antiopa (Mourning Cloak)	4 July	1	4 Jul
Papilio polyxenes (Black Swallowtail)	13 –15 June; 14 Aug	1–2	15 Jun
Pholisora catullus (Common Sooty Wing)	10 Jul; 5–11 Aug	1	10 Jul 5, 11 Aug
Phyciodes tharos (Pearl Crescent)	15 Jun–10 Jul; 26 Jul–14 Aug	1–5	18 Jun
Pieris rapae (Cabbage Butterfly)	4 June –14 Aug	1–8	15 Jun
Polites peckius (Peck's Skipper)	22 Jul–14 Aug	1–3	5 Aug
Polites themistocles (Tawny-edged Skipper)	9 –18 Jun; 5 Aug	1	1 each date
Pompeius verna (Little Glassywing)	4 Jul	1	4 Jul
Pontia protodice (Checkered White)	10 Jul – 2 Aug	1–6	22 Jul
Pyrgus communis (Checkered Skipper)	9–20 Jun; 5 –14 Aug	1–5	11 Aug
Speyeria cybele (Great Spangeled Fritillary)	18 Jun	1	18 Jun
Speyeria idalia (Regal Fritillary)	13 Jun – 14 Aug	1–30	23 Jun
Strymon melinus (Gray Hairstreak)	22 Jul –5 Aug	1–2	5 Aug
Vanessa atalanta (Red Admiral)	4 Jun; 20 Jun; 4 Jul; 26 Jul; 14 Aug	1	1 each date
Vanessa cardui (Painted Lady)	10 Jul; 26 Jul – 14 Aug	1–8	5 Aug

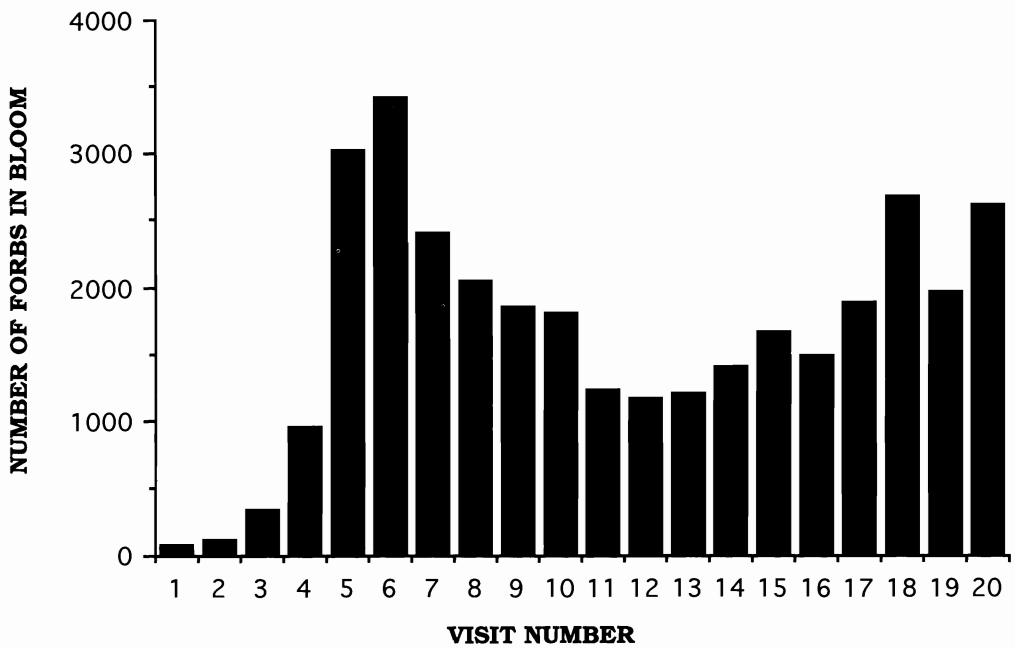
beetles, and wasps also found it attractive. Whorled milkweed (*Asclepias verticillata*) began blooming as common milkweed was declining in numbers. It also was attractive to five species of butterflies but the number of visits totaled only twelve.

False sunflower (*Heliopsis helianthoides*) was the most popular nectar source in the late summer. It also has a large inflorescence with ample landing space for even large butterflies, and it has numerous nectaries in one head. In addition, it was abundant at Stolley Prairie during July and August. False sunflower received 80 visits by 15 species, the most butterfly species to visit any forb.

Prairie phlox was visited by seven species for a total of 14 nectar-seeking visits. However, considering that at the peak of bloom, approximately 2500 phlox plants were present in the transect, this flower was not a particular favorite of butterflies. In contrast, purple coneflower (*Echinacea angustifolia*) had only 20 plants in bloom, yet had 10 nectar-seeking visits from three species

It is interesting to note those plants not utilized as nectar sources during this study. Compass plant (*Silphium laciniatum*), wild monarda (*Monarda fistulosa*), and white sweet-clover (*Melilotus alba*) are often popular nectar sources with butterflies. These species were present at Stolley Prairie in small numbers and may have been overlooked by the butterflies or may have been visited when I was not present. *Teucrium canadense*, a plant that is utilized by skippers, bloomed for only ten days and in addition was overshadowed by taller grasses. Species such as violet and yellow wood sorrels, bird's-foot-violet, and prairie ragwort (*Senecio plattensis*), bloomed early in the summer when not many butterflies were present. Canada milk-vetch (*Astragalus canadensis*) and wild white indigo (*Baptisia lactea*) have flowers which require strong pressure to reach the nectaries and are primarily visited by bees. Turk's-cap lily (*Lilium canadense*) has a





Figures 4 and 5. **4.** Number of butterflies seen on the transect per visit. **5.** Estimated number of forbs seen in bloom on the transect per visit. Dates of visits were as follows: 1—May 25, 2—May 28, 3—Jun. 4, 4—Jun. 9, 5—Jun. 13, 6—Jun. 15, 7—Jun.18, 8—Jun. 20, 9—Jun.23, 10—Jun. 27, 11—Jul. 4, 12—Jul. 10, 13—Jul. 14, 14—Jul. 18, 15— Jul. 22, 16—Jul. 26, 17—Aug. 2, 18—Aug. 5, 19—Aug. 11, 20—Aug. 14.

Table 4. Nectar sources utilized at Stolley Prairie, May 25 to August 14, 1988. Plants are identified by number in Table 2.

Butterfly	Plant																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Ancyloxypha numitor			1																		
Atalopedes campestris										2											
Atrytone logan										1											
Cercyonis pegala																					
Colias eurytheme	3		5					3		27		5				1					
Colias philodice										3											1
Danaus plexippus			22	7						17	3	1				3					1
Epargyreus clarus																					1
Erynnis sp.										1											
Euptoieta claudia	1	1	31					6		2		1	1	1							
Everes comyntas	1	1		1			7			4		1	1					6		1	
Lycaena dione	1	3	3																		
Nymphalis antiopa																					
Papilio polyxenes																					
Pholisora catullus			1																		
Phyciodes tharos	2		8							2		2			1						
Pieris rapae		4	2						4			3					1				
Polites peckius				2		1			1												
Polites themistocles			1							1											
Pompeius verna																					
Pontia protodice										4											
Pyrgus communis									1	3		1							1		
Speyeria cybele																					
Speyeria idalia			10	1	1	1		1	1	4											1
Strymon melinus							1											2			
Vanessa atalanta																					
Vanessa cardui				1						8						3		2			

large, downward facing corolla that is adapted more to hovering moths. Extending this study into September would undoubtedly have added species of asters to the list of nectar sources.

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