COPPERHEAD
ENVIRONMENTAL CONSULTING, INC.

MAMMALS OF ABRAHAM LINCOLN BIRTHPLACE & BOYHOOD HOME NATIONAL HISTORIC SITES, LARUE COUNTY, KENTUCKY

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March 10, 2006

Teresa Leibfreid
National Park Service
Inventory and Monitoring Coordinator
Cumberland Piedmont Network
Mammoth Cave National Park
P.O. Box 112
Mammoth Cave, KY 42259

Subject: **Mammals of Abraham Lincoln Birthplace & Boyhood Home National Historic Sites, Larue County, Kentucky**

Dear Ms. Leibfreid,

Copperhead Environmental Consulting, Inc. (dba: Copperhead Consulting) is pleased to submit this final report package for completion of a mammal survey for Abraham Lincoln Birthplace National Historic Site (ABLI), Larue County, Kentucky. We at Copperhead Consulting hope that the survey was satisfactory to the staff at ABLI and that our hard work and dedication to provide quality work shows.

Copperhead Consulting provides a wide variety of ecological assessment services to clients throughout the eastern United States and has the qualifications and experience to provide high quality inventories. To ensure our clients receive the highest quality product, we remain dedicated and focused in our areas of expertise. Our passion, our enthusiasm for the natural world, and our determination to provide the best environmental services prove it!

We hope that this package provides the detailed information that you require for your review. If you have any questions regarding this submittal or need additional information, please do not hesitate to contact us.

Sincerely,

Mark Gumbert
President / Principal Wildlife Biologist
Copperhead Environmental Consulting, Inc.

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March 10, 2006

Sandy Brue
Chief of Operations
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(207) 358-3137 (phone)
(270) 358-3874 (fax)

Subject: **Mammals of Abraham Lincoln Birthplace & Boyhood Home National Historic Sites, Larue County, Kentucky**

Dear Ms. Brue,

Copperhead Environmental Consulting, Inc. (dba: Copperhead Consulting) is pleased to submit this final report package for completion of a mammal survey for Abraham Lincoln Birthplace National Historic Site (ABLI), Larue County, Kentucky. We at Copperhead Consulting hope that the survey was satisfactory to the staff at ABLI and that our hard work and dedication to provide quality work shows.

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Copperhead Environmental Consulting, Inc.

MAMMALS OF ABRAHAM LINCOLN BIRTHPLACE & BOYHOOD HOME NATIONAL HISTORIC SITES, LARUE COUNTY, KENTUCKY

PREPARED FOR:

NATIONAL PARK SERVICE
Abraham Lincoln Birthplace National Historic Site
2995 Lincoln Farm Road
Hodgenville, Kentucky, 42748

PREPARED BY:

Mark Gumbert
Piper Roby-Thomas
and
Kevin McDonald

10 March 2006

AUTHORS

The following people conducted the field work and worked directly on the main body of text for this report.

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Principal Wildlife Biologist / Copperhead Environmental Consulting, Inc.

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ABSTRACT

With a new management strategy, the National Park Service is relying more on science to enhance management decisions to help preserve our natural resources. Biological inventories of these natural resources are the first phase for developing a comprehensive natural and cultural resource plan for each park. Deficiencies exist in the baseline information on the mammalian species of Abraham Lincoln Birthplace National Historic Site, Larue County, Kentucky. Thus, this report summarizes results of an intensive, year-long study aimed at documenting the occurrence of small, meso, and large mammalian species, including bats, during 2005. Documentation of mammals was conducted through photograph, voucher specimen, or sigh collection through various capture and monitoring techniques. Using such methods, 242 individual observations of mammals were made. A total of 30 species were documented including 12 small mammals, 12 meso and large mammals and 7 bat species. In addition, the survey documented 11 new Larue County records. Management recommendations such as controlled burning, reforestation of riparian zones, strip mowing with in meadows, and maintaining snag retention within forested areas will all help maintaining a diverse array of available habitats within the park.

ACKNOWLEDGEMENTS

Development and deployment of this survey was guided by Teresa Leibfreid, Inventory and Monitioring Coordinator, National Park Service. We would also like to thank the staff at Abraham Lincoln Birthplace National Historic Site, especially Sandy Brue and Jennie Jones for providing initial instructions and technical support for the project. Additional park service employee Steve Thomas helped with reviewing the draft report. We owe a tremendous amount of gratitude to our mentor John R. MacGregor for his timeless support, verification of specimens, and review of the draft report. Additional field help was granted by Gregg Shirk, Price Sewell, Jeremy Sheets, and Catie Byers and a big thinks is due for their participation with the project.

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INTRODUCTION

Knowing and understanding the diverse flora and fauna within a given area are important information for land managers. The United States National Park Service owns 1.8 million ha (4.5 million acres) and manages another 1.7 million ha (4.3 million acres) of private lands. Current documentation regarding the distribution, abundance, and habitat relationships of species within park boundaries or private lands managed by the park is essential for the management and protection of these natural resources. Although some of these properties are considered historical parks rather than natural parks, those ecosystems and the associated species are important and can easily be impacted by management decision. Surprisingly, many parks have never been surveyed to document what species are present. Thus, the National Park Service has created an inventory and monitoring network to gather this necessary information. The Cumberland Piedmont Network consists of 14 parks and includes Abraham Lincoln Birthplace National Historic Site (ABLI), Larue County, Kentucky. This report covers the results of the mammal inventory of ABLI.

Mammals, as a group, play an extremely important ecological role in the function of natural ecosystems. Burrows created by many mammals provide shelter for a large number of other species including invertebrates and vertebrates (Mumford and Whitaker 1982). These burrows also help aerate the soil, which increases water absorption and decreases runoff during rainfall (Schwartz and Schwartz 1981). Within fields and forests, mammals help control pest insects and distribute seeds of trees and other plants, as well as provide a food base for numerous predators such as snakes, raptors, and larger mammals (Barbour and Davis 1974, Webster et al. 1985). Though animals play a vital role in a balanced ecosystem, their behavior may render them inconspicuous. Such behavior may include nocturnal or crepuscular, fossorial or semifossorial, and cryptic behavior. Still, they are major players in a balanced ecosystem.

Within the boundaries of Kentucky, 71 species of wild mammals have been documented (Barbour and Davis 1974, Caldwell 1980, Thomas 2001, John MacGregor, Kentucky State Herpetologist, Kentucky Department of Fish & Wildlife Resources, Kentucky. 2006. pers. comm.). Prior to the field survey, a list of species thought to have a reasonable probability of occurring at ABLI was compiled. Twenty-one species have been documented from Larue County and another 24 species most likely occur within the county (Barbour and Davis 1974, Bryan 1979, Caldwell 1980, Caldwell and Bryan 1982, Thomas 2001), which brings the expected mammal fauna of ABLI to 45 species: including 1 marsupial, 6 insectivores, 11 bats, 1 lagomorph, 16 rodents, 9 carnivores, and 1 ungulate (Appendix 1). The species that make up this varied and diverse assemblage exhibit a wide variety of lifestyles and require specialized habitats that will contribute to a unique set of challenges to document each species.

Among the expected assemblage of species two federally endangered bats [Indiana bat (*Myotis sodalis*) and gray bat (*Myotis grisescens*)] potentially occur at ABLI. In addition, there are three mammal species that are of special concern in Kentucky (KSNPC data, 2006); Rafinesque's big-eared bat (*Coryhnorhinus rafinesquii*), evening bat (*Nycticeius humeralis*), and the least weasel (*Mustela nivalis*). All of the endangered and special concern bat species can be found during the summer as close as Mammoth Cave, located approximately 55 km (34 miles) southwest of ABLI. The least weasel is known from 10 counties within the Bluegrass and the Eastern Coalfield (KSNPC data, 2005).

The objective of this study was to conduct a comprehensive inventory to document the mammals living within or otherwise using ABLI. The focus of the work was to document 90% (41 of 45) of the expected mammalian fauna.

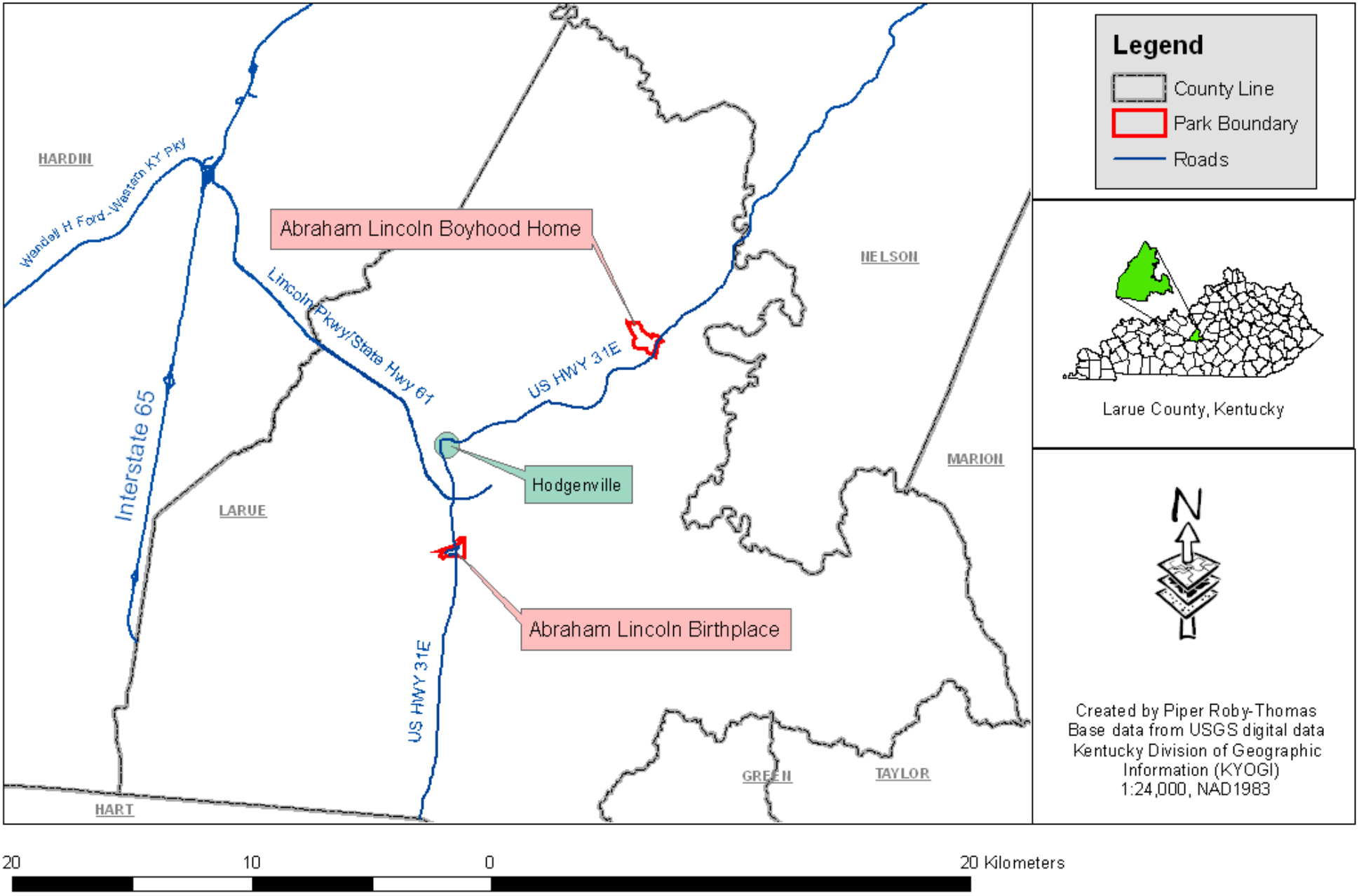
Study Area

Abraham Lincoln Birthplace National Historic Site, Larue County, Kentucky is the combination of two historic parcels: the Birthplace of Abraham Lincoln and his Boyhood home site. These two properties are known together by the National Park Service code ABLI. The Birthplace property is 45.7 ha (112.9 acres) located approximately 2.9 miles (4.7 km) south of Hodgenville along US 31E. The Boyhood home parcel is 92.2 ha (227.9 acres) and is located approximately 6.5 miles (10.5 km) northeast of Hodgenville along US 31E/KY84 (Figure 1). The habitat at ABLI is surrounded by agricultural fields and urban sprawl from Hodgenville. A visitor center and park can be found at the Birthplace parcel and trails that can be accessed by the public at both parcels. At the Birthplace property, trails meander through an upland forest dominated by 50-70 year-old trees with some older individuals occurring throughout. Storm damaged trees were observed within the forest and such trees are often important to many mammals. Habitat within the Boyhood home parcel appeared to be younger with varying stages of succession. Areas along a small tributary to Knob Creek that runs through the park are mowed, as are areas on top of some ridges within the park. Both parcels are located in the Mississippian Plateau physiographic region among the Muldraugh's Hills, just south of the Knobs region of the state. Here the topography is hilly ranging in elevation from 159.7-256.9 m (524-843 ft) above sea level.

METHODS

An initial visit to ABLI was conducted in 2003. During this visit, researchers met with park biologists, obtained maps of the park, located areas of interest, and surveyed important roads and access points by vehicle. In order to document the occurrence of as many species as possible within the park, a variety of field methods were used including: mist netting surveys, small mammal trapping arrays, and visual encounters. The location of each survey site was accurately recorded using a Global Positioning System

Figure 1. Location of Abraham Lincoln Birthplace National Historic Site, Larue County, Kentucky.



(GPS) unit. These coordinates were mapped on a 1:24,000 USGS digitized topographic quadrangle (Kentucky Geological Survey) in ArcView v9.1 (ESRI, Redlands, CA).

Mist Netting Survey

Five sites were surveyed sporadically from May through October 2005 for bats (Table 1 and Figure 2). Nylon low visibility nets were used to capture bats foraging over streams, road-rut ponds, and road corridors. Mist nets 6 m (20 ft) and 9 m (30 ft) in length (depending upon the width of the flight corridor) stacked on top of one another was considered a net set. Netting consisted of a minimum of two mist net sets at each site, no closer than 30 m (100 ft) apart. Nets were set prior to sunset, deployed at dusk and were left open for at least five hours after sunset each night. Each night that one net set was open was considered one net-night. Nets were checked every 10-15 minutes and disturbance near the nets (other than to check them and remove bats) was kept to a minimum.

Data recorded for bats captured included capture time, species, sex, age (adult or juvenile), reproductive condition (pregnant, lactating, post-lactating, scrotal, non-reproductive), weight (g), and forearm length (mm). In addition, height in net and the specific net set each bat was captured in was recorded. Captured bats were banded with a numbered aluminum band (provided by the Kentucky Department of Fish and Wildlife Resources) and released where captured. Weather data was recorded for each site on an hourly basis to monitor the conditions throughout the night with a VWR temperature/humidity min/max reader.

Table 1. Netting locations, schedule, and coordinates for each site surveyed at Abraham Lincoln Birthplace and Boyhood Home National Historic Site, Larue County, Kentucky, 2005.

Site #	Location Date Surveyed	Parcel*	County	UTM (Zone 16)	
				Easting	Northing
5	Service Rd, 0.1 mi W of US 31E 17-May-05 18-May-05	BP	Larue	611813	4154518
6	Keith Rd, 0.4 mi E of US 31E 17-May-05 18-May-05	BP	Larue	612227	4154727
7	Boyhood Home 0.4 mi NE 23-Jun-05 15-Oct-05 16-Oct-05	BH	Larue	619663	4163867
8	Boyhood Home 0.9 mi W of Cabin, on hill 23-Jun-05	BH	Larue	619296	4163422
9	Knob Creek, Boyhood Home and US 31E 24-Jun-05 15-Oct-05 16-Oct-05	BH	Larue	620208	4163374

* BP = Birth Place Parcel, BH = Boyhood Home Parcel

Small Mammal Trapping

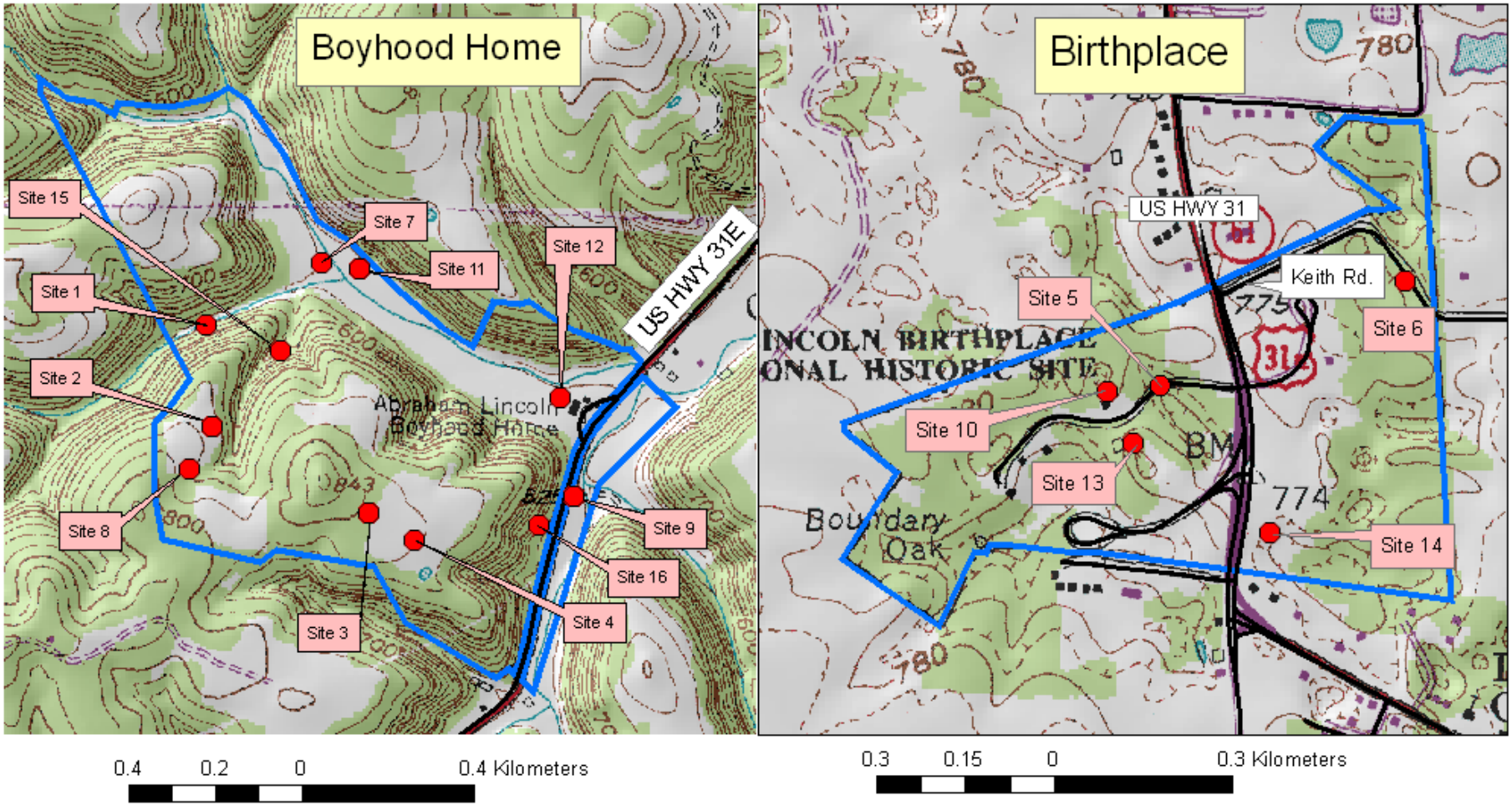
Fieldwork took place from May to December 2005. Mammals were surveyed at 13 sites (Table 2 and Figure 2). Each site was selected based on the available habitat within ABLI and particular target species that are otherwise difficult to capture or document.

Table 2. Trapping locations, schedule, and coordinates for each site surveyed at Abraham Lincoln Birthplace and Boyhood Home National Historic Site, Larue County, Kentucky, 2005.

	Location			UTM (Zone 16)	
Site #	**Date Surveyed**	**Parcel**	**County**	**Easting**	**Northing**
1	Near creek at bottom of steep hill, Boyhood home 14-18-Dec 05	BH	Larue	619342	4163754
2	Trail at Top of hill, near tin site 23-24-Jun 05 13-18-Dec 05	BH	Larue	619359	4163518
3	Trail toward pond on top of hill, near tin site 25-26-May 05 16-Jun-05 13-18-Dec 05	BH	Larue	619724	4163321
6	Big Sink Trail, Keith Rd, 0.4 mi E of US 31E 17-19-May 05 16-Jun-05 13-18-Dec 05	BP	Larue	612212	4154907
7	Service Rd, 0.3 mi W of US 31E, S of small stream 25-26-May 05 16-Jun-05 15-16-Oct 05	BH	Larue	619633	4163870
9	Knob Creek, E. of US 31E 24-Jun-05 15-16-Oct 05 12-15-Dec-05	BH	Larue	620198	4163368
10	Service Rd, 0.15 mi W of US 31E 16-Jun-05 23-24-Jun-05	BP	Larue	611712	4154713
11	Service Rd, 0.3 mi W of US 31E, N of small stream 25-26-May 05 23-24-Jun-05 17-18-Dec-05 16-Jun-05	BH	Larue	619694	4163888
12	Boyhood Home Cabin 14-18-Dec 05	BH	Larue	620155	4163500
13	Service Rd., behind Ranger Offices 14-18-Dec 05	BP	Larue	611758	4154627
14	E. of US 31E, S. of Birthplace 14-18-Dec 05	BP	Larue	611990	4154479
15	On hillside before steep hill, Boyhood home 14-18-Dec 05	BH	Larue	619528	4163829
16	On hillside next to Hwy 31, across from Site #9 12-18-Dec 05	BH	Larue	620117	4163299

* BP = Birth Place Parcel, BH = Boyhood Home Parcel

Figure 2. Survey locations within Abraham Lincoln Birthplace National Historic Site, Larue County, Kentucky, 2005.



Legend

- Park Boundary
- Roads
- Survey sites

Larue County, Kentucky

N

Created by Piper Roby-Thomas
Base data from USGS digital data
Kentucky Division of Geographic Information (KYOGI)
1:24,000, State Plane, NAD1983

Specimens were collected using four different trapping methods: Museum Specials (snap traps), Sherman live-traps, Tomahawk box-traps, and dry pitfall cups. 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 and how long traps were actively open. The number of trap nights at each site was inadvertently affected by the amount of disturbance the site received by raccoons (*Procyon lotor*) and opossums (*Didelphis virginiana*) or other predators. Woodlands, shrubby riparian, old fields, and meadow habitats were sampled for small mammals primarily using these methods.

Two Museum Specials were tethered together in order to prevent large trapped specimens from absconding with the traps, as well as reduce the possibility of predators carrying off the trapped specimen along with the trap. Museum Specials were clustered in groups accompanied by Sherman live-traps. Specific placement and trap interval varied with habitat type, available cover, and specialized microhabitats with maintained runways, fresh droppings, and recent cuttings that often indicate high levels of small mammal activity. Large (Sherman) live-traps were baited with peanut butter and Weasel Lure (Carman's Animal Lures, New Milford, PA 18834) and/or Morning Song black oil sunflower seeds (Gutwein and Co., Lafayette, IN) and seedless raisins (The Kroger Co., Cincinnati, OH). Museum Specials were baited with peanut butter (Creamy Peanut Butter, Panner, Save-A-Lot Food Stores, Inc. Earth City, MO). Tomahawk box-traps were set along small trails or within thick underbrush attempting to capture medium-sized mammals. These traps were baited with a mixture of sliced apples, peanut butter rolled in oats, or sardines. In addition, metal inserts were placed in each Tomahawk box-trap to provide shelter and reduce nose rubbing by captured mammals. Thirty-two ounce (946 ml) pitfall cups were placed along logs and rocks and sunk to ground level in areas of suspected high levels of small mammal activity. Cups were used to live capture mammals, therefore holes were punched in the bottom of the cups to prevent rainwater from filling the cups and drowning captured mammals.

All individual specimens were identified with the use of standard museum body measurements (total length, tail length, and hind foot length), weight and dentition. Species captured alive were identified, measured (if possible and needed), photographed (if possible) and released whenever possible. Animals were sacrificed using ether in situations that required accurate museum measurements, skull morphometrics, and dentition for positive identification. Each specimen was assigned a field number and submitted to the Curator of Mammals, Mammoth Cave National Park, Mammoth Cave, Kentucky.

Visual Encounters

Field observations were also used to informally document mammals throughout ABLI from the first day within the park to the last day (May 2003 to December 2005). Visual encounters include sight of animals,

audible calls, sign (scat, tracks, nest, den, territorial markings, etc.), and roadkill. A trail camera was used to capture photos of mammals along trails and roads. A predatory call tape (Caller Cassette No. 1, Half Grown Jackrabbit, Burnham Bros.) was used to lure in predators for visual confirmation and photographic opportunities. Two scent posts were established using Weasel Lure (Carman's Animal Lures, New Milford, PA 18834).

RESULTS

Weather conditions were typical of the region during the survey with exception to the amount of rainfall. June through December 2005 temperatures ranged from 0˚ C (32˚ F) to 36.1˚ C (97˚ F) for the highs and -11˚ C (11˚ F) to 23.3˚ C (74˚ F) for the lows. Rain occurred sparsely throughout a large portion of spring lasting through the end of summer resulting in a drought for most of the year. The region received 57.96 cm (22.82 in) of rain from May 2005 through December 2005, which was 3.48 cm (1.37 in) below normal.

During the survey, 30 species of mammals were recorded, and 242 individual observations of mammals were made (including those captured, observed, or documented by sign; Appendix 1). No endangered, threatened, or candidate species for listing as endangered or threatened were captured. The 30 species of mammals that were documented, however, represent 67 percent of the 45 species that were expected to occur at ABLI: The marsupial (1 documented of 1 expected; 100%); insectivores (13 documented of 17 expected; 77%) included all five expected shrews (100%), the single expected mole (100%), and seven of the 11 expected bats (64%); rodents (10 documented of 17 expected; 59%) included the single expected rabbit (100%), four of the five expected squirrels (80%), five of the 11 expected mice (46%); carnivores (4 documented of 9 expected: 44%) included two of the three expected canines (67%), the single expected raccoon (100%), two of the four expected mustelids (50%), the single feline was not documented (0%); and ungulate (1 documented of 1 expected; 100%). The survey documented 11 new county records for Larue County (Appendix 1); insectivores (7 of 13 documented; 54%) included two of the five shrews (40%), a mole (100%), four of the seven bats (57%); rodents (3 of 10 documented; 30%) included one of the four squirrels (25%) and two of the five mice (40%); and carnivores (1 of 5 documented; 20%) included one the three canines (33%). All species found during the survey are relatively widespread and considered common in Kentucky (Barbour and Davis 1974, Thomas 2001).

Mist Netting

Five sites were sampled by mist netting during eleven nights of netting. Of 25 total net nights conducted, 9 were over streams, 11 were over dry road corridors, one was over a wildlife pond, and one was over a road rut filled with water (Table 3). Despite the high number of mist net nights over dry road corridors (11), only 2 bats were captured at these sites. The number of bats captured at a site varied from 0-16 on a given night.

Table 3. Bat species caught in various habitats at Abraham Lincoln Birthplace and Boyhood Home National Historic Site, Larue County, Kentucky, 2005.

Species	Stream	Road Rut Pond	Wildlife Pond	Dry Road Corridors	Total
Silver-haired Bat	3				**3**
Eastern Red Bat	35			2	**37**
Hoary Bat	1				**1**
Little Brown Bat	1				**1**
Northern Long-eared Bat	1	1			**2**
Eastern Pipistrelle	3				**3**
Total individuals	**44**	**1**	**0**	**2**	**47**
Total species	**6**	**1**	**0**	**1**	**6**
Net nights	**9**	**1**	**1**	**11**	**22**

We captured 47 bats representing 6 species (Table 3), including 37 red bats (*Lasiurus borealis*), 1 hoary bat (*Lasiurus cinereus*), 3 silver-haired bats (*Lasionycteris noctivagans*), 1 little brown bat (*Myotis lucifugus*), 2 northern bats (*Myotis septentrionalis*) and 3 eastern pipistrelle bats (*Pipistrellus subflavus*). Measurements and band numbers for each bat captured can be found in Appendix 2. The total effort resulted in a capture rate of 1.9 bats/net night. With this survey method, 55 percent, or 6 of the 11 bat species on the initial list were captured. Overall captures were highest over streams (n=44). Reproductively active female and/or juvenile bats were captured for 3 of the 6 species (little brown bat, eastern pipistrelle bat, and red bat), thereby indicating the occurrence of reproduction at or near ABLI.

Mammalian Trapping

Thirteen sites were surveyed for small mammals during 7 months resulting in 2,629 combined trap nights. A total of 1,180 Museum Special trap nights, 628 Sherman live-trap nights, 11 Tomahawk box-trap nights, and 110 pitfall trap nights were conducted during the survey. These trapping methods were used throughout different habitats within ABLI. Woodlands received 462 trap nights, old fields received 1,133 trap nights, and meadows received 1,034 trap nights.

A total of 94 small mammals representing 11 species were captured during the 2,579 combined trap nights (Table 4). Measurements and field numbers of specimens collected can be found in Appendix 3 and 4. During this portion of the study, 61 percent, or 11 of the 18 small mammals on the initial list were captured. Museum Specials captured 68 individuals of 9 species, Sherman live-traps captured 20 individuals of two species, Tomahawk box-traps did not capture a single species, and dry pit-fall cups captured 6 individuals of 4 species. Sites 9 and 11 rendered the largest number of individuals and the highest species diversity

(21/3 and 20/7 respectively). From the 13 trap sites collectively, the four most numerous species were the white-footed mouse (*Peromyscus leucopus*; n=54), short-tailed shrew (*Blarina brevicauda*; n=8), southern bog lemming (*Synaptomys cooperi*; 7), and Eastern harvest mouse (*Reithrodontomys humulis*; n=6).

Table 4. Small mammals captured from different habitat types at Abraham Lincoln Birthplace and Boyhood Home National Historic Site, Larue County, Kentucky, 2005.

Species	Woods	Old Field	Meadow	Total
Southeastern shrew	1			**1**
Pigmy shrew	2			**2**
Short-tailed shrew	1	2	5	**8**
Least shrew			5	**5**
Eastern chipmunk			1	**1**
Eastern harvest mouse		2	4	**6**
White-footed mouse	19	26	9	**54**
Prairie vole		3	3	**6**
Pine vole	2		3	**5**
Southern bog lemming		3	4	**7**
Total individuals	**25**	**36**	**34**	**95**
Total species	**5**	**5**	**8**	**10**
Total sites	**4**	**6**	**3**	**13**

Visual Encounter

A total of 24 full days were spent at ABLI with multiple personnel resulting in 51 man-days within the park. During this time, 101 mammals representing 21 species were documented by sight, sign, or sound (Table 5). Using visual encounters, 47 percent of the 45 mammal species on the original list were documented. Seventy-six individual mammals of 17 species were sighted, sign at 8 locations for 4 species was documented, audible cues were responsible for the documentation of four individuals of two species, and those found dead on the road represented 13 individuals of 7 species on the park. Trail cameras captured no photographs of animals while they were active, no mammalian predators responded to the game call tape, and the scent post produced sign of 4 mammals of two species.

Two of the top three mammals visually sited were observed while searching for reptiles at the established tin sites; pine vole (*Microtus pinetorum*; n=16) and short-tailed shrew (n=10). The gray squirrels (*Sciurus carolinensis*; n=11) was commonly observed near the visitor center at the Birthplace property. A single big brown bat (*Eptesicus fuscus*) was found on the ground outside of the Memorial Building at the Birthplace parcel. Also, a single little brown bat (*Myotis lucifugus*) and guano from a night roosting colony of big brown bats were observed under the bridge at the edge of the Boyhood home park boundary. A road-

killed little brown bat was also found along US 31E within the Boyhood home boundary. Just north of the Boyhood home site [3.7 km (2.3 miles)] along US 31E a road-killed mink (*Mustela vison*) was observed. This animal was included in the survey due to its close proximity to the park, which is well with in the home range of an adult mink.

Table 5. Mammals visually encountered at Abraham Lincoln Birthplace and Boyhood Home National Historic Site, Larue County, Kentucky, 2005.

Species	**Visual Encounters**				
	Sight	**Sign**	**Heard**	**Dead**	**Total**
Virginia opossum	3			3	**6**
Smoky shrew	2				**2**
Short-tailed shrew	10				**10**
Eastern mole	6				**6**
Eastern cottontail	1	2			**3**
Little brown bat	1			1	**2**
Big brown bat	1	1			**2**
Eastern chipmunk	1				**1**
Woodchuck				2	**2**
Gray squirrel	11				**11**
Fox squirrel	3		1		**4**
White-footed mouse	6				**6**
Prairie vole	1				**1**
Pine vole	16				**16**
Southern bog lemming	6				**6**
Coyote		3	3		**6**
Red fox	2				**2**
Raccoon	3			3	**6**
Mink				1	**1**
Striped skunk				2	**2**
White-tailed deer	3	2		1	**6**
Total individuals	**76**	**8**	**4**	**13**	**101**
Total species	**17**	**4**	**2**	**7**	**21**

* DOR=Dead on road

DISCUSSION

The mammalian fauna found at ABLI is typical of the Muldraugh's Hills region of central Kentucky. The major goal of this study was to document 90 percent of the mammal species expected to be present. During this study, approximately 67 percent or 30 of the 45 species on the initial list were found including 11 county records for Larue County (Appendix 1). Of the 15 species not documented during this study, five are considered rare (Gray bat, Indiana bat, Evening bat, Rafinesque's big-eared bat, and least weasel), four are considered localized [Prairie deer mouse (*Peromyscus maniculatus bairdii*), golden mouse

(*Ochrotomys nuttalli*), meadow vole (*Microtus pennsylvanicus*), and meadow jumping mouse (*Zapus hudsonius*)], and two are considered extremely cryptic [long-tailed weasel (*Mustela frenata*) and bobcat (*Lynx rufus*). In addition, two species are considered common [Southern flying squirrel (*Glaucomys volans*) and gray fox (*Urocyon cinereoargenteus*)] and two are exotic species to Kentucky [Norway rat (*Rattus norvigicus*) and house mouse (*Mus musculus*)]. Only two of the 15 species not found during this study had previously been reported from Larue County; house mouse and meadow jumping mouse.

Although no endangered or special concern bat was captured at ABLI, quality foraging and roosting habitat does exist within the park. The assemblage of the bat community documented on the park would most likely be different if nets were placed in alternate habitats. However, suitable net sites at different habitat types were limiting. Stream corridors received the largest number of net nights because there was a lack of net sites that provided a comparable success rate.

Trapping success varied greatly, likely due to varying weather conditions during the study. The abundance of natural foods (seeds, nuts, green vegetation, etc.) during summer and autumn was also another factor likely related to trapping success. Trapping success is usually considerably greater during the winter and early spring, when natural food is less available. This was certainly the case during this study. Seventy small mammals were captured at sites trapped during early winter, while only 25 mammals were captured at sites trapped during spring, summer, and autumn combined.

The combination of all methods used contributed to the total species composition located at ABLI. 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 current species data and distribution for mammals within ABLI and Larue County, Kentucky.

RECOMMENDATIONS

Future management efforts on ABLI should focus on maintaining a diverse array of available habitats such as open grassland, early successional habitat and intact forests. A combination of these habitats is vital for maintaining a diverse mammalian fauna. Within fields and meadows consider planting native grasses and forbs in restoration efforts along with the elimination of exotic plant species. In early successional habitats, it is important to maintain a mixture of early and late stages of old-field succession. In the absence of regular maintenance to maintain early succession, these habitats will eventually revert to forests; the tree canopy will reduce light penetration and decrease the density of understory vegetation. Most early-successional species initially present will no longer use the area. Prescribed fire is a useful tool for maintaining these desired habitats. Mowing and burning rotations may be necessary to maintain the

desired percent of each available habitat. Strip mowing in areas can also help develop different stages of old-field succession.

Maintain and promote snag retention within forested habitat. Trees damaged during storm events should be left standing unless they pose an immediate danger to the public. Live cavity trees and standing dead trees (snags) of all sizes should be retained because they are often used by a variety of mammals as dens, nest sites, and roosts. Several species of bats prefer snags with exfoliating bark that extend above the surrounding canopy and receive lots of solar exposure as maternity roosts. Nevertheless, understory snags may also provide roosting opportunities for bats. Trees that have fallen to the ground provide habitat for many woodland species and they should be left to decay. The canopy gaps that are created will allow younger vegetation to sprout that provides additional stages of succession within the forest setting. Turned up root-wads that hold water may be a vital water source for numerous species.

Promote restoration of forested riparian zones and maintain vernal pools such as road ruts along the trail and upland ponds. The establishment of protected riparian buffer zones will help control sedimentation and reduce streambank erosion, which will increase water quality. In addition, forested streams provide a greater amount of flight protection for bats and produce a greater abundance of insect prey for many species. The construction and maintenance of vernal pools as water sources could be one of the most important habitat alterations in upland areas and in areas were water is scarce. Many species including mammals would benefit from these water sources.

All habitat management has an affect on the species that inhabit the surrounding environment. Alterations to the environment that is not specifically intended as wildlife management do however influence species composition. Even the harvesting of hay from a meadow or the clearing of trails can attribute to the occurrence of one species over another. Hands-off management over the long term can also attribute to the change in species abundance and species richness. If succession is allowed to proceed until all is converted to forested habitat, the overall mammalian species diversity will decrease. Therefore, future management efforts at ABLI should focus on maintaining the diverse array of available habitats.

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APPENDIX 1

Mammalian Species Known, Expected, and Observed at ABLI, 2005

Appendix 1. Mammal species known, expected, and observed on Abraham Lincoln Birthplace & Boyhood Home National Historic Sites, Larue County, Kentucky, 2003-2005.

Standard Common Name	Standard Scientific Name	Known from Larue County	Observed	
			Yes	No
Order: Didelphimorphia				
Family: Didelphidae (Opossum)				
Virginia opossum	*Didelphis virginiana*	Yes	X	
Order: Insectivora				
Family: Soricidae (Shrews)				
Southeastern shrew	*Sorex longirostris*	Yes	X	
Smoky shrew	*Sorex fumeus*	No	X	
Pygmy shrew	*Sorex hoyi*	Yes	X	
Short-tailed shrew	*Blarina brevicauda*	Yes	X	
Least shrew	*Cryptotis parva*	No	X	
Family: Talpidae (Moles)				
Eastern mole	*Scalopus aquaticus*	No	X	
Order: Chiroptera				
Family: Vespertilionidae (Bats)				
Big brown bat	*Eptesicus fuscus*	No	X	
Silver-haired bat	*Lasionycteris noctivagans*	No	X	
Eastern red bat	*Lasiurus borealis*	No	X	
Hoary bat	*Lasiurus cinereus*	No	X	
Gray bat	*Myotis grisescens*	No		X
Little brown bat	*Myotis lucifugus*	Yes	X	
Northern bat	*Myotis septentrionalis*	Yes	X	
Indiana bat	*Myotis sodalis*	No		X
Evening bat	*Nycticeius humeralis*	No		X
Eastern Pipistrelle	*Pipistrellus subflavus*	Yes	X	
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	No		X
Order: Lagomorpha				
Family: Leporidae (Rabbits)				
Eastern cottontail	*Sylvilagus floridanus*	Yes	X	
Order: Rodentia				
Family: Sciuridae (Squirrels)				
Eastern chipmunk	*Tamias striatus*	No	X	
Woodchuck	*Marmota monax*	Yes	X	
Gray squirrel	*Sciurus carolinensis*	Yes	X	
Fox squirrel	*Sciurus niger*	Yes	X	
Southern flying squirrel	*Glaucomys volans*	No		X
Family: Cricetidae (New world rats & mice)				
Eastern harvest mouse	*Reithrodontomys humulis*	No	X	
Prairie deer mouse	*Peromyscus maniculatus bairdii*	No		X
White-footed mouse	*Peromyscus leucopus*	Yes	X	
Golden mouse	*Ochrotomys nuttalli*	No		X

Standard Common Name	Standard Scientific Name	Known from Larue County	Observed	
			Yes	No
Family: Cricetidae (New world rats & mice) continued				
Meadow vole	*Microtus pennsylvanicus*	No		X
Prairie vole	*Microtus ochrogaster*	Yes	X	
Pine vole	*Microtus pinetorum*	Yes	X	
Southern bog lemming	*Synaptomys cooperi*	No	X	
Family: Muridae (Old world rats & mice)				
Norway rat	*Rattus norvegicus*	No		X
House mouse	*Mus musculus*	Yes		X
Family: Zapodidae (Jumping mice)				
Meadow jumping mouse	*Zapus hudsonius*	Yes		X
Order: Carnivora				
Family: Canidae (Foxes and allies)				
Coyote	*Canis latrans*	Yes	X	
Red fox	*Vulpes vulpes*	No	X	
Gray fox	*Urocyon cinereoargenteus*	No		X
Family: Procyonidae (Raccoons and allies)				
Raccoon	*Procyon lotor*	Yes	X	
Family: Mustelidae (Weasels and allies)				
Long-tailed weasel	*Mustela frenata*	No		X
Least weasel	*Mustela nivalis*	No		X
Mink	*Mustela vison*	Yes	X	
Striped skunk	*Mephitis mephitis*	Yes	X	
Family: Felidae (Cats)				
Bobcat	*Lynx rufus*	No		X
Order: Artiodactyla (Even-toed ungulates)				
Family: Cervidae (Deer)				
White-tailed deer	*Odocoileus virginianus*	Yes	X	

APPENDIX 2

Measurements and Band Number for Bats Captured at ABLI, 2005

Appendix 2. All bats captured with mist nets on Abraham Lincoln Birthplace & Boyhood Home National Historic Site, Larue County, Kentucky, 2005.

Species Band No.*	Date	Site	Time	Sex	Repro. Cond.**	Age	Weight (g)	Forearm / Pp (mm)	Net / Height (ft)	Notes
Eastern Red Bat *(Lasiurus borealis)*										
A10830	16-Oct-05	5	20:40	M	TD	J	9.5	39/-	A/10	
A10831	16-Oct-05	5	20:20	M	NR	J	9.5	39/-	A/6	
A10833	15-Oct-05	5	0:00	M	TD	J	10.2	40/-	C/6	
A10834	15-Oct-05	5	23:55	M	TD	J	10.8	39/-	A/3	
A10836	15-Oct-05	5	23:25	M	TD	J	10.0	40/-	A/2	
A10837	15-Oct-05	5	23:25	M	TD	J	10.0	39/-	B/12	
A10838	15-Oct-05	5	22:35	M	TD	J	9.5	39/-	B/1	
A10839	15-Oct-05	5	22:10	M	TD	A	10.5	41/-	C/4	
A10840	15-Oct-05	5	22:00	M	TD	A	9.5	41.5/-	A/2	
A10841	15-Oct-05	5	21:30	M	TD	A	9.0	38/-	C/-	
A10842	15-Oct-05	5	21:15	M	TD	J	9.5	39.5/-	C/4	
A10843	15-Oct-05	5	21:10	M	TD	A	10.0	40/-	C/-	
A10844	15-Oct-05	5	21:10	M	TD	J	9.0	39/-	C/4	
A10845	15-Oct-05	5	20:50	M	TD	A	9.5	38/-	C/3	
A10846	15-Oct-05	5	20:45	M	TD	J	9.0	38.5/-	C/1	
A10847	15-Oct-05	5	20:15	M	NR	J	10.5	41/-	B/7	
A12594	18-May-05	1	1:49	M	NR	A	9.0	38/3	A/15	Broke Wing
A12656	15-Oct-05	3	22:38	M	TD	J	11.5	40/-	B/5	
A12657	15-Oct-05	3	22:15	M	NR	J	9.5	42/-	B/6	
A12658	15-Oct-05	3	22:15	M	NR	J	10.0	41/-	B/2	
A12659	15-Oct-05	3	21:52	M	TD	J	8.5	40/-	B/12	
A12660	15-Oct-05	3	20:47	M	TD	J	8.5	39/-	B/6	
A12661	15-Oct-05	3	20:45	M	TD	J	9.0	39/-	B/4	
A12662	15-Oct-05	3	20:39	M	TD	J	9.5	40/-	B/8	
A12663	15-Oct-05	3	20:34	M	NR	J	8.5	40/-	B/4	
A12664	15-Oct-05	3	20:34	M	TD	J	10.0	39/-	B/0.5	
A12665	15-Oct-05	3	20:02	M	NR	J	9.5	38/-	B/4	
A12818	23-Jun-05	3	21:20	F	Lac	A	11.0	42/-	A/2	
A12822	24-Jun-05	5	21:45	M	NR	A	11.0	40/4.5	A/0.5	
A12823	24-Jun-05	5	21:45	M	NR	A	11.3	40.5/5	A/3	
-	17-May-05	2	21:14	-	-	-	-	-	A/15	got out of net
-	15-Oct-05	3	20:47	-	-	-	-	-	B/10	got out of net
-	15-Oct-05	5	21:30	-	-	-	-	-	C/-	got out of net
-	15-Oct-05	5	22:20	-	-	-	-	-	A/-	got out of net
-	16-Oct-05	3	19:40	-	-	-	-	-	C/0.5	got out of net
-	16-Oct-05	3	22:20	-	-	-	-	-	-	got out of hand
-	24-Jun-05	5	21:45	-	-	-	-	-	A/4	got out of net
Hoary Bat *(Lasiurus cinereus)*										
A12825	24-Jun-05	5	23:15	M	NR	A	24.4	53/5	B/10	

Appendix 2. (continued).

Species Band No.*	Date	Site	Time	Sex	Repro. Cond.**	Age	Weight (g)	Forearm / Pp (mm)	Net / Height (ft)	Notes
Silver-haired Bat *(Lasionycteris noctivagans)*										
A10829	16-Oct-05	5	22:50	F	PL	A	15.0	42.3/-	A/3	
A10835	15-Oct-05	5	23:40	F	NR	J	18.2	42/-	B/12	
A12826	24-Jun-05	5	23:35	M	NR	A	9.7	42/-	B/12	
Little Brown Bat *(Myotis lucifugus)*										
A12820	23-Jun-05	3	23:15	F	L	A	6.0	37/2.5	B/12	
Northern Long-eared Bat *(Myotis septentrionalis)*										
A10832	16-Oct-05	5	20:00	M	S	A	7.6	35/4	A/12	
-	23-Jun-05	4	22:50	M	-	-	-	-	B/12	got out of hand
Eastern Pipistrelle *(Pipistrellus subflavus)*										
A12819	23-Jun-05	3	21:30	M	NR	A	4.7	34/2	A/5.5	
A12821	24-Jun-05	5	21:25	F	P	A	7.2	33/2	A/3	
A12824	24-Jun-05	5	22:15	M	NR	A	5.3	35/-	A/1	

* = Band provided by KDFWR, Frankfort, Kentucky
** = P=Pregnant; L=Lactating; PL=Post Lactating; NR=Non-reproductive; S=Scrotal

APPENDIX 3

Measurements and Date Observed for Terrestrial Mammals at ABLI, 2005

Appendix 3. All terrestrial mammals observed or collected on Abraham Lincoln Birthplace & Boyhood Home National Historic Site, Larue County, Kentucky, 2005.

Order Species Date	Site	Sex	Repro. Cond.**	Age	Lengths (mm) Total	Tail	HF**	Weight (g)	Trap Type***	Notes
Didelphimorphia										
Virginia opposum *(Didelphis virginiana)*										
10-Apr-04	1	-	-	-	-	-	-	-	7	-
16-Dec-05	6	-	-	-	-	-	-	-	8	skull, collected
16-Dec-05	12	-	-	-	-	-	-	-	7	-
16-Dec-05	-	-	-	-	-	-	-	-	8	0.4mi N. of Boyhood
16-Dec-05	8	-	-	-	-	-	-	-	7	photo by S. Brue's bro
19-Dec-05	-	-	-	-	-	-	-	-	8	0.3mi N. of Boyhood
Insectivora										
Southeastern shrew *(Sorex longirostris)*										
17-Dec-05	6	F	-	A	78	30	10	2.4	4	-
Smokey shrew *(Sorex fumeus)*										
13-Dec-05	2	-	-	A	110	43	13	4.7	7	-
13-Dec-05	4	-	-	A	118	42	13	4.7	7	-
Pigmy shrew *(Sorex hoyi)*										
16-Dec-05	15	-	NR	A	72	24	9	10.8	4	-
19-Dec-05	16	-	-	A	66	24	8	2.4	4	-
Short-tailed shrew *(Blarina brevicauda)*										
4-Sep-03	1	-	-	-	-	-	-	-	7	-
26-Sep-03	3	-	-	-	-	-	-	-	7	-
22-Nov-03	3	-	-	-	-	-	-	-	7	-
10-Apr-04	2	-	-	-	-	-	-	-	7	-
10-Apr-04	3	-	-	-	-	-	-	-	7	-
17-Jun-05	6	-	-	A	93	17	12.5	11	1	-
17-Jun-05	11	-	-	A	119	16	13	18.9	1	-
17-Oct-05	11	-	-	A	100	19	13	14.7	1	-
27-May-05	7	F	-	A	113	21	14	15.5	1	-
25-Jun-05	2	-	-	A	116	20	14	10.8	1	-
12-Oct-05	3	-	-	-	-	-	-	-	7	-
12-Oct-05	3	-	-	-	-	-	-	-	7	-
13-Dec-05	3	-	-	-	-	-	-	-	7	-
14-Dec-05	4	-	-	-	-	-	-	-	7	-
16-Dec-05	3	-	NR	A	101	22	15	11.4	1	-
16-Dec-05	3	-	NR	A	105	22	14	16.3	1	-
17-Dec-05	4	-	-	-	-	-	-	-	7	under tin
19-Dec-05	11	-	-	SA	92	16	12	10.7	1	-

Appendix 3. (continued).

Order / Species / Date	Site	Sex	Repro. Cond.**	Age	Lengths (mm) Total	Tail	HF**	Weight (g)	Trap Type***	Notes
Insectivora (continued)										
Least shrew *(Cryptotis parva)*										
17-Dec-05	3	-	NR	A	73	12	10	4.2	1	-
17-Dec-05	3	-	NR	A	66	9	9	4.4	1	-
19-Dec-05	11	-	-	A	70	11	10	4.5	1	-
19-Dec-05	11	-	-	A	72	12	10	5.4	1	-
19-Dec-05	11	-	-	A	77	11	10	4.3	1	-
Eastern mole *(Scalopus aquaticus)*										
11-Jul-03	4	-	-	-	-	-	-	-	7	-
29-Jul-03	12	-	-	-	-	-	-	-	7	-
19-May-05	2				161	26	19	-	7	-
20-May-05	1				148	26	20	-	7	-
21-May-05	1				169	26	20	-	7	-
22-May-05	1				152	22	20	-	7	photographed
Lagomorpha										
Eastern cottontail *(Sylvilagus floridanus)*										
29-Jul-03	8	-	-	-	-	-	-	-	7	-
16-Dec-05	14	-	-	-	-	-	-	-	10	-
17-Dec-05	12	-	-	-	-	-	-	-	10	-
Rodentia										
Eastern chipmunk *(Tamias striatus)*										
29-Jul-03	7	-	-	-	-	-	-	-	7	-
16-Dec-05	13	F	NR	A	211	71	32	>30	1	-
Woodchuck *(Marmota monax)*										
16-Sep-04	-	-	-	-	-	-	-	-	8	-
16-Dec-05	12	-	-	-	-	-	-	-	8	near bridge
Gray squirrel *(Sciurus carolinensis)*										
13-Dec-05	-	-	-	A	-	-	-	-	7	visitor center
13-Dec-05	-	-	-	A	-	-	-	-	7	visitor center
13-Dec-05	-	-	-	A	-	-	-	-	7	visitor center
13-Dec-05	-	-	-	A	-	-	-	-	7	visitor center
13-Dec-05	-	-	-	A	-	-	-	-	7	visitor center
13-Dec-05	-	-	-	A	-	-	-	-	7	visitor center
13-Dec-05	-	-	-	A	-	-	-	-	7	visitor center
13-Dec-05	-	-	-	A	-	-	-	-	7	visitor center
13-Dec-05	6	-	-	A	-	-	-	-	7	Keith Rd.
13-Dec-05	6	-	-	A	-	-	-	-	7	Keith Rd.
13-Dec-05	6	-	-	A	-	-	-	-	7	Keith Rd.

Appendix 3. (continued).

Date	Site	Sex	Repro. Cond.**	Age	Lengths (mm) Total	Tail	HF**	Weight (g)	Trap Type***	Notes
Order										
Species										
Rodentia (continued)										
Fox squirrel *(Sciurus niger)*										
17-May-05	6	-	-	-	-	-	-	-	7	-
17-May-05	6	-	-	-	-	-	-	-	7	-
13-Dec-05	1	-	-	A	-	-	-	-	7	-
13-Dec-05	14	-	-	A	-	-	-	-	9	-
Eastern harvest mouse *(Reithrodontomys humulis)*										
16-Dec-05	2	M	NR	A	108	50	15	7.6	1	-
19-Dec-05	11	M	NR	A	111	46	13	7.3	1	-
19-Dec-05	11	F	NR	A	110	47	13	7.2	1	-
19-Dec-05	11	M	NR	A	121	54	13	7.6	1	-
19-Dec-05	11	M	NR	A	120	52	14	8.9	1	-
19-Dec-05	2	M	NR	A	116	55	15	8	1	-
White-footed mouse *(Peromyscus leucopus)*										
18-May-05	6	-	-	A	158	76	22	-	2	released
19-May-05	6	-	-	A	-	-	-	-	2	released
19-May-05	6	-	-	A	-	-	-	-	2	released
19-May-05	6	-	-	A	-	-	-	-	2	released
17-Jun-05	6	-	-	J	137	58	-	10.7	1	hind foot gone
17-Jun-05	6	-	-	A	148	68	20	18.4	1	-
17-Jun-05	6	M	-	A	143	72	19.5	13.9	1	-
17-Jun-05	6	M	-	A	148	63	20	14.7	1	-
17-Jun-05	6	M	-	A	147	66	21	16.3	1	-
25-Jun-05	10	-	-	A	134	65	19	14.6	1	-
24-Jun-05	7	-	-	A	146	56	20	18.6	1	-
24-Jun-05	7	-	-	J	71	15	19	4.8	1	-
25-Jun-05	2	-	-	J	124	59	19	19.2	1	-
17-Jun-05	10	-	-	A	-	-	-	-	2	released
17-Jun-05	10	-	-	A	-	-	-	-	2	released
17-Jun-05	10	-	-	A	-	-	-	-	2	released
17-Jun-05	10	-	-	A	-	-	-	-	2	released
13-Dec-05	9	M	NR	A	161	66	20	18.4	1	-
13-Dec-05	9	M	NR	J	138	60	20	14.8	1	-
13-Dec-05	9	M	NR	A	180	85	20	24.6	1	-
14-Dec-05	9	M	NR	J	114	47	19	8.6	1	-
14-Dec-05	9	F	PL	A	158	71	20	22	1	-
14-Dec-05	9	M	NR	A	172	75	21	23.7	1	-
14-Dec-05	9	M	NR	A	173	78	20	19.5	1	-
14-Dec-05	9	M	NR	J	128	55	20	13.7	1	-

Appendix 3. (continued).

Date	Site	Sex	Repro. Cond.**	Age	Lengths (mm) Total	Tail	HF**	Weight (g)	Trap Type***	Notes
Order										
Species										
Rodentia (continued)										
White-footed mouse *(Peromyscus leucopus)* continued										
14-Dec-05	9	M	NR	A	158	70	21	20.6	1	-
13-Dec-05	2	M	NR	J	139	60	20	15.2	7	-
13-Dec-05	2	-	-	J	-	-	-	-	7	-
13-Dec-05	4	-	-	-	-	-	-	-	7	-
13-Dec-05	4	-	-	-	-	-	-	-	7	-
14-Dec-05	6	M	-	A	158	66	19	21.9	2	-
14-Dec-05	6	F	L	A	175	83	20	>30	2	-
14-Dec-05	6	M	NR	SA	145	59	19	21	2	-
16-Dec-05	9	F	PL	A	149	62	20	19.5	1	-
16-Dec-05	9	M	NR	SA	130	53	18.5	14	1	-
16-Dec-05	9	M	NR	SA	138	61	19	14.8	1	-
16-Dec-05	9	M	NR	A	149	62	20	18.1	1	-
16-Dec-05	9	F	PL	A	153	72	20	20.2	1	-
16-Dec-05	16	M	NR	SA	132	54	20	14.2	2	-
16-Dec-05	2	M	NR	SA	134	55	20	16.1	1	-
16-Dec-05	3	F	NR	SA	160	70	20	23.4	1	-
16-Dec-05	15	F	NR	SA	126	52	18.5	14.9	4	-
16-Dec-05	13	M	NR	A	160	65	20	22.9	1	-
16-Dec-05	6	-	-	-	155	73	20	18	2	-
17-Dec-05	14	M	NR	J	142	57	20	15.9	1	-
17-Dec-05	6	M	NR	J	140	60	20	17.5	2	-
17-Dec-05	9	-	-	-	147	60	19	17.2	1	-
17-Dec-05	3	-	-	-	-	-	-	-	7	under tin
17-Dec-05	4	-	-	-	-	-	-	-	7	under tin
17-Dec-05	6	-	-	-	-	-	-	-	2	released
16-Dec-05	6	-	-	-	-	-	-	-	2	released
19-Dec-05	12	F	L	A	187	86	20	23.2	2	-
19-Dec-05	11	F	PL	A	167	72	21	25.2	1	-
19-Dec-05	11	F	PL	A	171	73	19	25.1	1	-
19-Dec-05	11	F	PL	A	160	68	20	23.1	1	-
19-Dec-05	11	M	NR	J	141	60	19	16.3	1	-
19-Dec-05	11	M	NR	A	135	54	19	16	1	-
19-Dec-05	3	M	NR	A	160	71	20	24	1	-
19-Dec-05	3	M	NR	SA	125	58	20	12.6	2	-
19-Dec-05	6	M	NR	A	171	71	21	23.2	2	-
Prairie vole *(Microtus ochrogaster)*										
16-Sep-04	3	-	-	-	-	-	-	-	7	-

Appendix 3. (continued).

Date	Site	Sex	Repro. Cond.**	Age	Lengths (mm) Total	Tail	HF**	Weight (g)	Trap Type***	Notes
Order										
Species										
Rodentia (continued)										
Prairie vole *(Microtus ochrogaster)* continued										
14-Dec-05	9	F	PL	A	138	31	19	>30	1	-
14-Dec-05	9	M	NR	A	130	31	20	>30	1	-
16-Dec-05	9	F	NR	A	142	27	19	21.5	1	partially eaten
16-Dec-05	3	F	NR	SA	132	27	18	>30	1	-
16-Dec-05	3	M	NR	A	142	31	18	>30	1	-
19-Dec-05	11	F	PL	A	152	34	19	>30	1	-
Pine vole *(Microtus pinetorum)*										
4-Sep-03	1	-	-	-	-	-	-	-	7	-
4-Sep-03	3	-	-	-	-	-	-	-	7	-
4-Sep-03	4	-	-	-	-	-	-	-	7	-
26-Sep-03	1	-	-	-	-	-	-	-	7	-
10-Apr-04	2	-	-	-	-	-	-	-	7	-
10-Apr-04	2	-	-	-	-	-	-	-	7	-
10-Apr-04	2	-	-	-	-	-	-	-	7	-
10-Apr-04	2	-	-	-	-	-	-	-	7	-
10-Apr-04	1	-	-	-	-	-	-	-	7	-
10-Apr-04	1	-	-	-	-	-	-	-	7	-
10-Apr-04	3	-	-	-	-	-	-	-	7	-
29-Apr-05	1	-	-	-	-	-	-	-	7	-
29-Apr-05	1	-	-	-	-	-	-	-	7	-
29-Apr-05	1	-	-	-	-	-	-	-	7	-
29-Apr-05	1	-	-	-	-	-	-	-	7	-
27-May-05	11	-	-	A	106	24	17	19.5	1	-
17-Jun-05	11	F	L	A	117	11	19	34	1	most of tail gone
17-Jun-05	11	M	-	A	127	25	17	22.4	1	-
14-Dec-05	3	M	NR	A	104	19	15	17.2	7	-
16-Dec-05	15	M	NR	A	103	16	16	22.1	4	-
16-Dec-05	15	M	NR	A	113	19	17	23.7	4	-
Southern bog lemming *(Synaptomys cooperi)*										
10-Apr-04	4	-	-	-	-	-	-	-	7	-
10-Apr-04	4	-	-	-	-	-	-	-	7	-
10-Apr-04	4	-	-	-	-	-	-	-	7	-
10-Apr-04	4	-	-	-	-	-	-	-	7	-
10-Apr-04	3	-	-	-	-	-	-	-	7	-
14-Dec-05	9	M	NR	A	104	15	18	28.1	1	-
14-Dec-05	9	M	NR	A	112	17	17	>30	1	-
14-Dec-05	4	M	NR	J	81	12	17	7.4	7	-

Order Species Date	Site	Sex	Repro. Cond.**	Age	Lengths (mm) Total	Tail	HF**	Weight (g)	Trap Type***	Notes
Rodentia (continued)										
Southern bog lemming *(Synaptomys cooperi)* cont.										
16-Dec-05	9	M	NR	A	109	14	18	24.6	1	-
16-Dec-05	13	M	NR	SA	109	16	18	24.3	1	-
17-Dec-05	13	M	NR	A	121	14	18	>30	1	-
19-Dec-05	11	F	PL	A	120	12	18	>30	1	-
19-Dec-05	13	M	NR	A	106	14	17	>30	1	-
Carnivora										
Coyote *(Canis latrans)*										
12-Dec-05	-	-	-	-	-	-	-	-	9	-
December	4	-	-	-	-	-	-	-	10	-
December	1	-	-	-	-	-	-	-	10	-
December	2	-	-	-	-	-	-	-	10	-
Red fox *(Vulpes vulpes)*										
17-May-05	-	-	-	-	-	-	-	-	9	-
17-May-05	-	-	-	-	-	-	-	-	9	-
Raccoon *(Procyon lotor)*										
4-Sep-03	-	-	-	-	-	-	-	-	8	-
17-May-05	5	-	-	-	-	-	-	-	7	den in tree
18-May-05	5	-	-	-	-	-	-	-	7	den in tree(same)
13-Dec-05	10	-	-	A	-	-	-	-	7	next to rd.
14-Dec-05	9	-	-	-	-	-	-	-	8	skull collected
14-Dec-05	-	-	-	-	-	-	-	-	8	-
Mink *(Mustela vison)*										
28-May-05	-	-	-	-	-	-	-	-	8	2.3mi N. of Boyhood
Striped skunk *(Mephitis mephitis)*										
4-Sep-03	-	-	-	-	-	-	-	-	8	-
14-Dec-05	-	-	-	-	-	-	-	-	8	1.7mi N. of Boyhood
Artiodactyla										
White-tailed deer *(Odocoileus virginianus)*										
22-Nov-03	2	-	-	-	-	-	-	-	7	-
10-Apr-04	1	-	-	-	-	-	-	-	7	-
17-May-05	6	-	-	-	-	-	-	-	10	-
18-May-05	1	-	-	-	-	-	-	-	7	-
14-Dec-05	-	-	-	-	-	-	-	-	8	-
16-Dec-05	14	-	-	-	-	-	-	-	10	-

* L=Lactating, PL=Post Lactating, NR=Non-reproduction, **HF=Hind foot

*** 1= Museum Special, 2=Sherman live-traps, 3=Tomahawk box-traps, 4=Pitfall cups, 7=Sight, 8=Dead on road, 9=audible call, 10=Sign (scat, tracks, etc.) Age Code: A=adult, SA=subadult, J-juvenile

APPENDIX 4

Collection Catalog for all Mammals Collected at ABLI, 2005

Appendix 4. Collection catalog for all mammals collected on Abraham Lincoln Birthplace & Boyhood Home National Historic Site, Larue County, Kentucky, 2005.

Species Field #	Date	Site	Sex	Repro. Cond.**	Age	Lengths (mm) Total	Tail	HF**	Weight (g)	Trap Type***	Notes
Virginia opposum (Didelphis virginiana)											
71	16-Dec-05	6	-	-	-	-	-	-	-	8	skull, collected
Southeastern shrew (Sorex longirostris)											
74	17-Dec-05	6	F	-	A	78	30	10	2.4	4	-
Smokey shrew (Sorex fumeus)											
40	13-Dec-05	2	-	-	A	110	43	13	4.7	7	-
41	13-Dec-05	4	-	-	A	118	42	13	4.7	7	-
Pigmy shrew (Sorex hoyi)											
63	16-Dec-05	15	-	NR	A	72	24	9	10.8	4	-
98	19-Dec-05	16	-	-	A	66	24	8	2.4	4	-
Short-tailed shrew (Blarina brevicauda)											
9	17-Jun-05	6	-	-	A	93	17	12.5	11	1	-
14	17-Jun-05	11	-	-	A	119	16	13	18.9	1	-
16	17-Oct-05	11	-	-	A	100	19	13	14.7	1	-
17	27-May-05	7	F	-	A	113	21	14	15.5	1	-
21	25-Jun-05	2	-	-	A	116	20	14	10.8	1	-
58	16-Dec-05	3	-	NR	A	101	22	15	11.4	1	-
59	16-Dec-05	3	-	NR	A	105	22	14	16.3	1	-
80	19-Dec-05	11	-	-	SA	92	16	12	10.7	1	-
Least shrew (Cryptotis parva)											
77	17-Dec-05	3	-	NR	A	73	12	10	4.2	1	-
78	17-Dec-05	3	-	NR	A	66	9	9	4.4	1	-
81	19-Dec-05	11	-	-	A	70	11	10	4.5	1	-
82	19-Dec-05	11	-	-	A	72	12	10	5.4	1	-
83	19-Dec-05	11	-	-	A	77	11	10	4.3	1	-
Eastern chipmunk (Tamias striatus)											
69	16-Dec-05	13	F	NR	A	211	71	32	>30	1	-
Eastern harvest mouse (Reithrodontomys humulis)											
57	16-Dec-05	2	M	NR	A	108	50	15	7.6	1	-
84	19-Dec-05	11	M	NR	A	111	46	13	7.3	1	-
85	19-Dec-05	11	F	NR	A	110	47	13	7.2	1	-
86	19-Dec-05	11	M	NR	A	121	54	13	7.6	1	-
87	19-Dec-05	11	M	NR	A	120	52	14	8.9	1	-
95	19-Dec-05	2	M	NR	A	116	55	15	8	1	-
White-footed mouse (Peromyscus leucopus)											
1	18-May-05	6	-	-	A	158	76	22	-	2	released
2	19-May-05	6	-	-	A	-	-	-	-	2	released
3	19-May-05	6	-	-	A	-	-	-	-	2	released
4	19-May-05	6	-	-	A	-	-	-	-	2	released

Appendix 4. (continued).

Species Field #	Date	Site	Sex	Repro. Cond.**	Age	Lengths (mm) Total	Tail	HF**	Weight (g)	Trap Type***	Notes
White-footed mouse (Peromyscus leucopus) continued											
5	17-Jun-05	6	-	-	J	137	58	-	10.7	1	hind foot gone
6	17-Jun-05	6	-	-	A	148	68	20	18.4	1	-
7	17-Jun-05	6	M	-	A	143	72	19.5	13.9	1	-
8	17-Jun-05	6	M	-	A	148	63	20	14.7	1	-
10	17-Jun-05	6	M	-	A	147	66	21	16.3	1	-
11	25-Jun-05	10	-	-	A	134	65	19	14.6	1	-
18	24-Jun-05	7	-	-	A	146	56	20	18.6	1	-
19	24-Jun-05	7	-	-	J	71	15	19	4.8	1	-
20	25-Jun-05	2	-	-	J	124	59	19	19.2	1	-
22	17-Jun-05	10	-	-	A	-	-	-	-	2	released
23	17-Jun-05	10	-	-	A	-	-	-	-	2	released
24	17-Jun-05	10	-	-	A	-	-	-	-	2	released
25	17-Jun-05	10	-	-	A	-	-	-	-	2	released
26	13-Dec-05	9	M	NR	A	161	66	20	18.4	1	-
27	13-Dec-05	9	M	NR	J	138	60	20	14.8	1	-
28	13-Dec-05	9	M	NR	A	180	85	20	24.6	1	-
33	14-Dec-05	9	M	NR	J	114	47	19	8.6	1	-
34	14-Dec-05	9	F	PL	A	158	71	20	22	1	-
35	14-Dec-05	9	M	NR	A	172	75	21	23.7	1	-
36	14-Dec-05	9	M	NR	A	173	78	20	19.5	1	-
37	14-Dec-05	9	M	NR	J	128	55	20	13.7	1	-
38	14-Dec-05	9	M	NR	A	158	70	21	20.6	1	-
39	13-Dec-05	2	M	NR	J	139	60	20	15.2	7	-
42	14-Dec-05	6	M	-	A	158	66	19	21.9	2	-
43	14-Dec-05	6	F	L	A	175	83	20	>30	2	-
44	14-Dec-05	6	M	NR	SA	145	59	19	21	2	-
48	16-Dec-05	9	F	PL	A	149	62	20	19.5	1	-
49	16-Dec-05	9	M	NR	SA	130	53	18.5	14	1	-
50	16-Dec-05	9	M	NR	SA	138	61	19	14.8	1	-
51	16-Dec-05	9	M	NR	A	149	62	20	18.1	1	-
52	16-Dec-05	9	F	PL	A	153	72	20	20.2	1	-
53	16-Dec-05	16	M	NR	SA	132	54	20	14.2	2	-
56	16-Dec-05	2	M	NR	SA	134	55	20	16.1	1	-
60	16-Dec-05	3	F	NR	SA	160	70	20	23.4	1	-
64	16-Dec-05	15	F	NR	SA	126	52	18.5	14.9	4	-
67	16-Dec-05	13	M	NR	A	160	65	20	22.9	1	-
70	16-Dec-05	6	-	-	-	155	73	20	18	2	-
73	17-Dec-05	14	M	NR	J	142	57	20	15.9	1	-
75	17-Dec-05	6	M	NR	J	140	60	20	17.5	2	-

Appendix 4. (continued).

Species Field #	Date	Site	Sex	Repro. Cond.**	Age	Lengths (mm) Total	Tail	HF**	Weight (g)	Trap Type***	Notes
White-footed mouse (Peromyscus leucopus) continued											
76	17-Dec-05	9	-	-	-	147	60	19	17.2	1	-
79	19-Dec-05	12	F	L	A	187	86	20	23.2	2	-
88	19-Dec-05	11	F	PL	A	167	72	21	25.2	1	-
89	19-Dec-05	11	F	PL	A	171	73	19	25.1	1	-
90	19-Dec-05	11	F	PL	A	160	68	20	23.1	1	-
91	19-Dec-05	11	M	NR	J	141	60	19	16.3	1	-
92	19-Dec-05	11	M	NR	A	135	54	19	16	1	-
96	19-Dec-05	3	M	NR	A	160	71	20	24	1	-
97	19-Dec-05	3	M	NR	SA	125	58	20	12.6	2	-
100	19-Dec-05	6	M	NR	A	171	71	21	23.2	2	-
Prairie vole (Microtus ochrogaster)											
29	14-Dec-05	9	F	PL	A	138	31	19	>30	1	-
30	14-Dec-05	9	M	NR	A	130	31	20	>30	1	-
55	16-Dec-05	9	F	NR	A	142	27	19	21.5	1	partially eaten
61	16-Dec-05	3	F	NR	SA	132	27	18	>30	1	-
62	16-Dec-05	3	M	NR	A	142	31	18	>30	1	-
93	19-Dec-05	11	F	PL	A	152	34	19	>30	1	-
Pine vole (Microtus pinetorum)											
12	27-May-05	11	-	-	A	106	24	17	19.5	1	-
13	17-Jun-05	11	F	L	A	117	11	19	34	1	most of tail gone
15	17-Jun-05	11	M	-	A	127	25	17	22.4	1	-
45	14-Dec-05	3	M	NR	A	104	19	15	17.2	7	-
65	16-Dec-05	15	M	NR	A	103	16	16	22.1	4	-
66	16-Dec-05	15	M	NR	A	113	19	17	23.7	4	-
Southern bog lemming (Synaptomys cooperi)											
31	14-Dec-05	9	M	NR	A	104	15	18	28.1	1	-
32	14-Dec-05	9	M	NR	A	112	17	17	>30	1	-
46	14-Dec-05	4	M	NR	J	81	12	17	7.4	7	-
54	16-Dec-05	9	M	NR	A	109	14	18	24.6	1	-
68	16-Dec-05	13	M	NR	SA	109	16	18	24.3	1	-
72	17-Dec-05	13	M	NR	A	121	14	18	>30	1	-
94	19-Dec-05	11	F	PL	A	120	12	18	>30	1	-
99	19-Dec-05	13	M	NR	A	106	14	17	>30	1	-
Raccoon (Procyon lotor)											
47	14-Dec-05	9	-	-	-	-	-	-	-	8	skull collected

* L=Lactating, PL=Post Lactating, NR=Non-reproduction,

** HF=Hind foot

*** 1= Museum Special, 2=Sherman live-traps, 3=Tomahawk box-traps, 4=Pitfall cups, 7=Sight, 8=Dead on road, 9=audible call, 10=Sign (scat, tracks, etc.)