

**TERRESTRIAL MAMMALS
OF COWPENS NATIONAL BATTLEFIELD
CHESNEE, SOUTH CAROLINA**

Final Report

PREPARED FOR:

**NATIONAL PARK SERVICE
COWPENS NATIONAL BATTLEFIELD
Chesnee, SC 29323**

PREPARED BY:

**DR EDWARD PIVORUN
Clemson University, Clemson, SC
DR LINDA FULTON
U of Mississippi Medical School
Jackson, MS**

INTRODUCTION

Although a great deal of biological/ecological information has been gathered on the large charismatic mammals in many of the larger National Parks, virtually no information is available on the presence, distribution and population dynamics of the smaller mammalian species. This is especially true with regards to the rodents and insectivores inhabiting the various parks managed by the United States National Park Service. These smaller members of the mammalian fauna represent a major biomass component that avian, reptilian, and mammalian predators utilize. Rodents and insectivores also have a major impact on the various ecosystems they inhabit, since they utilize the flora and the invertebrate fauna as major food resources. Mammals can have a major effect on the control of insect pests and on the survival of both herbaceous and woody vegetation by impacting seed survival and distribution. Proper management, protection, and documentation of the effects of climatic change on these treasured natural areas requires inventory and monitoring procedures that utilize the expertise of trained biologist from both the public and private sector. The lack of this essential information was the basis for the creation of an inventory and monitoring network to gather this necessary information by the National Park Service. This report covers the results of the mammal inventory (excluding bats) of Cowpens National Battlefield in Chesnee, SC. This is the second known effort to document the mammalian fauna at the Cowpens site. Previous work had been done by David Farris in 2000 – 2001 in a study on nonvolant small mammals in the park.

The state of South Carolina has a relatively diverse mammalian fauna consisting of 69 species, some rare and some very common (Webster et al. 1985). Prior to our fieldwork at the site, we compiled a list of the mammals (excluding bats) that would be expected in the historic site. Our own research trapping efforts near the site (northern Pickens and Greenville counties, SC) provided us with an informed list of what should be expected at the site. We expected to find or document the presence of 26 species: including 1 marsupial, 4 insectivores, 1 lagomorph, 12 rodents, 7 carnivores, and 1 ungulate (Appendix 1). The habitats present at the Cowpens site represent both manmade grassy

fields and a mixed conifer/hardwood forest. The site is surrounded by home sites/ farms and the cats and dogs owned by private individuals may have a profound effect on small mammal populations at the site.

The objective of this study was to conduct a comprehensive inventory to document the terrestrial mammals living within or otherwise using the Cowpens National Battlefield site. The focus of the work was to document 90% of the expected mammalian fauna.

Study Area

Cowpens National Battlefield (Figure 1):

Location: In Chesnee SC, at 4001 Chesnee Highway, Spartanburg Co.

The Battle of Cowpens was the event which started Cornwallis on his road to Yorktown . Three miles east of the small town of Chesnee in South Carolina on Route 11, in a grassy meadow lightly peppered with trees, was the site of one of the most crucial battles of the American Revolution .

The Cowpens site is surrounded by relatively old home sites, farms, and mixed pine and hardwood woodlands. A visitor center is located near the public parking area. As a unit of the National Park System, Cowpens National Battlefield protects and preserves the historic scene. Protection means taking care of the battlefield for this and future generations. Preservation means restoring the battlefield to its appearance in 1781. After the expanded park and Visitor Center opened in 1980, park managers concentrated on keeping the core battlefield open as it was in 1781, while letting much of the land revert to forest. To return the park to the forage and trees native at the time of the battle, the National Park Service removed early succession trees such as sweetgum and wild cherry and replaced them with a limited planting of oaks, yellow poplars, and maples. Based on current research, the battlefield core encompasses a larger area than originally thought. To restore these areas, the park clears underbrush between large trees and reintroduces native grasses using various methods of restoration .

Periodic burning clears the forest floor and opens up the woodland. Native Americans and settlers used fire to clear underbrush in heavily wooded areas. Because fire is a natural occurrence, many native plants and animals flourish after a fire.

METHODS

An initial visit to the Cowpens site was conducted in 2006. During this visit, we met with park officials, obtained maps of the park, located areas of interest, and surveyed important roads and access points by vehicle and foot. In order to document the occurrence of as many terrestrial mammalian species as possible within the park, we used: small mammal trapping arrays consisting of live traps, pitfall traps, remotely triggered digital cameras and visual encounters. The location of each survey site was accurately recorded using a Global Positioning System or GPS unit.

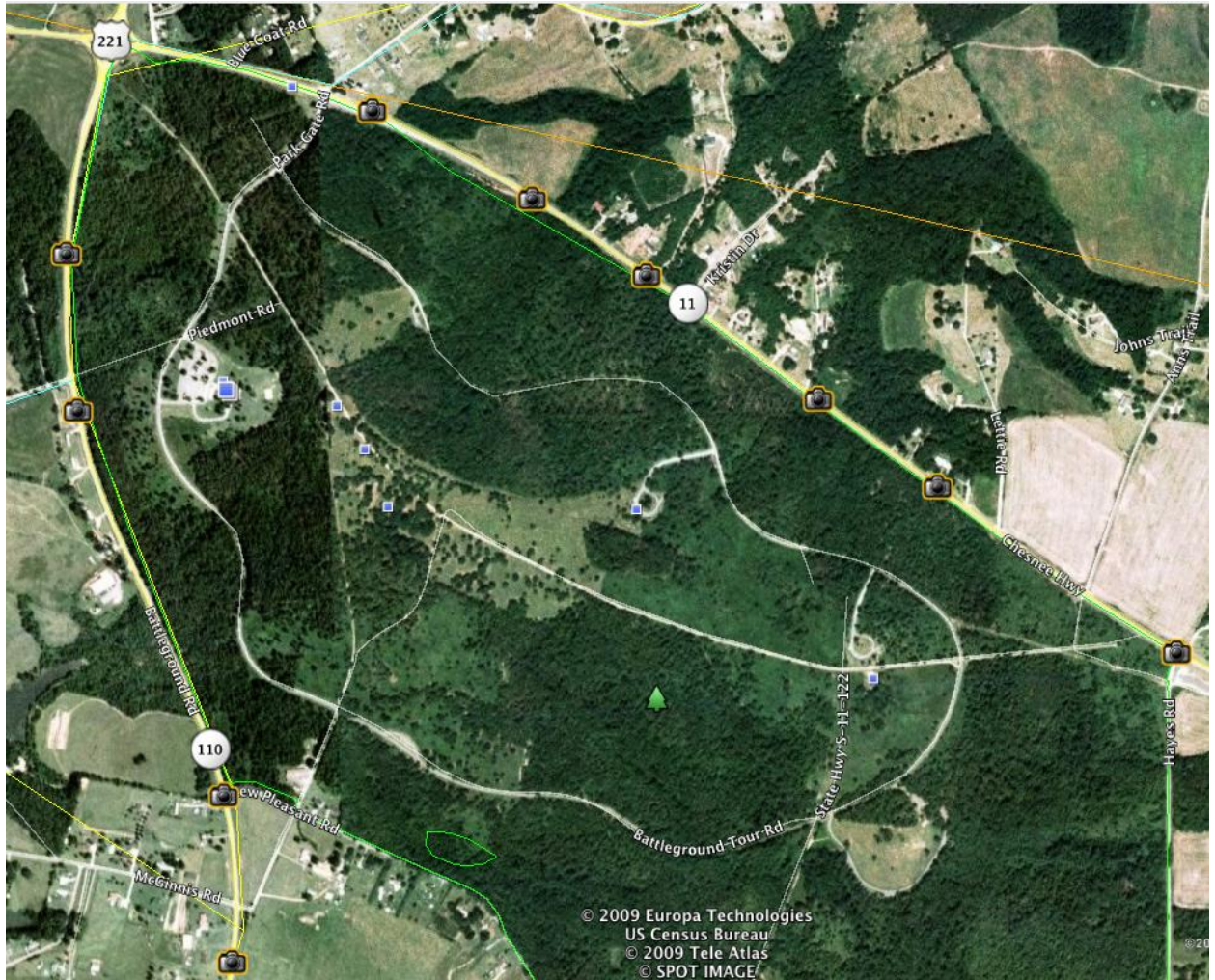


Figure 1. Location of Cowpens National Battlefield, Chesnee, SC.

Small Mammal Trapping

Fieldwork took place from January 2007 to December 2008. Mammals were surveyed at 10 sites (Table 1 and Figure 2). Each site was selected based on the available habitat within the Cowpens site and on the likelihood that particular target species would be located at these sites.

Table 1. Trapping locations and coordinates for each site surveyed at Cowpens National Battlefield, Chesnee, South Carolina, 2007-2008.

Site #	Location Habitat/ Sampling Method	UTM	
		Easting	Northing
1	Woodland with intermittent stream Traps/ pitfall/ Camera	425459	3887991
2	Woodland with stream Traps/ pitfall/ Camera	426375	3887395
3	Woodland with stream Traps	426316	3887723
4	Woodland with stream Traps/ pitfall	426790	3887334
5	Old field Traps/ pitfall	426934	3888061
6	Old field near Scruggs House Traps/ pitfall	426653	3887973
7	Old field Traps	426393	3888404
8	Woodland Traps	425897	3888532
9	Woodland Traps	425777	3888810
10	Woodland Traps	425605	3889011

* Cameras were out every month from February 2007 to October 2008.

* Trapping occurred over a 2-day period during 1/07; 4/07; 12/08.

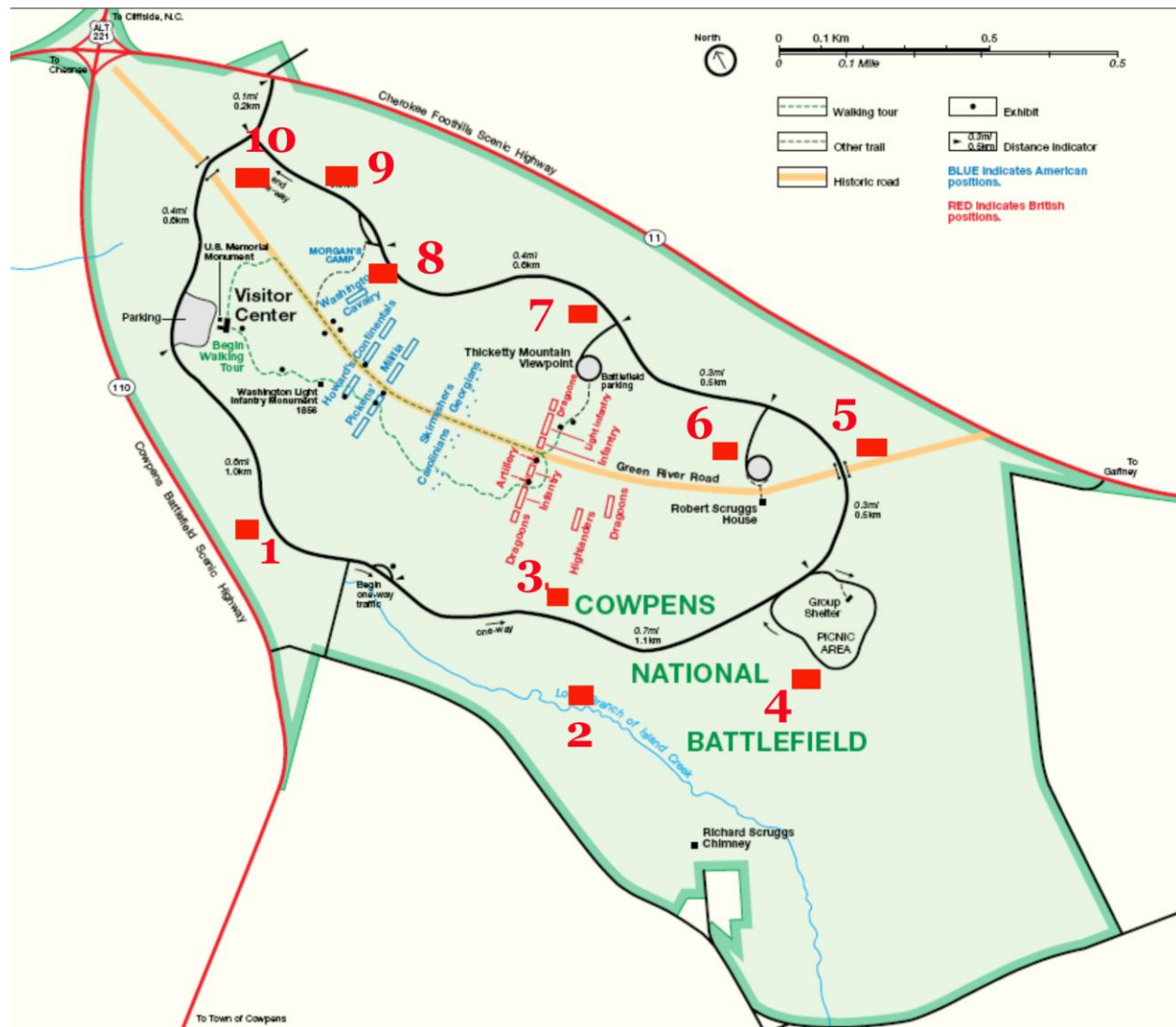


Figure 2. Trapping locations for each site surveyed at Cowpens National Battlefield, Chesnee, SC, 2007-2008.

Attempts were made to capture specimens using four different trapping methods: Sherman live-traps, Tomahawk box-traps, and dry pitfall buckets. Snap traps were not utilized since the park personnel did not want any animals harmed during the sampling procedures. Each night that a trap was open was considered a trap-night. Trap nights at each site varied, depending upon the number of traps deployed, how long traps were actively open, and the effect of raccoons (*Procyon lotor*) on trap site integrity. Some sites were markedly affected by raccoon depredation on the traps. Data could not be collected, since every trap was disturbed, opened or destroyed. Woodlands, stream side edges, old fields, and areas in close proximity to buildings were sampled for small mammals.

Specific trap locations, numbers and types of traps deployed, and distances between traps varied with habitat type, available cover, and specialized microhabitats. Traps were placed near maintained runways, fresh droppings, and other habitat components that often indicate high levels of small mammal activity. Small and large (Sherman) live-traps were baited with peanut butter. Tomahawk box-traps were set along small trails, along stream edges, or within thick underbrush attempting to capture medium-sized mammals. These traps were baited with a mixture of sliced apples and peanut butter. One gallon pitfall buckets were placed along logs and rocks and sunk to ground level in areas of suspected high levels of small mammal activity. Since these pitfall traps were used to live capture mammals, holes were punched in the bottom of the buckets to prevent rainwater from filling the traps and drowning captured mammals.

Trapped individuals were identified with the use of standard museum body measurements (total length, tail length, and hind foot length), and weight. All specimens captured alive were identified, measured, photographed (if possible) and released. No specimens were euthanized. However, two animals were found dead in the traps. Both were so damaged by ants that they were not collected as museum specimens.

Visual Encounters

Field observations were also used to informally document mammals throughout the Cowpens site. Visual encounters include direct observation of individuals, photographs, sign (scat and tracks), and roadkill. Two digital cameras were deployed in various habitats to detect the presence of larger mammalian species. These cameras are triggered by warm moving bodies and allow for photographic confirmation of mammalian species. The sites were baited with sardines or catfood.

RESULTS

Weather conditions were atypical of the region during the two year survey period with higher than normal temperatures and significant reductions in the amount of rainfall. Rain occurred sparsely throughout a large portion of the two years of the survey period resulting in a drought for most of those years.

During the survey, 9 species of terrestrial mammals was recorded, and 45 individual observations of mammals were made (including those captured or observed; Appendix 1). No endangered, threatened, or candidate species for listing as endangered or threatened were captured. The 9 species of mammals that were documented, however, represent 35 percent of the 26 species that were expected to occur at the Cowpens site: The marsupial (1 documented of 1 expected; 100%); insectivores (0 documented of 4 expected; 0%); rodents (3 documented of 12 expected; 25%) including 2 of the 3 expected squirrels (67%), and 1 of the 9 expected rats/mice/voles (11%); lagomorphs (1 documented of 1 expected; 100%); carnivores (3 documented of 7 expected: 43%) including 2 of the 3 expected canines (67%), the single expected raccoon (100%), none of the 2 expected mustelids (0%), and none of the single expected feline (0%); and the ungulate (1 of the 1 expected; 100%). All species found during the survey are relatively widespread and considered common in South Carolina.

Mammalian Trapping

Ten sites were surveyed for small mammals during the two year period resulting in 345 combined trap nights. A total of 300 Sherman live-trap nights, 15 Tomahawk box-trap nights, and 30 pitfall trap nights were conducted during the survey. These trapping methods were used throughout different habitats within the Cowpens site. Woodlands received 275 trap nights and old fields received 70 trap nights.

A total of 15 small mammals representing 1 species were captured during the 345 combined trap nights (Table 2). Measurements of specimens captured can be found in Appendix 2. During this portion of the study, 6 percent, or 1 of the 16 small mammals (squirrel size or smaller) on the initial list were captured. Sherman live-traps captured all individuals of the one species, Tomahawk box-traps and dry pit-fall buckets did not capture a single species. The relatively low success of the live trapping procedures can be attributed to: 1) the fact that drought conditions were present during the two years of the study, 2) the fact that the site is in the Piedmont region of the state (small mammal diversity is usually very low in the Piedmont), 3) the relatively xeric habitats noted throughout the woodlands and 4) the potential presence of feral and domestic cats and dogs in both the old fields and woodlands.

Table 2. Small mammals captured from different habitat types at Cowpens National Battlefield, SC, 2007-2008.

Species	Woods	Old Field	Total
White-footed mouse	15	0	15
Total Individuals	15	0	15

Visual Encounters

Direct visual observations, sign, and image capture via remote cameras documented the presence of 31 individuals representing 8 species (Table 3). Using visual encounters, 30

percent of the 26 mammal species on the original list were documented. No roadkill or dead mammals were located in the park. Striped skunk was observed on the county and state roads surrounding the park.

From the 10 trap and camera sites collectively: the most numerous species in the woodlands were the white-footed mouse (*Peromyscus leucopus*), raccoons, opossums, and gray squirrels. Numerous is a relative term, since so few animals were live trapped. However, these species are the species that one would expect in this habitat in this part of the USA.

Gray squirrels, chipmunks, and cottontail rabbits were observed at the camera or traps sites. Raccoons and opossums were captured by the remote cameras. Two coyotes and three gray fox were captured by the remote cameras in the woodlands. These predators were intermittent users of the Cowpens site. No red fox were captured at the baited camera sites.

Table 3. Mammals visually encountered at Cowpens National Battlefield, SC, 2007-2008.

Species	Visual Encounters			
	Visual/ Camera	Sign	Dead	Total
Virginia opossum	0/7			7
Eastern cottontail	1/1			2
Eastern chipmunk	3/0			3
Gray squirrel	8/0			8
Coyote	0/2			2
Gray Fox	0/3			3
Raccoon	0/5			5
Deer		1		1
Total individuals	30	1	0	31
Total species	7	1	0	8

DISCUSSION

The mammalian fauna found at the Cowpens site is typical of the Piedmont region of South Carolina. The major goal of this study was to document 90 percent of the mammal species expected to be present. During this study, approximately 35 percent or 9 of the 26 terrestrial species on the initial list were found at the Cowpens site. Of the 17 species not documented during this study, three are primarily associated with human constructed buildings (house mouse, Norway rat and black rat), two are considered localized [golden mouse (*Ochrotomys nuttalli*) and meadow jumping mouse (*Zapus hudsonius*)], two are considered extremely cryptic [long-tailed weasel (*Mustela frenata*) and bobcat (*Lynx rufus*)], and four are considered extremely difficult to live trap [Southeastern shrew (*Sorex longirostris*), least shrew (*Crypotis parva*), Eastern mole (*Scalopus aquaticus*) and Eastern harvest mouse (*Reithrodontomys humulis*)]. In addition, five species not documented in this study are generally common in this part of the Southeastern United States [Southern flying squirrel (*Glaucomys volans*), hispid cotton rat (*Sigmodon hispidus*), pine vole (*Microtus pinetorum*), striped skunk (*Mephitis mephitis*), and red fox (*Vulpes vulpes*)].

Trapping success was extremely poor, likely due to the major drought and high temperature conditions during the spring, summer and fall months. Both factors probably reduced reproductive success of the insectivores and rodents. *Peromyscus* sp. tend to reduce reproductive activity during the hot summer months. The small streams and Long Branch of Island Creek dried up completely or were represented by small intermittent pools rather than contiguous watercourses. Another reason that so few small shrews, mice and voles were captured may be do to the presence of farms and home sites adjacent to the Cowpens site. Although we did not observe many cats or dogs on the site, cats especially, are a major predator on small rodents and insectivores. The absence of any pasture or field rodents such as the hispid cotton rat may be due to the periodic cutting of the fields.

The combination of all methods used contributed to a better understanding of the total species composition located at the Cowpens site. Even though visual encounters contributed more individuals and more species, the primary goal of 90 percent of the expected species was not met. However, this study provides baseline species data and distribution for mammals within the Cowpens National Battlefield site.

RECOMMENDATIONS

Future management efforts on the Cowpens site should continue to focus on maintaining a diverse array of available habitats such as grasslands, small bodies of water, and intact forests. Varied habitats are vital for maintaining a diverse mammalian fauna. Allowing fields to remain uncut or restoring the native grassland habitat on the periphery of the actual battlefield site may also allow for the establishment and maintenance of small rodent and insectivore populations. This in turn would allow for the maintenance of larger populations of mammalian predators such as the red fox and birds of prey.

Efforts should also be focused on the maintenance of snags (standing dead trees) retention and coarse woody debris (tree trunks and branches on the ground) within the woodlands. Trees damaged during storm events should be left standing unless they pose an immediate danger to the public. Live cavity trees and snags should be retained because they provide sites for dens, nests, and roosts.

One factor that should be examined is the removal of feral cats and dogs from the property. Politically this would be difficult if the cats and dogs wandering on the property belong to neighboring home sites.

REFERENCE

Webster, D., J. F. Parnell, and W. C. Biggs. 1985. *Mammals of the Carolinas, Virginia, and Maryland*. The University of North Carolina Press, Chapel Hill and London, 255 pp.

Appendix 1. Mammal species known, expected, and observed on Cowpens National Battlefield, SC, 2007-2008.

Standard Common Name	Standard Scientific Name	Observed	
		Yes	No
Order: Didelphimorphia			
Family: Didelphidae (Opossum)			
Virginia opossum	<i>Didelphis virginiana</i>	X	
Order: Insectivora			
Family: Soricidae (Shrews)			
Southeastern shrew	<i>Sorex longirostris</i>		X
Short-tailed shrew	<i>Blarina brevicauda</i>		X
Least shrew	<i>Cryptotis parva</i>		X
Family: Talpidae (Moles)			
Eastern mole	<i>Scalopus aquaticus</i>		X
Order: Lagomorpha			
Family: Leporidae (Rabbits)			
Eastern cottontail	<i>Sylvilagus floridanus</i>	X	
Order: Rodentia			
Family: Sciuridae (Squirrels)			
Eastern chipmunk	<i>Tamias striatus</i>	X	
Gray squirrel	<i>Sciurus carolinensis</i>	X	
Southern flying squirrel	<i>Glaucomys volans</i>		X
Family: Muridae (rats & mice)			
Eastern harvest mouse	<i>Reithrodontomys humulis</i>		X
White-footed mouse	<i>Peromyscus leucopus</i>	X	
Golden mouse	<i>Ochrotomys nuttalli</i>		X
Hispid cotton rat	<i>Sigmodon hispidus</i>		X
Pine vole	<i>Microtus pinetorum</i>		X
Norway rat	<i>Rattus norvegicus</i>		X
Black Rat	<i>Rattus rattus</i>		X
House mouse	<i>Mus musculus</i>		X
Family: Dipodidae (Jumping mice)			
Meadow jumping mouse	<i>Zapus hudsonius</i>		X
Order: Carnivora			
Family: Canidae (Foxes and allies)			
Coyote	<i>Canis latrans</i>	X	
Red fox	<i>Vulpes vulpes</i>		X
Gray fox	<i>Urocyon cinereoargenteus</i>	X	
Family: Procyonidae (Raccoons and allies)			
Raccoon	<i>Procyon lotor</i>	X	
Family: Mustelidae (Weasels and allies)			

Long-tailed weasel	<i>Mustela frenata</i>	X
Striped skunk	<i>Mephitis mephitis</i>	X
Family: Felidae (Cats)		
Bobcat	<i>Lynx rufus</i>	X
Order: Artiodactyla (Even-toed ungulates)		
Family: Cervidae (Deer)		
White-tailed deer	<i>Odocoileus virginianus</i>	X

Appendix 2. All terrestrial mammals live trapped at Cowpens National Battlefield, SC 2007-2008.

Order

Species

Date	Site	Sex	Repro. Cond.	Age	Lengths (mm)			Weight (g)
					Total	Tail	HF	

Rodentia

White-footed mouse (*Peromyscus leucopus*)

Jan 20 07	2	F	-	A	152	72	20.1	17.5
Jan 20 07	2	F	-	A	151	71.7	20.5	18.0
Jan 20 07	9	M	-	A	163	81.6	19.4	22.3
Apr 14 07*	2	M	-	A	147	63.2	17.9	17.7
Apr 14 07	2	M	-	A	154	73.6	18.5	20.3
Apr 14 07	2	F	-	A	144	56.0	17.9	20.3
Apr 14 07	2	M	-	A	151	62.5	18.0	19.6
Apr 14 07	2	F	Preg	A	158	68.8	20.0	25.1
Apr 14 07*	9	M	-	A	159	69.9	17.2	15.3
Apr 14 07	9	M	-	A	150	62.0	18.6	15.9
Apr 14 07	9	M	-	A	168	78.4	18.9	20.5
Dec 3 08	2	F	-	A	144	55.7	17.2	15.6
Dec 3 08	2	F	-	A	153	65.2	20.4	18.2
Dec 3 08	5	M	-	A	149	70.8	19.6	20.9
Dec 3 08	9	F	Preg	A	151	71.2	20.3	24.8

* Died in trap

Appendix 3. All terrestrial mammals visually encountered at Cowpens National Battlefield Site, SC, 2007-2008.

Order

Species

Date

Site

Habitat

**Visual,
Sign, or
Camera**

Observer

Image #

Didelphimorphia

Virginia opossum (*Didelphis virginiana*)

Appendix 3. All terrestrial mammals visually encountered at Cowpens National Battlefield Site, SC, 2007-2008.

2/18/07	2	woodland	camera	---	posFeb18
2/19/07	2	woodland	camera	---	---
2/22/07	2	woodland	camera	---	---
2/24/07	2	woodland	camera	---	---
4/1/07	2	woodland	camera	---	---
4/8/07	2	woodland	camera	---	---
4/11/07	2	woodland	camera	---	---

Lagomorpha

Eastern cottontail (*Sylvilagus floridanus*)

4/14/07	4	woodland	visual	Johnson	1 rabbit
12/3/08	4	woodland	camera	Pivorun	RabDec3

Rodentia

Gray squirrel (*Sciurus carolinensis*)

1/20/07	4	woodland	visual	Pivorun	n/a
1/20/07	4	woodland	visual	Johnson	n/a
4/14/07	4	woodland	visual	Johnson	n/a
4/14/07	2	woodland	visual	Johnson	n/a
4/14/07	2	woodland	visual	Johnson	n/a
4/14/07	3	woodland	visual	Johnson	n/a
12/3/08	2	woodland	visual	Pivorun	n/a
12/3/08	4	woodland	visual	Pivorun	n/a

Eastern Chipmunk (*Tamias striatus*)

1/20/07	2	woodland	visual	Johnson	n/a
1/20/07	4	woodland	visual	Johnson	n/a
12/3/08	4	woodland	visual	Pivorun	n/a

Carnivora

Coyote (*Canis latrans*)

2/22/07	2	woodland	camera	---	CoyFeb22
2/24/07	2	woodland	camera	---	---

Gray Fox (*Urocyon cinereoargenteus*)

1/9/07	2	woodland	camera	---	foxJan9
1/20/07	2	woodland	camera	---	foxJan20
1/20/07	2	woodland	camera	---	fox2Jan20

Raccoon (*Procyon lotor*)

2/23/07	2	woodland	camera	---	racFeb23
2/24/07	2	woodland	camera	---	racFeb24

Appendix 3. All terrestrial mammals visually encountered at Cowpens National Battlefield Site, SC, 2007-2008.

2/26/07	2	woodland	camera	---	racFeb26
12/1/08	2	woodland	camera	---	racDec1
12/2/08	2	woodland	camera	---	---

Artiodactyla

White-tailed Deer (*Odocoileus virginianus*)

12/3/08	4	woodland	sign	Pivorun	---
---------	---	----------	------	---------	-----