

**Baseline survey of grassland insect populations at Blackacre State Nature Preserve,  
Jefferson County Kentucky**

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**Background**

In 2005, The Kentucky State Nature Preserves Commission (KSNPC) began a series of prescribed burns and herbicide applications on fields and meadows at Blackacre State Nature Preserve in Jefferson County, Kentucky. Burning was performed to facilitate restoration of native glade habitat, which had been previously used as livestock pasture. A study of this restoration was conducted four years later (Almeida, et al. 2009). In 2006, herbicide was applied to several fields that had formerly been planted in clover and fescue for hay. These fields were reseeded with a mix of native tall grasses in order to restore prairie habitat. The predominant prairie grasses in the field were *Sorghastrum nutans* (Indiangrass), *Andropogon gerardii* (Big Bluestem), *Andropogon virginicus* (Broomsedge Bluestem) and *Panicum virgatum* (Switchgrass).

**Purpose**

Our purpose in this study was to conduct a baseline survey of flying insects in the restored tall grass prairie. Insects were chosen because not only are they indicators to how other wildlife are effected, but they also play a crucial role in pollination and diversity of plants. As pointed out by Campbell, (2006) “pollination by insects is an extremely important process that should be conserved.”

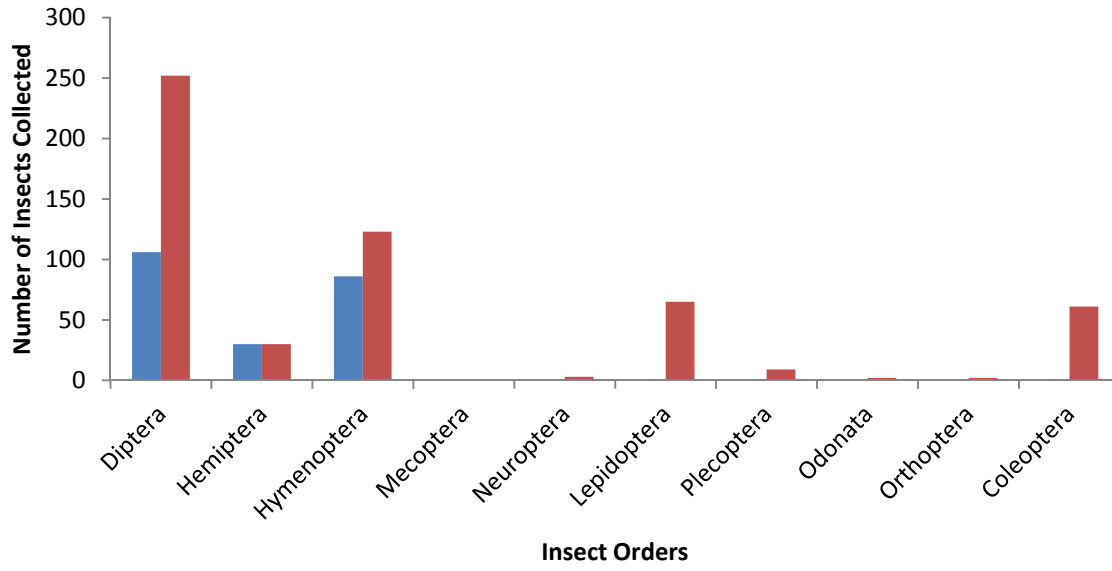
Our inventory can then be used in future studies to measure the effects of grassland re-growth and of habitat management on the insect population diversity, which in turn, acts as an overall indicator of habitat diversity. We were also interested in a comparison between the insect fauna of the grassland and the insect fauna as recorded from a 2009 study (Almeida, et. al 2009) of the glade habitat restoration.

## **Methods**

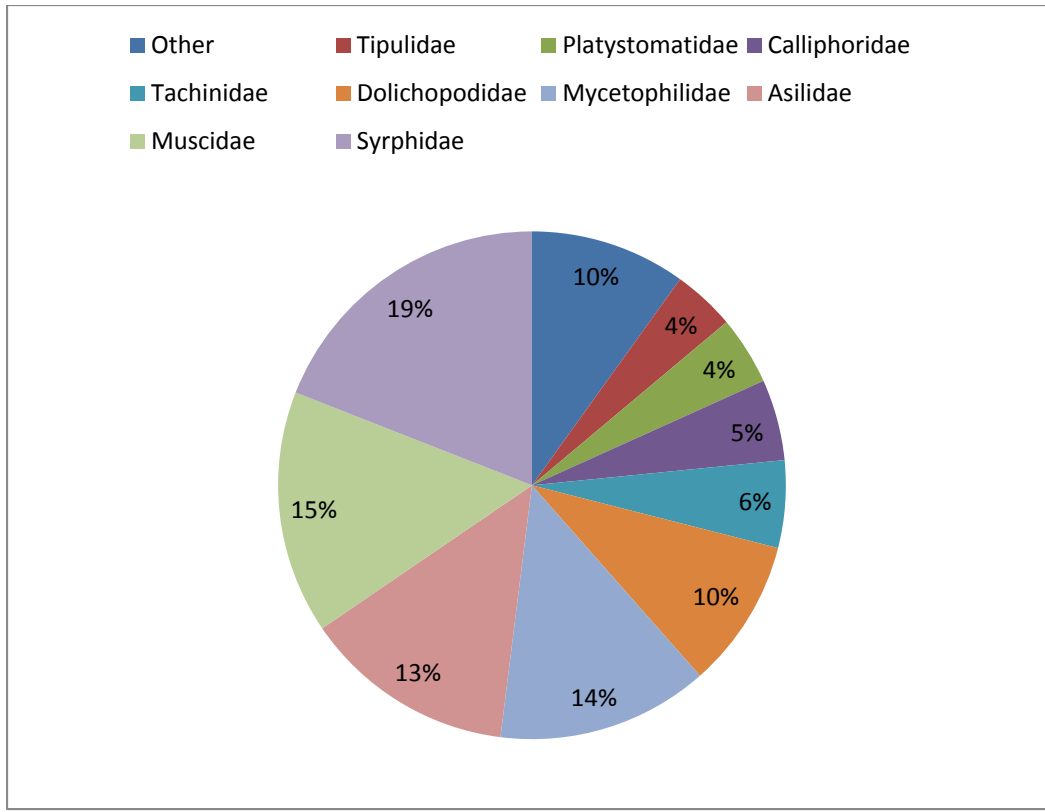
The Malaise trap was set out from June 3-10 and June 17-24, 2011. This was a good time in which to conduct the study, as many adult insects had emerged for breeding. Because of the substantial amount of material collected from the Malaise trap, we did not find it necessary to use sweep nets or pitfall traps as originally proposed. We were able to collect enough data to use for comparison in future baseline studies. Insects were then identified using stereomicroscopes and taxonomic keys (Arnett, 2000; Covell, 2005; Johnson and Triplehorn, 2004).

## **Results/Data**

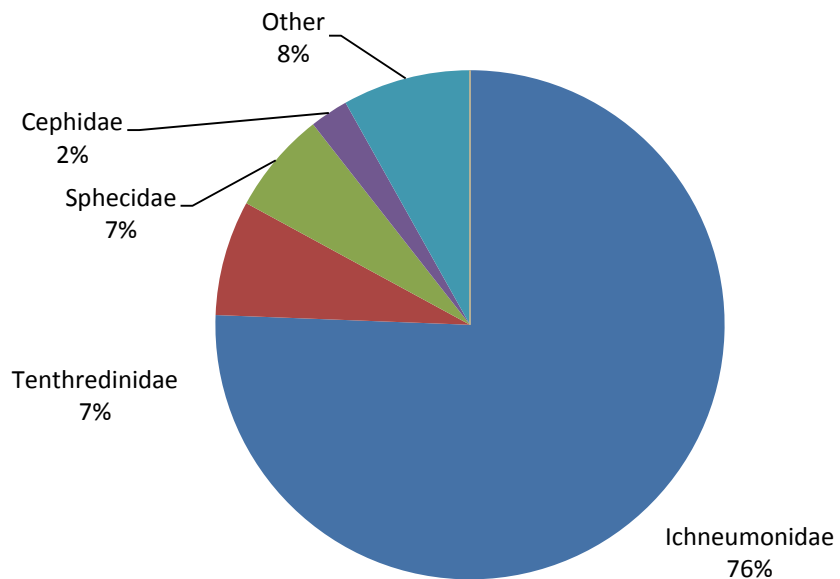
We collected a total of 548 insects of four mm or greater in size. These were distributed in 10 insect orders and 56 different families. Our results include a high number of the orders Diptera and Hymenoptera. Among these orders there are high numbers of Ichneumonidae, Syrphidae, Muscidae, Asilidae, and Mycetophilidae. There are also high proportions of Cicadellidae, Cantharidae, Lampyridae, Noctuidae, and Geometridae; as well as the presence of some unexpected aquatic insects such as the Plecoptera, which would be expected in a riparian area.



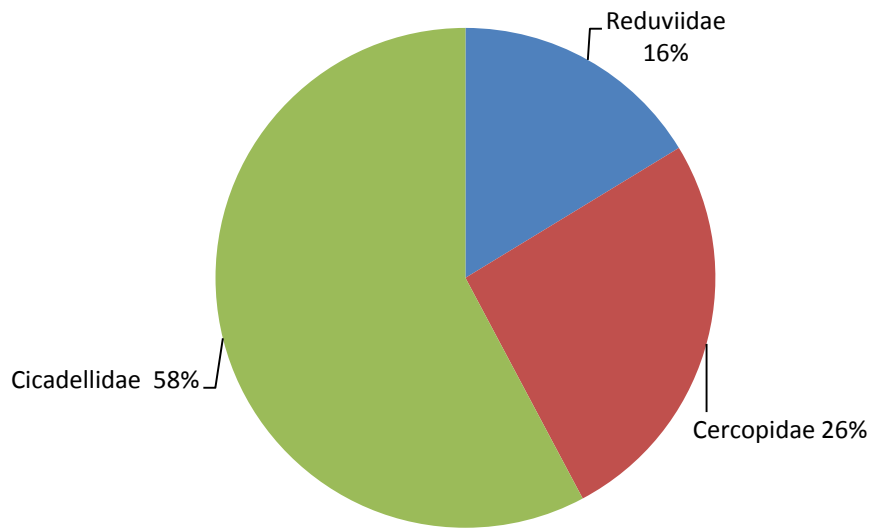
**Figure 1.** Comparison of insect orders collected in 2009 in the glade habitat and 2011 in the prairie habitat (respectively), at Blackacre State Nature Preserve, following restoration efforts.



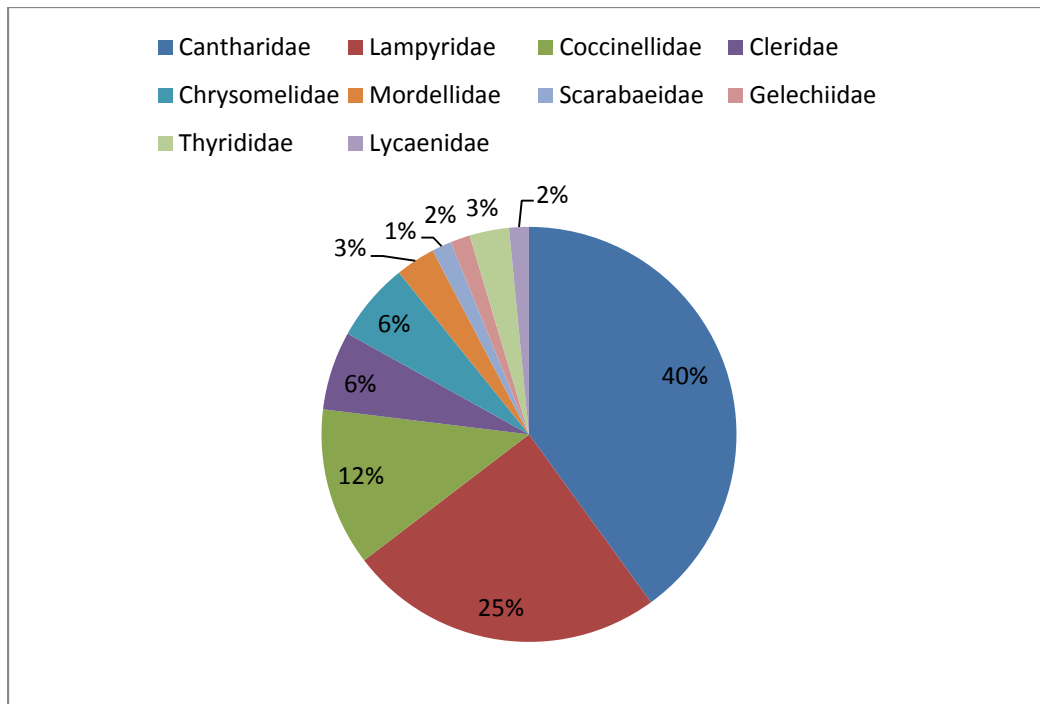
**Figure 2.** Distribution of Diptera in 2011 survey at Blackacre State Nature Preserve.



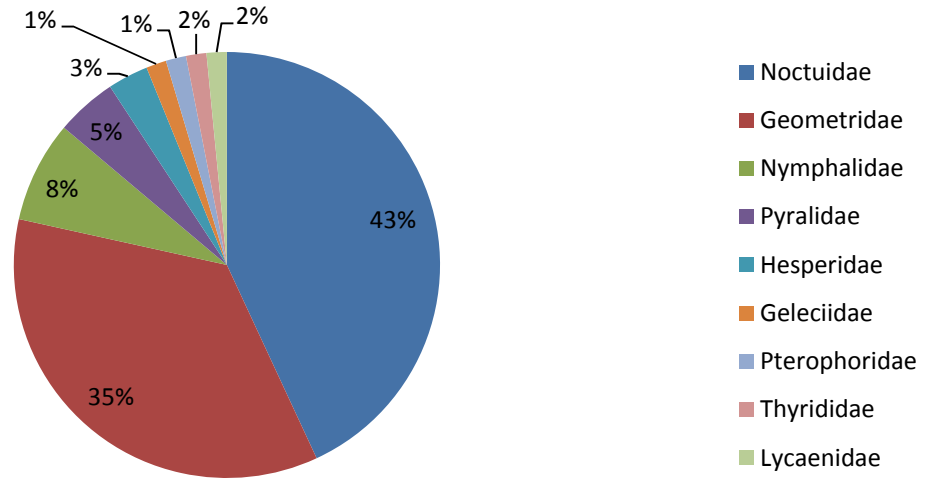
**Figure 3.** Distribution of Hymenoptera in 2011 survey at Blackacre State Nature Preserve.



**Figure 4.** Distribution of Hemiptera in 2011 survey at Blackacre State Nature Preserve.



**Figure 5.** Distribution of Coleoptera in 2011 survey at Blackacre State Nature Preserve.



**Figure 6.** Distribution of Lepidoptera in 2011 survey at Blackacre State Nature Preserve.

Order	Family	Amount
Odonata	Coenagrionidae	2
Orthoptera	Acrididae	2
Plecoptera	Peltoperlidae	9
Hemiptera	Cercopidae	3
	Cicadellidae	26
	Reduviidae	1
Neuroptera	Chrysopidae	1
	Hemerobiidae	2
Coleoptera	Lampyridae	16
	Scarabaeidae	1
	Cantharidae	26
	Cleridae	4

	Coccinellidae	8
	Chrysomelidae	4
	Mordellidae	2
Diptera	Mycetophilidae	34
	Tabanidae	2
	Asilidae	34
	Dolichopodidae	24
	Phoridae	5
	Syrphidae	48
	Calliphoridae	13
	Muscidae	39
	Tachinidae	14
	Tephritidae	2
	Ulidiidae	1
	Platystomatidae	11
	Sciomyzidae	1
	Tipulidae	10
	Cecidomyiidae	1
	Bombyliidae	3
	Rhagionidae	3
	Therevidae	2
	Pipunculidae	1
	Hippoboscidae	1
	Pygotidae	3
Hymenoptera	Braconidae	2

	Ichneumonidae	93
	Chalcididae	2
	Sphecidae	8
	Halictidae	2
	Apidae	2
	Tiphiidae	2
	Tenthredinidae	9
	Cephalidae	3
Mecoptera	Panorpidae	1
Lepidoptera	Geleciidae	1
	Pterophoridae	1
	Thyrididae	1
	Pyralidae	3
	Hesperidae	2
	Lycaenidae	1
	Nymphalidae	5
	Geometridae	23
	Noctuidae	28
<b>Total-10</b>	<b>56</b>	<b>548</b>

**Table 1.** Insect Orders and Families collected in 2011 baseline survey of grassland area at Blackacre State Nature Preserve.



## Discussion

In this study, we observed high numbers of individual leafhoppers, soldier beetles, fireflies, Ichneumon wasps.

Ichneumon wasps (Ichneumonidae): Ichneumon wasps are a large family. This family is distinctive because of their narrowed thorax and shortened ovipositor. We were able to collect and identify ninety-three of these insects in just a two week span. Wasps are important pollinators that favor leaf litter and woody plant material for habitat. Ichneumonidae are parasitoids that use other Hymenoptera and Diptera, among other insects, as their hosts (Gauld and Bolton, 1988). Therefore, it makes sense that their numbers increased with increase in host populations.

There were a few common Dipteran families we found in abundance- Syrphidae, Muscidae and Asilidae. Hover flies or flower flies (Syrphidae) can resemble bees or wasps but do not bite or sting. Adults occupy a wide variety of habitats and feed upon the nectar of flowers. Robberflies (Asilidae) can be distinguished from other large flies by the hollowed space between the eyes and their distinctive bearded appearance. These insects are sometimes referred to as 'bee killers' because they catch their prey in midair. Because the flies are predatory upon other insects, their numbers were quite abundant in the fields we surveyed. This may be why the soils of the fields and woodland during the summer months serve as their ideal environment.

Leafhoppers (Cicadellidae) are part of the family commonly known as 'true bugs' or Hemiptera. They are mostly plant feeders and because of this, we expected to find a variety through identification of the insects in the tall grass prairie surveyed. With some 22,000 species

of these insects worldwide, it goes to be noted that they can be seen in a wide variety of colors and sizes.

Soldier beetles (Cantharidae): The soldier beetles identified also came as little surprise. These insects are commonly confused as being Lampyridae as they look very similar aside from their Active in the warmer months. The freshly mown prairie with its abundant leaf litter was an ideal spot in late spring for the beetles to lay their eggs and emerge within the time we were collecting.

Fireflies (Lampyridae): The general appearance of a firefly is astoundingly similar to that of the soldier beetle. One way to distinguish between the two is by checking for the extended pronotum which covers the head slightly from above. Also, as might be expected, fireflies also have a luminary appendage affixed to the last abdominal sternite. Larvae of the Lampyridae feed upon small insects and as adults may often be found upon flowering plants. Due again to the timing of collection, these insects were a likely find.

Noctuidae is the largest family of Lepidoptera. These moths are nocturnal and have a pair of tympanal auditory organs thought to be used in evading bats. The larvae feed on foliage and are typical of the area surveyed. Common moths (Geometridae) are one of the largest families of Lepidoptera with about 1400 species found in North America. Many of the larvae are important forest pests, feeding on hemlocks and other conifers. (Covell, 2005).

The numbers we obtained regarding these families were as expected, as the members of these families are exceptionally important pollinators in tall grass prairie habitats.

The large numbers in Diptera and Hymenoptera are a positive indicator that the prairie ecosystem is recovering. Findings would suggest that our data is in alignment with that of other studies (Campbell, et al 2006; Panzer, 2002), in which large numbers were observed after a prescribed burn or herbicide application.

The stoneflies (Plecoptera), normally found close to bodies of water, were somewhat unexpected as their habitat differs considerably from the tall grass prairie in which specimens were collected. However, after reviewing several of the other families collected, many of them are either aquatic, have aquatic larvae, or are generally found near water. The presence of these stoneflies, as well as several others is an indicator of good water conditions in the streams and ponds found at Blackacre.

We hope this survey will provide a baseline for future studies of the insects in the grasslands at Blackacre and that the data will be useful in management of the preserve.

### **Acknowledgements**

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## **References**

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