

ARTHROPOD SPECIES DIVERSITY, COMPOSITION AND TROPHIC STRUCTURE AT THE SOIL LEVEL BIOTOPE OF THREE NORTHEASTERN ILLINOIS PRAIRIE REMNANTS

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ABSTRACT

Arthropod pitfall trap samples from the soil level biotope of three Cook County, Illinois prairie remnants were obtained in July of 1983. The remnants were the James Woodworth Prairie (JWP), Miami Woods Prairie (MWP) and Stein Tract Prairie (STP). Arthropods trapped at all remnants totaled 9,124 individuals, representing 17 orders, 121 families and 392 species. The number of species trapped was highest at JWP (206) followed by STP (198) and MWP (166). Species of Hymenoptera and Acarina were most numerous in all remnants. Individuals of Acarina, Collembola and Hymenoptera were dominant in all remnants and represented 82 percent of all arthropods collected. STP had the highest number of individuals collected (4,580) and represented 50 percent of all arthropods taken. For each remnant, Formicidae had the highest number of species and individuals per family. Other species dominant families were Entomobryidae, Linyphiidae, Sminthuridae, Staphylinidae and Scelionidae. Adult arthropod individual richness, species richness, diversity (Brillouin), evenness (Pielou) and similarity (modified Sorensen and Curtis) were determined and compared for each remnant. Individual richness and species richness were significantly different, however, all remnants were not significantly different in species diversity and evenness. Family level similarity for all remnants was high, while species and individual level similarities were low. All remnants had a similar number of species at each trophic level. At all remnants, herbivores and

carnivores were the most numerous in species while omnivores and detritivores were the most numerous in individuals.

INTRODUCTION

The prairie remnants of Illinois can be classified as the *Andropogon-Panicum-Sorghastrum* type which is indicative of the True Prairie (Kuchler 1964). The True Prairie is the most typical and maximally developed subset of the eastern tallgrass prairie (Clements and Shelford 1939). Studies of the arthropod community in the True Prairie region have been done in other states. Hayes (1927) concentrated on the ecology of certain prairie insects in the vicinity of Riley Co., Kansas. Evans and Murdoch (1969) studied the insect community in an oil field (degraded prairie-forest ecotone undergoing secondary succession) in Michigan. They characterized the major taxonomic groups of insects by percent composition and trophic structure. A comprehensive study of the True Prairie (Risser, *et al.* 1981) included data on the invertebrate community at twelve sites in eleven states. However, most of the data was from the large Osage Prairie in northeastern Oklahoma. They ranked the major taxa by total number and biomass.

Although the botanical nature and distribution of the True Prairie grasslands in Illinois have been well documented (Gleason 1908, 1910; Vestal 1913, 1914, 1931; Sampson 1916, 1921; Clements and Shelford, 1939; Evers 1955; Anderson 1970; Schwegman 1973, 1983), the arthropod community has been neglected. Only Shelford (1913), Adams (1915) and Shackleford (1929) published papers including information on the arthropod communities of Illinois prairies. Shelford studied the animal communities of high and low prairies near Chicago and provided lists including common arthropod species. Adams and Shackleford list dominant arthropod species at specific prairie strip sties along railroad right-of-ways in east central Illinois. Shelford and Adams give no quantitative data and Shackleford provides only minimal quantitative data on some of the dominant species (i.e. number of individuals per square meter per season).

A few papers have been published on specific arthropod groups or species inhabiting only one of the prairie remnants included in this study (Park, *et al.*, 1949; Auerbach, 1951; Park, *et al.*, 1953; Hamilton, 1981; Hamilton and Kuritsky, 1981).

This study is the first to quantitatively characterize the arthropod community of the soil level biotope in three Cook County, Illinois prairie remnants and to compare these remnants with respect to arthropod composition, dominance, species diversity, and trophic structure. It provides a means, other than the usual botanical and soil characteristics, for assessing prairie remnant quality and stability. This study is based entirely on samples from the soil level biotope and does not represent the total prairie arthropod community at these sites.

MATERIALS AND METHODS

The three prairie remnants were selected on the basis of accessibility, location and quality. The size of each remnant was obtained from the 1982 Illinois Natural Area Inventory Survey (INAIS) and/or individual management records. The quality of the prairie remnants was assessed by INAIS quality grades, the total number of prairie plant species, the population densities of dominant prairie grasses, the presence of prairie indicator forbs and Native Area Rating Index (NARI) values

(Swink and Wilhelm 1979). INAIS quality grades are based on the presence and extent of disturbed areas, i.e. areas denoted by the presence of weed and non-native shrubs, and from historical records or other documentation. Grade A quality is indicative of pristine, undisturbed area of native condition. Grade B is assigned to a native condition which exhibits some signs of disturbance. Grade C denotes areas of extreme disturbance indicative of relatively recent grazing and/or cultivating practices. Botanical data were derived from floral lists provided by the management personnel of each prairie remnant. Native prairie plant species were identified from these lists. The dominant prairie grasses and indicator forbs given for these three remnants were taken from Schwegman (1983). Schwegman indicates that eleven dominant prairie grasses and sixteen indicator forbs can variably inhabit Illinois prairie remnants. Dominant prairie grasses are those plants which occupy the most space in a prairie because of their distribution and numbers. Prairie indicator forbs are those plants that are restricted to the prairie community and will decline or disappear with disturbances such as grazing or farming. The Native Area Rating Index (NARI), developed by Swink and Wilhelm (1979), was used to quantify the native condition of each remnant. The NARI value in this paper is based only on native prairie plants. NARI values greater than 40 indicate an area that possesses sufficient native character to be of considerable importance in preservation, while values greater than 50 denote rare areas of high to extremely high quality that are of paramount importance in preservation (Swink and Wilhelm 1979).

Arthropods from the soil level biotope were sampled by pitfall traps in Mid-July of 1983. A 10 m² quadrat grid system within an approximate area of 2.00 ha was delimited at each study site. A three part plastic pitfall trap (Morrill 1975) was placed within fifteen randomly selected quadrats. A killing-preserving solution of 50 percent ethanol was placed in the inner cup of each trap. Samples were taken at each remnant after a 48 hour period between July 12-17, 1983. All adult arthropods were sorted, identified to family and counted to the species level. Immatures were not included unless they could be associated with their respective adults. Some groups were identified in lab but most were sent to specialists for lower level identification. Approximately 80 percent of all species trapped have been identified to the genus or species level. All arthropods have been retained in a voucher collection at Loyola University of Chicago, Lake Shore Campus. A complete list by family and remnant site of all pitfall trapped arthropod species and individuals is included with this paper (Appendix I).

The soil level arthropod community was analyzed by several diversity parameters: species richness (k), the number of species per sample; individual richness (n), the number of arthropods per sample; Brillouin's diversity index (H), and Pielou's evenness (J), (Zar 1984). Brillouin's diversity index was selected since it best accounts for the non-random properties associated with pitfall trapping (Pielou, 1966). A Kruskal-Wallis test was used to test significance of the diversity data (i.e. comparison of 15 k values, n values, H values and J values for each remnant). A Tukey test was used to determine between sample significance. A modified Sorensen's coefficient was used to calculate family and species similarity (Qf and Qs) and a modified Curtis' community coefficient was used for individual similarity (Qi) (Southwood, 1978). Two-way comparisons were determined by $Q = [2jN/aN + bN] * 100$ and three-way comparisons by $Q = [3jN/aN + bN + cN] * 100$. Coefficient values greater

than 50 percent denote similarity, while values less than 50 percent indicate dissimilarity (Price 1975).

Adult trophic relationships were determined by relevant literature (Krantz 1978, Borror *et al.* 1981, Risser *et al.* 1981, Kethley 1982).

DESCRIPTION OF STUDY AREAS

James Woodworth Prairie (JWP): JWP is owned and managed by the University of Illinois at Chicago. This 2.14 ha remnant is located in Maine township of Cook county on the east side of Milwaukee Avenue, one half mile north of the Golf Road and Milwaukee Avenue intersection. Houses border its north side and commercial businesses border its south side. Greenwood Avenue and Milwaukee Avenue abut the property on its east and west sides respectively. JWP is completely fenced and permanently divided into ten meter square quadrats. This prairie is regularly cleared of invading weeds, trees and shrubs and has been burned annually since 1972. JWP has the highest prairie quality and botanical characteristics of the remnants included in this study (Table 1). All three grades of quality are present in this remnant, of which 70 percent is of A quality. The pristine nature of JWP is also indicated by its very diverse flora, which has been well documented (Paintin 1929, Betz and Cole 1969, Apfelbaum and Rouffa 1981). Betz and Cole (1969) commented that the great plant variety, lack of uniformity in the vegetative cover and the lack of dominance of any one species indicated conditions of high quality and prolonged virginity. In 1983, 97 plant species native to the tallgrass prairie biome were believed to be in this remnant. The preserve contains nine of the eleven dominant Illinois prairie grasses: big bluestem grass, little bluestem grass, blue joint grass, Canada wild rye, June grass, switch grass, prairie cord grass, prairie dropseed and Indian grass. The preserve also contains the following fourteen Illinois prairie indicator forbs: leadplant, heath aster, cream wild indigo, stiff tickseed, rattlesnake master, prairie gentian, prairie alumroot, prairie lily, hoary puccoon, white prairie clover, purple prairie clover, prairie cinquefoil, prairie violet and golden alexanders.

Miami Woods Prairie (MWP): MWP is part of the Miami Woods Forest Preserve and is owned by the Cook County Forest Preserve District (CCFPD). This 6.07 ha remnant is located within Niles township of Cook county and is east of Caldwell Avenue and north of Oakton Street. The prairie remnant is bordered by forested areas on the north and south, residences on the west, and the North Branch of the Chicago River on the east. Its management and restoration is handled by the North Branch Prairie Project (NBPP) which is supported by the Chicago Audubon Society, Illinois Chapter of the Nature Conservancy and the Chicago Group of the Sierra Club. An annual random patch-burning program began in the spring of 1983. MWP has the lowest prairie quality and the lowest botanical characteristics of the remnants in this study (Table 1). Ninety percent of this prairie is classified as grade C and it is considered to be a rather disturbed remnant. In 1983, 83 prairie plant species inhabiting this remnant were documented. However, eighteen of these prairie plants were recently introduced and have not been included in the remnant's botanical assessment. Four dominant prairie grasses are present in this remnant: big bluestem grass, switch grass, prairie cord grass and Indian grass. Four prairie indicator forbs are also present: heath aster, cream wild indigo, prairie alum root and golden alexanders.

Stein Tract Prairie (STP): STP is owned primarily by the city of Markham. This 25.90 ha remnant is located north of 155th Street between Alton Drive and the Tri-State Tollway in Bremen township of Cook county. It is bordered by residences on the west and north, I-294 on the east, and the 50.99 ha fenced Gensburg-Markham Prairie Preserve on the south. Although it is not currently under regular management, the Nature Conservancy of Illinois is trying to purchase this remnant for incorporation into the Gensburg-Markham Prairie Preserve. STP is somewhat intermediate to JWP and MWP in botanical characteristics (Table 1). Sixty percent of this prairie is of grade C quality while 40 percent is of grade B. The floral list of STP was updated in 1982 and 88 prairie plants were recorded. Although a visual survey of this remnant would suggest that it is not as botanically diverse as the Gensburg-Markham Prairie Preserve, nine of the eleven dominant Illinois prairie grasses inhabit this area: big bluestem grass, little bluestem grass, blue joint grass, Canada wild rye, prairie sedge, switch grass, Indian grass, prairie cord grass and prairie dropseed. Seven Illinois prairie forb indicators can also be found in this remnant: heath aster, cream wild indigo, rattlesnake master, prairie alum root, purple prairie clover, prairie cinquefoil and golden alexanders.

RESULTS AND DISCUSSION

Arthropods collected from all remnants totaled 9,124 individuals, representing 17 orders, 121 families and 392 species. The numbers of orders, families, species and individual arthropods collected at each remnant are indicated in Table 2. Family and species numbers were highest at JWP, second highest at STP, and lowest at MWP. The STP family and species numbers were only slightly lower than those at JWP. Also, STP contained the highest number of individuals trapped and represented 50 percent of all arthropods collected in this study.

The number of species in each order was for the most part very similar for all three remnants (Table 3). The orders Hymenoptera, Acarina, Coleoptera, Araneae and Collembola had the highest number of species, each with nineteen or more species. Hymenopteran species were most numerous in the samples from all three remnants with 46 species at JWP (22 percent), 35 species at MWP (21 percent), and 39 species at STP (20 percent). Evans and Murdoch (1969) found similar Hymenopteran species numbers in their twelve year study of the pterygote insect community in an old field in Michigan. They collected 578 species of Hymenoptera, which represented 37 percent of all insects taken. Acarina ranked second in number of species per order at all three sites but, due to the large number of families recognized in that group, no specific acarine family can be recognized as dominant. Risser *et al.* (1981) found that Coleoptera contained the highest number of species at the Osage prairie in Oklahoma. In this study, Coleoptera ranked third in species dominance at JWP and STP and fifth at MWP. Evans and Murdoch (1969) also found lower numbers of Coleoptera species and attributed this to their rather cryptic and sedentary nature and the relatively few concealment habitats in prairies. For each remnant, the hymenopteran family Formicidae had the highest number of species collected (Table 4). No other study of the prairie arthropod community has reported such a diverse number of ant species (JWP, 16 species; MWP, 14 species; STP, 13 species). Adams (1915), Shackelford (1929) and Risser *et al.* (1981) listed only three, nine and seven ant species respectively. Eight species of ants were found in the True Prairies of the Chicago region (Gregg 1944). Four of these ant species were col-

lected in this study: *Formica montana* Emery, *Leptothorax ambiguus* Emery, *Formica integra* Nylander, and *Polyergus breviceps* Emery. Only *F. integra* and *P. breviceps* are found exclusively in the True Prairie according to Gregg. *F. integra*, *F. montana* and *P. breviceps* were trapped only at the relatively undisturbed JWP. In addition, only one of the eight True Prairie ant species listed by Gregg, *L. ambiguus*, was trapped at the more disturbed MWP and STP. Although JWP is considered a relatively undisturbed prairie remnant, it apparently has only four (includes *L. ambiguus* not taken in pitfall traps during this study) of the eight species of ants that inhabited True Prairies of the Chicago region in 1944. The 18 non True Prairie ant species now found in these remnants are most likely invaders from other habitats (e.g. pasture, meadow, and forest edge) that have become more or less established over time.

Muma and Muma (1949) found 11 species of Lycosidae in a Nebraska prairie and listed this family as one of four families of Araneae containing the highest number of species. The dominant spider family in this study was the Linyphiidae followed by the Lycosidae. Muma and Muma also showed that species of cursorial spiders dominated their Nebraska prairie site. The cursorial spiders, in general, were the dominant group of Araneae at each remnant in this study. This undoubtedly reflects the trapping method used. Species of cursorial spiders from JWP, MWP and STP represented 52 percent, 68 percent and 56 percent of the total spiders respectively and represented five of the eleven families of Araneae collected. Other dominant families common to all three remnants were Cicadellidae, Entomobryidae, Scelionidae, Sminthuridae and Staphylinidae.

The number of individuals found in each order was also consistent for all three remnants (Table 5). Individuals in the orders Acarina, Collembola and Hymenoptera were the most abundant arthropods taken in each remnant and represented 75 percent of the total at JWP, 86 percent of the total at MWP and 83 percent of the total at STP. Individuals belonging to the families Formicidae, Entomobryidae, Sminthuridae, Eupodidae and Oniscidae, were dominant in each remnant (Table 6).

Shackleford (1929) indicated that ants were predominant in central Illinois prairies. Risser *et al.* (1981) indicated that hymenopteran dominance in their data was due to the large number of individual ants collected. Formicidae contained the largest number of individuals of any arthropod family taken at JWP and STP, and was second only to eupodid mites at MWP. At least three of the top five families that dominated each remnant in numbers of individuals belonged to the microarthropod orders Acarina and Collembola. Data from this study indicate that individuals of Acarina and Collembola represented 50 percent of the total at JWP, 69 percent of the total at MWP and 52 percent of the total at STP. The 52 percent at STP is misleading due to the large number of ants trapped. In absolute numbers STP had twice as many microarthropods as JWP and 1.6 times as many as MWP. Risser *et al.* (1981) determined that these two orders of microarthropods (Acarina and Collembola) were extremely numerous and represented 55 percent of all arthropods taken above ground. Seastedt (1984) also estimated a large number of microarthropods inhabiting a prairie in Kansas and observed that burning affects their numbers. He found a 1.5 times greater number of individuals in an unburned prairie versus a burned prairie. MWP and STP samples contained 1.3 and 2.0 times more individual microarthropods respectively than the regularly burned JWP.

Family level similarity for all three remnants was high in both the two-way and three-way analysis. In general, two-way and three-way species and individual similarities were low (Table 7). Only ants and collembolans have a moderate to high degree of species similarity in all remnants. The reason for this dissimilarity is unknown although remnant isolation, species mobility and local extinctions are probably important determining factors. JWP and MWP are more similar to each other in arthropod families and species than either is to STP. This similarity is probably due in large part to the proximity of these two remnants. JWP and MWP are only about 3.2 km apart while STP is located about 35 km to the southeast of these two remnants.

The diversity data for each remnant are listed in Table 8. Individual richness (n) and species richness (k) for all three remnants were significantly different. The data from STP was found to be the reason for the difference in both cases. Both mean numbers of individuals and species caught at STP were much higher than at either JWP or MWP. However, for species diversity (H) and evenness (J) there were no significant differences between remnants ($0.25 > P > 0.10$ and $0.50 > P > 0.25$ respectively). It is unknown why a greater species and individual richness was found at STP. It could be related to the size of the remnant and adjacent areas and the fact that this remnant has never been regularly burned or greatly disturbed.

Murdoch *et al.* (1972) studied the relationship of homopteran diversity to plant diversity in three large old fields. They showed that insect species diversity, evenness and number were positively correlated with corresponding plant species diversity parameters. Although inconclusive in this study, the remnant with the highest number of plant species also had the highest number of arthropod species trapped (JWP) and the remnant with the lowest number of plant species had the lowest number of arthropod species trapped (MWP).

All remnants exhibited similar percent composition of adult arthropods at each trophic level (Table 9). Species of herbivores were dominant at each site. Species of carnivores were the second largest group trapped and were followed by detritivores, omnivores and parasites. Evans and Murdoch (1969) found that 85 percent of all individual insects collected in their study were herbivores, 12 percent carnivores and 3 percent other. Since they concentrated only on the pterygote insects of the foliage level biotope, this high percentage of herbivore individuals would be expected. Since this study sampled the soil level biotope, larger numbers of detritivore and omnivore individuals were expected and were in fact trapped. Individuals of erythraeid mites, lycosids and staphylinids were the dominant carnivores at each site. Nagel (1979) found lycosids to be the most important carnivores on a mixed prairie in Nebraska. Omnivore individuals made up the greatest number of arthropods collected, followed by detritivores, herbivores, carnivores and parasites (Table 9). The large number of omnivores at JWP and STP was due primarily to the high number of ants trapped. Formicids from JWP and STP represented 72 percent and 71 percent of all omnivores respectively. The relatively low percentage of formicids at MWP (43 percent) was due to the large number of eupodid mites taken. These mites comprised 53 percent of all omnivores taken at this remnant. A high abundance of detritivores in several arthropod families was also found. It has been suggested that the recycling of organic matter by detritivores and omnivores may be the most important activity of invertebrates of the True Prairie (Risser *et al.* 1981).

Dominant parasitoid species belonged to the hymenopterous families Scelionidae, Ceraphronidae and Diapriidae. Their specific effect on the prairie arthropod community structure is unknown and needs to be investigated.

SUMMARY

The remnants included in this study are very similar in arthropod diversity, higher taxa composition and trophic structure but are clearly dissimilar at the species and individual levels. JWP and MWP are more similar to each other in arthropod families and species than either is to STP.

There was no significant difference in median diversity indices or median evenness values for each remnant. A significant difference did occur in species and individual richness values for each remnant. Data from STP was the cause of the differences in both cases. Fifty percent of all arthropod individuals were taken at STP. STP has a much larger number of detritivores and omnivores (i.e. ants, eupodid mites and collembolans) than either of the other two remnants. This is probably the result of much more detritus at that site. Lower numbers of these groups at JWP and MWP could be the result of reduced detritus levels brought about by regular burning and severe past disturbance respectively.

Acarina, Collembola and Hymenoptera are dominant in numbers of individuals in all three remnants. The hymenopteran family Formicidae dominated all remnants in terms of species and individuals per family. The presence or absence of certain True prairie ants could indicate the degree of disturbance in a particular remnant.

The number of species trapped was highest at the remnant with the highest botanical quality and lowest at the remnant with the lowest botanical quality. In this study, larger overall remnant size did not result in a larger number of total species trapped. The greatest number of species was trapped at the smallest remnant. Species of Hymenoptera, Acarina, Coleoptera, Araneae, and Collembola dominated the remnants. Hymenoptera and Acarina were first and second respectively in number of species at all three remnants with Araneae ranking third at MWP and Coleoptera third at JWP and STP.

Trophic level data imply arthropod community stability at the soil level biotope. Herbivores represent only about 40 percent of the species at each remnant. Relatively large numbers of carnivore species (approximately 30 percent of the species at each remnant) can prey on the small number of detritivore and omnivore species found in large numbers. The large number of individual detritivores and omnivores are supported by the usually abundant soil level detritus.

The three prairie remnants included in this study have a rich and varied soil level arthropod population. New genera and species were found in the samples from these remnants and undoubtedly many more remain to be found. These remnants, and others like them, merit further study as well as the continued support and management of private and public organizations.

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LITERATURE CITED

- Adams, C.C. 1915. An ecological study of prairie and forest invertebrates. Bull. Ill. Nat. Hist. Survey 11: 33-280.
- Anderson, R.C. 1970. Prairies in the prairie state. Trans. Ill. State Acad. Sci. 63: 214-221.
- Apfelbaum, S.L. and A.S. Rouffa. 1981. James Woodworth Prairie Preserve (Peacock Prairie): the flora. Trans. Ill. Acad. Sci. 74: 1-7.
- Auerbach, S.I. 1951. The centipedes of the Chicago area with special reference to their ecology. Ecol. Monogr. 21: 97-124.
- Betz, R.F. and M.H. Cole. 1969. The Peacock Prairie — a study of a virgin Illinois mesic black-soil prairie forty years after initial study. Trans. Ill. Acad. Sci. 62: 44-53.
- Borror, D.J., D.M. DeLong, and C.A. Triplehorn. 1981. An Introduction to the Study of Insects, 5th edition. Saunders College Publishing, Philadelphia, PA., 827pp.
- Clements, F.E. and V.E. Shelford. 1939. Bioecology. John Wiley and sons, Inc. N.Y., 425pp.
- Evans F.C. and W.W. Murdoch. 1969. Taxonomic composition, trophic structure, and seasonal occurrence in a grassland insect community. J. Anim. Ecol. 37: 259-273.
- Evers, R.A. 1955. Hill Prairies of Illinois. Bull. Ill. Nat. Hist. Survey, 26: 368-444.
- Cleason, H.A. 1908. A virgin prairie in Illinois. Trans. Ill. Acad. Sci. 1: 62.
- Cleason, H.A. 1910. The vegetation of the inland sand deposits of Illinois. Bull. Ill. State Lab. Nat. Hist. 9:23-174.
- Gregg, R.E. 1944. The ants of the Chicago region. Ann. Entomol. Soc. Am. 37: 447-480.
- Hamilton, R.W. 1981. Description of the larva and pupa of *Haplorhynchites acneus* (Coleoptera: Curculionidae, Rhynchitidae). J. Kan. Entomol. Soc. 54: 616-624.
- Hamilton, R.W. and S.S. Kuritsky. 1981. Description of the larva and pupa of *Merhyuchites bicolor* (Coleoptera: Rhynchitidae). Coleop. Bull. 35: 189-195.
- Hayes, W.P. 1927. Prairie insects. Ecology, 8: 238-250.
- Kethley, J. 1982. Arthropoda. In Synopsis and Classification of Living Organisms, Vol. 2. McGraw-Hill, Inc., St. Louis, MO., pp. 71-729 (117-145).
- Krantz, C.W. 1978. A Manual of Acarology, 2nd edition., Oregon State University Book Stores, Inc., Corvallis, OR., 509pp.
- Kuehler, A.W. 1964. Potential natural vegetation of the conterminous United States. Am. Geogr. Soc. Spec. Publ. 36, 116pp.
- Morrill, W.L. 1975. Plastic pitfall trap. Environ. Entomol. 4: 596.

- Muma, M.H. and K.E. Muma. 1949. Studies on a population of prairie spiders. *Ecology* 30: 485-503.
- Murdoch, W.W., F.C. Evans and C.H. Peterson. 1972. Diversity and pattern in plant and insects. *Ecology* 53: 819-829.
- Nagel, H.C. 1979. Analysis of invertebrate diversity in a mixed prairie ecosystem. *J. Kan. Entomol. Soc.* 52: 777-786.
- Paintin, R.D. 1929. The morphology and nature of a prairie in Cook County, Illinois. *Ill. State Acad. Sci. Trans.* 21: 152-175.
- Park, O., S. Auerbach, and M. Wilson. 1949. Pselaphid beetles of an Illinois prairie: the fauna and its relation to the prairie peninsula hypothesis. *Bull. Chicago Acad. Sci.* 8: 267-277.
- Park, O., S. Auerbach, and M. Wilson. 1953. Pselaphid beetles of an Illinois prairie: the population. *Ecol. Monogr.* 23: 1-15.
- Pielou, E.C. 1966. The measurement of diversity in different types of biological collections. *J. Theor. Biol.* 13: 131-144.
- Price, P.W. 1975. *Insect ecology*. John Wiley and Sons, Inc., New York, NY., 514pp.
- Risser, P.C., E.C. Birney, H.D. Blocker, S.W. May, W.J. Parton, and J.A. Wiens. 1981. *The True Prairie Ecosystem*. Hutchinson Ross Publishing Co., Stroudsburg, PA., 557pp.
- Sampson, H.C. 1916. Ecological survey of the vegetation of the Illinois prairies, a preliminary report. *Trans. Ill. Acad. Sci.* 9: 123-125.
- Sampson, H.C. 1921. An ecological survey of the prairie vegetation of Illinois. *Ill. Nat. Hist. Survey Bull.* 13: 523-576.
- Seastedt, T.R. 1984. Microarthropods of burned and unburned tallgrass prairie. *J. Kan. Entomol. Soc.* 57: 468-476.
- Schwegman, J.E. 1973. *Comprehensive Plan for the Illinois Natural Preserves System. Part 2. The Divisions of Illinois*. Illinois Nature Preserves Commission, Springfield, IL., 32pp.
- Schwegman, J.E. 1983. Illinois prairie: then and now. *Outdoor Highlights* 11: 3-13.
- Shackleford, M.W. 1929. Animal communities of an Illinois prairie. *Ecology* 10: 126-155.
- Shelford, V.E. 1913. *Animal Communities in Temperate America as Illustrated in the Chicago Region*. *Bull. Geogr. Soc. Chicago, No. 5.*, Univ. of Chicago Press, Chicago, 362pp.
- Southwood, T.R.E. 1978. *Ecological Methods with Particular Reference to the Study of Insect Populations*, 2nd edition. John Wiley and Sons, Inc., New York, NY., 524pp.
- Swink, F.A. and G.S. Wilhelm. 1979. *Plants of the Chicago region*, revised and expanded edition. The Morton Arboretum, Lisle, IL., 922pp.
- Vestal, A.G. 1913. An associational study of the Illinois sand prairies. *Bull. Ill. State Lab. Nat. Hist.* 10: 1-96.
- Vestal, A.G. 1914. A black-soil prairie station in northeastern Illinois. *Bull. Torr. Bot. Club* 41: 351-363.
- Vestal, A.G. 1931. A preliminary vegetation map of Illinois. *Trans. Ill. Acad. Sci.* 24: 204-217.
- Zar, J.H. 1984. *Biostatistical analysis*, 2nd ed. Prentice Hall, Inc., Englewood Cliffs, NJ., 718pp.

Table 1. Prairie Quality and Botanical Characteristics.

	JWP	MWP	STP
Quality Grades			
Grade A	70%	—	—
Grade B	15%	10%	40%
Grade C	15%	90%	60%
Plant Species Composition			
Native prairie plants	97	65	88
Dominant prairie grasses	9	4	9
Prairie indicator forbs	14	4	7
Native Area Rating Index (NARI)	72	51	61

Table 2. Arthropod Numbers by Remnant.

Group	JWP	MWP	STP
Orders	16	14	15
Families	84	69	81
Species	206	166	198
Individuals	2,354	2,190	4,580

Table 3. Arthropod Species by Order.

	JWP		MWP		STP	
	Total	Rank	Total	Rank	Total	Rank
Acarina	37	(2)	31	(2)	36	(2)
Araneae	24	(4)	22	(3)	25	(4)
Coleoptera	31	(3)	19	(5)	27	(3)
Collembola	21	(5)	21	(4)	23	(5)
Diplura	1	(13)	—		1	(12)
Diptera	11	(7)	6	(8)	17	(6)
Hemiptera	1	(13)	1	(11)	3	(9)
Homoptera	17	(6)	15	(6)	15	(7)
Hymenoptera	46	(1)	35	(1)	39	(1)
Isopoda	3	(10)	3	(9)	2	(11)
Lepidoptera	4	(8)	—		—	
Lithobiomorpha	1	(13)	1	(11)	1	(12)
Opiliones	2	(11)	1	(11)	3	(9)
Orthoptera	2	(11)	3	(9)	4	(8)
Polydesmida	—		—		1	(12)
Spirobolida	1	(13)	1	(11)	—	
Thysanoptera	4	(8)	7	(7)	1	(12)

Table 4. Dominant Arthropod Families by Species*

JWP		MWP		STP	
Formicidae	(16)	Formicidae	(14)	Fomicidae	(13)
Scelionidae	(12)	Sminthuridae	(9)	Linyphiidae	(11)
Staphylinidae	(12)	Entomobryidae	(8)	Scelionidae	(10)
Entomobryidae	(10)	Staphylinidae	(6)	Staphylinidae	(10)
Sminthuridae	(7)	Linyphiidae	(6)	Entomobryidae	(10)
Aphididae	(6)	Scelionidae	(5)	Ceraphronidae	(8)
Cicadellidae	(6)	Gnaphosidae	(5)	Lycosidae	(8)
Linyphiidae	(6)	Cicadellidae	(5)	Sminthuridae	(8)
Lycosidae	(6)	Thripidae	(5)	Cicadellidae	(6)
Carabidae	(5)			Erythraeidae	(5)
Diapriidae	(5)				

*Only families with 5 or more species are included

Table 5. Arthropod Individuals by Order.

	JWP		MWP		STP	
	Total	Rank	Total	Rank	Total	Rank
Acarina	659	(1)	979	(1)	976	(3)
Araneae	133	(5)	60	(5)	73	(7)
Coleoptera	46	(8)	36	(7)	132	(6)
Collembola	512	(3)	542	(2)	1,424	(1)
Diplura	1	(16)	—		1	(14)
Diptera	15	(9)	7	(11)	65	(8)
Hemiptera	1	(15)	1	(13)	8	(12)
Homoptera	71	(7)	61	(6)	140	(5)
Hymenoptera	595	(2)	372	(3)	1,392	(2)
Isopoda	209	(4)	85	(4)	283	(4)
Lepidoptera	4	(12)	—		—	
Lithobiomorpha	2	(14)	12	(10)	12	(11)
Opiliones	13	(10)	6	(12)	20	(10)
Orthoptera	80	(6)	15	(8)	38	(9)
Polydesmida	—		—		12	(11)
Spirobolida	3	(13)	1	(13)	—	
Thysanoptera	10	(11)	13	(9)	4	(13)

Table 6. Dominant Arthropod Families by Individuals*

JWP		MWP		STP	
Formicidae	(496)	Eupodidae	(408)	Formicidae	(1,315)
Entomobryidae	(279)	Formicidae	(335)	Entomobryidae	(1,026)
Oniscidae	(209)	Entomobryidae	(270)	Eupodidae	(436)
Mycobatidae	(190)	Sminthuridae	(256)	Sminthuridae	(343)
Sminthuridae	(130)	Erythracidae	(125)	Oniscidae	(283)
Galumnidae	(129)	Galumnidae	(103)	Pygmephoridae	(202)
Isotomidae	(99)	Oniscidae	(85)	Cicadellidae	(101)
Lycosidae	(98)	Scheloribatidae	(81)	Staphylinidae	(70)
Oribatulidae	(87)	Nanorchestidae	(56)	Galumnidae	(56)
Eupodidae	(85)	Oribatulidae	(49)	Erythraeidae	(49)
Gryllidae	(80)			Scheloribatidae	(47)
Scelionidae	(74)			Tydeidae	(47)

*Only families with 47 or more individuals are included

Table 7. Arthropod Similarity Indices.

Comparison	Family (Qf)	Species (Qs)	Individual (Qi)
Two-way			
JWP vs MWP	74.5	44.6	40.9
JWP vs STP	65.5	39.6	31.8
MWP vs STP	65.3	39.6	43.3
Three-way			
JWP vs MWP vs STP	59.0	29.5	24.2

Table 8. Diversity Indices and Comparative Test Values.

	JWP	MWP	STP
Mean individual richness (n)	156.93	146.00	305.33
Mean species richness (k)	33.93	33.20	44.07
Median Brillouin's diversity (H)	1.11	1.12	1.15
Median Pielou's evenness (J)	0.77	0.76	0.74
Kruskal-Wallis Test Values*			
n (13.69)	k (14.10)	H (2.90)	J (2.63)

*He, 0.05, 15, 15, 15 = 5.99

Table 9. Arthropod Trophic Level Data.

		Herbivore	Carnivore	Omnivore	Detritivore	Parasite
JWP	Sp.	83 (40%)	65 (32%)	21 (10%)	34 (16%)	3 (2%)
	Ind.	693 (29%)	237 (10%)	664 (28%)	755 (32%)	5 (>1%)
MWP	Sp.	69 (42%)	51 (30%)	18 (11%)	25 (15%)	3 (2%)
	Ind.	611 (28%)	280 (13%)	755 (34%)	498 (23%)	46 (2%)
STP	Sp.	81 (41%)	57 (29%)	19 (10%)	38 (19%)	3 (1%)
	Ind.	888 (19%)	320 (7%)	1832 (40%)	1515 (33%)	25 (1%)

APPENDIX I (PITFALL TRAPPED ARTHROPODS)

The number of trapped adult individuals per species is indicated for each study site. All individuals were trapped in Mid-July, 1983. A hyphen indicates that a particular species was not trapped at that site.

JWP = James Woodworth Prairie, Glenview, IL

MWP = Miami Woods Prairie, Morton Grove, IL

STP = Stein Tract Prairie, Markham, IL

Dt = Detritivore Hb = Herbivore Om = Omnivore

Cn = Carnivore Ps = Parasite

	JWP	MWP	STP
ACARINA			
Anystidae (Cn)			
<i>Anystis</i> sp.	—	—	23
Astegistidae (Dt)			
<i>Cultroribula divergens</i> Jacot	—	—	16
Bdellidae (Cn)			
Undetermined sp.	1	5	1
Undetermined sp.	1	2	—
Undetermined sp.	2	—	—
Undetermined sp.	—	4	—
Undetermined sp.	—	2	—
Undetermined sp.	—	—	2
Bimichaelidae (Hb)			
Undetermined sp.	28	41	2
Cunaxidae (Cn)			
Undetermined sp.	21	—	—
Undetermined sp.	—	6	—
Damacidae (Dt)			
<i>Epidameus puritanicus</i> Banks	—	—	3
Erythracidae (Cn-Ps)			
Undetermined sp.	2	20	2
Undetermined sp.	3	—	—
Undetermined sp.	1	66	3
Undetermined sp.	2	—	—
Undetermined sp.	—	36	26
Undetermined sp.	—	3	—
Undetermined sp.	—	—	16
Undetermined sp.	—	—	2
Eupodidae (Om)			
<i>Eupodes</i> sp.	85	408	436

Galumnidae (Hb)			
<i>Galumna virginiensis</i> Jacot	129	103	45
<i>Pergalumna curva</i> (Ewing)	—	—	11
Laelapidac (Ps)			
Undetermined sp.	3	31	21
Undetermined sp.	1	—	—
Undetermined sp.	—	12	—
Undetermined sp.	—	—	3
Mochlozetidae (Dt)			
<i>Podoribates pratensis</i> (Banks)	13	1	—
Mycobatidac (Hb)			
<i>Pelopsis bifurcata</i> (Ewing)	182	—	—
<i>Punctoribates</i> sp.	8	—	—
Nanorchestidae (Hb)			
<i>Speleorchestes</i> sp.	5	48	13
Undetermined sp.	—	7	—
Undetermined sp.	—	1	—
Undetermined sp.	—	—	1
Oribatulidae (Dt)			
<i>Zygoribatula</i> sp.	82	—	—
<i>Zygoribatula rostrata</i> Jacot	1	36	27
<i>Lucoppia</i> nr. <i>burrowsi</i> (Michael)	4	13	—
<i>Tectocephus</i> sp. prob. <i>velatus</i>	—	—	1
Parasitidae (Cn-Ps)			
Undetermined sp.	4	1	3
Pelopidae (Dt)			
<i>Peloptulus americanus</i> (Ewing)	—	—	3
Phytoseiidac (Hb)			
Undetermined sp.	—	—	1
Plateromacidae (Dt)			
Unknown gen. nr. <i>Pedrocortesella</i>	—	—	3
Pygmephoridae (Hb)			
Undetermined sp.	4	1	185
Undetermined sp.	—	—	17
Rhagidiidae (Cn)			
Undetermined sp.	4	26	6
Rhodacaridae (Cn)			
Undetermined sp.	2	—	6
Undetermined sp.	3	—	—
Undetermined sp.	2	2	—
Undetermined sp.	—	—	1
Schelorbitidae (Dt)			
<i>Schelorbites</i> nr. <i>lanceoliger</i> Berl.	23	48	4
<i>Schelorbites milleri</i> Jacot	5	33	43
Scutacaridae (Ps)			
Undetermined sp.	1	3	—

Tarsonemidae (Om)			
Undetermined sp.	2	—	—
Undetermined sp.	1	—	—
Undetermined sp.	—	—	1
Tegoribatidae (Hb)			
<i>Lepidozetes</i> , new sp.	—	5	—
Tenupalpidae (Hb)			
Undetermined sp.	—	—	2
Trombidiidae (Cn-Ps)			
Allotrombiinae sp.	1	1	—
Allotrombiinae sp.	3	1	—
Microtrombidiinae sp.	7	13	—
Microtrombidiinae sp.	4	—	—
Tydeidae (Om)			
Undetermined sp.	—	—	41
Undetermined sp.	—	—	5
Undetermined sp.	—	—	1
Uropodidae (Dt)			
Undetermined sp.	1	—	—
Winterschmidtidae (Dt)			
Undetermined sp.	18	—	—
ARANEAE			
Agelenidae (Cn)			
<i>Agelenopsis pensylvanica</i> (Koch)	5	—	—
<i>Cicurina</i> sp.	1	—	—
Araneidae (Cn)			
<i>Pachygnatha xanthostoma</i> Koch	1	—	—
Clubionidae (Cn)			
<i>Clubiona abbotti</i> Koch	1	—	1
<i>Phruotimpus borcalis</i> (Emerton)	—	—	5
<i>Phruolithus</i> sp.	—	1	—
Dictynidae (Cn)			
<i>Dictyna</i> sp.	1	—	—
<i>Argenna obesa</i> Emerton	1	—	—
Gnaphosidae (Cn)			
<i>Drassylus rufulus</i> (Banks)	1	—	—
<i>Micaria montana</i> Emerton	1	—	—
<i>Drassylus depressus</i> (Emerton)	2	2	—
<i>Gnaphosa parrula</i> (Emerton)	—	1	—
<i>Tennesseillum fornicum</i> (Emerton)	—	1	—
<i>Zelotes laccus</i> (Barrows)	—	1	—
<i>Micaria elizabethae</i> Gertsch	—	3	—
Hahniidae (Cn)			
<i>Neoantistea agilis</i> (Keyserling)	1	—	—
Linyphiidae (Cn)			
<i>Meioneta unimaculata</i> (Banks)	7	4	3
<i>Meioneta</i> sp., not <i>unimaculata</i> (Banks)	—	—	1

<i>Meioneta angulata</i> (Emerton)	---	--	1
<i>Bathypantes pallida</i> (Banks)	---	2	—
<i>Bathypantes concolor</i> (Wider)	—	1	—
<i>Linyphia clathrata</i> Sundervall	—	—	1
<i>Ceraticellus emertoni</i> (Cambridge)	1	---	3
<i>Erigone autumnalis</i> (Emerton)	3	3	1
<i>Eperigone trilobata</i> (Emerton)	1	1	2
<i>Eperigone</i> sp.	---	---	2
<i>Islandiana flaveola</i> (Banks)	1	1	—
<i>Ceratinopsis laticeps</i> (Emerton)	1	—	---
<i>Eridantes erigonoides</i> (Emerton)	—	—	2
<i>Walckenaeria</i> sp.	—	—	2
<i>Grammonota pictilis</i> (Cambridge)	—	—	1
Lycosidae (Cn)			
<i>Schizocosa avida</i> (Walckenaer)	—	5	—
<i>Schizocosa saltatrix</i> (Hentz)	—	1	—
<i>Schizocosa bilineata</i> Emerton	—	—	4
<i>Pirata aspirans</i> Chamberlin	14	—	5
<i>Pirata minutus</i> Emerton	11	6	3
<i>Pirata piraticus</i> (Clerck)	1	—	—
<i>Pirata insularis</i> Emerton	2	---	—
<i>Lycosa frondicola</i> Emerton	3	—	2
<i>Lycosa punctulata</i> Hentz	—	—	15
<i>Pardosa saxatilis</i> (Hentz)	67	13	10
<i>Pardosa moesta</i> Banks	---	---	1
<i>Pardosa distincta</i> (Blackwell)	---	---	2
Salticidae (Cn)			
<i>Icius</i> sp.	1	—	1
<i>Sitticus cursor</i> Barrows	—	1	—
Tetragnathidae (Cn)			
<i>Pachygnatha tristriata</i> Koch	—	1	---
Thomisidae (Cn)			
<i>Oxyptila georgiana</i> Keyserling	5	1	—
<i>Xysticus</i> sp.	—	1	—
<i>Xysticus triguttatus</i> Keyserling	—	8	—
<i>Xysticus</i> sp.	—	—	2
<i>Synema biocolor</i> Keyserling	—	---	1
<i>Thanatus rubicellus</i> Melb-Leitao	—	2	2
COLEOPTERA			
Carabidae (Cn)			
<i>Amara</i> sp.	1	—	—
<i>Bembidion affine</i> Say	1	—	—
<i>Bembidion</i> sp.	1	—	—
<i>Poecilus lucublandus</i> Say	—	—	2
<i>Tachys incurvus</i> Say	1	—	—
<i>Tachys</i> sp.	1	—	---
<i>Eumolops</i> sp.	---	2	29

<i>Notiophilus</i> sp.	—	1	—
<i>Poecilus</i> sp.	—	—	1
Cryptophagidae (Dt)			
<i>Anchicera</i> sp.	—	—	1
<i>Anchicera</i> sp.	—	—	1
Chrysomelidae (Hb)			
<i>Chaetocnema pulichaira</i> Melsheimer	4	—	—
<i>Longitarsus subrufus</i> LeConte	3	—	—
<i>Lonitarsus testaceus</i> (Melsheimer)	—	14	5
<i>Paria</i> sp.	1	—	—
<i>Trirhabda virgata</i> LeConte	1	—	—
<i>Trirhabda</i> sp.	—	1	—
<i>Longitarsus</i> sp.	—	2	—
Cicindelidae (Cn)			
<i>Cicindela sexguttata</i> Fabricius	—	1	—
Corylophidae (Dt)			
<i>Arthrolips</i> sp.	—	1	—
Curculionidae (Hb)			
<i>Otiorhynchus ovatus</i> (L.)	—	—	3
<i>Sitona</i> sp.	—	1	—
<i>Sphenophorus</i> sp.	—	—	1
<i>Sphenophorus</i> sp.	—	1	—
<i>Tyloderma nigra</i> Casey	2	—	1
Elateridae (Hb)			
<i>Conoderus</i> sp.	—	—	2
<i>Conoderus</i> sp.	—	—	1
<i>Drasterius amabilis</i> (LeConte)	1	1	—
Lathridiidae (Dt)			
<i>Corticarina longipennis</i> (LeConte)	3	1	9
<i>Melanophthalma americana</i> (Mann)	—	—	2
Leiodidae (Dt)			
<i>Anistoma</i> sp.	1	—	—
<i>Anistoma</i> sp.	—	—	1
<i>Colenis impunctata</i> LeConte	—	—	1
Mordellidae (Hb)			
<i>Mordellistena</i> sp.	1	—	—
Nitidulidae (Hb)			
<i>Epuraea</i> sp.	1	—	—
<i>Glisrochilus quadrisignatus</i> (Say)	3	1	—
<i>Stelidota geminata</i> (Say)	1	1	1
Phalacridae (Hb)			
<i>Stilbus nitidus</i> (Melsheimer)	1	—	1
Seydmacnidae (Dt)			
<i>Sternichnus</i> sp.	1	—	—
Staphylinidae (Cn)			
Aleocharinae sp.	2	2	—
Aleocharinae sp.	—	—	57
Aleocharinae sp.	—	—	1

<i>Alcocharinae</i> sp.	1	1	—
<i>Alcocharinae</i> sp.	3	—	—
<i>Aleocharinae</i> sp.	1	—	—
<i>Anotylus</i> sp.	—	—	1
<i>Apocellus</i> sp.	1	—	—
<i>Bryoporus</i> sp.	—	—	2
<i>Mycetoporus</i> sp.	—	1	—
<i>Mycetoporus</i> sp.	—	—	3
<i>Oxytelus</i> sp.	1	—	—
<i>Paederus littorarius</i> Gravenhorst	1	—	1
<i>Quedius</i> sp.	1	—	—
<i>Quedius</i> sp.	1	—	—
<i>Scopaeus</i> sp.	—	—	1
<i>Stenus colonus</i> Erickson	3	—	—
<i>Tachyporus elegans</i> Horn	—	—	1
<i>Tachyporus nitidulus</i> (Fabr.)	—	2	—
<i>Tachyporus</i> sp.	1	1	1
<i>Tachyporus</i> sp.	—	1	—
Xantholini nr. <i>Philonthus</i>	1	—	—
Xantholini sp.	—	—	2

COLLEMBOLA

Entomobryidae (Dt)

<i>Entomobrya purpurescens</i> (Packard)	1	19	45
<i>Lepidocyrtus cinereus</i> Folsom	17	23	6
<i>Lepidocyrtus cyaneus</i> Tullberg	28	18	201
<i>Lepidocyrtus paradoxus</i> Uzel	114	72	547
<i>Lepidocyrtus pellidus</i> Reuter	24	44	60
<i>Lepidocyrtus violaceus</i> Fourcroy	2	—	15
<i>Orcherella ainsliei</i> Folsom	4	80	58
<i>Pseudosinella rolfsi</i> Mills	29	3	58
<i>Pseudosinella violenta</i> (Folsom)	5	—	6
<i>Tomocerus flavescens</i> Tullberg	55	11	30

Isotomidae (Dt)

<i>Folsomia elongata</i> (MacGillivray)	—	2	—
<i>Isotomurus bimus</i> Christiansen & Bell.	32	12	11
<i>Isotoma viridis</i> Bourlet	67	1	26
Undetermined sp.	—	1	—

Poduridae (Dt)

<i>Hypogastrura</i> sp.	—	—	7
<i>Pseudachorutes subcrassoides</i> Mills	2	—	—
<i>Tullbergia nulla</i> Christiansen & Bell.	—	—	4
<i>Xynella pseudomaritima</i> James	—	—	7
<i>Xynella grisea</i> Axelson	2	—	—

Sminthuridae (Hb)

<i>Bourletiella lipponi</i> Snider	20	70	23
<i>Bourletiella cf/savona</i> Maynard	—	87	105
<i>Bourletiella spinata</i> (Macgillivray)	1	6	—

<i>Dicyrtoma marmorata</i> (Packard)	—	4	4
<i>Sminthurides macnamari</i> Folsom & Mills	11	31	102
<i>Sminthurides pumilis</i> (Krausbauer)	7	5	90
<i>Sminthurinus cf/henshawi</i> (Folsom)	2	1	3
<i>Sminthurinus latimaculosus</i> Maynard	88	45	13
<i>Sminthurinus macgillivrayi</i> (Banks)	1	—	—
<i>Sminthurus banksi</i> Christiansen & Bell.	—	7	3
DIPLURA			
Campodeidae (Dt)			
<i>Campodea</i> sp.	1	—	1
DIPTERA			
Anthomyiidae (Hb)			
Undetermined sp.	—	—	1
Anthomyzidae (Hb)			
<i>Mumetopia occipitalis</i> Melander	—	—	1
Cecidomyiidae (Hb)			
<i>Lestodiplosis grassator</i> (Fyles)	1	—	—
<i>Micromya</i> sp.	1	—	—
<i>Neolasioptera</i> sp.	1	—	—
<i>Resseliella</i> sp.	1	—	—
<i>Contarinia</i> sp.	—	1	—
<i>Peromyia photophila</i> (Felt)	—	—	2
<i>Lestodiplosis</i> sp.	—	—	1
<i>Miastor</i> sp.	—	1	—
Ceratopogonidae (Ps)			
<i>Stilobezzia navatae</i> Wirth & Grogan	—	—	1
Chironomidae (Hb)			
Undetermined sp.	—	1	—
Chloropidae (Hb)			
<i>Conioscinella</i> , new sp.	—	—	1
<i>Thaumatomyia pulla</i> , var. <i>punctum</i> Becker	—	—	6
<i>Lasiosina</i> , new sp.	—	—	11
Dolichopodidae (Cn)			
<i>Chrysotus</i> sp.	1	—	—
Drosophilidae (Hb)			
<i>Drosophila</i> sp.	—	—	1
<i>Drosophila</i> sp.	—	—	1
Empididae (Cn)			
<i>Drapetis</i> sp.	1	—	19
Phoridae (Dt)			
<i>Pulicophora</i> sp.	—	1	5
Undetermined sp.	1	—	—
Undetermined sp.	1	—	1
Psychodidae (Hb)			
<i>Psychoda</i> sp.	—	1	—

Scatopsidae (Hb)			
<i>Swammerdamella obtusa</i> Cook	—	—	1
Sciaridae (Dt)			
<i>Eugnoriste</i> sp.	—	—	4
<i>Pnyxia scabiei</i> (Hopkins)	—	—	3
Sciomyzidae (Hb)			
Undetermined sp.	1	—	—
Sepsidae (Dt)			
<i>Sepsis punctum</i> (Fabr.)	2	—	—
Sphaeroceridae (Dt)			
<i>Leptocera fontinalis</i> (Fallen)	4	2	6
HEMIPTERA			
Lygaeidae (Hb)			
<i>Hypogeocoris piceus</i> (Say)	—	1	—
<i>Ligyrocoris diffusus</i> Uhler	1	—	5
<i>Xestocoris</i> sp.	—	—	2
Miridae (Hb)			
<i>Mimoceps</i> sp.	—	—	1
HOMOPTERA			
Aclerdidae (Hb)			
<i>Aclerda ferrisi</i> McConnell	—	—	3
Aphididae (Hb)			
<i>Acyrtosiphon</i> sp.	1	—	—
<i>Aphis oenotherae</i> Oestlund	—	—	1
<i>Aphis</i> sp.	10	6	—
<i>Capitophorus elaeagni</i> (Del Guercio)	3	1	—
<i>Uroleucon</i> sp.	3	—	—
<i>Uroleucon</i> sp.	15	—	—
<i>Uroleucon</i> sp.	8	—	—
Cicadellidae (Hb)			
<i>Aceratagallia sanguinolenta</i> (Provancher)	1	5	1
<i>Aphrodes costate</i> (Panzer)	5	—	—
<i>Aphrodes fusofusciata</i> (Goeze)	1	—	—
<i>Balclutha</i> sp.	4	—	—
<i>Deltocephalus</i> sp.	3	1	53
<i>Doratura stylata</i> (Boheman)	4	3	19
<i>Driotura gammaroides</i> (Van Duzee)	—	6	—
<i>Flexamia prairiana</i> De Long	—	—	23
<i>Stirellus bicolor</i> (Van Duzee)	—	—	4
<i>Xestocephalus desartorum</i> (Berg)	—	1	—
<i>Polyamia</i> sp.	—	—	1
Cixiidae (Hb)			
<i>Myndus fulvus</i> Osborn	1	—	—
<i>Myndus</i> sp.	—	1	—

Coccidae (Hb)			
Undetermined sp.	—	4	—
Delphacidae (Hb)			
<i>Pissonotus</i> sp.	—	1	—
Diaspididae (Hb)			
Undetermined sp.	—	1	1
Eriococcidae (Hb)			
<i>Eriococcus</i> sp.	4	—	—
<i>Eriococcus</i> sp.	2	—	—
<i>Eriococcus</i> , new sp.	—	—	1
Issidae (Hb)			
<i>Bruchomorpha dorsata</i> Fitch	—	—	18
Pseudococcidae (Hb)			
<i>Chaurococcus trifolii</i> (Forbes)	1	—	—
Planococcini sp.	—	1	3
<i>Trionymus</i> sp.	5	27	9
Undetermined sp.	—	2	2
Undetermined sp.	—	1	—
Psyllidae (Hb)			
<i>Aphalara</i> nr. <i>fumida</i> Caldwell	—	—	1
HYMENOPTERA			
Aphelinidae (Hb)			
<i>Aphytis</i> sp.	—	—	1
Apidae (Hb)			
<i>Apis mellifera</i> L.	1	—	—
Braconidae (Hb)			
<i>Microplitis</i> sp.	3	—	—
<i>Urosigalphus</i> sp.	1	—	—
Ceraphronidae (Hb)			
<i>Aphanogmus</i> sp.	3	—	1
<i>Aphanogmus</i> sp.	—	1	—
<i>Ceraphron</i> sp.	—	2	—
<i>Ceraphron</i> sp.	—	—	7
<i>Ceraphron</i> sp.	—	—	1
<i>Ceraphron</i> sp.	—	—	2
<i>Ceraphron</i> sp.	—	—	3
<i>Ceraphron</i> sp.	—	—	1
<i>Ceraphron</i> sp.	—	—	1
<i>Ceraphron</i> sp.	—	—	4
<i>Lagynodes pallidus</i> (Boheman)	—	1	—
Diapriidae (Hb)			
<i>Basalys</i> sp.	—	1	—
<i>Basalys</i> sp.	1	—	—
<i>Basalys</i> sp.	1	—	—
<i>Basalys</i> sp.	1	—	—
<i>Basalys</i> sp.	—	—	1

<i>Basalys</i> sp.	—	—	2
<i>Monelata</i> sp.	—	2	—
<i>Trichopria</i> sp.	2	—	—
<i>Trichopria</i> sp.	1	—	—
<i>Trichopria</i> sp.	—	1	—
Encyrtidae (Hb)			
Undetermined sp.	—	—	1
Eulophidae (Hb)			
<i>Tetrastichus</i> sp.	1	—	—
Unknown Gen. & sp.	1	—	—
Formicidae (Om)			
<i>Aphaenogaster rudis</i> Emery	9	—	88
<i>Brachymyrmex depilis</i> Emery	1	2	—
<i>Camponotus pennsylvanicus</i> (DeGeer)	—	1	—
<i>Crematogaster cerasi</i> (Fitch)	3	2	33
<i>Formica integra</i> Nylander	5	—	—
<i>Formica montana</i> Emery	40	—	—
<i>Formica pallidiflava nitidiventris</i> Emery	11	19	39
<i>Formica pergandei</i> Emery	—	5	3
<i>Formica subsericea</i> L.	99	4	—
<i>Formica</i> sp.	—	—	74
<i>Lasius alienus</i> (Foerster)	10	16	—
<i>Lasius flavus</i> (Fabr.)	—	—	6
<i>Lasius neoniger</i> Emery	180	247	430
<i>Leptothorax ambiguus</i> Emery	—	4	13
<i>Myrmica americana</i> Weber	—	5	—
<i>Myrmica fractricornis</i> Emery	64	24	488
<i>Polyergus breviceps</i> Emery	2	—	—
<i>Ponera pennsylvanica</i> Buckley	1	—	4
<i>Solenopsis molesta</i> (Say)	13	2	124
<i>Stenamma brevicorne</i> Mayr	1	2	10
<i>Tapinoma sessile</i> (Say)	9	2	3
<i>Tetramorium caespitum</i> (L.)	48	—	—
Halictidae (Hb)			
<i>Dialictus pilosus</i> (Say)	—	—	1
Ichneumonidae (Hb)			
<i>Cymodusa distincta</i> (Cresson)	—	1	—
<i>Campoletis</i> sp.	—	1	—
Megachilidae (Hb)			
<i>Osmia atriventris</i> Cresson	1	1	—
<i>Iloplitis producta</i> Cresson	—	1	—
Multillidae (Hb)			
<i>Timulla barbiger</i> (Bradley)	—	1	—
Mymaridae (Hb)			
<i>Gonatocevus</i> sp.	—	1	—
<i>Litus</i> , new sp.	3	—	—
<i>Polynema</i> sp.	—	3	3

Pompilidae (Cn)			
Undetermined sp.	1	—	—
<i>Anoplius (Pompilinus) marginatus</i> (Say)	—	1	—
<i>Anoplius (Anoplius) illinoisensis</i> (Rob.)	—	—	1
<i>Ageniella (Ageniella) norata</i> (Banks)	—	1	—
Pteromalidae (Hb)			
<i>Spalungia nigra</i> Latreille	1	—	—
Undetermined sp.	1	—	—
Rhopalosomatidae (Hb)			
<i>Olixon banksii</i> (Brues)	1	1	2
Scelionidae (Hb)			
<i>Baeus</i> sp.	1	7	5
<i>Baeus</i> sp.	—	—	1
<i>Calliscelio marlatti</i> (Ashmead)	5	—	—
<i>Gryon</i> sp.	1	—	2
<i>Gryon</i> sp.	—	—	2
<i>Paridris laeviceps</i> (Ashmead)	1	—	—
<i>Platygaster</i> sp.	1	—	—
<i>Scelio</i> sp.	—	2	—
<i>Trimorus</i> sp.	11	—	1
<i>Trimorus</i> sp.	30	—	—
<i>Trimorus</i> sp.	6	—	2
<i>Trimorus</i> sp.	9	5	18
<i>Trimorus</i> sp.	—	—	2
<i>Trimorus</i> sp.	2	2	—
<i>Trimorus</i> sp.	6	—	—
<i>Trimorus</i> sp.	1	—	—
<i>Telonomus</i> , new sp.	—	—	11
<i>Telonomus</i> , new sp.	—	1	—
New Gen. & Sp.	—	—	1
Vespidae (Cn)			
<i>Parancistrocerus</i> sp.	1	—	—

ISOPODA

Oniscidae (Dt)			
<i>Armadillidium vulgare</i> (Latreille)	5	16	—
<i>Armadillidium</i> sp.	1	—	1
<i>Trachelipus rathkei</i> Brandt	203	68	282
<i>Trachelipus</i> sp.	—	1	—

LEPIDOPTERA

Cochylidae (Hb)			
Undetermined sp.	1	—	—
Gelichiidae (Hb)			
Undetermined sp.	1	—	—
Heliodinidae (Hb)			
Undetermined sp.	1	—	—

Tortricidae (Hb)			
Undetermined sp.	1	—	—
LITHOBIOMORPHA			
Lithobiidae (Cn)			
<i>Lithobius</i> sp.	2	12	12
OPIILIONES			
Phalangidae (Cn)			
<i>Leiobunum nigripes</i> Weed	1	—	13
<i>Phalangium opilio</i> L.	12	6	2
<i>Leiobunum</i> sp.	—	—	5
ORTHOPTERA			
Acrididae (Hb)			
<i>Melanoplus impudicus</i> Scudder	—	5	1
Gryllacrididae (Dt)			
<i>Ceuthophilus divergens</i> Scudder	—	—	4
Gryllidae (Om)			
<i>Gryllus pennsylvanicus</i> Burmeister	39	7	4
<i>Nemobius</i> sp.	41	3	29
POLYDESMIDA			
Polydesmidae (Dt)			
Undetermined sp.	—	—	12
SPIROBOLIDA			
Parajulidae (Dt)			
Undetermined sp.	3	1	—
THYSANOPTERA			
Phlaeothripidae (Hb)			
<i>Neothrips (Bolothrips) bicolor</i> (Hecgar)	1	3	—
Undetermined sp.	—	1	—
Thripidae (Hb)			
<i>Frankliniella tritici</i> (Fitch)	6	4	4
<i>Frankliniella</i> sp.	1	—	—
<i>Frankliniella fusca</i> (Hinds)	—	1	—
<i>Chirothrips manicatus</i> Haliday	2	—	—
<i>Microcephalothrips abdominalis</i> (Crawford)	—	1	—
Undetermined sp.	—	1	—
Undetermined sp.	—	2	—