Mammal Inventory Report: Battelle Darby Creek Metropark

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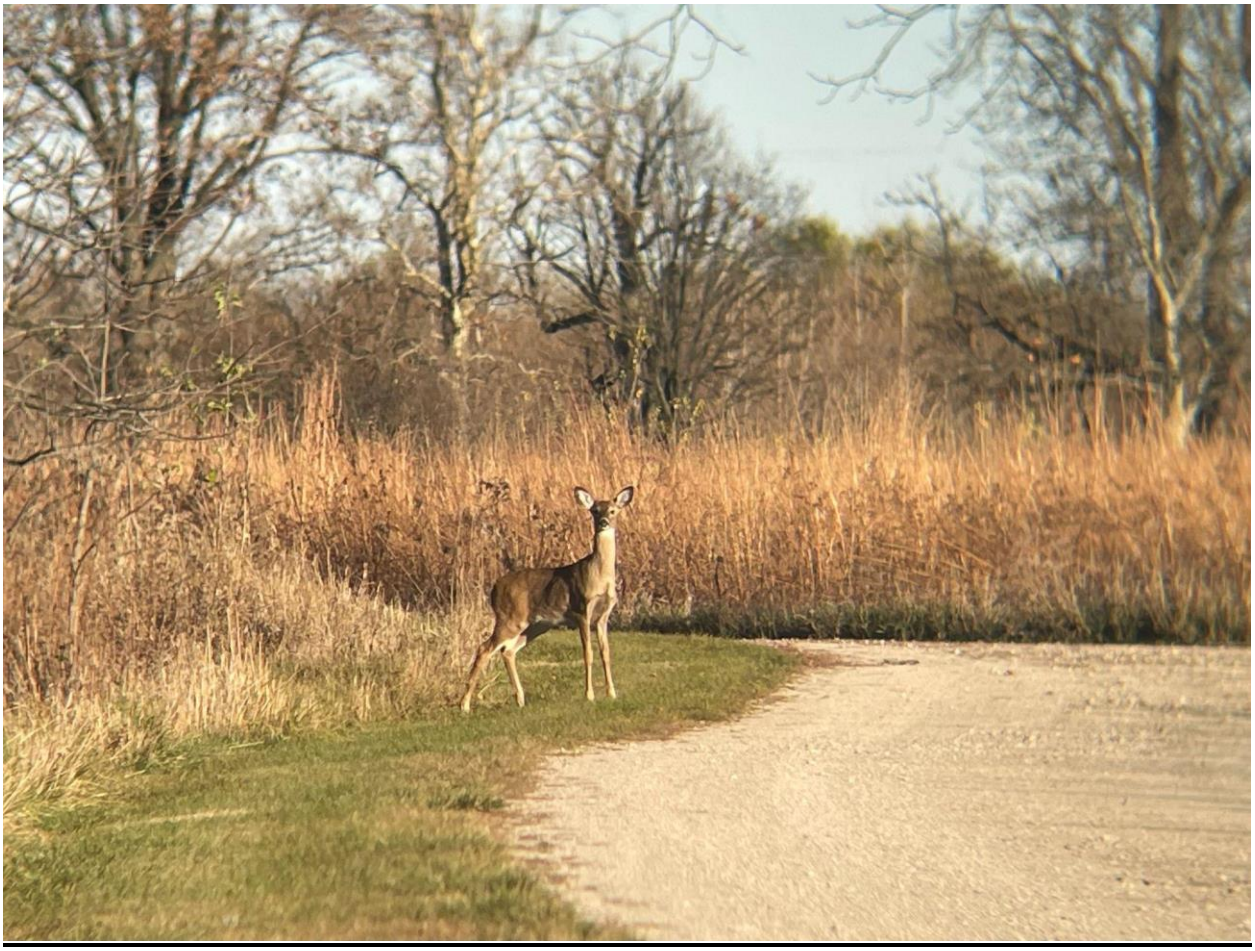

Introduction

Understanding mammalian diversity in urban parks is critical to making wildlife and natural resource management decisions. As urban areas continue to expand and change the landscape, the potential for human-wildlife conflict increases (Schell 2020). However, in Franklin County, Ohio, there is substantial effort by the Franklin County MetroParks system that is devoted to wildlife and natural resource conservation, and the safe facilitation of human-wildlife interaction.

Battelle Darby Creek Metro Park is the largest park by acreage in the Franklin County Metro Park system, providing varied habitat types and supporting a multitude of different species (Gordon 2022). The purpose of this report is to assess the diversity of this park by observing and surveying two areas where there is less human traffic. Observations were done via camera-trapping from November 6th, 2022 to December 5th, 2022. Additional observations were made during five trail surveys completed by multiple observers. A mud trap was set on the bank of Big Darby Creek between our cameras, and was checked on the same days as trail surveys. A variety of wildlife survey methods were used to reduce any bias or environmental factors that would hinder one method (Clare 2017) This report will detail the specific species found and the habitats in which they were found, include explanations of the utilized observational methods, and address potential variation in expected species versus those actually observed.

Before the study progressed, we defined what some species we may record would be, and the likelihood that we would record them, based on Ohio population data of the species (Bokman 2016), and where Batelle Darby Creek Metro Park is located in the state. It is important to note

this was not a comprehensive estimate, and thus does not include every species that may occur in Ohio, but is a few species operating as a framework for a basis of comparison.

The five species we expected were:

1. Gray squirrel (*Sciurus carolinensis*)
2. White-tailed deer (*Odocoileus virginianus*)
3. Eastern cottontail rabbit (*Sylvilagus floridanus*)
4. Raccoon (*Procyon lotor*)
5. Shrew sp. (Soricidae family)

The five species we listed as possible, but unexpected were:

1. Mink (*Neovison vison*)
2. Coyote (*Canis latrans*)
3. Eastern Fox squirrel (*Sciurus niger*)
4. Red fox (*Vulpes vulpes*)
5. Beaver (*Castor canadensis*)

The two species we listed as extremely unlikely were:

1. River otter (*Lontra canadensis*)
2. Black bear (*Ursus americanus*)

The objective of this assignment is to provide students with experience in visual identification of mammals and predict where certain species may occur according to their natural histories and habitat requirements. Additionally, learning how to set camera traps and other passive mammal inventory methods such as mud traps is crucial in further understanding how to quantify mammal presence in an area. The goal of this report is to determine the mammal assemblage in Battelle Darby Creek Metro Park and evaluate the suitability of this habitat for

diverse species. This study can be applied to future management decisions, particularly in relation with urban wildlife ecology and identifying species which present potential human-wildlife conflicts.

Study Area

Battelle Darby Creek Metro Park is located in Galloway, Ohio, on the western edge of Franklin County, bordering Madison County. The park is approximately seven-thousand acres of forest, prairie, and wetland habitat ("Battelle Darby Creek" n.d.). The Big Darby Creek and Little Darby Creek converge near the center of the park. Surrounding the park is an urbanizing area, dominated by an increasing number of housing complexes along main roads leading to the park. Directly next to the study area is land privately owned by individual homeowners, as well as an agricultural area. Across from our study area is the Darby Dan Airport. Focusing on the northern end of the Darby Creek Greenway Trail, near the Darby Dan Training Barn and Loop (approximated by coordinates 39.9412, -83.2223), the habitat primarily consists of restored prairie, and transitions to a forested landscape until reaching the eastern bank of Big Darby Creek (Gordon 2022).

The study area consists of 96.7 hectares of this mixed landscape ("Battelle Darby Creek" n.d.), and is dominated by temperate forest plants, typically calciferous. Maples (*Acer* spp.), oaks (*Quercus* spp.), hickories (*Carya* spp.), American sycamore (*Platanus occidentalis*), eastern cottonwood (*Populus deltoides*), black cherry (*Prunus serotina*), Ohio buckeye (*Aesculus glabra*), pawpaw (*Asimina triloba*), birch (*Betula* spp.), dogwoods (*Cornus* spp.), and blue and green ash (*Fraxinus quadrangulata* and *F. pennsylvanica*) are all common, especially in the more dense woodland portions of the study area. Other vegetation includes herbaceous species, particularly in prairie and wetland areas. Honeysuckle (*Lonicera* spp.), milkweed (*Asclepias*

spp.), asters (*Symphyotrichum* spp.), tall grasses, and similarly common Ohio plants are dominant (Klips 2022).

The site had a diverse set of land covers and uses, consisting of a mixture of forest, prairie, restored wetland, open managed turf, and agricultural field. One border of the site was demarcated by Big Darby Creek. The forest community adjacent to the river is predominantly oak-hickory with an understory of spicebush.

The cameras were placed off an unused trail in the forest on November 6th, 2022, Camera 1 by Big Darby Creek and Camera 2 about 500 feet away up a nearby slope. They were out during most of November, during which the weather was usually cool (40s-50s) and dry, with a couple very cold days (20s-30s) and a couple rainstorms (NOAA 2022). Figure 1 shows a map of our study area, along with camera locations and the trail survey transect.

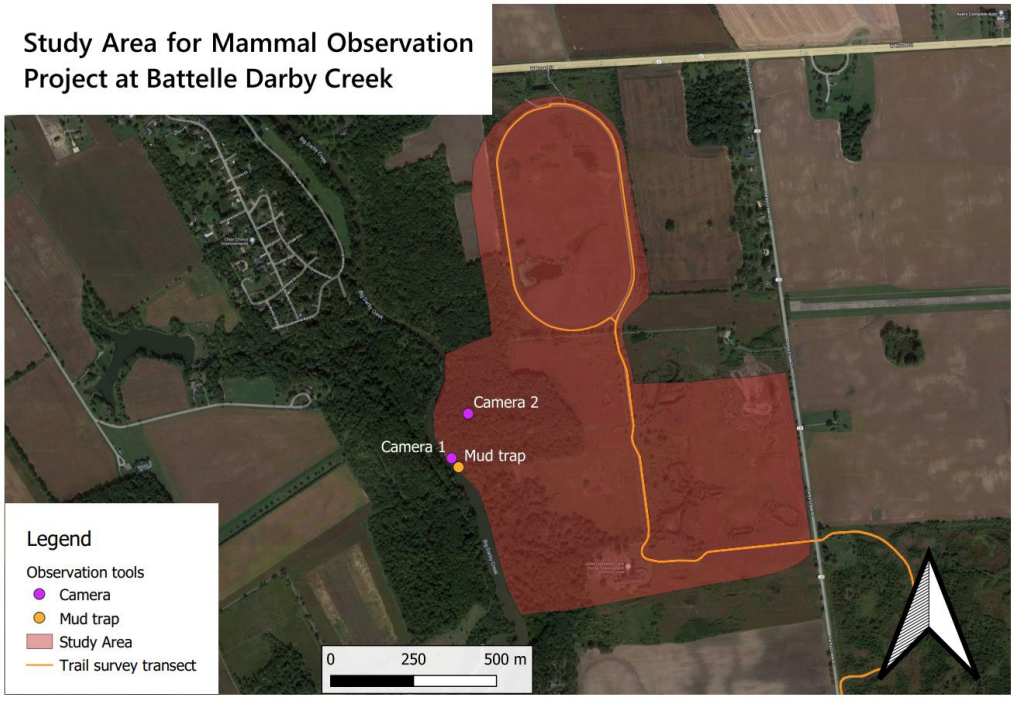

Figure 1. Map of study area, including camera locations and trail survey transect.

Due to the varied habitat area of this site and the land use around it, there is high diversity of mammalian species expected. Although it was not part of the survey, the nearby restored wetland habitat has a potentially substantial impact on the mammal community of all surrounding areas, particularly in relation to small mammals (Noe. 2022). The restored prairie is likely to house several small mammal species, including those belonging to families Soricidae, Sciuridae, and Cricetidae (including members from genera *Microtus* and *Peromyscus*), and white-tailed deer (Harder 2014; Eder 2001). In the riparian area, anticipated species include raccoon, Virginia opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), and white-tailed deer (Eder 2001). Aquatic mammals such as mink, beaver, and muskrat (*Ondatra zibethicus*) are potential species along the Big Darby River (Albin n.d.).

Methods

Two cameras were placed in different locations in the study area. They were affixed to trees using python locks at about chest height. Camera 1 was placed approximately 10 feet from the eastern bank of Big Darby Creek, facing westward across to the opposite bank. Camera 2 was placed about 500 feet away up a nearby slope, facing down the hill. Cameras were set to take time lapses, with a photo taken every half hour. In addition, they were set to take a photo whenever motion was detected in an attempt to photograph all mammals passing in view of the cameras. To attract mammals that lived in the study area to within the field of view of the cameras, we rubbed scented lures onto trees in front of the cameras. Lures used were for minks and felines.

In addition to the two cameras, trail surveys were conducted to observe mammals that did not travel into the areas monitored by the cameras. Surveys were conducted by walking along the existing metropark trail and watching for any mammals or mammal signs. Surveys lasted

approximately one hour each, and were conducted on 11/7/22, 11/9/22, 11/18/22, 11/23/22, 11/30/22 (days 2, 4, 13, 17, and 25 of the cameras being deployed) for a total of 5 surveys. Mammals observed directly or indirectly were noted to species, or as specific as possible given the observation type. Examples of direct observation included visually observing or taking a picture of the species. Examples of indirect observation included identifiable scat, and tracks.

Results

Across both cameras and all other methods of detection (live sightings, scat, tracks, etc), 64 individuals representing six different species were sighted. Of these, 40 (61%) were detected by camera, 12 (19%) were live sightings, 4 (6%) were detected by scat, 7 (11%) were detected by tracks, and 2 (3%) were detected by other means of detection. Camera 1, next to the river, detected 36 total mammals. Camera 2, up on the hill, detected four. Table 1 details each of our observations.

We calculated two indices of biodiversity: the Shannon-Wiener index and the Simpson index. We found a Shannon-Wiener index (D) of 3.44, and a Simpson index (H) of 2.78.

Habitat Total							
Species		Frequency	Method of detection				
Scientific Name	Common Name		Camera	Live	Scat	Tracks	Other
Odocoileus virginianus	White-tailed deer	25	16	2	-	7	-
Sciurus carolinensis	Gray squirrel	12	3	9?	-	-	-
Sciurus niger	Eastern Fox squirrel	20	20	-	-	-	-
Procyon lotor	Raccoon	4	-	1	+/-3	-	-

Canis latrans	Coyote	2	-	-	1	-	1
Blarina brevicauda	Short-tailed shrew	1	-	-	-	-	1

Table 1. Number of each species found in our study area and method of detection.

Simpson's diversity index: D = 3.442016807
Shannon's diversity index: H = -2.78223827

Discussion

Over all, this study provided a useful look into the mammals in Battelle Darby Creek Metro Park, and a full month of observation was achieved. As shown in the results section, a total of 64 individuals of six different species were sighted. Four of the five expected species were sighted. This included white-tailed deer (*Odocoileus virginianus*), gray squirrel (*Sciurus carolinensis*), raccoon (*Procyon lotor*), and northern short-tailed shrew (*Blarina brevicauda*).

The expected eastern cottontail (*Sylvilagus floridians*) was not sighted. Two of the possible, but unexpected species were observed during the experiment. This included the eastern fox squirrel (*Sciurus niger*), and coyote (*Canis latrans*). The three possible, but unexpected species were not sighted during the experiment. This included the mink (*Neovision vision*), red fox (*Vulpes vulpes*), and beaver (*Castor canadensis*). Neither of the two extremely unlikely species were recorded during the experiment. This included the river otter (*Lontra canadensis*), and black bear (*Ursus americanus*).

These results align with our expectations at the beginning of the study, although not perfectly. Specifically, not seeing an eastern cottontail rabbit was surprising, given there was a projected 9-11 rabbits every 1k survey miles (Ohio Department of Natural Resources 2021). However, this discrepancy may be due to camera location and height - as the cameras were near wetlands and in forests. The rabbits may have been easier to detect in a more open prairie setting.

Additionally, the cameras being at chest height may have caused the rabbits to be out of the camera shot, even if they were in the area. It is relevant to note though, that lowering the cameras would have also resulted in a shorter field of view, potentially resulting in less sightings. Thus, the height of the cameras were adequate for this study. For a study specializing in smaller mammals, a lower camera may be necessary.

Outside of that rabbit discrepancy, the results were near to expected. It is important to note that the list of expectations of species designed prior to the experiment is not a complete list, as it was designed as a general guide, not a catch-all. Certainly other relatively common Ohio species were not found or listed in our expectations. Such species could have included opossums, skunks, mice, chipmunks, moles, and bats, among other mammals. While it may be prudent to consider them in potential hypotheses in any future studies, they were not reported in this current one, and thus it is not significant that we did not have an initial idea to use as a basis of comparison. However, similarly to rabbits, there may be a lack of small mammal diversity that might otherwise be expected. Again, it can be understood that using only camera traps and trail surveys makes identifying these populations challenging. In future studies, live-mammal trapping of these small animals may provide a better picture of the communities of these species than only the methods used in this study (Green 2020).

Diversity indices are a good way to get a general idea for the overall biodiversity of an ecosystem. Higher scores represent more biodiversity, which means an ecosystem will have higher overall productivity and function and be more resilient to disturbances like invasive species or diseases. Two commonly used metrics for biodiversity are the Shannon-Wiener index and the Simpson's index. These metrics take into account the total number of species found (species richness) as well as the proportion of the total each individual species makes up,

representing a more holistic view of the biodiversity of an ecosystem than species richness alone. As reported in the results, Simpson's diversity index: D = 3.442016807 and Shannon's diversity index: H = -2.78223827, and thus indicate a level of biodiversity that could be useful to compare to similar sites and/or statewide for further understanding of Battelle Darby Creek Metro Park biodiversity.

It is also relevant to note a small technological error - Camera 2 had an incorrect "AM/PM" stamp, although the date and time itself was correct besides that. For example, if a photo was taken at 10:30AM, the camera would record it as 10:30PM. This does not affect the numerical data results, but is important should the photos be examined at a later date.

While the data was significant and a good starting point, this study alone is certainly not comprehensive enough to be the basis of an entire management plan. There are a few limiting aspects of this study. First, there was a small number of detection techniques. As stated before, this study relied on two trail cameras with lures for mink and bobcat, as well as a mud trap and five on-foot trail surveys. This is certainly a strong start, but more frequent and consistent checking of the mud trap and trail surveys may have provided a more complete picture. More cameras in different locations may provide less bias in potential results as well (Kolowski 2017).

Additionally, other methods may have helped, such as nets (especially for medium-sized mammals), pitfalls and nest boxes (especially for small-sized mammals), wire cages, searching for dens/nests, more types of baits/lures at different locations, and other methods of creating a mud trap that may yield more clear results (Hoffman 2010). As mentioned before, all the cameras being chest-height might have also presented a problem by missing species that were low to the ground, but near to the camera, like rabbits.

Another issue that may have provided less than ideal data was the timing and related weather patterns of the study, during most of the month of November. During winter, animals may stay active (like deer), hibernate (like bats, and to some extent, bears), undergo torpor (like chipmunks), or migrate (Yahner 2011). Thus by the time this study was conducted, certain species of mammals may not be active in the same manner they are in summer, causing this study to mis-represent their activity and population. In a similar vein, November 2022, when this study was conducted, typical days range from 52°F to 33°F, and gets an average total of 0.15in of precipitation (Travelchime Inc. n.d.). However, this weather varies day to day and thus may impact what appears on any given day

Additionally, while Battelle Darby Creek Metro Park provided a secluded location, it was not entirely free from potential issues. Similarly, people (employees of the park or pedestrians wandering off the trails) accessing the area, even in a non-consumptive or destructive manner, may still potentially disturb wildlife, causing the mammals to temporarily or permanently leave the area, and thus not be recorded. (Boyle 1985). Notably, Camera 1 detected a kayaker pass through the area twice - see Photo 7. In addition, studies such as this inherently entail people disturbing the woods in order to conduct such a study, which may scare off wildlife from the area. Nearby area also has a hunting ground, and this study was conducted during the hunting and trapping seasons for white-tailed deer, red/gray/fox squirrels, eastern cottontail rabbits, red/gray fox, raccoons, skunks, opossums, weasels, coyotes, feral swine/wild boar, groundhog, mink, muskrats, beavers, and river otters (Ohio Department of Natural Resources 2022). Hunting may change wildlife distribution patterns during the study- either increasing the number of mammals (should the mammals come into the no-hunting park grounds for protection), or decreasing them (should the mammals leave the no-hunting park grounds and encounter

hunters). The exact effect of hunting on the ability to detect mammals in the park is not known, but it could be relevant for a longer-term study.

Finally, while we did detect multiple individuals of the same species, we do not possess the data to know for sure that these are in fact, different individuals and not just the same one appearing in multiple locations. While some species, like the deer, may have obvious antler differences, others may not be so noticeable, such as the squirrels. Testing dung for any identifiable material and trapping and releasing tagged and/or radio collared could clarify this data (Hoffman 2010), but given the limits of this study, that was unnecessary.

Due to these possible complications, further studies should be conducted before any management strategies are implemented based on this data. Such studies may use similar detection methods, but should attempt to avoid any potential complications, such as those explained above, that occurred during this study. That being understood, this study does provide a peek into the mammal populations of Battelle Darby Creek Metro Park, and further research could be used for potential management strategies.

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Appendix A: 2022 Mammal Inventory Raw Data

Day	Time	Sampling Technique	Habitat	Species	Record	Notes
11/7	Day	Trail Survey	Forest	Grey squirrel	Live	
11/7	Day	Trail Survey	Forest	Grey squirrel	Live	
11/7	Day	Trail Survey	Prairie	Short-tailed shrew	Live/photo	dead
11/7	Day	Trail Survey	Prairie	White-tailed deer	Tracks	paths
11/7	Day	Trail Survey	Prairie	White-tailed deer	Tracks	paths
11/7	Day	Trail Survey	Prairie	White-tailed deer	Live/photo	doe
11/7	Day	Trail Survey	Prairie	coyote	sign/photo	deer fur remains
11/7	Day	Camera	Forest	White-tailed deer	Photo	buck
11/9	Day	Trail Survey	Forest	Grey squirrel	Live	
11/9	Day	Trail Survey	Forest	Grey squirrel	Live	
11/9	Day	Trail Survey	Forest	Grey squirrel	Live	
11/9	Day	Trail Survey	Forest	Grey squirrel	Live	
11/9	Day	Trail Survey	Forest	White-tailed deer	Live/photo	buck
11/9	Day	Camera	Forest	Fox squirrel	Photo	
11/11	Day	Camera	Forest/River	White-tailed deer	Photo	buck
11/12	Day	Camera	Forest	White-tailed deer	Photo	buck
11/13	Day	Camera	Forest	White-tailed deer	Photo	doe
11/13	Day	Camera	Forest/River	White-tailed deer	Photo	buck
11/14	Day	Camera	Forest/River	White-tailed deer	Photo	buck
11/15	Night	Camera	Forest/River	White-tailed deer	Photo	buck
11/15	Night	Camera	Forest/River	White-tailed deer	Photo	doe
11/16	Day	Camera	Forest/River	Fox squirrel	Photo	
11/16	Night	Camera	Forest/River	White-tailed deer	Photo	doe
11/16	Night	Camera	Forest/River	White-tailed deer	Photo	doe
11/18	Day	Camera	Forest/River	White-tailed deer	Photo	buck

11/18	Day	Trail Survey	Forest	Grey squirrel	Live	
11/18	Day	Trail Survey	Forest	Grey squirrel	Live	
11/19	Day	Camera	Forest/River	Grey squirrel	Photo	
11/19	Day	Camera	Forest/River	Fox squirrel	Photo	
11/20	Day	Camera	Forest/River	Fox squirrel	Photo	
11/20	Day	Camera	Forest/River	Fox squirrel	Photo	
11/20	Day	Camera	Forest/River	Fox squirrel	Photo	
11/20	Day	Camera	Forest/River	Fox squirrel	Photo	
11/20	Day	Camera	Forest/River	Grey squirrel	Photo	
11/20	Day	Camera	Forest/River	Fox squirrel	Photo	
11/21	Day	Camera	Forest/River	Fox squirrel	Photo	
11/21	Day	Camera	Forest/River	Fox squirrel	Photo	
11/21	Day	Camera	Forest/River	Fox squirrel	Photo	
11/21	Day	Camera	Forest/River	Fox squirrel	Photo	
11/21	Day	Camera	Forest/River	Fox squirrel	Photo	
11/22	Day	Camera	Forest/River	Fox squirrel	Photo	
11/22	Day	Camera	Forest/River	Fox squirrel	Photo	
11/22	Day	Camera	Forest/River	Fox squirrel	Photo	
11/22	Day	Camera	Forest/River	Fox squirrel	Photo	
11/23	Day	Camera	Forest/River	Grey squirrel	Photo	
11/23	Day	Trail Survey	Forest/River	Raccoon	Live	
11/23	Day	Trail Survey	Prairie	White-tailed deer	Tracks	
11/23	Day	Trail Survey	Prairie	White-tailed deer	Tracks	
11/23	Day	Trail Survey	Prairie	Coyote	Scat	
11/24	Day	Camera	Forest/River	Fox squirrel	Photo	
11/26	Day	Camera	Forest/River	White-tailed deer	Photo	doe
11/26	Day	Camera	Forest/River	White-tailed doe	Photo	doe
11/26	Day	Camera	Forest/River	Fox squirrel	Photo	

11/26	Day	Camera	Forest/River	Fox squirrel	Photo	
11/27	Day	Camera	Forest/River	Fox squirrel	Photo	
11/28	Day	Camera	Forest/River	Fox squirrel	Photo	
11/30	Day	Camera	Forest/River	White-tailed deer	Photo	doe
11/30	Day	Camera	Forest/River	White-tailed deer	Photo	doe
11/30	Day	Mud Trap	Forest/River	White-tailed deer	Track	
11/30	Day	Trail Survey	Prairie	White-tailed deer	Tracks	
11/30	Day	Trail Survey	Prairie	White-tailed deer	Tracks	
11/30	Day	Trail Survey/Camera	Forest/River	Raccoon	Scat	Multiple spots
12/5	Day	Camera	Forest/River	White-tailed	Photo	doe

Appendix B: Photo log

Photo 1. Sample photo of a white-tailed deer buck (*Odocoileus virginianus*) on trail camera 2.

Photo 2. Short-tailed shrew (*Blarina brevicauda*), dead, encountered while performing a trail survey.

Photo 3. White-tailed deer (*Odocoileus virginianus*) night capture on camera 1.

Photo 4 Fox squirrel (*Sciurus niger*) climbing tree captured on camera 2.

Photo 5. White-tailed deer (*Odocoileus virginianus*) track found on mud trap.

Photo 6. Raccoon (*Procyon lotor*) scat spotted on a downed tree while performing a trail survey.

Photo 7. Kayaker found on camera 1.