Inventory of Distribution, Composition, and Relative Abundance of Mammals, including Bats, at Herbert Hoover National Historic Site

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Summary

An inventory of the presence/absence of mammals (including bats) was conducted at Herbert Hoover National Historic Site from May 21 through May 26, 2004. An initial expected species list suggested 43 species as present or probably present at the National Historic Site. Three species of terrestrial mammals and two bat species were added to the list. Two species were excluded due to lack of habitat and/or out of range and one species has a questionable status at the National Historic Site. After revising the list, the inventory documented 23 of 45 (51 %) expected species. Two non-native species are expected to be present around human habitation, but were not documented in this inventory.

Nine of the unverified species are small carnivores and may be present occasionally or in small numbers. Two aquatic rodents were also unverified, but may be present in the creek on an occasional basis. Species are typical of tall grass prairies, old farm fields, managed parkland, and riparian areas. No state or federally listed species were observed.

Further sampling may add to the number of confirmed small mammals and continued observations by National Historic Site personnel may add to the number of the larger species, especially if road kills on adjacent highways are identified and included. Sampling around National Historic Site buildings may confirm the presence of the two non-native mammals expected to be present on the Site.

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Introduction

The U.S. Congress passed the 1998 National Parks Omnibus Management Act in response to concerns about the condition of natural resources within the national parks. The act requires each park to gather baseline inventory data on pertinent natural resources, data that will provide a pivotal step toward establishing an effective monitoring program, and further our ability to effectively manage and protect park resources. The National Park Service (NPS) responded with the Natural Resource Challenge program, including the establishment of biome-based inventory and monitoring networks. The Heartland Network, as part of the NPS Inventory and Monitoring (I&M) program, has undertaken inventories of vascular plants and vertebrates within fifteen parks in eight Midwestern states.

This inventory will verify the expected species list, provide a foundation for future monitoring, allow for the determination and implementation of monitoring regimes, and help better manage resources and predict the possible impacts of management decisions on mammals. In order for scientifically sound management decisions to be made, basic information on species occurrence, distribution, and ancillary environmental information are needed.

The goal of the inventory is to document 90% of the species that are reasonably expected to occur at the National Historic Site. This inventory will provide data on mammal species composition, distribution, and relative abundance.

Study Area

Herbert Hoover National Historic Site is located in central eastern Iowa within the rural incorporated city of West Branch (Figure 1). The site commemorates the life of our 31st president. The park unit was designated a National Historic Site on August 12, 1965 with Congress stipulating in Public Law 89-119 (79 Stat. 510) that the site purpose was ". . . to preserve in public ownership historically significant properties associated with the life of Herbert Hoover." The National Historic Site preserves, protects, and interprets for present and future generations the natural and cultural resources associated with the life of Herbert Hoover in West Branch, Iowa (Boetsch et al 2000).

The central focus of the 75.6 ha (186.80 ac) includes 2 ha (5 ac) of historic neighborhood; the Hoover grave site; more than 20 ha (50 ac) of mowed landscape with picnic facilities; the NPS visitor center; and the National Archives and Records Administration Herbert Hoover Presidential Library-Museum. Additional resources include ½ mile of a tributary to the west branch of Wapsinonoc Creek; a 32.8 ha (81 ac) reconstructed tall grass prairie with small savanna areas; and administrative structures, such as a maintenance facility, parking areas, and roadways.

The National Historic Site is roughly rectangular with very irregular sides. Most of the cultural resources are located within the flood plain of the creek. The area is within the Southern-Iowa Drift Plain, where drainages cut a pattern of abruptly rolling countryside. Erosion and fracturing are constant problems in these friable clay/loess (Tama-Downs) soils. Streams that did not exist 150 years ago, such as the creek on site, have cut paths through areas that were once wetlands and seeps and are very susceptible to flash flooding or going dry during periods of drought (Boetsch et al 2000).

Interstate-80 passes along the southern border and downtown West Branch shares the northern and eastern borders of the National Historic Site. A working row-crop farm, belonging to the NPS, but on a life-time lease to a private farmer, lies on the western border. A buffer area separates the Gravesite from the Interstate to its south and farm to the west. This prairie buffer should "provide a natural, spacious setting to support the commemoration of Herbert Hoover" (General Management Plan 2004). The prairie covers upland areas and a portion of the flood plain.

The National Historic Site originally seeded the prairie buffer to five species of native grasses (big bluestem, *Andropogon gerardii*; little bluestem, *A. scoparium*; switchgrass, *Panicum virgatum*; Indian grass, *Sorghastrum nutans*; and side oats grama, *Bouteloua curtipendula*) in the spring of 1971 (Landers 1975). Managers added forbs in 1976, and made subsequent additions of forbs and Canada wild rye (*Elymus canadensis*) in 1992 and 1994. In 1997, a savanna was created on the southeast ridge of the prairie. This savanna was intended to further buffer the Gravesite from development along the Interstate. A nut tree grove was planted in spring of 2000 as another eventual savanna area immediately south and west of the Gravesite. Species planted include: shagbark hickory (*Carya ovata*), shellbark hickory (*Carya laciniosa*), American chestnut

(*Castanea dentata*), black walnut (*Juglans nigra*), butternut (*Juglans cinerea*), and American hazelnut (*Corylus americana*).

Surrounding landscape and land uses provide a potential source of exotic weeds and invasive plants for the prairie and creek bed. Agricultural runoff enters the prairie along three drainages on the western border. Some of the most extensive invasions of exotic plants occur along these drainages and the flood plain to the creek. Fencerows and mowed areas of the National Historic Site are planted to Kentucky bluegrass (*Poa pratensis*), fescue (*Festuca* spp.*)*, and smooth brome grass (*Bromus inermis*). Reed canary grass (*Phalaris arundinacea*) and various woody plants, including escaped ornamentals from the cultural area of the site, have invaded the prairie. The watershed surrounding the National Historic Site consists of agricultural land, residential areas, a golf course, and abandoned agricultural land being developed for commercial and residential purposes.

The reconstructed prairie represents one of the largest protected prairies in the vicinity. The expansive mowed parkland with sparse tree cover mimics savanna conditions and attracts birds associated with the oak-hickory savanna. No federally threatened or endangered species have been identified on site, but the site provides a significant island of habitat in a highly developed agricultural landscape. Species benefiting from this site include native plants, neo-tropical migrant birds, including the state listed threatened Henslow's sparrow and four other grassland obligate species, and numerous insects and mammals associated with prairie and rural countryside.

Materials and Methods

Terrestrial mammals and bats were inventoried via pitfall traps, live-traps, mist nets, and observations from June 21-25, 2004. Sites were located in the prairie, along the stream, and in the historic town setting in the National Historic Site. Within each vegetation type, both randomly and subjectively located sample points were deployed. Total sample effort for the National Historic Site was roughly distributed among the management units proportionate to their area (see Table 1). A list of potential random inventory sites was chosen using a random point generator within ArcView. Navigation to, and data collection thereof, utilized a Garmin eTrex.

Within the prairie, both randomly and subjectively located sample points were deployed. Additional subjective plots were located in several opportune areas and include: the narrow wooded area adjacent to the creek, near the loop road (as well as in the copse of trees west of the loop), under the bridge, and in and near a barn and outbuildings at the Miles Farm. The three latter areas are within an area designated as the Commemorative Zone (Table 1).

A pitfall array and transect of Sherman live traps was used at each sample point unless otherwise noted. In addition to the pitfall traps and Sherman trap transects in random areas, additional setups were placed non-randomly in habitat chosen because it represented additional habitat variables or because it might possibly contain species of interest. These transects were designated as non-random or select. Specialized traps were placed in areas of suspected activity.

The cross-type design of pitfall traps was placed at each random site and selected point in the study area. Each cross-type design had a central pitfall and four drift fences extending 10 m in each cardinal direction. Additional pitfalls were at the end of each fence (Figure 2). Drift fences were at least 20 cm high to steer mammals into the pitfalls. Pitfall traps were at least 25.4 cm (10 in) in depth and 25.4 cm (10 in) wide (i.e. a 2-gallon bucket). Pitfalls were un-baited, kept dry, and checked at least twice a day so animals could be released alive. Pitfalls were used for five consecutive nights per transect. When the study was complete, pitfall stations were restored to their natural condition to the maximum extent possible (i.e. excavated material was used to refill holes).

Sherman live traps were used on all trap transects. Each transect consisted of 30 Sherman live-traps. Three Sherman live traps were placed at each station, with these being no closer than one meter from each other and within two meters of the station point. Five nights of trapping yielded 150 trap nights at each transect.

Following identification and data collection, animals were released unharmed from live-traps and pitfall traps, except for the few that died in the traps. These were prepared as voucher specimens (Table 3). All traps were checked at least twice daily.

Mid-sized carnivores and other mid-sized mammals were documented with larger Hav-A-Hart live traps or by personal observations or reports from the National Historic Site staff. Hav-A-Hart traps were place in riparian areas and baited with fruit and sardines.

Bats were surveyed in all likely habitats, including riparian forest corridors, service roads between the forest and prairie and park land. The number of bat sampling sites and locations within the units were chosen based on discussions with National Historic Site personnel and previous experience. Therefore, all plots were non-random. Mist-nets were the primary survey method, but Anabat II® detectors that record bat vocalizations that can be identified to species were placed in these same areas. Qualitative and quantitative analyses for species identifications were performed on all recorded call sequences (Murray et al. 1999, 2001; Britzke et al. 2002).

Mist nets were made of the finest, lowest visibility commercially available 2 ply, 50 denier nylon (denoted 50/2) of approximately 38 mm. These nets conform to the USFWS standards recommended for Indiana bat (*Myotis sodalis*) surveys (U.S. Fish and Wildlife Service, 1999). Nets were placed in corridors such as streams or trails approximately perpendicular across the corridor. Nets were set to fill the corridor from side to side and from stream (or ground) level up to the overhanging canopy. A typical set was seven meters high consisting of nets "stacked" on top one another and up to 18 meters wide (different width nets were used as the situation dictated).

Sample period began at sunset and continued until captures ceased, or activity ceased based on the bat detectors. Nets were checked at intervals of no longer than 20 minutes and disturbance was minimized near the nets, other than to check nets and remove bats. Netting and recording occurred during periods of no precipitation, when temperatures were above 10 degrees Celsius and with little wind. The moon was a waxing crescent with 13% of the visible disk illuminated on the 21st and attained first quarter illumination by the 25th.

Specimens were identified following Bowles (1975) and Whitaker and Hamilton (1998). Vouchers consist of photographic evidence or whole animals with picture vouchers collected for all captured species. For small mammals, an attempt was made to release all animals at the site of capture after they were identified to species, aged, and sex was determined. Voucher specimens of individuals that died subsequent to capture were prepared as skin and skull or placed in fluid preservative. All biological voucher specimens are deposited at the Museum of the High Plains, Fort Hays State University, Hays, Kansas.

The principle investigator worked closely with National Historic Site staff regarding our activities to ensure that there were no negative impacts to the visitor experience. All persons involved with trapping followed the American Society of Mammalogists "Guidelines for the Capture, Handling, and Care of Mammals" http://www.mammalsociety.org/committees/commanimalcareuse/98acucguidelines.PDF

Results

An initial expected species list suggested 43 species as present or probably present at the National Historic Site. Three species of terrestrial mammals were added, two documented as present (meadow jumping mouse, *Zapus hudsonius* and eastern mole, *Scalopus aquaticus*) and one as probably present (ermine, *Mustela erminea*). Two bat species were added to the list (red bat, *Lasiurus borealis* and hoary bat, *Lasiurus cinereus*). Two species were excluded due to lack of habitat and/or out of range and one species has a questionable status at the National Historic Site (Table 2).

After revising the list, the inventory documented 23 of 45 (51 %) species listed as either present or probably present. Two non-native species (*Mus musculus* and *Rattus norvegicus*) are expected to be present around human habitation, but were not documented in this inventory.

Overall, more than 260 individuals representing 18 species were captured (Tables 3 and 4). Almost three times as many captures resulted from using Sherman traps than pitfalls. The common shrew (*Sorex cinereus*) was the most common species trapped in pitfalls whereas meadow voles (*Microtus pennsylvanicus*), white-footed mice (*Peromyscus leucopus*), and deer mice (*Peromyscus maniculatus*) were most commonly captured in Sherman traps. The traps set around the buildings and barn yielded only white footed mice. Anabat II® detectors documented more species and numbers than mist nets. One raccoon (*Procyon lotor*) was documented with a Hav-A-Hart trap.

Ten other species were observed: eastern cottontail (*Sylvilagus floridanus*), eastern mole, fox and gray squirrels (*Sciurus niger* and *S. carolinensis*), mink (*Mustela vison*), plains pocket mouse (*Geomys bursarius*), red fox (*Vulpes vulpes*), striped skunk (*Mephitis mephitis*), white tailed deer (*Odocoileus virginianus*), and woodchuck (*Marmota monax*).

Discussion

The number of species documented during this inventory is a good reflection of the methods that were utilized, however the restriction on the type of traps that could be used (live traps) may have led to an under representation of the total number and number of species of small mammals sampled. Other species may be added as National Historic Site personnel or visitors report their sightings, or if similar studies are done at different times of the year. No unexpected species were documented.

Expected Species

Twenty two terrestrial species are considered probably present at the National Historic Site at some time during the year or in the near past.

Eight of these species are carnivores, including the opossum (*Didelphis virginiana*) have been documented in this part of the state (Bowles 1975). Some of these species are in decline (spotted skunk, *Spilogale putorius* and long-tailed weasel, *Mustela frenata*) in other parts of their range, and may have a non continuous distribution in Iowa that might not include the National Historic Site. Six other carnivores (coyote, *Canis latrans*; gray fox, *Urocyon cinereoargenteus*; bobcat, *Lynx rufus*; ermine; least weasel, *Mustela nivalis*; badger, *Taxidea taxus*) may only be occasional visitors, but may be documented in adjacent areas using road kill data or from future studies. The semi-aquatic species (beaver, *Castor canadensis* and muskrat, *Ondatra zibethicus*) may also be occasional visitors, but with the small amount of flowing or standing water on the National Historic Site, may not set up residence on the area.

The other small terrestrial species listed as 'probably present' in the National Historic Site are given this designation because their ranges include Cedar County. These include: short tailed shrew (*Blarina brevicauda*), least shrew (*Cryptotis parva*), woodland vole (*Microtus pinetorum*), southern bog lemming (*Synaptomys cooperi*), southern flying squirrel (*Glaucomys volans*), and eastern chipmunk (*Tamias striatus*). Long-term studies that include different times of the year may be needed to definitively document their presence, or conversely exclude them from the designation as 'probably present.'

Three of the seven bat species are listed as probably present, with two of these possibly being present only during spring and/or fall migration. These are the silver-haired bat (*Lasionycteris noctivagans*) and hoary bat. Keen's bat (*Myotis keenii*, syn. of *M. septentrionalis*) is found primarily in more heavily forested regions and may not be present on a regular basis in the limited forests of the National Historic Site.

Status of Franklin's ground squirrel (*Spermophilus franklinii*) was not determined in this inventory and no sightings were reported by National Historic Site personnel. The potential distribution is statewide in suitable habitats, but this species has been eradicated in many areas even where suitable tall grass cover is available (Bowles 1975).

Two species of introduced mammals (house mouse, Norway rat) may be present in and around buildings in the National Historic Site. In order to document the presence or absence of these two introduced species of rodents, extensive trapping should be carried out in the industrial and urban areas in and adjacent to the National Historic Site.

Two species would not be expected to occur due to a lack of habitat and/or out of range. These include: Indiana bat and white tailed jackrabbit (*Lepus townsendii*).

Conclusion

This small National Historic Site has a very good representation of available and historic habitat variables. However, because of its small size and isolation from comparable habitats, it is unlikely that a significant number of additional species, now designated as probably present, will be added to the National Historic Site list. No changes in the management plans are recommended, but I encourage the National Historic Site personnel to continue to maintain the habitat diversity of the restored prairie area and to keep a riparian buffer along both sides of Wapsinonoc Creek.

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Figure 1. Map of Herbert Hoover NHS showing mammal inventory plots.

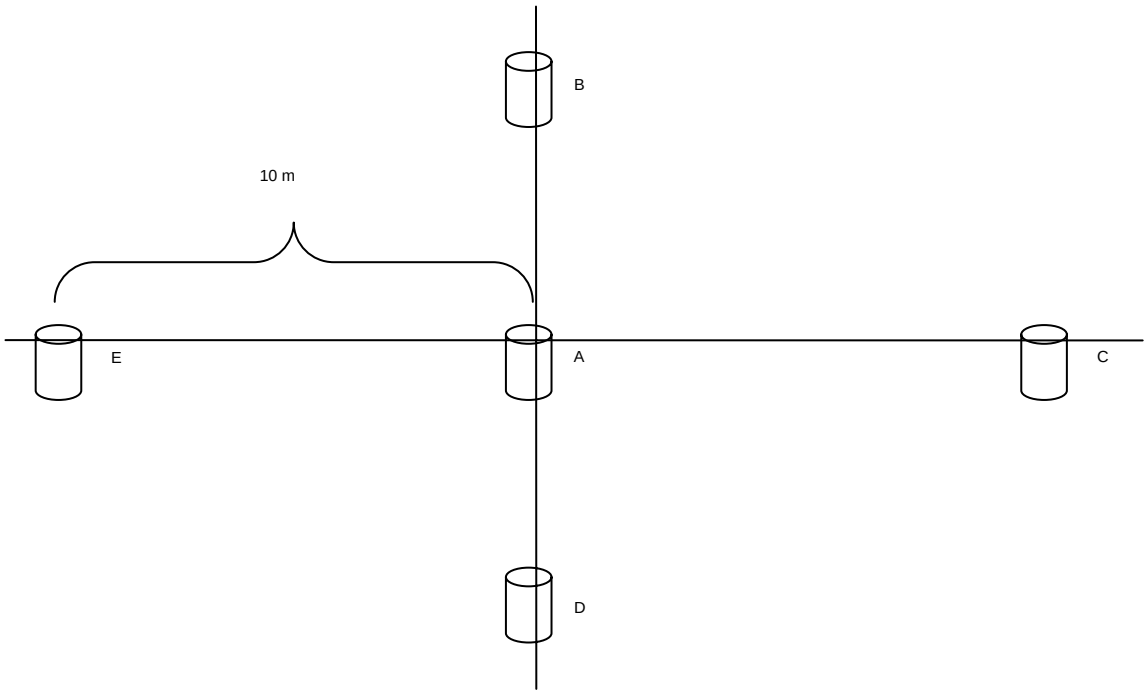

Figure 2. Cross-type design for pitfalls used at Herbert Hoover NHS.

Table 1. Effort of each trap type/transect at Herbert Hoover NHS.

Unit	Acres	Number of random sample points		Number of subjective sample units		Total Trap Nights	
		P	S	P	S	Pitfall	Transect
Prairie	81	2	2	2	2	100	600
Parkland grounds	52	0	0	0	1	0	150
Commemorative Zone		0	0	0	1	0	30*

P=Pitfall arrays, S=Sherman transects

* Five Sherman live traps and five Hav-A-Hart traps set around buildings and barn.

Table 2. List of potential or expected mammal species at Herbert Hoover NHS.

Order: Family	Scientific Name	Common Name	Abundance	Old	New	Author
Artiodactyla: Cervidae	Odocoileus virginianus	White-tailed deer	U	2	2	Yes
Carnivora: Canidae	Canis latrans	Coyote	-	1	1	No
	Urocyon cinereoargenteus	Gray fox	-	1	1	No
	Vulpes vulpes	Red fox	U	2	2	Yes
Felidae	Lynx rufus	Bobcat	-	1	1	No
Mustelidae	Mephitis mephitis	Striped skunk	?	2	2	Yes
	Mustela erminea		-	Na	1	No
	Mustela frenata	Long-tailed weasel	-	1	1	No
	Mustela nivalis	Least weasel	-	1	1	No
	Mustela vison	Mink	?	2	2	Yes
	Spilogale putorius	Spotted skunk	-	1	1	No
	Taxidea taxus	Badger	-	1	1	No
Procyonidae	Procyon lotor	Racoon	C	2	2	Yes
Chiroptera: Vespertilionidae	Eptesicus fuscus	Big brown bat	U	2	2	Yes
	Lasionycteris noctivagans	Silver-haired bat	-	1	1	No
	Lasiurus borealis	Red bat	C	Na	2	Yes
	Lasiurus cinereus	Hoary bat	-	Na	1	No
	Myotis keenii	Keen's bat	-	1	1	No
	Myotis lucifugus	Little brown bat	?	1	2	Yes
	Myotis sodalis	Indiana bat	-	1	0	-
	Pipistrellus subflavus	Eastern pipistrelle bat	U	1	2	Yes
Insectivora: Soricidae	Blarina brevicauda	Short tailed shrew	-	1	1	No
	Cryptotis parva	Least shrew	-	1	1	No
	Sorex cinereus	Masked shrew	C	1	2	Yes
Talpidae	Scalopus aquaticus	Eastern mole	U	Na	2	Yes
Lagomorpha: Leporidae	Lepus townsendii	White-tailed jackrabbit	-	1	0	-
	Sylvilagus floridanus	Eastern cottontail	C	2	2	Yes
Marsupalia: Didelphidae	Didelphis virginiana	Opossum	-	1	1	No
Rodentia: Castoridae	Castor canadensis	Beaver	-	1	1	No
Geomyidae	Geomys bursarius	Plains pocket gopher	U	1	2	Yes

Table 2. List of potential or expected mammal species at Herbert Hoover NHS (cont.).

Order: Family	Scientific Name	Common Name	Abundance	Old	New	Author
Rodentia: Muridae	Microtus ochrogaster	Prairie vole	C	1	2	Yes
	Microtus pennsylvanicus	Meadow vole	A	2	2	Yes
	Microtus pinetorum	Woodland vole	-	1	1	No
	Mus musculus	House mouse	-	1	1	No
	Ondatra zibethicus	Muskrat	-	2	1	No
	Peromyscus leucopus	White-footed mouse	C	2	2	Yes
	Peromyscus maniculatus	Deer mouse	C	2	2	Yes
	Rattus norvegicus	Norway rat	-	1	1	No
	Reithrodontomys megalotis	Harvest mouse	C	2	2	Yes
	Synaptomys cooperi	Southern bog lemming	-	1	1	No
Sciuridae	Glaucomys volans	Southern flying squirrel	-	1	1	No
	Marmota monax	Woodchuck	C	2	2	Yes
	Sciurus carolinesis	Gray squirrel	C	2	2	Yes
	Sciurus niger	Fox squirrel	C	2	2	Yes
	Spermophilus franklinii	Franklin's ground squirrel	-	2	?	No
	Spermophilus tridecemlineatus	13-lined ground squirrel	C	2	2	Yes
	Tamias striatus	Eastern chipmunk	-	2	1	No
Dipodidae	Zapus hudsonius	Meadow jumping mouse	U	Na	2	Yes

A=Abundant, C= Common, U= Uncommon. “Old” indicates the status prior the inventory, “New” the status after the inventory. Values for Old and New follow Boetsch et al (2000): a “1” is used to indicate that a given species is expected, “2” indicates that the species was observed (documented within the National Historic Site); “0” indicates not to be expected; “?” indicates a questionable status. Author=whether species was documented.

Table 3. List of animals captured by trap type at Herbert Hoover NHS.

Method	Scientific Name	Common Name	Number
Pitfall	Sorex cinereus	Common shrew	18
	Reithrodontomys megalotis	Western harvest mouse	2
	Microtus pennsylvanicus	Meadow vole	2
	Peromyscus maniculatus	Deer mouse	1
	Microtus ochrogaster	Prairie vole	1
		Total	**24**
Sherman	Microtus pennsylvanicus	Meadow vole	25
	Peromyscus leucopus	White footed mouse	13
	Peromyscus maniculatus	Deer mouse	11
	Reithrodontomys megalotis	Western harvest mouse	6
	Microtus ochrogaster	Prairie vole	5
	Zapus hudsonius	Meadow jumping mouse	2
	Sorex cinereus	Common shrew	1
		Total	**63**
Hav-A-Hart	Procyon lotor	Raccoon	1
		Total	**1**
Mist Net	Lasiurus borealis	Eastern red bat	1
	Myotis lucifugus	Little brown bat	1
		Total	**2**
Anabat Detector	Eptesicus fuscus	Big brown bat	>44
	Lasiurus borealis	Eastern red bat	>56
	Myotis lucifugus	Little brown bat	5
	Pipistrellus subflavus	Eastern pipistrelle	>65
		Total	**>170**

Table 4. List of photographic and specimen vouchers Herbert Hoover NHS.

Scientific Name	**Type**	**Habitat**	**Comments**
Bufo sp.	Photo	Near creek	By hand near creek
Bufo sp.	Photo	Near creek	By hand near creek
Bufo sp.	Photo	Near creek	By hand near creek
Lasiurus borealis	Photo	Woodland	Mist net and recorded
Microtus ochrogaster	Skin&Skull	Burned Prairie	Pitfall and Sherman traps
Microtus pennsylvanicus	Photo	Prairie	Sherman live trap
Microtus pennsylvanicus	In Fluid	Prairie	Pitfall and Sherman traps
Myotis lucifugus	Photo	Woodland Park, creek	Mist net and recorded
Peromyscus leucopus	Photo	Prairie	Sherman live trap
Peromyscus maniculatus	Photo	Prairie	Sherman live trap
Procyon lotor	Photo	Prairie near creek	Hav-A-Hart trap
Reithrodontomys megalotis	Photo	Prairie	Sherman live trap
Reithrodontomys megalotis	In Fluid	Prairie	Pitfall and Sherman traps
Sorex cinereus	In Fluid	Prairie	Pitfall and Sherman traps
Sorex cinereus	Skin&Skull	Prairie	Pitfall and Sherman traps
Sorex cinereus	Skin&Skull	Prairie	Pitfall and Sherman traps
Sorex cinereus	Skin&Skull	Prairie	Pitfall and Sherman traps
Sorex cinereus	Skin&Skull	Prairie	Pitfall and Sherman traps
Sorex cinereus	In Fluid	Prairie	Pitfall and Sherman traps
Sorex cinereus	Skin&Skull	Prairie	Pitfall and Sherman traps
Spermophilus tridecemlineatus	Photo	Woodland Park	Using water in burrow
Zapus hudsonius	Photo	Prairie	Sherman live traps, specimens in torpor