

# Regional biodiversity of terrestrial Heteroptera and Orthoptera in southwestern Illinois

Sam W. Heads, Steven J. Taylor, Daniel R. Swanson, & M. Jared Thomas



Final Report, submitted to:

Attn: Scott Ballard  
Office of Resource Conservation  
One Natural Resources Way  
Springfield, IL 62702

Illinois Natural History Survey Technical Report 2015(04)

January 2015

# Regional biodiversity of terrestrial Heteroptera and Orthoptera in southwestern Illinois

Sam W. Heads<sup>1,\*</sup>, Steven J. Taylor<sup>1</sup>, & M. Jared Thomas<sup>1</sup>, & Daniel R. Swanson<sup>2</sup>

<sup>1</sup>Illinois Natural History Survey, Prairie Research Institute, University of Illinois at Urbana-Champaign, 1816 South Oak Street, Champaign, Illinois 61820; <sup>2</sup>Department of Entomology, University of Illinois at Urbana-Champaign, 320 Morrill Hall, 505 South Goodwin Avenue, Urbana, Illinois 61801; \*Corresponding author: swheads@illinois.edu

## Abstract

We conducted a baseline inventory of terrestrial Heteroptera (true bugs) and Orthoptera (grasshoppers, crickets and katydids) at four sites in Monroe and Randolph counties, Illinois in 2014, namely: Mill Creek Natural Area (MCNA); White Rock Nature Preserve (WRNP); Fogelpole Cave Nature Preserve (FCNP); and Kidd Lake State Natural Area (KLSNA). A total of 95 species in the focal taxa were recorded (67 Heteroptera and 28 Orthoptera). In addition, a further 96 species of arthropods in groups other than Heteroptera and Orthoptera were also recorded. Heteropteran diversity was found to be typical of that expected for other natural areas in Illinois, though orthopteran diversity was much lower and may be related to structural aspects of the respective habitats. Cluster analysis of our presence/absence data revealed marked differences in site similarity between orthopteran and heteropteran species assemblages.

Cover photo: Dark (top) and pale (bottom) color forms of the female admirable grasshopper, *Syrbula admirabilis* (Orthoptera: Acrididae: Gomphocerinae), a slant-faced grasshopper species commonly encountered in southwestern Illinois. Note the wavy color pattern on the tegmen (forewing) that is characteristic of this species. Copyright 2015 Sam W. Heads, Ph.D.

## Introduction

Knowledge of the biota of a given region is important to understanding the requirements of an ecological community and subsequently formulating targeted conservation efforts. Certainly, the physiography of southwestern Illinois is unique in comparison to the rest of the state (e.g., Taylor *et al.* 2009) and this area therefore, becomes a suitable focus for conservation efforts. To this end, biological site inventories are required to better evaluate and ultimately justify the continued protection of natural areas in this region. Site inventories of understudied biota serve to further the preservation and enhance protection of non-game wildlife resources in Illinois by providing land managers with more knowledge of the species present and habitats in which they are found.

The true bugs (Insecta: Heteroptera) are an important group of insects which highlight the diverse modifications and specializations as well as varied forms of natural history (Schuh and Slater 1995). Each biotope, excluding polar regions, has been colonized by some subgroup of Heteroptera, and constituents of the order are frequently encountered by biologist and outdoor recreationalist alike. Furthermore, heteropterans affect mankind in sundry important economic ways (Schaefer and Panizzi 2000): herbivorous members may cause significant agricultural damage from mechanical feeding or as vectors of plant pathogens; predatory members have been investigated as biological control agents in various IPM regimens; and parasitic members create medical and financial burdens in the context of health care and sanitation efforts.

Despite these significant effects, the terrestrial component of this diverse group has been greatly understudied in Illinois. Surveys of only a few groups have been undertaken (e.g., McPherson 1982; Hagerty and McPherson 1999). Yet, in each the presence of previously unreported species have been revealed in the state and even more recent survey work in other parts of the state has revealed the presence of a rarely-encountered species hitherto unknown in Illinois (Swanson and Taylor, in prep.). In other words, the perceived heteropteran biodiversity of Illinois remains at a level of underrepresentation. This, in turn, may have great implications for conservation efforts, deflecting attention from areas worthy of protection. Thus, higher focus on heteropteran diversity is certainly warranted and informative.

Grasshopper, crickets and katydids (Insecta: Orthoptera) are a diverse and ecologically important group known to be valuable indicators of habitat quality and ecological integrity (Andersen *et al.* 2001; Bazelet & Samways 2012). They are global in distribution with representatives occurring in a wide variety of habitat types, from dense forests to open grasslands, riparian and semiaquatic areas and even subterranean environments. Over 140 species are known to occur in Illinois with the greatest diversity in the southern half of the state (Heads, unpublished data). Grasshoppers (Acrididae) are a particularly diverse and abundant component of terrestrial ecosystems in southern Illinois, with the distributions of many species interdigitating and in some cases overlapping, along the northern and southern limits of their geographical ranges. Other significant orthopteran groups include the true crickets (Gryllidae), mole crickets (Gryllotalpidae), scaly crickets (Mogoplistidae) and katydids (Tettigoniidae). Many of these taxa (particularly the true crickets and katydids) also dominate the ecological soundscape by way of their acoustic signaling.

Given their sensitivity to environmental variables, orthopterans are also extremely useful indicators of habitat quality and ecosystem health (Lockwood *et al.* 2000; Andersen *et al.* 2001). Yet despite their importance, very little is known about the orthopteran communities of Illinois. This is particularly true of those occupying the complex mosaic of habitats bordering the Mississippi river. Indeed, the most recent comprehensive assessment of the grasshoppers and other orthopterans of Illinois was that of Hebard (1934). As detailed knowledge of orthopteran diversity and community composition is essential to the proper assessment and management of natural areas, a modern survey of this important group is now long overdue.

## Material and methods

### Study sites

Sites included in this study are:

1. Mill Creek Natural Area [MCNA], Randolph County
2. White Rock Nature Preserve [WRNP], Monroe County
3. Fogelpole Cave Nature Preserve [FCNP], Monroe County
4. Kidd Lake State Natural Area [KLSNA], Monroe County

Precise locality details (Lat. Lon. And TRS coordinates) and habitat descriptions are provided in Table 1. The location of each site within southwestern Illinois is shown in Figure 1. Maps of each locality are provided in figures 2–5. Photographs of representative habitat types at each locality are provided in Figure 6.

### Sampling

Field surveys for Heteroptera and Orthoptera were carried out according to standard protocols, with specimens collected using a variety of methods including sweep netting, beating, and active collecting by hand. All representative habitats at each site were searched for Heteroptera and Orthoptera. In addition to the focal taxa, many other insects were collected as by-catch, particularly in sweep net samples. Sampling locations were recorded using a handheld GPS receiver and all data compiled into spreadsheets detailing precise locality of each sample, the habitat type, date and collector, etc. Specimens were either dried and pinned, or stored in alcohol and are held at the Illinois Natural History Survey in Champaign, IL.

## Results

At all four sites combined, we recorded a total of 95 species of Heteroptera (67 spp.) and Orthoptera (28 spp.) representing 28 families (23 Heteroptera and 5 Orthoptera). A complete list of all heteropteran and orthopteran species recorded is provided in Appendix I. Lists of species arranged by site are provided in Appendix II. Common names of all species recorded are presented in Appendix III. In addition to the heteropteran and orthopteran taxa recorded, we encountered a number of additional arthropod taxa which are listed in Appendix IV as supplementary data.

### Taxonomic breakdown

Figures 7 and 8 illustrate the relative proportion of species by family recorded for Heteroptera and Orthoptera respectively. Significantly greater diversity of Heteroptera were recorded. The heteropteran assemblage is dominated by Miridae and Pentatomidae with each accounting for 19% of the total number of species recorded during the study. The orthopteran assemblage is dominated by Acrididae, which is typical of the orthopteran fauna state-wide. Figure 9 illustrates a further breakdown of Acrididae by subfamily. The acridid assemblage is dominated by Melanoplinae (accounting for 50% of the total number of species recorded) and Oedipodinae (accounting for 29% of the total number of species recorded).

### Site comparison

Figure 10 provides a general comparison of heteropteran and orthopteran diversity at the study sites. As expected, Heteroptera are consistently more diverse than Orthoptera at all sites, though there were some differences observed between each site. A complete linkage cluster analysis was used to compare the four

sites and grouped sites with similar species assemblages (Figure 11). Significant differences were observed between Heteroptera and Orthoptera.

## Discussion

The results of this study provide preliminary baseline data on the diversity of Heteroptera and Orthoptera at selected sites in southwestern Illinois (Table 1; Figures 7–10). The lists of species presented in this report (see Appendices I–IV) is by no means exhaustive and more detailed, longer-term surveys and monitoring efforts will certainly add additional species to the lists. Nonetheless, the preliminary data provided here suggests that heteropteran diversity at most of the study sites is largely in line with that expected for other parts of the state. In addition, the study also resulted in the discovery of two new state records, namely the stilt bug *Metacanthus multispinus* (Berytidae) and the assassin bug *Phymata fasciata* (Reduviidae). These will be formally published in a forthcoming paper (Swanson *et al.*, in prep).

In contrast, the number of orthopteran species recorded is rather paltry in comparison with other sites and well below that expected in the focal region. This is likely the result of management practices focused primarily on maintaining floral components of habitats, oftentimes to the detriment of structural elements. Grasshoppers (Orthoptera: Acrididae) are particularly sensitive to structural changes in their habitat and nowhere was this clearer than at Kidd Lake State Natural Area (KLSNA) which had been extensively mown prior to one of our visits to this site, resulting in only two orthopteran species being recorded, neither of which were grasshoppers (Figure 10; Appendix II). This has been observed at other natural areas throughout the state (Heads, unpublished) and management practices should likely be modified to take into account the structural characteristics of the habitats. A more detailed investigation of this phenomenon is currently underway (Heads, *et al.*, T-92-R-1 SWG) that will shed more light on the issue and provide management recommendations.

For the Orthoptera (Figure 11A) FCNP and KLSNA had faunas that were more similar to one another based on presence/absence data, than to the other two sites, with WRNP the least similar to FCNP and KLSNA. For Heteroptera (Figure 11B) KLSNA and WRNP were the most similar to one another based on species presence/absence data, with MCNA having the least in common with the other sites. It is difficult to attribute these differences in patterns to any particular factor given the limited nature of the dataset. Each of the sites appeared to be markedly different in terms of habitat structure and diversity. More intensive quantitative sampling while measuring various habitat parameters would be necessary to tease out meaningful correlates of the observed patterns.

## Literature Cited

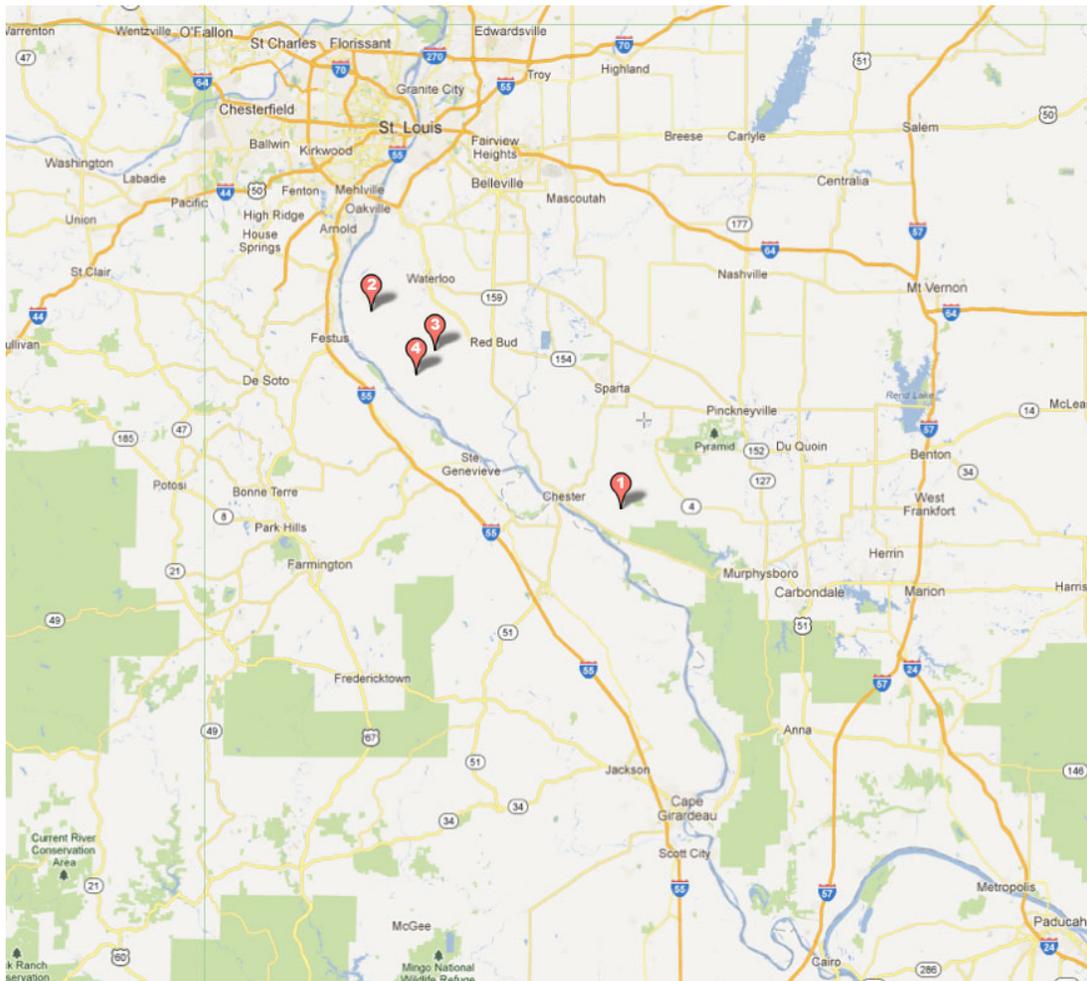
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## Figures and Tables

**Table 1.** Study site locations and descriptions.

	<b>Site</b>	<b>County</b>	<b>Location</b>	<b>Habitats Represented</b>
1	Mill Creek Natural Area [MCNA]	Randolph	37.8918 -89.6479 T7S R5W s27, 28	sandstone canyon & forest and dry exposed bluff associations
2	White Rock Nature Preserve [WRNP]	Monroe	38.2705 -90.2966 T3S R11W s 14, 15, 22, 23	hill prairie, talus slope, and forested upland
3	Fogelpole Cave Nature Preserve [FCNP]	Monroe	38.1968 -90.1292 T4S R9W s 7, 8	wooded sinkhole and sinkhole plain prairie
4	Kidd Lake State Natural Area [KLSNA]	Monroe	38.1475 -90.1867 T4S R10W s 34, 35	riparian zone & marsh habitat



**Figure 1.** Area map of southwestern Illinois showing locations of study sites: (1) Mill Creek Natural Area; (2) White Rock Nature Preserve; (3) Fogelpole Cave Nature Preserve; and (4) Kidd Lake Marsh State Natural Area.

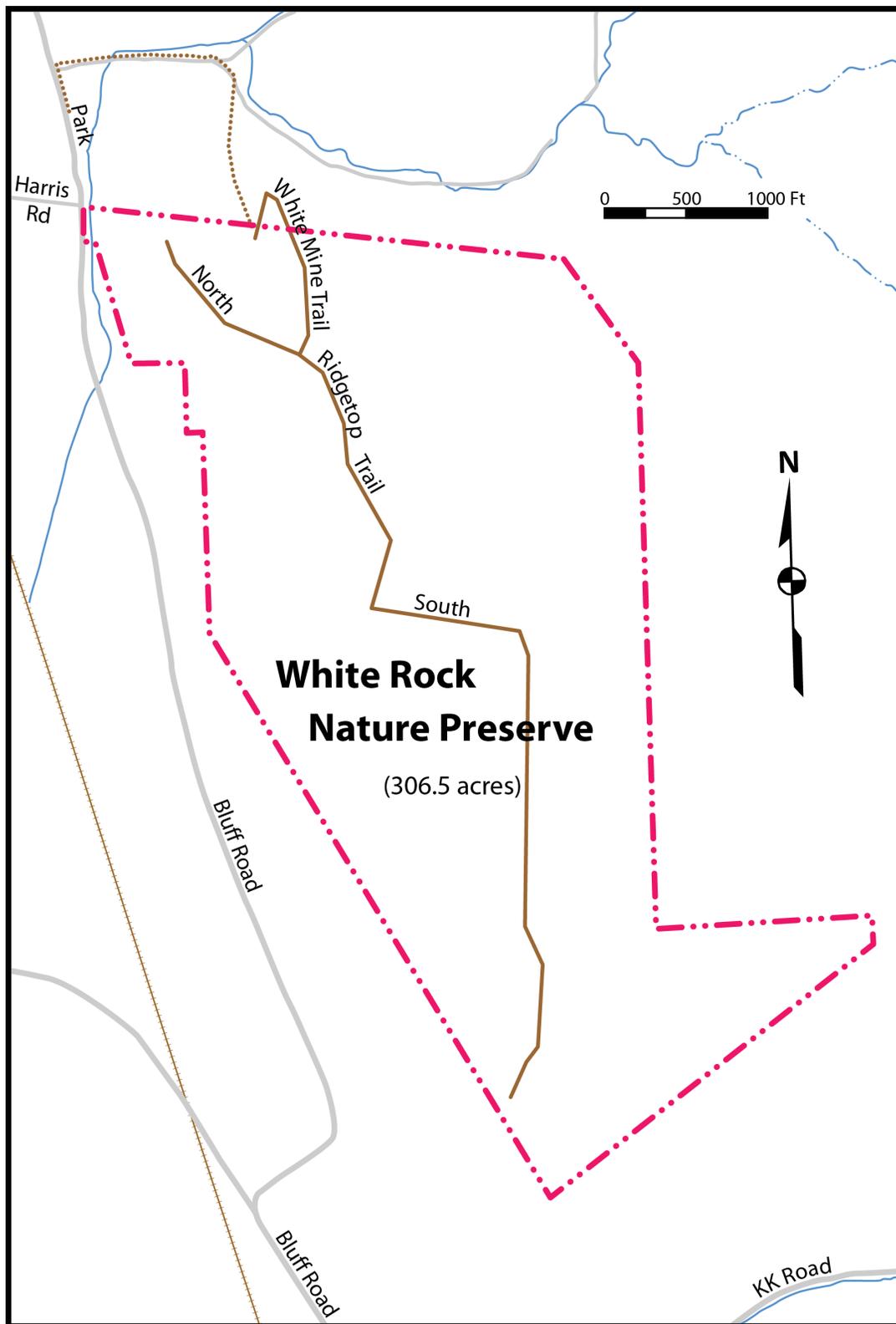
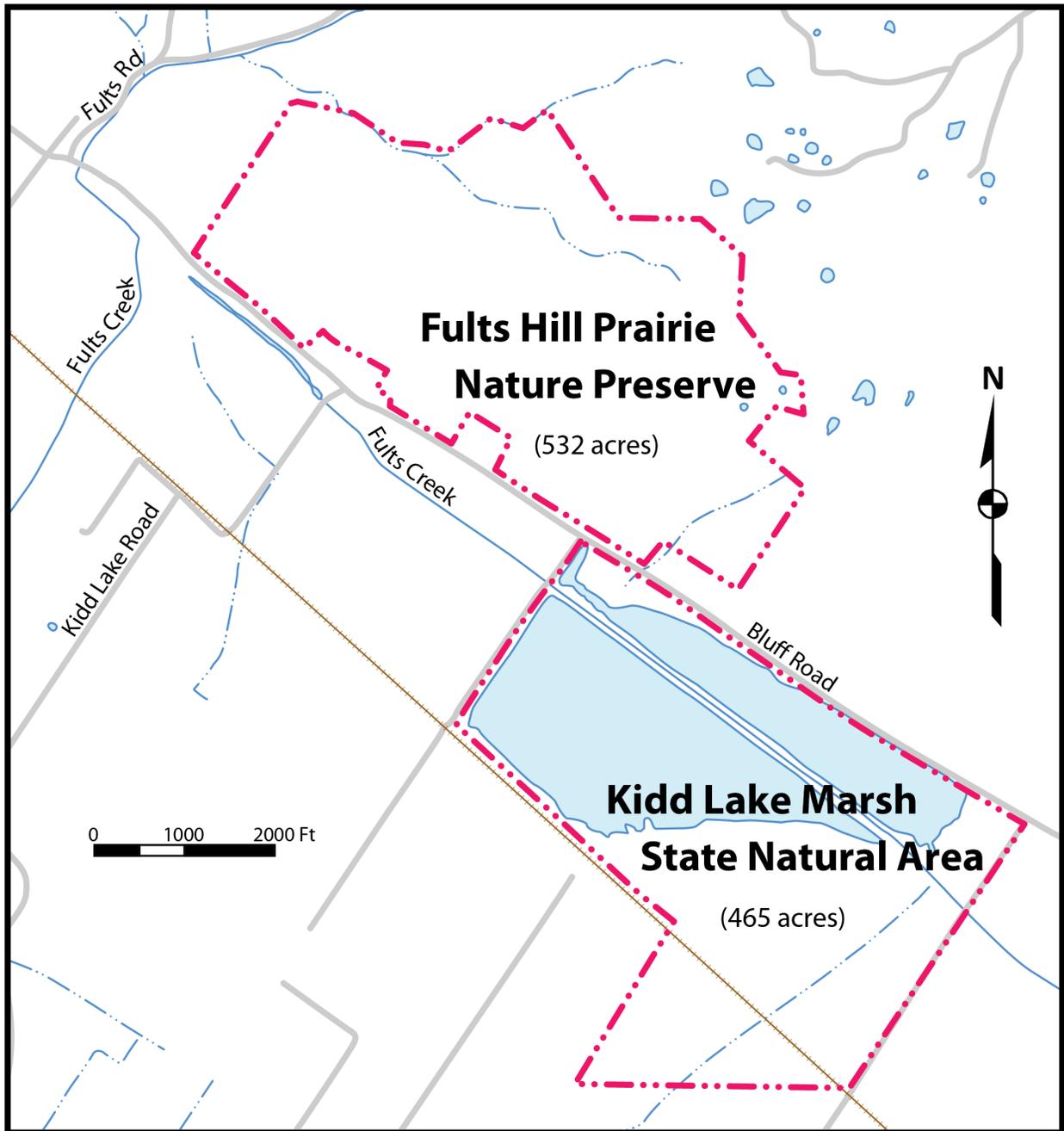


Figure 2. Map of White Rock Nature Preserve.



**Figure 3.** Map of Kidd Lake State Natural Area showing proximity to Fults Hill Prairie Nature Preserve.

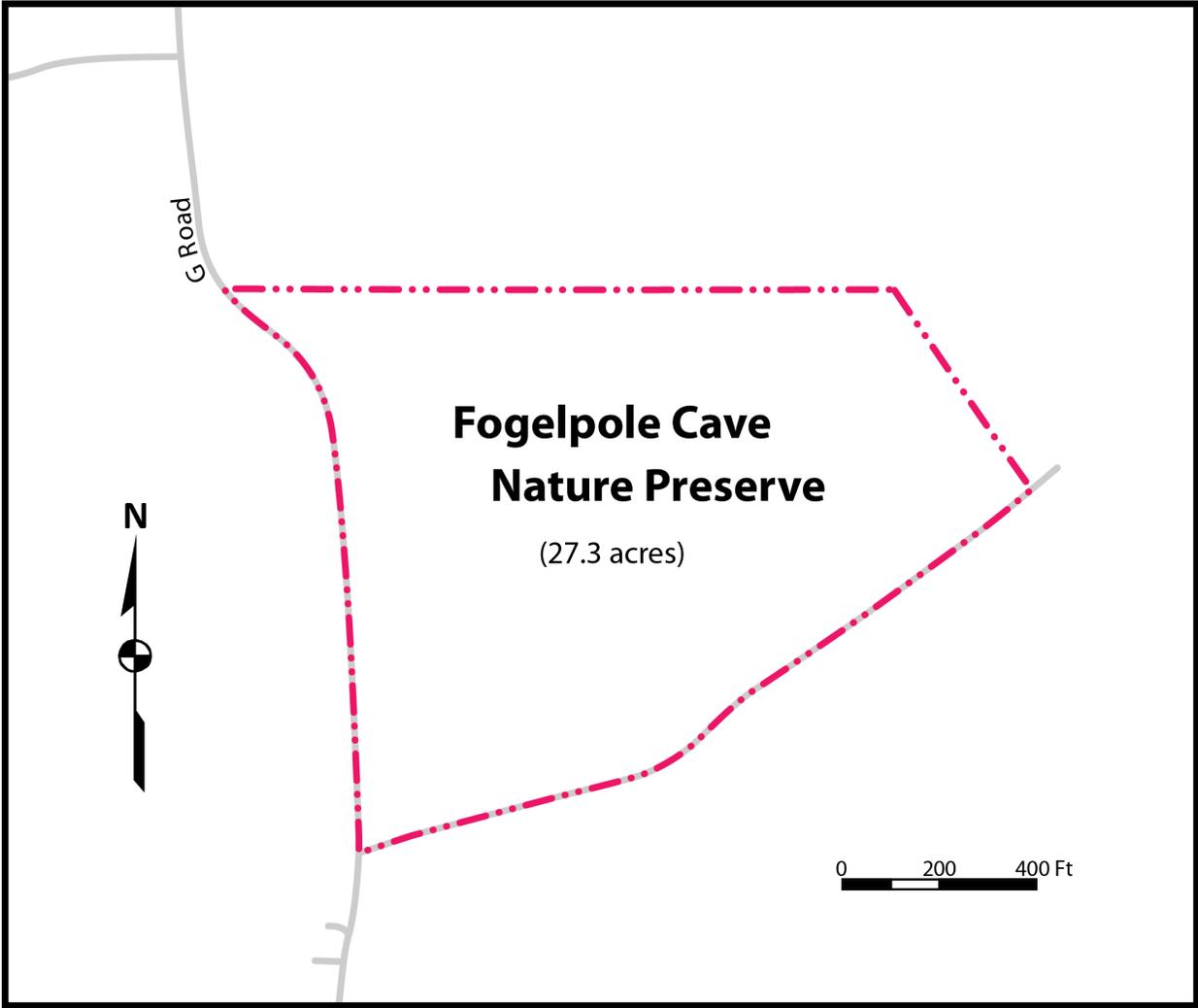


Figure 4. Map of Fogelpole Cave Nature Preserve.

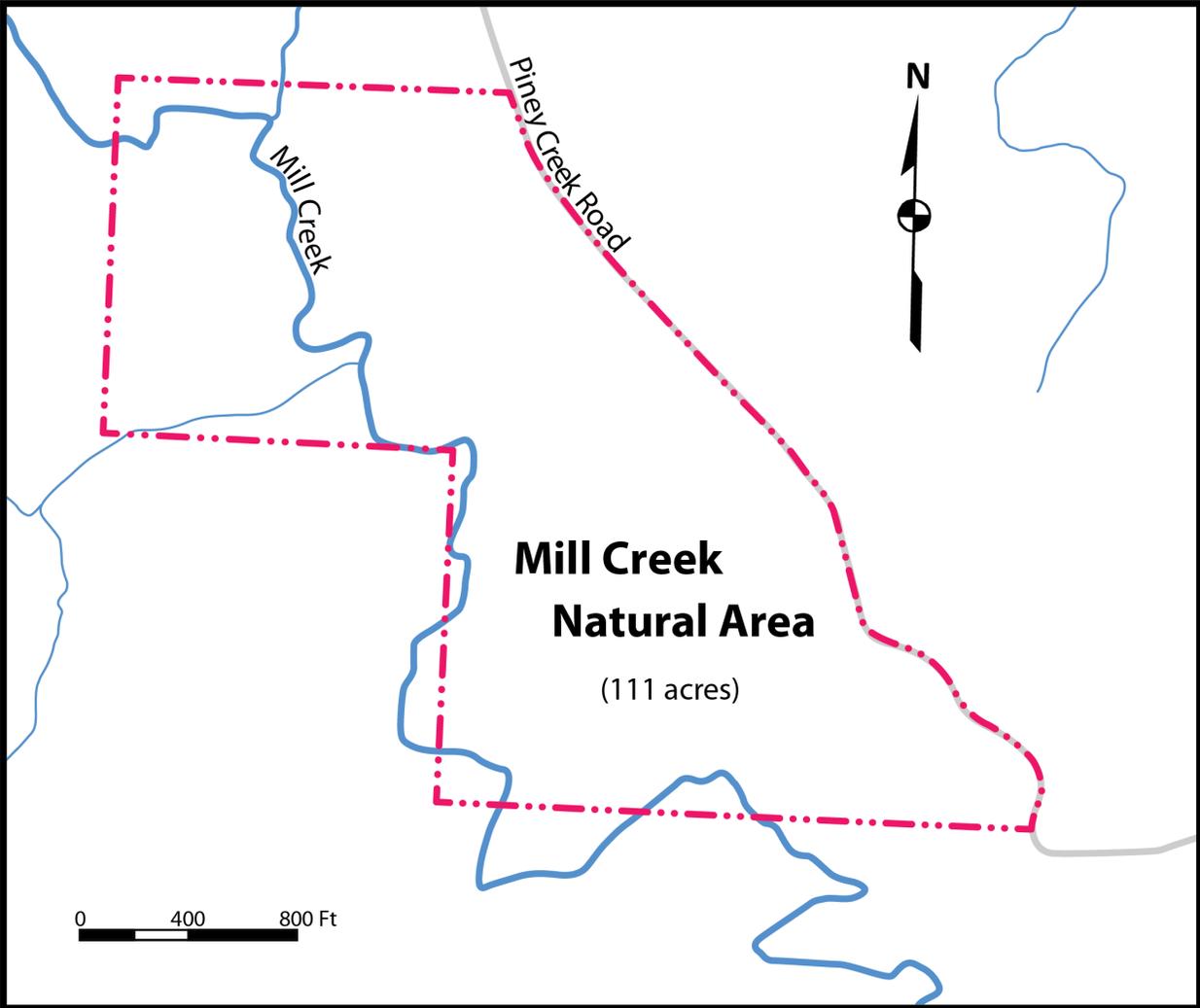
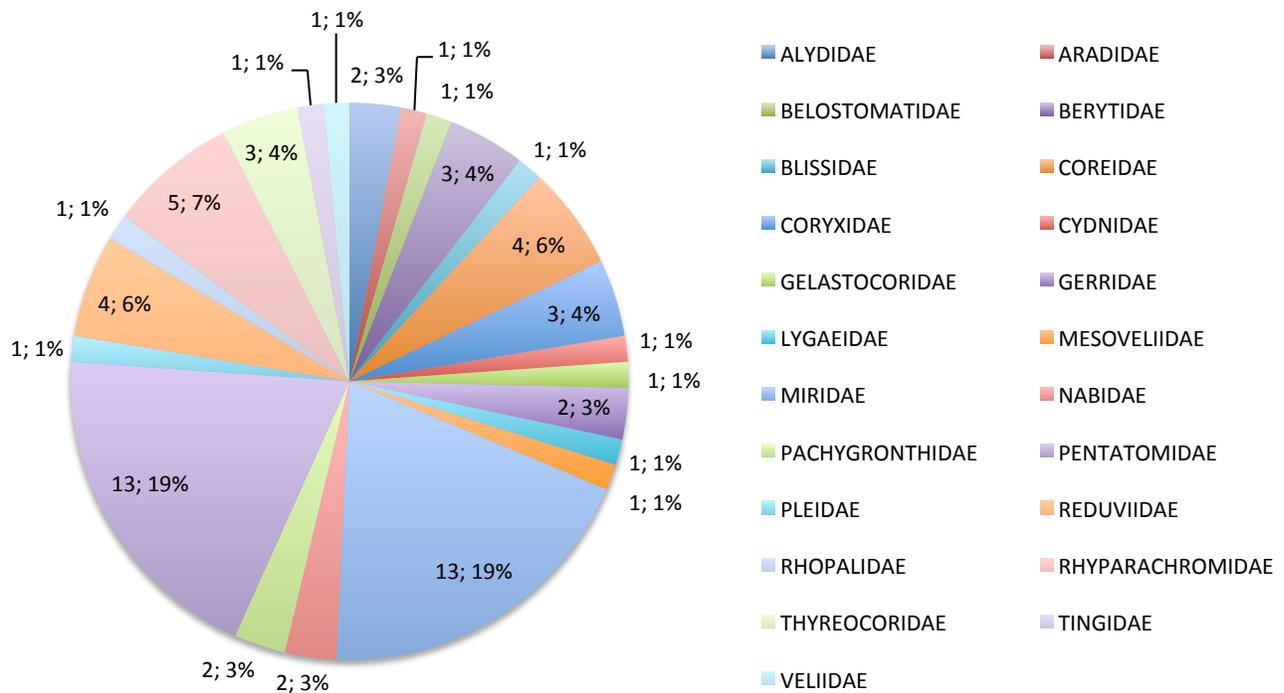


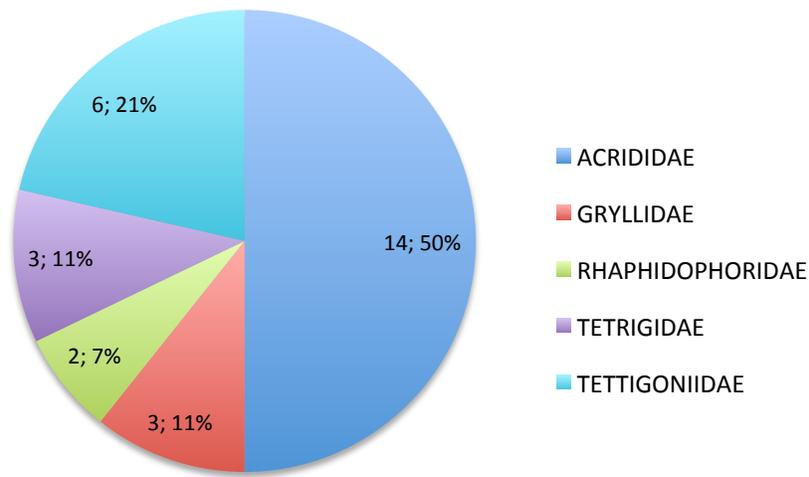
Figure 5. Map of Mill Creek Natural Area.



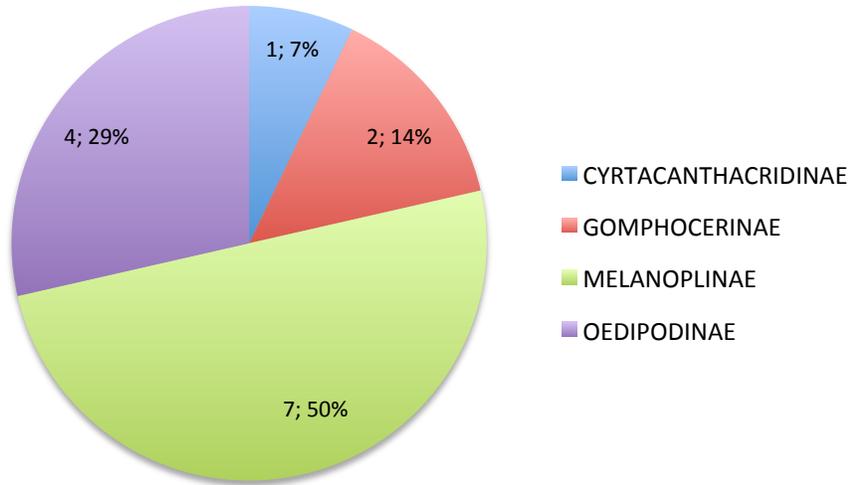
**Figure 6.** Photographs of scientists working in representative habitats at each site: (A) Fogelpole Cave Nature Preserve; (B) Kidd Lake Marsh State Natural Area; (C) White Rock Nature Preserve; and (D) Mill Creek Natural Area. Photographs copyright Steven J. Taylor.



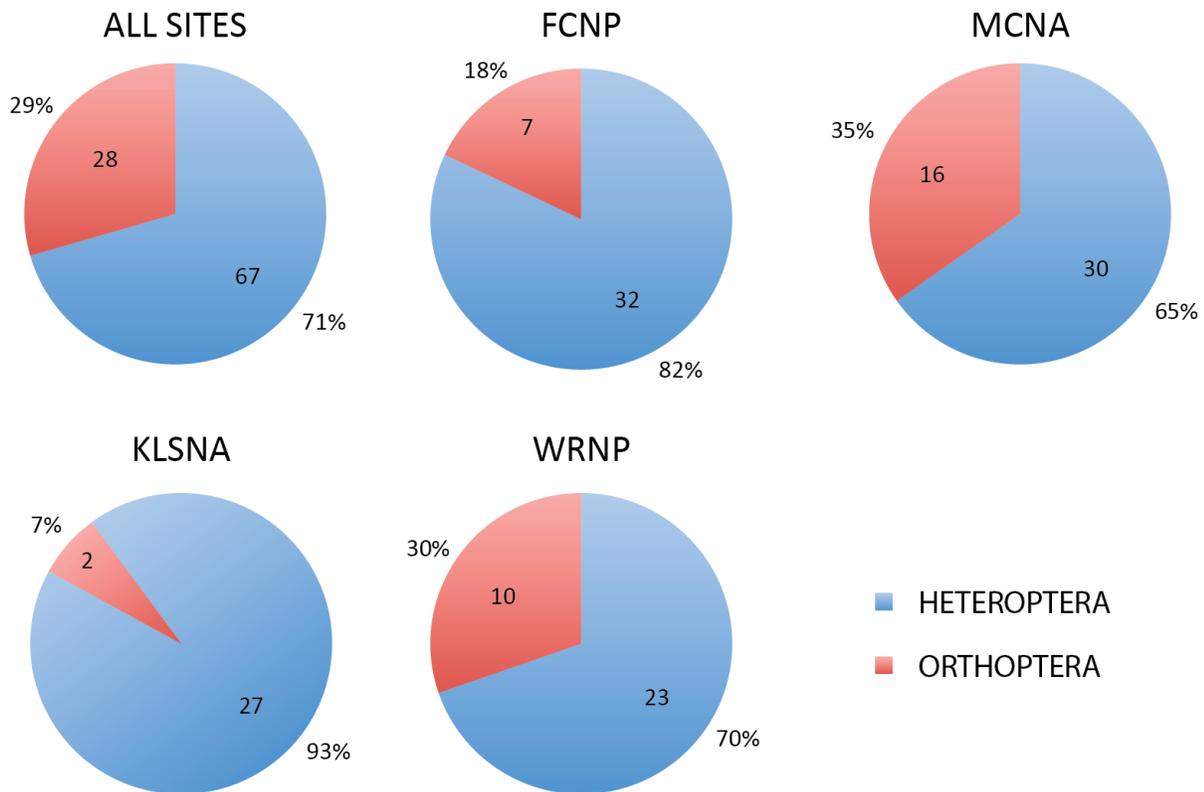
**Figure 7.** Heteropteran families recorded during this study (all sites) and their relative diversity. Values indicate the number of species in each family and percentage of the total. For details, see Appendix I.



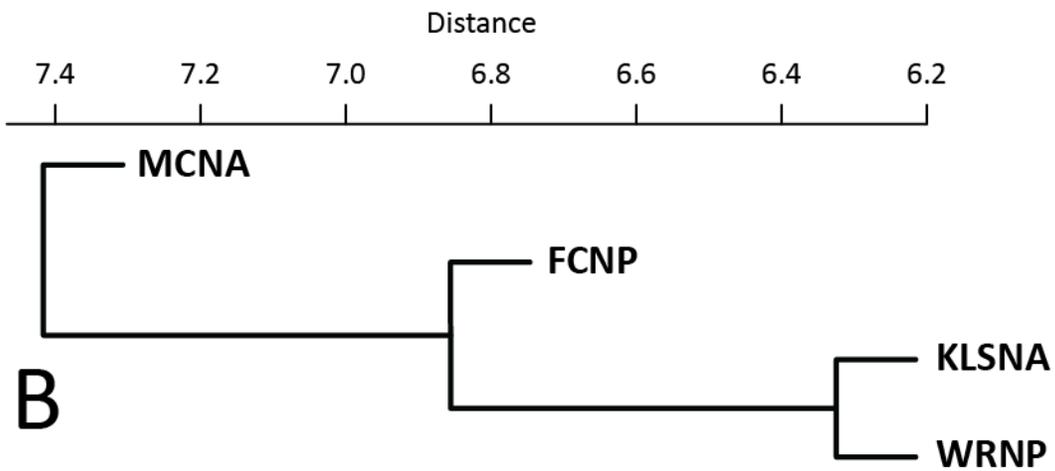
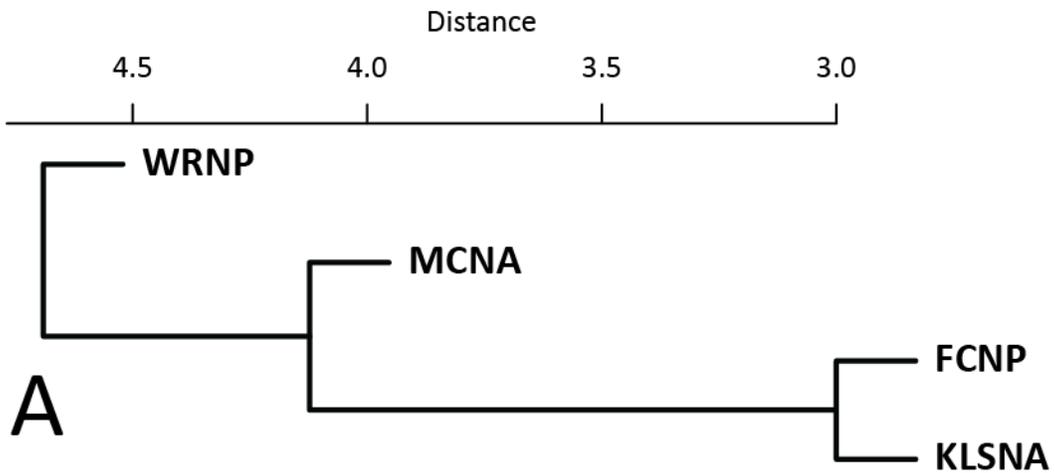
**Figure 8.** Orthopteran families recorded during this study (all sites) and their relative diversity. Values indicate the number of species in each family and percentage of the total. For details, see Appendix I.



**Figure 9.** Grasshopper (Acrididae) subfamilies recorded during this study (all sites) and their relative diversity. Values indicate the number of species in each subfamily and percentage of the total. For details, see Appendix I.



**Figure 10.** Comparison of Heteroptera and Orthoptera diversity across all sites and at each individual site (site abbreviations as in text and Appendix I. Values inside pie charts indicate number of species.



**Figure 11.** Cluster analysis of species presence/absence at each of the four sites, using complete linkage analysis: (A) Orthoptera; and (B) Heteroptera.

## Appendix I: Total species list (all sites)

The following list includes all Heteroptera and Orthoptera encountered during this study listed alphabetically by order, family and subfamily. Presence at each of the sampled areas is indicated in square brackets following the species name using the following codes: FCNP, Fogelpole Cave Nature Preserve; KLSNA, Kidd Lake State Natural Area; MCNA, Mill Creek Natural Area; WRNP, White Rock Nature Preserve.

### HETEROPTERA (67 species)

Family ALYDIDAE	
<i>Alydus eurinus</i> (Say, 1825)	[FCNP]
<i>Alydus pilosulus</i> Herrich-Schaeffer, 1847	[FCNP]
Family ARADIDAE	
<i>Mezira granulata</i> (Say, 1831)	[MCNA]
Family BELOSTOMATIDAE	
<i>Belostoma lutarium</i> (Stål, 1855)	[KLSNA]
Family BERYTIDAE	
<i>Jalysus spinosus</i> (Say, 1824)	[FCNP, WRNP]
<i>Jalysus wickhami</i> Van Duzee, 1906	[FCNP, KLSNA, MCNA, WRNP]
<i>Metacanthus multispinus</i> (Ashmead, 1887)	[FCNP] <b>NEW STATE RECORD</b>
Family BLISSIDAE	
<i>Blissus leucopterus</i> Say, 1831	[MCNA]
Family COREIDAE	
<i>Acanthocephala terminalis</i> (Dallas, 1852)	[FCNP, KLSNA, MCNA, WRNP]
<i>Anasa repetita</i> Heidemann, 1905	[KLSNA]
<i>Chelinidea vittiger</i> Uhler, 1863	[WRNP]
<i>Euthochtha galeator</i> (Fabricius, 1803)	[FCNP, WRNP]
Family CORIXIDAE	
<i>Hesperocorixa lucida</i> (Abbott, 1916)	[KLSNA]
<i>Hesperocorixa vulgaris</i> (Hungerford, 1925)	[FCNP, KLSNA]
<i>Trichocorixa</i> sp.	[KLSNA, MCNA]
Family CYDNIDAE	
<i>Sehirus cinctus</i> (Palisot de Beauvois, 1811)	[KLSNA, WRNP]
Family GELASTOCORIDAE	
<i>Gelastocoris oculatus</i> (Fabricius, 1789)	[MCNA]
Family GERRIDAE	
<i>Aquarius remigis</i> (Say, 1831)	[MCNA]
<i>Limnopus canaliculatus</i> (Say, 1831)	[MCNA]
Family LYGAEIDAE	
<i>Neortholomus scolopax</i> (Say, 1831)	[FCNP]
Family MESOVELIIDAE	
<i>Mesovelia mulsanti</i> White, 1879	[KLSNA]
Family MIRIDAE	
<i>Amblytylus nasutus</i> (Kirschbaum, 1856)	[FCNP]
<i>Ceratocapsus</i> sp.	[KLSNA]
<i>Deraeocoris histrio</i> (Reuter, 1876)	[KLSNA]
<i>Halticus bracteatus</i> (Say, 1831)	[MCNA]
<i>Keltonia</i> sp.	[FCNP]
<i>Leptopterna dolabrata</i> (Linnaeus, 1758)	[FCNP]
<i>Lygus lineolaris</i> (Palisot de Beauvois, 1818)	[FCNP, KLSNA, MCNA, WRNP]
<i>Megaloceroea recticornis</i> (Geoffrey, 1785)	[KLSNA, MCNA, WRNP]

<i>Neurocolpus nubilus</i> (Say, 1831)	[KLSNA]
<i>Plagiognathus</i> sp.	[FCNP]
<i>Reuteroscopus ornatus</i> (Reuter, 1876)	[MCNA]
<i>Slaterocoris</i> sp.	[FCNP]
<i>Stenodema trispinosum</i> Reuter, 1904)	[MCNA]
Family NABIDAE	
<i>Hoplistoscelis pallescens</i> (Reuter, 1872)	[MCNA]
<i>Nabis roseipennis</i> Reuter, 1872	[MCNA, WRNP]
Family PACHYGRONTHIDAE	
<i>Oedancala dorsalis</i> (Say, 1831)	[KLSNA, WRNP]
<i>Phlegyas abbreviatus</i> (Uhler, 1876)	[FCNP]
Family PENTATOMIDAE	
<i>Banasa dimiata</i> (Say, 1831)	[FCNP, KLSNA, MCNA, WRNP]
<i>Brochymena</i> sp.	[KLSNA]
<i>Chinavia hilaris</i> (Say, 1831)	[FCNP, KLSNA, MCNA, WRNP]
<i>Cosmopepla lintneriana</i> Kirkaldy, 1909	[FCNP, KLSNA]
<i>Dendrocoris humeralis</i> (Uhler, 1877)	[WRNP]
<i>Euschistus servus</i> (Say, 1831)	[FCNP, KLSNA, MCNA, WRNP]
<i>Euschistus tristigmus</i> (Say, 1831)	[KLSNA, MCNA, WRNP]
<i>Euschistus variolarius</i> (Palisot de Beauvois, 1817)	[FCNP, MCNA]
<i>Mormidea lugens</i> (Fabricius, 1775)	[FCNP, MCNA]
<i>Oebalus pugnax</i> (Fabricius, 1775)	[MCNA, WRNP]
<i>Podisus maculiventris</i> (Say, 1831)	[MCNA]
<i>Stiretrus anchorago</i> (Fabricius, 1775)	[WRNP]
<i>Thyanta calceata</i> (Say, 1831)	[FCNP, WRNP]
Family PLEIDAE	
<i>Neoplea striola</i> (Fieber, 1844)	[KLSNA]
Family REDUVIIDAE	
<i>Melanolestes picipes</i> (Herrich-Schaeffer, 1846)	[MCNA]
<i>Phymata fasciata</i> (Gray, 1832)	[FCNP, KLSNA, WRNP] <b>NEW STATE RECORD</b>
<i>Sinea diadema</i> (Fabricius, 1776)	[FCNP, KLSNA, MCNA]
<i>Zelus luridus</i> Stål, 1862	[FCNP, MCNA, WRNP]
Family RHOPALIDAE	
<i>Arhyssus nigristernum</i> (Signoret, 1859)	[FCNP]
Family RHYPAROCHROMIDAE	
<i>Heraeus plebejus</i> Stål, 1874	[KLSNA]
<i>Myodocha serripes</i> Olivier, 1811	[KLSNA, MCNA]
<i>Neopamera bilobata</i> (Say, 1831)	[FCNP, WRNP]
<i>Ozophora picturata</i> Uhler, 1871	[WRNP]
<i>Pseudopachybrachius basalis</i> (Dallas, 1852)	[FCNP, MCNA]
Family THYREOCORIDAE	
<i>Corimelaena lateralis</i> (Fabricius, 1803)	[FCNP]
<i>Corimelaena obscura</i> McPherson & Sailer, 1978	[WRNP]
<i>Corimelaena pulicaria</i> (Germar, 1839)	[FCNP, KLSNA]
Family TINGIDAE	
<i>Corythucha</i> sp.	[FCNP, MCNA]
Family VELIIDAE	
<i>Microvelia americana</i> (Uhler, 1884)	[MCNA]

**ORTHOPTERA** (28 species)

## Family ACRIDIDAE

## Subfamily CYRTACANTHACRIDINAE

*Schistocerca alutacea* (Harris, 1841) [WRNP]

## Subfamily GOMPHOCERINAE

*Dichromorpha viridis* (Scudder, 1862) [MCNA]

*Syrbula admirabilis* (Uhler, 1864) [FCNP, MCNA]

## Subfamily MELANOPLINAE

*Dendrotettix quercus* Packard, 1890 [MCNA]

*Melanoplus borealis* (Fieber, 1853) [WRNP]

*Melanoplus differentialis* (Thomas, 1865) [FCNP]

*Melanoplus fasciatus* (Walker, 1870) [WRNP]

*Melanoplus femurrubrum* (De Geer, 1773) [MCNA]

*Melanoplus sanguinipes* (Fabricius, 1798) [FCNP]

*Melanoplus viridipes* Blatchley, 1903 [WRNP]

## Subfamily OEDIPODINAE

*Arphia sulphurea* (Fabricius, 1781) [FCNP, MCNA]

*Arphia xanthoptera* (Burmeister, 1838) [MCNA]

*Chortophaga viridifasciata* (De Geer, 1773) [FCNP, MCNA]

*Dissosteira carolina* (Linnaeus, 1758) [FCNP]

## Family GRYLLIDAE

## Subfamily OECANTHINAE

*Oecanthus quadripunctatus* Beutenmüller, 1894 [FCNP]

## Subfamily TRIGONIDIINAE

*Anaxipha exigua* (Say, 1825) [MCNA]

*Falcicula hebari* Rehn, 1903 [MCNA]

## Family RHAPHIDOPHORIDAE

## Subfamily CEUTHOPHILINAE

*Ceuthophilus seclusus* Scudder, 1894 [WRNP]

*Ceuthophilus elegans* Hubbell, 1934 [KLSNA, MCNA]

## Family TETRIGIDAE

## Subfamily BATRACHIDEINAE

*Tettigidea lateralis* (Say, 1824) [MCNA, WRNP]

## Subfamily TETRIGINAE

*Nomotettix parvus* Morse, 1895 [MCNA, WRNP]

*Tetrix subulata* (Linnaeus, 1758) [WRNP]

## Family TETTIGONIIDAE

## Subfamily CONOCEPHALINAE

*Conocephalus fasciatus* (De Geer, 1773) [WRNP]

*Neoconocephalus nebrascensis* (Bruner, 1891) [MCNA]

## Subfamily PHANEROPTERINAE

*Amblycorypha oblongifolia* (De Geer, 1773) [KLSNA, MCNA,

*Scudderia furcata* Brunner von Wattenwyl, 1878 [WRNP]

## Subfamily PSEUDOPHYLLINAE

*Pterophylla camellifolia* (Fabricius, 1775) [MCNA]

## Subfamily TETTIGONIINAE

*Atlanticus monticola* Davis, 1915 [MCNA]

## Appendix II: Species lists by site

### Fogelpole Cave Nature Preserve (FCNP), Monroe County

#### **HETEROPTERA (32 species)**

##### Family ALYDIDAE

- Alydus eurinus* (Say, 1825)
- Alydus pilosulus* Herrich-Schaeffer, 1847

##### Family BERYTIDAE

- Jalysus spinosus* (Say, 1824)
- Jalysus wickhami* Van Duzee, 1906
- Metacanthus multispinus* (Ashmead, 1887)

##### Family COREIDAE

- Acanthocephala terminalis* (Dallas, 1852)
- Euthochtha galeator* (Fabricius, 1803)

##### Family CORIXIDAE

- Hesperocorixa vulgaris* (Hungerford, 1925)

##### Family LYGAEIDAE

- Neortholomus scolopax* (Say, 1831)

##### Family MIRIDAE

- Amblytylus nasutus* (Kirschbaum, 1856)
- Keltonia* sp.
- Leptopterna dolabrata* (Linneaus, 1758)
- Lygus lineolaris* (Palisot de Beauvois, 1818)
- Plagiognathus* sp.
- Slaterocoris* sp.

##### Family PACHYGRONTHIDAE

- Phlegyas abbreviatus* (Uhler, 1876)

##### Family PENTATOMIDAE

- Banasa dimiata* (Say, 1831)
- Chinavia hilaris* (Say, 1831)
- Cosmopepla lintneriana* Kirkaldy, 1909
- Euschistus servus* (Say, 1831)
- Euschistus variolarius* (Palisot de Beauvois, 1817)
- Mormidea lugens* (Fabricius, 1775)
- Thyanta calceata* (Say, 1831)

##### Family REDUVIIDAE

- Phymata fasciata* (Gray, 1832)
- Sinea diadema* (Fabricius, 1776)
- Zelus luridus* Stål, 1862

##### Family RHOPALIDAE

- Arhyssus nigristernum* (Signoret, 1859)

##### Family RHYPAROCHROMIDAE

- Neopamera bilobata* (Say, 1831)
- Pseudopachybrachius basalis* (Dallas, 1852)

##### Family THYREOCORIDAE

- Corimelaena lateralis* (Fabricius, 1803)
- Corimelaena pulicaria* (Germar, 1839)

##### Family TINGIDAE

- Corythucha* sp.

**ORTHOPTERA** (7 species)

Family ACRIDIDAE

Subfamily GOMPHOCERINAE

*Syrbula admirabilis* (Uhler, 1864)

Subfamily MELANOPLINAE

*Melanoplus differentialis* (Thomas, 1865)

*Melanoplus sanguinipes* (Fabricius, 1798)

Subfamily OEDIPODINAE

*Arphia sulphurea* (Fabricius, 1781)

*Chortophaga viridifasciata* (De Geer, 1773)

*Dissosteira carolina* (Linnaeus, 1758)

Family GRYLLIDAE

Subfamily OECANTHINAE

*Oecanthus quadripunctatus* Beutenmüller, 1894

Kidd Lake State Natural Area (KLSNA), Monroe County

**HETEROPTERA** (27 species)

Family BELOSTOMATIDAE

*Belostoma lutarium* (Stål, 1855)

Family BERYTIDAE

*Jalysus wickhami* Van Duzee, 1906

Family COREIDAE

*Acanthocephala terminalis* (Dallas, 1852)

*Anasa repetita* Heidemann, 1905

Family CORIXIDAE

*Hesperocorixa lucida* (Abbott, 1916)

*Hesperocorixa vulgaris* (Hungerford, 1925)

*Trichocorixa* sp.

Family CYDNIDAE

*Sehirus cinctus* (Palisot de Beauvois, 1811)

Family MESOVELIIDAE

*Mesovelia mulsanti* White, 1879

Family MIRIDAE

*Ceratocapsus* sp.

*Deraeocoris histrio* (Reuter, 1876)

*Lygus lineolaris* (Palisot de Beauvois, 1818)

*Megaloceroea recticornis* (Geoffrey, 1785)

*Neurocolpus nubilus* (Say, 1831)

Family PACHYGRONTHIDAE

*Oedancala dorsalis* (Say, 1831)

Family PENTATOMIDAE

*Banasa dimiata* (Say, 1831)

*Brochymena* sp.

*Chinavia hilaris* (Say, 1831)

*Cosmopepla lintneriana* Kirkaldy, 1909

*Euschistus servus* (Say, 1831)

*Euschistus tristigmus* (Say, 1831)

Family PLEIDAE

*Neoplea striola* (Fieber, 1844)

Family REDUVIIDAE

*Phymata fasciata* (Gray, 1832)

*Sinea diadema* (Fabricius, 1776)

Family RHYPAROCHROMIDAE

*Heraeus plebejus* Stål, 1874

*Myodocha serripes* Olivier, 1811

Family THYREOCORIDAE

*Corimelaena pulicaria* (Germar, 1839)

**ORTHOPTERA** (2 species)

Family RHAPHIDOPHORIDAE

Subfamily CEUTHOPHILINAE

*Ceuthophilus elegans* Hubbell, 1934

Family TETTIGONIIDAE

*Amblycorypha oblongifolia* (De Geer, 1773)

Mill Creek Natural Area (MCNA), Randolph County

**HETEROPTERA** (30 species)

Family ARADIDAE

*Mezira granulata* (Say, 1831)

Family BERYTIDAE

*Jalysus wickhami* Van Duzee, 1906

Family BLISSIDAE

*Blissus leucopterus* Say, 1831

Family COREIDAE

*Acanthocephala terminalis* (Dallas, 1852)

Family CORIXIDAE

*Trichocorixa* sp.

Family GELASTOCORIDAE

*Gelastocoris oculus* (Fabricius, 1789)

Family GERRIDAE

*Aquarius remigis* (Say, 1831)

*Limnopus canaliculatus* (Say, 1831)

Family MIRIDAE

*Halticus bracteatus* (Say, 1831)

*Lygus lineolaris* (Palisot de Beauvois, 1818)

*Megaloceroea recticornis* (Geoffrey, 1785)

*Reuteroscopus ornatus* (Reuter, 1876)

*Stenodema trispinosum* Reuter, 1904

Family NABIDAE

*Hoplistoscelis pallescens* (Reuter, 1872)

*Nabis roseipennis* Reuter, 1872

Family PENTATOMIDAE

*Banasa dimiata* (Say, 1831)

*Chinavia hilaris* (Say, 1831)

*Euschistus servus* (Say, 1831)

*Euschistus tristigmus* (Say, 1831)

*Euschistus variolarius* (Palisot de Beauvois, 1817)

*Mormidea lugens* (Fabricius, 1775)

*Oebalus pugnax* (Fabricius, 1775)

*Podisus maculiventris* (Say, 1831)

Family REDUVIIDAE

*Melanolestes picipes* (Herrich-Schaeffer, 1846)

*Sinea diadema* (Fabricius, 1776)

*Zelus luridus* Stål, 1862

Family RHYPAROCHROMIDAE

*Myodocha serripes* Olivier, 1811

*Pseudopachybrachius basalis* (Dallas, 1852)

Family TINGIDAE

*Corythucha* sp.

Family VELIIDAE

*Microvelia americana* (Uhler, 1884)

**ORTHOPTERA** (16 species)

Family ACRIDIDAE

Subfamily GOMPHOCERINAE

*Dichromorpha viridis* (Scudder, 1862)

*Syrbula admirabilis* (Uhler, 1864)

Subfamily MELANOPLINAE

*Dendrotettix quercus* Packard, 1890

*Melanoplus femurrubrum* (De Geer, 1773)

Subfamily OEDIPODINAE

*Arphia sulphurea* (Fabricius, 1781)

*Arphia xanthoptera* (Burmeister, 1838)

*Chortophaga viridifasciata* (De Geer, 1773)

Family GRYLLIDAE

Subfamily TRIGONIDIINAE

*Anaxipha exigua* (Say, 1825)

*Falcicula hebardei* Rehn, 1903

Family RHAPHIDOPHORIDAE

Subfamily CEUTHOPHILINAE

*Ceuthophilus elegans* Hubbell, 1934

Family TETRIGIDAE

Subfamily BATRACHIDEINAE

*Tettigidea lateralis* (Say, 1824)

Subfamily TETRIGINAE

*Nomotettix parvus* Morse, 1895

Family TETTIGONIIDAE

Subfamily CONOCEPHALINAE

*Neoconocephalus nebrascensis* (Bruner, 1891)

Subfamily PHANEROPTERINAE

*Amblycorypha oblongifolia* (De Geer, 1773)

Subfamily PSEUDOPHYLLINAE

*Pterophylla camellifolia* (Fabricius, 1775)

Subfamily TETTIGONIINAE

*Atlanticus monticola* Davis, 1915

White Rock Nature Preserve (WRNP), Monroe County

**HETEROPTERA** (23 species)

Family BERYTIDAE

*Jalysus spinosus* (Say, 1824)

*Jalysus wickhami* Van Duzee, 1906

Family COREIDAE

*Acanthocephala terminalis* (Dallas, 1852)

*Chelinidea vittiger* Uhler, 1863

*Euthochtha galeator* (Fabricius, 1803)

Family CYDNIDAE

*Sehirus cinctus* (Palisot de Beauvois, 1811)

Family MIRIDAE

*Lygus lineolaris* (Palisot de Beauvois, 1818)

*Megaloceroea recticornis* (Geoffrey, 1785)

Family NABIDAE

*Nabis roseipennis* Reuter, 1872

Family PACHYGRONTHIDAE

*Oedancala dorsalis* (Say, 1831)

Family PENTATOMIDAE

*Banasa dimiata* (Say, 1831)

*Chinavia hilaris* (Say, 1831)

*Dendrocoris humeralis* (Uhler, 1877)

*Euschistus servus* (Say, 1831)

*Euschistus tristigmus* (Say, 1831)

*Oebalus pugnax* (Fabricius, 1775)

*Stiretrus anchorago* (Fabricius, 1775)

*Thyanta calceata* (Say, 1831)

Family REDUVIIDAE

*Phymata fasciata* (Gray, 1832)

*Zelus luridus* Stål, 1862

Family RHYPAROCHROMIDAE

*Neopamera bilobata* (Say, 1831)

*Ozophora picturata* Uhler, 1871

Family THYREOCORIDAE

*Corimelaena obscura* McPherson & Sailer, 1978

**ORTHOPTERA** (10 species)

Family ACRIDIDAE

Subfamily CYRTACANTHACRIDINAE

*Schistocerca alutacea* (Harris, 1841)

Subfamily MELANOPLINAE

*Melanoplus borealis* (Fieber, 1853)

*Melanoplus fasciatus* (Walker, 1870)

*Melanoplus viridipes* Blatchley, 1903

Family RHAPHIDOPHORIDAE

Subfamily CEUTHOPHILINAE

*Ceuthophilus seclusus* Scudder, 1894

Family TETRIGIDAE

Subfamily BATRACHIDEINAE

*Tettigidea lateralis* (Say, 1824)

Subfamily TETRIGINAE

*Nomotettix parvus* Morse, 1895

*Tetrix subulata* (Linnaeus, 1758)

Family TETTIGONIIDAE

Subfamily CONOCEPHALINAE

*Conocephalus fasciatus* (De Geer, 1773)

Subfamily PHANEROPTERINAE

*Scudderia furcata* Brunner von Wattenwyl, 1878

### Appendix III: Common names

#### HETEROPTERA

Family ALYDIDAE	
<i>Alydus eurinus</i> (Say, 1825)	broad-headed bug
<i>Alydus pilosulus</i> Herrich-Schaeffer, 1847	broad-headed bug
Family ARADIDAE	
<i>Mezira granulata</i> (Say, 1831)	flat bug
Family BELOSTOMATIDAE	
<i>Belostoma lutarium</i> (Stål, 1855)	predaceous water bug
Family BERYTIDAE	
<i>Jalysus spinosus</i> (Say, 1824)	spined stilt bug
<i>Jalysus wickhami</i> Van Duzee, 1906	spined stilt bug
<i>Metacanthus multispinus</i> (Ashmead, 1887)	stilt bug
Family BLISSIDAE	
<i>Blissus leucopterus</i> Say, 1831	chinch bug
Family COREIDAE	
<i>Acanthocephala terminalis</i> (Dallas, 1852)	spine-headed leaf-footed bug
<i>Anasa repetita</i> Heidemann, 1905	squash bug
<i>Chelinidea vittiger</i> Uhler, 1863	Opuntia bug
<i>Euthochtha galeator</i> (Fabricius, 1803)	helmeted squash bug
Family CORIXIDAE	
<i>Hesperocorixa lucida</i> (Abbott, 1916)	water boatman
<i>Hesperocorixa vulgaris</i> (Hungerford, 1925)	water boatman
<i>Trichocorixa</i> sp.	water boatman
Family CYDNIDAE	
<i>Sehirus cinctus</i> (Palisot de Beauvois, 1811)	burrower bug
Family GELASTOCORIDAE	
<i>Gelastocoris oculatus</i> (Fabricius, 1789)	big-eyed toad bug
Family GERRIDAE	
<i>Aquarius remigis</i> (Say, 1831)	water strider
<i>Limnopus canaliculatus</i> (Say, 1831)	water strider
Family LYGAEIDAE	
<i>Neortholomus scolopax</i> (Say, 1831)	seed bug
Family MESOVELIIDAE	
<i>Mesovelia mulsanti</i> White, 1879	water treader
Family MIRIDAE	
<i>Amblytylus nasutus</i> (Kirschbaum, 1856)	plant bug
<i>Ceratocapsus</i> sp.	mirid
<i>Deraeocoris histrio</i> (Reuter, 1876)	mirid
<i>Halticus bracteatus</i> (Say, 1831)	flea hopper plant bug
<i>Keltonia</i> sp.	little green mirid
<i>Leptopterna dolabrata</i> (Linnaeus, 1758)	meadow plant bug
<i>Lygus lineolaris</i> (Palisot de Beauvois, 1818)	tarnished plant bug
<i>Megaloceroea recticornis</i> (Geoffrey, 1785)	green plant bug
<i>Neurocolpus nubilus</i> (Say, 1831)	clouded plant bug
<i>Plagiognathus</i> sp.	mirid
<i>Reuteroscopus ornatus</i> (Reuter, 1876)	ornate plant bug
<i>Slaterocoris</i> sp.	mirid
<i>Stenodema trispinosum</i> Reuter, 1904)	green plant bug

Family NABIDAE	
<i>Hoplistoscelis pallescens</i> (Reuter, 1872)	damsel bug
<i>Nabis roseipennis</i> Reuter, 1872	damsel bug
Family PACHYGRONTHIDAE	
<i>Oedancala dorsalis</i> (Say, 1831)	pachygronthid
<i>Phlegyas abbreviatus</i> (Uhler, 1876)	pachygronthid
Family PENTATOMIDAE	
<i>Banasa dimiata</i> (Say, 1831)	green stink bug
<i>Brochymena</i> sp.	stink bug
<i>Chinavia hilaris</i> (Say, 1831)	green stink bug
<i>Cosmopepla lintneriana</i> Kirkaldy, 1909	twice-stabbed stink bug
<i>Dendrocoris humeralis</i> (Uhler, 1877)	stink bug
<i>Euschistus servus</i> (Say, 1831)	brown stink bug
<i>Euschistus tristigmus</i> (Say, 1831)	dusky stink bug
<i>Euschistus variolarius</i> (Palisot de Beauvois, 1817)	one-spotted stink bug
<i>Mormidea lugens</i> (Fabricius, 1775)	stink bug
<i>Oebalus pugnax</i> (Fabricius, 1775)	spine-shouldered rice bug
<i>Podisus maculiventris</i> (Say, 1831)	spined soldier bug
<i>Stiretrus anchorago</i> (Fabricius, 1775)	predatory stink bug
<i>Thyanta calceata</i> (Say, 1831)	green stink bug
Family PLEIDAE	
<i>Neoplea striola</i> (Fieber, 1844)	pygmy backswimmer
Family REDUVIIDAE	
<i>Melanolestes picipes</i> (Herrich-Schaeffer, 1846)	black corsair
<i>Phymata fasciata</i> (Gray, 1832)	ambush bug
<i>Sinea diadema</i> (Fabricius, 1776)	spiny assassin bug
<i>Zelus luridus</i> Stål, 1862	assassin bug
Family RHOPALIDAE	
<i>Arhyssus nigristernum</i> (Signoret, 1859)	scentless plant bug
Family RHYPAROCHROMIDAE	
<i>Heraeus plebejus</i> Stål, 1874	dirt-colored seed bug
<i>Myodocha serripes</i> Olivier, 1811	dirt-colored seed bug
<i>Neopamera bilobata</i> (Say, 1831)	dirt-colored seed bug
<i>Ozophora picturata</i> Uhler, 1871	dirt-colored seed bug
<i>Pseudopachybrachius basalis</i> (Dallas, 1852)	dirt-colored seed bug
Family THYREOCORIDAE	
<i>Corimelaena lateralis</i> (Fabricius, 1803)	ebony bug
<i>Corimelaena obscura</i> McPherson & Sailer, 1978	ebony bug
<i>Corimelaena pulicaria</i> (Germar, 1839)	ebony bug
Family TINGIDAE	
<i>Corythucha</i> sp.	lace bug
Family VELIIDAE	
<i>Microvelia americana</i> (Uhler, 1884)	small water strider

## ORTHOPTERA

### Family ACRIDIDAE

#### Subfamily CYRTACANTHACRIDINAE

*Schistocerca alutacea* (Harris, 1841) leather-colored bird grasshopper

#### Subfamily GOMPHOCERINAE

*Dichromorpha viridis* (Scudder, 1862) short-winged grasshopper

*Syrbula admirabilis* (Uhler, 1864) admirable grasshopper

#### Subfamily MELANOPLINAE

*Dendrotettix quercus* Packard, 1890 post oak grasshopper

*Melanoplus borealis* (Fieber, 1853) northern spur-throat grasshopper

*Melanoplus differentialis* (Thomas, 1865) differential grasshopper

*Melanoplus fasciatus* (Walker, 1870) huckleberry grasshopper

*Melanoplus femurrubrum* (De Geer, 1773) red-legged grasshopper

*Melanoplus sanguinipes* (Fabricius, 1798) migratory grasshopper

*Melanoplus viridipes* Blatchley, 1903 green-legged spur-throat grasshopper

#### Subfamily OEDIPODINAE

*Arphia sulphurea* (Fabricius, 1781) sulphur-winged grasshopper

*Arphia xanthoptera* (Burmeister, 1838) autumn yellow-winged grasshopper

*Chortophaga viridifasciata* (De Geer, 1773) northern green-striped grasshopper

*Dissosteira carolina* (Linnaeus, 1758) carolina grasshopper

### Family GRYLLIDAE

#### Subfamily OECANTHINAE

*Oecanthus quadripunctatus* Beutenmüller, 1894 four-spotted tree cricket

#### Subfamily TRIGONIDIINAE

*Anaxipha exigua* (Say, 1825) Say's trig

*Falcicula hebardei* Rehn, 1903 Hebard's trig

### Family RHAPHIDOPHORIDAE

#### Subfamily CEUTHOPHILINAE

*Ceuthophilus seclusus* Scudder, 1894 secluded camel cricket

*Ceuthophilus elegans* Hubbell, 1934 elegant camel cricket

### Family TETRIGIDAE

#### Subfamily BATRACHIDEINAE

*Tettigidea lateralis* (Say, 1824) black-sided pygmy grasshopper

#### Subfamily TETRIGINAE

*Nomotettix parvus* Morse, 1895 low-ridged pygmy grasshopper

*Tetrix subulata* (Linnaeus, 1758) awl-shaped pygmy grasshopper

### Family TETTIGONIIDAE

#### Subfamily CONOCEPHALINAE

*Conocephalus fasciatus* (De Geer, 1773) slender meadow katydid

*Neoconocephalus nebrascensis* (Bruner, 1891) Nebraska conehead

#### Subfamily PHANEROPTERINAE

*Amblycorypha oblongifolia* (De Geer, 1773) oblong-winged katydid

*Scudderia furcata* Brunner von Wattenwyl, 1878 fork-tailed bush katydid

#### Subfamily PSEUDOPHYLLINAE

*Pterophylla camellifolia* (Fabricius, 1775) common true katydid

#### Subfamily TETTIGONIINAE

*Atlanticus monticola* Davis, 1915 least shieldback katydid

#### Appendix IV: Additional arthropod records

The following non-heteropteran and non-orthopteran arthropod species were also recorded during this study, being encountered during collection of the focal taxa. They are provided here as supplementary data in addition to the heteropteran and orthopteran lists. Presence at sites is indicated using codes as in Appendix I.

##### ACARI (mites and ticks)

###### Family IXODIDAE

<i>Amblyomma americanum</i> (Linnaeus, 1758)	[FCNP, MCNA]
<i>Amblyomma maculatum</i> Koch, 1844	[KLSNA]
<i>Dermacentor variabilis</i> (Say, 1821)	[FCNP]

##### ARANEAE (spiders)

###### Family ARANEIDAE

<i>Micrathena gracilis</i> (Walckenaer, 1842)	[MCNA]
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##### COLEOPTERA (beetles)

###### Family ATTELABIDAE

<i>Homoeolabus analis</i> (Illiger, 1791)	[FCNP]
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###### Family BOSTRICHIDAE

<i>Xylobiops basilaris</i> (Say, 1823)	[MCNA]
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###### Family BUPRESTIDAE

<i>Actenodes acornis</i> (Say, 1833)	[WRNP]
<i>Agrilus</i> sp.	[WRNP]
<i>Buprestis rufipes</i> Olivier, 1790	[MCNA]
<i>Pachyschelus laevigatus</i> (Say, 1839)	[FCNP]

###### Family CANTHARIDAE

<i>Tytthonyx erythrocephala</i> (Fabricius, 1801)	[FCNP]
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###### Family CARABIDAE

<i>Agonum decorum</i> (Say, 1823)	[MCNA]
<i>Agonum extensicolle</i> (Say, 1823)	[MCNA]
<i>Bembidion</i> sp.	[MCNA]
<i>Calosoma sayi</i> Dejean, 1826	[MCNA]
<i>Chlaenius tomentosus</i> (Say, 1823)	[MCNA]
<i>Cicindela unipunctata</i> Fabricius, 1775	[MCNA]
<i>Clivina</i> sp.	[WRNP]
<i>Dicaelus purpuratus</i> Bonelli, 1813	[WRNP]
<i>Omophron americanum</i> Dejean, 1831	[MCNA]
<i>Pterostichus permundus</i> (Say, 1830)	[MCNA]
<i>Stenolophus ochropezus</i> (Say, 1823)	[MCNA]
<i>Tachys oblitus</i> Casey, 1918	[MCNA]

###### Family CERAMBYCIDAE

<i>Distenia undata</i> (Fabricius, 1775)	[MCNA]
<i>Elaphidion mucronatum</i> (Say, 1824)	[WRNP]
<i>Euderces picipes</i> (Fabricius, 1787)	[MCNA]

###### Family CHRYSOMELIDAE

<i>Anisostena nigrita</i> (Olivier, 1808)	[FCNP]
<i>Chrysochus auratus</i> (Fabricius, 1775)	[KLSNA]
<i>Cryptocephalus</i> sp.	[FCNP]
<i>Disonycha</i> sp.	[KLSNA]

<i>Griburius scutellaris</i> (Fabricius, 1801)	[FCNP]
<i>Octotoma plicatula</i> (Fabricius, 1801)	[WRNP]
<i>Zygogramma suturalis</i> (Fabricius, 1775)	[MCNA]
Family COCCINELLIDAE	
<i>Coleomegilla maculate</i> (DeGeer, 1775)	[KLSNA]
Family CUPEDIDAE	
<i>Tenomerga cinerea</i> (Say, 1831)	[WRNP]
Family CURCULIONIDAE	
<i>Acanthoscelidius</i> sp.	[KLSNA]
<i>Conotrachelus fissunguis</i> LeConte, 1876	[KLSNA]
<i>Cossonus</i> sp.	[WRNP]
<i>Curculio</i> sp.	[WRNP]
<i>Geraeus</i> sp.	[WRNP]
<i>Lixus</i> sp.	[KLSNA]
<i>Rhinoncus</i> sp.	[KLSNA]
<i>Rhodoabaenus quinquepunctatus</i> (Say, 1824)	[KLSNA, MCNA]
<i>Tanysphyrus lemnae</i> (Fabricius, 1792)	[KLSNA]
Family DRYOPIDAE	
<i>Helichus</i> sp.	[KLSNA, MCNA]
Family DYTISCIDAE	
<i>Coptotomus</i> sp.	[KLSNA, WRNP]
Family ELATERIDAE	
<i>Aeolus</i> sp.	[MCNA]
Family ELMIDAE	
<i>Stenelmis</i> sp.	[MCNA]
Family EROTYLIDAE	
<i>Megalodacne fasciata</i> (Fabricius, 1777)	[WRNP]
<i>Megalodacne heros</i> (Say, 1823)	[WRNP]
Family GYRINIDAE	
<i>Dineutus ciliates</i> Forsburg, 1821	[MCNA]
Family HALIPLIDAE	
<i>Peltodytes sexmaculatus</i> Robert, 1913	[KLSNA]
Family HETEROCERIDAE	
<i>Heterocerus</i> sp.	[FCNP, KLSNA, MCNA]
<i>Tropicus pusillus</i> (Say, 1823)	[KLSNA]
Family HYDROPHILIDAE	
<i>Hydrochara</i> sp.	[KLSNA, WRNP]
Family LUCANIDAE	
<i>Lucanus capreolus</i> (Linnaeus, 1763)	[MCNA]
<i>Platycerus virescens</i> (Fabricius, 1775)	[WRNP]
Family MELOIDAE	
<i>Epicauta vittata</i> (Fabricius, 1775)	[MCNA]
Family NITIDULIDAE	
<i>Cryptarcha ampla</i> Erichson, 1843	[MCNA]
Family PYROCHROIDAE	
<i>Dendroides canadensis</i> Latreille, 1810	[WRNP]
Family RHIPIPHORIDAE	
<i>Glipa oculata</i> (Say, 1835)	[WRNP]
Family SCARABAEIDAE	
<i>Aphodius</i> sp.	[MCNA]

<i>Ataenius</i> sp.	[MCNA, WRNP]
<i>Callistethus marginatus</i> (Fabricius, 1792)	[MCNA]
<i>Parastasia brevipes</i> (LeConte, 1856)	[WRNP]
<i>Phyllophaga</i> sp.	[WRNP]
<i>Popillia japonica</i> (Newman, 1841)	[FCNP, KLSNA, MCNA]
Family SILPHIDAE	
<i>Nicrophorus orbicollis</i> Say, 1825	[FCNP, KLSNA, WRNP]
<i>Nicrophorus pustulatus</i> Herschel, 1807	[FCNP, WRNP]
Family STAPHYLINIDAE	
<i>Homaeotarsus</i> sp.	[WRNP]
<i>Stenus</i> sp.	[MCNA]
Family TENEBRIONIDAE	
<i>Alobates pennsylvanica</i> (DeGeer, 1775)	[MCNA]
Family TETRATOMIDAE	
<i>Penthe pimelia</i> (Fabricius, 1801)	[WRNP]
<b>DERMAPTERA (earwigs)</b>	
Family FORFICULIDAE	
<i>Forficula auricularia</i> Linnaeus, 1758	[KLSNA]
<b>DIPTERA (flies)</b>	
Family ASILIDAE	
<i>Diogmites platypterus</i> Loew, 1866	[FCNP]
<i>Efferia</i> sp.	[FCNP]
<i>Megaphorus</i> sp.	[WRNP]
<i>Psilocurus</i> sp.	[MCNA]
Family OTITIDAE	
<i>Tetroxa flexa</i> (Wiedemann, 1830)	[MCNA]
Family TABANIDAE	
<i>Chrysops pikei</i> Whitney, 1904	[MCNA]
<i>Tabanus pallidescens</i> Philip, 1936	[MCNA]
<b>HEMIPTERA: AUCHENORRHYNCHA (non-heteropteran bugs)</b>	
Family CICADELLIDAE	
<i>Limotettix anthracinus</i> Van Duzee, 1894	[WRNP]
<i>Tinobregmus viridiscens</i> DeLong, 1916	[FCNP]
Family CICADIDAE	
<i>Cicadetta calliope</i> (Walker, 1850)	[FCNP]
<i>Tibicen</i> sp.	[WRNP]
<b>HYMENOPTERA (ants, bees and wasps)</b>	
Family FORMICIDAE	
<i>Camponotus</i> sp.	[MCNA]
Family MUTILLIDAE	
<i>Dasymutilla</i> sp.	[FCNP]
<b>MANTODEA (mantises)</b>	
Family MANTIDAE	
<i>Tenodera sinensis</i> (Saussure, 1871)	[WRNP]

**MECOPTERA (hanging flies and scorpion flies)**

Family BITTACIDAE

*Bittacus apicalis* Hagen, 1861 [WRNP]

*Bittacus strigosus* Hagen, 1861 [WRNP]

Family PANORPIDAE

*Panorpa Helena* Byers, 1962 [WRNP]

*Panorpa nebulosa* Westwood, 1846 [WRNP]

**NEUROPTERA (lacewings and antlions)**

Family ASCALAPHIDAE

*Ululodes quadripunctatus* (Burmeister, 1839) [WRNP]

Family CHRYSOPIDAE

*Chrysopa* sp. [KLSNA]

Family MANTISPIDAE

*Dicromantispa sayi* (Banks, 1897) [FCNP]

**TRICHOPTERA (caddis flies)**

Family HYDROPSYCHIDAE

*Potamyia flava* (Hagen, 1861) [KLSNA]