

INVENTORY OF MAMMALS AT SHILOH NATIONAL MILITARY PARK

FINAL REPORT—2007



Prepared for:

United States Department of the Interior
National Park Service
Shiloh National Military Park
1055 Pittsburg Landing Road
Shiloh, Tennessee 38376

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FOREWORD

The following pages present a final report for work relating to an inventory of the mammals (other than bats) at Shiloh National Military Park. This investigation draws from collections made at Shiloh National Park recently (2005 and 2006) and from material collected at Shiloh National Military Park during 1983 and 1984, which is housed in the Collection of Mammals at The University of Memphis. Dr. Michael L. Kennedy was the principal investigator for both projects. While this investigation focused on mammals other than bats, one species of bat (Rafinesque's big-eared bat, *Corynorhinus rafinesquii*) was sighted during this study. Because this bat has not previously been recorded on the park, information pertaining to this sighting is given in Appendix I. Additionally, to make the report more complete, Appendix II provides GPS coordinates for selected plots, and Appendix III provides photographic information (a photo log). Scientific and common names followed Choate et al. (1994) or Schwartz and Schwartz (2001). However, interested readers should be aware of the taxonomic revisions of Wilson and Reeder (2005).

ACKNOWLEDGMENTS

Thanks are extended to personnel at Shiloh National Military Park for their help in many aspects of the study. Several students (graduate and undergraduate) from The University of Memphis assisted in fieldwork. The investigation was funded in part by the National Park Service.

INVENTORY OF MAMMALS AT SHILOH NATIONAL MILITARY PARK

ABSTRACT—An inventory of the mammals (other than bats) at Shiloh National Military Park (SNMP) in Hardin County, Tennessee, was conducted during 2005 and 2006. Purposes of the work were to: (1) document at least 90% of the species reasonably expected to occur at SNMP; (2) describe the distribution and, if possible, relative abundance of species of special concern occurring on the park; and (3) provide baseline information on the distribution, abundance, and habitat association of mammalian populations at the site. Survey methods included trapping (utilizing Sherman live traps and pitfall traps), scent-station procedures, cameras at bait stations, general observations, and spotlight surveys. Additionally, specimens housed in the Mammal Collection at The University of Memphis were examined. Twenty-nine species of mammals, representing 7 orders and 14 families, were confirmed at SNMP. The white-footed mouse (*Peromyscus leucopus*) was the most common small mammal recorded. Eastern moles (*Scalopus aquaticus*), raccoons (*Procyon lotor*), and white-tailed deer (*Odocoileus virginianus*) had site-wide distributions and were among the more common mammals occurring at the park. No state or federally listed endangered or threatened species was documented during the investigation. Overall, biodiversity at the site approached that known for western Tennessee. Therefore, SNMP represents an important area for sustaining mammalian biodiversity in the region.

INTRODUCTION

In 2004, an investigation was initiated by the National Park Service (NPS) to survey the mammalian biodiversity at Shiloh National Military Park (SNMP) in western Tennessee (Hardin County). The work was part of a broad study to inventory the mammalian biodiversity (species richness) on lands governed by the NPS. In 1983 and 1984, an inventory of mammals at SNMP was conducted by personnel from The University of Memphis, and collections made during this work are housed in the Mammal Collection (UM) at The University of Memphis. This work was summarized by Kennedy (1984). However, at the present time, little published data are available relating to occurrences of mammalian species in western Tennessee. Yet, the collections made during 1983 and 1984 at SNMP coupled with the report of Kennedy (1991) relating to the mammals of western Tennessee provide a strong base from which to develop a more complete understanding of the mammalian biodiversity at this site. Such detailed studies have been conducted at only a few locations in the region. Because regional biotas usually contain more species than are found in any single locality or habitat type, limits exist as to species richness at the local levels (Meffe et al. 1997). Consequently, sustainability of natural resources requires an understanding of biodiversity measures, such as species richness, at local levels as well as at larger scales. Therefore, results of the present investigation should provide valuable information for conservation and management decisions at SNMP.

SNMP makes an interesting area for study. It represents a unit of land (rural and relatively undisturbed except by visitors) that exemplifies an island of somewhat natural and mature habitat. Surrounding areas have been impacted by agricultural practices,

clear-cutting, erosion, and other sources associated with human activity. However, SNMP's location in the Tennessee River Valley and the diversity of habitats occurring on the site provides for the potential occurrence of a number of mammalian species. Therefore, an understanding of the biodiversity at SNMP could be important to understanding the biodiversity of the region.

Purposes of the present study were to survey the mammalian biodiversity at SNMP. Specifically, goals were to: (1) document at least 90% of the mammals reasonably expected to occur on the site; (2) describe the distribution and, if possible, relative abundance of species of special concern occurring on the park; and (3) provide baseline information on the distribution, abundance, and habitat association of mammalian populations occurring on the site.

STUDY AREA

SNMP (established in 1894) was located in Hardin County, Tennessee (Fig. 1), and consisted of approximately 1700 ha (4200 acres). Much of the eastern boundary of the park followed the western edge of the Tennessee River (Fig. 2). The park consisted primarily of upland and bottomland forest characteristic of the region. Generally, upland forest was comprised of oaks (*Quercus* spp.), hickories (*Carya* spp.), maples (*Acer* spp.), sweetgum (*Liquidambar styraciflua*), and juniper (*Juniperus virginiana*) on ridge tops and beech (*Fagus grandifolia*), cottonwood (*Populus deltoids*), and yellow poplar (*Liriodendron tulipifera*) in hollows. Bottomland forest was dominated by oaks, water tupelo (*Nyssa aquatica*), green ash (*Fraxinus pennsylvanica*), cottonwood, sycamore (*Platanus occidentalis*), and sweetgum. A number of agricultural fields and mowed areas

occurred on the park. Topography of uplands consisted of alternating ridge tops and hollows with steep slopes, while bottomlands were generally flat. Several streams and beaver ponds were located on the site. Representative photographs of the study area are given as Figs. 3-6. Elevation ranged from about 110 m (360 ft) to 177 m (580 ft).

MATERIALS AND METHODS

Randomly selected, 1-ha plots ($n = 21$) were established throughout SNMP (Fig. 7). Survey techniques at these sites and other selected locations included trapping utilizing Sherman live traps (7.5 x 9 x 23 cm; H. B. Sherman Traps, Inc., Tallahassee, Florida) and pitfall traps (plastic containers, 19 cm deep and 14 cm wide). Additionally, scent-station procedures were conducted at plot sites, bait/camera stations were employed at selected localities, and spotlight surveys were conducted from roads. Habitat types on SNMP not sufficiently represented in the randomly selected plots but judged good habitat for small mammals also were selected for sampling to maximize the survey effort. Sightings of species and signs of species (e.g., tracks, fecal material, and beaver dams) also were recorded. Verification of the occurrence of species on SNMP was by actual voucher specimen (voucher = specimen taken to verify the presence of a species on the site during the study), photograph of specimen, photograph of sign characteristic of a species, or confirmed sighting by knowledgeable individuals. At this time, voucher specimens are housed in the collection of mammals at The University of Memphis.

Sherman live traps were set during 2005 and 2006 in various microhabitats at plot sites and other selected locations (Fig. 8). Sampling was conducted in fall, winter, and spring (seasons with greatest capture success for small mammals). Usually, traps were

placed in microhabitats within sites that were judged to have the greatest opportunity for capture (e.g., in thick ground cover, adjacent to down logs, near water sources). At each of the randomly selected plots, small mammals were sampled utilizing 50 Sherman traps in place over 2 consecutive nights. This resulted in 100 trap nights (trap night = 1 trap set for 1 night) at each of 21 plots. In total, the procedures included approximately 3850 trap nights. Traps were baited with rolled oats and checked daily. Upon capture, individuals were identified to species and, in most cases, sex and age determined. Selected individuals were photographed, and animals released were at the site of capture.

Pitfall traps (see Jones et al., 1996) were placed in the ground with the rim of the container at surface level at all randomly selected sites (Fig. 7). Traps were not baited or filled with fluid. They were placed in microhabitats where shrews were likely to occur (e.g., adjacent to down logs or decaying stumps; in thick vegetation). Pitfall traps were maintained for 10 nights during either October or November 2005 at plot sites (those randomly selected). This resulted in 2100 pitfall-trap nights (pitfall trap night = 1 pitfall trap set for 1 night).

Scent-station procedures followed those outlined in Leberg and Kennedy (1987). Each scent station consisted of a circle of sifted sand 1 m in diameter. A cotton ball saturated with bobcat urine was attached to a wooden applicator stick placed in the center of the circle. Stations were operated for 1 night. Presence or absence of tracks was noted. This procedure allowed for verification of the occurrence of species utilizing records from tracks. A single station was placed at each plot site (Fig. 7) in areas likely to represent a travel corridor for medium to large mammals. This resulted in 21 scent-station nights (scent-station night = 1 scent station set for 1 night) during the study.

Additionally, when tracks were observed at other sites on the landscape, they were generally noted.

Three bait stations were placed at ground level, and 6 were established at an arboreal level. Locations are shown in Fig 9. Ground-level stations were baited with shelled corn and, occasionally, canned cat food, and arboreal stations with mixed-bird feed. Baiting was done prior to setting up infrared-triggered cameras in order to allow mammals time to locate bait and, thus, enhance the number of pictures taken during the time of recording. Cameras for ground level investigation (Fig. 10) were mounted 0.5 m to 1 m (1.6 ft to 3.3 ft) off the ground on an available tree in a direction facing the corn. Arboreal cameras were mounted on trees at a height of about 4 m to 5 m (approximately 13 ft to 16 ft; Fig. 11). Cameras overlooked bait which was placed on a small L-shaped platform attached to an adjacent tree about 2 m (6.5 ft) away (Fig. 11). Bait and cameras were checked at least bi-weekly. Film and batteries for cameras were changed as needed. Bait/camera stations were utilized during all seasons of the year.

Sightings of mammals and sightings of tracks and other signs of mammals were recorded across the park when there was opportunity. Field guides (Murie 1974; Elbroch 2003) were used to verify tracks and signs of species.

RESULTS

In total, 42 species were considered to have some potential for occurring at SNMP (Table 1). Of these, 34 species were considered to have a high probability for occurrence, while 8 were considered to have only a low potential for presence on the site

(Table 1). Mammals captured or identified (with some form of documentation) numbered 29 species and are given in Table 2.

Species documented at SNMP represented 7 orders and 14 families (Order Didelphimorphia, Family Didelphidae; Order Insectivora, families Soricidae and Talpidae; Order Xenarthra, Family Dasypodidae; Order Lagomorpha, Family Leporidae; Order Rodentia, families Sciuridae, Castoridae, and Muridae; Order Carnivora, families Canidae, Procyonidae, Mustelidae, Mephitidae, and Felidae; Order Artiodactyla, Family Cervidae) of mammals. Species within families were ranked as to status (e.g., rare, common, uncommon) based on their abundance as determined during the study. No federal or state listed endangered or threatened species was identified during the investigation. At the state level, the only species taken at SNMP listed as in need of management was the southeastern shrew (*Sorex longirostris*), which was taken during the 1983-84 study. Status of each species identified at the site is given in Table 2.

Using Sherman live traps we captured 1 species of shrew (southern short-tailed shrew, *Blarina carolinensis*) and 6 species of rodents (marsh rice rat, *Oryzomys palustris*; white-footed mouse, *Peromyscus leucopus*; cotton mouse, *P. gossypinus*; golden mouse, *Ochrotomys nuttalli*; hispid cotton rat, *Sigmodon hispidus*; woodland vole, and *Microtus pinetorum*). Number of captures were as follows: southern short-tailed shrew, 1; marsh rice rate, 1; white-footed mouse, 29; cotton mouse, 8; golden mouse, 2; hispid cotton rat, 11; and woodland vole, 1. Captures of the present study numbered 53. See Table 3 for natural history and locality information and Table 3 and Table 4 for information relating to voucher specimens.

Pitfall trapping yielded 9 captures of shrews. Species and number of captures were as follows: southern short-tailed shrew, *Blarina carolinensis*, 8; least shrew, *Cryptotis parva*, 1. See Table 3 for capture information and Table 4 for information relating to voucher specimens.

Scent-station procedures provided verification of the presence of 5 species. These included Virginia opossum (*Didelphis virginiana*), domestic dog (*Canis familiaris*), coyote (*C. latrans*), raccoon (*Procyon lotor*), and white-tailed deer (*Odocoileus virginianus*). See Table 3 for locality information.

Camera stations resulted in the documentation of 5 species. Species identified included: Virginia opossum, nine-banded armadillo (*Dasypus novemcinctus*), coyote, raccoon, and white-tailed deer. Only the raccoon was documented at the arboreal level. All five species were recorded at the ground level. See Table 3 for locality information.

During spotlight surveys, 5 species were verified. These included the Virginia opossum, coyote, gray fox (*Urocyon cinereoargenteus*), raccoon, and white-tailed deer. See Table 3 for locality information.

Records of general observations of taxa or sightings of sign of mammals are given in Table 3. Overall, 19 species were documented by sightings or signs.

DISCUSSION

The purposes of this study were to document at least 90% of the mammalian species reasonably expected to occur on the site, describe the distribution and, if possible, relative abundance of species of special concern occurring on the park, and provide baseline information on the distribution, abundance, and habitat associations of mammalian

populations occurring on the site. Kennedy (1991) reported a checklist of mammals occurring in western Tennessee. From this work and others (e.g., Hall 1981; Choate et al. 1994), a list of 34 species thought to have a relatively high potential for occurring on the park was constructed. Of these, 29 taxa (85%) were verified during the study (see Tables 1 and 2). When considering specimens collected during 1983 and 1984 at SNMP (see Kennedy 1984), 4 additional species (see Table 2) are added to the list of species known from the park. The combined assessments (1983-84 and 2005-06 studies) coupled with an inventory of bats in 2001 (Kennedy 2002), provide a strong database for management of natural resources at SNMP.

The Virginia opossum was the only member of the family Didelphidae documented at SNMP and is the only marsupial known to occur in western Tennessee (Kennedy 1991; Choate et al. 1994). Generally, this species prefers wooded areas near streams but is known to inhabit a wide range of habitats (McManus 1974; Schwartz and Schwartz 2001). At SNMP, the Virginia opossum was observed in both upland and bottomland sites. However, greatest abundance is likely associated with wetland habitat. Kennedy (1984) reported the species at SNMP, and Kennedy (1991) indicated this species as common in western Tennessee.

Two shrews (southern short-tailed shrew and least shrew) of the family Soricidae were documented during the present study. Neither of the species appeared to be abundant. Southern short-tailed shrews have been collected in a wide variety of habitats (e.g., woodlands, marshy areas, grasslands, and relatively dry uplands; Kennedy 1991). Early successional habitat (e.g., grassy fields) is generally preferred by least shrews (Schwartz and Schwartz 2001). Kennedy (1991) reported southern short-tailed shrews and least

shrews to have region-wide distributions in western Tennessee. The mammal survey during 1983-84 (Kennedy 1984), while recording the southeastern shrew, *Sorex longirostris*, and southern short-tailed shrews at SNMP, did not record least shrews at the site. Overall, 3 species of the Family Soricidae are known to have been collected on the park. Because southeastern shrews have been collected in an array of places such as along sandy river bluffs, old fields, edges of pine forest, and moist situations and are known at other sites in western Tennessee (Kennedy 1991; Choate et al. 1994; Whitaker and Hamilton 1998), future investigations at SNMP will likely demonstrate the current presence of this species on the park.

The eastern mole (*Scalopus aquaticus*) was the only member of the family Talpidae recorded at SNMP. Mole sign (ridges caused by tunneling under the soil) was observed throughout the park. The species prefers loose well-drained soils (Schwartz and Schwartz 2001). This mammal also was recorded in the 1983-84 work at SNMP (Kennedy 1984).

Nine-banded armadillos (*Dasypus novemcinctus*) represent the only member of the family Dasypodidae documented on SNMP. This species was not known on the site during the 1983-84 work (see Kennedy 1984) and represents a new member of the mammalian fauna at the park. Currently, the species is known throughout western Tennessee and from a variety of habitats.

Two taxa of rabbits (eastern cottontail, *Sylvilagus floridanus*; swamp rabbit, *S. aquaticus*) of the family Leporidae have been documented at SNMP. Habitat for both species appears limited on the park. Eastern cottontails occupy open brushy or forest-edge habitat (Schwartz and Schwartz 2001), and swamp rabbits are never found far from

water (Chapman and Feldhamer 1981). The eastern cottontail was recorded in the 1983-84 survey at SNMP, but the swamp rabbit was not recorded in that work (Kennedy 1984).

Four sciurids (family Sciuridae) have been documented. Three species were recorded in the present study and one additional species in the 1983-84 work at SNMP (see Kennedy 1984). These include the woodchuck (*Marmota monax*), eastern gray squirrel (*Sciurus carolinensis*), and eastern chipmunk (*Tamias striatus*) from the present investigation, and the fox squirrel (*Sciurus niger*) from the 1983-84 work (Kennedy 1984). Kennedy (1991) noted that woodchucks are a common mammal in woodlands, roadside habitats, and fields. Eastern gray squirrels are typical of hardwood forest (Choate et al. 1994), and they appeared to be quite abundant during the present investigation. Chipmunks also are typical of forested habitat (Whitaker and Hamilton, 1998). However, this species appeared to be uncommon during the present study. Additionally, it was not documented during the 1983-work. A local resident expressed to M. L. Kennedy during 2006 that he had seen a chipmunk near the Indian Mounds cutting hickory nuts (the specific tree was pointed out). Cuttings on hickory nuts were examined at this site and judged to be those of chipmunks. While trapping with Sherman live traps at this site failed to capture the species, a chipmunk was seen by M. L. Kennedy only a short distance from the hickory tree where cuttings of hickory nuts had been previously observed. Kennedy (1991) reported fox squirrels (*Sciurus niger*) to be a common species of hardwood forest in western Tennessee, and this species was recorded at SNMP during the 1983-84 work (Kennedy 1984). However, fox squirrels were not seen during the present study. Additionally, personnel at SNMP have not noted the presence of this species in many years (S. Allen, pers. obser.). Therefore, it is likely that this is a rare

species on the site. However, Nixon and Hansen (1987) indicated fox squirrels to utilize forest patches <40 ha with an open understory in different deciduous and mixed-forest habitats. Given that fragmentation of forested habitat continues in areas surrounding SNMP, abundance of this species could increase in the area in the future. A sciurid known in the region and considered to have a relatively high potential for occurring at SNMP (Table 1) but not documented in the 1983-84 work (Kennedy 1984) or the present study is the southern flying squirrel (*Glaucomys volans*). Considerable effort, utilizing arboreal bait stations and cameras, was made to verify the presence of this species at SNMP. However, efforts were not productive. Yet, given the habitat at this park, it is likely that this species could be added to the list of mammals occurring at the site in the future.

Beaver (Family Castoridae) were documented on the park from sign (e.g., observation of dams in wetlands or cuttings on trees). Kennedy (1991) noted that this species is locally abundant in many areas of western Tennessee. It is generally associated with wetland habitat (Schwartz and Schwartz 2001). This species also was documented on the park during work conducted in 1983-84 (Kennedy 1984).

Six species of small-murid rodents (Family Muridae) were verified at SNMP. These include the marsh rice rat, white-footed mouse, cotton mouse, golden mouse, hispid cotton rat, and woodland vole. These species occupy a wide assortment of habitats and are considered to be region-wide in distribution (Kennedy 1991; Hall 1981). Marsh rice rats are a relative common species in a variety of marshes and wet meadows (Kennedy 1991), while hispid cotton rats prefer early successional habitats. Whitaker and Hamilton (1998) indicated hispid cotton rats to occupy grass-dominated fields. Moist timbered

areas are generally preferred by cotton mice, while white-footed mice are found in a wide range of woodland habitats (Lackey et al. 1985; Choate et al. 1994; Schwartz and Schwartz 2001). Golden mice occur chiefly in forests where there are tangles of trees, brush, and vines (Whitaker and Hamilton 1998; Schwartz and Schwartz 2001). Habitats such as fields adjacent to wooded areas, in orchards, and thickets along forest edges are commonly favored by woodland voles (Choate et al. 1994; Whitaker and Hamilton 1998), and muskrats (*Ondatra zibethicus*) occur in many aquatic habitats (Willner et al. 1980; Choate et al. 1994). The eastern harvest mouse (*Reithrodontomys humulis*) and house mouse (*Mus musculus*) represent species collected on the park during 1983-84 (Kennedy 1984) that were not captured during the present study. Choate et al. (1994) reported eastern harvest mice to be most abundant in old fields containing dense weed patches and grasses. Generally, house mice occupy areas associated with human habitation (Schwartz and Schwartz 2001). Given the distributions of these 2 species, both likely are part of the mammalian fauna currently present on the park. Overall, for a local site, biodiversity in the family Muridae was relatively high, and species evenness was typical of most natural populations, where 1 or 2 species are present in greater numbers and other species are represented by fewer individuals (see Smith 1986). The most common and abundant small mammal was the white-footed mouse. The hispid cotton rat (not known from the 1983-84 work at the site; Kennedy 1984) was added to the mammalian biodiversity of SNMP during the present work. Other murid species that be added to the list of mammals occurring at the site in the future include the deer mouse (*P. maniculatus*), eastern woodrat (*Neotoma floridana*), southern bog lemming (*Synaptomys cooperi*), prairie vole (*M. ochrogaster*), black rat (*Rattus rattus*), and Norway rat (*R.*

norvegicus). Also, the meadow jumping mouse (*Zapus hudsonicus*; Family Dipodidae) has potential to occur at SNMP.

Family Canidae was represented on the site by the coyote, domestic dog, red fox (*Vulpes vulpes*), and gray fox (*Urocyon cinereoargenteus*). Based on sightings and sign, the coyote was the most abundant canid on the park. Both species of foxes have been observed by personnel at SNMP; however, the 2 species are considered uncommon at this time. Coyotes and foxes have a broad tolerance for habitat (Whitaker and Hamilton 1998). Domestic dogs (observed relatively frequently by park personnel) do well in areas near human habitation. However, this species was not recorded during the 1983-84 work at the park (Kennedy 1984)

Based on sign and observations, raccoons (Family Procyonidae) appeared to be abundant on the park. Numerous authors (e.g., Choate et al. 1994; Whitaker and Hamilton 1998; Schwartz and Schwartz 2001) have noted a wide tolerance for habitat by raccoons, but, generally, they prefer habitats near water. Raccoons were documented on the park in 1983-84 (Kennedy 1984).

Two species of mustelids (Family Mustelidae) were documented. These included mink (*Mustela vison*) and river otter (*Lontra canadensis*). Both species were documented from sign. Whitaker and Hamilton (1998) noted that these species occupy diverse wetland habitats ranging from large swamps to small streams. Mink were recorded during the 1983-1984 survey at the park, while river otter were not (Kennedy 1984). Personnel at SNMP have had a report of river otter on lands near the park.

The striped skunk (*Mephitis mephitis*) was the only member of the family Mephitidae recorded during the present study on SNMP. While known to have a broad tolerance for

habitat (Bolen and Robinson 2003), striped skunks appeared to be uncommon on the park during the present investigation. The species was recorded in the 1983-84 work at the park (Kennedy 1984) and is known to be locally abundant in some areas of western Tennessee. Additionally, park personnel have observed skunks on the park; however, this has been less frequently in the last few years.

Based on sign and observations, bobcats (Family Felidae) were uncommon on SNMP during the present study. The species prefers river bottoms and forested habitat associated with thick underbrush (Kennedy 1991). Bobcats also were recorded in the 1983-84 work at SNMP (Kennedy 1984). Feral cats (*Felis catus*) were observed during our survey by park personnel. They have found, from time to time, the abundance of feral cats to be of concern (because of the potential to impact other species such as small vertebrates) and have taken management action on occasion to keep this species at acceptable levels. Because of the potential negative impact on other species, the presence of feral cats on the park should be followed closely and management action taken as needed.

White-tailed deer (Family Cervidae) were abundant during the study. This species occupies a mosaic of habitats, especially those associated with edge (Schwartz and Schwartz 2001) and was observed in most habitat types found to occur on the site. White-tailed deer represent an economically and socially important species (Bolen and Robinson 2003) occurring on the site. While not hunted on the park, it offers significant recreational value to visitors who enjoy seeing deer as they travel through the area.

No state or federal listed endangered or threatened species was documented on SNMP during the study. However, the state status for the southeastern shrew (documented on

the park during 1983-84; Kennedy 1984) is D (deemed in need of management), and the global rank is G5 (demonstrably widespread and secure globally). Other species deemed in need of management that could be added in the future include the eastern woodrat, southern bog lemming, and meadow jumping mouse.

Because species richness at SNMP approaches that known for the region (Hall 1981; Kennedy 1991; Choate et al. 1994) and because of the high quality of the mature forest on the site, the park represents an import area for sustaining mammalian biodiversity in the region. However, habitat loss in areas surrounding the park will likely continue and human impact, in a variety of forms, will no doubt impact the park. Therefore, strong management will be required to sustain biodiversity in the future. Factors to consider in conservation of biodiversity at SNMP include: (1) reduction in use of chemical treatment in agriculture and for insects; (2) removal of exotic species of plants and animals; (3) maintain oldfield habitat through a rotation in mowing; (4) maintain a mosaic of habitat types; (5) control litter, especially containers such as bottles that are known to be detrimental to shrews and insects; (6) monitor white-tailed deer population (over abundance of such species can have a negative impact on other species); (7) monitor standing water resulting from beaver activity in bottomlands (such activity can have a negative impact on forest stands); (8) monitor domestic dog and feral cat populations and take management actions when necessary to control such species; (9) maintain corridors that connect small habitat patches to foster gene flow and provide potential for metapopulation dynamics that maintain populations of rare species; (10) monitor traffic flow of vehicles and people and, when necessary, reduce traffic in sensitive areas; (11) develop a research program that allows for monitoring biodiversity temporally and, thus,

maintaining a measure of the health of the environment at SNMP; and (12) establish educational programs to assist local residents and visitors in understanding goals and needs of management.

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Figures

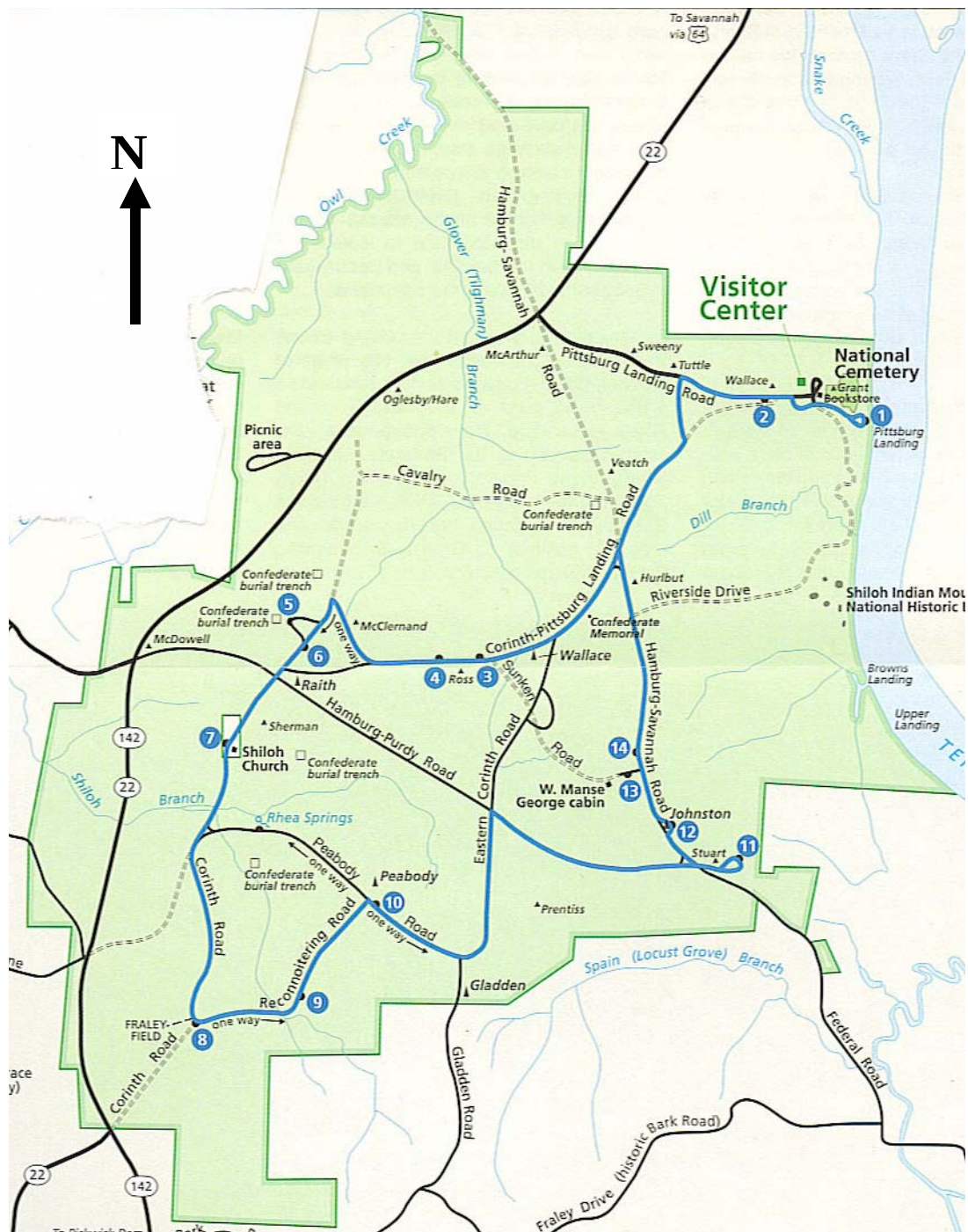


Fig. 1. Map showing (in green) Shiloh National Military Park (site of a survey of mammals in 2005-2006) in Hardin County, Tennessee.



Fig. 2. View from eastern boundary (Tennessee River) at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006.

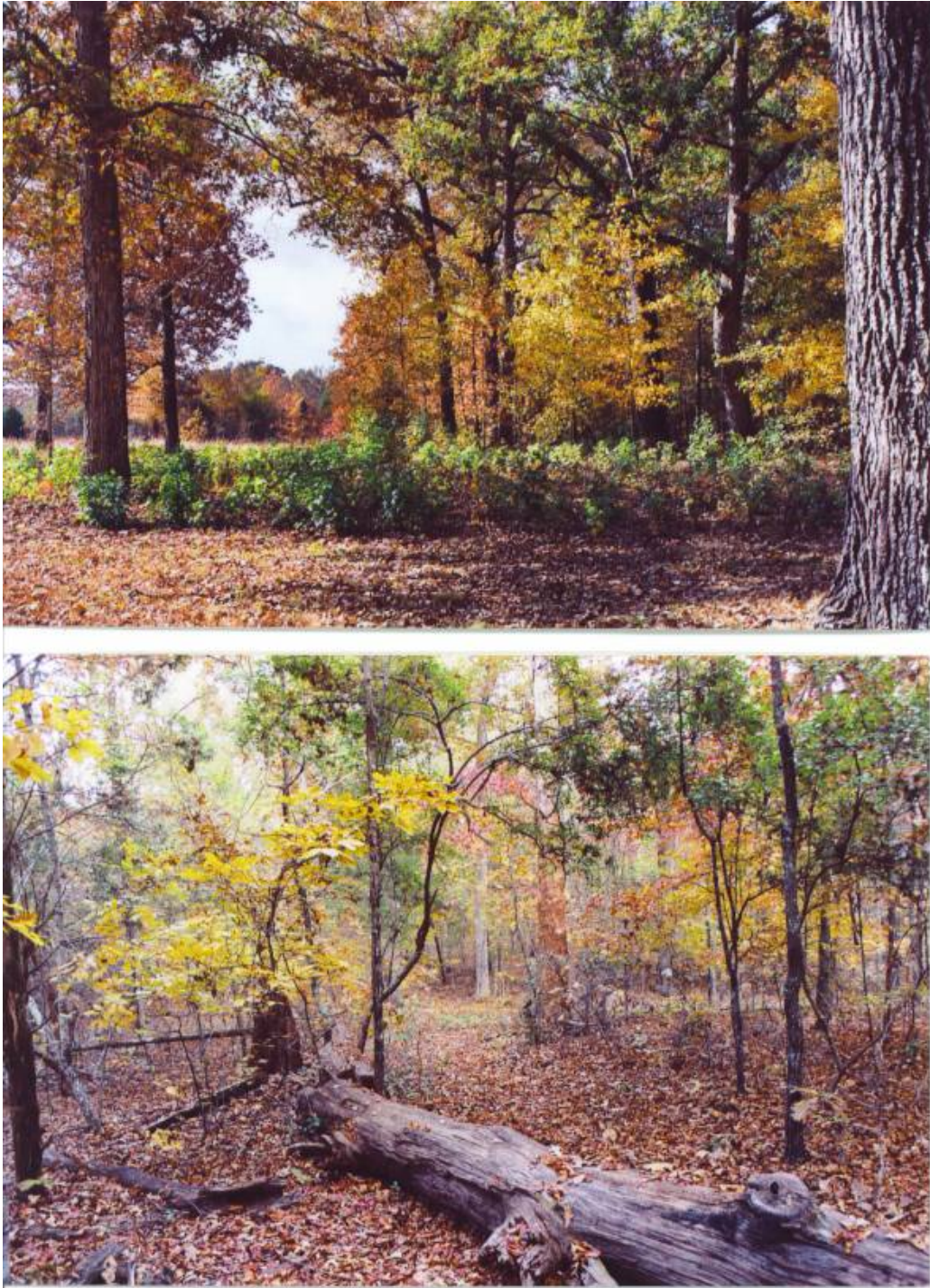


Fig. 3. Photographs representing upland forest at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006.



Fig. 4. Photographs representing bottomland forest at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006.



Fig. 5. Photographs representing maintained and agricultural areas at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006.



Fig. 6. Photographs representing wetland sites at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006.

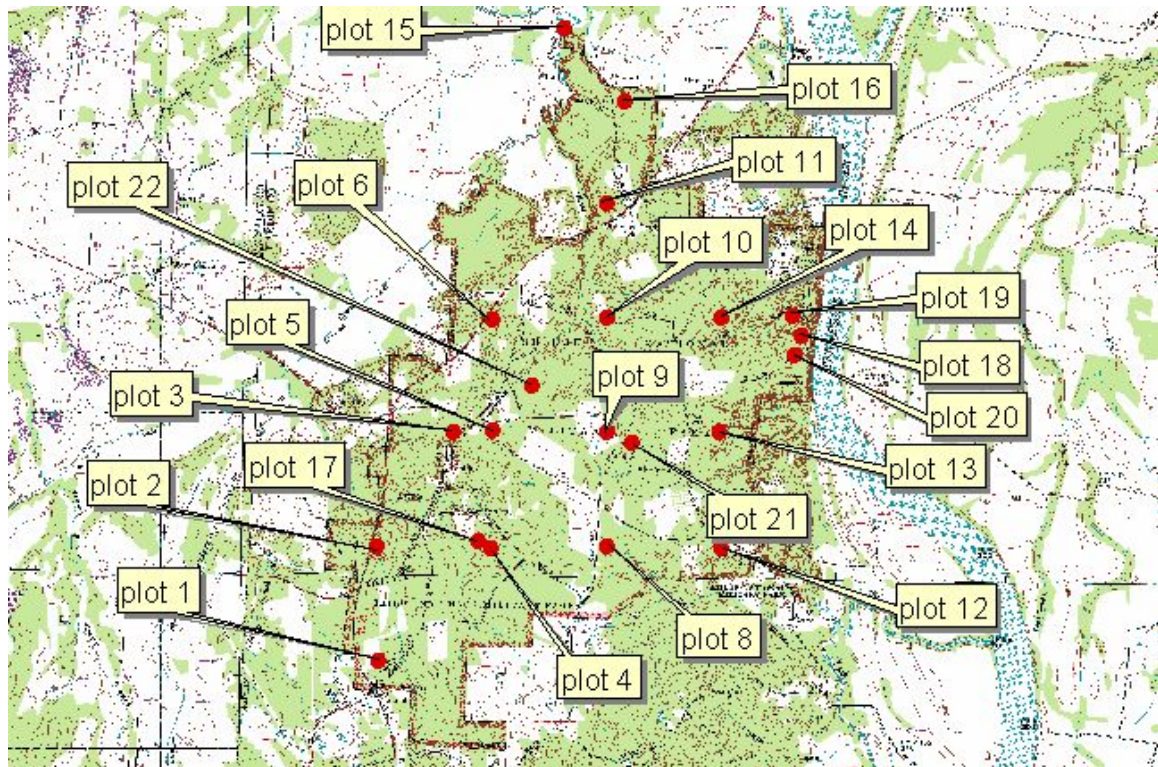


Fig. 7. Map showing locations of randomly established plots at Shiloh National Military Park in Hardin County, Tennessee, which were used as sampling sites in a study of mammalian biodiversity during 2005-2006. Sampling was at 21 plots. Plot numbers are 1-6 and 8-22. Coordinates for plots are given in Appendix II.

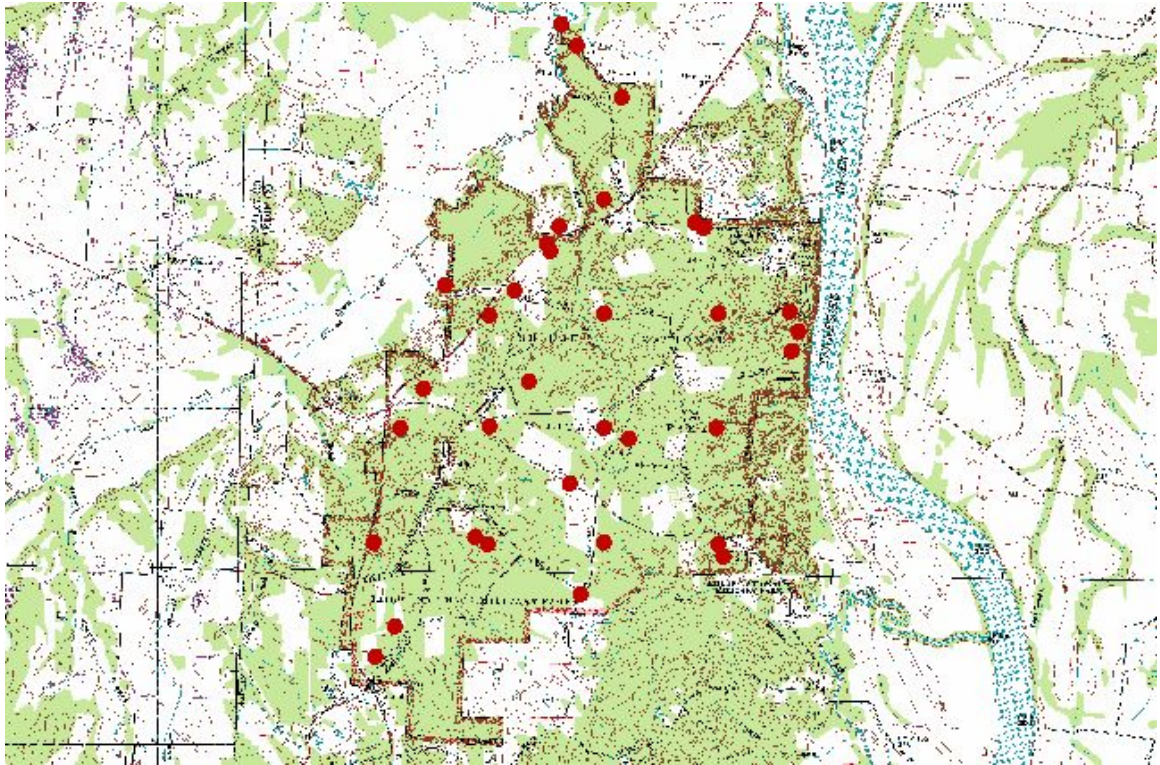


Fig. 8. Map showing location of selected sites utilized in a study of mammalian biodiversity employing Sherman live traps at Shiloh National Military Park, Hardin County, Tennessee, during 2005-2006.

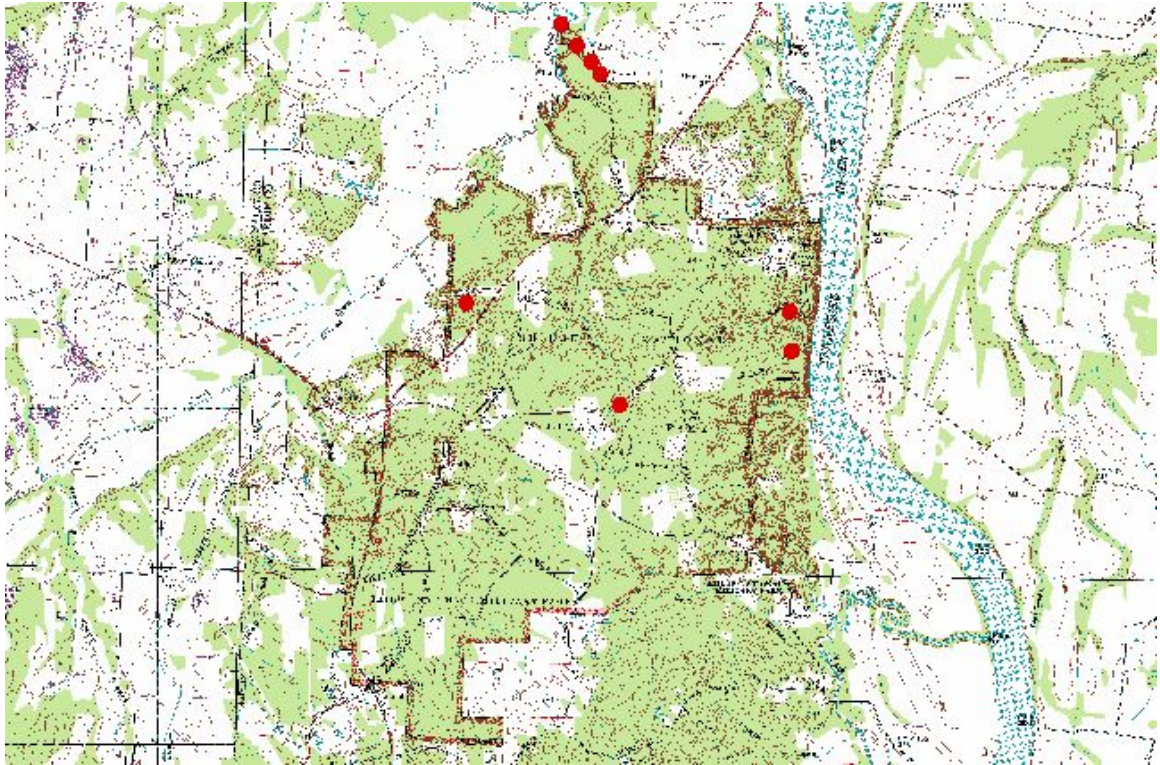


Fig. 9. Map showing location of selected sites utilized in a study of mammalian biodiversity employing infrared-triggered cameras over bait stations at Shiloh National Military Park, Hardin County, Tennessee, during 2005-2006.



Fig. 10. Photographs representative of the set up for infrared-triggered cameras placed at ground level, baited with cat food and corn, at Shiloh National Military Park in Hardin County, Tennessee, during a study of mammalian biodiversity in 2005-2006.



Fig. 11. Photographs representative of the set up for infrared-triggered cameras placed at an arboreal level at Shiloh National Military Park in Hardin County, Tennessee, during a study of mammalian biodiversity in 2005-2006.

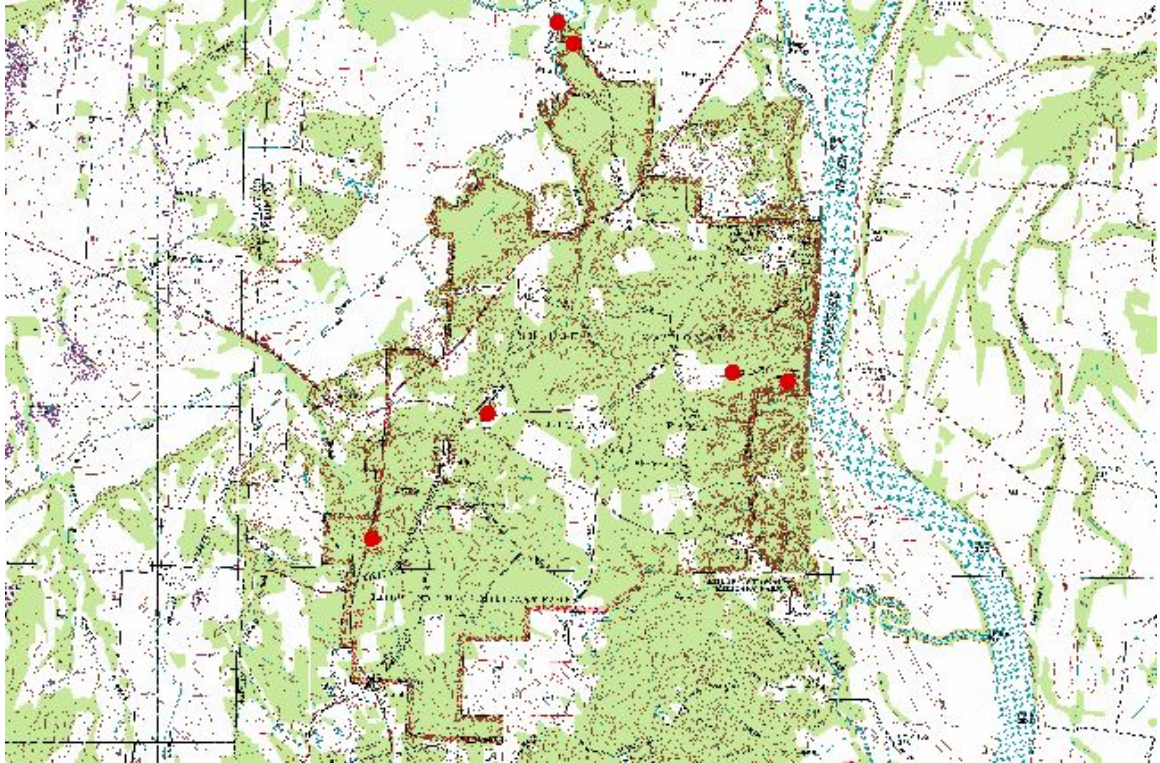


Fig. 12. Map showing sites from which the Virginia opossum (*Didelphis virginia*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

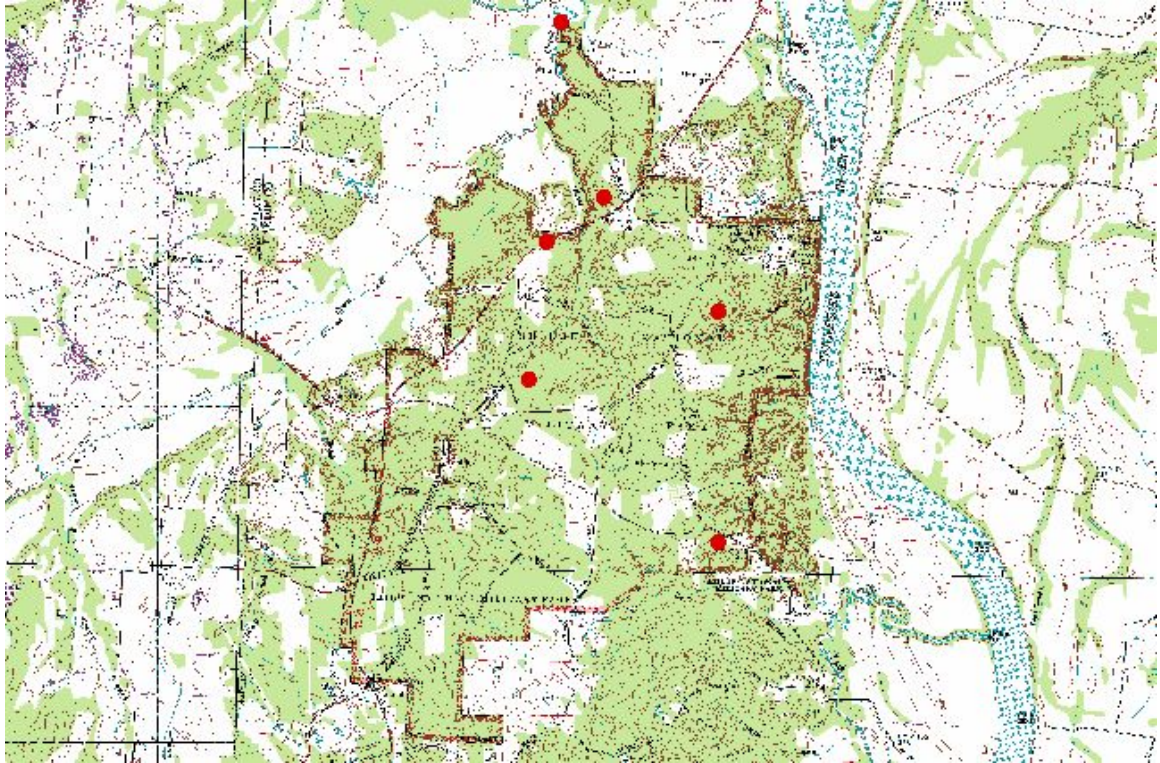


Fig. 13. Map showing sites from which the southern short-tailed shrew (*Blarina carolinensis*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

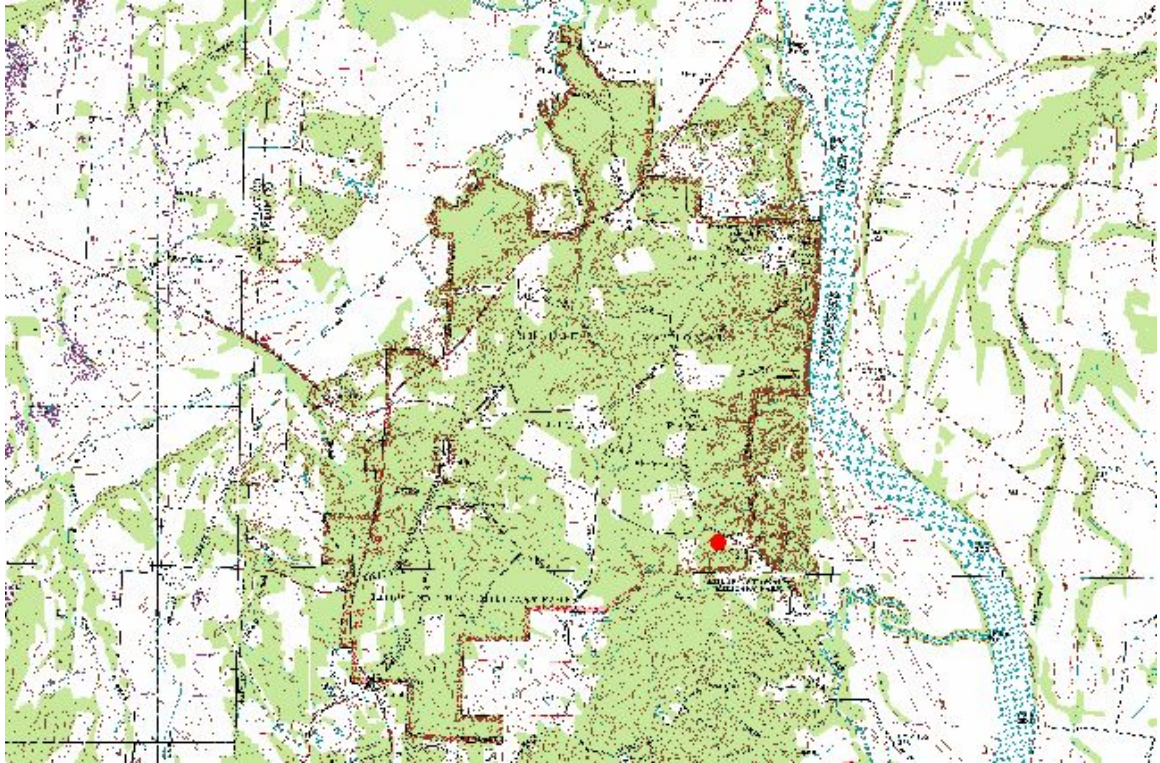


Fig. 14. Map showing sites from which the least shrew (*Cryptotis parva*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

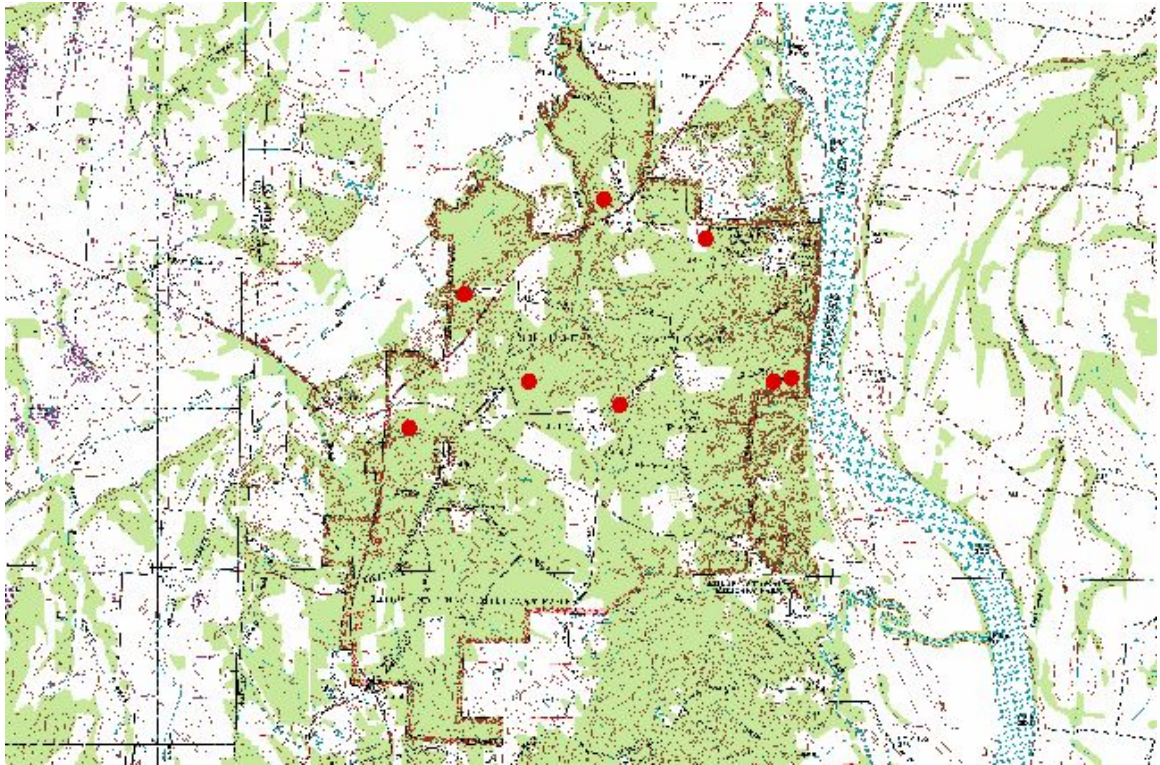


Fig. 15. Map showing sites from which the eastern mole (*Scalopus aquaticus*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

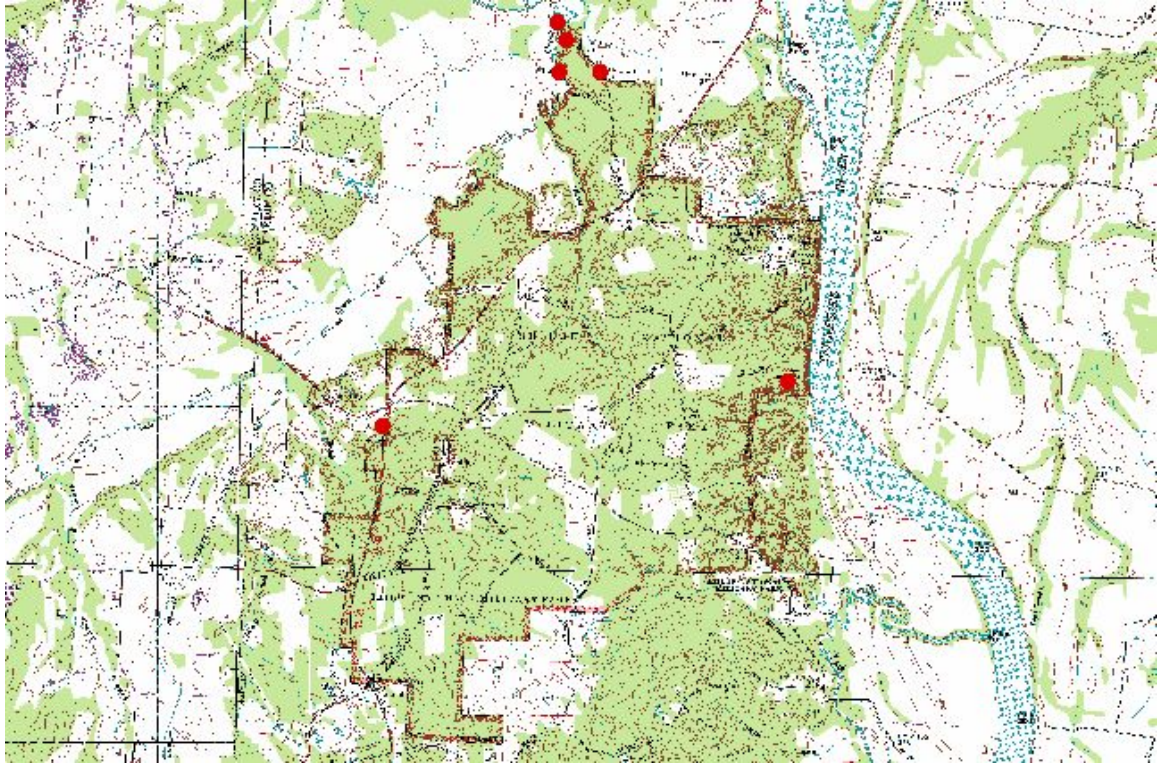


Fig. 16. Map showing sites from which the nine-banded armadillo (*Dasypus novemcinctus*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

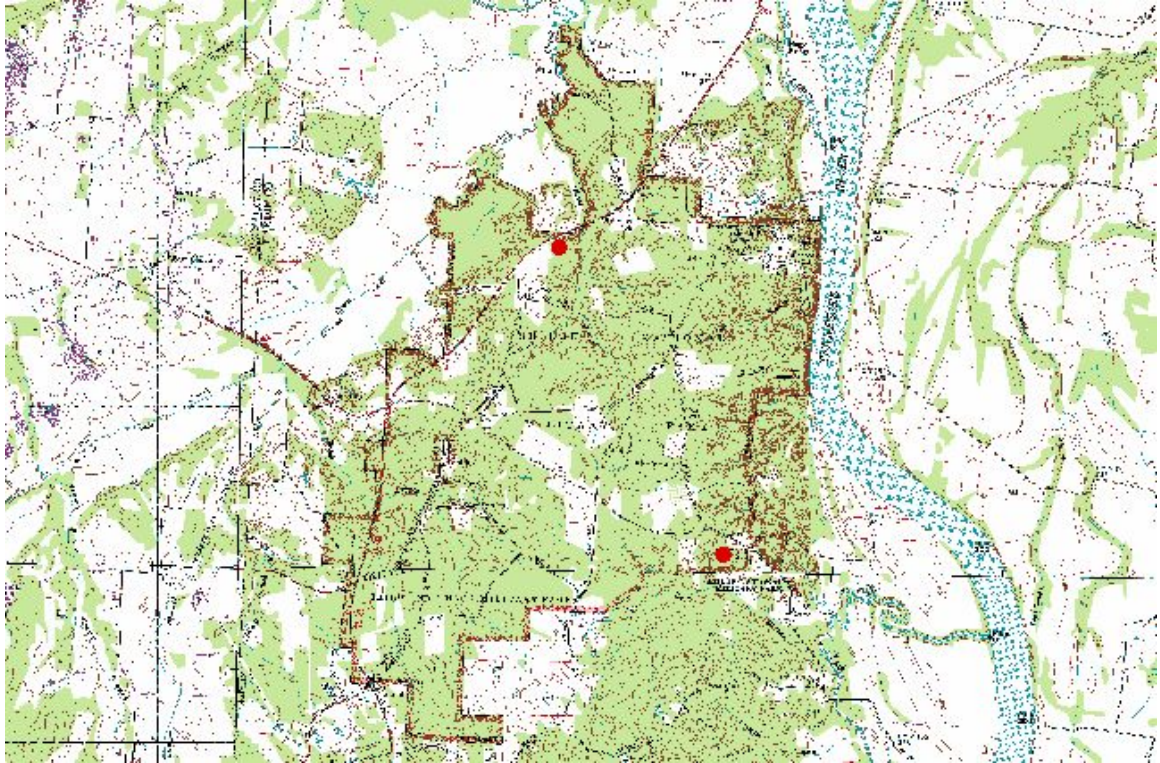


Fig. 17. Map showing sites from which the eastern cottontail (*Sylvilagus floridanus*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

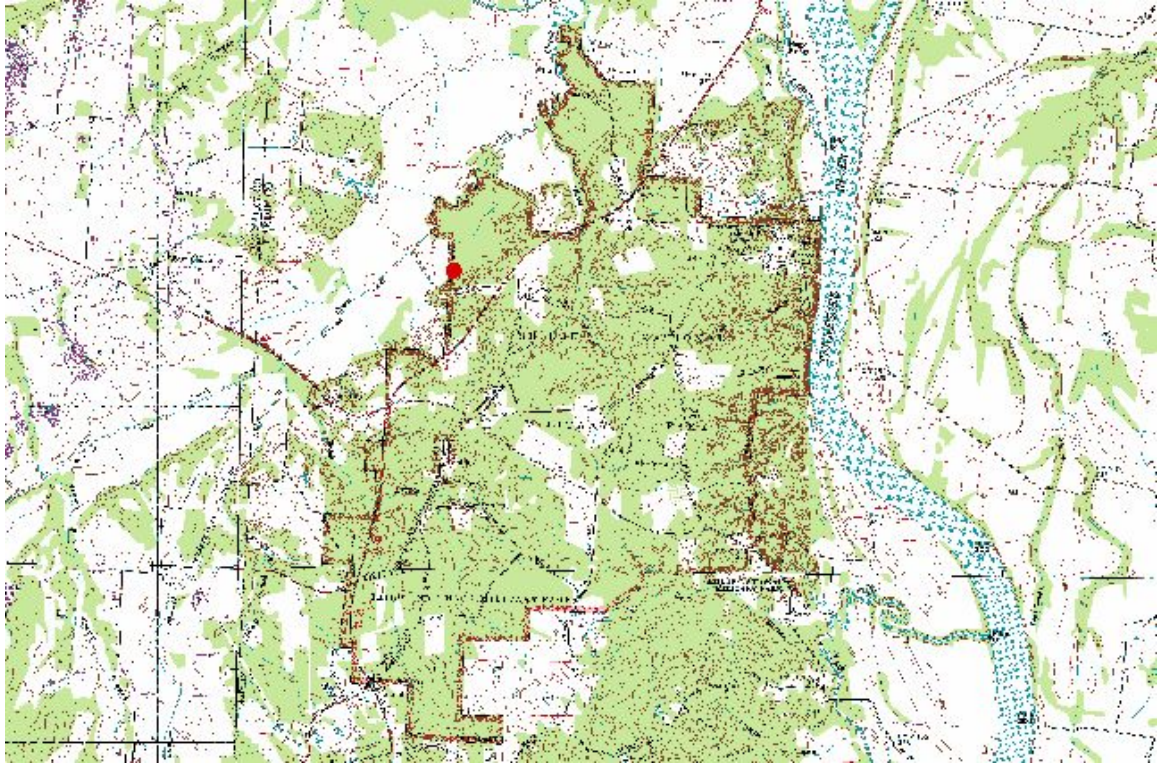


Fig. 18. Map showing a site from which the swamp rabbit (*Sylvilagus aquaticus*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

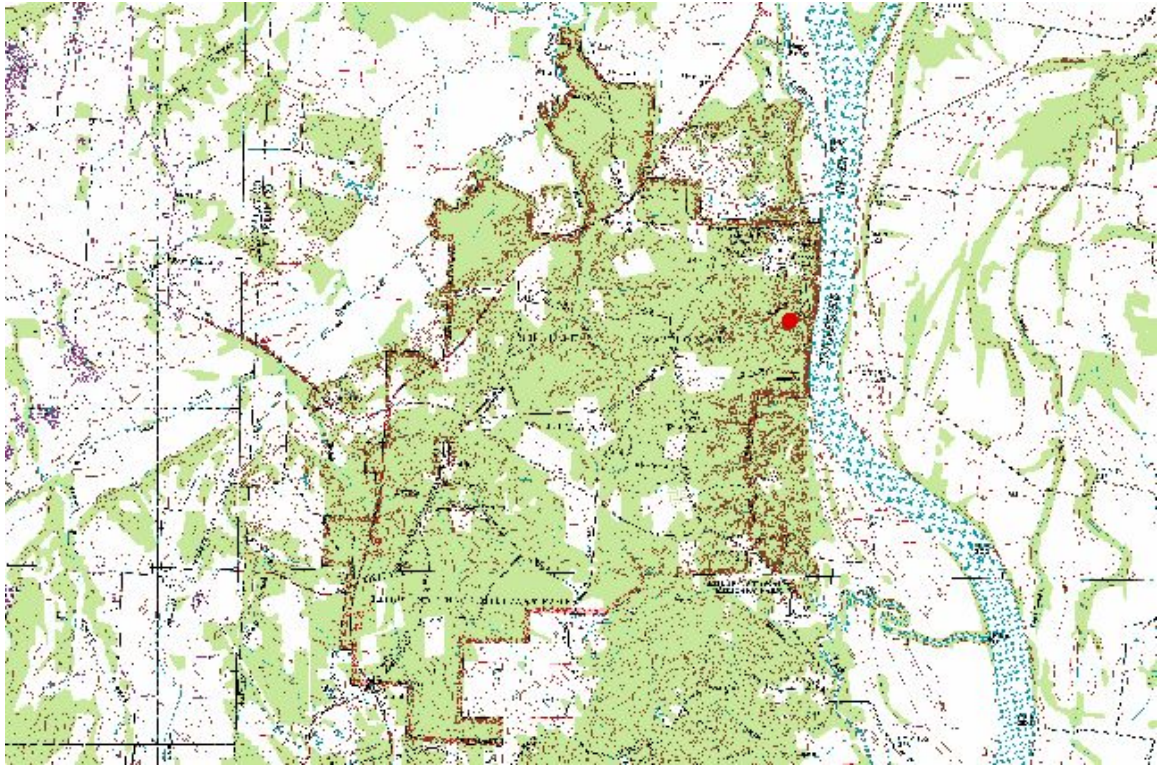


Fig. 19. Map showing a site from which the eastern chipmunk (*Tamias striatus*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

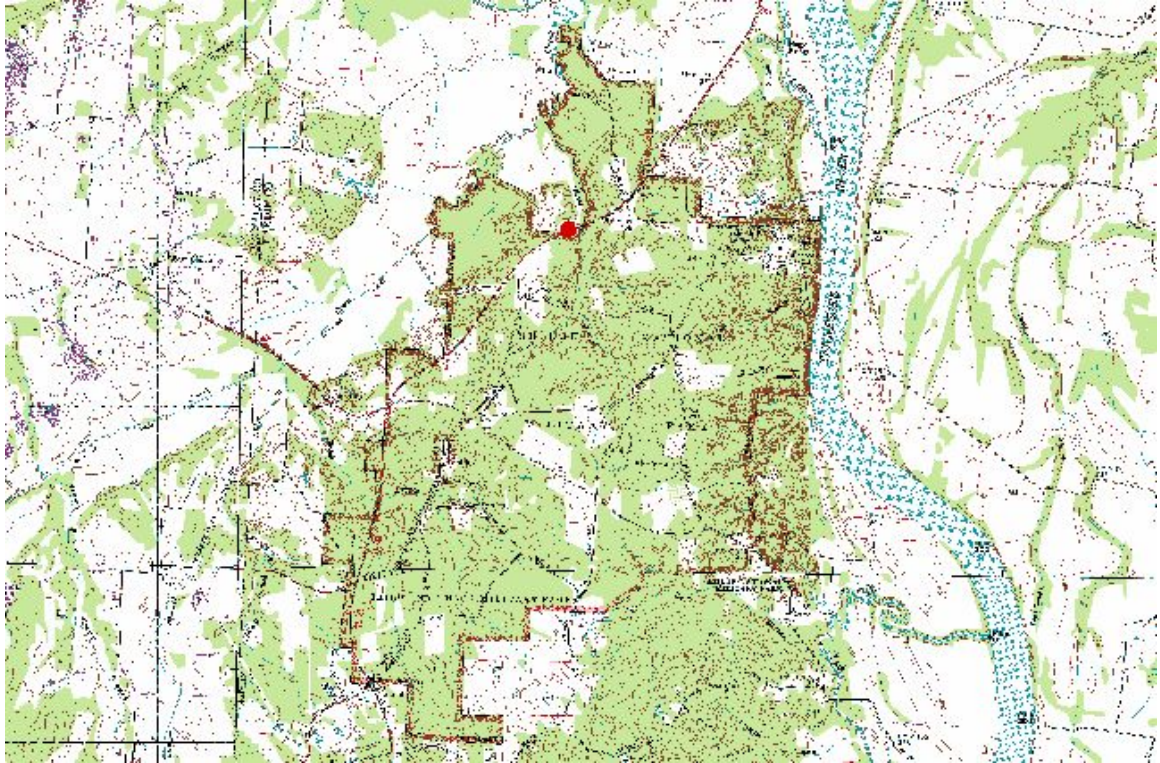


Fig. 20. Map showing a site from which the woodchuck (*Marmota monax*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

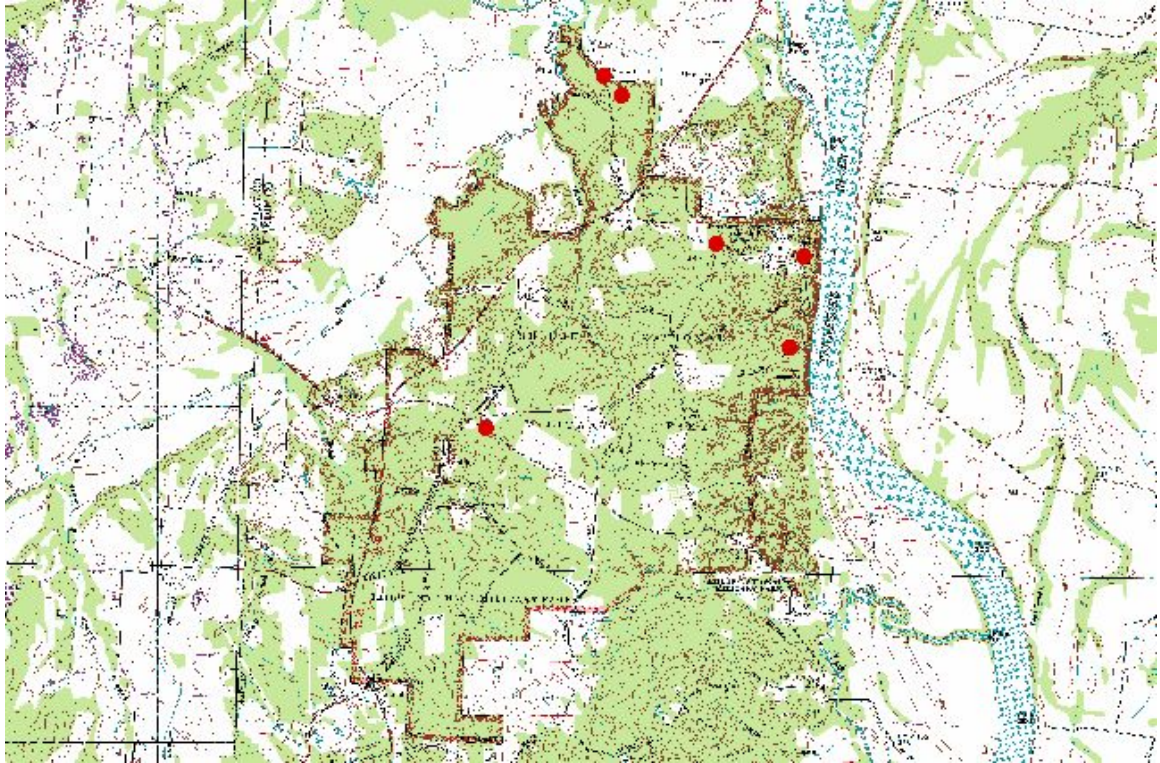


Fig. 21. Map showing sites from which the gray squirrel (*Sciurus carolinensis*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

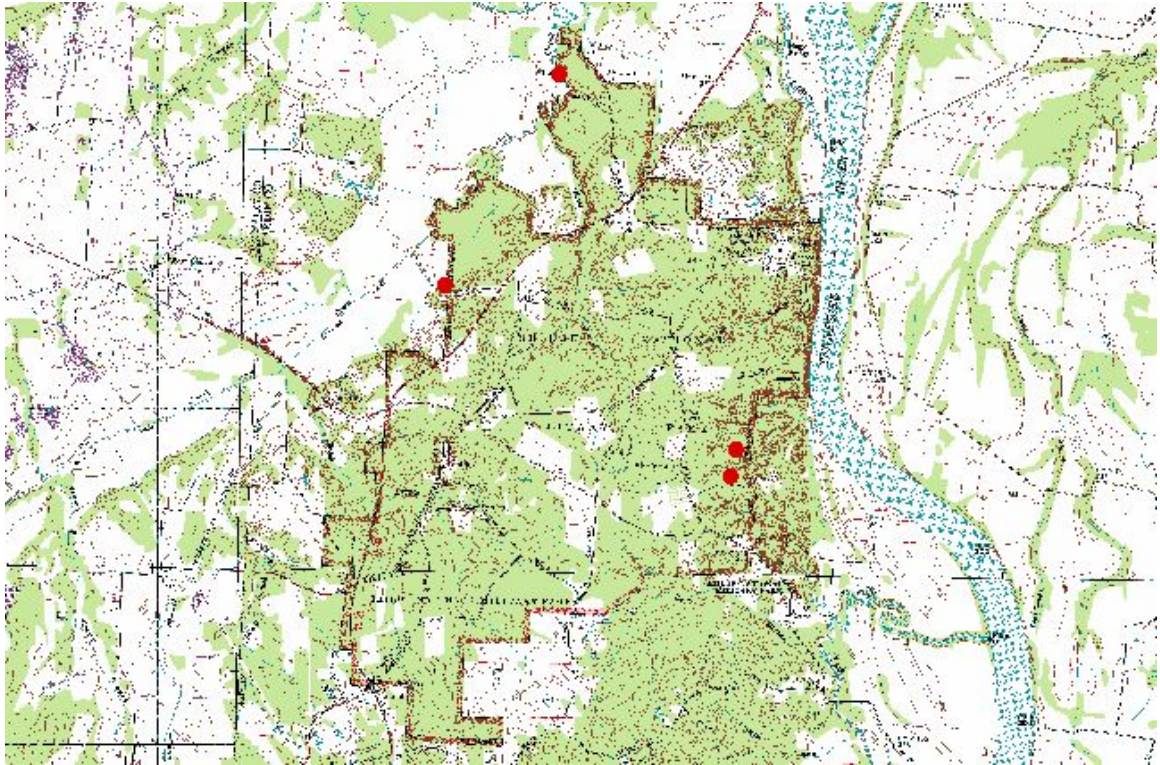


Fig. 22. Map showing sites from which the beaver (*Castor canadensis*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

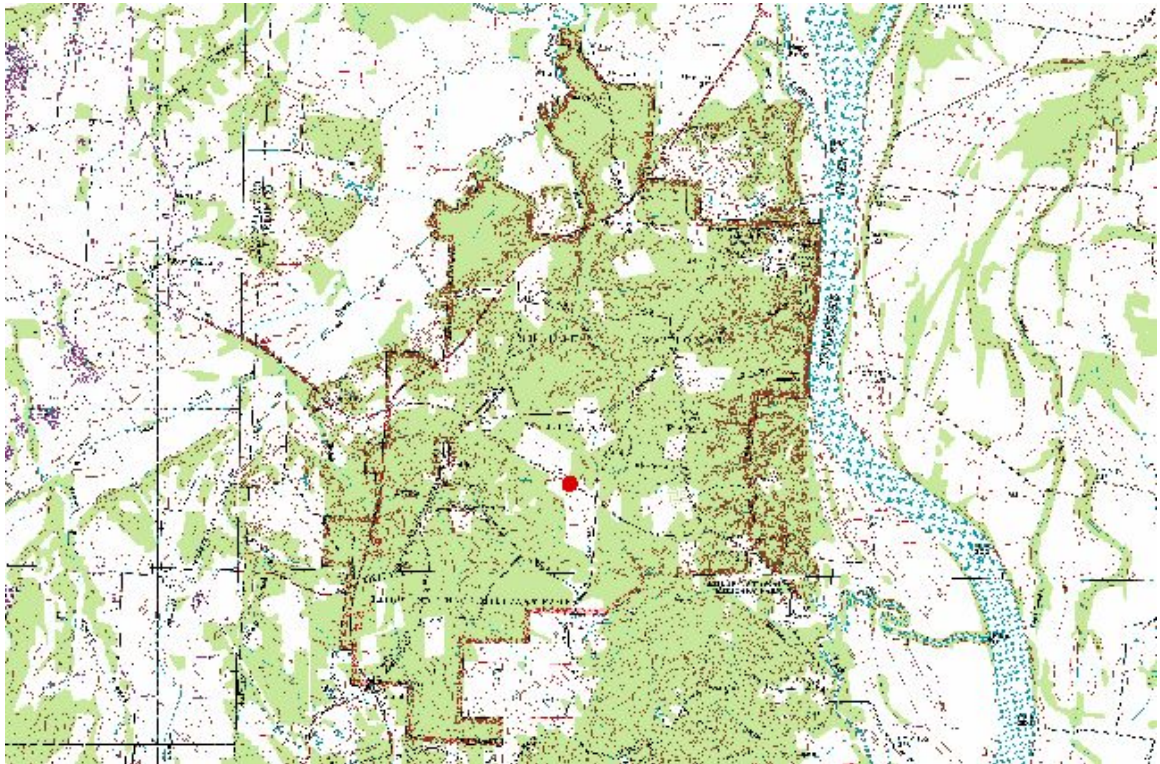


Fig. 23. Map showing a site from which the marsh rice rat (*Oryzomys palustris*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

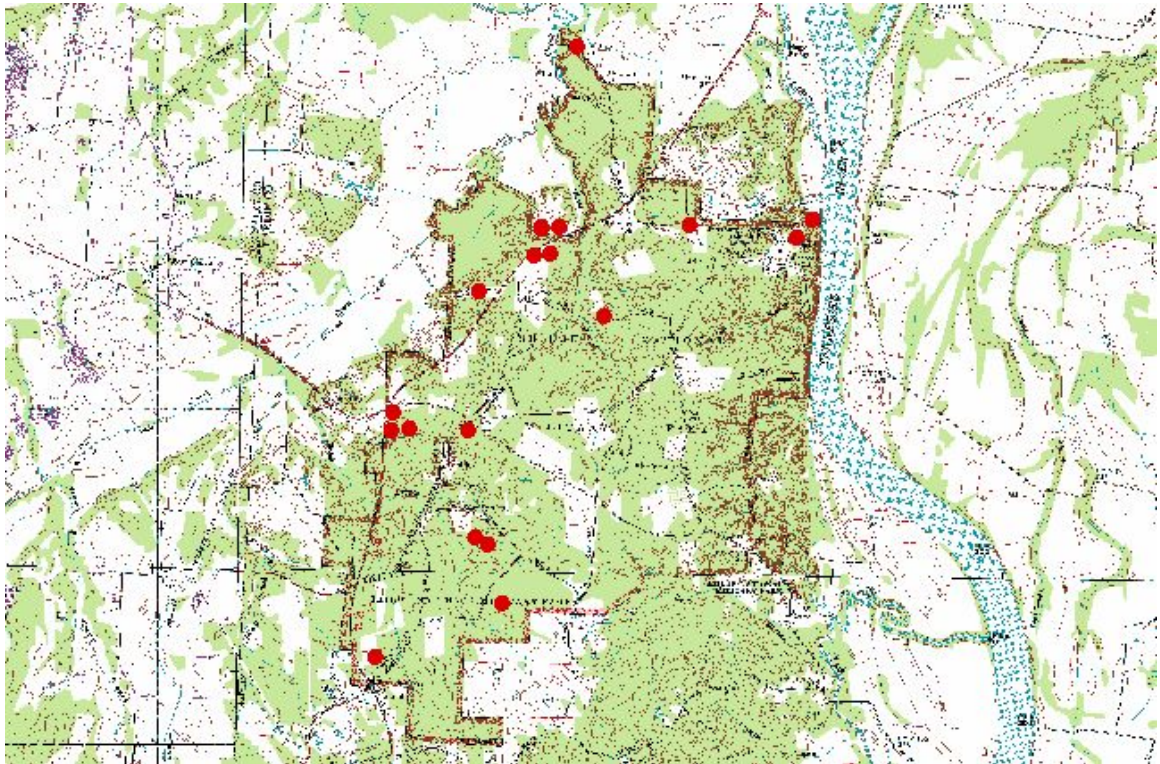


Fig. 24. Map showing sites from which the white-footed mouse (*Peromyscus leucopus*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

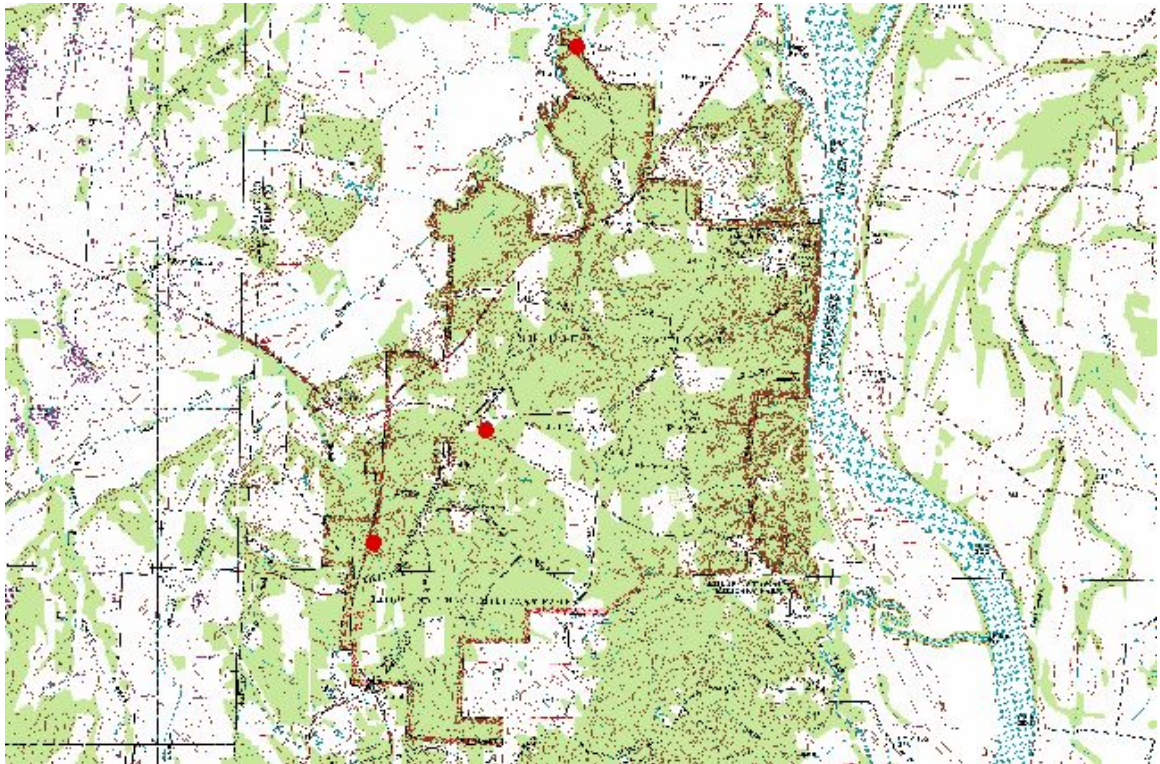


Fig. 25. Map showing sites from which the cotton mouse (*Peromyscus gossypinus*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

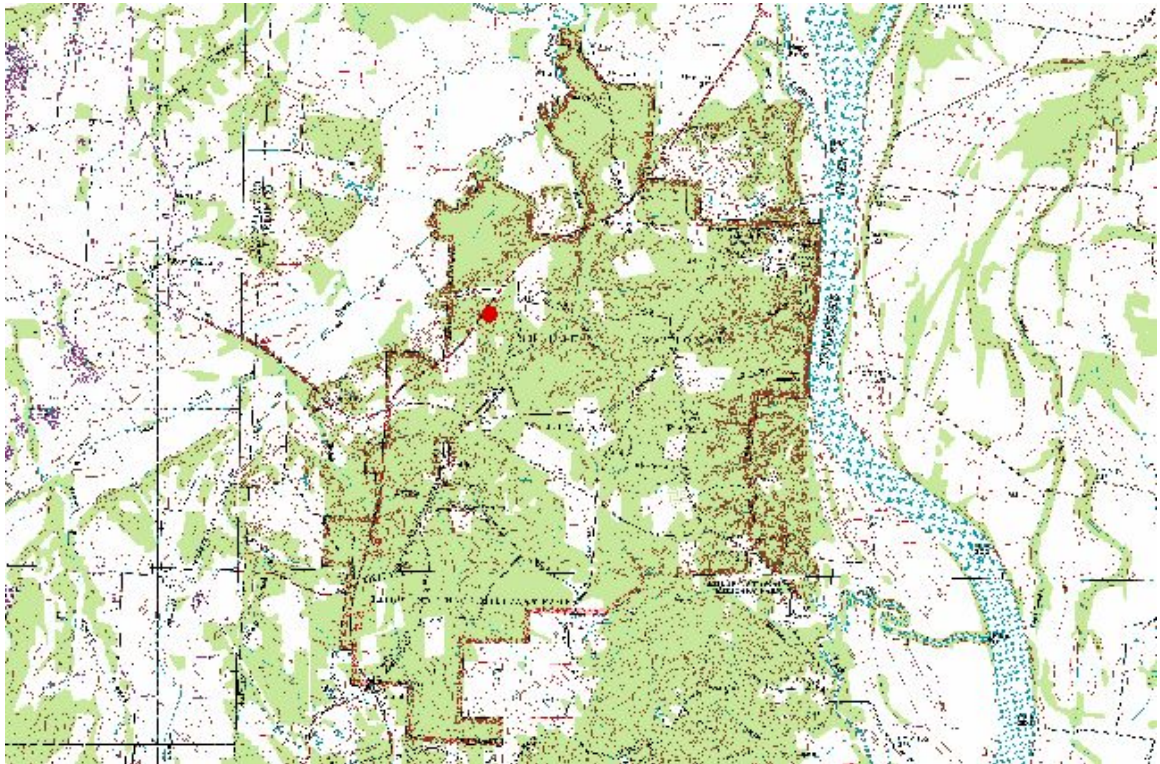


Fig. 26. Map showing a site from which the golden mouse (*Ochrotomys nuttalli*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

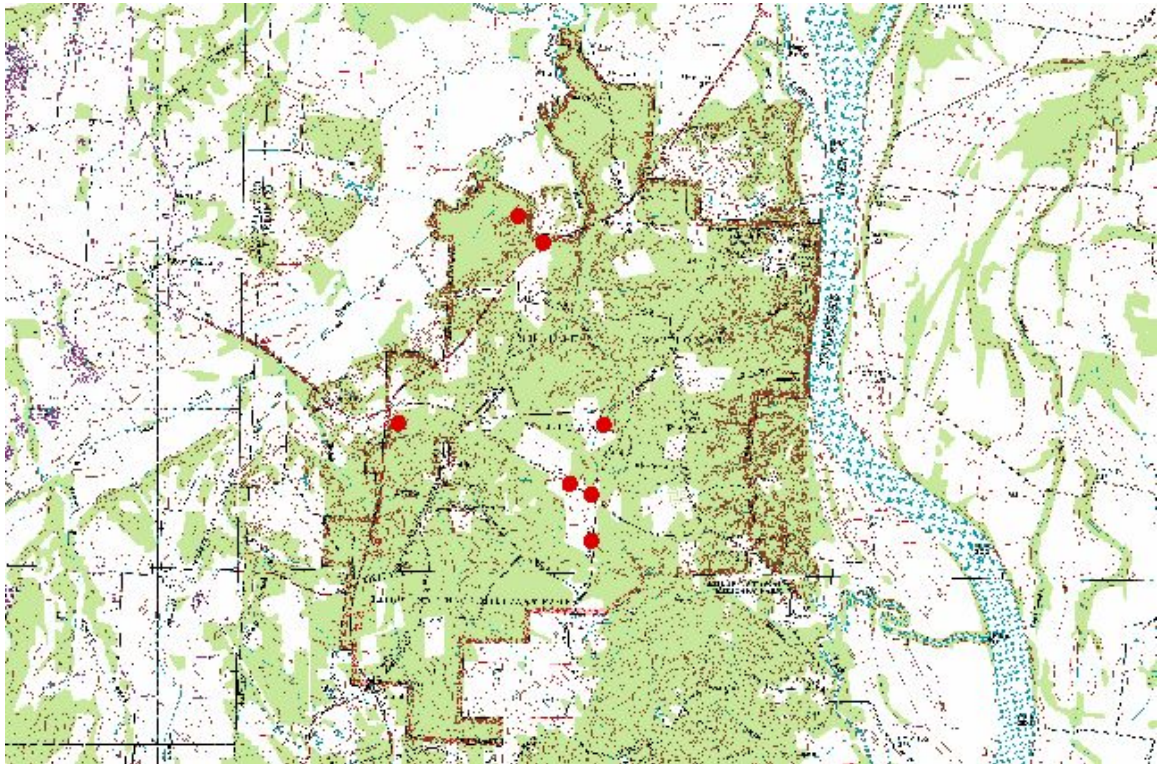


Fig. 27. Map showing sites from which the hispid cotton rat (*Sigmodon hispidus*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

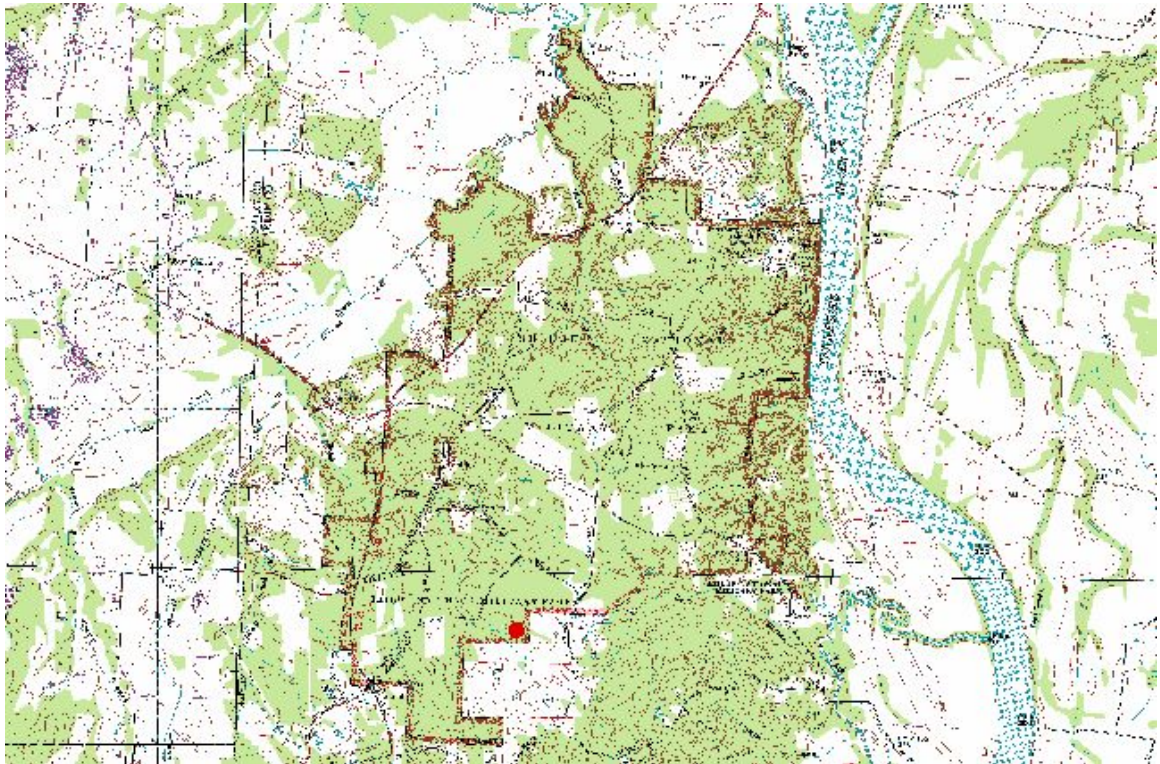


Fig. 28. Map showing a site from which the woodland vole (*Microtus pinetorum*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

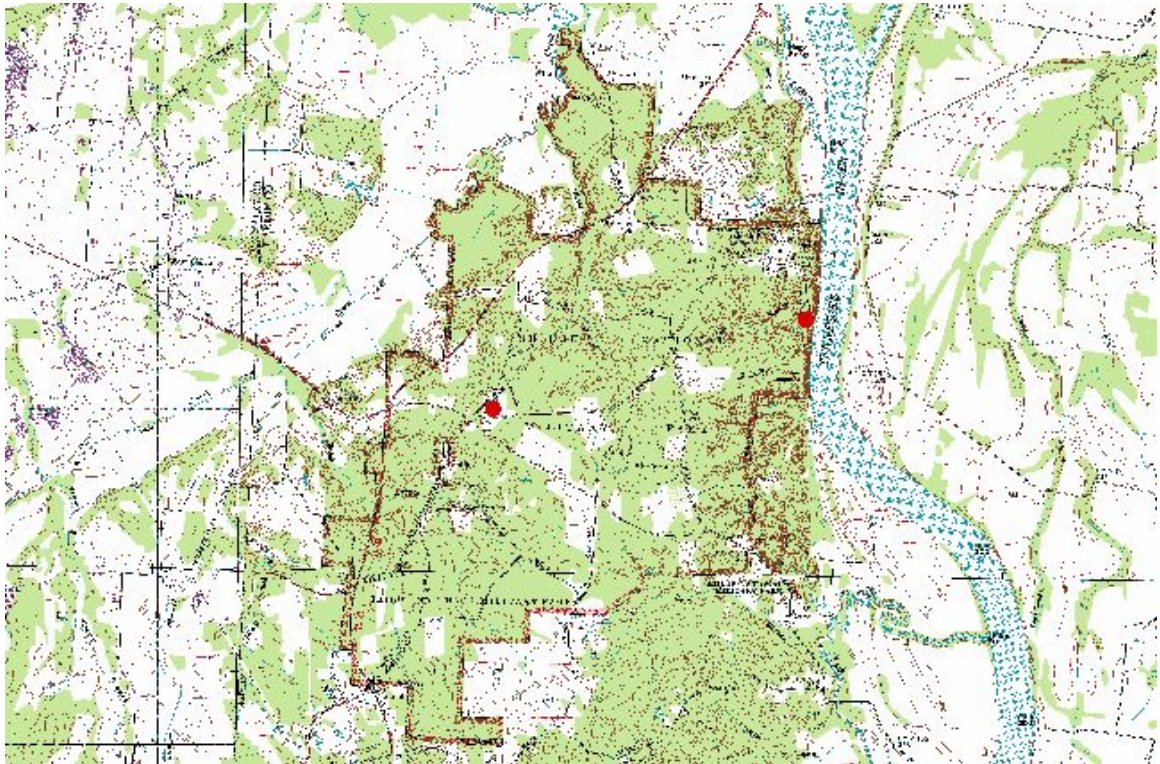


Fig. 29. Map showing sites from which the muskrat (*Ondatra zibethicus*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

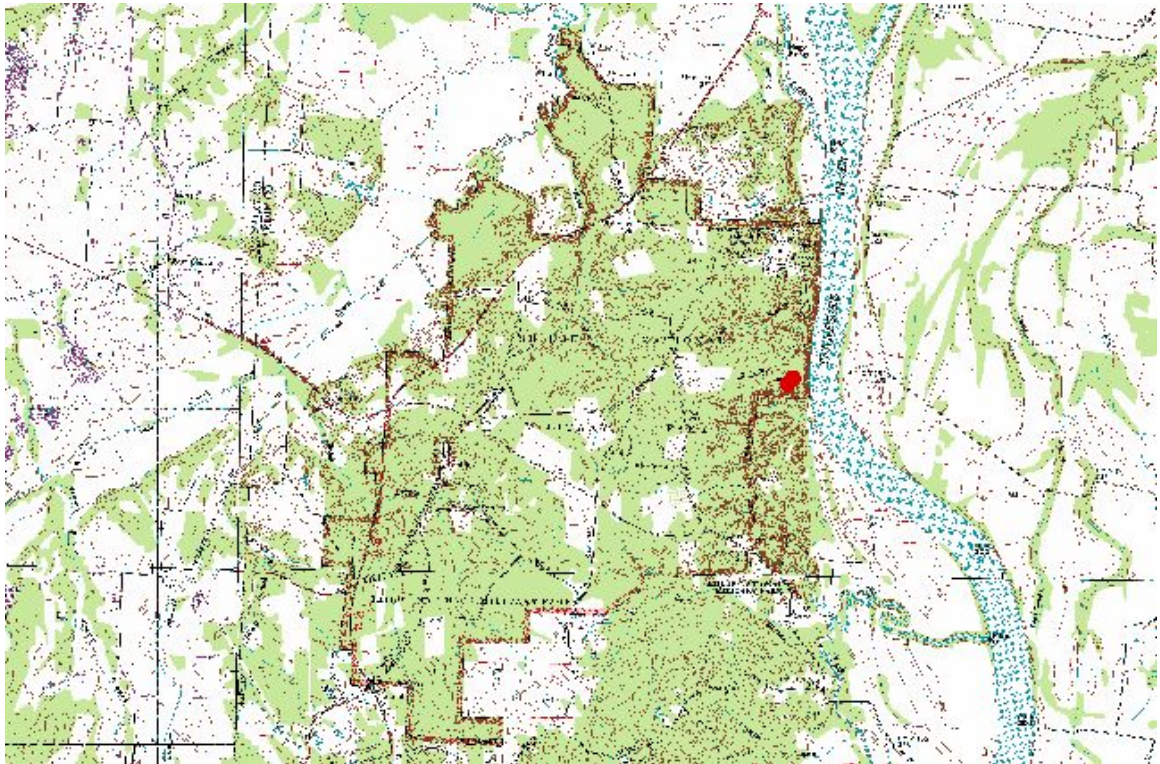


Fig. 30. Map showing a site from which the domestic dog (*Canis familiaris*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

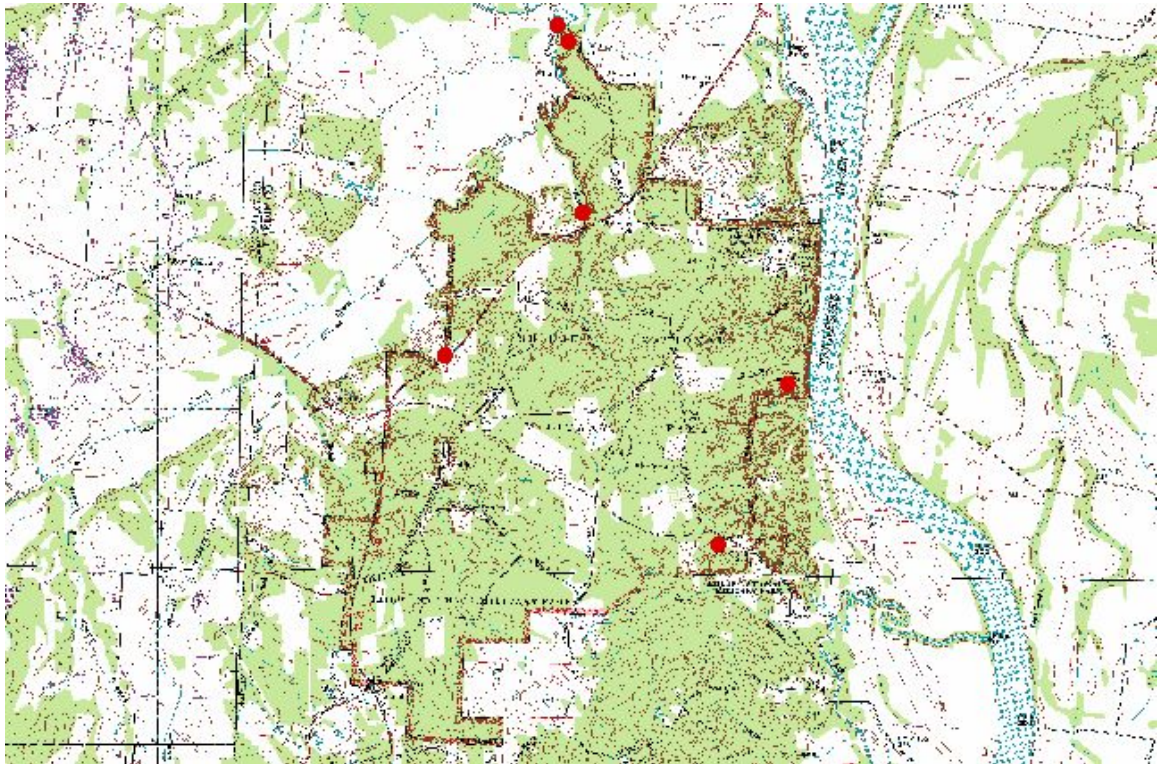


Fig. 31. Map showing sites from which the coyote (*Canis latrans*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

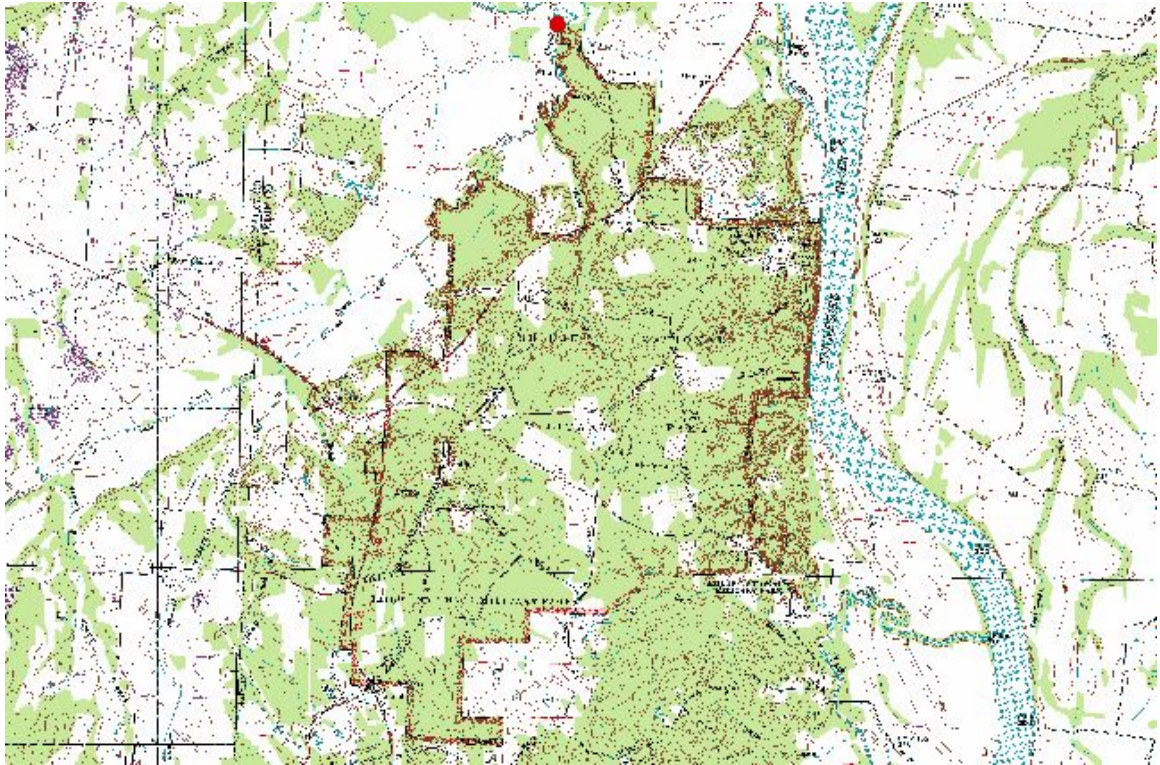


Fig. 32. Map showing a site from which the red fox (*Vulpes vulpes*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

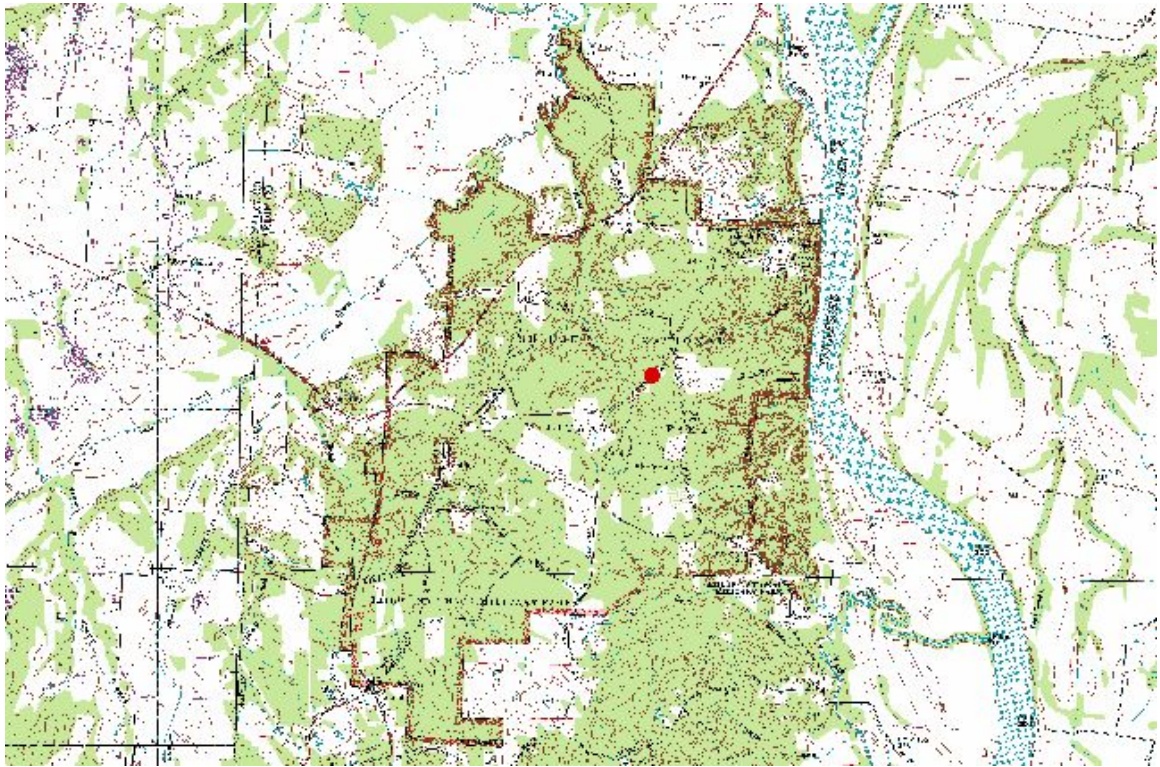


Fig. 33. Map showing a site from which the gray fox (*Urocyon cinereoargenteus*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

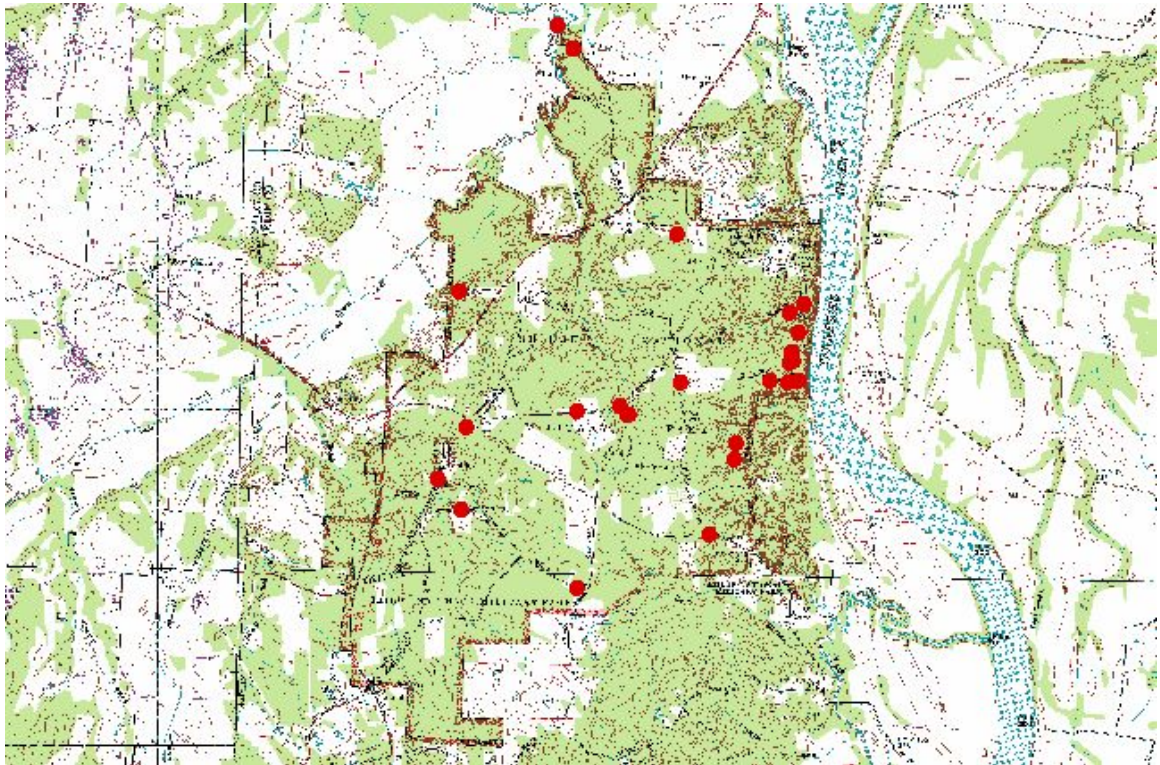


Fig. 34. Map showing sites from which the raccoon (*Procyon lotor*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

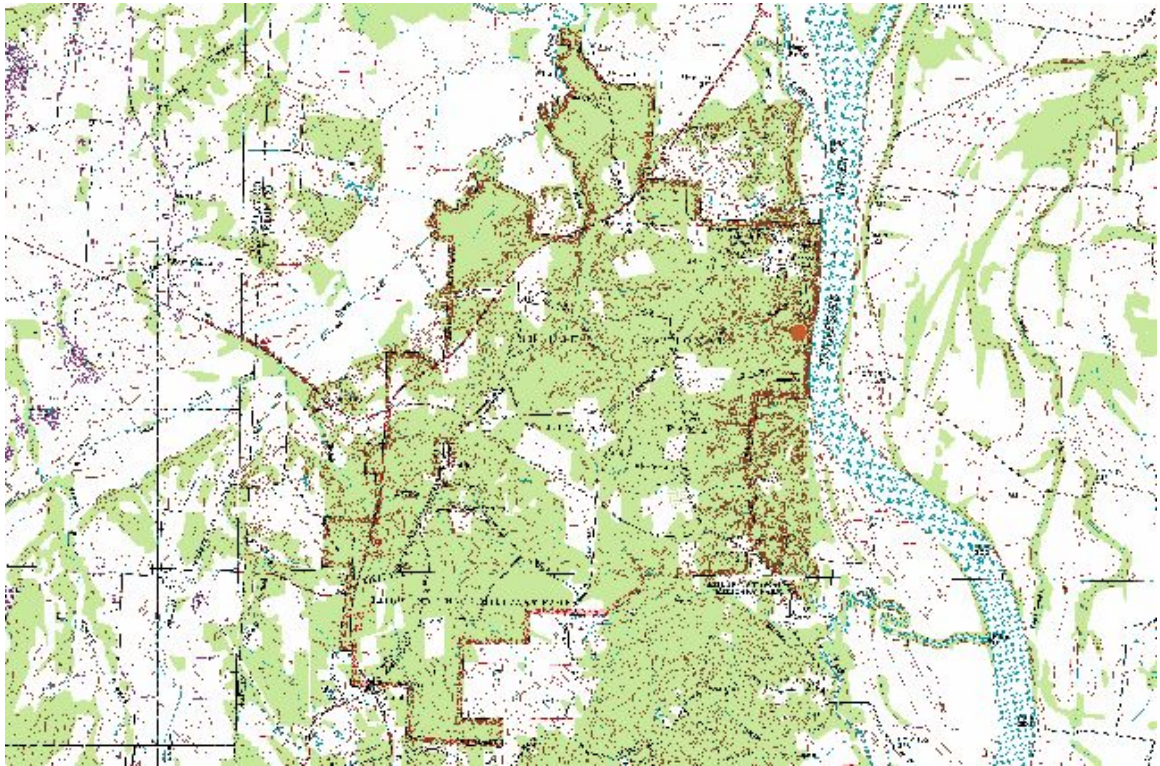


Fig. 35. Map showing a site from which the mink (*Mustela vison*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

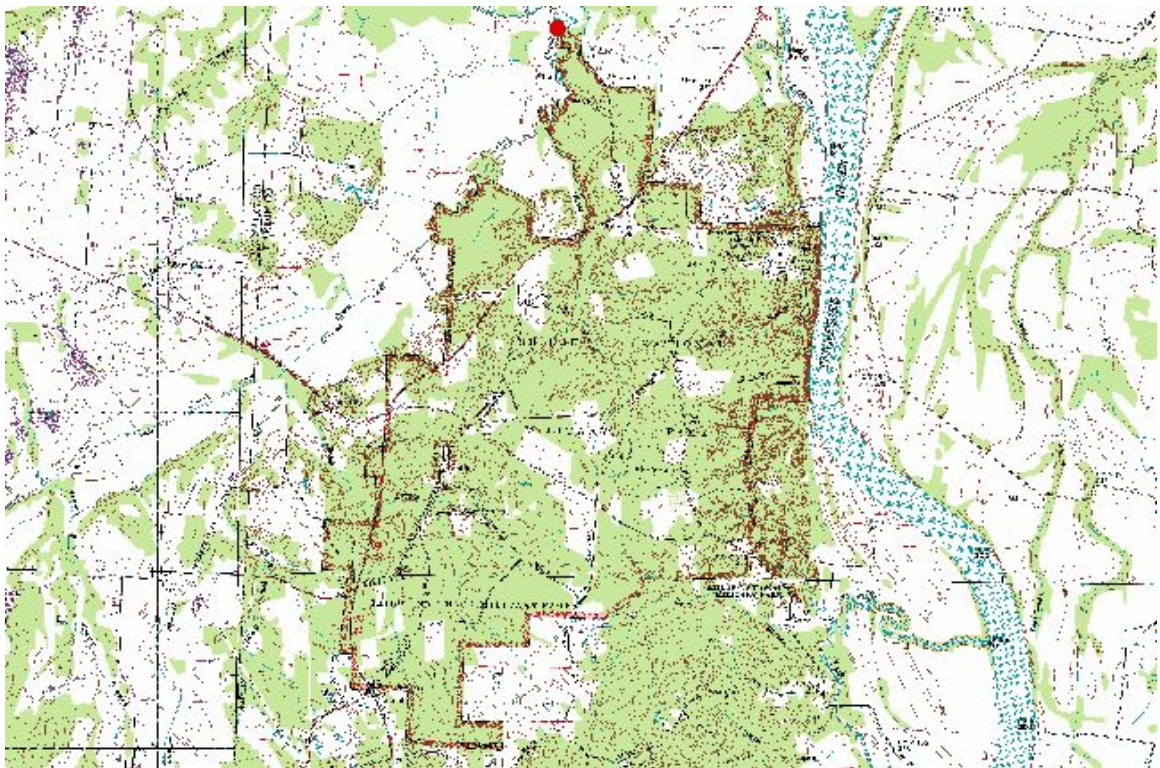


Fig. 36. Map showing a site from which the striped skunk (*Mephitis mephitis*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

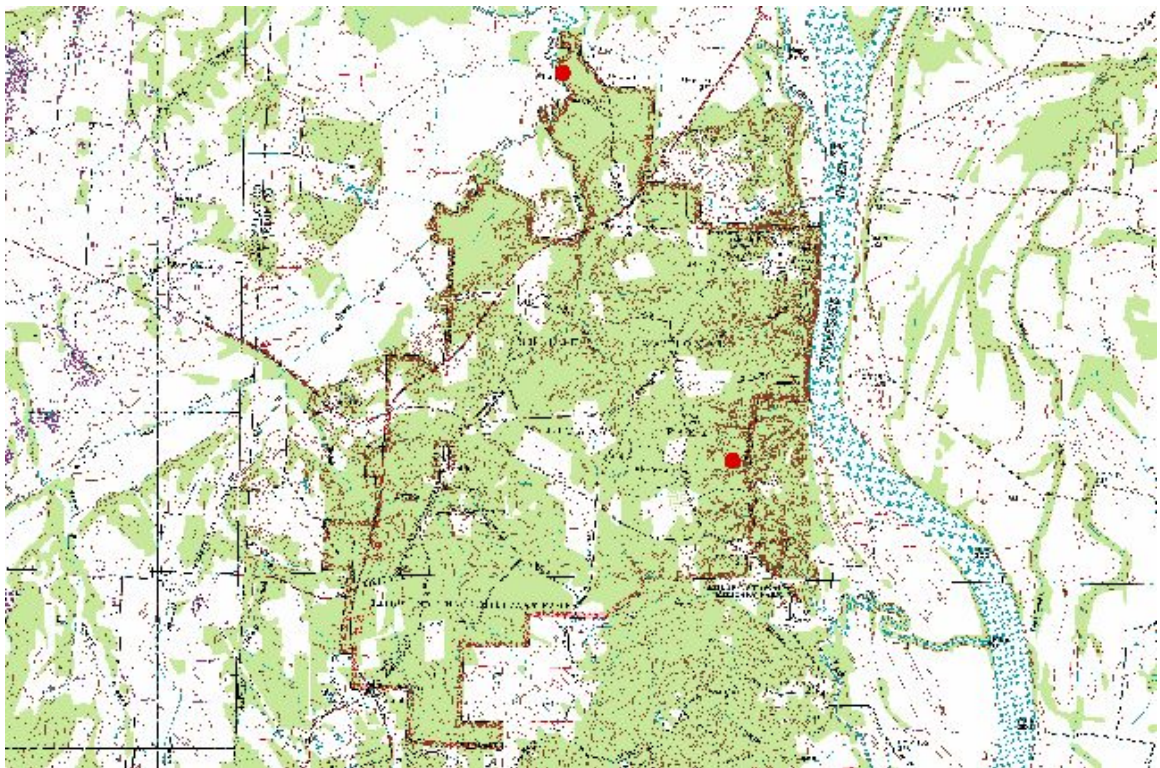


Fig. 37. Map showing sites from which the river otter (*Lontra canadensis*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

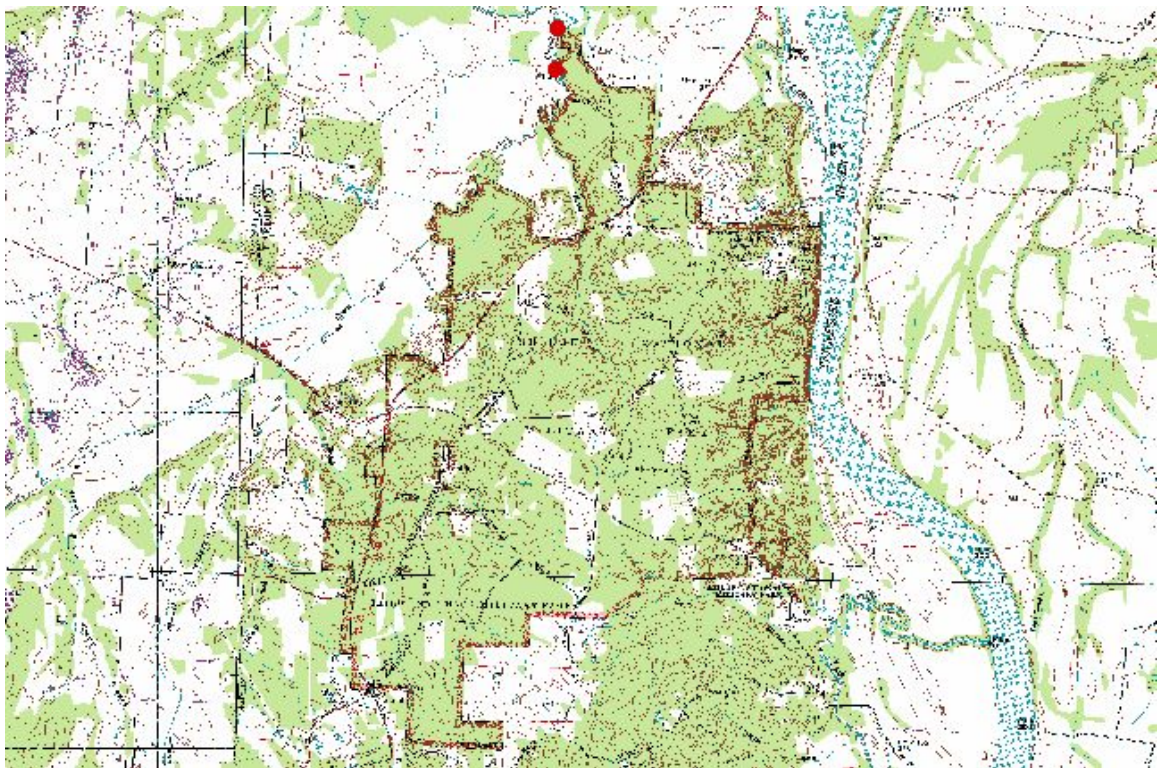


Fig. 38. Map showing sites from which the bobcat (*Lynx rufus*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

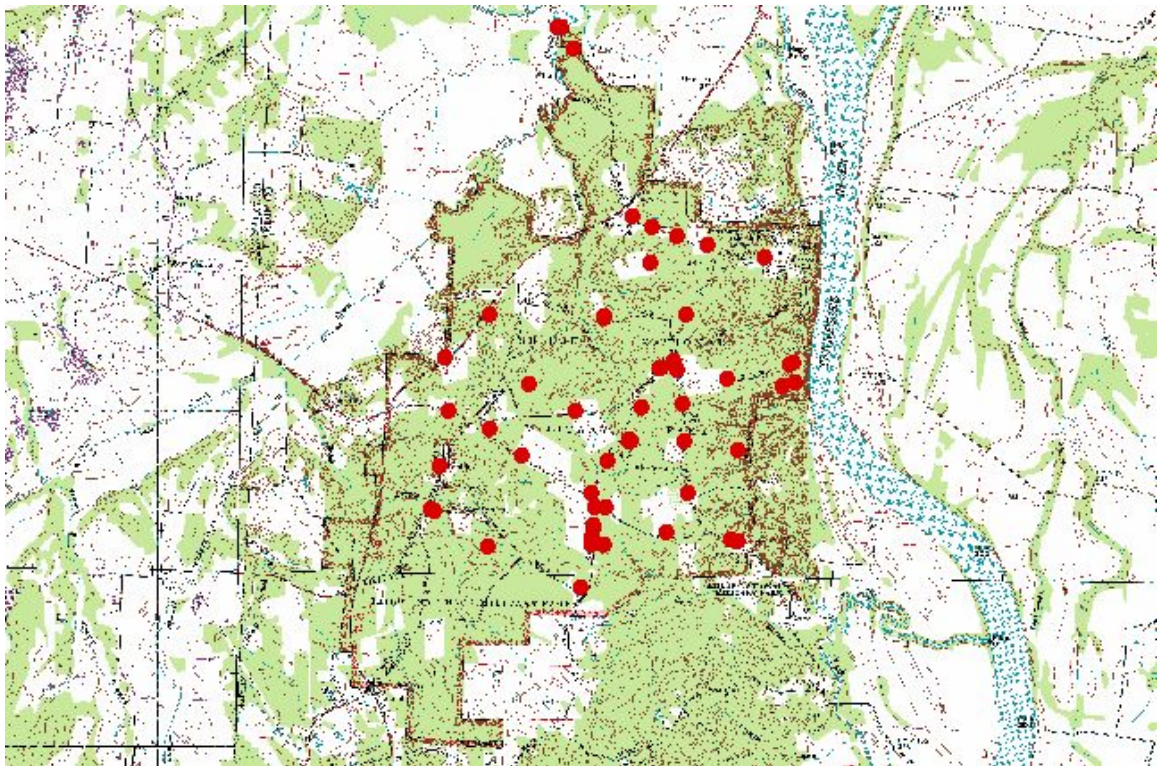


Fig. 39. Map showing sites from which the white-tailed deer (*Odocoileus virginianus*) was documented at Shiloh National Military Park in Hardin County, Tennessee, during 2005-2006 in a survey of mammalian biodiversity.

Tables

Table 1. Checklist of mammals with a potential for occurring at Shiloh National Military Park in Hardin County, Tennessee. Species marked with an asterisk were considered to have a relatively high probability for occurrence at the site (species not marked had a low probability for occurrence).

	Species	Common name
1.	<i>Didelphis virginiana</i>	Virginia opossum*
2.	<i>Sorex longirostris</i>	southeastern shrew*
3.	<i>Blarina carolinensis</i>	southern short-tailed shrew*
4.	<i>Cryptotis parva</i>	least shrew*
5.	<i>Scalopus aquaticus</i>	eastern mole*
6.	<i>Dasypus novemcinctus</i>	nine-banded armadillo*
7.	<i>Sylvilagus floridanus</i>	eastern cottontail*
8.	<i>Sylvilagus aquaticus</i>	swamp rabbit*
9.	<i>Tamias striatus</i>	eastern chipmunk*
10.	<i>Marmota monax</i>	woodchuck*
11.	<i>Sciurus carolinensis</i>	eastern gray squirrel*
12.	<i>Sciurus niger</i>	fox squirrel*
13.	<i>Glaucomys volans</i>	southern flying squirrel*
14.	<i>Castor canadensis</i>	beaver*
15.	<i>Oryzomys palustris</i>	marsh rice rat*
16.	<i>Reithrodontomys humulis</i>	eastern harvest mouse*
17.	<i>Peromyscus maniculatus</i>	deer mouse
18.	<i>Peromyscus leucopus</i>	white-footed mouse*
19.	<i>Peromyscus gossypinus</i>	cotton mouse*
20.	<i>Ochrotomys nuttalli</i>	golden mouse*
21.	<i>Sigmodon hispidus</i>	hispid cotton rat*
22.	<i>Neotoma floridana</i>	eastern woodrat
23.	<i>Microtus ochrogaster</i>	prairie vole
24.	<i>Microtus pinetorum</i>	woodland vole*
25.	<i>Ondatra zibethicus</i>	muskrat*
26.	<i>Synaptomys cooperi</i>	southern bog lemming
27.	<i>Rattus rattus</i>	black rat
28.	<i>Rattus norvegicus</i>	Norway rat
29.	<i>Mus musculus</i>	house mouse*
30.	<i>Zapus hudsonius</i>	meadow jumping mouse
31.	<i>Canis familiaris</i>	domestic dog*
32.	<i>Canis latrans</i>	coyote*
33.	<i>Vulpes vulpes</i>	red fox*
34.	<i>Urocyon cinereoargenteus</i>	gray fox*
35.	<i>Procyon lotor</i>	raccoon*
36.	<i>Mustela frenata</i>	long-tailed weasel
37.	<i>Mustela vison</i>	mink*
38.	<i>Mephitis mephitis</i>	striped skunk*
39.	<i>Lontra canadensis</i>	river otter*
40.	<i>Felis catus</i>	domestic cat*
41.	<i>Lynx rufus</i>	bobcat*

Table 1. (cont.)

42.	<i>Odocoileus virginianus</i>	white-tailed deer*
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Table 2. Mammals captured or identified (with some form of documentation) in surveys of mammals at Shiloh National Military Park during 1983-84 and 2005-06. Letter abbreviations* refer to abundance rankings: A = abundant; C = common; UC = uncommon; R=rare. Species noted with a double asterisk (**) were documented only in 1983-84.

Scientific name	Common name	Status	Documentation
<i>Didelphis virginiana</i>	Virginia opossum	C	Photograph of species and track
<i>Sorex longirostris</i> **	Southeastern shrew	R	Voucher specimen
<i>Blarina carolinensis</i>	Southern short-tailed shrew	C	Voucher specimen
<i>Cryptotis parva</i>	Least shrew	R	Voucher specimen
<i>Scalopus aquaticus</i>	Eastern mole	A	Voucher specimen and photo of mole run
<i>Dasypus novemcinctus</i>	Nine-banded armadillo	C	Photo of species
<i>Sylvilagus floridanus</i>	Eastern cottontail	UC	Photo of fecal pellets
<i>Sylvilagus aquaticus</i>	Swamp rabbit	R	Photo of fecal pellets
<i>Tamias striatus</i>	Eastern chipmunk	UC	Photo of feeding sign and sighting
<i>Marmota monax</i>	Woodchuck	C	Voucher specimen
<i>Sciurus carolinensis</i>	Eastern gray Squirrel	A	Voucher specimen
<i>Sciurus niger</i> **	Fox Squirrel	R	Sighting of animal
<i>Castor canadensis</i>	Beaver	C	Photo of sign (dam and cuttings)
<i>Oryzomys palustris</i>	Marsh rice rat	UC	Voucher specimen
<i>Reithrodontomys humulis</i> **	Eastern harvest mouse	UC	Voucher specimen
<i>Peromyscus leucopus</i>	White-footed mouse	C	Voucher specimen and photo
<i>Peromyscus gossypinus</i>	Cotton mouse	C	Voucher specimen
<i>Ochrotomys nuttalli</i>	Golden mouse	UC	Voucher specimen
<i>Sigmodon hispidus</i>	Hispid cotton rat	C	Voucher specimen
<i>Microtus pinetorum</i>	Woodland vole	C	Voucher specimen
<i>Ondatra zibethicus</i>	Muskrat	UC	Muskrat run sighted
<i>Mus musculus</i> **	House mouse	UC	Voucher specimen
<i>Canis familiaris</i>	Domestic dog	C	Sighting
<i>Canis latrans</i>	Coyote	C	Photo of species and track
<i>Vulpes vulpes</i>	Red fox	UC	Photo of track
<i>Urocyon cinereoargenteus</i>	Gray fox	UC	Sighting
<i>Procyon lotor</i>	Raccoon	A	Photo of species and track
<i>Mustela vison</i>	Mink	UC	Sighting of track
<i>Lontra canadensis</i>	River otter	R	Photo of scat and track
<i>Mephitis mephitis</i>	Striped skunk	UC	Track sighted

<i>Lynx rufus</i>	Bobcat	UC	Photo of track
<i>Felis catus</i>	Domestic cat	C	Sighting by SNMP Personnel
<i>Odocoileus virginianus</i>	White-tailed deer	A	Photo of species

Table 2 (cont.)

*Abundant: Species may be seen daily, in suitable habitat and season, and counted in relatively large numbers.

Common: Species may be seen daily, in suitable habitat and season, but not counted in relatively large numbers.

Uncommon: Species likely to be seen monthly in appropriate season and habitat and may be locally common.

Rare: Species present but usually seen only a few times each year.

Table 3. Mammalian species documented at Shiloh National Military Park during 2005-06.

Species*	Date	Sex	Weight	Age	UTM Coordinates	Documentation**
<i>Didelphis virginiana</i>	10/18/05				E 379637 N 3889420	C
<i>Didelphis virginiana</i>	08/20/06				E 377714 N 3892435	G
<i>Didelphis virginiana</i>	07/15/05				E 377576 N 3892625	O
<i>Didelphis virginiana</i>	05/23/06				E 379129 N 3889491	P
<i>Didelphis virginiana</i>	05/24/06				E 376945 N 3889130	P
<i>Didelphis virginiana</i>	08/20/06				E 375919 N 3888013	K
<i>Blarina carolinensis</i> *	11/05/05		6.5g	Adult	E 376967 N 3890032	B
<i>Blarina carolinensis</i> *	11/02/05		5.0g	Juv	E 377982 N 3891057	B
<i>Blarina carolinensis</i> *	11/09/05		5.5g	Adult	E 379013 N 3887978	B
<i>Blarina carolinensis</i> *	11/05/05		5.5g	Adult	E 379000 N 3890039	B
<i>Blarina carolinensis</i> *	11/02/05		6.0g	Adult	E 377598 N 3892632	B
<i>Blarina carolinensis</i> *	11/02/05		7.5g	Adult	E 377598 N 3892632	B
<i>Blarina carolinensis</i> *	11/05/07		9.0g	Adult	E 377598 N 3892632	B
<i>Blarina carolinensis</i> *	11/02/05		6.0g	Juv	E 377318 N 3889436	B
<i>Blarina carolinensis</i> *	09/10/05			Adult	E 377477 N 3890669	A
<i>Cryptotis parva</i> *	11/05/05		3.0g	Adult	E 379013 N 3887978	B
<i>Scalopus aquaticus</i>	09/10/05				E 378895 N 3890718	J
<i>Scalopus aquaticus</i>	09/10/05				E 377982 N 3891057	J
<i>Scalopus aquaticus</i>	07/15/05				E 379661 N 3889466	J
<i>Scalopus aquaticus</i>	07/24/05				E 379749 N 3889098	S
<i>Scalopus aquaticus</i>	09/10/05				E 378895 N 3890718	S

<i>Scalopus aquaticus</i>	09/10/05				E 377982 N 3891057	J
<i>Scalopus aquaticus</i>	10/16/05				E 377318 N 3889436	S
<i>Scalopus aquaticus</i>	10/08/05				E 376254 N 3889016	S
<i>Scalopus aquaticus</i>	06/29/06				E 378131 N 3889234	S
<i>Scalopus aquaticus</i>	06/29/06				E 376747 N 3890209	S
<i>Dasypus novemcinctus</i>	10/30/05				E 379637 N 3889420	C
<i>Dasypus novemcinctus</i>	09/11/05				E 376012 N 3889022	R
<i>Dasypus novemcinctus</i>	06/29/06				E 377584 N 3892185	O
<i>Dasypus novemcinctus</i>	09/11/05				E 376012 N 3889022	R
<i>Dasypus novemcinctus</i>	07/10/05				E 377658 N 3892469	L
<i>Dasypus novemcinctus</i>	07/14/05				E 377576 N 3892625	O
<i>Dasypus novemcinctus</i>	07/09/05				E 377576 N 3892625	O
<i>Dasypus novemcinctus</i>	06/29/06				E 377962 N 3892180	Q
<i>Sylvilagus floridanus</i>	07/10/05				E 377587 N 3890614	F
<i>Sylvilagus floridanus</i>	08/19/06				E 379054 N 3887870	Q
<i>Sylvilagus aquaticus</i>	10/14/05				E 376645 N 3890403	F,Q
<i>Tamias striatus</i>	09/10/05				E 379646 N 3889976	H
<i>Tamias striatus</i>	05/25/05			Adult	E 379646 N 3889976	Q
<i>Marmota monax*</i>	05/23/06				E 377662 N 3890779	R
<i>Sciurus carolinensis</i>	07/15/05				E 379773 N 3890543	Q
<i>Sciurus carolinensis</i>	11/02/05				E 376935 N 3889000	Q
<i>Sciurus carolinensis</i>	10/28/05				E 378147 N 3891976	Q
<i>Sciurus carolinensis</i>	10/16/05				E 379648 N 3889716	Q

<i>Sciurus carolinensis</i>	07/09/05				E 378987 N 3890643	Q
<i>Sciurus carolinensis</i>	08/20/06				E 377980 N 3892150	Q
<i>Castor canadensis</i>	07/15/05				E 379116 N 3888588	N
<i>Castor canadensis</i>	06/29/06				E 377584 N 3892185	N
<i>Castor canadensis</i>	07/07/06				E 376561 N 3890298	N
<i>Castor canadensis</i>	08/20/06				E 379161 N 3888825	N
<i>Oryzomys palustris</i>	07/10/05	F		Adult	E 377686 N 3888531	A
<i>Peromyscus leucopus</i>	07/10/05	F		Sub-adult	E 377428 N 3890802	A
<i>Peromyscus leucopus</i>	07/10/05	M		Sub-adult	E 377428 N 3890802	A
<i>Peromyscus leucopus</i>	10/17/05	F	19.5g	Adult	E 377984 N 3890028	A
<i>Peromyscus leucopus</i>	10/17/05	M		Adult	E 376949 N 3887988	A
<i>Peromyscus leucopus</i>	10/16/05				E 376874 N 3890240	Q
<i>Peromyscus leucopus</i>	10/16/05	F	11.0g	Juv	E 376836 N 3888049	A
<i>Peromyscus leucopus</i>	10/16/05	F	39.0g	Adult	E 376836 N 3888049	A
<i>Peromyscus leucopus</i>	10/16/05	F	25.0g	Adult	E 377984 N 3890028	A
<i>Peromyscus leucopus</i>	10/09/05	M	15.0g	Sub-adult	E 376254 N 3889016	A
<i>Peromyscus leucopus</i>	10/09/08	M	24.0g	Adult	E 376096 N 3889011	A
<i>Peromyscus leucopus</i>	10/08/05	M	20.0g	Adult	E 375942 N 3886974	A
<i>Peromyscus leucopus</i>	09/11/05	M		Adult	E 378749 N 3890840	A
<i>Peromyscus leucopus</i>	09/11/05	M		Sub-adult	E 378749 N 3890840	A
<i>Peromyscus leucopus</i>	09/11/05	M		Adult	E 377506 N 3890589	A
<i>Peromyscus leucopus</i>	07/16/05	M		Juv	E 377741 N 3892434	A
<i>Peromyscus leucopus</i>	07/10/05			Adult	E 377593 N 3890819	A

<i>Peromyscus leucopus</i>	07/10/05	M		Adult	E 377593 N 3890819	A
<i>Peromyscus leucopus</i>	07/10/05	F		Adult	E 377593 N 3890819	A
<i>Peromyscus leucopus</i>	07/10/05	M		Adult	E 377593 N 3890819	A
<i>Peromyscus leucopus</i>	07/09/05			Sub-adult	E 377431 N 3890815	A
<i>Peromyscus leucopus</i>	05/24/06	M		Adult	E 379711 N 3890728	A
<i>Peromyscus leucopus</i>	05/24/06			Adult	E 379860 N 3890894	A
<i>Peromyscus leucopus</i>	05/24/06	F		Adult	E 377371 N 3890563	A
<i>Peromyscus leucopus</i>	05/24/06	F		Adult	E 376111 N 3889166	A
<i>Peromyscus leucopus</i>	05/24/06	F		Sub-adult	E 376111 N 3889166	A
<i>Peromyscus leucopus</i>	05/24/06				E 376111 N 3889166	A
<i>Peromyscus leucopus</i>	05/24/06				E 376111 N 3889166	A
<i>Peromyscus leucopus</i>	05/24/06	M		Adult	E 376768 N 3889011	A
<i>Peromyscus leucopus</i>	08/20/06	F	13.0g	Sub-adult	E 377084 N 3887460	A
<i>Peromyscus gossypinus</i>	11/17/05	F	40.0g	Adult	E 375934 N 3888006	A
<i>Peromyscus gossypinus</i>	10/16/05	F	39.0g	Adult	E 375934 N 3888006	A
<i>Peromyscus gossypinus</i>	10/09/05	M	40.0g	Adult	E 376935 N 3889000	A
<i>Peromyscus gossypinus</i>	10/09/05	M	40.0g	Adult	E 376935 N 3889000	A
<i>Peromyscus gossypinus</i>	10/08/05	M	43.0g	Adult	E 376935 N 3889000	A
<i>Peromyscus gossypinus</i>	10/08/05	F	41.0g	Adult	E 376935 N 3889000	A
<i>Peromyscus gossypinus</i>	07/16/05				E 377741 N 3892434	A
<i>Peromyscus gossypinus</i>	07/16/05	M		Adult	E 377741 N 3892434	A
<i>Ochrotomys nuttalli</i>	10/09/05	M	3.0g	Juv	E 376967 N 3890041	A
<i>Ochrotomys nuttalli</i>	10/08/05	M	3.0g	Juv	E 376967 N 3890041	A

<i>Sigmodon hispidus</i>	07/10/05	M		Juv	E 377874 N 3888424	A
<i>Sigmodon hispidus*</i>	07/09/05			Adult	E 377456 N 3890854	A
<i>Sigmodon hispidus</i>	07/10/05				E 377686 N 3888531	A
<i>Sigmodon hispidus</i>	10/17/05	F		Adult	E 377991 N 3889054	A
<i>Sigmodon hispidus</i>	10/16/05	M	51.0g	Sub-adult	E 377991 N 3889054	A
<i>Sigmodon hispidus</i>	07/10/05	F		Adult	E 377874 N 3888424	A
<i>Sigmodon hispidus</i>	07/10/05			Juv	E 377686 N 3888531	A
<i>Sigmodon hispidus</i>	07/10/05	F		Juv	E 377220 N 3890918	A
<i>Sigmodon hispidus</i>	07/10/05	F		Sub-adult	E 377876 N 3888008	A
<i>Sigmodon hispidus</i>	07/09/05			Adult	E 377444 N 3890678	A
<i>Sigmodon hispidus</i>	05/24/06				E 376151 N 3889067	A
<i>Microtus pinetorum</i>	07/15/05	M	130.0g	Juv	E 377199 N 3887220	A
<i>Ondatra zibethicus</i>	08/20/06				E 376996 N 3889196	I
<i>Ondatra zibethicus</i>	08/20/06				E 379785 N 3890000	G
<i>Canis familiaris</i>	10/14/05				E 379637 N 3889420	Q
<i>Canis familiaris</i>	08/20/06				E 379861 N 3889465	K
<i>Canis latrans</i>	10/19/05				E 379637 N 3889420	C
<i>Canis latrans</i>	10/12/05				E 379637 N 3889420	C
<i>Canis latrans</i>	09/05/05				E 379637 N 3889420	C
<i>Canis latrans</i>	07/10/05				E 377661 N 3892479	L
<i>Canis latrans</i>	07/14/05				E 377576 N 3892625	L
<i>Canis latrans</i>	11/09/05				E 379013 N 3887978	M
<i>Canis latrans</i>	07/09/05				E 377661 N 3892479	L

<i>Canis latrans</i>	07/09/05				E 377576 N 3892625	L
<i>Canis latrans</i>	05/23/06				E 376571 N 3889671	P
<i>Canis latrans</i>	05/23/06				E 376571 N 3889671	P
<i>Canis latrans</i>	08/20/06				E 377791 N 3890955	K
<i>Vulpes vulpes</i>	07/10/05				E 377576 N 3892625	G
<i>Vulpes vulpes</i>	07/14/05				E 377576 N 3892625	L
<i>Urocyon cinereoargenteus</i>	05/23/06				E 378423 N 3889493	P
<i>Procyon lotor</i>	07/14/05				E 377576 N 3892625	G
<i>Procyon lotor</i>	08/30/05				E 379470 N 3889450	C
<i>Procyon lotor</i>	08/31/05				E 377576 N 3892625	C
<i>Procyon lotor</i>	10/08/05				E 379470 N 3889450	C
<i>Procyon lotor</i>	10/10/05				E 379470 N 3889450	C
<i>Procyon lotor</i>	10/11/05				E 379470 N 3889450	C
<i>Procyon lotor</i>	10/22/05				E 379470 N 3889450	C
<i>Procyon lotor</i>	07/09/05				E 377718 N 3892425	K,M
<i>Procyon lotor</i>	10/17/05				E 379641 N 3890059	K
<i>Procyon lotor</i>	10/17/05				E 379721 N 3889878	K
<i>Procyon lotor</i>	07/14/05				E 377576 N 3892625	K
<i>Procyon lotor</i>	10/17/05				E 379654 N 3889701	K
<i>Procyon lotor</i>	07/15/05				E 377576 N 3892625	K
<i>Procyon lotor</i>	05/23/06				E 377749 N 3889182	K
<i>Procyon lotor</i>	05/23/06				E 376760 N 3889040	K
<i>Procyon lotor</i>	05/23/06				E 376509 N 3888578	Q

<i>Procyon lotor</i>	05/23/06				E 379647 N 3889615	P
<i>Procyon lotor</i>	05/24/06				E 377746 N 3887605	P
<i>Procyon lotor</i>	05/24/06				E 378207 N 3889145	P
<i>Procyon lotor</i>	05/24/06				E 378202 N 3889143	P
<i>Procyon lotor</i>	05/24/06				E 378666 N 3889438	P
<i>Procyon lotor</i>	05/24/06				E 379682 N 3889633	P
<i>Procyon lotor</i>	05/24/06				E 376704 N 3888296	P
<i>Procyon lotor</i>	05/24/06				E 378932 N 3888077	P
<i>Procyon lotor</i>	05/24/06				E 378641 N 3890758	P
<i>Procyon lotor</i>	08/20/06				E 376702 N 3890255	K
<i>Procyon lotor</i>	08/20/06				E 379766 N 3890130	K
<i>Procyon lotor</i>	08/20/06				E 379144 N 3888746	K
<i>Procyon lotor</i>	08/20/06				E 379175 N 3888886	K
<i>Procyon lotor</i>	08/20/06				E 379626 N 3889430	K
<i>Procyon lotor</i>	08/20/06				E 379719 N 3889446	K
<i>Procyon lotor</i>	07/26/06				E 378131 N 3889234	D
<i>Mustela vison</i>	05/25/06				E 379721 N 3889878	K
<i>Lontra canadensis</i>	08/20/06				E 379130 N 3888759	G,M
<i>Lontra canadensis</i>	06/29/06				E 377612 N 3892227	L
<i>Mephitis mephitis</i>	07/09/05				E 377576 N 3892625	T
<i>Lynx rufus</i>	07/10/05				E 377576 N 3892625	G
<i>Lynx rufus</i>	07/09/05				E 377576 N 3892625	K
<i>Lynx rufus</i>	06/29/06				E 377555 N 3892256	O

<i>Odocoileus virginianus</i>	10/08/05				E 379577 N 3889420	C
<i>Odocoileus virginianus</i>	10/10/05				E 379577 N 3889420	C
<i>Odocoileus virginianus</i>	10/12/05				E 379577 N 3889420	C
<i>Odocoileus virginianus</i>	10/13/05				E 379577 N 3889420	C
<i>Odocoileus virginianus</i>	10/14/05				E 379577 N 3889420	C
<i>Odocoileus virginianus</i>	10/15/05				E 379577 N 3889420	C
<i>Odocoileus virginianus</i>	10/23/05				E 379577 N 3889420	C
<i>Odocoileus virginianus</i>	07/14/05				E 377576 N 3892625	C
<i>Odocoileus virginianus</i>	07/15/05				E 377576 N 3892625	K
<i>Odocoileus virginianus</i>	07/14/05				E 377576 N 3892625	K
<i>Odocoileus virginianus</i>	07/15/05				E 377576 N 3892625	C
<i>Odocoileus virginianus</i>	07/18/05				E 377576 N 3892625	C
<i>Odocoileus virginianus</i>	07/20/05				E 377576 N 3892625	C
<i>Odocoileus virginianus</i>	07/21/05				E 377576 N 3892625	C
<i>Odocoileus virginianus</i>	07/22/05				E 377576 N 3892625	C
<i>Odocoileus virginianus</i>	07/23/05				E 377576 N 3892625	C
<i>Odocoileus virginianus</i>	08/05/04				E 377598 N 3892632	C
<i>Odocoileus virginianus</i>	08/28/05				E 377576 N 3892625	C
<i>Odocoileus virginianus</i>	07/15/05				E 377870 N 3888461	E
<i>Odocoileus virginianus</i>	07/09/05				E 377576 N 3892625	K
<i>Odocoileus virginianus</i>	07/08/05	F			E 378914 N 3890681	Q
<i>Odocoileus virginianus</i>	07/08/05	F			E 378726 N 3890064	Q
<i>Odocoileus virginianus</i>	07/09/05	F			E 378690 N 3889260	Q

<i>Odocoileus virginianus</i>	07/09/05				E 377723 N 3892428	K
<i>Odocoileus virginianus</i>	07/10/05	F			E 376606 N 3889202	Q
<i>Odocoileus virginianus</i>	07/10/05	F			E 376435 N 3888314	Q
<i>Odocoileus virginianus</i>	07/10/05				E 377876 N 3887995	Q
<i>Odocoileus virginianus</i>	10/09/05	F		Adult	E 378015 N 3888751	Q
<i>Odocoileus virginianus</i>	10/09/05				E 378207 N 3888918	Q
<i>Odocoileus virginianus</i>	10/16/05				E 377318 N 3889436	K
<i>Odocoileus virginianus</i>	10/17/05				E 377980 N 3887994	M
<i>Odocoileus virginianus</i>	11/09/05				E 376967 N 3889028	Q
<i>Odocoileus virginianus</i>	07/15/05				E 379093 N 3889483	Q
<i>Odocoileus virginianus</i>	11/02/05				E 376949 N 3887988	Q
<i>Odocoileus virginianus</i>	11/02/05				E 377984 N 3890028	Q
<i>Odocoileus virginianus</i>	10/08/05				E 378223 N 3888924	Q
<i>Odocoileus virginianus</i>	10/09/05				E 376967 N 3890054	M
<i>Odocoileus virginianus</i>	05/23/06				E 378710 N 3888920	P
<i>Odocoileus virginianus</i>	05/23/06				E 379120 N 3888040	P
<i>Odocoileus virginianus</i>	05/23/06				E 378545 N 3888105	P
<i>Odocoileus virginianus</i>	05/23/06				E 377893 N 3888178	P
<i>Odocoileus virginianus</i>	05/23/06				E 377782 N 3887614	P
<i>Odocoileus virginianus</i>	05/23/06				E 378318 N 3890872	P
<i>Odocoileus virginianus</i>	05/23/06				E 379647 N 3889615	P
<i>Odocoileus virginianus</i>	05/23/06				E 378608 N 3889635	P
<i>Odocoileus virginianus</i>	05/23/06				E 376571 N 3889671	P

<i>Odocoileus virginianus</i>	05/23/06				E 376571 N 3889671	P
<i>Odocoileus virginianus</i>	05/24/06				E 376472 N 3888308	P
<i>Odocoileus virginianus</i>	05/24/06				E 377988 N 3890042	P
<i>Odocoileus virginianus</i>	05/24/06				E 378500 N 3889584	P
<i>Odocoileus virginianus</i>	05/24/06				E 378216 N 3888945	P
<i>Odocoileus virginianus</i>	05/24/06				E 377897 N 3888149	P
<i>Odocoileus virginianus</i>	05/24/06				E 377913 N 3888326	P
<i>Odocoileus virginianus</i>	05/24/06				E 377257 N 3888789	P
<i>Odocoileus virginianus</i>	05/24/06				E 378409 N 3890512	P
<i>Odocoileus virginianus</i>	05/24/06				E 378633 N 3889564	P
<i>Odocoileus virginianus</i>	05/24/06				E 378743 N 3888455	P
<i>Odocoileus virginianus</i>	05/24/06				E 379187 N 3888026	P
<i>Odocoileus virginianus</i>	05/24/06				E 379682 N 3889633	P
<i>Odocoileus virginianus</i>	05/24/06				E 378483 N 3889570	P
<i>Odocoileus virginianus</i>	05/24/06				E 378320 N 3889223	P
<i>Odocoileus virginianus</i>	05/24/06				E 377737 N 3889190	P
<i>Odocoileus virginianus</i>	05/24/06				E 376524 N 3888698	P
<i>Odocoileus virginianus</i>	05/24/06				E 377881 N 3888069	P
<i>Odocoileus virginianus</i>	05/24/06				E 378003 N 3888338	P
<i>Odocoileus virginianus</i>	05/24/06				E 378641 N 3890758	P
<i>Odocoileus virginianus</i>	05/24/06				E 378410 N 3890846	P
<i>Odocoileus virginianus</i>	05/24/06				E 378240 N 3890936	P
<i>Odocoileus virginianus</i>	05/23/06				E 379422 N 3890563	Q

<i>Odocoileus virginianus</i>	08/20/06				E 379696 N 3889450	K
<i>Odocoileus virginianus</i>	08/20/06				E 379176 N 3888840	K

Specimens marked with a single asterisk () were taken as voucher specimens.

Type of documentation is denoted by a double asterisk ().

- A: Capture in Sherman trap
- B: Capture in pitfall trap
- C: Photograph of animal at camera site
- D: Photograph of animal at arboreal camera site
- E: Photograph of animal (other than camera site)
- F: Photograph of fecal pellets
- G: Photograph of track
- H: Photograph of feeding sign
- I: Photograph of sign
- J: Photograph of mole run
- K: Track was sighted at scent station
- L: Photograph at bait station (ground level)
- M: Scat record
- N: Sign (dam) sighted
- O: Track was sighted other than at scent station
- P: Animal sighted during spotlight survey
- Q: Animal sighted
- R: Road kill
- S: Sighted mole run
- T: Track sighted but no photograph

Table 4. Voucher specimens in the mammal collection of The University of Memphis, Memphis, Tennessee, collected at Shiloh National Military Park (SNMP), Hardin County, Tennessee, 1983-84.

Museum no.	Species	Locality	Date
12555	<i>Sorex longirostris</i>	Sowell Field picnic area	11/24/1983
12553	<i>Blarina carolinensis</i>	Sowell Field picnic area	11/24/1983
12554	<i>Blarina carolinensis</i>	Sowell Field picnic area	11/24/1983
12552	<i>Scalopus aquaticus</i>	SNMP	02/09/1983
12617	<i>Sciurus carolinensis</i>	SNMP	08/--/1983
12635	<i>Oryzomys palustris</i>	Owl Creek	09/17/1983
12556	<i>Reithrodontomys humulis</i>	Glover Field	11/27/1983
12557	<i>Reithrodontomys humulis</i>	Glover Field	11/27/1983
12652	<i>Reithrodontomys humulis</i>	Glover Field	11/27/1983
12577	<i>Peromyscus leucopus</i>	Old Roger's Place	05/05/1984
12578	<i>Peromyscus leucopus</i>	Rushton Field	05/06/1984
12579	<i>Peromyscus leucopus</i>	Rushton Field	05/05/1984
12580	<i>Peromyscus leucopus</i>	Rushton Field	05/05/1984
12581	<i>Peromyscus leucopus</i>	Rushton Field	05/17/1984
12582	<i>Peromyscus leucopus</i>	Owl Creek Bottom	09/17/1984
12583	<i>Peromyscus leucopus</i>	Owl Creek Bottom	09/17/1984
12584	<i>Peromyscus leucopus</i>	Old Pugh Place	05/05/1984
12585	<i>Peromyscus leucopus</i>	Old Pugh Place	05/17/1984
12586	<i>Peromyscus leucopus</i>	Old Pugh Place	04/29/1984
12587	<i>Peromyscus leucopus</i>	0.5 mi E. Peach Orchard	11/26/1983
12588	<i>Peromyscus leucopus</i>	SNMP	03/04/1984
12637	<i>Peromyscus leucopus</i>	Sowell Field	11/24/1983
12638	<i>Peromyscus leucopus</i>	0.5 mi E. Peach Orchard	11/26/1983
12639	<i>Peromyscus leucopus</i>	Glover Field	11/27/1983
12640	<i>Peromyscus leucopus</i>	Owl Creek	09/10/1983
12641	<i>Peromyscus leucopus</i>	0.5 mi E. Peach Orchard	11/26/1983
12642	<i>Peromyscus leucopus</i>	0.5 mi E. Peach Orchard	11/26/1983
12643	<i>Peromyscus leucopus</i>	Glover Field	11/27/1983
12644	<i>Peromyscus leucopus</i>	Glover Field	11/27/1983
12645	<i>Peromyscus leucopus</i>	Old Pugh Place	04/29/1984
12646	<i>Peromyscus leucopus</i>	Rushton Field	05/05/1984
12647	<i>Peromyscus leucopus</i>	Rushton Field	05/17/1984
12648	<i>Peromyscus leucopus</i>	Peach Orchard	04/27/1984
12674	<i>Peromyscus leucopus</i>	Robertson Field	04/29/1984
12675	<i>Peromyscus leucopus</i>	Robertson Field	05/06/1984
12676	<i>Peromyscus leucopus</i>	Robertson Field	05/06/1984
12677	<i>Peromyscus leucopus</i>	Robertson Field	05/17/1984
12558	<i>Peromyscus gossypinus</i>	Owl Creek bottom	09/--/1984
12559	<i>Peromyscus gossypinus</i>	Sowell Field picnic area	11/26/1983
12576	<i>Peromyscus gossypinus</i>	Wissinger House	03/06/1984

12649	<i>Peromyscus gossypinus</i>	Rushton Field	05/17/1984
12560	<i>Ochrotomys nuttalli</i>	Old Pugh Place	05/17/1984
12561	<i>Ochrotomys nuttalli</i>	Ruggell's & Conf Rd*	11/26/1983
12562	<i>Ochrotomys nuttalli</i>	Ruggell's & Conf Rd*	11/25/1983
12563	<i>Ochrotomys nuttalli</i>	0.5 mi E. Peach Orchard	11/26/1983
12567	<i>Microtus pinetorum</i>	Old Pugh Place	04/27/1984
12568	<i>Microtus pinetorum</i>	Old Pugh Place	04/27/1984
12569	<i>Microtus pinetorum</i>	Old Pugh Place	04/27/1984
12570	<i>Microtus pinetorum</i>	Old Pugh Place	04/29/1984
12571	<i>Microtus pinetorum</i>	Old Pugh Place	05/05/1984
12572	<i>Microtus pinetorum</i>	Old Pugh Place	05/05/1984
12573	<i>Microtus pinetorum</i>	Old Pugh Place	04/29/1984
12574	<i>Microtus pinetorum</i>	Old Pugh Place	05/26/1984
12575	<i>Microtus pinetorum</i>	Owl Creek Bottom	04/29/1984
12650	<i>Microtus pinetorum</i>	Robertson Field	04/29/1984
12651	<i>Microtus pinetorum</i>	Robertson Field	05/17/1984
12564	<i>Mus musculus</i>	Old Roger's Place	05/05/1984
12565	<i>Mus musculus</i>	Rushton Field	05/05/1984
12566	<i>Mus musculus</i>	SNMP	02/09/1984

*Ruggell's & Conf Rd = Ruggell's Line and Confederate Road.

Appendices

Appendix 1. Information relating to the sighting of Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) at Shiloh National Military Park in Hardin County, Tennessee.

Species sighted: Rafinesque's big-eared bat (*Corynorhinus rafinesquii*)

Date: 23 May 2006

Observation by: M. L. Kennedy, Dept. of Biology, The University of Memphis

Location: Old house at southwestern corner of junction of Hwy 22 and Hwy 142

Latitude: N35 08.201' Longitude: W088 21.743'

The bat was observed in the NW corner of the attic of the old house. There was only one bat, and, from the size, it appeared to be an adult. The time was late afternoon on Tuesday (23 May). On the following Wednesday and Thursday (24 and 25 May), the house was checked again (but during the morning rather than afternoon), and no bats were found. Temperature in the attic was pretty hot.

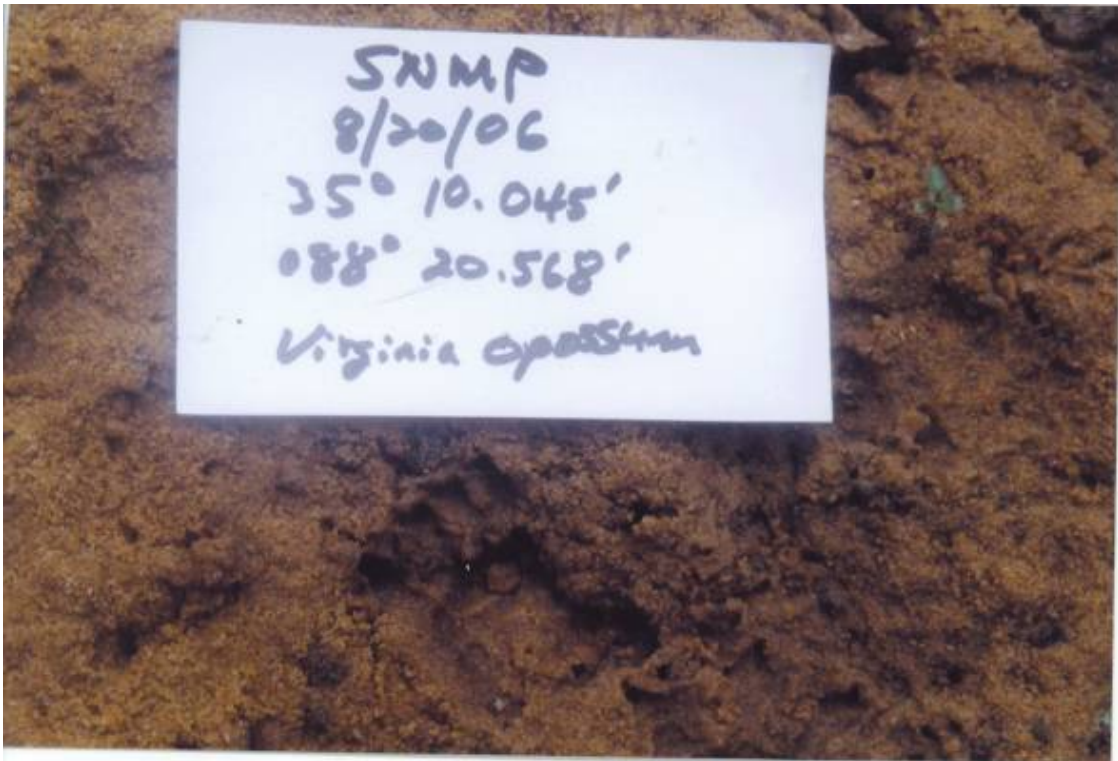
Appendix II. GPS coordinates for 21 plots investigated in an assessment of the mammalian biodiversity at Shiloh National Military Park in Hardin Co., Tennessee, during 2005 and 2006. Coordinates are in Universal Transverse Mercator (UTM) format.

Plot #	Easting	Northing
Plot 1	375942	3886974
Plot 2	375930	3887999
Plot 3	376617	3889014
Plot 4	376949	3887988
Plot 5	376967	3889028
Plot 6	376965	3890032
Plot 8	377979	3887994
Plot 9	377981	3889017
Plot 10	377984	3890037
Plot 11	377982	3891057
Plot 12	379013	3887978
Plot 13	378988	3889023
Plot 14	379000	3890039
Plot 15	377598	3892632
Plot 16	378152	3891969
Plot 17	376842	3888045
Plot 18	379721	3889878
Plot 19	379641	3890059
Plot 20	379654	3889701
Plot 21	378207	3888918
plot 22	377322	3889430

Appendix III. Photo log of pictures taken to verify the mammalian biodiversity occurring at Shiloh National Military Park in Hardin Co., Tennessee.



Didelphis virginiana (10/18/2005)
N 35° 08'15.5" W 88° 19'11.9"



Didelphis virginiana (8/20/2006)
N 35° 10.045' W 88° 20.568'



Scalopus aquaticis (9/10/2005)
N 35° 09' 07.5" W 88° 19' 46.5"



Scalopus aquaticus (9/10/2005)
N 35° 7.6' 43.91" W 88° 19.6' 72.91"



Scalopus aquaticus (7/15/2005)
N 35° 08' 14.1" W 88° 19' 10.6"



Dasytus novemcinctus (10/30/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



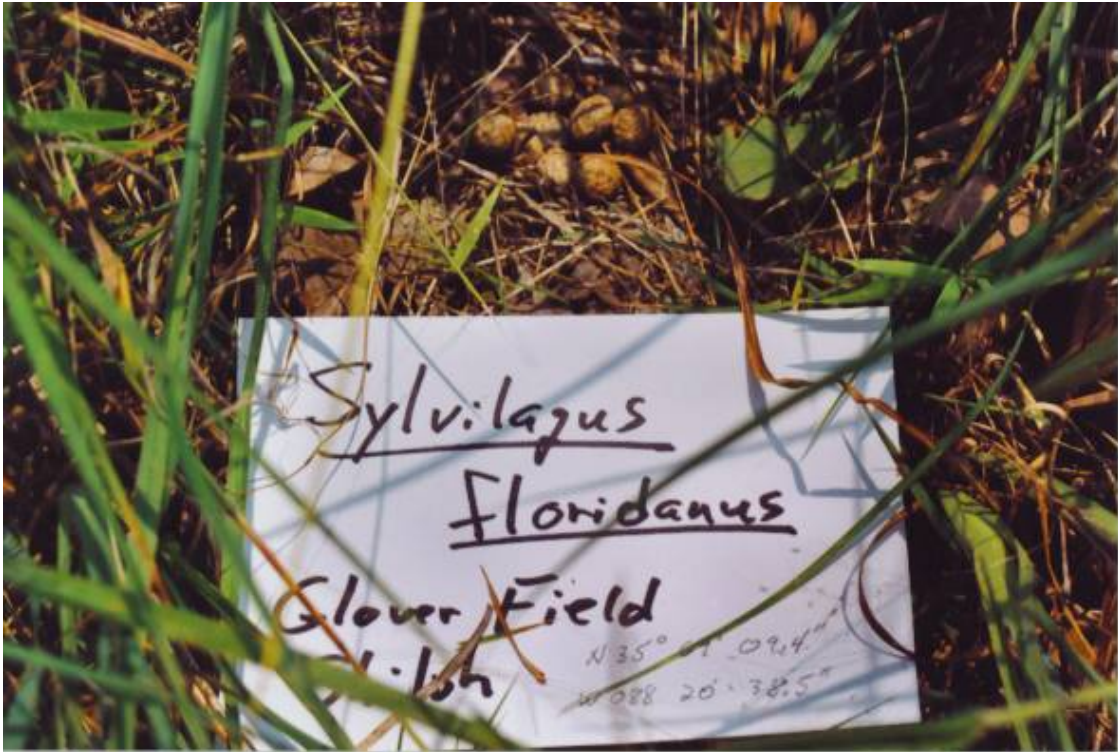
Dasypus novemcinctus (9/11/2005)
N 35° 08' 11.2" W 88° 21' 39.5"



Dasypus novemcinctus (9/11/2005)
N 35° 08' 11.2" W 88° 21' 39.5"



Dasypus novemcinctus (7/10/2005)
N 35° 10' 03.8" W 88° 20' 36.3"



Sylvilagus floridanus (7/10/2005)
N 35° 09' 09.4" W 88° 20' 38.5"



Sylvilagus aquaticus (10/14/2005)
N 35° 08' 56.3" W 88° 21' 15.2"



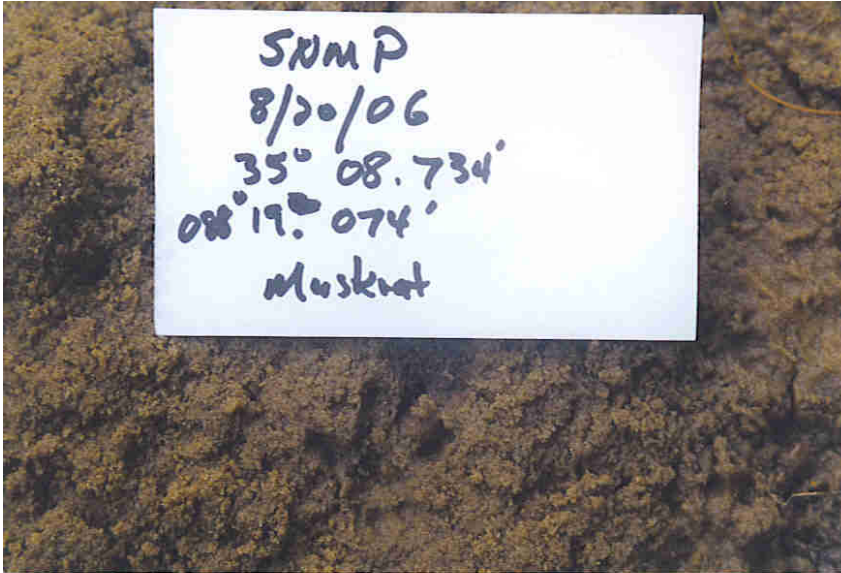
Tamias striatus (9/10/2005) (see Elbroch 2003)
N 35° 8.1' 14.65" W 88° 20.2' 11.86"



Castor canadensis (7/15/2005)
N 35° 07' 57.2" W 88° 19' 07.4"



Peromyscus leucopus (7/10/2005)
N 35° 09' 09.6" W 88° 20' 44.5"



Ondatra zibethicus (8/20/2006)
N 35° 08.734' W 88° 19.074'



Canis latrans (10/19/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



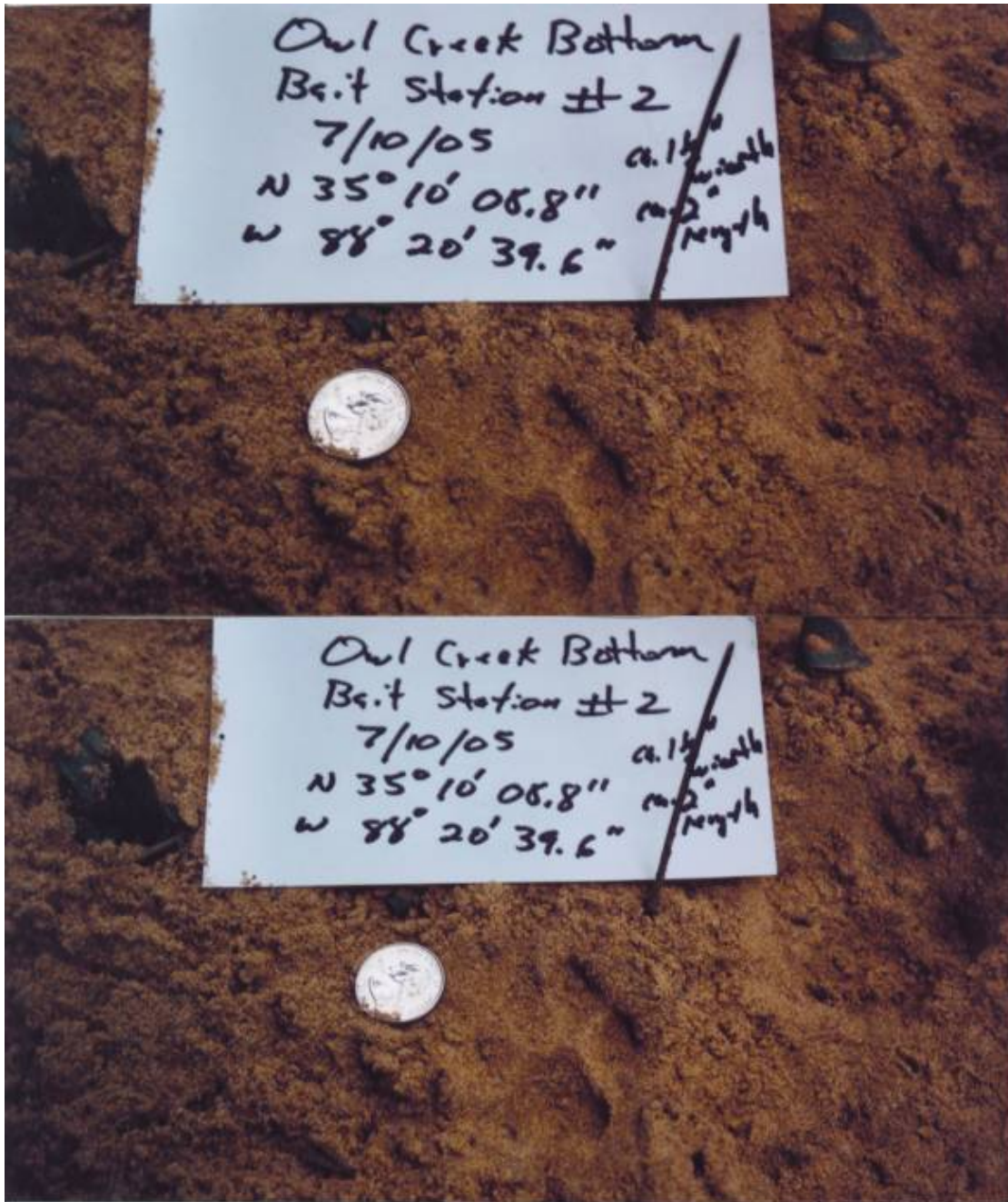
Canis latrans (10/12/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



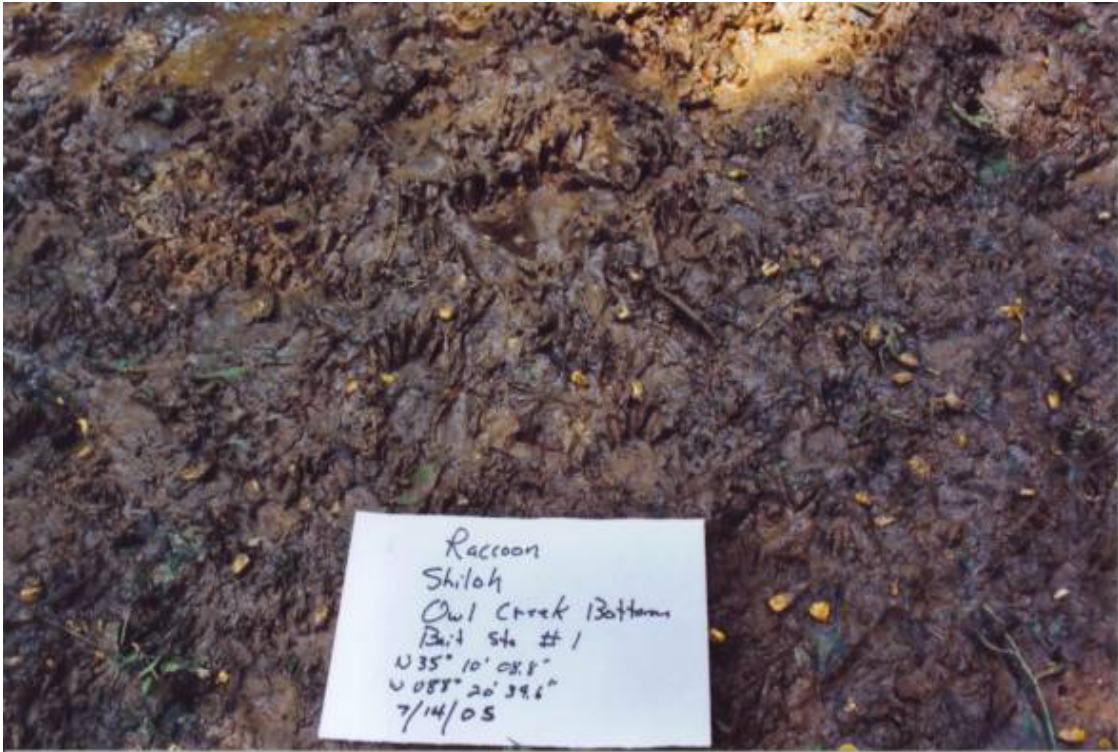
Canis latrans (9/5/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



Canis latrans (7/10/2005)
N 35° 10' 4.1" W 88° 20' 36.2"



Vulpes vulpes (7/10/2005) (see Murie 1974)
N 35° 10' 08.8" W 88° 20' 39.6"



Procyon lotor (7/14/2005)
N 35° 10' 08.8" W 88° 20' 39.6"



Procyon lotor (8/30/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



Procyon lotor (8/31/2005)
N 35° 10' 08.8" W 88° 20' 39.6"



Procyon lotor (10/8/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



Procyon lotor (8/11/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



Procyon lotor (8/22/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



Lontra canadensis (8/20/2006)
N 35° 08.073' W 88° 19.063'



Lontra canadensis (8/20/2006)
 N 35° 08.073' W 88° 19.063'



Lynx rufus (7/10/2005)
N 35° 10' 08.8" W 88° 20' 39.6"



Odocoileus virginianus (10/8/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



Odocoileus virginianus (10/10/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



Odocoileus virginianus (10/12/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



Odocoileus virginianus (10/13/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



Odocoileus virginianus (10/13/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



Odocoileus virginianus (10/13/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



Odocoileus virginianus (10/13/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



Odocoileus virginianus (10/14/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



Odocoileus virginianus (10/14/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



Odocoileus virginianus (10/15/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



Odocoileus virginianus (10/23/2005)
N 35° 08' 15.3" W 88° 19' 11.9"



Odocoileus virginianus (7/14/2005)
N 35° 10' 08.8" W 88° 20' 39.6"



Odocoileus virginianus (7/15/2005)
N 35° 10' 08.8" W 88° 20' 39.6"



Odocoileus virginianus (7/18/2005)
N 35° 10' 08.8" W 88° 20' 39.6"



Odocoileus virginianus (7/20/2005)
N 35° 10' 08.8" W 88° 20' 39.6"



Odocoileus virginianus (7/20/2005)
N 35° 10' 08.8" W 88° 20' 39.6"



Odocoileus virginianus (7/21/2005)
N 35° 10' 08.8" W 88° 20' 39.6"



Odocoileus virginianus (7/21/2005)
N 35° 10' 08.8" W 88° 20' 39.6"



Odocoileus virginianus (7/21/2005)
N 35° 10' 08.8" W 88° 20' 39.6"



Odocoileus virginianus (7/22/2005)
N 35° 10' 08.8" W 88° 20' 39.6"



Odocoileus virginianus (7/23/2005)
N 35° 10' 08.8" W 88° 20' 39.6"



Odocoileus virginianus (7/23/2005)
N 35° 10' 08.8" W 88° 20' 39.6"



Odocoileus virginianus (7/23/2005)
N 35° 10' 08.8" W 88° 20' 39.6"



Odocoileus virginianus (8/3/2005)
UTM X 0377598 UTM Y 3892632



Odocoileus virginianus (8/28/2005)
N 35° 10' 08.8" W 88° 20' 39.6"



Odocoileus virginianus (7/15/2005)
N 35° 07' 53.8" W 88° 20' 25.8"