

**EFFECTS OF STANDARD MANAGEMENT PRACTICES ON,
AND FAUNISTICS OF NATIVE PRAIRIES:**

A study of three sites in western Minnesota.

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The Nature Conservancy, and the R. J. Kose foundation.

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ABSTRACT

From 1995 through 1999 an ongoing study was conducted to examine the effects of standard prairie management practices (burning, grazing, haying) and unmanaged prairie, with regard to arthropod communities. Additional objectives were to gather baseline data on the arthropod species present on remnant prairies of western Minnesota, to identify rare species found on these sites, and if possible, to determine prairie indicator species which might be used to identify dry, mesic, or wet prairies types in a manner similar to the plant indicator species used in botanical studies.

At present, nearly 35,000 insect specimens have been pinned, labeled, and identified representing more than 750 species. As additional material is processed and identified, we expect the number of species found on these sites to more than double, perhaps even triple.

This report provides a summary of work completed as of May, 2000, and includes species lists, information on species distributions (state records and extensions of known species ranges), presence of rare or state endangered species on these prairies, diversity indices for prairie sites, types, and management practices, and management histories of the study areas.

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Introduction

Beginning in mid-1995 and continuing, a project was initiated to examine the effects of standard prairie management practices on the arthropod fauna of tallgrass prairies on three sites in western Minnesota. Additionally, baseline species inventory data was to be compiled for these sites. It is somehow appropriate, at the close of a millennium which has witnessed the reduction of native prairies to less than one half of one percent, that we are asking the twin questions— What portion of our inheritance of biotic diversity has been preserved? and – Is this portion being maintained? The information presented herein provides a baseline for the first of these queries. As for the second, we present important data and provide some tentative conclusions, however, this analysis is continuing and the final answers will be ‘complex sentences’ rather than ‘simple statements.’ This report is necessarily condensed; it provides site locations, brief explanations of procedures, tentative conclusions based upon species of three insect orders with quite different bionomics, significant information on faunistics (species distributions), and baseline species lists.

The Study Area

Three sites in western Minnesota, were chosen as study areas. They were: 1) Bluestem prairie complex (Bluestem State Natural Area [SNA], Buffalo River State Park, County owned hayland, and local ranchland); 2) Felton prairie complex (Blazing Star SNA, Bicentennial SNA, B-B ranch, County owned hayland, and leased land); and 3) Agassiz Dunes prairie complex (Agassiz Dunes SNA, Prairie Smoke SNA, and City of Fertile parkland). A listing of all sites, transects, and stations is provided in Appendix I. The management histories of these areas are provided in Appendix II.

Bluestem prairie complex. There were 12 transects on the Bluestem prairie complex: two transects respectively on dry, mesic, and wet prairies managed by burning; two transects on hayed land; two transects on unmanaged land; and a transect each on reclaimed prairie and on prairie managed by grazing. Each transect consisted of three stations except the first hayed transect which had two. At the inception of this study in 1995, only the first six transects listed above were run, each transect had five stations save the first dry transect which had six.

Felton prairie complex. On the Felton prairie complex there were eight transects, two transects for each of the four treatments: burned, hayed, grazed, and unmanaged prairie. Each transect consisted of three stations except as follows: in 1995, there was a single, five station, transect on hayed land, two five station transects on burned lands, and a single five station transect on grazed land.

Agassiz Dunes prairie complex. Agassiz Dunes prairie complex had seven transects, five on lands managed by burning, and two on unmanaged prairie. Of these two, one was burned about 20 years previous, the other, in roughly the same time frame, was managed by grazing (see Appendix II). Each transect again consisted of three stations except as follows: in 1995 there

were four transects, three (A, B, C) on burned and the fourth (D) on unmanaged prairie with a distant history of burning. Each of the 1995 transects consisted of five stations.

Sampling

Sampling methods. Arthropods were collected via sweep-net, pitfall trap, Malaise trap, window-pane trap, and light trap. Additional records were obtained as observational data. Sweep-net samples collect planticolous insects. Pitfall traps collect terricolous species. Malaise and Window-pane traps are flight intercept traps which collect insect which fly upward or drop downward, respectively, upon meeting a barrier. Light trapping by the use of a Mercury vapor light and a Black light takes advantage of the phototropism often exhibited by nocturnal insects. It is a qualitative (as is a visual observation) method for sampling.

Sweep net samples consisted of 50 sweeps with a 38 cm diameter sweep net, in a broad circular pattern about each station. Samples were placed in labeled Zip-loc® bags and transported to the lab where they were killed and transferred to petri dishes for drying and temporary storage. Exceptions to this procedure were as follows: in 1995, two samples were taken for each station. In 1995 and the first two sampling dates of 1996, samples were taken along the transect rather than around each station (Robert Dana, who evaluated the transects and station placements suggested this change). At the Agassiz Dune prairie complex, samples for all years were taken in linear transects corresponding to the dune crest, dune slope, and dune slack areas as local topography usually prevented a circumlocution of each station.

Pitfall traps consisted of two 16 oz. (4.73 cc) plastic cups counter sunk into the ground and separated by a meter length of lawn edging. Each cup contained about 4 oz. (1.2 cc) of ethylene glycol (anti-freeze). Insects travel along the barrier created by the lawn edging and are trapped in the ethylene glycol.

Malaise traps consisted of four fine mesh panels below a conical mesh top. At the apex of the cone was an inverted funnel leading into a jar. The jar contained a killing agent (vapon). Insects, upon meeting the barrier of the panels moved upward into the cone and ultimately into the jar where they were trapped and killed. In 1995, traps were placed on the D1, M1, and W2 transects at Bluestem. From 1996-1998, traps were placed on the D2, M1, W2, and N1 transects at Bluestem, the BzS transect at Felton, and the A and D transects at Agassiz Dunes. In 1999, (due to trap attrition and weather) only a single trap was placed on the D1 transect on Bluestem.

Window-pane traps consisted of a plexi-glass barrier above a tray of ethylene glycol mounted in a wooden frame. The frame was suspended between two pipes which were anchored into the ground. The frame heights were periodically adjusted so as to be at the top of the growing vegetation. From 1995-1998, traps were placed on the D2, M2, W1 transects on Bluestem, on the BzS and B-B1 transects at Felton, and the B and D transects at Agassiz Dunes. From 1996-1998, additional traps were placed on the N1, H1 transects on Bluestem, the CCL1 and CNM1 transects at Felton, and the E and F transects at Agassiz Dunes. In 1996 and 1997, a trap was placed on the F1 transect at Bluestem.

Light trapping consisted of attaching a Mercury vapor light and a long-wave UV light onto a metal frame. A white sheet was stretched over the frame which was then anchored into the ground. An additional sheet was placed on the ground below the frame. Nocturnal insects, coming to the light would alight on the suspended sheet or on the ground sheet where they were

easily collected. This is a qualitative sampling method as the collector must actively determine which specimens are to be taken.

Sampling protocol. Beginning in May, and continuing until at least the first frost, transects were established on each site. At approximately two week intervals (weather permitting) sweep net samples and pitfall trap samples were taken from each station. In addition, Malaise and window-pane trap samples were taken. A list of collecting dates from sweep samples is given in Appendix III. Due to weather conditions, these dates do not exactly correspond with all pitfall samples. This table accurately portrays the seasonal sampling for the years 1995 through 1999. Pitfall dates begin two weeks earlier than the earliest listed dates in all years except 1999. In 1999 pitfall dates also extend for another month (two sampling dates).

Sweep net samples were treated as noted above. Pitfall and window-pane samples were stored in 95 % ethanol until processing. Malaise trap samples were also stored in petri dishes. At present, only select groups have been processed (pinned, mounted, and labeled) as follows: sweep net samples for 1995, 1996 and orthopteroid insects from the sweeps through 1997; pitfall samples from 1995-1997 and carabid beetles through 1999. Most material collected via light trapping has been processed.

Results

As of May 1, 2000, approximately 34,600 specimens representing 759 species have been identified and recorded from three prairie sites. See Appendix IV for a listing of species. Another 72,000 specimens (conservative estimate) have been processed and are awaiting identification.

Groups which have received extensive attention for identification purposes are: **Orthoptera** (Acrididae, Tettigoniidae, Gryllidae, Rhaphidophoridae); **Homoptera** (Derbidae, Membracidae, Cicadellidae, Cercopidae); **Hemiptera** (Miridae, Tingidae, Reduviidae, Alydidae, Lygaeidae *sensu lato*, Scutelleridae, Pentatomidae); **Coleoptera** (Carabidae, Curculionidae, Silphidae, Coccinellidae); **Lepidoptera** (Tortricidae, Sphingidae, Arctiidae, and Noctuidae). There is a great deal of identification work yet to be done. Major groups to be worked through include the orders Diptera and Hymenoptera. Major families which as yet have received little or no attention include: Staphylinidae, Scarabaeidae, Elateridae, and Chrysomelidae among the Coleoptera. We expect the faunal list, as represented by Appendix IV, to more than double in size as additional species are identified, i.e., there should be more Lepidoptera inhabiting these sites than bird species in America north of Mexico. However, fewer than 20 additional species of Orthoptera remain to be found on these sites.

Faunistics

Distribution records: Four categories of species are represented under this heading. First, wide-ranging species which have not been reported from the area due to lack of collecting, or such specimens existing in university collections but having not been examined by a taxonomist familiar with the group. This is the subject of Appendix IV, baseline species lists from all sites. Second, species whose known distribution ends some distance (we have arbitrarily picked 150 km) from the study areas. Third, rare species whose distributions are

incompletely known or which are known to have had much more expansive ranges historically than at present. And fourth, adventive species, taxa which have been introduced into North America and have been found in significant numbers on prairie sites.

Species whose known distribution has been expanded by this research include the following:

Orthoptera: Distributional data from Otte (1981).

Acrididae: *Stethophyma celata* Otte: previously known from southeastern South Dakota and northeastern Minnesota, has been collected at all three sites, Bluestem, Felton, and Agassiz Dunes.

Hemiptera: Distributional data from Henry & Froeschner (1988).

Tingidae: *Corythaica bellula* Torre-Bueno: an eastern species recorded from Nebraska, has been collected from the Felton prairie complex.

Tingidae: *Hesperotingis antennata* Parshley: an eastern species recorded from Missouri and New Hampshire, has been collected from the Felton prairie complex.

Tingidae: *Hesperotingis* sp.: A second species of this genus has been collected from the Bluestem and Felton prairie complexes. All other species of the genus are southern with the closest records to our area from Illinois.

Miridae: *Trigonotylus flavicornis* Kelton: previously recorded from Saskatchewan and Manitoba, it has been collected from the Bluestem and Felton prairie complexes.

Miridae: *Lindbergocapsus planifrons* (Knight): previously known distribution was Iowa, South Dakota, Manitoba, and Saskatchewan, it has been collected from the Bluestem and Felton prairie complexes.

Miridae: *Plagiognathus medicagus* Arrand: previously known from the Canadian border provinces from Manitoba westward and also Montana, it has been collected at Agassiz Dunes, Bluestem, and Felton prairie complexes.

Alydidae: *Megalotomus quinquespinosus* (Say): previously known from Iowa, Michigan and Colorado, has been collected from Agassiz Dunes SNA.

Lygaeidae: *Ischnodemus hesperius* Parshley: previously known from the South Dakota, Iowa, Illinois and Manitoba, it has been collected from the Bluestem prairie complex.

Lygaeidae: *Crophius disconotus* (Say): previously known from Wyoming, Saskatchewan, and Ontario, it has been collected from the Felton prairie complex.

Lygaeidae: *Trapezonotus arenarius* (Linnaeus): previously known from the New England states and Canada, it has been collected from the Felton prairie complex.

Lygaeidae: *Sisames claviger* (Uhler): a widespread species with previously published records from Iowa, and Nebraska, it has been collected from the Felton prairie complex.

Lygaeidae: *Kolenetrus plenus* (Distant): closest published records are Ontario and British Columbia, also known from the New England states and Arizona, it has been collected from Bluestem SNA.

Lygaeidae: *Eremocoris borealis* (Dallas): closest published records are Montana and Michigan, a northern and Appalachian species, it has been collected from Bluestem SNA.

Lygaeidae: *Carpilis consimilis* Barber: Previously known from the Northeastern U.S. and as far west as Quebec, it has been collected from the Felton prairie complex.

- Coreidae: *Nisoscolopocerus apiculatus* Barber: previously known from Alberta, Colorado, New Mexico, and Nebraska, it has been collected from Agassiz Dunes and Bluestem prairie complexes.
- Coleoptera:** Distributional data for the Carabidae from Bousquet & Laroche (1993), for Coccinellidae from Gordon (1985).
- Carabidae: *Cicindella cursitans* LeConte: previously known from the Dakotas, Nebraska, Iowa, and Indiana); the species has been collected from wet and mesic prairie on Bluestem State Natural Area (Tinerella & Rider 2000).
- Carabidae: *Calleida purpurea* (Say): previously known from Manitoba, South Dakota and Wisconsin, specimens have been collected from the Felton prairie complex, county trust hayed land, leased no management land, and Bicentennial Prairie State Natural Area (Tinerella 2000b).
- Carabidae: *Poecilus corvus* (LeConte): previously known from Manitoba and the Dakotas, specimens have been collected on Bluestem and Agassiz Dunes Prairie complexes.
- Carabidae: *Chlaenius purpuricollis* Randall: A widespread species, previously unrecorded from Minnesota.
- Carabidae: *Diplocheila undulata* Carr.: previously known from Alberta, Manitoba, and Illinois, specimens have been collected from the Bluestem Prairie complex.
- Carabidae: *Cymindis platycollis* (Say): an eastern species reported from Iowa and Wisconsin, it has been collected from Agassiz Dunes State Natural Area.
- Staphylinidae: *Micropeplus sp.*: Species of this genus, while widespread (Bousquet 1991), have not been reported from Minnesota, it has been collected from Bluestem prairie complex.
- Staphylinidae: *Xenodusa cf. reflexa* (Walker): Recorded from the Canadian prairie provinces and westward (Bousquet 1991), it has been collected from the Felton prairie complex.
- Coccinellidae: *Hyperaspidium walcotti* (Nunenmacher): previously known from Indiana, Iowa, and Kansas, it has been collected from Agassiz Dunes State Natural Area.
- Coccinellidae: *Brachyacantha tau* LeConte: previously known from eastern Kansas and central Montana, it has been collected on Bluestem SNA (Fauske and Tinerella, *in prep.*).
- Coccinellidae: *Hyperaspis proba* (Say): previously known from southern portions of South Dakota, Minnesota, and Wisconsin, it has been collected from Agassiz Dunes State Natural Area.
- Coccinellidae: *Hyperaspis inflexa* Casey: a species with a spotty distribution, closest points are extreme eastern Illinois, central North Dakota and Oklahoma. The species has been collected from Agassiz Dunes State Natural Area.

Lepidoptera

- Tortricidae: *Hystrichophora talaena* (Grote): Previously known from Colorado, Kansas, Iowa, Illinois (Heinrich 1923 [as *H. ochreicostana*]), and North Dakota (Gerald Fauske). The species was not listed by Miller (1987). Collected from the Felton prairie complex.

Rare species: Species whose distributions are incompletely known, or which are known to have had an historically more extensive distribution are as follows.

Hemiptera

Pentatomidae: *Chlorochroa belfragii* (Uhler): Known from about 20 specimens, the 1995 collection from the Bluestem Prairie complex (D2 transect) is the only Minnesota record. The last time the species was collected was in 1988 from the Carrington Experimental Station, Foster Co., North Dakota.

Homoptera

Cicadellidae: *Aflexia rubronura* (Delong): Not listed by Medler (1942) or Beirne (1956), but has been collected in Minnesota near the Bicentennial prairie sign by Dr. H. K. Andrew Hamilton. This leafhopper is associated with *Sporobolus heterolepis* A. Gray (Delong 1948). The species has been found on the Felton Prairie complex on the hayland on transect CCL1.

Coleoptera

Cerambycidae: *Megacyllene powersi* Linsley & Chemsak: Known from southeastern North Dakota (Lindsey 1964) and Ulen, Minnesota (North Dakota State Insect Reference collection), it has been found on the CCL1 transect, on prairie east of that transect, and the NM1 transect on the Felton Prairie complex. Larvae of the closely related *M. decora* (Olivier) live within the stems of *Amorpha fruticosa* L. (Yanega 1996)

Lepidoptera

Tortricidae: *Cydia lacustrana* (Miller): Described and previously only known from Michigan, the species was collected from the Bluestem D1 transect between stations d2 and d3 by mercury vapor light trap. Males of this species are unknown (Miller 1987).

Hesperiidae: *Hesperia dacotae* Skinner: Historically, the Dakota skipper occupied a wide range from northern Illinois and southern Wisconsin, westward through northern and central Iowa, central and western Minnesota, eastern South Dakota, eastern and northcentral North Dakota, and northward into southern Manitoba (McCabe 1981). Larvae prefer bunch grasses such as *Andropogon scoparia* Michx., *A. gerardi* Vitman, *Koehleria cristata* (L.) Pers. *Phleum pratense* L. and will also accept *Poa pratensis* L. (McCabe 1981, MacNeill 1964). The species is associated with alkali soils such as occur on beach ridges. It occurs on the D1 transect at Bluestem State Natural Area (Brian Winter, pers. comm.) and has been found on the CCL1 hayed transect on the Felton prairie complex, and on private land immediately south of the firebreak separating the D unmanaged transect at Agassiz Dunes State Natural Area.

Nymphalidae: *Speyeria idalia* (Drury): Historically, this species occurred from southern Canada to North Carolina and from the western edge of the Great Plains to the Atlantic (Scott 1986). The species has disappeared from most of its range east of the Mississippi and is uncommon outside of grassland preserves (Opler 1998). It occurs in only two or three sites in Michigan (David Cuthrell, Michigan Natural Resources Inventory, pers. comm.). Larvae have been recorded as feeding on at least five species of *Viola* (Scott 1986). Regal fritillaries have been observed flying at both the Bluestem and Felton prairie complexes on all transects.

It should be noted that of the species listed above, four of the six, i.e. *Chlorochroa belfragii*, *Aflexia rubranura*, *Megacyllene powersi*, and *Hesperia daacotae* appear in some way connected to glacial lake Agassiz in this area (or other glacial lakes outside this area but within the northern Great Plains?). Species are found either on gravel ridges or eolian sand from this event, or associated with alkali soils and their plants which in our area are linked to glaciation events. Of the remaining two: *Cydia lacustrana* is little known but appears to have such an association; *Speyeria idalia* is thought to be a pre-glaciation relict species (Hovanitz 1963).

Introduced species: Also known as adventive species, are those which are recent accidental or deliberate introductions to the entomofauna of North America and which have been found in the study areas. These probably represent permanent additions to the continental fauna. See Table 1 for a listing of these species.

Table 1. Adventive species found on three prairie sites in western Minnesota.

Species	origin	Earliest records of occurrence	Citation	Prairie site
Homoptera				
<i>Athysanus argentarius</i> Metc.	Europe	MA, 1920's	Hamilton 1983	A, B, F
Coleoptera				
<i>Pterostichus melanarius</i> Illiger	Europe	N.S. 1926	Brown 1950 Tinerella & Pollock, <i>in prep.</i>	B, F
<i>Onthophagus nuchicornis</i> (L.)	Europe	PA, 1844	Brown 1940 Tinerella & Fauske 1999	A, B, F
<i>Coccinella septempunctata</i> (L.)	Europe	NJ, 1973	Gordon 1985	
<i>Polydrusus impressifrons</i> (Gyllenhal)	Europe	NY, 1916	Blatchley & Leng 1916	A, B, F
				B
Lepidoptera				
<i>Coleophora trifolii</i> (Curtis)	Europe	NY, 1965	Pilley & Trieselmann, 1967 Landry & Wright 1993	A, B
<i>Ostrinia nubilalis</i> (Hübner)	Europe	MA, 1917	Vinal 1917 Munroe 1976	A, B, F
<i>Pieris rapae</i> (L.)	Europe	QU, 1860	Scudder 1887 Opler & Krizek 1984	A, B, F

What impact these introductions have on native species is not known. The leafhopper is a general feeder on grasses, the three Lepidoptera are important pests of food or forage crops, while the Seven spotted ladybeetle (C-7), *Coccinella septempunctata*, was deliberately introduced as a biological control agent against aphids. The purpose of the above table is to

make cognizant the fact that natural preserves, like natural communities, are dynamic rather than static in composition.

Diversity indices. A few caveats should be given ‘up front.’ First, these numbers are tentative in that data for a given taxonomic group throughout a complete burn cycle will not exist until (earliest) the end of the 2000 field season. Second, a few of these transects have a mixed management history, i.e. harvesting for seed on the D (burned) transects of Bluestem, a 1997 fall burn on the Felton CNM (unmanaged) 1 transect, or lack of grazing in 1998 on Bluestem G1 transect. We believe these to be minor ‘perturbations’ but only a larger data set can address this question. Third, effects of yearly and seasonal temperature and precipitation variances on a short term study; i.e., extremely heavy rains influenced sample dates and quantities in 1998 on both Agassiz Dunes and Bluestem transects, the winters of 1997-98 and 1998-99 were much warmer than the 30 year norm. Fourth, many species of insects are known to exhibit long term (more than a decade) cycles in abundance. Fifth, Hemiptera data cover the years 1995-1996, the Coleoptera data are from 1995-1997, while the Orthoptera data are 1995-1999 inclusive. The practice of assigning index values to a given transect or prairie type under a particular management regime and for a given taxonomic group can only be a ‘temporal snapshot.’ Many ‘snapshots’ of a diverse array of taxonomic groups will be needed or a much longer temporal baseline will be necessary to evaluate management practices by such indices.

Comparison of sites. An overall comparison of sites is provided in Table 2. From the two data sets it is immediately seen that Shannon-Wiener values are higher for the Orthoptera than Coleoptera. This is most likely a reflection of proportionally more individuals per species and so fewer “rare” species among the Orthoptera. There are certainly far more Carabidae than Acrididae/Tettigoniidae on these transects – for those values which are close (grazed Bluestem or unmanaged Agassiz Dunes) note caveat five above. This interpretation may also apply to the Simpson’s diversity numbers as well. When the analysis of Orthoptera from pitfall samples is complete, we expect to have a greater range in species abundances as in the Coleoptera, and consequently, lower H values for Orthoptera.

Some inferences may be made from the equitability numbers. First, there appears to be some correspondence between equitability numbers and management type for the Orthoptera that is not readily discernible in the Coleoptera. Second, within the Orthoptera, the highest equitability numbers are correlated with unmanaged transects, the lowest with burned or grazed transects.

A possible reason for the first difference could be traced to the basic differences in life cycles/ histories of the two groups. Orthoptera are paurometabolous insects, each of the five nymphal instars require essentially the same habitat and occupy essentially the same niche as their respective adults– and so are subject to, for the most part, the same biotic and abiotic selection factors as their adults. By contrast, Coleoptera are holometabolous insects with distinct larval, pupal, and adult stages. Larvae of the Carabidae may, in some cases, require radically different habitats than their respective adults, or may be temporally as well as distributionally sympatric with their respective adults. This wide variation in larval habits, translating into more, or different interactions of biotic and abiotic selection pressures than their respective adults, may account for much of the lack of resolution between management types and Carabidae as reflected in equitability numbers (but note also the Shannon-Wiener discussion above).

Table 2. Diversity indices of prairie sites¹.

A. Indices based upon ground beetles (Coleoptera: Carabidae) (See Tinerella 2000a for additional indices and interpretations).						
	Index value ²		D=	S=	n=	Number of transects
	H=	J=				
Burned transects						
Agassiz Dunes	1.0	0.67	0.15	31	1,265	6
Bluestem	1.005	0.6	0.15	46	5,841	6
Felton	1.06	0.69	0.14	34	960	2
Hayed transects						
Bluestem	0.91	0.65	0.18	25	1,250	2
Felton	0.93	0.62	0.235	31	809	2
Grazed transects						
Bluestem	0.89	0.75	0.16	15	263	1
Felton	0.86	0.66	0.225	20	300	2
Unmanaged transects						
Agassiz Dunes	1.06	0.78	0.125	23	346	2
Bluestem	1.05	0.67	0.16	37	1,609	2
Felton	1.07	0.69	0.115	35	1,180	2
B. Indices based upon Grasshoppers (Orthoptera: Acrididae and Tettigoniidae) (Gerald Fauske).						
	Index value		D=	S=	n=	Number of transects
	H=	J=				
Burned transects						
Agassiz Dunes	3.22	0.73	0.14	21	912	6
Bluestem	2.59	0.56	0.28	25	818	6
Felton	2.01	0.53	0.35	14	394	2
Hayed transects						
Bluestem	2.41	0.65	0.25	13	215	2
Felton	2.2	0.64	0.32	11	191	2
Grazed transects						
Bluestem	2.59	0.75	0.23	11	51	1
Felton	2.06	0.56	0.36	13	173	2
Unmanaged transects						

Agassiz Dunes	3.23	0.72	0.15	22	341	2
Bluestem	2.69	0.73	0.22	13	139	2
Felton	2.67	0.77	0.2	11	193	2

¹Software by Chi 1997.

²H= Shannon-Wiener Index, J= Equitability index= H/H_{\max} , D= Simpson's diversity index = $\Sigma(p_i)^2$, S= number of species, n= number of specimens.

As an explanation of the second inference, using the Orthoptera data and equitability numbers, within the ranges given in Table 2, the lower the J value, the closer the species assemblage approaches the hollow curve expected as a function of species and number of individuals/species in a natural community. Contrawise, as the J value approaches one, the probability of collecting each particular species in the community approaches equality (Krebs 1985). The burned transects of Bluestem and Felton and the continuously grazed Felton transects show species abundances more in accord with a natural community than those of the unmanaged transects on Agassiz Dunes, Bluestem, and Felton, i.e. 0.56, 0.53 and 0.56, respectively, versus 0.72, 0.73 and 0.77, respectively. Two possible discrepancies of this interpretation are: A) burned transects of Agassiz Dunes show a J value of 0.73, resembling an unmanaged site; B) the grazed transect of Bluestem shows a J value of 0.75, again resembling an unmanaged site. In case A, these are all “overgrown” transects and in that specific sense resemble unmanaged sites with respect to orthopteran host plants. There are no active dunes on our transects at Agassiz Dunes SNA. In case B), the Bluestem grazed transect is also heavily overgrown and unlike the Felton grazed transects, has been only intermittently grazed (half the summer in 1997, not at all in 1998). Possible supporting evidence for this interpretation of the Bluestem grazed transect comes from the carabid data for the Bluestem and Felton grazed transects which also show a difference in equitability numbers for the two sites: Carabidae– 0.75, 0.66; Acrididae/Tettigoniidae– 0.75, 0.56, respectively. It should be noted, however, that the Bluestem grazed transect was the smallest sample analyzed for Orthoptera and we have not yet determined if these differences are statistically significant.

In summary, equitability numbers for Orthoptera samples may support a conclusion that management types effect the structure of species communities. Burned and grazed transects have the lowest equitability numbers, unmanaged transects the highest. Hayed transects fall between the two groups.

Comparison of prairie types. The Bluestem SNA transects were designed for comparisons of dry, mesic, and wet prairies under the same management regime. Table 3 provides some data on the Carabidae, Miridae, and Acrididae/Tettigoniidae. Shannon-Wiener numbers confirm collection data – Carabidae are the most diverse group on all three prairie types. Fewer species of the phytophagous Miridae and Acrididae/Tettigoniidae were found on mesic or wet prairie. Fewest numbers of individuals for both groups were found on mesic prairie. Carabidae were more abundant in terms of numbers of individuals on mesic prairies (see

extended discussion under Prairie indicator species below). Note the great variation in equitability numbers (J) using this subsample. Possibly an indication of either the need for a larger data set (phytophagous insects) or the presence of other, unknown/undetermined mixed effects.

Comparisons of management practices. Transects on the Felton Prairie complex were designed to look at the effects of burning, haying, grazing, and also unmanaged prairie on insect species diversity and composition. Table 4 gives this data for Acrididae/Tettigoniidae from sweep samples and Carabidae from pitfall samples. Cautionary notes in the interpretation of this data include: potential for differential trap avoidance of the various taxa, overall low numbers of Acrididae/Tettigoniidae, loss of pitfall samples due to cattle on grazed sites, and overall size and/or lack of isolation of transects with respect to adjoining land uses.

With these caveats, note the Shannon-Wiener values (H) for burned prairies at Felton with nearly equal number of sampling dates and exactly equal number of sampling stations are very different from the burned value for dry or mesic prairies on Bluestem (Table 3). However, both the equitability number (J) and Simpson's diversity number (D) agree closely in their ratios between the two sites.

One interpretation of these numbers are that while the sites themselves are quite different, the overall community structure is similar with the same management technique (as expected). A greater number of samples are needed from Bluestem hayed or grazed transects to confirm this.

Table 3. Carabidae, Miridae, and Acrididae/Tettigoniidae diversity indices for dry, mesic, and wet prairie from the Bluestem Prairie complex.

Prairie type	Taxa	Index value					
		H=	J=	D=	S=	n=	
<u>Dry</u>	Carabidae	3.7	0.71	0.12		37	727
	Miridae 2.67	0.72	0.22		13	296	
	Acridid/Tettigoniid	2.65	0.64	0.295		18	339
<u>Mesic</u>	Carabidae	2.88	0.58	0.17		32	2864
	Miridae 2.09	0.63	0.37		10	99	
	Acridid/Tettigoniid	1.41	0.38	0.595		13	230
<u>Wet</u>	Carabidae	2.96	0.6	0.2		30	1718
	Miridae 1.36	0.63	0.58		8	393	
	Acridid/Tettigoniid	1.36	0.41	0.58		10	241

Table 4. Diversity indices for burned, hayed, grazed, and unmanaged prairie on the Felton Prairie complex.

Treatment	Taxa	Index value					Number of transects
		H=	J=	D=	S=	n=	
Burning	Carabidae	1.06	0.69	0.14	34	960	2
	Acridid/Tettigoniid	2.01	0.53	0.35	14	394	2
Haying	Carabidae	0.93	0.62	0.235	31	809	2
	Acridid/Tettigoniid	2.2	0.64	0.32	11	191	2
Grazing	Carabidae	0.86	0.66	0.225	20	300	2
	Acridid/Tettigoniid	2.06	0.56	0.36	13	173	2
Unmanaged (control)	Carabidae	1.07	0.69	0.115	35	1,180	2
	Acridid/Tettigoniid	2.67	0.77	0.2	11	193	2

Prairie indicator species.

One of the purposes of this study was to, if possible, determine species of insects which might serve as indicators of prairie type. Certain prairie indicator species are well known. *Speyeria idalia* (Drury) for example, is found in areas where its *Viola* sp. host is also found. *Hesperia dacotae* (Skinner) occurs on prairies that contain both its major host plants, and a nectar source/perching site plants. In the first instance, the butterfly is a strong flier and is often found away from prairie habitat, while in the second, the plants are more readily identifiable than the insect. A requirement of a good indicator species for field biologists is its ease of identification.

Table 5 is a representative taxa list of Carabidae, Miridae, and Acrididae/Tettigoniidae from each of the four prairie types (sand, dry, mesic, and wet). Species marked with an asterisk might be useful indicator species on prairie managed by burning. Note that these species are not prairie obligates but they would be expected in suitable prairie habitats.

Within each of these taxonomic groups there are species strongly although not exclusively associated with wet, dry, or sand prairie regimes. As yet, species showing a near exclusivity for mesic prairie have not been found in these groups.

Three sets of factors which might be compounding the above results are based upon what each prairie type really is, i.e. various combinations of edaphic factors and moisture regimes with native plants adapted to them. Viewed in this way, note that the phytophagous groups, Acrididae/Tettigoniidae and Miridae, show the fewest number of individuals on mesic prairie.

Table 5. Species occurrence on sand, dry, mesic, or wet prairie.**A. Acrididae/Tettigoniidae (Orthoptera) data from Bluestem prairie and Agassiz Dunes from two transect of each prairie type managed by burning (1995-1999) (Gerald Fauske).**

Species	Prairie type			
	sand	dry	mesic	wet
<i>Melanoplus angustipennis</i> *	221	9	0	0
<i>Melanoplus keeleri</i>	54	14	1	0
<i>Conocephalus saltans</i>	106	41	27	34
<i>Aeropedellus clavatus</i>	18	17	0	0
<i>Melanoplus dawsoni</i>	147	175	6	2
<i>Orphulella speciosa</i> *	0	15	2	0
<i>Chorthippus curtipennis</i>	45	18	175	180
<i>Conocephalus fasciatus</i>	0	0	3	4
<i>Conocephalus brevipennis</i> *	0	0	5	10
<i>Eunemobius carolinus</i>	0	0	0	7
Total	591	289	224	237

B. Miridae (Hemiptera) data from Bluestem prairie and Agassiz Dunes from two transect of each prairie type managed by burning (1995-6) (Jesse Albertson).

Species	Prairie type			
	sand	dry	mesic	wet
<i>Lygus lineolaris</i> *	494	5	6	8
<i>Adelphocoris lineolatus</i>	116	77	15	25
<i>Stemodema vicina</i>	22	14	7	9
<i>Lygus borealis</i>	3	6	0	0
<i>Lindbergocapsus planifrons</i> *	0	18	0	0
<i>Plagiognathus laricicola</i>	8	42	1	1
<i>Phytocoris pallidicornis</i>	2	2	1	1
<i>Polymerus unifasciatus</i>	0	7	4	15
<i>Trigonotylus coelestialium</i>	145	103	57	295
<i>Trigonotylus flavicornis</i> *	0	0	6	39
Total	790	274	97	393

C. Carabidae (Coleoptera data from Bluestem prairie and Agassiz Dunes from two transect of each prairie type managed by burning (1995-7) (Paul Tinerella).

Species	Prairie type			
	sand	dry	mesic	wet
<i>Harpalus ereaticus</i>	323	3	2	10
<i>Cicindela formosa</i> *	214	0	0	0
<i>Anisodactylus merula</i>	119	7	0	0
<i>Cicindela scutellaris</i>	34	0	0	0
<i>Amara obesa</i>	15	6	0	0
<i>Pasimachus elongatus</i>	28	38	2	0
<i>Calosoma calidum</i>	24	94	27	7
<i>Agonum cupreum</i>	0	3	10	5
<i>Calathus gregarius</i>	0	29	120	15
<i>Chlaenius platyderus</i>	0	41	263	29
<i>Pterosticus commutabilis</i>	1	17	479	256
<i>Agonum cupripenne</i>	1	112	610	110
<i>Pterosticus novus</i>	29	71	627	650
<i>Elaphrus fuliginosus</i>	0	0	0	7
<i>Anisodactylus harrisii</i>	0	2	23	36
<i>Scaphanotus elevatus</i>	0	1	7	45
<i>Carabus meander</i>	0	3	44	163
<i>Cicindela cursitans</i> *	0	0	1	62
Total	788	427	2212	395

This is consistent with the idea of a species which is tied to a few host plants which are in turn dependant upon a moisture regime or soil type. Mesic prairie would then be viewed as a less favorable habitat for those insect associated with dry or wet prairie dependant plants (an alternative hypothesis being a classification of prairie types based upon indicator plants does not coincide with a similar classification based upon insects). Contrawise, the Carabidae, not being dependant on specific host plants but perhaps with overlapping moisture or soil requirements, then might show the observed result of greatest numbers of individuals on mesic prairies (i.e. species inhabiting either dry or wet prairie might find the moisture regime [or soil properties] of mesic prairie acceptable). This hypothesis can only be tested by examining additional taxonomic groups such as speciose groups of vagile or sedentary taxa with combinations of life cycle and niche as: holometabolous versus paurometabolous predators, or holometabolous versus paurometabolous herbivores. Examples are holometabolous herbivores such as the sedentary/aerial Tephritidae in the Diptera, or Chrysomelidae and Curculionidae in the Coleoptera, as opposed to the holometabolous cursorial predators/omnivores (Carabidae) or paurometabolous herbivores which are saltatorial (Acrididae, Tettigoniidae) or sedentary/aerial (Miridae) analyzed above.

At a specific level, species known to be associated with soil type include: *Melanoplus keeleri* and *Cicindela formosa*. Species apparently directly (or indirectly through their host plants) linked with moisture regimes include *Melanoplus dawsoni*, *Chorthippus curtipennis*, *Trigonotylus flavicornis*, *Calosoma calidum*, and *Carabus maeander*. Species linked to a particular host include *Hypochlora alba* (on *Artemisia ludoviciana* Nutt. and only collected

when that plant is swept), *Lindbergocapsus planifrons* (on *Allium stellatum* Ker.), and *Scaphanotus elevatus* (predaceous on snails).

In summary, more tabulation of specimens must be completed to focus on what species characterize a mesic prairie, or what factor (moisture, soil type, host association) is most important in determining prairie indicator species of insects.

Conclusions

All conclusions here are tentative and should not be taken as the final word but only as work in progress.

- We have identified more than 750 species of insects from native prairies of western Minnesota, we expect that number of species to more than double, as a number of speciose groups have not yet been addressed, and we are in the process of identifying more than twice the number (35,000) of specimens which are covered in this report.
- We believe that management effects species composition and community structure as measured by diversity.
- At present, site differences appear to be as important as management practices in determining species composition and diversity on prairies of a given type. More data must be analyzed to address this point.
- Applying more than a single management technique to a contiguous site should lower diversity, based upon the previous two conclusions.
- We have not yet addressed the succession of insect species or periodic changes in the population of a given species through a burn cycle.
- We have noted some possible prairie indicator insect species but caution that they are not prairie obligates and we do not yet have such species for mesic prairie.

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Appendix I. Locations of study sites by global positioning system (GPS) and by township and range (TR).

Site: Agassiz Dunes State Natural Area (6 transects), Norman and Polk Counties, Minnesota..

station	GPS	TR
Transect A. Polk Co., MN. (burned)		T147N R44W Sec. 32
a1 (slope)	47° 30' 31" N 96° 17' 82" W	
a2 (slack)	47° 30' 26" N 96° 17' 84" W	
a3 (crest)	47° 30' 31" N 96° 17' 84" W	
Transect B. Polk Co., MN. (burned)		T147N R44W Sec. 32
b1 (crest)	47° 30' 14" N 96° 18' 00" W	
b2 (slope)	47° 30' 14" N 96° 17' 06" W	
b3 (slack)	47° 30' 15" N 96° 17' 02" W	
Transect C. Norman Co., MN. (burned)		T146N R44W Sec. 6
c1 (slope)	47° 30' 00" N 96° 18' 35" W	
c2 (slack)	47° 30' 02" N 96° 18' 36" W	
Transect D. Norman Co., MN. (unmanaged)		T146N R44W Sec. 6
d1 (slope)	47° 29' 93" N 96° 18' 56" W	
d2 (crest)	47° 29' 92" N 96° 18' 57" W	
d3 (slack)	47° 29' 95" N 96° 18' 59" W	
Transect E. Polk Co., MN. (burned)		T147N R44W Sec. 32
e1 (crest)	47° 30' 44" N 96° 17' 64" W	
e2 (slope)	47° 30' 40" N 96° 17' 63" W	
e3 (slack)	47° 30' 45" N 96° 17' 64" W	
Transect F. Polk Co., MN. (unmanaged)		T147N R44W Sec. 19
f1 (crest)	47° 31' 68" N 96° 17' 85" W	
f2 (slack)	47° 31' 69" N 96° 18' 63" W	
f3 (slope)	47° 31' 73" N 96° 18' 65" W	

Site: Bluestem Prairie complex (12 transects), Clay Co., Minnesota.

station	GPS	TR
Transect D1. Bluestem SNA (d1, 2) and Buffalo River State park (d3). (burned) T139N R46W Sec. 15		
d1	46° 51' 33" N 96° 28' 35" W	
d2	46° 51' 42" N 96° 28' 30" W	
d3	46° 51' 54" N 96° 28' 18" W	
Transect D2. Bluestem SNA. (burned) T139N R46W Sec. 15		
d7	46° 51' 53" N 96° 28' 69" W	
d8	46° 51' 57" N 96° 28' 69" W	
d9	46° 51' 61" N 96° 28' 68" W	
Transect M1. Bluestem SNA. (burned) T139N R46W Sec. 15		
m1	46° 50' 91" N 96° 28' 68" W	
m2	46° 50' 95" N 96° 28' 67" W	
m3	46° 51' 02" N 96° 28' 62" W	
Transect M2. Bluestem SNA. (burned) T139N R46W Sec. 15		
m6	46° 51' 32" N 96° 27' 78" W	
m7	46° 51' 34" N 96° 27' 79" W	
m8	46° 51' 37" N 96° 27' 82" W	
Transect W1. Bluestem SNA. (burned) T139N R46W Sec. 15 (w1), Sec. 21 (w2, w3)		
w1	46° 50' 86" N 96° 29' 07" W	
w2	46° 50' 84" N 96° 29' 10" W	
w3	46° 50' 91" N 96° 28' 97" W	
Transect W2. Bluestem SNA. (burned) T139N R46W Sec. 22		
w6	46° 50' 78" N 96° 28' 19" W	
w7	46° 50' 76" N 96° 28' 15" W	
w8	46° 50' 72" N 96° 28' 15" W	

Site: Bluestem Prairie complex (12 transects), Clay Co., Minnesota (continued).

station	GPS	TR
Transect N1. Bluestem SNA. (unmanaged)		
n1	46° 51' 34" N 96° 27' 01" W	T139N R46W Sec. 14
n2	46° 51' 35" N 96° 26' 98" W	
n3	46° 51' 40" N 96° 27' 03" W	
Transect N2. Clay county land north of Buffalo River State Park. (unmanaged)		
		T139N R46W Sec. 10
n4	46° 52' 46" N 96° 28' 53" W	
n5	46° 52' 46" N 96° 28' 57" W	
n6	46° 52' 48" N 96° 28' 58" W	
Transect H1. County owned land east of Bluestem SNA. (hayed)		
		T139N R46W Sec. 13, sw 1/4
h1	46° 51' 05" N 96° 26' 05" W	
h2	46° 51' 00" N 96° 25' 05" W	
Transect H2. County owned land west of Clay county landfill. (hayed)		
		T139N R46W Sec. 19
h3	46° 50' 08" N 96° 25' 06" W	
h4	46° 50' 08" N 96° 25' 08" W	
h5	46° 50' 11" N 96° 25' 06" W	
Transect G1. Ranchland east of Bluestem SNA. (grazed)		
		T139N R46W Sec. 13, nw 1/4
g1	46° 51' 15" N 96° 26' 52" W	
g2	46° 51' 13" N 96° 26' 49" W	
g3	46° 51' 06" N 96° 26' 46" W	
Transect F1. Bluestem SNA. (old field)		
		T139N R46W Sec. 23
f1	46° 50' 01" N 96° 26' 76" W	
f2	46° 50' 05" N 96° 26' 76" W	
f3	46° 50' 08" N 96° 26' 77" W	

Site: Felton Prairie complex (8 transects), Clay Co., Minnesota.

station	GPS	TR
Blazingstar SNA. (burned)		T141N R45W Sec. 5 NE
BzS 1	47°03' 53" N 96°24' 75" W	
BzS 2	47°03' 54" N 96°24' 75" W	
BzS 3	47°03' 56" N 96°24' 76" W	
Bicentennial SNA. (burned)		T141N R45W Sec. 5 SW
Bct 1	47°03' 37" N 96°25' 59" W	
Bct 2	47°03' 34" N 96°25' 61" W	
Bct 3	47°03' 31" N 96°25' 57" W	
Clay county trust land 1. (hayed)		T141N R45W Sec. 6
ccl 1	47°03' 54" N 96°26' 13" W	
ccl 2	47°03' 59" N 96°26' 17" W	
ccl 3	47°03' 62" N 96°26' 15" W	
Clay county trust land 2. (hayed)		T141N R45W Sec. 6
ccl 4	47°03' 67" N 96°26' 10" W	
ccl 5	47°03' 71" N 96°26' 07" W	
ccl 6	47°03' 67" N 96°25' 99" W	
Clay county (no mgt.) land 1. (unmanaged)		T142N R45W Sec. 32
cnm 1	47°03' 87" N 96°25' 64" W	
cnm 2	47°03' 89" N 96°25' 63" W	
cnm 3	47°03' 92" N 96°25' 64" W	
Clay count (no mgt.) land 2. (unmanaged)		T142N R45W Sec. 31
cnm 4	47°03' 99" N 96°26' 01" W	
cnm 5	47°03' 95" N 96°25' 98" W	
cnm 6	47°03' 94" N 96°26' 00" W	
B-B ranch 1. (grazed)		T141N R45W Sec. 8
b-b 1	47°02' 77" N 96°25' 24" W	
b-b 2	47°02' 73" N 96°25' 19" W	
b-b 3	47°02' 71" N 96°25' 17" W	
B-B ranch 2. (grazed)		T141N R46W Sec. 12
b-b 4	47°02' 70" N 96°26' 35" W	
b-b 5	47°02' 72" N 96°26' 41" W	
b-b 6	47°02' 75" N 96°26' 39" W	

Appendix II. Management Histories of Agassiz Dunes State Natural Area, Bluestem Prairie Complex, and Felton Prairie Complex.

I. Burning history of transect areas

A. Agassiz Dunes State Natural Area

Transect A:	1993	18 May	
	1987	24 April	
	1984	4 October	
	1979	25 October	
Transects B & C:	1999	25 May	
	1990	4 May	
	1984	13 May	
	1981	13 May	
Transect E:	1998	5 May	
	1993	4 May	
	1987	9 May	
	1981	28 October	(eastern one-half)
	1978	10 October	(eastern one-half)

B. Bluestem Prairie Complex

Transect D1:	1998	2 May	(northern one-third of transect)
	1995	20 April	(southern one-third of transect)
	1992	28 September	(southern two-thirds of transect)
	1989	3 May	
	1984	17 May	
	1982	3 October	(southern two-thirds of transect)
	1978	21 October	(wildfire)
	1977	15 August	
Transect D2	1999	17 May	
	1998	2 May	
	1993	10 May	
	1988	16 October	
	1984	19 May	
	1982	4 October	
	1978	21 October	(wildfire)
	1977	15 August	

Bluestem prairie complex (continued).

Transect M1	1996	5 May	(wildfire)
	1992	9 October	
	1988	30 April	
	1985	16 October	
	1982	12 May	
	1981	8 April	
	1978	21 October	(wildfire)
Transect M2	1992	28 September	
	1989	3 May	
	1984	17 May	
	1982	3 October	
	1978	21 October	(wildfire)
	1977	15 August	
Transect W1	1997	16 May	(complete transect)
	1996	6 May	(wildfire)
	1995	4 May	(southwestern four-fifths of transect)
	1992	9 October	(northeastern one-fifth of transect)
	1988	30 April	(northeastern one-fifth of transect)
	1985	16 October	(northeastern one-fifth of transect)
	1982	12 May	(northeastern one-fifth of transect)
	1981	8 April	(northeastern one-fifth of transect)
Transect W2	1996	6 May	(wildfire)
	1991	11 May	
	1989	10 October	
	1978	21 October	(wildfire)
C. Felton Prairie Complex			
Bicentennial Prairie	1997	Spring (northern one-half)	
	1996	Spring (southern one-half)	
	1994	15 May	(eastern one-third)
	1993	Spring (northwestern one-third)	
	1988	21 April	(eastern one-third)
	1987	29 April	(southwestern one-third)
	1985	10 October	(northwestern one-third)
1984	3 May	(western one-third)	

Felton prairie complex (continued).

Blazing Star Prairie	1997	30 April	(southwest and northeast one quarter)
	1992	6 October	
	1988	14 October	
	1985	14 October	
	1981	20 March	
Clay County NM1	1997	Fall	

II. Haying history of transect areas:
A. Bluestem Prairie Complex

Transect D1	1998 Aug.	(D2)
Transect D2	1999 Aug.	(D6, 7, 8)
	1998 Aug.	(D7, 8)
Transect H1	> 20 years	
Transect H2	> 20 years	

B. Felton Prairie Complex

CCL 1 & 2	1998 Aug	
	1997 Aug.	
	1995 Aug.	(annually since 1930's)
CNM2	1998 Aug.	
BzS	1998	(BzS 2, 3)
Bct	1998 Aug.	(south of transect)

III. Grazing history of transect areas:
A. Bluestem Prairie

Transect G1	(periodic grazing for at least 20 years)
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B. Felton Prairie

B-B Ranch # 1	(>20 years)
B-B Ranch # 2	(>20 years)

IV. Unmanaged prairie, history of transect areas:

A. Agassiz Dunes State Natural Area

Transect D: No management since 1975 (previously managed by burning)

Transect F: No management since 1976 (grazed until 1976)

B. Bluestem Prairie Complex

N1 >20 years

N2 >20 years

C. Felton Prairie Complex

CNM 1 (until Fall 1997)

CNM 2 (until August 1998)

Appendix III. Sampling dates for Agassiz Dunes, Bluestem, and Felton prairie complexes.

Site	Year					
	1995	1996	1997	1998	1999	
Bluestem	—	—	—	—	11 May	
	—	3 June	—	—	26 May	
	13 June	—	10 June	26 June	27 June	
	—	24 June	—	—	—	
	13 July	10 July	14 July	7 July	7 July	
	28 July	23 July	—	29 July	21 July	
	9 August	5 August	—	—	—	
	17 August	—	—	13 August	—	
	22 August	20 August	18 August	—	19 August	
	7 September	3 September	4 September	4 September	10 September	
	—	16 September	24 September	—	24 September	
	Felton	—	—	—	—	1 May
		—	—	—	—	20 May
—		7 June	—	—	4 June	
—		21 June	—	26 June	18 June	
—		3 July	9 July	—	30 June	
24 July		15 July	—	—	13 July	
4 August		1 August	28 July	27 July	30 July	
15 August		15 August	13 August	21 August	18 August	
25 August		27 August	1 September	2 September	8 September	
14 September		13 September	22 September	—	22 September	
—		1 October	—	—	—	
Agassiz Dunes		—	—	—	—	17 May
		—	—	—	—	27 May
	—	17 June	17 June	11 June	11 June	
	—	30 June	1 July	—	29 June	
	—	—	—	8 July	9 July	
	1 August	30 July	6 August	—	31 July	
	—	—	—	—	27 July	
	16 August	12 August	—	14 August	13 August	
	28 August	21 August	21 August	21 August	25 August	
	16 September	10 September	8 September	—	17 September	
	—	24 September	—	—	—	

Appendix IV. Species list.

The following lists contains species or genera of selected groups for which identifications have been made. This information is presented with collection sites and numbers. Sites are designated as follows: A, Agassiz Dunes Prairie complex, including Agassiz Dunes SNA, Prairie Smoke SNA, and City of Fertle parkland; Felton Prairie complex, including Bicentennial SNA, Blazingstar SNA, B-B ranch, and Clay County trust lands; and B, Bluestem Prairie complex, including Bluestem SNA, part of Buffalo River State Park, and local ranch and hayed lands. Various sections of this list have been compiled by a number of workers. Contributions of single individuals to the identifications within major groups are listed under each group. More detailed transect and station data is available for all species on this list. Updated May 15, 2000.

Orthoptera: Grasshoppers and Crickets (Gerald Fauske)

Acrididae (Spur-throated grasshoppers)

<i>Melanoplus angustipennis</i> (Dodge)	A, B	430
<i>Melanoplus bivittatus</i> (Say)	A, B, F	66
<i>Melanoplus borealis</i> Fieber	A, B, F	7
<i>Melanoplus bruneri</i> Scudder	A, B	3
<i>Melanoplus confusus</i> Scudder	A, B, F	26
<i>Melanoplus dawsoni</i> (Scudder)	A, B, F	1038
<i>Melanoplus femurrubrum</i> (DeGeer)	A, B, F	115
<i>Melanoplus flavidus</i> Scudder	A	1
<i>Melanoplus foedus</i> Scudder	A, B, F	54
<i>Melanoplus gladstoni</i> Scudder	A	3
<i>Melanoplus huroni</i> Blatchley	A	2
<i>Melanoplus keeleri</i> (Thomas)	A, B, F	140
<i>Melanoplus packardii</i> Scudder	A	1
<i>Melanoplus sanguinipes</i> (Fabricius)	A, B, F	96
<i>Hesperotettix viridis</i> Scudder	A	2
<i>Hypochlora alba</i> Dodge	A, B, F	11
<i>Phoetaliotes nebrascensis</i> (Thomas)	A, B, F	64
<i>Aeropedellus clavatus</i> (Thomas)	A, B, F	152
<i>Ageneotettix deorum</i> (Scudder)	A, B	151
<i>Chorthippus curtippennis</i> (Harris)	A, B, F	807
<i>Chloealtis conspersus</i> Harris	A, B	17
<i>Eritettix simplex</i> (Scudder)	A, B, F	25
<i>Pseudopomala brachyptera</i> (Scudder)	A, B, F	15
<i>Orphulella speciosa</i> (Scudder)	A, B, F	39
<i>Stethophyma celata</i> Otte	A, B, F	4
<i>Arphia conspersa</i> Scudder	F	1
<i>Arphia pseudonietana</i> (Thomas)	F	3
<i>Chortophaga viridifasciata</i> (DeGeer)	B	1
<i>Pardalophora haldemani</i> (Scudder)	A, F	2
<i>Spharagemon collare</i> (Scudder)	A, B, F	44
<i>Trachyrachys kiowa</i> (Thomas)	F	1
Tetrigidae (Grouse locusts)		
<i>Tetrix ornata</i> (Say)	A, B	10
<i>Tetrix subulata</i> (Linnaeus)	B	1

<i>Tettigidea lateralis</i> (Say)	B	2
Tettigoniidae (Long-horned grasshoppers)		
<i>Neoconocephalus ensiger</i> (Harris)	A, B, F	23
<i>Conocephalus saltans</i> (Scudder)	A, B, F	771
<i>Conocephalus brevipennis</i> (Scudder)	B	42
<i>Conocephalus fasciatus</i> (DeGeer)	B, F	79
<i>Orchelimum gladiator</i> Bruner	B	18
<i>Orchelimum vulgare</i> Harris	B	3
<i>Scudderia curvicauda</i> (DeGeer)	F	1
<i>Scudderia furcata</i> (Br. von Watt.)	B	1
<i>Scudderia pistillata</i> (Br. von Watt.)	B, F	11
<i>Scudderia texensis</i> (Saussure & Pictet)	F	1
Gryllidae (Crickets)		
<i>Oecanthus quadripunctatus</i> Beutenmuller	A, B	2
<i>Oecanthus nigricornis</i> (Alex. & Thom.)	F, F	3
<i>Allonemobius allardi</i> (Alex. & Thom.)	A, B, F	329
<i>Allonemobius griseus</i> (E.M. Walker)	A	62
<i>Eunemobius carolinus</i> (Scudder)	B, F	8
<i>Gryllus pennsylvanicus</i> Burmeister	B, F	41
<i>Gryllus veletus</i> (Alex. & Bigalow)	A, B, F	96
Rhaphidophoridae (Cammel crickets)		
<i>Ceuthophilus pallidus</i> (Thomas)	A, B, F	132
<i>Ceuthophilus fusciformis</i> (Scudder)	F	4
<i>Udeopsylla robusta</i> (Haldeman)	B, F	15
Hemiptera: True bugs (David Rider except as noted).		
Corixidae (Water boatman) (Paul Tinerella)		
<i>Trichocorixa sexcincta</i> (Champion)	B	
<i>Trichocorixa borealis</i> Sailer	B	
<i>Hesperocorixa atopodonta</i> (Hungerford)	B	
<i>Cenocorixa dakotensis</i> (Hungerford)	B	
<i>Sigara conocephala</i> (Hungerford)	B	
<i>Sigara decoratella</i> (Hungerford)	B	
<i>Sigara bicoloripennis</i> (Walley)	B	
<i>Sigara alternata</i> (Say)	B	
<i>Sigara solensis</i> (Hungerford)	B	
Reduviidae (Assassin bugs)		
<i>Sinea diadema</i> (Fabricius)	B, F	20
<i>Phymata</i> sp.	A, B, F	143
Tingidae (Lace bugs)		
<i>Corythaica bellula</i> Torre-Bueno	F	3
<i>Corythucha arcuata</i> (Say)	A	3
<i>Corythucha marmorata</i> (Uhler)	F	18
<i>Hesperotingis antennata</i> Parshley	F	2
<i>Hesperotingis</i> sp.	B, F	5
<i>Melanorhopala clavata</i> (Stål)	B	1
Miridae (Plant bugs) (Jesse Albertson)		
Subfamily Mirinae		
<i>Adelphocoris lineolatus</i> (Goeze)	A, B, F	253
<i>Lygus atritibialis</i> Knight	B	11
<i>Lygus borealis</i> Kelton	A, B, F	14
<i>Lygus lineolaris</i> (Palisot de Beauvois)	A, B, F	633

<i>Phytocoris pallidicornis</i> Reuter	A, B, F	12
<i>Polymerus unifasciatus</i> (Fabricius)	B, F	20
<i>Polymerus chrysopsis</i> Knight	B	3
<i>Collaria meilleurii</i> Provancher	F	5
<i>Stenoderna trispinosa</i> Reuter	A	1
<i>Stenoderna vicina</i> (Provancher)	A, B	45
<i>Trigonotylus coelestialium</i> (Kirkaldy)	A, B, F	777
<i>Trigonotylus flavicornis</i> Kelton	B, F	16
Subfamily Orthotylinae		
<i>Lindbergocapsus planifrons</i> (Knight)	B, F	22
<i>Lopidea dakota</i> Knight	B	1
<i>Lopidea instabilis</i> (Reuter)	A	1
<i>Lopidea minor</i> Knight	A, B, F	14
<i>Slaterocoris pallidicornis</i> (Knight)	A	1
Subfamily Phylinae		
<i>Plagiognathus blatchleyi</i> (Reuter)	B	1
<i>Plagiognathus fuscus</i> (Provancher)	F	1
<i>Plagiognathus laricicola</i> Knight	A, B, F	100
<i>Plagiognathus medicagus</i> Arrand	A, B, F	17
<i>Pseudatomoscelis seriatus</i> (Reuter)	A	22
Coreidae (Squash bugs)		
<i>Nisoscolopocerus apiculatus</i> Barber	A, B	2
Alydidae (Broad-headed bugs)		
<i>Alydus conspersus</i> (Montanel)	A, B, F	124
<i>Alydus eurinus</i> (Say)	A, B	3
<i>Megalotomus quinquespinosus</i> (Say)	A	1
Lygaeidae (Seed bugs) (<i>Sensu Lato</i>)		
Subfamily Blissinae		
<i>Blissus sp.</i>	A, B, F	57
<i>Ishnodemus falicus</i> (Say)	B	1
Subfamily Geocorinae		
<i>Geocoris bullulatus</i> (Say)	B	1
<i>Geocoris limbatus</i> (Stål)	A, B, F	14
Subfamily Ischnorhynchinae		
<i>Kleidocerys sp.</i>	F	2
Subfamily Orsillinae		
<i>Nysius spp.</i>	A, B, F	774
<i>Neortholomus scolopax</i> (Say)	B, F	16
Subfamily Oxycarninae		
<i>Crophius disconotus</i> (Say)	F	2
Subfamily Rhyparochrominae		
<i>Eremocoris borealis</i> (Dallas)	B	1
<i>Scolopostethus sp.</i>	B	6
<i>Atrazonotus umbrosus</i> Distant	B, F	45
<i>Emblethis vicarius</i> Horvath	B, F	39
<i>Trapezonotus arenarius</i> (Linnaeus)	F	18
<i>Sphragisticus nebulosus</i> (Fallen)	A, B	128
<i>Carpilis sp.</i>	F	13
<i>Kolenetrus plenus</i> (Distant)	B	1
<i>Ligyrocoris diffusus</i> Uhler	A, B, F	334
<i>Ligyrocoris sylvestris</i> (Linnaeus)	A, B	19
<i>Perigenes constrictus</i> (Say)	B	1

<i>Pseudocnemodus canadensis</i> (Provancher)	B, F	35	
<i>Sisamnes claviger</i> (Uhler)	F	1	
<i>Zeridonous costalis</i> (Van Duzee)	A, B, F	206	
<i>Slaterobius insignis</i> (Uhler)	A, B, F	46	
Corimelanidae (Negro bugs)			
<i>Corimelana pulicaria</i> M. & M.	A, F	3	
Pentatomidae (Stink bugs)			
Subfamily Asopinae			
<i>Apocilus bracteatus</i> (Fitch)	B, F	8	
Subfamily Pentatomidae			
<i>Aelia americana</i> Dallas	A, B, F	17	
<i>Chlorochroa belfragii</i> (Stål)	B	1	
<i>Chlorochroa persimilis</i> Horvath	A, F	22	
<i>Coenus delius</i> (Say)	A, B, F	1104	
<i>Cosmopepla lintneriana</i> Kirkaldy	B, F	4	
<i>Euschistus servus</i> (Say)	A, B, F	34	
<i>Euschistus variolarius</i> (P. de B.)	B	1	
<i>Holcostethus abbreviatus</i> Uhler	F	1	
<i>Holcostethus limbolarius</i> Stål	B	1	
<i>Mormidea lugens</i> (Fabricius)	A	20	
<i>Neottiglossa undata</i> (Say)	A, B, F	24	
<i>Trichopepla atricornis</i> Stål	B, F	30	22
<i>Sciocoris microphththalmus</i> Flor	B, F	30	
Subfamily Podopinae			
<i>Amaurochrous brevitylus</i> Barb. & Sailer	B	27	
Scutelleridae (Shield bugs)			
<i>Eurygaster alternata</i> (Say)	A, B, F	807	
<i>Homaemus aenifrons</i> (Say)	A, B, F	108	
<i>Homaemus bijugis</i> Uhler	A, B, F	401	
<i>Vanduzeeina borealis</i> Van Duzee	A	18	

Homoptera: Aphids, Scales, Cicadas, etc. (David Rider, except as noted)

Membracidae (Treehoppers) (Jesse Albertson)

<i>Publilia concava</i> (Say)	A	1	
<i>Publilia modesta</i> (Uhler)	F	19	
<i>Vanduzeeia triguttata</i> (Burmeister)	A, B	47	
<i>Tortistilus minutus</i> (Caldwell)	B	53	
<i>Glossonotus nimbatulus</i> Ball	B	1	
<i>Glossonotus univittatus</i> (Harris)	A	1	
<i>Telamona spreta</i> Goding	A	1	
<i>Cyrtolobus griseus</i> Van Duzee	A	1	
<i>Campylenchia latipes</i> (Say)	B, F	26	
Cicadellidae (Leafhoppers)			
<i>Macrostoteles spp.</i>	A, B, F	3888	
<i>Destria spp.</i>	F	181	
<i>Amphicephalus inimicus</i>	A, B, F	589	
<i>Amphicephalus spp.</i>	A	32	
<i>Roserius spp.</i>	B, F	72	
<i>Doratura spp.</i>	A, B, F	244	
<i>Athysanella spp.</i>	A, B, F	101	
<i>Aceratagallia spp.</i>	A, B, F	169	
<i>Flexamia spp.</i>	A, B, F	202	

<i>Athysanus argentarius</i> Metc.	A, B, F	183	
<i>Chlorotettix</i> spp.	A, B, F	82	
<i>Draculocephala</i> spp.	A, B, F	21	
<i>Paraphlepsius</i> sp #1	A, B, F	9	
<i>Paraphlepsius</i> sp #2	A, F	2	
<i>Paraphlepsius</i> sp. #3	B	1	
<i>Paraphlepsius</i> sp. #4	A	1	
<i>Frigartus</i> spp	B, F	19	
<i>Scaphytopius</i> spp.	A, B, F		81
<i>Graphocephala coccinea</i> (Forst)	A	4	
<i>Aflexia rubranura</i> (Delong)	F	1	
<i>Prairiana</i> sp.	B	1	
<i>Dorycara</i> sp.	B, F	5	
<i>Neohecalus</i> sp.	A	5	
<i>Attenuipyga</i> sp	F	4	
<i>Hecalus</i> sp.	B	10	
<i>Xerophloea</i> sp.	A, B	2	
<i>Neocoelidia</i> sp.	B	4	
<i>Limotettix</i> sp.	B	1	
<i>Neokolla</i> sp.	A	1	
<i>Memnonia</i> sp.	F	1	
<i>Exitianus</i> sp.	A, F	21	
<i>Texanimus</i> sp.	A	11	
<i>Driotura</i> sp.	A, B, F	34	
<i>Balclutha</i> spp	A, B, F	254	
<i>Gypona</i> sp.	B, F	27	
<i>Gyponana</i> sp.	A, B, F	4	
Cercopidae (Froghoppers)			
<i>Philaenarcys bilineata</i> (Say)	A, B, F	339	
<i>Lepyronia gibbosa</i> Ball	A, B, F	114	
<i>Lepyronia quadrangularis</i> (Say)	A	1	
<i>Philaenus spumarius</i> (Linnaeus)	A, B, F	123	
<i>Aphrophera quadrinotata</i> Say	A	3	
Derbidae (Derbid planthoppers) (Paul Tinerella)			
<i>Cerusa</i> sp.	B	2	
<i>Apheloneura histrionica</i> Stål	A	55	
<i>Apheloneura simplex</i> Uhler	B	6	
<i>Apheloneura bivittata</i> Ball	F	2	

Coleoptera: Beetles**Carabidae (Ground and Tiger beetles) (Paul Tinerella)**Tribe **NOTIOPHILINI**

<i>Notiophilus semistriatus</i> Say	B, F	15
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Tribe **CICINDELINI**

<i>Cicindela cursitans</i> LeConte	B	65
<i>Cicindela formosa formosa</i> Say	A	214
<i>Cicindela limbalis</i> Klug	A, F	2
<i>Cicindela punctulata punctulata</i> Olivier	A, B, F	78
<i>Cicindela purpurea purpurea</i> Olivier	F	4
<i>Cicindela scutellaris lecontei</i> Haldeman	A	34
<i>Cicindela sexguttata</i> Fabricius		

Tribe **CARABINI**

<i>Calosoma calidum</i> (F.)	A, B, F	1289	
<i>Carabus serratus</i> Say	A, B, F	265	
<i>Carabus maeander</i> Fischer	B, F		417
Tribe CYCHRINI			
<i>Scaphinotus elevatus coloradensis</i> Van Dyke	B, F	83	
Tribe ELAPHRINI			
<i>Elaphrus fuliginosus</i> Say	B	7	
<i>Elaphrus cf. lecontei</i> Crotch	B	2	
<i>Elaphrus</i> sp. A			
Tribe OMOPHRONINI			
<i>Omophron americanum</i> Dejean	B, F	5	
Tribe BRACHININI			
<i>Brachinus cyanochroaticus</i> Erwin	B	4	
<i>Brachinus ovipennis</i> LeConte	B	1	
<i>Brachinus quadripennis</i> Dejean	A, B	3	
Tribe SCARITINI			
<i>Pasimachus elongatus</i> LeConte	A, B, F	272	
Tribe CLIVININI			
<i>Dyschirius truncatus</i> LeConte			
<i>Dyschirius</i> sp. A			
<i>Dyschirius</i> sp. B			
<i>Dyschirius</i> sp. C			
Tribe BEMBIDIINI			
<i>Bembidion quadrimaculatum oppositum</i> Say			
<i>Bembidion</i> sp. A			
<i>Bembidion</i> sp. B			
<i>Bembidion</i> sp. C			
<i>Bembidion</i> sp. D			
<i>Bembidion</i> sp. E			
<i>Mioptachys</i> sp.			
<i>Tachyta</i> sp.			
<i>Elaphropus</i> sp.			
<i>Porotachys</i> sp.			
Tribe PATROBINI			
<i>Patrobus lecontei</i> Chaudoir			
<i>Patrobus longicornis</i> (Say)			
Tribe PTEROSTICHINI			
<i>Poecilus corvus</i> (LeConte)	A, B	3	
<i>Poecilus lucublandus lucublandus</i> (Say)	A, B, F	2396	
<i>Pterostichus caudicalis</i> (Say)			
<i>Pterostichus commutabilis</i> (Motschulsky)	A, B, F	1086	
<i>Pterostichus corvinus</i> (Dejean)			
<i>Pterostichus femoralis</i> (Kirby)	A, B, F	64	
<i>Pterostichus luctuosus</i> (Dejean)			
<i>Pterostichus melanarius</i> (Illiger)	A, B	10	
<i>Pterostichus novus</i> Straneo	A, B, F		2450
<i>Pterostichus pensylvanicus</i> LeConte			
Tribe ZABRINI			
<i>Amara carinata</i> (LeConte)			
<i>Amara littoralis</i> Mannerheim	A, B, F	109	
<i>Amara obesa</i> (Say)	A, B, F	288	
<i>Amara quenseli</i> (Schönherr)	A, B, F	232	

<i>Amara rubrica</i> Haldeman	A, B, F	39	
<i>Amara</i> sp. A			
<i>Amara</i> sp. B			
Tribe CHLAENIINI			
<i>Chlaenius alternatus</i> Horn	B	2	
<i>Chlaenius impunctifrons</i> Say			
<i>Chlaenius lithophilus lithophilus</i> Say	B	7	
<i>Chlaenius niger</i> Randall	B	1	
<i>Chlaenius pennsylvanicus pennsylvanicus</i> Say	A, B		2
<i>Chlaenius platyderus</i> Chaudoir	B, F	743	
<i>Chlaenius purpuricollis purpuricollis</i> Randall	A, B, F	123	
<i>Chlaenius sericeus sericeus</i> (Forster)	A, B	2	
<i>Chlaenius tomentosus tomentosus</i> (Say)	A, B	2	
Tribe LICININI			
<i>Diplocheila assimilis</i> (LeConte)			
<i>Diplocheila impressicollis</i> (Dejean)			
<i>Diplocheila obtusa</i> (LeConte)			
<i>Diplocheila stratiopunctata</i> (LeConte)			
<i>Diplocheila undulata</i> Carr	B	7	
<i>Dicaelus sculptilis upioides</i> Ball	A, B	9	
<i>Badister notatus</i> Haldeman			
<i>Badister parviceps</i> Ball			
<i>Badister</i> sp. A			
<i>Badister</i> sp. B			
Tribe HARPALINI			
<i>Anisodactylus harrisii</i> LeConte	B, F	187	
<i>Anisodactylus merula</i> (Germar)	A, B, F	271	
<i>Anisodactylus rusticus</i> (Say)	A, B, F	43	
<i>Anisodactylus sanctaecrucis</i> (F.)			
<i>Geopinus incrassatus</i> (Dejean)	B	1	
<i>Amphasia sericea</i> (Harris)	B, F	4	
<i>Stenolophus comma</i> (Fab.)	B	2	
<i>Euryderus grossus</i> (Say)	A, B	2	
<i>Harpalus faunus</i> Say			
<i>Harpalus pensylvanicus</i> (DeGeer)	B	80	
<i>Harpalus calignosus</i> (Fabricius)	A, B, F	5	
<i>Harpalus eraticus</i> Say	A, B, F	429	
<i>Harpalus</i> sp. A			
<i>Harpalus</i> sp. B			
<i>Harpalus</i> sp. C			
<i>Harpalus</i> sp. D			
<i>Harpalus</i> sp. E			
<i>Harpalus</i> sp. F			
Tribe PLATYNINI			
<i>Calathus gregarius</i> (Say)	B, F	317	
<i>Calathus ingratus</i> Dejean	B, F	22	
<i>Synuchus impunctatus</i> (Say)	A, B, F	266	
<i>Oxytelaphus pusillus</i> (LeConte)	B, F	77	
<i>Agonum corvus</i> (LeConte)			
<i>Agonum cupreum</i> Dejean	B, F	181	
<i>Agonum cupripenne</i> Say	A, B, F	1205	
<i>Agonum decorum</i> (Say)			

<i>Agonum gratiosum</i> (Mannerheim)	A, B, F	67	
<i>Agonum melanarium</i> Dejean			
<i>Agonum nutans</i> (Say)	B	31	
<i>Agonum placidum</i> (Say)			
<i>Agonum</i> spp.			
<i>Platynus decentis</i> (Say)			
Tribe LEBIINI			
<i>Cymindis borealis</i> LeConte	B, F	46	
<i>Cymindis cribricollis</i> Dejean	F	1	
<i>Cymindis neglectus</i> Haldeman	A, B, F	5	
<i>Cymindis pilosus</i> Say	A, B, F	12	
<i>Cymindis planipennis</i> LeConte			
<i>Cymindis platicollis</i> (Say)	A	2	
<i>Syntomus americanus</i> (Dejean)	A, B, F	233	
<i>Lebia atriventris</i> Say			
<i>Lebia viridis</i> Say			
<i>Lebia pumila</i> Dejean			
<i>Lebia</i> sp. A			
<i>Lebia</i> sp. B			
<i>Calleida punctata</i> LeConte			B 4
<i>Calleida purpurea</i> (Say)	F	23	
Staphylinidae (Rove beetles)			
<i>Xenodusa cf. reflexa</i> (Walker)	F	1	
<i>Micropeplus</i> sp.	B	2	
Silphidae (Carrion beetles) (Gerald Fauske)			
<i>Necrophila americana</i> (Linnaeus)	B	27	
<i>Thanatophilus lapponicus</i> (Herbst)	B	91	
<i>Nicrophorus guttula</i> Motsch.	B	2	
<i>Nicrophorus hybridus</i> (Hatch & Angell)	B, F	184	
<i>Nicrophorus marginatus</i> Fabricius	B, F	118	
<i>Nicrophorus obscurus</i> Kirby	B, F	70	
<i>Nicrophorus orbicollis</i> Say			A, B 16
<i>Nicrophorus sayi</i> Laporte	A	1	
<i>Nicrophorus tomentosus</i> Weber	A, B, F	142	
<i>Nicrophorus vespilloides</i> Herbst	B	16	
Scarabaeidae (Scarab beetles) (Paul Lago)			
<i>Aphodius pinguellis</i> Br.	B	2	
<i>Aphodius concavus</i> Say	A	5	
<i>Onthophagus hecate</i> (Panzer)	A, B, F	661	
<i>Onthophagus nuchicornis</i> (Linnaeus)	A, B, F	76	
<i>Onthophagus orpheus</i> (Panzer)	F	1	
<i>Aphonus tridentatus</i> (Say)	A, B	25	
<i>Geotrupes splendidus</i> (Fabricius)	A, B, F	12	
<i>Hoplia laticollis</i> LeConte	A, F	9	
<i>Hoplia modesta</i> Haldeman	B	1	
<i>Cremastocheilus knochi</i> LeConte	F	2	
Eucinetidae (Eucinetid beetles)			
<i>Eucinetus terminalis</i> LeConte	B	4	
Cantharidae (Soldier beetles)			
<i>Chauliognathus pennsylvanicus</i> DeGeer	B, F	34	

Coccinellidae (Ladybeetles) (Gerald Fauske)		
<i>Anisosticta bitriangularis</i> (Say)	B	12
<i>Brachiacantha decempustulata</i> (Melsh.)	B	3
<i>Brachiacantha tau</i> LeConte	B	1
<i>Brachiacantha ursina</i> (Fabricius)	B, F	12
<i>Coccinella trifasciata</i> (Linnaeus)	A	1
<i>Coccinella septempuncta</i> (Linnaeus)	A, B, F	183
<i>Coleomegilla maculata</i> (DeGeer)	B	2
<i>Cycloneda munda</i> (Say)	B, F	3
<i>Hippodamia convergens</i> Guerin	A, B, F	12
<i>Hippodamia glacialis</i> (Fabricius)	B, F	3
<i>Hippodamia parenthesis</i> (Say)	A, B, F	12
<i>Hippodamia tredecimpunctata</i> (Linnaeus)	A, B, F	55
<i>Hyperaspis wolcotti</i> (Nunenmacher)	A	11
<i>Hyperaspis inflexa</i> Casey	A	4
<i>Hyperaspis proba</i> (Say)	A	3
<i>Hyperaspis undulata</i> (Say)	F	3
<i>Scymnus apicamus</i> J. Chapin	F	1
Languriidae (Lizard beetles)		
<i>Languria mozardi</i> Latrielle	F	3
Cleridae (Checkered beetles)		
<i>Trichodectes nuttalli</i> Kirby	A	1
Meloidae (Blister beetles)		
<i>Meloe niger</i> Kirby	A, B, F	64
<i>Meloe impressus</i> Kirby	B, F	155
Anthicidae (Ant-like flower beetles)		
<i>Notoxus anchora</i> Hentz	A, B, F	19
Cerambycidae (Long-horned beetles)		
<i>Prionus imbricornis</i> (Say)	B	2
<i>Prionus fissicornis</i> Haldeman	B, F	8
<i>Megacyllene powersi</i> Linsley and Chemsak	F	2
<i>Tetraopes annulatus</i> LeConte	A	2
Curculionoidea (Snout beetles) (Laura Schmaltz)		
Apionidae (Globose weevils)		
<i>Nanophyes canadensis</i> W.J. Brown	A	2
<i>Apion</i> sp.#1	B	6
<i>Apion</i> sp.#2	B, F	25
<i>Apion</i> sp.#3	A, B, F	37
<i>Apion</i> sp.#4	B, F	31
<i>Apion</i> sp.#5	B, F	10
<i>Apion</i> sp.#6	B, F	78
<i>Apion</i> sp.#7	A, B, F	73
Rhynchitidae (Rhynchitid weevils)		
<i>Haplorhynchites aenus</i> Boheman	B	3
<i>Rhynchites bicolor</i> (Fabricius)	B	1
Curculionidae (Weevils)		
<i>Otiorhynchus ovatus</i> (Linnaeus)	A, B, F	27
<i>Miarus hispidulus</i> Reitter	F	1
<i>Polydrusus sericeus</i> Gyllenhal	B	8
<i>Sitona cylindricollis</i> (Fabricius)	A, B, F	36
<i>Sitona hispidulus</i> (Fabricius)	B, F	2
<i>Sitona lineelus scissifrons</i> (Say)	B	2

<i>Lixus concavus</i> (Say)	B	1	
<i>Anthonomus elongatus</i> LeConte	F	1	
<i>Anthonomus rufipes</i> LeConte	A, B, F	95	
<i>Anthonomus squamosus</i> LeConte	A, B, F	20	
<i>Chelonychus longipes</i> Dietz	F	1	
<i>Conotrachelis posticatus</i> (Say)	A	1	
<i>Promecotarsus fumatus</i> Casey	B	1	
<i>Smicronyx amoenus</i> (Say)	B, F	51	
<i>Smicronyx fulvus</i> LeConte	B, F	2	
<i>Smicronyx tessellatus</i> Dietz	A, B, F	6	
<i>Smicronyx sp.</i>	A, B, F	143	
<i>Curculio strictus</i> Casey	A	1	
<i>Acanthoscelidius acephalus</i> (Say)	A, B	6	
<i>Auleutes asper</i> LeConte	F	5	
<i>Ceutorhynchus neglectus</i> Blatchley	F	1	
<i>Phyxelis rigidus</i> (Say)	B	1	
<i>Tychius aratus</i> (Say)	B, F	4	
<i>Tychius picirostris</i> (Fabricius)	F	1	
<i>Tychius sp.</i>	B	1	
<i>Baris strenua</i> LeConte	F	1	
<i>Cosmobaris americana</i> Casey	A, F	2	
<i>Odontocorynus pulverulentus</i> Casey		A	4
Anthribidae (Fungus weevils)			
<i>Anthribus sp.</i>	A	1	

Lepidoptera: Butterflies and Moths¹ (Gerald Fauske)

Oecophoridae (Oecophorid moths)

956 *Psilocorsis cryptolechiella* (Chambers) A

987 *Ethmia monticola* Walsingham A

Coleophoridae (Case-bearers)

1388 *Coleophora trifolii* (Curtis)+ A, B

Cosmopterygidae

1615 *Walshia miscecolorella* (Chambers) A

Gelechiidae

1929-1967 *Gelechia spp.* A

2267 *Helcystogramma fernaldella* (Busck) A

¹Numbers collected are not indicated on this list as the great majority of specimens were individually collected and such data are not quantifiable. In addition, some of these records are field sight identification and were not collected. Checklist numbers are from Hodges *et al.* 1983.

Sesiidae (Clear-winged moths)2532 *Albuna fraxini* (Hy. Edwards) A**Cossidae (Carpenter moths)**2675 *Acossus centerensis* Lintner A**Tortricidae (Leaf rollers/ Bell moths)**

Olethreutinae

2769 *Pseudosciaphila duplex* (Walsingham) A, B3091 *Eucosma matutina* (Grote) F3120 *Eucosma derelicta* Heinrich F3162 *Pelochrista corosana* (Walsingham) B3265 *Gretchia delicatana* (Heinrich) A3367 *Ancylis burgessiana* (Zeller) A3464 *Cydia lacustrina* (Miller) B3494 *Cydia latiferriana* (Walsingham) A3395 *Hystrichophora talaena* (Grote) F

Tortricinae

3594 *Pandemis limitata* (Robinson) A, B3595 *Pandemis canadana* Kearfott B3621 *Argyrotaenia quadrfaciana* Fernald A3624 *Argyrotaenia alisellana* (Robinson) A3635 *Choristoneura rosaceana* (Harris) A3648 *Archips argyrospila* (Walker) A3661 *Archips cerasivorana* (Fitch) A, B3682 *Clepsis persicaria* (Fitch) A3684 *Clepsis clemensiana* Fernald B3693 *Xenotemna pallorana* (Robinson) B, F3695 *Sparganothis xanthoides* (Walker) A, F3706 *Sparganothis sulfureana* (Clemens) F3796 *Phtheochroa waracana* (Kearfott) B3830 *Cochylis hospes* (Walsingham)+ B, F3830.1 *Cochylis arthuri* Dang F**Hesperiidae (Skippers)**3495 *Erynnis icelus* (Scudder & Burgess) A3947 *Erynnis juvenalis* (Fabricius) A4023 *Hesperia leonardus pawnee* Dodge A4031 *Hesperia dacotae* (Skinner) A, F4041 *Polites themistocles* (Latreille) B4051 *Atrytone delaware* (Edwards) A, B4059 *Poanes hobomok* (Harris) A4078 *Euphyes ruricola* (Boisduval) A4080 *Atrytonopsis hiana* (Scudder) F**Pieridae (Sulphurs and Whites)**4197 *Pieris rapae* (Linnaeus) A, B, F4202 *Euchloe olympia* (Edwards) B4209 *Colias philodice* Godart A, B, F4210 *Colias eurytheme* Boisduval B**Lycaenidae (Gossomer-winged butterflies)**4275 *Harkenclenus titus* (Fabricius) F4281 *Satyrium edwardsi* (Grote & Robinson) A4361 *Everes comyntas* (Godart) B4363 *Celastrina neglecta* (W. H. Edwards) B4375 *Lycæides melissa* (Edwards) A, F

4376	<i>Plebejus saepiolus</i> (Boisduval)	F
Nymphalidae (Brush-footed butterflies)		
4434	<i>Vanessa virginiensis</i> (Drury)	F
4435	<i>Vanessa cardui</i> (Linnaeus)	B
4447	<i>Euptoieta claudia</i> (Cramer)	B
4451	<i>Speyeria aphrodite</i> (Fabricius)	A, B
4452	<i>Speyeria idalia</i> (Drury)	B, F
4465	<i>Clossiana bellona</i> (Fabricius)	A
4481	<i>Phyciodes tharos</i> (Drury)	A, B, F
4489	<i>Charidryas gorgone</i> (Hübner)	B, F
4490	<i>Charidryas nycteis</i> (Doubleday)	A
4522	<i>Limenitis arthemis arthemis</i> (Drury)	A, B, F
4523	<i>Limenitis archippus</i> (Cramer)	A, B, F
Satyridae (Satyr butterflies)		
4578	<i>Megisto cymela</i> (Cramer)	A, B
4583	<i>Coenonympha inornata</i> W. H. Edwards	A, B, F
4587	<i>Cercyonis pegala</i> (Fabricius)	A, B, F
Danaidae (Milkweed butterflies)		
4614	<i>Danaus plexippus</i> (Linnaeus)	A, B, F
Limacodidae (Slug caterpillars)		
4697	<i>Euchlea delphinii</i> (Boisduval)	A
Pyalidae (Snout moths)		
Nymphulinae		
4761	<i>Paraponyx badiusalis</i> Walker	B
4951	<i>Perispasta caeculalis</i> Zeller	A
Pyraustinae		
4949	<i>Ostrinia nubilalis</i> (Hübner)+	A, B, F
5004	<i>Loxostege sticticalis</i> (Linnaeus)+	B
5079	<i>Udea rubigalis</i> (Guenee)	B, F
5136	<i>Nomophila nearctica</i> Munroe	F
5159	<i>Desmia funeralis</i> (Hübner)	A, B, F
5241	<i>Pantographa limata</i> (Grt. & Rob.)	A
5275	<i>Herpetogramma pertextalis</i> (Lederer)	B
5276	<i>Herpetogramma abdominalis</i> (Zeller)	A
5281	<i>Pilocrocis ramentalis</i> Lederer	A
Crambiinae		
5343	<i>Crambus perlellus</i> (Scopoli)	B
5355	<i>Crambus praefectellus</i> Zincken+	B
5357	<i>Crambus leachellus</i> Zincken	A
5362	<i>Crambus agitatellus</i> Clemens	F
5378	<i>Crambus laqueatellus</i> Clemens	A
5381	<i>Crambus caliginosellus</i> (Clemens)	B
5391	<i>Chrysoteuchia topiaria</i> (Zeller)+	A, B, F
5403	<i>Agriphila vulgivagella</i> (Clemens)	B
5413	<i>Pediasia trisecta</i> (Walker)	B
5464	<i>Urola nivalis</i> (Drury)*	A, B
5465	<i>Vaxi auratella</i> (Clemens)*	B
Pyalinae		
5524	<i>Hypopygia costalis</i> (Fabricius)+	B
5533	<i>Herculea olinalis</i> (Guenee)	A
Epipaschiinae		
5595-5620	<i>Pococera</i> sp.	A

Geometridae (Inchworm moths)

Ennominae

6272	<i>Eumacaria latiferrugata</i> (Walker)	F	
6283	<i>Itame sulphuraria</i> Packard	A, B, F	
6331	<i>Semiothisa promiscuata</i> Ferguson	A	
6357	<i>Semiothisa eremiata</i> (Guenee)	B	
6373	<i>Semiothisa denticulata</i> Grote	B	
6590	<i>Anavitrinella pampinaria</i> (Guenee)	A	
6640	<i>Biston betularia</i> (L.)	A	
6667	<i>Lomographa vestaliata</i> (Guenee)	A	
6678	<i>Cabera variolaria</i> Guenee	B	
6720	<i>Lytrosis unitaria</i> (Herrich-Schäffer)	A	
6724	<i>Euchlaena serrata</i> (Drury)	F	
6729	<i>Euchlaena johnsonaria</i> (Fitch)	B, F	
6740	<i>Xanthotype urticaria</i> Swett		A
6763	<i>Nacophora quernaria</i> (J. E. Smith)	A	
6796	<i>Campaea perlata</i> (Guenee)	A	
6797	<i>Ennomos magnaria</i> Guenee	A, F	
6820	<i>Metanema determinata</i> Walker	A, B	
6844	<i>Plagodis alcoolaria</i> (Guenee)	A	
6941	<i>Eusarca confusaria</i> Hübner	B	
6964	<i>Tetracis cachexiata</i> Guenee	B	
7009	<i>Nematocampa limbata</i> (Haworth)	A	

Sterrhinae

7159	<i>Scopula limboundata</i> (Haworth)	A, B	
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Larentiinae

7414	<i>Orthonama obstipata</i> (Fabricius)	B	
7416	<i>Orthonama centrostrigata</i> Wollaston	B, F	
7440	<i>Eubaphe memdica</i> (Walker)	B	
7640	<i>Lobophora nivigerata</i> Walker	A	

Epiplemidae

7653	<i>Calledapteryx dryopterata</i> (Grote)	A	
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Lasiocampidae (Tent caterpillars/ Lappet moths)

7687	<i>Phyllodesma americana</i> (Harris)	A, B	
7698	<i>Malacosoma disstria</i> Hübner	A	

Saturniidae (Giant silk moths)

7746	<i>Automeris io</i> (Fabricius)	A	
7757	<i>Antheracea polyphemus</i> (Cramer)	A, B	

Sphingidae (Sphinx, Hawk, and Hummingbird moths)

Sphinginae

7786	<i>Ceratonia amyntor</i> (Geyer)	A, B	
7787	<i>Ceratonia undulosa</i> (Walker)	A, B	
7803	<i>Sphinx vashti</i> Strecker	B	
7809	<i>Sphinx kalmae</i> (J.E. Smith)		A, B
7821	<i>Smerinthus jamaicensis</i> (Drury)	A, B	
7822	<i>Smerinthus cerisyi</i> (Kirby)	A	
7824	<i>Poanias excaecatus</i> (J.E. Smith)	A, B	
7825	<i>Poanias myops</i> (J.E. Smith)	A	
7828	<i>Pachysphinx modesta</i> (Harris)	A, B	

Macroglossinae

7855	<i>Hemaris diffinis</i> (Boisduval)	B, F	
7861	<i>Eumorpha achemon</i> (Drury)	A, F	

7870	<i>Sphecodina abbottii</i> (Swainson)	A
7875	<i>Proserpinus juanita</i> (Strecker)	F
7885	<i>Darapsa myron</i> (Cramer)	A, B, F
7886	<i>Darapsa pholus</i> (Cramer)	A
7893	<i>Hyles gallii</i> (Rottemburg)	B, F
Notodontidae (Prominent moths)		
7895	<i>Clostera albosignata</i> Fitch	B
7896	<i>Clostera inclusa</i> (Hübner)	B
7905	<i>Datana major</i> Grt. & Rob.)	A
7915	<i>Nadata gibbosa</i> (J.E. Smith)	A
7917	<i>Hyperaeschra georgica</i> (Herrich-Schäffer)	A
7921	<i>Peridea ferruginea</i> (Packard)	A
7922	<i>Pheosia rimosa</i> Packard	A
7924	<i>Odontosa elegans</i> (Strecker)	A, B
7931	<i>Gluphisia septrionalis</i> Walker	A, B
7937	<i>Furcula cinerea</i> (Walker)	A, B
7942	<i>Cerura scitiscrupta</i> (Walker)	A
7995	<i>Heterocampa biundata</i> Walker	A
Arctiidae (Tiger moths)		
Lithosiinae		
8043	<i>Eilema bicolor</i> (Grote)	F
8045.1	<i>Crambidia pallida</i> Packard	A, B, F
8051	<i>Crambidia casta</i> (Packard)	A
8089	<i>Hypoprepia minians</i> (Kirby)	A, B, F
8090	<i>Hypoprepia fucosa</i> (Hübner)	A
Arctiinae		
8099	<i>Pagara simplex</i> Walker	B
8111	<i>Haploa lecontei</i> (Guerin)	B
8123	<i>Holomelina ferruginosa</i> (Walker)	F
8129	<i>Pyrrharctia isabella</i> (J.E. Smith)	A, B, F
8131	<i>Estigmene acrea</i> (Drury)	A, B
8134	<i>Spilosoma congrua</i> Walker	A
8137	<i>Spilosoma virginica</i> (Fabricius)	A
8156	<i>Phragmatobia fuliginosa</i> (Linnaeus)	B
8170	<i>Apantesis vittata</i> (Fabricius)	B
8175	<i>Grammia virguncula</i> (Kirby)	A, F
8176	<i>Grammia anna</i> (Grote)	A
8196	<i>Grammia parthenice</i> (Kirby)	B
8197	<i>Grammia virgo</i> (Linnaeus)	A, B, F
8199	<i>Grammia arge</i> (Drury)	A
8203	<i>Halysidota tessellaris</i> (J.E. Smith)	A, B
8214	<i>Lophocampa maculata</i> (Harris)	A
8230	<i>Cycnia tenera</i> Hübner	A
8231	<i>Cycnia oregonensis</i> (Stretch)	B
8254	<i>Pygarctia spraguei</i> (Grote)	A
Ctenuchinae		
8262	<i>Ctenucha virginiana</i> (Esper)	A
8267	<i>Cisseps fulvicollis</i> (Hübner)	A
Lymantriidae		
8316	<i>Orgyia leucostigma</i> (J.E. Smith)	A
Noctuidae (Owlet moths)		
Herminiinae		

8323	<i>Idia aenula</i> (Hübner)	A	
8353	<i>Zanclognatha ochreipennis</i> (Grote)	A	
8360	<i>Macrochilo orciferalis</i> (Walker)	B	
8370	<i>Bleptina cardinalis</i> Guenee	A	
Hypeninae			
8446	<i>Bomolacha cf. deceptalis</i> (Walker)	A	
8461	<i>Hypenna humuli</i> Harris	A, B, F	
8465	<i>Plathypenna scabra</i> (Fabricius)	A, B, F	
Catocalinae			
8587	<i>Panopoda rufimargo</i> (Hübner)	A	
8692	<i>Zale galbanata</i> (Morrison)	A, B	
8697	<i>Zale minerea</i> (Guenee)	A	
8738	<i>Caenurgina crassiuscula</i> (Haworth)		B, F
8739	<i>Caenurgina erechtea</i> (Cramer)	B, F	
8801	<i>Catocala ilia</i> (Cramer)	A	
8803	<i>Catocala relicta</i> Walker	A	
8817	<i>Catocala briseis</i> Edwards	B	
8822	<i>Catocala meski</i> Grote	B, F	
8833	<i>Catocala concumbens</i> Walker	A, B	
8841	<i>Catocala abbreviatella</i> Grote	B	
8843	<i>Catocala whitneyi</i> Dodge	B, F	
8851	<i>Catocala coccinata</i> Grote	A	
Plusiinae			
8924	<i>Anagrapha falcifera</i> (Kirby)	B, F	
8952	<i>Plusia contexta</i> Grote	B	
Eutelinae			
8955	<i>Marathyssa inficita</i> (Walker)	A	
8957	<i>Paectes oculatrix</i> (Guenee)	A	
Sarrothripinae			
8973	<i>Baileya australis</i> (Grote)	A	
Nolinae			
8990	<i>Nola cilicoides</i> (Grote)	F	
Acontiinae			
9046	<i>Lithacodia bellicula</i> Hübner	B	
9048	<i>Lithacodia albidula</i> Guenee	A, B	
9049	<i>Lithacodia synochitis</i> (Grote & Robinson)	A, B	
9053	<i>Lithacodia carneola</i> (Guenee)	A, F	
9062	<i>Cerma cerintha</i> (Treitshke)	A	
9089	<i>Tarachidia binocula</i> (Grote)	F	
9090	<i>Tarachidia candefacta</i> (Hübner)	A, B	
9101	<i>Tarachidia tortricina</i> (Zeller)	B, F	
Acronictinae			
9203	<i>Acronicta dactylina</i> Grote	B	
9242	<i>Acronicta exilis</i> Grote	A	
9259	<i>Acronicta noctivaga</i> Grote	A	
9280	<i>Simyra henrici</i> (Grote)	B	
Agaristinae			
9301	<i>Eudryas grata</i> (Fabricius)	B	
Zenobiinae			
9333	<i>Apamea lignicolora</i> (Guenee)	B, F	
9382	<i>Crymodes devastator</i> (Brace)	A, B, F	
9391	<i>Luperina passer</i> (Guenee)	B, F	

9417	<i>Oligia egens</i> (Walker)	B
9471	<i>Papaipema arctivorens</i> Hampson	F
9546	<i>Phlogophora iris</i> Guenee	A
9549	<i>Enargia decolor</i> (Walker)	A
9555	<i>Ipimorpha pheonectusa</i> Grote	A
9556	<i>Chitonix palliatricula</i> (Guenee)	A
9638	<i>Amphipyra pyramidoides</i> Guenee	A
9647	<i>Athetis miranda</i> (Grote)	A, B
9649	<i>Athetis mendosa</i> (McDunnough)	B
9664	<i>Balsa labecula</i> (Grote)	A
9681	<i>Elaphria festivooides</i> (Guenee)	A
Cucullinae		
9913	<i>Lithophane georgii</i> Grote	F
10062	<i>Homohadena stabilis</i> Smith	B
10135	<i>Oncocnemis riparia</i> Morrison	A
10198	<i>Cucullia postera</i> Guenee	A
10199	<i>Cucullia omissa</i> Dod	B
10200	<i>Cucullia asteroides</i> Guenee	B
Hadeninae		
10223	<i>Dicestria trifolii</i> (Hufnagal)+	A, B, F
10265	<i>Sideridis rosea</i> (Harvey)	A
10280	<i>Polia purpurissata</i> (Grote)	B
10290	<i>Polia obscura</i> (Smith)	B, F
10291	<i>Polia latex</i> (Guenee)	A
10292	<i>Melanchra adjuncta</i> (Guenee)	A
10295	<i>Melanchra assimilis</i> (Morrison)	A
10296	<i>Lacanobia nevadae</i> (Grote)	B
10297	<i>Lacanobia atlantica</i> (Grote)	B
10299	<i>Lacanobia subjuncta</i> (Grote & Robinson)	A
10300	<i>Lacanobia grandis</i> (Guenee)	B
10303	<i>Lacanobia tacoma</i> (Strecker)	B
10307	<i>Lacanobia lilacina</i> Harvey	B
10394	<i>Lacinipolia vicina</i> (Grote)	B
10397	<i>Lacinipolia renigera</i> (Stephens)	B, F
10405	<i>Lacinipolia lorea</i> (Guenee)	A
10431	<i>Faronta diffusa</i> (Walker)	B
10438	<i>Pseudaletia unipuncta</i> (Haworth)	A, B, F
10447	<i>Leucania commoides</i> Guenee+	A, B, F
10449	<i>Leucania insueta</i> Guenee	F
10462	<i>Leucania pseudargyria</i> Guenee	A
10627	<i>Tricholita signata</i> Walker	B
Noctuinae		
10641	<i>Agrotis vetusta</i> Walker	B
10663	<i>Agrotis ipsilon</i> (Hufnagal)	B
10670	<i>Feltia jaculifera</i> Guenee	B, F
10674	<i>Feltia subgothica</i> (Haworth)	F
10780	<i>Euxoa comosa</i> (Morrison)	A
10801	<i>Euxoa ochrogaster</i> Walker	B
10805	<i>Euxoa tessellata</i> (Harris)	A, B, F
10891	<i>Ochropleura implecta</i> Lafontaine	A
10903	<i>Euagrotis illapsa</i> (Walker)	A
10926	<i>Spaelotis clandestina</i> (Harris)	A, B, F

10928	<i>Graphiphora haruspica</i> (Grote)	A, B
10929	<i>Eurois occulta</i> (Linnaeus)	A
10942.1	<i>Xestia dolosa</i> (Franclemont)	A, B
10992	<i>Paradiarsia litoralis</i> (Packard)	B
11000	<i>Anaplectoides praesina</i> (D. & Sch)	A, B
11006	<i>Protolampra brunneicollis</i> (Grote)	B
11029	<i>Abagrotis alternata</i> (Grote)	A
Helioidinae		
11072	<i>Heliothis phloxiphagus</i> Grote & Robinson	B, F
11082	<i>Protoschinia nuchalis</i> (Grote)	A, B
11128	<i>Schinia arcigera</i> (Guenee)	F
11164	<i>Schinia florida</i> (Guenee)	B
11174	<i>Schinia lucens</i> (Morrison)	B, F
11192	<i>Schinia cumatilis</i> Grote	B