2001-F

BASELINE INVENTORY OF MAMMALS, REPTILES, AND AMPHIBIANS AT WASHITA BATTLEFIELD NATIONAL HISTORIC SITE, OKLAHOMA

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Prepared for Washita Battlefield National Historic Site, National Park Service
Draft: Tuesday, August 21, 2001

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Abstract: Washita Battlefield National Historic Site was established in 1996 in order to "protect and interpret the site of the Southern Cheyenne village of Peach Chief Black Kettle that was attacked by the 7th U.S. Cavalry under Lt. Col. George A. Custer just before dawn on November 27, 1868. As part of a recent National Park Service initiative, the park has been charged with restoring the "visual scene" as near as possible to its condition at the time of the 1868 battle. Part of this process involves baseline inventories of all plant and animal species presently occurring in the park. We report here on results of our research documenting the presence and use of lands within the National Historic Site by mammals, reptiles and amphibians. We conducted surveys for mammals, reptiles and amphibians within eight habitat types found within the park boundaries. Surveys were conducted in three distinct survey periods. Species composition within each habitat is discussed and dominant species of each habitat are identified. Changes in hspecies occurrence across survey periods are linked to changes in vegetation within those habitats. Overall, 21 mammal species, 11 reptiles and 4 amphibians were detected. Forty-five (45) birds were recorded incidental to our survey efforts for mammals and herps giving a grand total of 81 terrestrial vertebrate species detected. We are about to begin formal and more thorough surveys for birds later this year. We hope our efforts will be the first in a series of studies documenting and monitoring plant and animal species at the site.

Introduction

The National Park Service (NPS) has recently become interested in obtaining inventories of plant and animal life occurring on its land. NPS typically enlists the aid of local universities or wildlife agencies to conduct such inventories. We were asked to conduct surveys for mammals and reptiles and amphibians (herps) on Washita Battlefield National Historic Site (WBNHS) in Cheyenne, Oklahoma. WBNHS is a recent addition to the National Park system. To date, extensive botanical surveys have been conducted at the site (Stotts and DuBey 1998), but information on animal species potentially using the site is lacking. We hope that our studies of mammals and herps at WBNHS will be the first in a series of studies documenting the use of the site by vertebrate and invertebrate animal species.

WBNHS occupies a land area of 326 acres (~132 hectares) in Roger Mills County, west-central Oklahoma. Up until the time the park was established (1996), much of the land area at the site was used for agricultural purposes (various crops and grazing). Within the near future (~2002)

the park will be initiating major restoration activities and will be developing on-site visitor facilities such as trails and parking. It is important to identify species that may potentially be impacted by such restoration activities, and baseline inventories are a good beginning for such work.

Mammals and herps can be important components in temperate ecosystems of North America (Kiester 1971, Burton and Kikens 1975, Hairston 1987, Caire et al. 1989). Thirty percent of the native vertebrate fauna of the United States and Canada consist of reptiles and amphibians (Bury et al. 1980). Over the past several decades, biologists have documented reptile and amphibian declines across the globe (Carey 1993, Bradford et al. 1994, Pounds and Crump 1994). The potential causes and ramifications of these declines are still debated. A problem facing many regions of the United States, including Oklahoma, is that the knowledge of the distributions of many species are inadequate to assess the degree of population declines. Further, amphibians and reptiles within Oklahoma have received relatively little scientific study over the past century as compared to other regions of the continental United States. In addition, there are no organized reptile and amphibian monitoring programs in operation for the state. Hopefully, this study will be the beginning of a long-term monitoring program for mammals, reptiles and amphibians at Washita Battlefield National Historic Site.

We conducted surveys for mammals, reptiles and amphibians within eitght habitat types found within the park boundaries. Surveys were conducted in three distinct survey periods. Species composition within each habitat is discussed and dominant species of each habitat are identified. Changes in species occurrence across survey periods are linked to changes in vegetation within those habitats.

Materials and Methods

Mammal species were recorded by active live-trapping, surveying for sign, photographing and direct observation. Sixteen trapping stations were selected throughout the park to represent each major macrohabitat type (Figure 1). These sites were maintained throughout the study and marked with a numbered, wooden stake and a surveyor's flag. The stakes and flagging were removed at the conclusion of the study. Two trapping sessions were conducted: 30 July - 11 August 2000 and 8 - 20 May 2001. For the most part, vegetation at the park followed the descriptions of Stotts and DuBey (1998) with the following exceptions. At the time of their report, much of the area in the southwest quarter of the park was described as wheat fields. They indicate that transects were not taken in these areas due to mowing and reseeding operations that were underway. By the time of our first surveys in July 2000, wheat fields were no longer apparent and were replaced by weedy forbs and some grasses. We refer to these areas as *restored wheat fields*. Also, Stotts and DuBey (1998) describe a meadow south of the river in the northeast quarter of the park. This meadow had been plowed as part of the park's restoration effort and was predominantly bare soil during our surveys. We call this area plowed field. Survey stations and tracking plates were located in *upland range, restored wheat field, sandy prairie, south riparian, north bench, north flood plain, plowed field* and *river/riparian* (habitat

names closely follow those of Stotts and DuBey (1998)) (Figure 1, Table 1).

Survey stations consisted of one chipmunk-sized Tomahawk live-trap (12.7 x 12.7 x 40.8 cm [5.0 x 5.0 x 16.0 inches]; Tomahawk Live Trap, Tomahawk, Wisconsin) surrounded by one large Sherman live-trap (10.2 x 11.4 x 38.1 cm [4.0 x 4.5 x 15.0 inches]; H.B. Sherman Traps, Tallahassee, Florida) and three small Sherman live-traps (7.6 x 7.6 x 22.9 cm [3.0 x 3.0 x 9.0 inches]) placed along the four cardinal directions around the Tomahawk trap. Approximately 10 m from the center of each station, we placed a 5 m drift fence of garden edging. Sealed, 2 liter plant pots (pitfalls) were buried at each end and at the center of the fence and filled 1/4 full with water. Tomahawk traps were baited with mackerel, apples, cracked corn and a mixture of peanut butter and oats. Sherman traps were baited with apples and peanut butter and oats. A small wad of cotton was added to each Sherman trap during the trapping session to provide insulation and bedding material for any captures. Pitfalls were baited with peanut butter and oats. Traps were locked open for a 5 day pre-bait period , then unlocked, rebaited and checked daily for 7 days. All small mammals captured were identified to species, weighed, measured, sexed, aged, marked by toe clipping and released. Relative frequencies for each trapped species captured were determined by dividing the number of unique individuals captured by the number of functional trap nights. Functional trap nights were calculated by subtracting from the total potential number of trap nights 1.0 for traps that were not functional and 0.5 for traps that were disturbed, missing bait, or contained a recaptured individual (Songer et al. 1997). Trapping proceeded for seven days following a five day pre-bait.

At each trap station, habitat variables were recorded during each session. A 10 m rope, knotted at 1 m intervals, was laid on the ground at each cardinal direction from the center of the station. Therefore, there were 40 measurement points (4 - 10 m lines with 10 knots per line). Under each knot, we recorded the presence of grass, forb, bare soil, cacti, yucca, sticks/logs, shrubby/woody vegetation, leaf litter, rocks, water, or crop stubble. We also recorded vegetation height at each point in one of six categories: <10 cm, 11-25 cm, 26-50cm, 51-75cm, 76-100cm and >100 cm. Measurements were converted into a percentage of sampling points containing a particular vegetation type or belonging to a particular height category.

Plate stations consisted of a baited 1 m^2 metal tracking plate paired with an infrared triggered camera unit (Figure 2). Each plate was sprayed with a mixture of carpenter's chalk and alcohol. The alcohol quickly evaporated leaving the plate covered with a thin layer of chalk allowing prints to be recorded. Set-ups were checked periodically during the session to look for and identify prints and sign, replace film, rebait and check for the proper functioning of the equipment. The tracking stations ran throughout each of the 12 day trapping sessions. We also ran a third camera session from 16 - 25 February 2001 (Figure 3).

Herp species were recorded by active trapping at the survey stations described above (especially pitfall traps), surveys for sign and direct observation. Evening surveys for calling frogs were also conducted during the May 2001 session. Formal searches for herps were conducted during each trapping session. Surveyors would walk throughout the park, turning over logs, rocks, etc. to flush individuals. Walking surveys along the river were also conducted, looking for

individuals in or near the water. Informal searches were always conducted as we walked to and from our stations and drove throughout the park.

Results and Discussion

In all, 21 mammal species, 11 reptiles and 4 amphibians were detected by at least one survey method over the three survey sessions (Table 2). Forty-five (45) birds were recorded incidental to our survey efforts for mammals and herps (Table 3) giving a grand total of 81 species detected. We are about to begin formal and more thorough surveys for birds later this year.

Mammals:
Mammals were detected by trapping and tracking. The first trapping session (July/August 2000) produced the majority of our trapping success (Table 4). Session 2 (May 2001) only accounted for 18.5% of unique captures and no new species. This was perhaps due to the wet conditions during the second session, but most likely was a result of surveying in different seasons resulting in vegetation differences (especially vegetation height) between the two time periods (Table 5). In general, percent cover by different ground cover remained similar between late summer 2000 and spring 2001. However, vegetation height was reduced in the early growing period of May 2001. Available cover is often important for small mammal species and may have been a significant factor contributing to observed differences in trapping success between the two sessions.

Ten species of small mammal were trapped during two trapping sessions. The most common mammal trapped was the hispid cotton rat (*Sigmodon hispidus*) (Table 4). This species comprised 47.4% of all unique captures and was trapped at 10 of the 16 stations. Although very abundant, cotton rats were not detected north of the Washita River. No individuals were captured in the north bench or north flood plain habitats. In order of abundance, *Sigmodon* was followed by the white-footed mouse (*Peromyscus leucopus*; 12.7%, 10 stations), Ord's kangaroo rat (*Dipodomys ordii*; 8.7%, 1 station), hispid pocket mouse (*Chaetodipus hispidus*; 7.5%, 6 stations), thirteen lined-ground squirrel (*Spermophilus tridecemlineatus*; 6.9%, 2 stations), deer mouse (*Peromyscus maniculatus*; 5.2%, 5 stations), southern plains woodrat (*Neotoma micropus*; 4.0%, 6 stations), northern grasshopper mouse (*Onychomys leucogaster*; 4.0%, 3 stations), least shrew (*Cryptotis parva*; 2.3%, 4 stations) and western harvest mouse (*Reithrodontomys megalotis*; 1.2%, 2 stations). Striped skunks (*Mephitis mephitis*; 3 stations) and the Virginia opossum (*Didelphis virginianus*; 2 stations) were also trapped, but were not classified with the small mammals.

The most common species detected at the tracking plates were raccoon (*Procyon lotor*; 4 plates), striped skunk and opossum (3 plates each) and southern plains woodrat (2 plates). The armadillo (*Dasypus novemcinctus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*) and hispid cotton rat were each detected at one plate.

Upland range was represented by Station #1 and Plate #1 (Tables 6 and 7). Hispid cotton rats,

thirteen-lined ground squirrels and northern grasshopper mice were the common species of this habitat. Also present were deer mice, eastern cottontail, hispid pocket mice, striped skunk, western harvest mice and white-footed mice. Hispid cotton rats were only trapped during the first session, none were detected in May 2001. Grasshopper mice and thirteen-lined ground squirrels dominated the second trapping session in this habitat and would probably be most typical of this habitat type. This area also included old sign (oval-shaped holes in the ground) of the presence of American badgers,. However, there was no indication of recent activity and no pictures were taken of badgers. The vegetation changed little between the two sessions, but generally had shorter grasses and an increase in cover by forbs during the second trapping session (Table 5).

Restored wheat field sites were the most variable of any habitat type and were also the second most speciose (Tables 6 and 7). There were marked changes in vegetation height between the two trapping sessions although ground cover remained relatively similar (Table 5). This probably led to the observed differences in trap success between the two sessions given that during the first session, this habitat was the domain of the hispid cotton rat, producing the most unique captures than any other habitat type. However, not one cotton rat was trapped in these habitats during the May 2001 session. Hispid cotton rats are generalist species preferring heavy cover and the loss of cover between session 1 and session 2 may explain differences in trapping success. These habitats were represented by Station #2, #3 and #5 and Plate #2. Again, hispid cotton rats were the dominant species of this habitat, but it also included bobcat, deer mouse, hispid pocket mouse, least shrew, opossum, raccoon, striped skunk, thirteen-lined ground squirrel and western harvest mouse. Thirteen-lined ground squirrels were only trapped at Station #2 within this habitat type and were thus limited to Station #1 and #2 in the southeast quarter of the park.

Sandy prairie was represented by Station #4 in the southwest corner of the park (Tables 6 and 7). This site was the domain of the Ord's kangaroo rat. This habitat specialist was quite abundant, but was only found in this area of the park. Numbers were reduced between session 1 and session 2. This habitat also included deer mouse and northern grasshopper mouse, neither of which occurred in larger numbers.

The ***south riparian*** area is a wooded strip stretching east to west across the park, generally following the old railroad grade (Tables 6 and 7). This area was surveyed with Station #6, #7 and #8 and Plate #3. Again, hispid cotton rats were the most common species in this habitat type, but white-footed mice were also abundant. This habitat also included hispid pocket mice, least shrew, opossum, southern plains woodrat and striped skunk. Vegetation height and ground cover changed markedly for Station #6 and #8 between the two trapping sessions (Table 5). An increase in ground cover was evident under the canopy of Station #6 and vegetation height decreased for both stations between the trapping sessions. Station #7 did not change much as it is mostly leaf litter below the canopy. As with most of the other stations, trapping success was reduced in the second session.

The ***north bench*** was represented by Station #9 and Plate #6 (Tables 6 and 7). This is also a

wooded area similar to the south riparian. White-footed mice and southern plains woodrat were the common species of this habitat type, but also included armadillo, opossum and raccoon. In fact, this was the only habitat type in which armadillos were detected.

The ***north flood plain*** had the least diversity of any habitat type (Tables 6 and 7). The again, it was represented by just one site, Station #10. Deer mice were the only mammal species detected and they were not very abundant. All individuals were trapped during the first session. There were no captures during May 2001. Vegetation height decreased between the two sessions and an increase in grasses at the expense of some forbs was also observed (Table 5).

We had two stations (#11 and #12) within the ***plowed field*** between the south riparian and river riparian habitats stretching from the center of the park to the northeast corner (Tables 6 and 7). The field had been recently plowed before each visit, but was not plowed while we were working on the site. Hispid pocket mice were the most common species in this habitat, but also included deer mice, northern grasshopper mice, striped skunk and white-footed mice. Coyote and white-tailed deer tracks were occasionally found along the truck trail that separated the plowed field from river riparian vegetation. Vegetation characteristics changed very little between the two trapping sessions (Table 5). Nevertheless, fewer individuals were trapped in session 2 as opposed to session 1.

River/riparian habitat was represented by Station #13, #14, #15 and #16 and Plate #4 and #5 placed near the banks of the Washita River (Tables 6 and 7). Originally, Station #13 and #14 as well as Plate #4 were placed along the south bank of the river while Station #15 and #16 and Plate #5 were placed on the north bank of the river. During the second session Station #15 and #16 were moved to the south bank of the river due to flooding on the north side in the location of the original stations. Plate #5 remained on the north bank of the river, but was moved several meters from its original location. None of the stations or plates were flooded during the survey sessions. White-footed mice were the most common species in this habitat, followed closely by hispid cotton rats. Although only detected by prints and pictures and therefore not assigned density measures, raccoons were also very abundant along the river. This habitat also included coyote, least shrew, southern plains woodrat and striped skunk. White-tailed deer tracks were common at river crossings. Like the badger in upland range, there was old sign of the presence of beaver along the river. However, beaver were never seen and there was no evidence of recent activity. Ground cover did not change much between the two sessions, even with the change in station locations. Like most of the other stations, vegetation height was reduced between session 1 and session 2 (Table 5).

Reptiles and Amphibians:

Reptiles and amphibians were detected by trapping and direct observation. Herps were present in nearly all macrohabitats of the park, but most species were recorded along the river, either in the water on along its banks. Edge habitats, especially between plowed field and riparian vegetation, also produced a number of sightings. Only two herps (great plains narrowmouth toad (*Gastrophryne olivacea*) and prairie racerunner (*Cnemidophorus sexlineatus*)) were captured at mammal trapping stations, and they are listed with those stations in the above section. Herps

would also be expected to respond to vegetation changes, but this was not obvious in our results. That is, detection of herps did not seem to change between the two sessions. This is perhaps due to most detections being along the river, which did not change significantly between sessions.

By far the most common reptile on site was the prairie racerunner. It was often detected along the access road running parallel to the river. Racerunners were also trapped in restored wheat fields, sandy prairie, south riparian and river riparian. They were not detected in the north flood plain or the north bench. Texas horned lizards (*Phrynosoma cornutum*) were also seen regularly. They were most common along the vehicle access road running parallel to the river within restored wheat field habitat. They were also occasionally seen near the gate in the southeast corner of the park in upland range habitat.

Along the river, Blanchard's cricket frogs (*Acris crepitans*) were very common. Numerous individuals could be seen leaping into the water as we walked along the river bank. They could also be found in the ephemeral pools near the river that were filled by heavy rains during May 2001. Blotched (plainbelly) water snakes (*Nerodia erythrogaster*) were found in the river as well. A juvenile individual was also found which might indicate a breeding population. Bullfrogs (*Rana catesbeiana*) and plains leopard frogs (*Rana blairi*) were observed at several places along the river, but seemed to be more abundant in late summer 2000 than spring 2001. This may be due to the overflowing river during spring, 2001, reducing the number of sandy "perches" along the banks of the river. Bullfrogs were regularly heard calling during the first survey session.

Edge habitats were productive areas for herps. Lizards could often be found along the vehicle "trial" of the plowed field, next to river riparian habitat. The most abundant lizard in this habitat was the northern prairie lizard or fence lizard (*Sceloporus undulatus*) . The open plowed field provided good basking spots for the lizards to warm up in the morning. A black (Texas) rat snake (*Elaphe obsoleta*) was also found at the edge of the plowed field and river riparian habitat.

Although not productive for mammals, 3 snakes were found in the north flood plain: prairie kingsnake (*Lampropeltis calligaster*), prairie rattlesnake (*Crotalus viridis*) and western coachwhip (*Masticophis flagellum*). The rattlesnake was observed in the north flood plain by Kurt Foote, Natural Resources Specialist for the park, before our first survey began. A western coachwhip was also observed in river riparian habitat.

Other herps of interest include the great plains narrowmouth toad. This species was trapped at Station #5 in restored wheat field habitat. Ornate box turtles (*Terrapene ornata*) were observed several times in upland range habitat. An empty shell of a box turtle was found in the north flood plain, but live individuals were not detected here. It would not be unexpected to find them in this habitat, but the shell may also have been carried to this area by a carnivore or scavenger. Prairie ringneck snakes (*Diadophis punctatus*) were found under logs and debris in river riparian habitat. They were most common in the northeast corner of the park. Finally, western ribbon snakes (*Thamnophis proximus*) were observed at the entrance to the access road on the west side of the park and near Station #16 in river riparian vegetation.

Overall, a healthy abundance of species were detected at the battlefield site. Several species dominated in sheer numbers, but all taxa were well represented. There were no threatened or endangered species observed. We would recommend continued monitoring of mammal and herp species throughout the prairie restoration process along with a formal and more thorough survey of avian species. Species composition changes will likely be observed as the vegetation changes. Such information may be important for future projects that might have to work with and around sensitive species.

Acknowledgments

We thank Sarah Craighead and Kurt Foote of the National Park Service for the opportunity to conduct this research and for their logistical support during our field work. Pam Benjamin and Brian Carlstrom provided access to the GIS layers we used in Figure 1. Stephen Richter of the University of Oklahoma assisted with the herp surveys. We also thank the Oklahoma Biological Survey for access to vehicles.

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Figure 1. Trapping station and plate locations at Washita Battlefield National Historic Site surveyed 30 July – 11 August 2000, 16-25 February 2001, and 8-20 May 2001. Filled circles labeled "S" and "P" indicate locations of live-trapping surveys, and tracking plates, respectively.

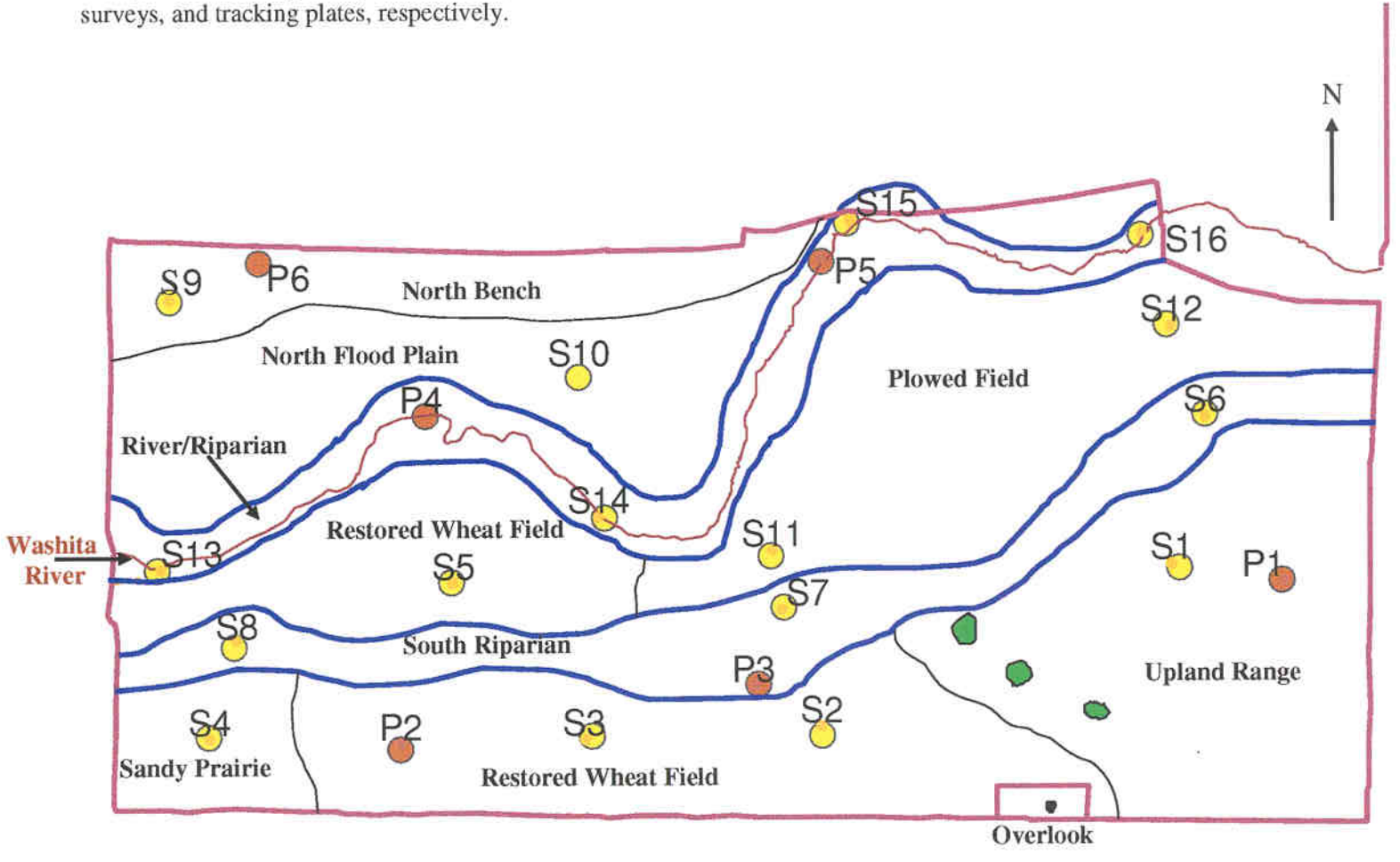

Figure 2. Field set-up of infra-red triggered cameras. The metal plate is sprayed with a mixture of carpenter's chalk and alcohol. The alcohol quickly evaporates leaving a thin layer of "printable" chalk. The plate is baited with raw beef and mackerel. In front of the plate we place herbivore bait consisting of a apples, corn, and a mixture of peanut butter and oats. The plunger unit with camera (absent in this photo) and infra-red sensor are attached to a wooden stake facing the plate.

Figure 3. Selected photographs taken from infra-red triggered cameras at Washita Battlefield National Historic Site, 2000 - 2001. See Figure 1 for plate locations.

Striped Skunk (*Mephitis mephitis*)
Plate #1, August 2000

Bobcat (*Lynx rufus*)
Plate #2, February 2001

Virginia opossum (*Didelphis virginia*)
Plate #3, August 2000

Coyote (*Canis latrans*)
Plate #4, February 2001

Raccoon (*Procyon lotor*)
Plate #5, August 2000

Southern plains woodrats
(*Neotoma micropus*)
Plate #5, August 2000

American Crows (*Corvus brachyrhynchos*)
Plate #5, August 2000

Raccoons (*Procyon lotor*)
Plate #6, May 2001

Table 1. Habitat types and locations of 16 trapping stations and 6 plate stations at Washita Battlefield National Historic Site. Sites were surveyed 30 July - 11 August 2000, 16-25 February 2001, and 8-20 May 2001.

Survey Location	Description	Latitude (N) Min.Deg.Sec	Longitude (W) Min.Deg.Sec.	Elevation (m)
Trapping Stations:				
1	Upland range; prairie; on hill; thick little blue-stem	35.37.13.9	99.41.54.2	609
2	Restored wheat field; weedy; thick vegetation	35.37.06.5	99.42.11.8	595
3	Restored wheat field; weedy; thick vegetation	35.37.05.8	99.42.23.7	597
4	Sandy prairie; sparse vegetation	35.37.05.8	99.42.42.6	608
5	Restored wheat field; weedy; thick vegetation	35.37.12.9	99.42.30.3	593
6	South riparian; closed canopy	35.37.20.6	99.41.52.6	607
7	South riparian; closed canopy; near railroad grade	35.37.11.8	99.42.13.8	593
8	South riparian; closed canopy; near railroad grade	35.37.10.2	99.42.41.3	602
9	North bench; partially closed canopy	35.37.25.6	99.42.44.7	592
10	North flood plain; weedy; thick vegetation	35.37.22.5	99.42.24.0	597
11	Plowed field	35.37.14.4	99.42.14.3	588
12	Plowed field	35.37.24.6	99.41.54.3	586
13	River riparian; south bank of river; open canopy	35.37.13.6	99.42.45.1	595
14	River riparian; south bank of river; open canopy	35.37.15.8	99.42.23.0	596
15	River riparian; north bank of river; partially closed canopy	35.37.29.0	99.42.10.5	591
16	River riparian; north bank of river; partially closed canopy	35.37.28.4	99.41.55.8	590
Plates / Cameras:				
1	Upland range; below prairie; weedy	35.37.13.1	99.41.48.5	598
2	Restored wheat field; along slough; weedy; thick vegetation	35.37.05.7	99.42.33.0	595
3	South riparian; railroad grade; near homestead	35.37.08.3	99.42.15.2	595
4	River riparian; south bank of river; open canopy	35.37.20.3	99.42.32.0	599
5	River riparian; north bank of river; open canopy	35.37.28.0	99.42.11.9	597
6	North bench; closed canopy	35.37.27.2	99.42.40.5	593

Table 2. Mammal and herp species detected at Washita Battlefield National Historic Site: 30 July - 11 August 2000, 16-25 February 2000, and 8-20 May 2001. Method of detection, locations detected, and habitats also given.

Species	Scientific Name	Detection Method	Station(s)	Plate(s)	Habitats Detected *
Mammals:					
American Badger	*Taxidea taxus*	Sign	-----	-----	a
Armadillo	*Dasypus novemcinctus*	Pictures	-----	6	e
Beaver	*Castor canadensis*	Sign	-----	-----	h
Bobcat	*Lynx rufus*	Pictures	-----	2	b
Coyote	*Canis latrans*	Tracks, scat, pictures	-----	4	g, h
Deer Mouse	*Peromyscus maniculatus*	Trap	1, 3, 4, 10, 12	-----	a, b, c, f, g
Eastern Cottontail	*Sylvilagus floridanus*	Sight	-----	-----	a
Hispid Cotton Rat	*Sigmodon hispidus*	Trap, Pictures	1, 2, 3, 5, 6, 7, 8, 14, 15, 16	3	a, b, d, h
Hispid Pocket Mouse	*Chaetodipus hispidus*	Trap	1, 2, 3, 5, 7, 11	-----	a, b, d, g
Least Shrew	*Cryptotis parva*	Trap	2, 3, 6, 15	-----	b, d, h
Northern Grasshopper Mouse	*Onychomys leucogaster*	Trap	1, 4, 11	-----	a, c, g
Opossum	*Didelphis virginianus*	Pictures, trap, tracks	7, 8	2, 3, 6	b, d, e
Ord's Kangaroo Rat	*Dipodomys ordii*	Trap	4	-----	c
Pocket Gopher	*Cratogeomys/Pappogeomys sp.*	Sign	-----	-----	i
Raccoon	*Procyon lotor*	Pictures, tracks	-----	2, 4, 5, 6	b, e, h
Southern Plains Woodrat	*Neotoma mexicanus*	Trap, Pictures	6, 8, 9, 13, 15, 16	5, 6	d, e, h
Striped Skunk	*Mephitis mephitis*	Pictures, trap, tracks	1, 8, 11	1, 2, 5	a, b, d, g, h
Thirteen-lined Ground Squirrel	*Spermophilus tridecemlineatus*	Trap	1, 2	-----	a, b
Western Harvest Mouse	*Reithrodontomys megalotis*	Trap	1, 3	-----	a, b
White-footed Mouse	*Peromyscus leucopus*	Trap	1, 6, 7, 8, 9, 12, 13, 14, 15, 16	-----	a, d, e, g, h
White-tailed Deer	*Odocoileus virginianus*	Tracks	-----	-----	g, h
Herps:					
Black (Texas) Rat Snake	*Elaphe obsoleta*	Sight	-----	-----	g, h
Blanchard's Cricket Frog	*Acris crepitans*	Sight, call	-----	-----	h
Blotched (Plainbelly) Water Snake	*Nerodia erythrogaster*	Sight	-----	-----	h
Bullfrog	*Rana catesbeiana*	Sight	-----	-----	h
Great Plains Narrowmouth Toad	*Gastrophryne olivacea*	Trap	5	-----	b
Northern Prairie Lizard (Fence Lizard)	*Sceloporus undulatus*	Sight	-----	-----	g, h
Ornate Box Turtle	*Terrapene ornata*	Sight, sign	-----	1	a
Plains Leopard Frog	*Rana blairi*	Sight	-----	-----	h
Prairie Kingsnake	*Lampropeltis calligaster*	Sight	-----	-----	f
Prairie Racerunner	*Cnemidophorus sexlineatus*	Sight, trap	4, 5, 6, 7, 13, 14	-----	b, c, d, h
Prairie Rattlesnake	*Crotalus viridis*	Sight	-----	-----	f
Prairie Ringneck Snake	*Diadophis punctatus*	Sight	-----	-----	h
Texas Horned Lizard	*Phrynosoma cornutum*	Sight	-----	-----	a, b
Western Coachwhip	*Masticophis flagellum*	Sight	-----	-----	f, h
Western Ribbon Snake	*Thamnophis proximus*	Sight	-----	-----	b, h

* Habitats: a-Upland Range, b-Restored Wheat Field, c-Sandy Prairie, d-South Riparian, e-North Bench, f-North Flood Plain, g- Plowed Field, h-River Riparian, i-Overlook.

Table 3. List of bird species recorded incidentally from Washita Battlefield National Hisoric Site: 30 July - 11 August 2000, 16-25 February 2001, and 8-20 May 2001.

Species	Scientific Name	Detection Method	Station(s)	Plate(s)
American Crow	*Corvus brachyrhynchos*	Sight, Pictures	-----	1, 5
American Goldfinch	*Carduelis tristis*	Sight	-----	-----
American Kestrel	*Falco sparverius*	Sight	-----	-----
Barn Swallow	*Hirundo rustica*	Sight (nest at overlook)	-----	-----
Bewick's Wren	*Thryomanes bewickii*	Sight, call	-----	-----
Blue Grosbeak	*Guiraca caerulea*	Sight	-----	-----
Blue Jay	*Cyanocitta cristata*	Call	-----	-----
Blue-gray Gnatcatcher	*Polioptila caerulea*	Sight, call	-----	-----
Brown-headed Cowbird	*Molothrus ater*	Sight, call	-----	-----
Carolina Chickadee	*Poecile carolinensis*	Sight, call	-----	-----
Cassin's Sparrow	*Aimophila cassinii*	Sight, call	-----	-----
Cliff Swallow	*Petrochelidon pyrrhonota*	Sight	-----	-----
Common Grackle	*Quiscalus quiscula*	Sight	-----	-----
Common Nighthawk	*Chordeiles minor*	Sight, call	-----	-----
Dickcissel	*Spiza americana*	Call	-----	-----
Downy Woodpecker	*Picoides pubescens*	Sight, call	-----	-----
Eastern Meadowlark	*Sturnella magna*	Sight, call	-----	-----
Eastern Phoebe	*Sayornis phoebe*	Call	-----	-----
Field Sparrow	*Spizella pusilla*	Call	-----	-----
Grasshopper Sparrow	*Ammodramus savannarum*	Call	-----	-----
Great Blue Heron	*Ardea herodias*	Sight	-----	-----
Great Crested Flycatcher	*Myiarchus crinitus*	Sight, call	-----	-----
Greater Roadrunner	*Geococcyx californianus*	Sight	-----	-----
Green Heron	*Butorides virescens*	Sight	-----	-----
Hairy Woodpecker	*Picoides villosus*	Sight	-----	-----
Indigo Bunting	*Passerina cyanea*	Sight, call	-----	-----
Killdeer	*Charadrius vociferus*	Sight	-----	-----
Lark Sparrow	*Chondestes grammacus*	Sight	-----	-----
Mississippi Kite	*Ictinia mississippiensis*	Sight	-----	-----
Mourning Dove	*Zenaida macroura*	Sight	-----	-----
Northern Bobwhite	*Colinus virginianus*	Trap, sight, call	15	-----

Northern Cardinal	*Cardinalis cardinalis*	Sight, call	-----	-----
Northern Flicker	*Colaptes auratus*	Sight, call	-----	-----
Red-bellied Woodpecker	*Melanerpes carolinus*	Sight, call	-----	-----
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Sight, call	-----	-----
Red-tailed Hawk	*Buteo jamaicensis*	Sight	-----	-----
Red-winged Blackbird	*Agelaius phoeniceus*	Sight	-----	-----
Scissor-tailed Flycatcher	*Tyrannus forficatus*	Sight	-----	-----
Swainson's Hawk	*Buteo swainsoni*	Sight	-----	-----
Turkey Vulture	*Cathartes aura*	Sight	-----	-----
Upland Sandpiper	*Bartramia longicauda*	Sight, call	-----	-----
Western Kingbird	*Tyrannus verticalis*	Sight	-----	-----
Western Meadowlark	*Sturnella neglecta*	Sight, call	-----	-----
Wild Turkey	*Meleagris gallopavo*	Sight	-----	-----
Yellow-billed Cuckoo	*Coccyzus americanus*	Call	-----	-----

Table 4. Number of unique mammals trapped and functional trap nights at each station for Washita Battlefield National Historic Site. See Figure 1 for station locations.

		Mammal Trapping (# Unique Individuals)										Functional Trap Nights			
Date	Station	Chhi	Crpa	Dior	Nemi	Onle	Pele	Pema	Reme	Sihi	Sptr	T	LgSh	SmSh	Pits
30 July - 11 August 2000	1	1	0	0	0	2	1	2	1	8	3	6.5	6.5	17.5	36.0
30 July - 11 August 2000	2	0	1	0	0	0	0	0	0	18	4	6.0	6.0	19.5	36.0
30 July - 11 August 2000	3	0	1	0	0	0	0	1	1	15	0	4.5	5.5	17.5	36.0
30 July - 11 August 2000	4	0	0	11	0	2	0	0	0	0	0	6.0	5.5	16.0	36.0
30 July - 11 August 2000	5	0	0	0	0	0	0	0	0	16	0	6.0	5.5	18.0	36.0
30 July - 11 August 2000	6	0	1	0	2	0	1	0	0	10	0	4.5	6.5	17.0	36.0
30 July - 11 August 2000	7	2	0	0	0	0	2	0	0	1	0	5.0	5.5	15.0	36.0
30 July - 11 August 2000	8	0	0	0	1	0	2	0	0	6	0	6.5	6.0	16.0	36.0
30 July - 11 August 2000	9	0	0	0	1	0	1	0	0	0	0	4.0	5.5	14.0	36.0
30 July - 11 August 2000	10	0	0	0	0	0	0	3	0	0	0	4.5	5.0	17.0	36.0
30 July - 11 August 2000	11	3	0	0	0	1	0	0	0	0	0	6.0	6.0	20.5	36.0
30 July - 11 August 2000	12	0	0	0	0	0	0	1	0	0	0	5.5	5.0	20.0	36.0
30 July - 11 August 2000	13	0	0	0	1	0	2	0	0	0	0	3.5	4.0	12.5	36.0
30 July - 11 August 2000	14	0	0	0	0	0	0	0	0	2	0	3.5	3.5	12.5	36.0
30 July - 11 August 2000	15	0	1	0	1	0	2	0	0	1	0	4.0	4.5	11.5	36.0
30 July - 11 August 2000	16	0	0	0	1	0	0	0	0	4	0	4.5	4.5	11.0	36.0
	Site Summary	6	4	11	7	5	11	7	2	81	7	80.5	85.0	255.5	576.0
	Capture %	4.3	2.8	7.8	5.0	3.5	7.8	5.0	1.4	57.4	5.0				
8 May - 20 May 2001	1	0	0	0	0	2	0	0	0	0	3	7.0	7.0	19.0	36.0
8 May - 20 May 2001	2	5	0	0	0	0	0	0	0	0	2	5.5	5.0	16.5	36.0
8 May - 20 May 2001	3	1	0	0	0	0	0	0	0	0	0	4.0	5.0	13.5	36.0
8 May - 20 May 2001	4	0	0	4	0	0	0	2	0	0	0	6.0	6.0	19.0	36.0
8 May - 20 May 2001	5	1	0	0	0	0	0	0	0	0	0	7.0	7.0	20.0	36.0
8 May - 20 May 2001	6	0	0	0	0	0	0	0	0	0	0	3.5	4.5	12.0	36.0
8 May - 20 May 2001	7	0	0	0	0	0	1	0	0	0	0	4.0	5.0	12.5	36.0
8 May - 20 May 2001	8	0	0	0	0	0	2	0	0	0	0	5.0	6.5	14.0	36.0
8 May - 20 May 2001	9	0	0	0	0	0	1	0	0	0	0	3.5	3.5	13.0	36.0
8 May - 20 May 2001	10	0	0	0	0	0	0	0	0	0	0	6.0	7.0	20.5	36.0
8 May - 20 May 2001	11	0	0	0	0	0	0	0	0	0	0	5.5	5.5	14.0	36.0
8 May - 20 May 2001	12	0	0	0	0	0	1	0	0	0	0	4.5	4.5	14.0	36.0
8 May - 20 May 2001	13	0	0	0	0	0	2	0	0	0	0	3.5	4.0	11.5	36.0
8 May - 20 May 2001	14	0	0	0	0	0	2	0	0	0	0	4.0	5.0	13.0	36.0
8 May - 20 May 2001	15	0	0	0	0	0	1	0	0	1	0	5.0	4.5	13.5	36.0
8 May - 20 May 2001	16	0	0	0	0	0	1	0	0	0	0	4.5	4.0	12.5	36.0
	Site Summary	7	0	4	0	2	11	2	0	1	5	78.5	84.0	238.5	576.0
	Capture %	21.9	0.0	12.5	0.0	6.3	34.4	6.3	0.0	3.1	15.6				
Totals	1	1	0	0	0	4	1	2	1	8	6	13.5	13.5	36.5	72.0
Totals	2	5	1	0	0	0	0	0	0	18	6	11.5	11.0	36.0	72.0
Totals	3	1	1	0	0	0	0	1	1	15	0	8.5	10.5	31.0	72.0
Totals	4	0	0	15	0	2	0	2	0	0	0	12.0	11.5	35.0	72.0
Totals	5	1	0	0	0	0	0	0	0	16	0	13.0	12.5	38.0	72.0
Totals	6	0	1	0	2	0	1	0	0	10	0	8.0	11.0	29.0	72.0
Totals	7	2	0	0	0	0	3	0	0	1	0	9.0	10.5	27.5	72.0
Totals	8	0	0	0	1	0	4	0	0	6	0	11.5	12.5	30.0	72.0
Totals	9	0	0	0	1	0	2	0	0	0	0	7.5	9.0	27.0	72.0
Totals	10	0	0	0	0	0	0	3	0	0	0	10.5	12.0	37.5	72.0
Totals	11	3	0	0	0	1	0	0	0	0	0	11.5	11.5	34.5	72.0
Totals	12	0	0	0	0	0	1	1	0	0	0	10.0	9.5	34.0	72.0
Totals	13	0	0	0	1	0	4	0	0	0	0	7.0	8.0	24.0	72.0
Totals	14	0	0	0	0	0	2	0	0	2	0	7.5	8.5	25.5	72.0
Totals	15	0	1	0	1	0	3	0	0	2	0	9.0	9.0	25.0	72.0
Totals	16	0	0	0	1	0	1	0	0	4	0	9.0	8.5	23.5	72.0
	Site Summary	13	4	15	7	7	22	9	2	82	12	159.0	169.0	494.0	1152.0
	Capture %	7.5	2.3	8.7	4.0	4.0	12.7	5.2	1.2	47.4	6.9				

Table 5. Vegetation height and ground cover from each trapping station, Washita Battlefield National Historic Site. Raw numbers were converted to percentage of sampling points at each station with a certain height category or of a certain ground cover type.

		% Veg. Ht. (cm) *						% Ground Cover *										
Date	Station	<10	11-25	26-50	51-75	76-100	>100	Grass	Forb	Soil	Cacti	Yucca	Stick / Log	Shrub	Litter	Rock	Crop	Water
August 2000	1	32.5	40.0	22.5	5.0	0.0	0.0	40.0	37.5	20.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0
August 2000	2	17.5	10.0	42.5	20.0	2.5	7.5	52.5	32.5	12.5	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0
August 2000	3	2.5	5.0	67.5	22.5	0.0	2.5	62.5	32.5	2.5	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0
August 2000	4	57.5	22.5	20.0	0.0	0.0	0.0	37.5	0.0	62.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
August 2000	5	5.0	12.5	42.5	25.0	15.0	0.0	17.5	67.5	2.5	0.0	0.0	5.0	5.0	2.5	0.0	0.0	0.0
August 2000	6	57.5	15.0	12.5	10.0	5.0	0.0	25.0	10.0	2.5	0.0	0.0	12.5	0.0	50.0	0.0	0.0	0.0
August 2000	7	57.5	17.5	5.0	5.0	7.5	7.5	0.0	22.5	5.0	0.0	0.0	32.5	0.0	40.0	0.0	0.0	0.0
August 2000	8	47.5	12.5	7.5	12.5	5.0	15.0	0.0	32.5	12.5	0.0	0.0	2.5	5.0	37.5	0.0	10.0	0.0
August 2000	9	7.5	27.5	52.5	10.0	2.5	0.0	67.5	25.0	0.0	0.0	0.0	0.0	2.5	5.0	0.0	0.0	0.0
August 2000	10	5.0	22.5	52.5	17.5	2.5	0.0	32.5	60.0	0.0	0.0	0.0	0.0	0.0	7.5	0.0	0.0	0.0
August 2000	11	97.5	2.5	0.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0
August 2000	12	97.5	2.5	0.0	0.0	0.0	0.0	0.0	10.0	72.5	0.0	0.0	0.0	0.0	0.0	0.0	17.5	0.0
August 2000	13	30.0	25.0	32.5	2.5	5.0	5.0	60.0	12.5	7.5	0.0	0.0	0.0	0.0	7.5	0.0	0.0	12.5
August 2000	14	17.5	32.5	25.0	17.5	5.0	2.5	57.5	17.5	5.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	10.0
August 2000	15	25.0	37.5	17.5	10.0	5.0	5.0	47.5	30.0	10.0	0.0	0.0	7.5	0.0	0.0	0.0	0.0	5.0
August 2000	16	25.0	12.5	20.0	27.5	7.5	7.5	62.5	17.5	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5
May 2001	1	45.0	42.5	7.5	2.5	2.5	0.0	37.5	47.5	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
May 2001	2	30.0	42.5	20.0	7.5	0.0	0.0	47.5	32.5	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
May 2001	3	7.5	55.0	30.0	7.5	0.0	0.0	55.0	32.5	5.0	0.0	0.0	0.0	7.5	0.0	0.0	0.0	0.0
May 2001	4	72.5	22.5	5.0	0.0	0.0	0.0	40.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
May 2001	5	25.0	50.0	25.0	0.0	0.0	0.0	35.0	50.0	5.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
May 2001	6	45.0	27.5	25.0	2.5	0.0	0.0	67.5	5.0	0.0	0.0	0.0	10.0	0.0	17.5	0.0	0.0	0.0
May 2001	7	65.0	12.5	20.0	2.5	0.0	0.0	20.0	7.5	7.5	0.0	0.0	15.0	0.0	50.0	0.0	0.0	0.0
May 2001	8	40.0	40.0	12.5	7.5	0.0	0.0	55.0	7.5	0.0	0.0	0.0	10.0	7.5	20.0	0.0	0.0	0.0
May 2001	9	17.5	10.0	40.0	27.5	2.5	2.5	55.0	22.5	0.0	0.0	0.0	0.0	2.5	20.0	0.0	0.0	0.0
May 2001	10	7.5	52.5	32.5	5.0	0.0	2.5	57.5	20.0	12.5	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
May 2001	11	95.0	2.5	2.5	0.0	0.0	0.0	0.0	7.5	72.5	0.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0
May 2001	12	90.0	10.0	0.0	0.0	0.0	0.0	0.0	17.5	67.5	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0
May 2001	13	45.0	35.0	12.5	2.5	2.5	2.5	75.0	0.0	10.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	12.5
May 2001	14	20.0	17.5	40.0	10.0	7.5	5.0	55.0	12.5	5.0	0.0	0.0	7.5	10.0	0.0	0.0	0.0	10.0
May 2001	15	60.0	17.5	22.5	0.0	0.0	0.0	47.5	15.0	22.5	0.0	0.0	5.0	0.0	2.5	0.0	0.0	7.5
May 2001	16	52.5	22.5	20.0	5.0	0.0	0.0	65.0	5.0	5.0	0.0	0.0	2.5	5.0	7.5	0.0	0.0	10.0

* Numbers represent % of 40 sampling points occurring in a particular height category or having a particular ground cover at each station. Forty sampling points were measured at each station. At each point, vegetation was recorded in a height category and having a ground cover. Sampling was conducted in the same manner for each trapping session.

Table 6. Mammal and herp species detected by habitat, Washita Battlefield National Historic Site: 30 July - 11 August 2000, 16-25 February 2000, and 8-20 May 2001. Detections by trapping, cameras, and incidental.

Habitat Type	Locations (S=Station, P=Plate)	# Mammal Species	# Herp Species	Species Recorded *
Upland Range	S1, P1	11	2	a, j, k, m, n, p, t, v, cc, dd, ee, gg, ii
Restored Wheat Field	S2, S3, S5, P2	10	4	g, j, l, m, n, o, r, x, aa, cc, dd, ee, gg, hh
Sandy Prairie	S4	3	1	j, p, s, x
South Riparian	S6, S7, S8, P3	7	1	m, n, o, r, x, bb, cc, ii
North Bench	S9, P6	5	0	b, r, aa, bb, ii
North Flood Plain	S10	1	3	j, w, y, ff
Plowed Field	S11, S12	7	2	i, d, j, n, p, q, cc, ii, jj
River/Riparian	S13, S14, S15, S16, P4, P5	9	10	c, d, e, f, h, i, m, o, q, u, x, z, aa, bb, cc, ff, hh, ii, jj

* Species List: a-American badger, b-armadillo, c-beaver, d-black (Texas) rat snake, e-Blanchards's cricket frog, f-blotched (plainbelly) water snake, g-bobcat, h-bullfrog, i-coyote, j-deer mouse, k-eastern cottontail, l-great plains narrowmouth toad, m-hispid cotton rat, n-hispid pocket mouse, o-least shrew, p-northern grasshopper mouse, q-northern prairie lizard (fence lizard), r-opossum, s-Ord's kangaroo rate, t-ornate box turtle, u-plains leopard frog, v-pocket gopher, w-prairie kingsnake, x-prairie racerunner, y-prairie rattlesnake, z-prairie ringneck snake, aa-raccoon, bb-southern plains woodrat, cc-striped skunk, dd-Texas horned lizard, ee-thirteen-lined ground squirrel, ff-western coachwhip, gg-western harvest mouse, hh-western ribbon snake, ii-white-footed mouse, jj-white-tailed deer.

Table 7. Mammal and herp species detected at trapping and plate stations, Washita Battlefield National Historic Site: 30 July - 11 August 2000, 16-25 February 2000, and 8-20 May 2001.

Location	# Mammal Species	# Herp Species	Species Recorded *
Station 1	8	0	d, e, f, h, m, n, o, p
Station 2	4	0	e, f, g, n
Station 3	5	0	d, e, f, g, o
Station 4	3	1	d, h, j, s
Station 5	2	2	e, f, q, s
Station 6	4	1	e, g, l, p, s
Station 7	5	0	e, g, l, p, s
Station 8	5	0	e, i, l, m, p
Station 9	2	0	l, p
Station 10	1	0	d
Station 11	3	0	f, h, m,
Station 12	2	0	d, p
Station 13	2	1	l, p, s
Station 14	2	1	e, p, s
Station 15	4	0	e, g, l, p
Station 16	3	0	e, l, p
Plate 1	1	1	m, r
Plate 2	4	0	b, i, k, m
Plate 3	2	0	e, i
Plate 4	2	0	c, k
Plate 5	5	0	k, l, m
Plate 6	4	0	a, i, k, l

* Species List: a-armadillo, b-bobcat, c-coyote, d-deer mouse, e-hispid cotton rat, f-hispid pocket mouse, g-least shrew, h-northern grasshopper mouse, i-opossum, j-Ord's kangaroo rat, k-raccoon, l-southern plains woodrat, m-striped skunk, n-thirteen-lined ground squirrel, o-western harvest mouse, p-white-footed mouse, q-great plains narrowmouth toad, r-ornate box turtle, s-prairie racerunner.