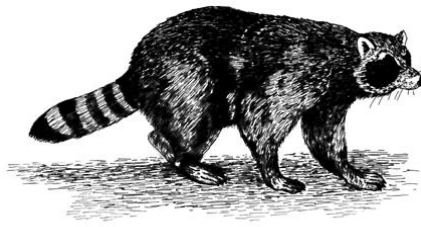
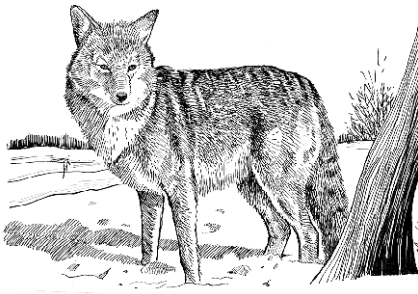
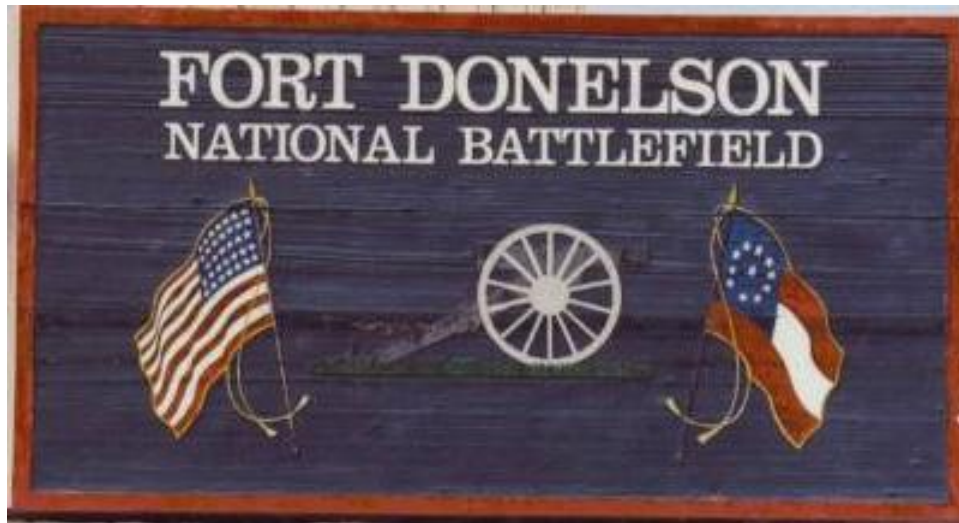


**INVENTORY OF MAMMALS AT
FORT DONELSON NATIONAL BATTLEFIELD**

2007



Prepared for:

Fort Donelson National Battlefield
174 National Cemetery Drive
Dover, Tennessee 37058

Prepared by:

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FINAL REPORT

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FOREWORD

The following pages present a final report for work relating to an inventory of mammals at Fort Donelson National Battlefield in Stewart County, Tennessee. Fieldwork was conducted by H. L. LaMountain, N. E. Jordan, M. L. Kennedy, and a number of students from The University of Memphis in 2004 and A. K. Featherston and R. D. McDermott during 2005. M. L. Kennedy conducted some visial surveys during 2007 and was the principal investigator for the project. To make the report more complete, GPS coordinates for selected plots have been provided as Appendix I, and Appendix II 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 Robert Wallace and other personnel at Fort Donelson National Battlefield for their help in many aspects of the study. Several students (graduate and undergraduate) from The University of Memphis assisted in fieldwork. Most identification of specimens and photographs taken were by Anna Featherston, Robert McDermott, Nick Jordan, and Heidi L. LaMountain. The investigation was funded in part by the National Park Service.

INVENTORY OF MAMMALS AT FORT DONELSON NATIONAL BATTLEFIELD

ABSTRACT—An inventory of the mammals at Fort Donelson National Battlefield (FDNB) in Stewart County, Tennessee, was conducted during 2004-2007. Sampling procedures included live trapping, pitfall trapping, bait/camera stations, scent stations, mist netting, spotlight surveys, and general observations. Thirty species, representing 7 orders and 13 families, were verified to occur on the site. Results reflected the presence of 2 species of shrews (northern short-tailed shrew, *Blarina brevicauda*; least shrew, *Cryptotis parva*), 1 species of mole (eastern mole, *Scalopus aquaticus*), 11 species of rodents (eastern chipmunk, *Tamias striatus*; woodchuck, *Marmota monax*; gray squirrel, *Sciurus carolinensis*; beaver, *Castor canadensis*; white-footed mouse, *Peromyscus leucopus*; cotton mouse, *P. gossypinus*; hispid cotton rat, *Sigmodon hispidus*; prairie vole, *Microtus ochrogaster*; woodland vole, *M. pinetorum*; muskrat, *Ondatra zibethicus*; and southern bog lemming, *Synaptomys cooperi*). Other species documented included: Virginia opossum (*Didelphis virginiana*), eastern cottontail (*Sylvilagus floridanus*), coyote (*Canis latrans*), domestic dog (*C. familiaris*), raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), striped skunk (*Mephitis mephitis*), bobcat (*Lynx rufus*), feral cat (*Felis catus*), and white-tailed deer (*Odocoileus virginianus*). Bats documented included: northern myotis (*Myotis septentrionalis*), gray bat (*M. grisescens*), eastern red bat (*Lasiurus borealis*), evening bat (*Nycticeius humeralis*), and eastern pipistrelle (*Pipistrellus subflavus*). One endangered species (gray bat) and 1 species (southern bog lemming) listed as deemed in need of management were recorded during the survey. Considerations for conservation and management of biodiversity are provided.

INTRODUCTION

An inventory was initiated in 2004 to survey the mammalian biodiversity at Fort Donelson National Battlefield (FDNB) in Stewart County, Tennessee. This work was part of a general effort by the National Park Service (NPS) to survey the species richness of the biota on lands under their supervision. Until recently, historic parks, such as FDNB, have been the focus of little scientific study. However, given that collectively historic parks and battlefields governed by the NPS constitute vast land holdings, represent diverse habitats, and are generally protected from consumptive types of recreation (e.g., no hunting or trapping), scientific investigations are critically needed to better understand the biodiversity represented on these lands. Additionally, due to the fact that regional biotas usually contain more species than are found at any single locality, limits to biodiversity exist at small scales (Meffe et al., 1997). Consequently, conservation and management planning requires an understanding of natural resources at a local or site level as well as at large scales. Previous investigations (e.g., Severinghaus and Beasley 1973; Graves and Harvey 1974; Harvey et al. 1976; and Kennedy 1991) have recorded mammalian occurrences in the western part of Tennessee. However, at this time, little information is available concerning the biodiversity of mammals at FDNB.

The purpose of the present investigation was to inventory the mammalian biodiversity occurring at FDNB to provide information for conservation and management of biodiversity on the site. Specifically, objectives were to: (1) document at least 90% of the mammals reasonably expected to occur on the park; (2) describe the distribution and, if possible, relative abundance of species of special concern occurring on the site; and (3) provide baseline information on the distribution, abundance, and habitat association of mammalian populations occurring on the park. Because habitat at FDNB is representative of that of much of the region, an understanding

of the biodiversity of the park could be important to understanding biodiversity of western and middle Tennessee.

STUDY AREA

FDNB was located in Stewart County, Tennessee (Fig. 1). The site was a 234 ha park which consisted of topographically diverse habitats that included narrow ridges, steep slopes and ravines, bottomlands, floodplains, rivers, and reservoirs. Forests were typical of the region and consisted mainly of oaks (*Quercus* spp.), maples (*Acer* spp.), hickory (*Carya* spp.), sweetgum (*Liquidambar styraciflua*), yellow poplar (*Liriodendron tulipifera*), sycamore (*Platanus occidentalis*), beech (*Fagus grandifolia*) and eastern red cedar (*Juniperus virginiana*). FDNB was situated adjacent to the Cumberland River within the Western Highland Rim Subsection, Highland Rim Section, of the Interior Low Plateaus Physiographic Province. Several wetlands and streams were present throughout the park, including Indian Creek and Hickman Creek. Anthropogenic influences have impacted the park, but plant diversity appeared high at the time of our investigation.

MATERIALS AND METHODS

Fifteen 1 ha plots (randomly selected) were established (Fig. 2). Coordinates for selected plots are given in Appendix I. Survey techniques (including live trapping, pitfall trapping, and mist netting) were carried out on all established plots. Bait/camera stations and scent stations were utilized at selected plots. Some areas judged good for mammals and habitat types not strongly represented in the random plots were also selected for sampling in order to more completely survey the mammalian biodiversity on the park. Spotlighting surveys were conducted on main roads, and general observations of species and signs of species were recorded

when judged significant (e.g., new record of a species or new area for a species). Sampling was initiated in the summer of 2004 and concluded during the fall of 2007.

Small mammals (other than bats) were sampled primarily using 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). Sherman traps were placed in various habitat types within each plot and at other selected areas throughout the park (see Fig. 3). Traps were placed in areas judged to have a high potential for capture (e.g., areas with thick cover, around fallen logs, adjacent to water or food source). They were baited with rolled oats and checked daily. Numbers of trap nights (trap night = 1 trap set for one night) were recorded, and, upon capture, individuals were identified to species (some were photographed) and sex, age, and weight determined for most animals. Animals were released at the site of capture.

Pitfall traps (utilized primarily to sample shrews) were placed in the ground with the rim of the plastic container at surface level (see Jones et al. 1996). Pitfall nights (pitfall night = 1 pitfall trap set for 1 night) were recorded. These traps were not baited and were not filled with fluids. We sampled plot sites and other selected areas on the park (see Fig. 4). Traps were placed in microhabitats where shrews were likely to occur (e.g., adjacent to down logs or decaying stumps, in thick vegetation). Upon capture, animals were identified to species and sex, age, and weight determined for most individuals.

Bait/camera stations were used to record the presence of generally medium to large-sized mammals such as raccoons (*Procyon lotor*), coyotes (*Canis latrans*), and white-tailed deer (*Odocoileus virginianus*). Stations were ground level and consisted of an infra-red triggered camera mounted about 0.5 m to 1 m off the ground on an available tree or post overlooking bait (shelled corn and canned cat food). The corn was spread on the ground about 3 m from the

camera. Baiting was done prior to turning the cameras on in order to allow mammals time to locate the bait and, thus, enhance the number of photographs taken during the time of recording. Cameras and bait were checked at least bi-weekly. Film and batteries were changed as needed. Locations of 4 bait/camera stations are given in Fig. 5.

Scent-station procedures followed methods reported by Linhart and Knowlton (1975) and Leberg and Kennedy (1982). This technique was used primarily to survey carnivores. Locations of scent stations are given in Fig. 6. Each station consisted of a circle of sifted sand 1 m in diameter placed on a cleared section of ground. A cotton ball saturated with bobcat urine was attached to a wooden applicator stick placed in the center of a circle. Stations were established in the afternoon and checked for presence or absence of tracks during the following morning. This procedure allowed for verification of the occurrence of species utilizing records from tracks. A single station was placed at each site (Fig. 6) in areas likely to represent a travel corridor for medium to large mammals. Scent-station nights (scent-station = 1 scent station set for 1 night) were recorded. Additionally, tracks and other signs of mammals (e.g., beaver cutting, beaver dams) were recorded.

Standard misting techniques were utilized to survey bats. Nets were placed at selected plots and other sites (see Fig. 7). Captured animals were identified and some photographed. Sex, age, and weight were determined in most cases, and animals were released at the site of capture. Nets were opened near or at dusk and closed near or at dawn. The number of mist-net nights (mist-net night = 1 mist net set for 1 night) was recorded.

Voucher specimens or other documentary material (e.g., photographs) were assembled from selected, captured animals. Information relating to documentation of species is given in Tables 3-8. Voucher specimens (n = 13) are identified in Tables 3, 4, and 7.

RESULTS

Mammals (56 species) thought to have a potential for occurring at FDNB are given in Table 1 (species with high potential for occurrence are noted). Documented species at FDNB are given in Table 2. In total, 33 species were considered to have a relatively high potential for occurring at FDNB. Of these, 30 (90%) were confirmed (Table 2) on the park.

Species verified at FDNB were from records that represent 7 orders and 13 families. These included the following taxa: Order Didelphimorphia, Family Didelphidae; Order Insectivora, Families Soricidae and Talpidae; Order Chiroptera, Family Vespertilionidae; Order Lagomorpha, Family Leporidae; Order Rodentia, Families Sciruidae and Muridae; Order Carnivora, Families Canidae, Procyonidae, Mephitidae, and Felidae; and Order Artiodactyla, Family Cervidae. Based on abundances observed over the investigation, species were ranked as to their commonness (Table 2).

Mammals captured using Sherman live traps included the following 9 species: northern short-tailed shrew, *Blarina brevicauda*; white-footed mouse, *Peromyscus leucopus*; cotton mouse, *P. gossypinus*; hispid cotton rat, *Sigmodon hispidus*; prairie vole, *Microtus ochrogaster*; woodland vole, *M. pinetorum*; southern bog lemming, *Synaptomys cooperi*; eastern chipmunk, *Tamias striatus*; and Virginia opossum, *Didelphis virginiana*. White-footed mice and hispid cotton rats were the species captured in greatest numbers. Results of captures are given in Table 3 and are based on approximately 8000 trap nights.

Pitfall trapping yielded 2 species of shrews (northern short-tailed shrew, *Blarina brevicauda*; least shrew, *Cryptotis parva*). Northern short-tailed shrews were captured in greatest abundance. Capture results, based on approximately 9000 pitfall nights, are given in Table 4.

Bait/camera stations resulted in the documentation of 5 species. Mammals identified included the Virginia opossum, coyote (*Canis latrans*), raccoon (*Procyon lotor*), bobcat (*Lynx rufus*), and white-tailed deer (*Odocoileus virginianus*). White-tailed deer was the most common species recorded at camera stations. Results, given in Table 5, are based on approximately 80 bait/camera stations nights.

Four species were confirmed using scent-station procedures. These included coyote, domestic dog (*C. familiaris*), raccoon, and white-tailed deer. Results are shown in Table 6.

Bats captured using mist nets documented 5 species (gray bat, *Myotis grisescens*; northern myotis, *M. septentrionalis*; eastern red bat, *Lasiurus borealis*; evening bat, *Nycticeius humeralis*; and eastern pipistrelle, *Pipistrellus subflavus*). Results are based on 75 mist-net nights and are shown in Table 7.

Sixteen species were confirmed by general observation and spotlight surveys (see Table 8). These included the eastern mole (*Scalopus aquaticus*), eastern cottontail (*Sylvilagus floridanus*), chipmunk, woodchuck (*Marmota monax*), gray squirrel (*Sciurus carolinensis*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), domestic dog, coyote, red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), feral cat (*Felis catus*), bobcat (*Felis rufus*), and white-tailed deer.

DISCUSSION

The purpose of the present study was to document at least 90% of the mammalian species reasonably expected to occur at FDNB, describe the distribution and, if possible, relative abundance of species of special concern occurring on the site, and provide baseline knowledge on the distribution, abundance, and habitat associations of mammalian populations known on the park. Overall, the investigation went well and provided much information that will be useful in

decision making regarding the mammals occurring at FDNB. Of the species judged (a priori) likely to occur on the site (high potential for occurrence), 90% of those were confirmed by at least one of several means. A relatively high biodiversity of mammals has been reported for western Tennessee (e.g., see Severinghaus and Beasley 1973; Graves and Harvey 1974; Harvey et al. 1976; Kennedy 1991). Given the size of the FDNB (234 ha), it is likely that population levels of rare species are influenced by metapopulation dynamics. Weins (1996) discussed metapopulations and noted that population stability or persistence is balanced between local extinctions and recolonizations of vacant, but suitable, patches. Future investigations at FDNB will no doubt add a few additional species to the list of mammals known to occur at the park.

One species of marsupial (Virginia opossum; Family Didelphidae) was documented on the site. The species is known to be a common mammal in western Tennessee (Kennedy 1991) and is no doubt distributed throughout FDNB. Virginia opossums have a wide tolerance for habitat but prefer wooded areas mostly near streams (McManus 1974; Schwartz and Schwartz 2001). Much of the habitat at FDNB appears suitable for this species.

Two species of shrews (northern short-tailed shrew and least shrew; Family Soricidae) were confirmed on the site. FDNB is located in the westernmost part of the distribution of Northern short-tailed shrews (George et al. 1986). Schwartz and Schwartz (2001) note that in some years this species may be very abundant and in other years populations may be low. This species is known to occupy a wide range of habitats that include woodlands, grasslands, brushy fencerows, and marshy areas (Choate et al. 1994). However, it is usually more abundant in forested habitats than in fields. Brush, open grass, and fallow fields are areas preferred by least shrews (Schwartz and Schwartz 2001). This species is more of a habitat specialist than northern short-tailed shrews. However, it is distributed throughout much of the eastern United States

(Whitaker 1974). Northern short-tailed shrews and least shrews likely occur throughout FDNB in appropriate habitat. These species have been reported in Stewart County, Tennessee, by Baumgardner et al. (1979) and Feldhamer et al. (1993). Two additional species of shrews (southeastern shrew, *Sorex longirostris*; pygmy shrew, *Sorex hoyi*) have been reported near FDNB in Stewart County (Feldhamer et al. 1993). Feldhamer et al. (1993) reported the southeastern shrew to be the rarest of the 4 species. Given that southeastern and pygmy shrews are known in Stewart County, future investigations may add these species to the list of mammals occurring at the park.

The eastern mole (Family Talpidae) was the only mole documented at FDNB. This is a common mammal in western Tennessee (Kennedy 1991) and is known throughout the state (Choate et al. 1994). It has a broad tolerance for habitat but prefers soils that are moist and loose in forested and nonforested areas (Whitaker and Hamilton 1998; Choate et al. 1994). It is likely distributed throughout FDNB in appropriate habitat

Five species of chiropterans (gray bat, northern myotis, eastern pipistrelle, eastern red bat, and evening bat; Family Vespertilionidae) were captured during the study. All are insectivorous and are known in the region (Graves and Harvey 1974). Given FDNB's location in Tennessee and its proximity to the habitats associated with the Cumberland River and Tennessee River, there is the potential for most all of the bats in Tennessee to occur on the park. However, because there are no caves or manmade structures suitable for roosting of cave bats, it is likely that cave bats (e.g., gray bats) are on and off the park as they forage for insects. Gray bats are known to forage over water (Barbour and Davis 1969) and have been reported in Stewart County, Tennessee (Graves and Harvey 1974; Harvey et al. 1976). The Cumberland and Tennessee rivers provide excellent foraging habitat for gray bats. Northern myotis are generally

rare in Tennessee but can be common locally. We have captured the species along the Duck River in Perry County. This species has a broader tolerance for habitat than gray bats. It can be found in hollow trees, attics, and natural crevices; in summer, the species may prefer forested habitats (Merritt 1987). Schwartz and Schwartz (2001) have noted that northern myotis may switch roosts in summer. Eastern pipistrelles roosts in the foliage of trees, caves, mines, crevices of cliffs, and buildings during summer and hibernate during winter mostly in caves (see Merritt 1987; Schwartz and Schwartz 2001). This is a common bat that is found throughout the region (Graves and Harvey 1974; Kennedy 1991). Graves and Harvey (1976) reported eastern red bats to be the most common bat in western Tennessee. The species is largely a solitary tree-inhabiting bat (Schwartz and Schwartz 2001). Evening bats are another common species in the region, which is found in forested habitat and in attics of old buildings (Kennedy 1991). The mature forest at FDNB (especially the large oak and hickory trees) would appear to make excellent habitat for tree-dwelling bats. Therefore, it is most likely that future studies will add additional species of chiropterans to the list of mammalian biodiversity at FDNB.

Nine-banded armadillos (Family Dasypodidae) were not documented on the park. However, they are known from sites near FDNB. This species will no doubt be added to the list of mammals at the park in the near future. This species occupies a variety of habitats (Kennedy 1991) but is found principally in woodlands, at forest edge, in brushy areas, and on savannas (Choate et al. 1994).

One species of rabbit (eastern cottontail; Family Leporidae) was confirmed at the site. Kennedy (1991) reported that eastern cottontails were common in western Tennessee and occurred in a variety of habitats that included old fields, brushy edges, and other habitats with a mixture of shrubby and herbaceous plants. Given the limited amount of these types of habitat at

FDNB, eastern cottontail populations are probably somewhat restricted. Because the distribution of swamp rabbits (*Sylvilagus aquaticus*) are thought to approach FDNB (see Choate et al. 1994), there is a potential that this species could be added to the list of mammals on the park in the future. Small patches of suitable habitat appeared to be available on the park.

Three sciurids (eastern chipmunk, woodchuck, and gray squirrel; Family Sciuridae) were documented on the park. Eastern chipmunks have been reported as a common species in forests of rural and urban areas in western Tennessee (Kennedy 1991). Merritt (1987) noted that this species adapts to several varying plant communities but is often found in deciduous forest with a well-developed understory. Woodchucks prefer to occupy forest bordered by open land or fencerows and heavily vegetated gullies or stream banks (Schwartz and Schwartz 2001). Kennedy (1991) reported this species to be common in suitable habitat in western Tennessee. Gray squirrels occur in hardwood and mixed coniferous-deciduous forest dominated by seed-producing trees (Merritt 1987). It is a common species in the region (Kennedy 1991) and occupies both rural and urban habitats (Schwartz and Schwartz 2001). Two other sciurids (fox squirrel, *S. niger*; southern flying squirrel, *Glaucomys volans*) are known in the region (Kennedy 1991). Because they are locally abundant in some areas, these species could be added to the list of mammals at FDNB in the future. Generally, habitat on the park appeared to be suitable for both species.

Beaver (Family Castoridae) is known as a common mammal in a variety of wetland habitats in western Tennessee (Kennedy 1991). During the present study, signs of this species (e.g., cutting on trees; dams on streams) were usually found at sites at or near water.

A number of murid rodents (Family Muridae) were confirmed at FDNB. These included the white-footed mouse, cotton mouse, hispid cotton rat, prairie vole, woodland vole, muskrat,

and southern bog lemming. Overall, these species occupy a wide variety of habitats. White-footed mice are found in an array of forested and field habitats, and cotton mice usually occupy moist timbered areas (Lackey et al. 1985; Choate et al. 1994; Schwartz and Schwartz 2001). Hispid cotton rats occur chiefly in dense, grassy fields and roadsides with broom sedge and weeds and the borders of cultivated fields (Schwartz and Schwartz 2001). For prairie voles, optimum habitat includes areas with substantial grassy cover; usually not found in woodlands (Choate et al. 1994). Woodland voles live in a wide range of habitats that include forest and grassy fields with brush and brambles (Choate et al. 1994). Muskrats are associated with aquatic habitats (Schwartz and Schwartz 2001). White-footed mice, cotton mice, hispid cotton rats, prairie voles, and woodland voles are relatively common to abundant species in western Tennessee, and muskrats may be locally abundant (Kennedy 1991; Choate et al 1994). However, records of southern bog lemmings in the western part of Tennessee are few. The nearest record to FDNB appears to be in adjacent Montgomery County (Kennedy and Harvey 1979). This species occupies heavy stands of grass in low, moist areas, and bogs, swamps, and damp woods (Schwartz and Schwartz 2001). Following Kennedy (1991), marsh rice rat (*Oryzomys palustris*), eastern harvest mouse (*Reithrodontomys humulis*), deer mouse (*P. maniculatus*), golden mouse (*Ochrotomys nuttalli*), Allegheny woodrat (*Neotoma magister*), black rat (*Rattus rattus*), Norway rat (*R. norvegicus*), house mouse (*Mus musculus*), and meadow jumping mouse (*Zapus hudsonius*) are rodents known in western Tennessee. Therefore, it is likely that future studies at FDNB will add to the list of mammals occurring on the site. Patches of habitat on the park appeared suitable for most of these species. The meadow jumping mouse is an uncommon species (Kennedy 1991), but it is known in Stewart County, Tennessee (Baumgardner et al. 1979).

Four canids (coyote, domestic dog, red fox, and gray fox; Family Canidae) were verified on the park during the present study. These species are known in the region and occupy a wide range of habitats. The gray fox (*Urocyon cinereoargenteus*) was not verified by personnel from The University of Memphis but has been observed by personnel at FBNB.

Procyonids documented at FDNB included 1 species (raccoon; Family Procyonidae). Raccoons are common in the region (Kennedy 1991). They have a wide tolerance for habitat but are most common in habitat near water, especially bottomlands and wooded areas (Choate et al. 1994).

No mustelids (Family Mustelidae) were documented during the present work. Kennedy (1991) reported mink (*Mustela vison*) and river otter (*Lontra canadensis*) as fairly common in some habitats in western Tennessee. Additionally, river otter have been reported in Stewart County, Tennessee (Baumgardner et al. 1979). Therefore, these species could be added to the list of mammalian biodiversity at FDNB in the future. There appeared to be suitable habitat for both mink and river otter on the park.

Long-tailed weasels (*Mustela frenata*) are uncommon in the region (Kennedy 1991) but the range of the species includes FDNB. This indicates a potential future occurrence of the species at the park. However, suitable habitat appeared limited.

One skunk (striped skunk; Family Mephitidae) is known on the park and in the region. This species can be locally abundant in a variety of habitats (Kennedy 1991).

Felids (Family Felidae) documented during the study included the bobcat (*Lynx rufus*) and feral cat (*Felis catus*). Both species are common in the region. Bobcats seem to prefer habitat with dense understory vegetation that may include wooded uplands, bottomland forest,

brushy areas, swamps, and partly open farmlands (Choate et al. 1994). Feral cats are common in the region and are usually associated with human habitation.

White-tailed deer (Family Cervidae) were observed routinely at FDNB. The species has a wide tolerance for habitat and does well in both urban and rural areas (Bolen and Robinson 2003). Bolen and Robinson (2003) noted that white-tailed deer represent an economically and socially important species. While not hunted on FDNB, the species offers significant recreational value to visitors who enjoy seeing deer as they travel through the park.

FDNB and surrounding areas of western and middle Tennessee are rich in mammalian biodiversity (Kennedy 1991; Choate et al. 1994), and populations are known to be dynamic and fluctuate temporally (see Smith 1986). Therefore, it is likely that species richness at local scales within the region vary as well. Such situations emphasize the need for long-term studies and investigations at different spatial scales. McCullough (1996) pointed out that movements of animals often exceed the spatial scale of study areas. Weins (1996) noted that metapopulation models deal with the dynamics of regional (meta) populations that are subdivided into small subpopulations linked by dispersal. Following metapopulation theory, local extinctions of subpopulations may occur; however, colonization from other subpopulations will reestablish populations in areas before all of the local subpopulations suffer extinction (Weins 1996). Meffe et al. (1997) pointed out that regional biotas contain more species than are found in any single locality or habitat type; therefore, there are limits to species richness at the local level. However, based on the total biodiversity known for the region (Kennedy 1991), it is likely that future studies will add to the mammalian biodiversity recorded at FDNB.

One federally listed endangered species (gray bat) was documented during the present investigation. Given that this species is likely using the park as a foraging area (feeding mostly

over water) and not as a roost site, no new management recommendations appear necessary at this time. Caution should be used toward actions that could interfere with foraging activities of the species. Another endangered bat (Indiana myotis; *Myotis sodalis*) is known to occur in the region and could be recorded at FDNB in the future. The only other state or federally listed species documented during the study was the southern bog lemming. The state status for this species is D (deemed in need of management), and the global rank is G5 (demonstrably widespread and secure globally). Other species listed in these categories that are known in the region and could be recorded at FDNB in the future include the southeastern shrew and meadow jumping mouse. Based on our sampling effort, it appears that neither gray bats nor southern bog lemmings are abundant on the site.

Given the recreational appeal of the area surrounding FDNB, it is likely that urbanization and fragmentation of habitat will continue in the region. Therefore, sound management will be required to sustain natural resources on the park for the future. Some factors to consider in conservation and management planning include: (1) some species (e.g., beaver, feral cats, and white-tailed deer) have the potential to reach high populations levels and, therefore, can have a negative impact on other populations; (2) chemical treatment in management practices can have negative impacts; (3) oldfield habitat is critical to selected species and can be maintained through a rotation in mowing; (4) litter, especially containers such as bottles, can be detrimental to shrews and other small organisms; (5) corridors are useful in connecting small patches of habitat, which fosters gene flow and provides potential for metapopulation dynamics (especially important to maintaining populations of rare species; (6) traffic flow of automobiles in sensitive areas can have a negative impact on species; (7) educational programs are needed to assist local

residents and visitors in understanding goals and needs of management; and (8) research to inventory and monitor biodiversity will provide critical information for decision making.

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Figures

Fort Donelson National Battlefield Stewart County, Tennessee

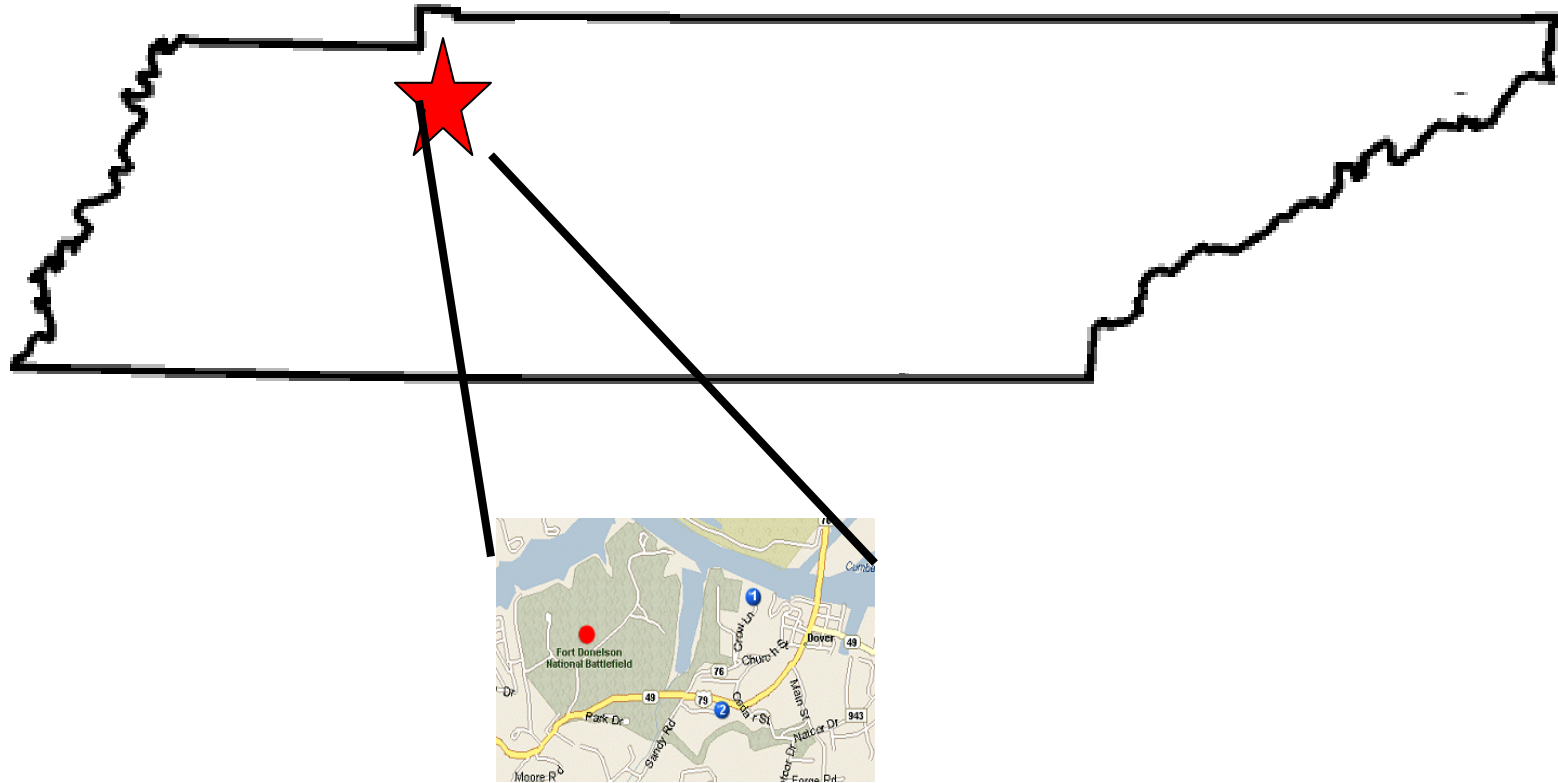


Fig. 1. Map showing location of Fort Donelson National Battlefield in Stewart County, Tennessee.

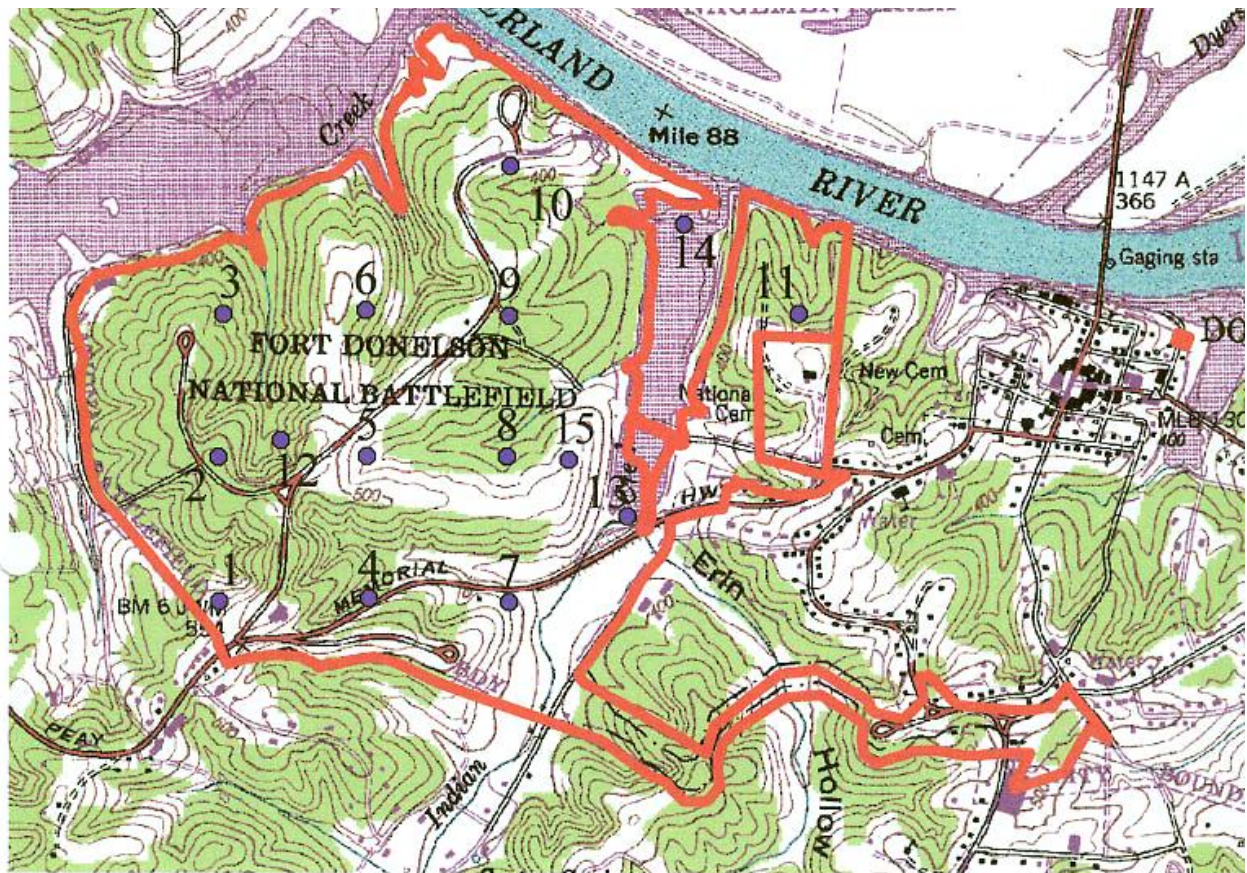


Fig. 2. Map showing locations of randomly established plots at Fort Donelson National Battlefield in Stewart County, Tennessee, which were used in sampling mammalian biodiversity during 2004-2007.

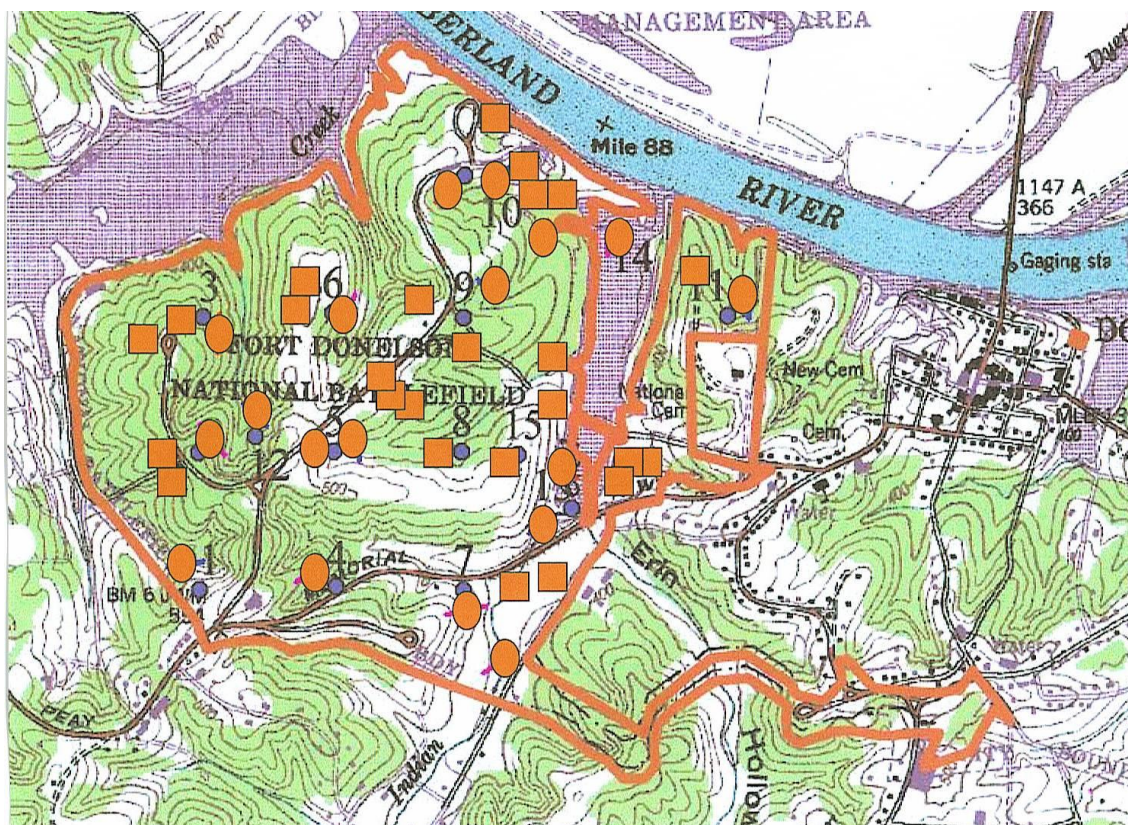


Fig. 3. Map of sampling locations utilized in a study of small mammals employing Sherman live-traps at Fort Donelson National Battlefield in Stewart County, Tennessee, during 2004-2005. Cicles represent 2004 and squares represent 2005.

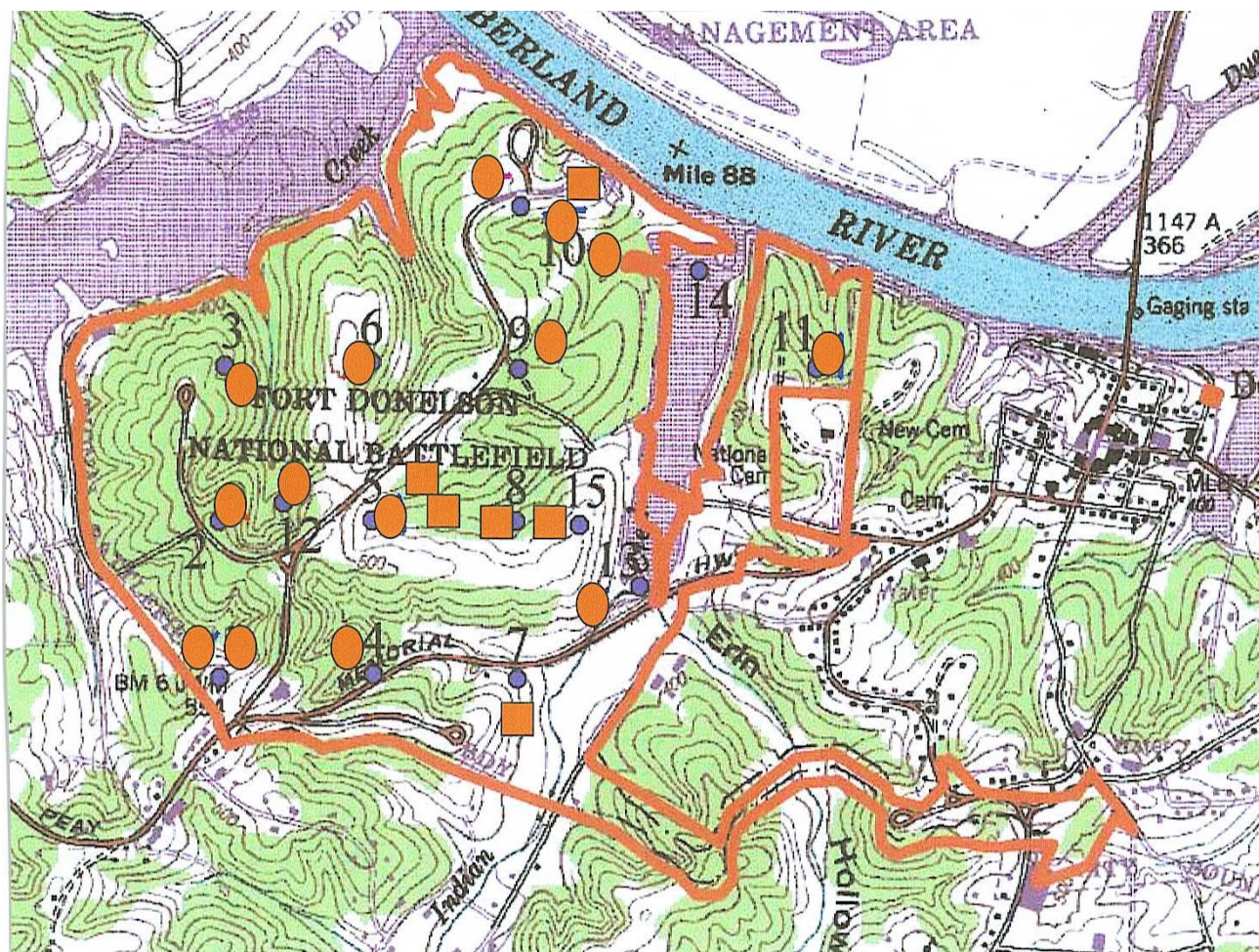


Fig. 4. Map of sampling locations utilized in a study of small mammals employing pitfall traps at Fort Donelson National Battlefield in Stewart County, Tennessee, during 2004-2005. Cicles represent 2004 and squares represent 2005.

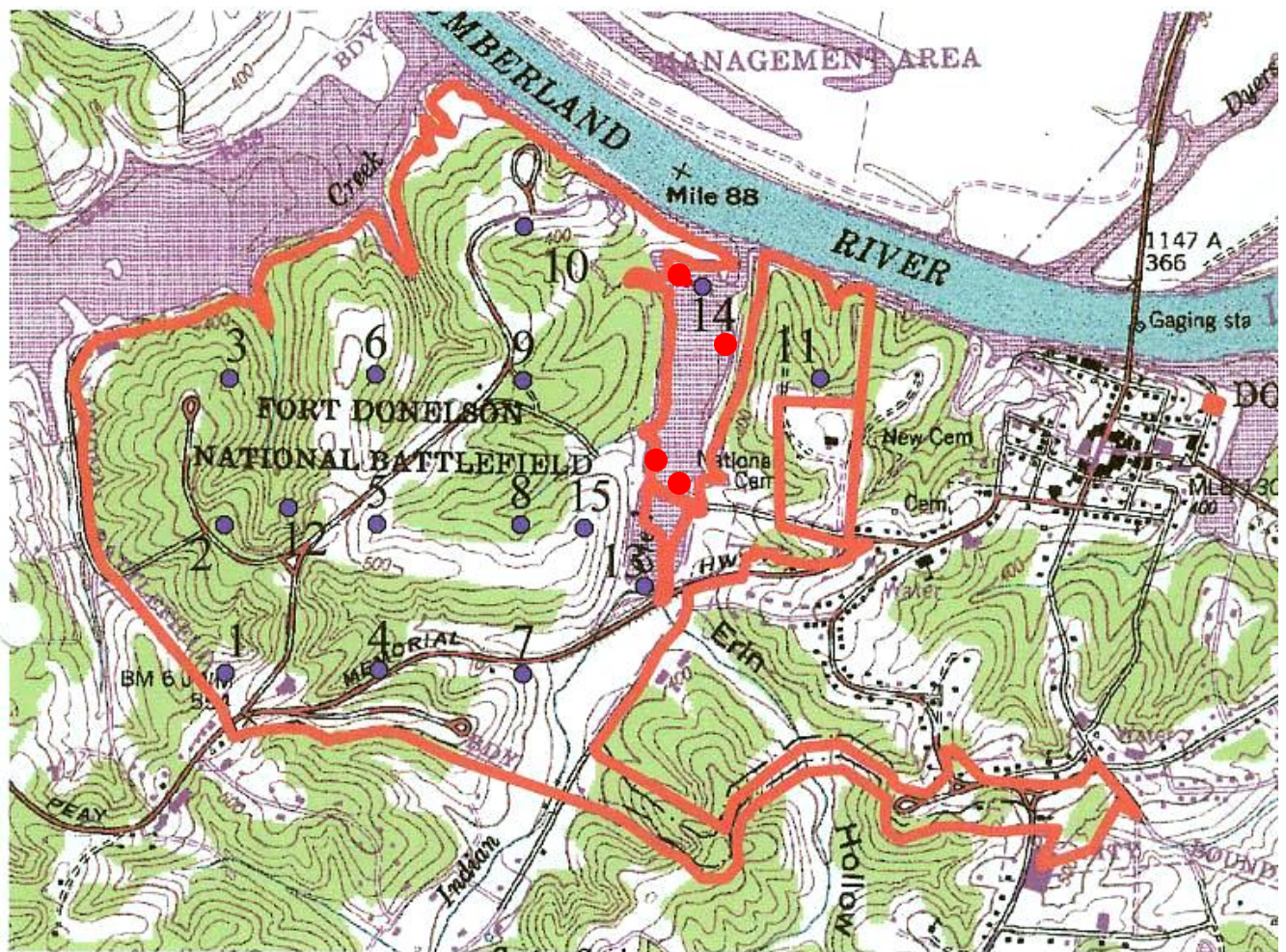


Fig. 5. Map of bait/camera locations used in a study of mammalian fauna at Fort Donelson National Battlefield in Stewart County, Tennessee, during 2004-2005.

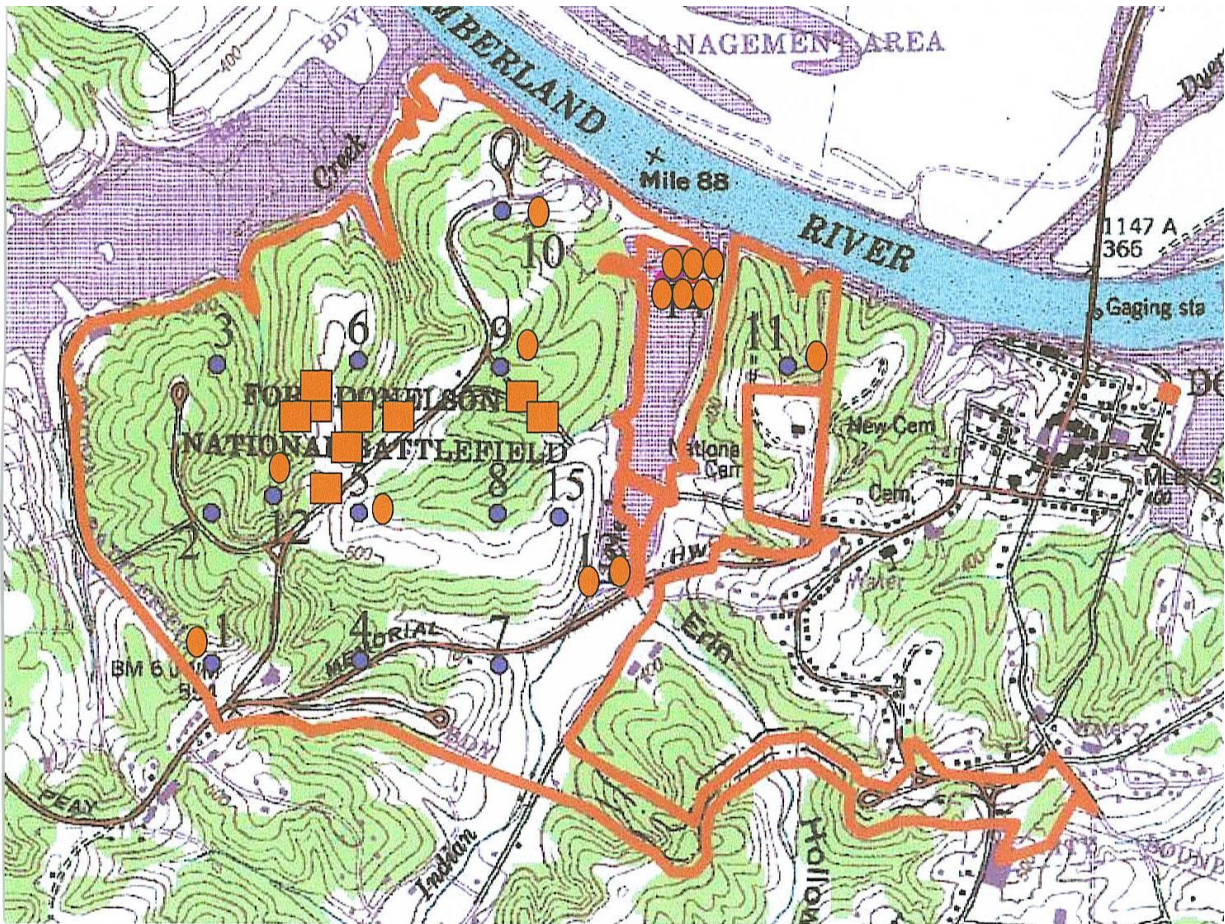


Fig. 7. Map of locations used in a study of bats at Fort Donelson National Battlefield in Stewart County, Tennessee, during 2004 and 2005. Circles represent 2004 and squares represent 2005.

Tables

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

Scientific Name	Common Name	Scientific Name	Common Name
<i>Didelphis virginiana</i> *	Virginia Opossum	<i>Oryzomys palustris</i>	Marsh Rice Rat
<i>Sorex longirostris</i>	Southeastern Shrew	<i>Reithrodontomys humulis</i>	Eastern Harvest Mouse
<i>Sorex hoyi</i>	Pygmy Shrew	<i>Peromyscus maniculatus</i>	Deer Mouse
<i>Blarina brevicauda</i> *	Southern Short-tailed Shrew	<i>Peromyscus leucopus</i> *	White-footed Mouse
<i>Cryptotis parva</i> *	Least Shrew	<i>Peromyscus gossypinus</i> *	Cotton Mouse
<i>Scalopus aquaticus</i> *	Eastern Mole	<i>Ochrotomys nuttalli</i>	Golden Mouse
<i>Dasypus novemcinctus</i>	Nine-banded Armadillo	<i>Sigmodon hispidus</i> *	Hispid Cotton Rat
<i>Myotis lucifugus</i>	Little Brown Myotis	<i>Neotoma magister</i>	Allegheny Woodrat
<i>Myotis grisescens</i> *	Gray Bat	<i>Microtus ochrogaster</i> *	Prairie Vole
<i>Myotis septentrionalis</i> *	Northern Long-eared Myotis	<i>Microtus pinetorum</i> *	Woodland Vole
<i>Myotis sodalis</i>	Indiana Myotis	<i>Ondatra zibethicus</i> *	Muskrat
<i>Myotis leibii</i>	Small-footed Myotis	<i>Synaptomys cooperi</i> *	Southern Bog Lemming
<i>Lasionycteris noctivagans</i>	Silver-haired Bat	<i>Rattus rattus</i>	Black Rat
<i>Pipistrellus subflavus</i> *	Eastern Pipistrelle	<i>Rattus norvegicus</i>	Norway Rat
<i>Eptesicus fuscus</i>	Big Brown Bat	<i>Mus musculus</i> *	House Mouse
<i>Lasiurus borealis</i> *	Eastern Red Bat	<i>Zapus hudsonius</i>	Meadow Jumping Mouse
<i>Lasiurus seminolus</i>	Seminole Bat	<i>Canis familiaris</i> *	Domestic Dog
<i>Lasiurus cinereus</i>	Hoary Bat	<i>Canis latrans</i> *	Coyote
<i>Nycticeius humeralis</i> *	Evening Bat	<i>Vulpes vulpes</i> *	Red Fox
<i>Corynorhinus rafinesquii</i>	Rafinesque's Big-eared Bat	<i>Urocyon cinereoargenteus</i> *	Gray Fox
<i>Sylvilagus floridanus</i> *	Eastern Cottontail	<i>Mephitis mephitis</i> *	Striped Skunk
<i>Sylvilagus aquaticus</i>	Swamp Rabbit	<i>Procyon lotor</i> *	Raccoon
<i>Tamias striatus</i> *	Eastern Chipmunk	<i>Mustela frenata</i>	Long-tailed Weasel
<i>Marmota monax</i> *	Woodchuck	<i>Mustela vison</i> *	Mink
<i>Sciurus carolinensis</i> *	Eastern Gray Squirrel	<i>Lontra canadensis</i> *	River Otter
<i>Sciurus niger</i>	Fox Squirrel	<i>Felis catus</i> *	Feral Cat
<i>Glaucomys volans</i>	Southern Flying Squirrel	<i>Lynx rufus</i> *	Bobcat
<i>Castor canadensis</i> *	Beaver	<i>Odocoileus virginianus</i> *	White-tailed Deer

Table 2. Mammals captured or identified (with some form of documentation) in a survey of mammals at Fort Donelson National Battlefield during 2004-2007. Letter abbreviations* refer to abundance rankings: A = abundant; C = common; UC = uncommon; R=rare.

Scientific Name	Common Name	Documentation	Abundance
<i>Didelphis virginiana</i>	Virginia opossum	Photo of species	C
<i>Blarina brevicauda</i>	Northern short-tailed shrew	Voucher specimen	C
<i>Cryptotis parva</i>	Least shrew	Voucher specimen	UC
<i>Scalopus aquaticus</i>	Eastern mole	Photo of mole run	C
<i>Myotis grisescens</i>	Gray bat	Captured & released	UC
<i>Myotis septentrionalis</i>	Northern myotis	Photo of species	UC
<i>Pipistrellus subflavus</i>	Eastern pipistrelle	Voucher specimen	C
<i>Lasiurus borealis</i>	Eastern red bat	Photo of species	C
<i>Nycticeius humeralis</i>	Evening bat	Photo of species	C
<i>Sylvilagus floridanus</i>	Eastern cottontail	Photo of species	UC
<i>Tamias striatus</i>	Eastern chipmunk	Photo of species	C
<i>Marmota monax</i>	Woodchuck	Photo of species	C
<i>Sciurus carolinensis</i>	Gray squirrel	Photo of species	A
<i>Castor canadensis</i>	Beaver	Photo of chewed tree	C
<i>Peromyscus leucopus</i>	White-footed mouse	Photo of species	A
<i>Peromyscus gossypinus</i>	Cotton mouse	Photo of species	UC
<i>Sigmodon hispidus</i>	Hispid cotton rat	Photo of species	C
<i>Microtus ochrogaster</i>	Prairie vole	Photo of species	UC
<i>Microtus pinetorum</i>	Woodland vole	Photo of species	UC
<i>Ondatra zibethicus</i>	Muskrat	Animal sighted	UC
<i>Synaptomys cooperi</i>	Southern bog lemming	Photo of species	R
<i>Canis familiaris</i>	Domestic dog	Photo of track	C
<i>Canis latrans</i>	Coyote	Photo of species	C
<i>Vulpes vulpes</i>	Red Fox	Photo of track	UC
<i>Urocyon cinereoargenteus</i>	Gray Fox	Sighted FDNB personnel	UC
<i>Mephitis mephitis</i>	Striped skunk	Track sighted	UC
<i>Procyon lotor</i>	Raccoon	Photo of species	A
<i>Felis catus</i>	Feral cat	Photo of species	C
<i>Lynx rufus</i>	Bobcat	Photo of track	UC
<i>Odocoileus virginianus</i>	White-tailed deer	Photo of species	C

*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. Data from sampling of small mammals using Sherman live traps conducted at Fort Donelson National Battlefield in Stewart Co. Tennessee (see text for explanation of plots and Fig. 2 for location of plot numbers). The study was conducted during 2004-2005.

Date	Species	Habitat ²	Sex	Weight	Coordinates	Plot
052704	<i>Didelphis virginiana</i>	Forest	F	135 g	N 36°29.220' W 87°51.775'	12
062304	<i>Blarina brevicauda</i>	Edge	---	---	N 36°29.674' W 87°51.376'	10
062404	<i>Blarina brevicauda</i> ¹	Edge	---	5 g	N 36°29.521' W 87°51.315'	10
052804	<i>Tamias striatus</i>	Forest	---	110 g	N 36°29.175' W 87°51.688'	12
052904	<i>Tamias striatus</i>	Forest	---	115 g	N 36°29.226' W 87°51.768'	12
062404	<i>Tamias striatus</i>	Edge	---	---	N 36°29.242' W 87°50.838'	*
072705	<i>Tamias striatus</i>	Forest	M	110 g	N 36°29.357' W 87°50.953'	*
080405	<i>Tamias striatus</i>	Forest	F	89 g	N 36°29.183' W 87°51.083'	*
080205	<i>Peromyscus leucopus</i>	Forest	F	25 g	N 36°29.244' W 87°51.151'	*
052704	<i>Peromyscus leucopus</i>	Forest	F	15 g	N 36°28.999' W 87°51.866'	1
052704	<i>Peromyscus leucopus</i>	Edge	F	28 g	N 36°28.940' W 87°51.856'	1
052704	<i>Peromyscus leucopus</i>	Edge	F	22 g	N 36°28.931' W 87°51.855'	1
052704	<i>Peromyscus leucopus</i>	Forest	F	15 g	N 36°29.186' W 87°51.747'	12
052704	<i>Peromyscus leucopus</i>	Forest	M	20 g	N 36°29.185' W 87°51.747'	12
052704	<i>Peromyscus leucopus</i>	Forest	M	15 g	N 36°29.330' W 87°51.418'	9
052704	<i>Peromyscus leucopus</i>	Forest	F	15 g	N 36°28.999' W 87°51.866'	1
052804	<i>Peromyscus leucopus</i>	Forest	M	20 g	N 36°29.000' W 87°51.866'	1
052804	<i>Peromyscus leucopus</i>	Forest	M	22 g	N 36°28.940' W 87°51.856'	1
052804	<i>Peromyscus leucopus</i>	Forest	M	22 g	N 36°28.940' W 87°51.856'	1
052804	<i>Peromyscus leucopus</i>	Forest	F	24 g	N 36°28.940' W 87°51.856'	1

052804	Peromyscus leucopus	Forest	M	24 g	N 36°29.175' W 87°51.688'	12
052804	Peromyscus leucopus	Forest	F	26 g	N 36°29.175' W 87°51.688'	12
052804	Peromyscus leucopus	Forest	M	24 g	N 36°29.175' W 87°51.688'	12
052804	Peromyscus leucopus	Forest	M	19 g	N 36°29.175' W 87°51.688'	12
052804	Peromyscus leucopus	Forest	M	20 g	N 36°29.175' W 87°51.688'	12
052804	Peromyscus leucopus		M	15 g	N 36°29.363' W 87°50.848'	11
052904	Peromyscus leucopus	Forest	M	17 g	N 36°29.180' W 87°51.719'	12
052904	Peromyscus leucopus	Forest	F	22 g	N 36°29.193' W 87°51.746'	12
052904	Peromyscus leucopus	Forest	M	25 g	N 36°28.942' W 87°51.845'	1
052904	Peromyscus leucopus	Forest	F	24 g	N 36°28.932' W 87°51.850'	1
052904	Peromyscus leucopus	Forest	M	18 g	N 36°28.970' W 87°51.850'	1
052904	Peromyscus leucopus	Forest	F	20 g	N 36°29.149' W 87°51.603'	5
052904	Peromyscus leucopus	Forest	M	18 g	N 36°29.351' W 87°51.357'	9
052904	Peromyscus leucopus	Forest	F	22 g	N 36°29.359' W 87°50.855'	11
052904	Peromyscus leucopus	Forest	F	26 g	N 36°29.121' W 87°51.184'	13
062304	Peromyscus leucopus	Edge	M	20 g	N 36°29.069' W 87°51.177'	13
072004	Peromyscus leucopus	Forest	M	---	N 36°29.474' W 87°51.086'	14
072104	Peromyscus leucopus	Forest	F	21 g	N 36°29.524' W 87°51.048'	14
072304	Peromyscus leucopus	Forest	F	24 g	N 36°29.457' W 87°51.075'	14
072304	Peromyscus leucopus	Forest	M	22 g	N 36°29.476' W 87°51.062'	14
072304	Peromyscus leucopus	Forest	F	18 g	N 36°29.482' W 87°51.049'	14
071905	Peromyscus leucopus	Edge	M	20 g	N 36°29.096' W 87°51.132'	*
071905	Peromyscus leucopus	Edge	M	21 g	N 36°29.098' W 87°51.095'	*

071905	Peromyscus leucopus	Forest	M	23 g	N 36°29.165' W 87°51.372'	8
071905	Peromyscus leucopus	Forest	F	17.5 g	N 36°29.165' W 87°51.365'	8
072005	Peromyscus leucopus	Forest	M	23 g	N 36°29.164' W 87°51.373'	15
072105	Peromyscus leucopus	Edge	M	21 g	N 36°29.076' W 87°51.104'	*
072105	Peromyscus leucopus	Forest	F	20.5 g	N 36°29.150' W 87°51.249'	15
072105	Peromyscus leucopus	Forest	M	25 g	N 36°29.148' W 87°51.265'	15
072605	Peromyscus leucopus	Edge	M	23 g	N 36°29.544' W 87°51.101'	*
072705	Peromyscus leucopus	Edge	M	21.5 g	N 36°29.530' W 87°51.064'	*
080205	Peromyscus leucopus	Forest	M	19.5 g	N 36°29.183' W 87°51.085'	*
080305	Peromyscus leucopus	Forest	M	19 g	N 36°29.194' W 87°51.088'	*
080405	Peromyscus leucopus	Forest	M	21 g	N 36°29.145' W 87°51.081'	*
080905	Peromyscus leucopus	Forest	M	15.9 g	N 36°28.770' W 87°50.410'	*
080905	Peromyscus leucopus	Forest	F	15 g	N 36°28.758' W 87°50.421'	*
081005	Peromyscus leucopus	Forest	M	18.5 g	N 36°29.076' W 87°52.014'	*
081005	Peromyscus leucopus	Forest	M	16 g	N 36°28.759' W 87°50.419'	*
081005	Peromyscus leucopus	Forest	M	17 g	N 36°28.767' W 87°50.441'	*
081005	Peromyscus leucopus	Forest	M	15 g	N 36°28.775' W 87°50.401'	*
081105	Peromyscus leucopus	Forest	M	16 g	N 36°28.776' W 87°50.410'	*
081105	Peromyscus leucopus	Forest	F	14 g	N 36°28.759' W 87°50.419'	*
081605	Peromyscus leucopus	Forest	M	26 g	N 36°28.753' W 87°50.419'	*
081705	Peromyscus leucopus	Forest	F	15 g	N 36°28.766' W 87°50.406'	*
081705	Peromyscus leucopus	Forest	M	24 g	N 36°28.758' W 87°50.417'	*
081805	Peromyscus leucopus	Forest	M	22 g	N 36°28.777' W 87°50.419'	*

081805	<i>Peromyscus leucopus</i>	Forest	M	20 g	N 36°28.767' W 87°50.392'	*
062304	<i>Peromyscus leucopus</i>	Field	F	27 g	N 36°29.212' W 87°51.633'	5
080905	<i>Peromyscus gossypinus</i> ^a	Forest	M	24 g	N 36°28.757' W 87°50.412'	*
072005	<i>Sigmodon hispidus</i>	Field	M	90 g	N 36°29.164' W 87°51.373'	14
081105	<i>Sigmodon hispidus</i>	Field	M	105 g	N 36°29.560' W 87°51.094'	*
081605	<i>Sigmodon hispidus</i>	Field	F	73 g	N 36°28.928' W 87°51.237'	*
081605	<i>Sigmodon hispidus</i>	Field	M	90 g	N 36°28.935' W 87°51.232'	*
081605	<i>Sigmodon hispidus</i>	Field	F	86 g	N 36°28.888' W 87°51.262'	*
081605	<i>Sigmodon hispidus</i>	Field	M	100 g	N 36°28.905' W 87°51.278'	*
081705	<i>Sigmodon hispidus</i>	Field	F	62 g	N 36°29.572' W 87°51.124'	*
081705	<i>Sigmodon hispidus</i>	Field	F	12 g	N 36°28.923' W 87°51.234'	*
081705	<i>Sigmodon hispidus</i>	Field	F	111 g	N 36°28.926' W 87°51.237'	*
081705	<i>Sigmodon hispidus</i>	Field	M	101 g	N 36°28.934' W 87°51.228'	*
081805	<i>Sigmodon hispidus</i>	Field	F	61 g	N 36°28.933' W 87°51.230'	*
081805	<i>Sigmodon hispidus</i>	Field	M	191 g	N 36°28.924' W 87°51.229'	*
081805	<i>Sigmodon hispidus</i>	Field	M	91 g	N 36°28.941' W 87°51.217'	*
081605	<i>Sigmodon hispidus</i>	Field	F	100 g	N 36°28.929' W 87°51.230'	*
081805	<i>Sigmodon hispidus</i>	Field	F	81 g	N 36°28.947' W 87°51.225'	*
081805	<i>Sigmodon hispidus</i>	Field	M	92 g	N 36°28.899' W 87°51.274'	*
081805	<i>Sigmodon hispidus</i>	Field	F	103 g	N 36°28.884' W 87°51.288'	*
081805	<i>Sigmodon hispidus</i>	Field	F	62 g	N 36°29.551' W 87°51.083'	*
081805	<i>Sigmodon hispidus</i>	Field	F	100 g	N 36°28.927' W 87°51.238'	*
062304	<i>Microtus ochrogaster</i>	Field	M	40 g	N 36°29.196' W 87°51.637'	5

062404	<i>Microtus ochrogaster</i>	Field	F	38 g	N 36°29.214' W 87°51.637'	5
062404	<i>Microtus ochrogaster</i>	Field	M	34 g	N 36°29.211' W 87°51.636'	5
062504	<i>Microtus ochrogaster</i>	Field	M	40 g	N 36°29.213' W 87°51.630'	5
062504	<i>Microtus ochrogaster</i>	Field	M	45 g	N 36°29.220' W 87°51.632'	5
081005	<i>Microtus ochrogaster</i>	Field	M	37 g	N 36°28.944' W 87°51.224'	*
052804	<i>Microtus pinetorum</i>	Forest	F	22 g	N 36°29.175' W 87°51.688'	12
072104	<i>Microtus pinetorum</i>	Edge	M	33 g	N 36°28.885' W 87°51.285'	*
072304	<i>Microtus pinetorum</i>	Edge	M	25 g	N 36°28.880' W 87°51.286'	*
072304	<i>Microtus pinetorum</i>	Edge	M	26 g	N 36°28.889' W 87°51.279'	*
081605	<i>Microtus pinetorum</i>	Edge	M	31 g	N 36°29.540' W 87°51.063'	*
080305	<i>Synaptomys cooperi</i> ^o	Forest	M	16 g	N 36°28.774' W 87°50.568'	*

¹ *Blarina brevicauda* was dead in trap and taken as voucher specimen.

² Edge habitat refers to forest/field edge.

*Individuals were captured at newly selected sites.

^aHind foot = 23.1 mm (identification by Anna Featherston)

^oSpecimen with grooved incisors and short tail (identification by Anna Featherston)

Table 4. Data* for small mammals collected using pitfall traps at Fort Donelson National Battlefield in Stewart Co., Tennessee, during 2005. See text for explanation of plots.

Date	Species	Habitat	Age	Weight	Coordinates	Plot
080105	<i>Blarina brevicauda</i>	edge	Adult	5 g	N 36°28.965' W 87°51.368'	7
080205	<i>Blarina brevicauda</i>	edge	Adult	10 g	N 36°29.218' W 87°51.469'	
080205	<i>Blarina brevicauda</i>	forest	Adult	14 g	N 36°28.965' W 87°51.368'	7
080805	<i>Blarina brevicauda</i>	forest	Adult	18 g	N 36°28.957' W 87°51.363'	7
080805	<i>Blarina brevicauda</i>	forest	Adult	13 g	N 36°28.965' W 87°51.368'	7
072005	<i>Cryptotis parva</i>	field	Adult	3 g	N 36°29.164' W 87°51.373'	
072505	<i>Cryptotis parva</i>	field	Adult	2 g	N 36°29.287' W 87°51.444'	
080105	<i>Cryptotis parva</i>	Field	---	---	N 36°29.367' W 87°51.493'	
080405	<i>Cryptotis parva</i>	Field	Adult	6 g	N 36°29.273' W 87°51.484'	
080805	<i>Cryptotis parva</i>	Field	Adult	3.5 g	N 36°29.561' W 87°51.168'	14
080805	<i>Cryptotis parva</i>	Field	Adult	5 g	N 36°29.298' W 87°51.466'	

*All shrews were dead in traps and taken as voucher specimens.

Table 5. Mammalian species documented using infra-red triggered cameras at Fort Donelson National Battlefield during 2004-2005.

Date	GPS coordinates of bait/camera	Species documented
052804	N36°29.537'	<i>Didelphis virginiana</i>
	W87°51.162'	
052804	N36°29.537'	<i>Odocoileus virginianus</i>
	W87°51.162'	
062204	N36°29.537'	<i>Canis latrans</i>
	W87°51.162'	
081604	N36°29.537'	<i>Lynx rufus</i>
	W87°51.162'	
081604	N36°29.537'	<i>Procyon lotor</i>
	W87°51.162'	
080505	N36° 29.102'	<i>Canis latrans</i>
	W87° 51.108'	
081105	N36° 29.522'	<i>Canis latrans</i>
	W87° 51.124'	
081305	N36° 29.102'	<i>Canis latrans</i>
	W87° 51.128'	
081505	N36° 29.102'	<i>Odocoileus virginianus</i>
	W87° 51.128'	
081705	N36° 29.522'	<i>Odocoileus virginianus</i>
	W87° 51.124'	
081405	N36° 29.522'	<i>Odocoileus virginianus</i>
	W87° 51.124'	
081305	N36° 29.522'	<i>Odocoileus virginianus</i>
	W87° 51.124'	
080705	N36° 29.522'	<i>Odocoileus virginianus</i>
	W87° 51.124'	
080605	N36° 29.522'	<i>Odocoileus virginianus</i>
	W87° 51.124'	

Table 6. Data for mammalian species documented using scent-station procedures at Fort Donelson National Battlefield in Stewart Co., Tennessee, during 2005.

Date	Species	Coordinates
080405	<i>Canis familiaris</i>	N 36°29.134' W 87°51.099'
080505	<i>Canis latrans</i>	N 36°29.102' W 87°51.108'
080405	<i>Procyon lotor</i>	N 36°29.123' W 87°51.089'
080405	<i>Procyon lotor</i>	N 36°29.134' W 87°51.099'
080405	<i>Odocoileus virginianus</i>	N 36°29.134' W 87°51.099'

Table 7. Bats captured at Fort Donelson National Battlefield using mist-net procedures in a study of mammalian biodiversity during 2004-2005. See text for explanation of plot numbers.

Date	Species	Sex (M/F)	Weight (g)	Age ^a	GPS Coordinates	Plot Number
071904	<i>Myotis grisescens</i> [°]	M	11	A	N 36°29.485'	14
					W 87°51.055'	
071904	<i>Myotis grisescens</i>	M	12	A	N 36°29.490'	14
					W 87°51.060'	
071904	<i>Lasiurus borealis</i>	F	14	A	N 36°29.485'	14
					W 87°51.055'	
071904	<i>Lasiurus borealis</i>	F	13	A	N 36°29.485'	14
					W 87°51.055'	
072004	<i>Lasiurus borealis</i>	F	13	A	N 36°29.485'	14
					W 87°51.055'	
072004	<i>Nycticeius humeralis</i>	M	7	J	N 36°29.502'	14
					W 87°51.060'	
072104	<i>Pipistrellus subflavus</i> *	M	5	J	N 36°29.485'	14
					W 87°51.055'	
072104	<i>Lasiurus borealis</i>	M	8.5	J	N 36°29.502'	14
					W 87°51.060'	
072605	<i>Myotis septentrionalis</i> ^{°°}	M	10.5	A	N 36°29.278'	--
					W 87°51.688'	

^aA = adult; J = juvenile.

[°]Specimen with uniform colored hair; wing membrane attached at ankle; identification by Heidi L. LaMountain.

* Taken as a voucher specimen.

^{°°}Specimen with long ears (length = 18 mm) and long-pointed tragus; identification by Anna Featherston.

Table 8. Data for mammalian species documented through observation at Fort Donelson National Battlefield during 2004-2007.

Date	Species	Form of Documentation	GPS Coordinates
052804	<i>Tamias striatus</i>	Animal sighted	N 36° 29.108
			W 87° 51.759
052704	<i>Scalopus aquaticus</i>	Mole run sighted	N 36° 29.330
			W 87° 51.418
052704	<i>Scalopus aquaticus</i>	Mole run sighted	N 36° 29.198
			W 87° 51.219
052804	<i>Sylvilagus floridanus</i>	Animal sighted	N 36° 29.033
			W 87° 51.431
062304	<i>Sylvilagus floridanus</i>	Animal sighted	N 36° 29.074
			W 87° 51.169
062404	<i>Sylvilagus floridanus</i>	Photo of animal	N 36° 29.074
			W 87° 51.170
052604	<i>Sciurus carolinensis</i>	Animal sighted	N 36° 29.108
			W 87° 51.759
052704	<i>Sciurus carolinensis</i>	Animal sighted	N 36° 29.551
			W 87° 51.457
052704	<i>Sciurus carolinensis</i>	Animal sighted	N 36° 28.972
			W 87° 51.768
052704	<i>Sciurus carolinensis</i>	Animal sighted	N 36° 29.249
			W 87° 50.820
052804	<i>Sciurus carolinensis</i>	Animal sighted	N 36° 29.619
			W 87° 51.350
062304	<i>Sciurus carolinensis</i>	Animal sighted	N 36° 29.674
			W 87° 51.376
082407	<i>Sciurus carolinensis</i>	Animal sighted	N 36° 29.117
			W 87° 51.744
082407	<i>Sciurus carolinensis</i>	Animal sighted	N 36° 29.647
			W 87° 51.401
082407	<i>Sciurus carolinensis</i>	Animal sighted	N 36° 29.580
			W 87° 51.407
082407	<i>Sciurus carolinensis</i>	Photo of animal	N 36° 28.966
			W 87° 51.750
082407	<i>Sciurus carolinensis</i>	Animal sighted	N 36° 29.192
			W 87° 50.839
071805	<i>Marmota monax</i>	Photo of animal	N 36° 29.148
			W 87° 50.825
082407	<i>Marmota monax</i>	Animal sighted	N 36° 29.647
			W 87° 51.401
062204	<i>Castor canadensis</i>	Photo of gnawed trees	N 36° 29.074
			W 87° 51.149
071805	<i>Castor canadensis</i>	Photo of gnawed trees	N 36° 29.106

			W 87°51.107'
081907	<i>Castor canadensis</i>	Photo of gnawed trees	N 36°29.229'
			W 87°51.156'
071805	<i>Ondatra zibethicus</i>	Animal sighted	N 36°29.772'
			W 87°51.497'
071805	<i>Canis familiaris</i>	Photo of track	N 36°29.083'
			W 87°51.129'
071805	<i>Canis latrans</i>	Photo of track	N 36°29.083'
			W 87°51.129'
081907	<i>Vulpes vulpes</i>	Photo of track	N 36°29.268'
			W 87°51.681'
081907	<i>Vulpes vulpes</i>	Photo of track	N 36°29.106'
			W 87°51.157'
2004-2007	<i>Urocyon cinereoargenteus</i>	Sighted by FDNB personnel	
081907	<i>Mephitis mephitis</i>	Track sighted	N 36°29.268'
			W 87°51.681'
052804	<i>Procyon lotor</i>	Animal sighted	N 36°29.085'
			W 87°51.747'
062204	<i>Procyon lotor</i>	Tracks sighted	N 36°29.074'
			W 87°51.149'
071805	<i>Procyon lotor</i>	Tracks sighted	N 36°29.109'
			W 87°51.118'
081505	<i>Procyon lotor</i>	Photo of animal	N 36°29.313'
			W 87°51.507'
081907	<i>Procyon lotor</i>	Photo of track	N 36°29.268'
			W 87°51.681'
081505	<i>Felis catus</i>	Photo of animal	N 36°29.601'
			W 87°51.294'
081907	<i>Lynx rufus</i>	Photo of track	N 36°29.106'
			W 87°51.157'
071805	<i>Odocoileus virginianus</i>	Parts of skeleton found	N 36°29.103'
			W 87°51.102'
062204	<i>Odocoileus virginianus</i>	Animal sighted	N 36°29.331'
			W 87°51.433'
052604	<i>Odocoileus virginianus</i>	Animal sighted	N 36°29.594'
			W 87°51.333'
052604	<i>Odocoileus virginianus</i>	Animal sighted	N 36°29.658'
			W 87°51.333'
081907	<i>Odocoileus virginianus</i>	Photo of animal	N 36°29.117'
			W 87°51.744'
082407	<i>Odocoileus virginianus</i>	Animal sighted	N 36°29.593'
			W 87°51.282'

082407	<i>Odocoileus virginianus</i>	Animal sighted	N 36° 29.260
			W 87° 51.218
052804	<i>Odocoileus virginianus</i>	Animal sighted	N 36° 29.033
			W 87° 51.431
062204	<i>Odocoileus virginianus</i>	Tracks sighted	N 36° 29.074
			W 87° 51.149
052604	<i>Odocoileus virginianus</i>	Animal sighted	N 36° 29.306
			W 87° 51.470
052604	<i>Odocoileus virginianus</i>	Animal sighted	N 36° 29.551
			W 87° 51.457
052604	<i>Odocoileus virginianus</i>	Animal sighted	N 36° 29.658
			W 87° 51.331
081505	<i>Odocoileus virginianus</i>	Photo of animal	N 36° 29.102
			W 87° 51.128

Appendices

Appendix I—Plot sites used in an inventory of mammals at Fort Donelson National Battlefield in Stewart Co., Tennessee, during 2004-2007.

<u>Plot number</u>	<u>UTM Easting</u>	<u>UTM Northing</u>
1	422581	4037835
2	422578	4038205
3	422591	4038574
4	422965	4037844
5	422960	4038209
6	422956	4038584
7	423328	4037834
8	423321	4038208
9	423328	4038571
10	423330	4038955
11	424079	4038577
12	422738	4038249
13	423634	4038057
14	423781	4038804
15	423482	4038200

Appendix II—Photo log for species documented at Fort Donelson National Battlefield, Stewart
County, Tennessee, 2004-2007.



Didelphis virginiana (5/27/2004)
N 36°29.220' W 87° 51.775'



Blarina brevicauda (8/1/2005) Bottom specimen
N 36°28.965' W 87° 51.368'

Blarina brevicauda (8/2/2005) Top specimen
N 36°29.218' W 87° 51.469



Cryptotis parva (7/20/05)
N 36°29.164' W 87° 51.373'



Scalopus aquaticus (5/27/2004)
N 36°29.330' W 87° 51.418'
Mole run



Lasiurus borealis (7/19/04)
N 36°29.485' W 87° 51.055'



Nycticeius humeralis (7/20/04)
N 36°29.502' W 87° 51.060'



Myotis septentrionalis (7/26/2005)
N 36°29.278' W 87° 51.688'



Sylvilagus floridanus (6/24/04)
N 36°29.074' W 87° 51.170'



Tamias striatus (7/27/05)
N 36°29.357' W 87° 50.953'



Marmota monax (7/18/05)
N 36°29.148' W 87° 50.825'



Sciurus carolinensis (8/24/07)
N 36°28.966' W 87° 51.750'



Castor canadensis (7/18/05)
N 36°29.106' W 87° 51.107'



Castor canadensis (8/19/07)
N 36°29.229' W 87° 51.156'



Peromyscus leucopus (7/19/05)
N 36°29.165' W 87° 51.365'



Peromyscus leucopus (7/26/05)
N 36°29.544' W 87° 51.101'



Peromyscus leucopus (8/4/05)
N 36°29.145' W 87° 51.081'



Peromyscus gossypinus (8/9/2005)
N 36°28.757' W 87° 50.412'



Sigmodon hispidus (8/18/05)
N 36°28.929' W 87° 51.230'



Sigmodon hispidus (8/18/05)
N 36°28.884' W 87° 51.288'



Microtus ochrogaster (8/10/05)
N 36°28.944' W 87° 51.224'



Microtus pinetorum (8/16/05)
N 36°29.540' W 87° 51.063'



Synaptomys cooperi (8/3/05)
N 36°28.774' W 87° 50.568'



Canis familiaris (7/18/05)
N 36°29.083' W 87° 51.129'



Canis latrans (8/5/05)
N 36°29.102' W 87° 51.108'



Vulpes vulpes (8/19/07)
N 36°29.106' W 87° 51.157'



Vulpes vulpes (8/19/07)
N 36°29.268' W 87° 51.681'



Procyon lotor (8/15/05)
N 36°29.313' W 87° 51.507'



Procyon lotor (8/19/07)
N 36°29.268' W 87° 51.681'



Procyon lotor (8/16/04)
N 36°29.537' W 87° 51.162'



Mephitis mephitis (8/19/07)

Photo taken near FDNB but not on the site



Felis catus (8/15/05)
N 36°29.601' W 87° 51.294'



Lynx rufus (8/19/07)
N 36°29.106' W 87° 51.157'



Lynx rufus (8/16/04)
N 36°29.537' W 87° 51.162'



Odocoileus virginianus (8/15/05)
N 36°29.102' W 87° 51.128'