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Environmental Survey Report for ORNL:

Small Mammal Abundance and Distribution Survey

Oak Ridge National Environmental Research Park

2009–2010

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August 2011

Prepared for
OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831-6283
managed by UT-BATTELLE, LLC
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Cover photo of white-footed mouse being released from a Sherman trap courtesy of Ron McConathy.

ORNL/TM-2011/XX

ENVIRONMENTAL SURVEY REPORT FOR ORNL: SMALL MAMMAL ABUNDANCE AND DISTRIBUTION SURVEY OAK RIDGE NATIONAL ENVIRONMENTAL RESEARCH PARK 2009–2010

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ACRONYMS

CWD	coarse woody debris
OR Research Park	Oak Ridge National Environmental Research Park
ORISE	Oak Ridge Institute for Science and Education
ORNL	Oak Ridge National Laboratory

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EXECUTIVE SUMMARY

This report summarizes a 1-year small mammal biodiversity survey conducted on the Oak Ridge National Environmental Research Park (OR Research Park). The task was implemented through the Oak Ridge National Laboratory (ORNL) Natural Resources Management Program and included researchers from the ORNL Environmental Sciences Division, interns in the Oak Ridge Institute for Science and Education Higher Education Research Experiences Program, and ORNL Environmental Protection Services staff. Eight sites were surveyed reservation wide.

The survey was conducted in an effort to determine species abundance and diversity of small mammal populations throughout the reservation and to continue the historical inventory of small mammal presence for biodiversity records. This data collection effort was in support of the approved Wildlife Management Plan for the Oak Ridge Reservation, a major goal of which is to maintain and enhance wildlife biodiversity on the Reservation. Three of the sites (Poplar Creek, McNew Hollow, and Deer Check Station Field) were previously surveyed during a major natural resources inventory conducted in 1996. Five new sites were included in this study: Bearden Creek, Rainy Knob (Natural Area 21), Gum Hollow, White Oak Creek and Melton Branch..

The 2009–2010 small mammal surveys were conducted from June 2009 to July 2010 on the Oak Ridge National Environmental Research Park (OR Research Park). The survey had two main goals: (1) to determine species abundance and diversity and (2) to update historical records on the OR Research Park. The park is located on the Department of Energy–owned Oak Ridge Reservation, which encompasses 13,580 ha. The primary focus of the study was riparian zones. In addition to small mammal sampling, vegetation and coarse woody debris samples were taken at certain sites to determine any correlations between habitat and species presence. During the survey all specimens were captured and released using live trapping techniques including Sherman and pitfall traps. In total 227 small mammals representing nine species were captured during the course of the study. The most common species found in the study was the white-footed mouse (*Peromyscus leucopus*). The least common species found were the deer mouse (*Peromyscus maniculatus*), meadow jumping mouse (*Zapus hudsonius*), woodland vole (*Microtus pinetorum*), and northern short-tailed shrew (*Blarina brevicauda*).

1. INTRODUCTION

As a follow-up to historical studies last undertaken in 1996, a small mammal species inventory was conducted across the Oak Ridge National Environmental Research Park (OR Research Park). The main purposes of the survey were to determine species abundance and diversity and update historical records. This data collection effort was in support of the approved Wildlife Management Plan for the Oak Ridge Reservation, a major goal of which is to maintain and enhance wildlife biodiversity on the Reservation. The study was specifically designed to target small mammal species present on the OR Research Park and was conducted from June 2009 to July 2010. The survey was coordinated through the Oak Ridge National Laboratory (ORNL) Natural Resources Management Program and led by an Oak Ridge Institute for Science and Education (ORISE) environmental technician working with an intern from Furman University who was participating in the ORISE Higher Education Research Experiences program at ORNL, ORNL Environmental Sciences Division researchers, and ORNL Environmental Protection Services personnel.

The survey included eight sites, which were dispersed across the entire OR Research Park (Fig. 1). Appendix A provides latitude and longitude coordinates for each survey location. Seven of the sites (Bearden Creek, McNew Hollow, Gum Hollow, Poplar Creek, Deer Check Station Field, White Oak Creek, and Melton Branch) were in riparian zones, and one (Rainy Knob [Natural Area 21]) was in upland forested habitat. Data for two of the sites (White Oak Creek and Melton Branch) was obtained solely from a separate radiological contamination study. Supplemental data for Gum Hollow was also obtained from this same study.

2. METHODS AND MATERIALS

2.1 SMALL MAMMAL SAMPLING

The study used two surveying techniques for small mammal trapping: Sherman and pitfall traps.

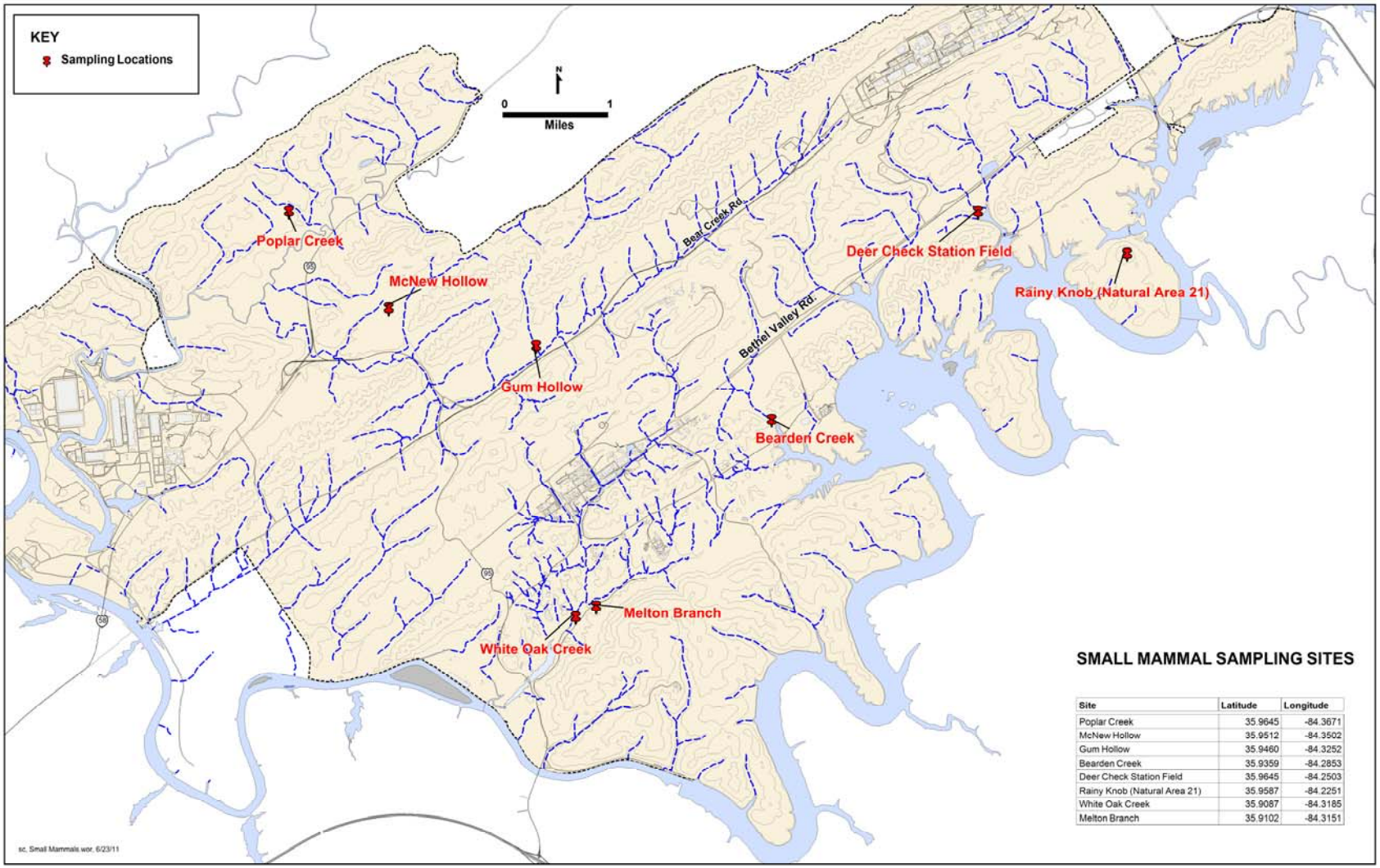
Sherman live traps, which are designed for live capture, were the primary method used in this study (Fig. 2). The traps were baited with sterile bird seed and cotton balls to provide the small mammals with food and bedding material. Trapline arrays were set in either a linear line or a square grid consisting of 25 traps. In accordance with Animal Care and Use Protocol #0381, "Oak Ridge Reservation Small Mammal Trapping Studies," approved by the ORNL Animal Care and Use Committee, the traps were checked twice daily and closed on days with extreme temperatures.

Pitfall traps were installed at two survey sites—in a field adjacent to the Deer Check Station Field (south of Bethel Valley Road) and at Rainy Knob (Freels Bend). This trap type is also designed for live capture. In accordance with the Animal Care and Use Protocol (#0381), the traps were checked every 3 hours and closed overnight. All pitfall traps were placed under cover to provide shade and protection from rain. At Rainy Knob, the pitfall traps were run with a drift fence array (Fig. 3). Drift fence arrays serve as travel barriers that direct mammals to pitfall trap locations.

All small mammals captured during the course of this study were released at the point of capture.

2.2 COARSE WOODY DEBRIS AND VEGETATION SAMPLING

To characterize the habitat in certain areas, coarse woody debris (CWD) and vegetation sampling was conducted at four study sites (Poplar Creek, Bearden Creek, McNew Hollow, and Gum Hollow). This type of sampling is necessary to determine correlations between certain target small mammal species and habitats in which they are likely to be found.



Site	Latitude	Longitude
Poplar Creek	35.9645	-84.3671
McNew Hollow	35.9512	-84.3502
Gum Hollow	35.9460	-84.3252
Bearden Creek	35.9359	-84.2853
Deer Check Station Field	35.9645	-84.2503
Rainy Knob (Natural Area 21)	35.9587	-84.2251
White Oak Creek	35.9087	-84.3185
Melton Branch	35.9102	-84.3151

Fig. 1. Map of small mammal survey locations.

Fig. 2. Sherman live trap setup. Photograph courtesy of Ron McConathy.

Fig. 3. Pitfall trap with drift fence array. Photograph courtesy of Scott Reasor.

CWD sampling involved measuring all woody debris with a diameter of approximately 10.16 cm or greater on a simple line transect throughout the survey sites. A minimum of 60% or greater of each site was covered during CWD sampling. Measurements were taken of log length, diameter, and decomposition stage, as well as location of the woody debris on the transect line (Fig. 4). A standard formula for calculating CWD volume was used:

$$V = (1.234/L) \times \sum d^2 \ ,$$

where

L = length of the log,
d = diameter of the log (Parminter 1998).

Measurement of log length during CWD sampling

Measurement of log diameter during CWD sampling

Fig. 4. Coarse woody debris sampling. Photographs courtesy of Ron McConathy.

Additionally, the survey team evaluated the presence of native versus invasive plants to determine whether there was any correlation with small mammal species diversity.

Plant species diversity was measured within a 1/4 m^2 quadrangle and data extrapolated to present results in square meters. Vegetation was sampled along four transect lines at three of the survey sites (Bearden Creek, McNew Hollow, and Gum Hollow). In each quadrangle researchers recorded species, number of stems, and percent cover to determine plant abundance and diversity (Fig. 5).

Vegetation sampling in 1/4 m^2 plot

Fig. 5. Measurement of plant species diversity. Photograph courtesy of Ron McConathy.

3. RESULTS

3.1 SMALL MAMMAL SPECIES RICHNESS AND DIVERSITY

During the sampling period nine small mammal species were recorded out of 227 captures at eight locations (Table 1). The Gum Hollow location yielded the greatest number of species (N=5) and the greatest number of captures (N=67). Species captured at Gum Hollow included white-footed mouse (*Peromyscus leucopus*), golden mouse (*Ochrotomys nuttalli*), eastern harvest mouse (*Reithrodontomys humulis*), meadow jumping mouse (*Zapus hudsonius*), and northern short-tailed shrew (*Blarina brevicauda*). However, it needs to be noted that Gum Hollow results are based on a significantly higher number of trap nights than for all other sites. The Deer Check Station Field yielded the least number of species (N=1) and the least number of captures (N=2), based on a very limited number of trapping nights. The white-footed mouse was by far the most common species captured during the study (184 out of 227 captures). The least common species captured were the deer mouse (*Peromyscus maniculatus*) (Melton Branch, N=1), meadow jumping mouse (Gum Hollow, N=1), woodland vole (*Microtus pinetorum*) (Rainy Knob, N=1), and northern short-tailed shrew (Gum Hollow, N=1).

Table 1. Summary of small mammals captured by location

Species	Bearden Creek	McNew Hollow	Gum Hollow	Poplar Creek	Rainy Knob	Deer Check Station Field	White Oak Creek	Melton Branch	Total
White-footed mouse (*Peromyscus leucopus*)	30	44	58	11	3		23	15	**184**
Deer mouse (*Peromyscus maniculatus*)								1	**1**
Golden mouse (*Ochrotomys nuttalli*)			2						**2**
Eastern harvest mouse (*Reithrodontomys humulis*)	4	11	5	4					**24**
Meadow jumping mouse (*Zapus hudsonius*)			1						**1**
Woodland vole (*Microtus pinetorum*)					1				**1**
Northern short-tailed shrew (*Blarina brevicauda*)			1						**1**
Hispid cotton rat (*Sigmodon hispidus*)		3				2	2	3	**10**
Eastern chipmunk (*Tamias striatus*)	3								**3**
Total	**37**	**58**	**67**	**15**	**4**	**2**	**25**	**19**	**227**

Appendix B contains complete capture records for the study. Appendix C contains photos of representative species captured during the course of the study.

3.2 RESULTS OF COARSE WOODY DEBRIS SURVEY

CWD was measured at four of the survey sites (Poplar Creek, Bearden Creek, McNew Hollow, and Gum Hollow). Bearden Creek had the greatest quantity of CWD (20 logs) and Gum Hollow had the smallest (10 logs). Poplar Creek had the greatest volume of CWD (17.5 m^3), and McNew Hollow had the smallest (3 m^3). Table 2 contains the complete results of the CWD sampling.

Table 2. CWD sampling results

Location	Quantity of CWD	Volume (per site)
Poplar Creek	16 logs	17.5 m^3
Bearden Creek	20 logs	4.3 m^3
McNew Hollow	15 logs	3.0 m^3
Gum Hollow	10 logs	7.3 m^3

3.3 RESULTS OF VEGETATION SAMPLING

Vegetation was sampled at three of the survey sites (Bearden Creek, McNew Hollow, and Gum Hollow). Bearden Creek had the highest diversity of plant species (N=35), and Gum Hollow had the lowest (N=15). The McNew Hollow site had the greatest number of invasive nonnative plant species (N=3) and was dominated by Japanese honeysuckle (*Lonicera japonica*) and Nepal grass (*Microstegium vimineum*). Privet (*Ligustrum sinense*) was also recorded at the McNew Hollow site. All three sites contained Japanese honeysuckle and Nepal grass. Table 3 contains complete vegetation sampling results.

Table 3. Vegetation sampling results[a]

Species	Native (N) or nonnative invasive (NNI)	Bearden Creek	McNew Hollow[b]	Gum Hollow
Hickory	**N**	**X**		**X**
White oak	**N**			**X**
Tulip poplar	**N**			**X**
Black cherry	**N**	**X**		**X**
Sugar maple	**N**	**X**		
American beech	**N**	**X**		
Ironwood	**N**	**X**	**X**	
Red maple	**N**	**X**		
Sweetgum	**N**		**X**	**X**
Eastern red cedar	**N**	**X**		**X**
Magnolia	**N**	**X**		
Hackberry	**N**	**X**		
Swamp dogwood	**N**			**X**
Witch-hazel	**N**	**X**		
Spicebush	**N**		**X**	

Table 3 (continued)

Species	Native (N) or nonnative invasive (NNI)	Bearden Creek	McNew Hollow[b]	Gum Hollow
Strawberry bush	N	X		X
Elm	N	X		
Mountain laurel	N		X	
Dewberry	N			X
Privet	NNI		X	
Muscadine	N		X	
Poison ivy	N	X	X	
Greenbriar	N	X		X
Japanese Honeysuckle	NNI	X	X	X
Virginia creeper	N	X	X	X
Christmas fern	N	X	X	
Rattlesnake fern	N	X		
River cane	N		X	
Lycopodium	N			X
Morning-glory	N	X		
Little brown jug	N	X		
Black snakeroot	N	X		
Solomon's-seal	N	X		
Aster	N	X		
Foamflower	N	X		
Goldenrod	N	X	X	
Sedge	N	X		X
Violet	N	X	X	
Spider lily	N	X		
Lizard's tail	N	X		
Indian cucumber	N	X		
Jewelweed	N	X		
Passion-flower	N	X		
Hog peanut	N	X	X	
Chickweed	NNI	X		
Panic grass	N		X	
Nepal grass	NNI	X	X	X
Total species		**35**	**16**	**15**

[a]Red indicates nonnative invasive species.

[b]McNew Hollow site was dominated by Japanese honeysuckle and Nepal grass.

3.4 COMPARISON BETWEEN CWD/VEGETATION SAMPLING AND SMALL MAMMAL CAPTURES

Table 4 provides a comparison between CWD sampling results and small mammal captures for three of the four sites surveyed. Poplar Creek was not included in the comparison because of the extremely low number of trapping nights conducted at that site. Gum Hollow had the highest volume (7.3 m^3) of CWD and the highest number of species captured. The actual number of logs on a site did not appear to have any correlation to number of small mammal species recorded or number of captures.

Table 4. Comparison of CWD results to small mammal captures

Location	Quantity of CWD	Volume	Number of small mammal species captured	Number of small mammals captured
Bearden Creek	20 logs	4.3 m^3	3	37
McNew Hollow	15 logs	3.0 m^3	3	58
Gum Hollow	10 logs	7.3 m^3	5[a]	67[a]

[a]Mammal species and capture counts are based on a significantly higher number of trap nights for this site.

Table 5 provides a comparison between the number of invasive plant species and overall plant species numbers and the small mammal captures for the three sites surveyed. No significant correlations could be made between the vegetation parameters measured and the number of small mammal species recorded or the number of captures.

Table 5. Comparison of vegetation sampling results to small mammal captures

Location	Number of invasive plant species	Number of plant species	Number of small mammal species captured	Number of small mammals captured
Bearden Creek	2	35	3	37
McNew Hollow	3	16	3	58
Gum Hollow	2	15	5[a]	67[a]

[a]Mammal species and capture counts are based on a significantly higher number of trap nights for this site.

4. DISCUSSION AND CONCLUSION

During the 2009–2010 small mammal survey, efforts were made to keep locations and methods similar to those of past studies conducted on the Oak Ridge National Environmental Research Park. Weather was a limiting factor during a portion of the study. In 2009 temperatures were mild and precipitation levels were average. However, from May 2010 until the end of the study, temperatures remained above average with a mean temperature of 96° Fahrenheit and above average precipitation according to the National Weather Service. This may have affected small mammal movement and behavior, resulting in a generally lower diversity of species captured during this study in comparison with past studies conducted in the park (Appendix D). The survey sites chosen were relatively the same size. However, due to topography and meandering riparian zones, the trap arrangement was varied. Most of the trap lines were set in a linear array to allow maximum coverage of the riparian zones. However, some of the upland sites were set in a square grid pattern to maximize area coverage of the site.

Although a standard method was used, during the CWD surveys it became evident that the survey was somewhat skewed by the width and length of the logs on some sites. On sites such as Poplar Creek, the CWD consisted of logs that were greater than 38 m in length and 29 cm in width. Whereas in sites such as McNew Hollow, the average log was 21 m in length and 26 cm in width. The formula used did not account for the actual number of CWD on each site. So there was actually a larger quantity of CWD on a site like McNew Hollow, which showed the least cubic volume of CWD, and a smaller amount of CWD on Poplar Creek, which showed the greatest cubic volume.

Only very limited correlations could be drawn between small mammal species diversity and CWD results. No distinct correlations could be drawn between plant species diversity (including the presence of nonnative invasive plants) and small mammal species diversity.

In conclusion, this small mammal survey showed average species diversity and viable small mammal populations for the Oak Ridge National Environmental Research Park. The white-footed mouse appears to be by far the most abundant small mammal species in the park. Species of particular interest found during the study were the meadow jumping mouse and woodland vole. The meadow jumping mouse is listed as a species In Need of Management by the state of Tennessee. A complete mammal list for the park is contained in Appendix E.

5. BIBLIOGRAPHY

Bowman, J.C., Darren Sleep, G.J. Forbes, and M. Edwards. 2000. "The Association of Small Mammals with Coarse Woody Debris at Log and Stand Scales." *Forest Ecology Management* **129** (1–3): 119–124.

Giffen, N.R., J.W. Evans, and P.D. Parr. 2007. *Wildlife Management Plan for the Oak Ridge Reservation*. ORNL/TM-2006/155. Oak Ridge National Laboratory, Oak Ridge, TN.

Howell, J.C., and P.B. Dunaway. 1959. *Long-Term Ecological Study of the Oak Ridge Area II on the Mammals with Special Reference to Melton Valley*. ORNL-CF59-10-126. Oak Ridge National Laboratory, Oak Ridge, TN.

Kitchings, J.T., and J.D. Story. *1984. Resource Management Plan for the Oak Ridge Reservation, Volume 16: Wildlife Management*. ORNL-6026/V16. Oak Ridge National Laboratory, Oak Ridge, TN.

Mitchell, J.M., E.R. Vail, J.W. Webb, J.W. Evans, A.L. King, and P.A. Hamlett. 1996. *Survey of Protected Terrestrial Vertebrates on the Oak Ridge Reservation*. ORNL-ES/ER/TM-188/R1. Oak Ridge National Laboratory, Oak Ridge, TN.

National Oceanic and Atmospheric Administration. http://www.NOAA.gov

Parminter, J. 1998. "Correction Factors for Coarse Woody Debris Sampling." Ministry of Forests, Research Branch, Victoria, British Columbia. http://www.for.gov.bc.ca/hre/deadwood/DTmes4.htm.

Reid, F. 2006. *A Field Guide to Mammals of North America*. 4th ed., The Peterson Field Guide Series, Houghton Mifflin Company, New York.

APPENDIX A. LATITUDE AND LONGITUDE FOR SURVEY LOCATIONS

Table A.1. Latitude and longitude for survey locations

Site	Latitude	Longitude
Poplar Creek	35.9645	–84.3671
McNew Hollow	35.9512	–84.3502
Gum Hollow	35.9460	–84.3252
Bearden Creek	35.9359	–84.2853
Deer Check Station Field	35.9645	–84.2503
Rainy Knob	35.9587	–84.2251
White Oak Creek	35.9087	–84.3185
Melton Branch	35.9102	–84.3151

APPENDIX B. 2009–2010 TRAPPING DATA FOR THE OAK RIDGE NATIONAL ENVIRONMENTAL RESEARCH PARK

Table B.1. 2009–2010 trapping data for the Oak Ridge National Environmental Research Park

Date	Time	Species	Location	Trap number	Habitat code	Additional notes
			2010 summer trapping data			
5/25/2010	9:45 AM	*Peromyscus leucopus*	Bearden Creek	BC-7	Riparian	Two in one trap
5/25/2010	9:45 AM	*Peromyscus leucopus*	Bearden Creek	BC-7	Riparian	
5/25/2010	9:45 AM	*Peromyscus leucopus*	Bearden Creek	BC-11	Riparian	
5/25/2010	9:45 AM	*Peromyscus leucopus*	Bearden Creek	BC-15	Riparian	
5/25/2010	9:45 AM	*Peromyscus leucopus*	Bearden Creek	BC-23	Riparian	
5/25/2010	11:00 AM	*Peromyscus leucopus*	McNew Hollow	MH-3	Riparian	
5/25/2010	11:00 AM	*Peromyscus leucopus*	McNew Hollow	MH-9	Riparian	
5/25/2010	11:00 AM	*Peromyscus leucopus*	McNew Hollow	MH-13	Riparian	
5/25/2010	11:00 AM	*Peromyscus leucopus*	McNew Hollow	MH-14	Riparian	
5/25/2010	11:00 AM	*Peromyscus leucopus*	McNew Hollow	MH-15	Riparian	
5/25/2010	11:00 AM	*Peromyscus leucopus*	McNew Hollow	MH-19	Riparian	
5/25/2010	11:00 AM	*Peromyscus leucopus*	McNew Hollow	MH-24	Riparian	
5/26/2010	12:00 PM	*Peromyscus leucopus*	McNew Hollow	MH-3	Riparian	Raccoon ran trap line last night; rain last night
5/26/2010	12:00 PM	*Peromyscus leucopus*	McNew Hollow	MH-4	Riparian	
5/26/2010	12:00 PM	*Peromyscus leucopus*	McNew Hollow	MH-8	Riparian	
5/26/2010	12:00 PM	*Peromyscus leucopus*	McNew Hollow	MH-11	Riparian	
5/26/2010	12:00 PM	*Peromyscus leucopus*	McNew Hollow	MH-14	Riparian	
5/26/2010	12:00 PM	*Peromyscus leucopus*	McNew Hollow	MH-15	Riparian	
5/26/2010	12:00 PM	*Peromyscus leucopus*	McNew Hollow	MH-16	Riparian	
5/26/2010	12:00 PM	*Peromyscus leucopus*	McNew Hollow	MH-18	Riparian	
5/26/2010	12:00 PM	*Peromyscus leucopus*	McNew Hollow	MH-20	Riparian	
5/26/2010	12:00 PM	*Peromyscus leucopus*	McNew Hollow	MH-22	Riparian	
5/26/2010	12:00 PM	*Peromyscus leucopus*	McNew Hollow	MH-24	Riparian	
6/3/2010	AM	*Reithrodontomys humulis*	Gum Hollow	GH-7	Upland hardwood	Raccoon ran trap line last night
6/3/2010	AM	*Reithrodontomys humulis*	Gum Hollow	GH-24	Upland hardwood	
6/3/2010	AM	*Peromyscus leucopus*	Poplar Creek	PC-25	Upland hardwood	
6/4/2010	AM	*Sigmodon hispidus*	Check Station Field	CS-15	Field	
6/11/2010	AM	*Peromyscus leucopus*	Poplar Creek	PC-15	Upland hardwood	
6/11/2010	AM	*Peromyscus leucopus*	Poplar Creek	PC-25	Upland hardwood	

Table B.1 (continued)

Date	Time	Species	Location	Trap number	Habitat code	Additional notes
			2010 summer trapping data (continued)			
6/11/2010	AM	*Peromyscus leucopus*	Gum Hollow	GH-4	Upland hardwood	
6/11/2010	12:00 PM	*Sigmodon hispidus*	Check Station Field	CS-21	Field	Mortality
6/15/2010	9:00 AM	*Peromyscus leucopus*	Bearden Creek	BC-4	Riparian	
6/15/2010	9:00 AM	*Peromyscus leucopus*	Bearden Creek	BC-7	Riparian	
6/15/2010	9:00 AM	*Tamias striatus*	Bearden Creek	BC-8	Riparian	
6/15/2010	9:00 AM	*Reithrodontomys humulis*	Bearden Creek	BC-11	Riparian	
6/15/2010	9:00 AM	*Peromyscus leucopus*	Bearden Creek	BC-19	Riparian	
6/15/2010	9:00 AM	*Peromyscus leucopus*	Bearden Creek	BC-23	Riparian	
6/15/2010	9:00 AM	*Peromyscus leucopus*	Bearden Creek	BC-25	Riparian	
6/15/2010	10:00 AM	*Peromyscus leucopus*	Gum Hollow	GH-8	Upland hardwood	
6/15/2010	1:30 PM	*Tamias striatus*	Bearden Creek	BC-5	Riparian	
6/16/2010	9:00 AM	*Peromyscus leucopus*	Bearden Creek	BC-6	Riparian	
6/16/2010	9:00 AM	*Peromyscus leucopus*	Bearden Creek	BC-7	Riparian	
6/16/2010	9:00 AM	*Tamias striatus*	Bearden Creek	BC-8	Riparian	
6/16/2010	9:00 AM	*Peromyscus leucopus*	Bearden Creek	BC-11	Riparian	
6/16/2010	9:00 AM	*Peromyscus leucopus*	Bearden Creek	BC-18	Riparian	
6/16/2010	9:00 AM	*Peromyscus leucopus*	Bearden Creek	BC-23	Riparian	
6/16/2010	9:00 AM	*Peromyscus leucopus*	Bearden Creek	BC-25	Riparian	
6/16/2010	9:00 AM	*Reithrodontomys humulis*	Bearden Creek	BC-25	Riparian	Cohabitating *Peromyscus* and *Reithrodontomys*
6/22/2010	10:00 AM	*Peromyscus leucopus*	Bearden Creek	BC-7	Riparian	
6/22/2010	10:00 AM	*Peromyscus leucopus*	Bearden Creek	BC-10	Riparian	
6/22/2010	10:00 AM	*Peromyscus leucopus*	Bearden Creek	BC-14	Riparian	
6/22/2010	10:00 AM	*Peromyscus leucopus*	Bearden Creek	BC-24	Riparian	
6/22/2010	10:00 AM	*Peromyscus leucopus*	Bearden Creek	BC-25	Riparian	
6/22/2010	11:00 AM	*Peromyscus leucopus*	Gum Hollow	GH-7	Upland hardwood	
6/22/2010	11:00 AM	*Peromyscus leucopus*	Gum Hollow	GH-23	Upland hardwood	
6/22/2010	11:00 AM	*Peromyscus leucopus*	Gum Hollow	GH-25	Upland hardwood	
6/29/2010	AM	*Peromyscus leucopus*	Bearden Creek	BC-10	Riparian	
6/29/2010	AM	*Peromyscus leucopus*	Bearden Creek	BC-12	Riparian	
6/29/2010	AM	*Peromyscus leucopus*	Bearden Creek	BC-18	Riparian	
6/29/2010	AM	*Peromyscus leucopus*	Gum Hollow	GH-3	Upland hardwood	

Table B.1 (continued)

Date	Time	Species	Location	Trap number	Habitat code	Additional notes
			2010 summer trapping data (continued)			
6/29/2010	AM	*Peromyscus leucopus*	Gum Hollow	GH-7	Upland hardwood	
6/30/2010	AM	*Peromyscus leucopus*	Gum Hollow	GH-1	Upland hardwood	
6/30/2010	AM	*Peromyscus leucopus*	Gum Hollow	GH-3	Upland hardwood	
6/30/2010	AM	*Peromyscus leucopus*	Gum Hollow	GH-6	Upland hardwood	
7/7/2010	AM	*Peromyscus leucopus*	McNew Hollow	MH-1	Riparian	
7/7/2010	AM	*Peromyscus leucopus*	McNew Hollow	MH-6	Riparian	
7/7/2010	AM	*Peromyscus leucopus*	McNew Hollow	MH-8	Riparian	
7/7/2010	AM	*Peromyscus leucopus*	McNew Hollow	MH-18	Riparian	
7/7/2010	AM	*Peromyscus leucopus*	McNew Hollow	MH-23	Riparian	
7/7/2010	AM	*Peromyscus leucopus*	Poplar Creek	PC-14	Upland hardwood	
7/14/2010	AM	*Microtus pinetorum*	Rainy Knob	RK-15	Upland hardwood	
7/20/2010	AM	*Peromyscus leucopus*	Rainy Knob	RK-2	Upland hardwood	
7/21/2010	AM	*Peromyscus leucopus*	Rainy Knob	RK-15	Upland hardwood	
7/21/2010	AM	*Peromyscus leucopus*	Rainy Knob	RK-16	Upland hardwood	
			Winter 2009 small mammal survey			
11/4/2009		*Peromyscus leucopus*	Gum Hollow	GH-18	Riparian	
11/4/2009		*Peromyscus leucopus*	Gum Hollow	GH-25	Upland hardwood	
11/4/2009		*Peromyscus leucopus*	Gum Hollow	GH-22	Low bottom area	
11/4/2009		*Peromyscus leucopus*	Gum Hollow	GH-16	Upland hardwood	
11/4/2009		*Ochrotomys nuttalli*	Gum Hollow	GH-10A	Low bottom area	
11/5/2009		*Peromyscus leucopus*	Gum Hollow	GH-4	Riparian	
11/5/2009		*Peromyscus leucopus*	Gum Hollow	GH-16	Upland hardwood	
11/6/2009		*Peromyscus leucopus*	Gum Hollow	GH-4	Riparian	
11/16/2009		*Ochrotomys nuttalli*	Gum Hollow	GH-7A	Low bottom area	
12/2/2009		*Reithrodontomys humulis*	McNew Hollow	MH-8	Riparian	
12/2/2009		*Peromyscus leucopus*	Gum Hollow	GH-1	Low bottom area	
12/2/2009		*Peromyscus leucopus*	Gum Hollow	GH-2	Low bottom area	
12/2/2009		*Peromyscus leucopus*	Gum Hollow	GH-7	Upland hardwood	
12/2/2009		*Peromyscus leucopus*	Gum Hollow	GH-9	Upland hardwood	
12/2/2009		*Peromyscus leucopus*	Gum Hollow	GH-9	Upland hardwood	
12/2/2009		*Peromyscus leucopus*	Gum Hollow	GH-13	Upland hardwood	

Table B.1 (continued)

Date	Time	Species	Location	Trap number	Habitat code	Additional notes
			Winter 2009 small mammal survey (continued)			
12/2/2009		*Reithrodontomys humulis*	Gum Hollow	GH-21	Low bottom area	
12/3/2009		*Peromyscus leucopus*	Gum Hollow	GH-3	Riparian	
12/3/2009		*Peromyscus leucopus*	Gum Hollow	GH-14	Upland hardwood	
12/3/2009		*Reithrodontomys humulis*	Gum Hollow	GH-17	Riparian	
12/3/2009		*Peromyscus leucopus*	Gum Hollow	GH-18	Riparian	
12/3/2009		*Peromyscus leucopus*	Gum Hollow	GH-25	Upland hardwood	
12/3/2009		*Reithrodontomys humulis*	Gum Hollow	GH-22	Riparian	
12/3/2009		*Peromyscus leucopus*	Gum Hollow	GH-19	Riparian	
12/3/2009		*Reithrodontomys humulis*	McNew Hollow	MH-8	Riparian	
12/3/2009		*Peromyscus leucopus*	McNew Hollow	MH-15	Riparian	
12/3/2009		*Reithrodontomys humulis*	Poplar Creek	PC-3	Upland hardwood	
12/3/2009		*Peromyscus leucopus*	Poplar Creek	PC-8	Upland hardwood	
12/3/2009		*Peromyscus leucopus*	Poplar Creek	PC-12	Upland hardwood	
12/3/2009		*Reithrodontomys humulis*	Poplar Creek	PC-21	Upland hardwood	
12/15/2009		*Peromyscus leucopus*	Bearden Creek	BC-20	Riparian	Down tree blocking the Gum Hollow sites 12–15
12/15/2009		*Peromyscus leucopus*	McNew Hollow	MH-1	Riparian	
12/15/2009		*Reithrodontomys humulis*	McNew Hollow	MH-2	Riparian	
12/15/2009		*Reithrodontomys humulis*	McNew Hollow	MH-3	Riparian	
12/15/2009		*Reithrodontomys humulis*	McNew Hollow	MH-4	Riparian	
12/15/2009		*Peromyscus leucopus*	McNew Hollow	MH-8	Riparian	
12/15/2009		*Peromyscus leucopus*	McNew Hollow	MH-10	Riparian	
12/15/2009		*Reithrodontomys humulis*	McNew Hollow	MH-11	Riparian	
12/15/2009		*Peromyscus leucopus*	McNew Hollow	MH-12	Riparian	

Table B.1 (continued)

Date	Time	Species	Location	Trap number	Habitat code	Additional notes
			Winter 2009 small mammal survey (continued)			
12/15/2009		*Peromyscus leucopus*	McNew Hollow	MH-13	Riparian	
12/15/2009		*Sigmodon hispidus*	McNew Hollow	MH-15	Riparian	
12/15/2009		*Peromyscus leucopus*	McNew Hollow	MH-17	Riparian	
12/15/2009		*Peromyscus leucopus*	McNew Hollow	MH-21	Riparian	
12/15/2009		*Peromyscus leucopus*	McNew Hollow	MH-22	Riparian	
12/15/2009		*Reithrodontomys humulis*	Poplar Creek	PC-4	Upland hardwood	
12/15/2009		*Peromyscus leucopus*	Poplar Creek	PC-10	Upland hardwood	
12/15/2009		*Reithrodontomys humulis*	Poplar Creek	PC-6	Upland hardwood	
12/15/2009		*Peromyscus leucopus*	Poplar Creek	PC-20	Upland hardwood	
12/16/2009		*Peromyscus leucopus*	Bearden Creek	BC-12	Riparian	
12/16/2009		*Peromyscus leucopus*	Bearden Creek	BC-22	Riparian	
12/16/2009		*Reithrodontomys humulis*	Bearden Creek	BC-22	Riparian	
12/16/2009		*Reithrodontomys humulis*	Bearden Creek	BC-24	Riparian	
12/16/2009		*Peromyscus leucopus*	McNew Hollow	MH-2	Riparian	
12/16/2009		*Reithrodontomys humulis*	McNew Hollow	MH-3	Riparian	
12/16/2009		*Reithrodontomys humulis*	McNew Hollow	MH-4	Riparian	
12/16/2009		*Reithrodontomys humulis*	McNew Hollow	MH-8	Riparian	
12/16/2009		*Peromyscus leucopus*	McNew Hollow	MH-10	Riparian	Mortality
12/16/2009		*Reithrodontomys humulis*	McNew Hollow	MH-11	Riparian	
12/16/2009		*Sigmodon hispidus*	McNew Hollow	MH-13	Riparian	Mortality
12/16/2009		*Peromyscus leucopus*	McNew Hollow	MH-14	Riparian	Mortality
12/16/2009		*Peromyscus leucopus*	McNew Hollow	MH-18	Riparian	
12/16/2009		*Sigmodon hispidus*	McNew Hollow	MH-22	Riparian	Mortality
12/16/2009		*Peromyscus leucopus*	McNew Hollow	MH-24	Riparian	
12/17/2009		*Peromyscus leucopus*	Bearden Creek	BC-22	Riparian	Mortality
12/17/2009		*Peromyscus leucopus*	Bearden Creek	BC-24	Riparian	Mortality

Table B.1 (continued)

Date	Time	Species	Location	Trap number	Habitat code	Additional notes
			Winter 2009/2010 small mammal survey (continued)			
12/17/2009		*Peromyscus leucopus*	McNew Hollow	MH-4	Riparian	
12/17/2009		*Peromyscus leucopus*	McNew Hollow	MH-3	Riparian	
12/17/2009		*Peromyscus leucopus*	McNew Hollow	MH-8	Riparian	
12/17/2009		*Peromyscus leucopus*	McNew Hollow	MH-9	Riparian	
12/17/2009		*Sigmodon hispidus*	McNew Hollow	MH-10	Riparian	Mortality
12/17/2009		*Peromyscus leucopus*	McNew Hollow	MH-15	Riparian	
12/18/2009		*Peromyscus leucopus*	Bearden Creek	BC-4	Riparian	
12/18/2009		*Reithrodontomys humulis*	McNew Hollow	MH-4	Riparian	
12/18/2009		*Peromyscus leucopus*	McNew Hollow	MH-3	Riparian	
12/18/2009		*Peromyscus leucopus*	McNew Hollow	MH-11	Riparian	
			Terrestrial biota study			
6/10/2009		*Peromyscus leucopus*	White Oak Creek	WO-1	Low bottom area	
6/10/2009		*Peromyscus leucopus*	Melton Branch	MB-25	Low bottom area	
6/10/2009		*Peromyscus leucopus*	Melton Branch	MB-27	Low bottom area	
6/10/2009		*Sigmodon hispidus*	Melton Branch	MB-11	Low bottom area	
6/10/2009		*Peromyscus leucopus*	Gum Hollow	GH-22	Upland hardwood	
6/11/2009		*Peromyscus leucopus*	White Oak Creek	WO-22	Low bottom area	
6/11/2009		*Peromyscus maniculatus*	Melton Branch	MB-9	Low bottom area	
6/11/2009		*Sigmodon hispidus*	Melton Branch	MB-11	Low bottom area	
6/11/2009		*Peromyscus leucopus*	Melton Branch	MB-1	Low bottom area	
6/11/2009		*Peromyscus leucopus*	Melton Branch	MB-10	Low bottom area	
6/11/2009		*Peromyscus leucopus*	Melton Branch	MB-16	Low bottom area	
6/11/2009		*Peromyscus leucopus*	Melton Branch	MB-17	Low bottom area	
6/11/2009		*Peromyscus leucopus*	Melton Branch	MB-20	Low bottom area	
6/11/2009		*Peromyscus leucopus*	Melton Branch	MB-27	Low bottom area	
6/11/2009		*Peromyscus leucopus*	Melton Branch	MB-28	Low bottom area	
6/11/2009		*Peromyscus leucopus*	Gum Hollow	GH-9	Upland hardwood	
6/11/2009		*Peromyscus leucopus*	Gum Hollow	GH-14	Upland hardwood	
6/11/2009		*Peromyscus leucopus*	Gum Hollow	GH-29	Upland hardwood	
6/16/2009		*Peromyscus leucopus*	White Oak Creek	WO-4	Low bottom area	
6/16/2009		*Peromyscus leucopus*	White Oak Creek	WO-10	Low bottom area	

Table B.1 (continued)

Date	Time	Species	Location	Trap number	Habitat code	Additional notes
			Terrestrial biota study (continued)			
6/16/2009		*Peromyscus leucopus*	White Oak Creek	WO-12	Low bottom area	
6/16/2009		*Peromyscus leucopus*	White Oak Creek	WO-13	Low bottom area	
6/16/2009		*Peromyscus leucopus*	White Oak Creek	WO-14	Low bottom area	
6/16/2009		*Peromyscus leucopus*	White Oak Creek	WO-15	Low bottom area	
6/16/2009		*Peromyscus leucopus*	White Oak Creek	WO-20	Low bottom area	
6/16/2009		*Peromyscus leucopus*	White Oak Creek	WO-22	Low bottom area	
6/16/2009		*Peromyscus leucopus*	White Oak Creek	WO-26	Low bottom area	
6/16/2009		*Peromyscus leucopus*	White Oak Creek	WO-28	Low bottom area	
6/16/2009		*Sigmodon hispidus*	White Oak Creek	WO-23	Low bottom area	
6/16/2009		*Peromyscus leucopus*	Melton Branch	MB-1	Low bottom area	
6/16/2009		*Peromyscus leucopus*	Melton Branch	MB-6	Low bottom area	
6/16/2009		*Peromyscus leucopus*	Melton Branch	MB-7	Low bottom area	
6/16/2009		*Peromyscus leucopus*	Melton Branch	MB-8	Low bottom area	
6/16/2009		*Peromyscus leucopus*	Melton Branch	MB-26	Low bottom area	
6/16/2009		*Peromyscus leucopus*	Melton Branch	MB-28	Low bottom area	
6/16/2009		*Sigmodon hispidus*	Melton Branch	MB-30	Low bottom area	
6/16/2009		*Peromyscus leucopus*	Gum Hollow	GH-29	Upland hardwood	
6/17/2009		*Peromyscus leucopus*	White Oak Creek	WO-3	Low bottom area	
6/17/2009		*Peromyscus leucopus*	White Oak Creek	WO-3	Low bottom area	
6/17/2009		*Peromyscus leucopus*	White Oak Creek	WO-6	Low bottom area	
6/17/2009		*Peromyscus leucopus*	White Oak Creek	WO-7	Low bottom area	
6/17/2009		*Peromyscus leucopus*	White Oak Creek	WO-9	Low bottom area	
6/17/2009		*Peromyscus leucopus*	White Oak Creek	WO-10	Low bottom area	
6/17/2009		*Peromyscus leucopus*	White Oak Creek	WO-14	Low bottom area	
6/17/2009		*Peromyscus leucopus*	White Oak Creek	WO-20	Low bottom area	
6/17/2009		*Peromyscus leucopus*	White Oak Creek	WO-21	Low bottom area	
6/17/2009		*Peromyscus leucopus*	White Oak Creek	WO-26	Low bottom area	
6/17/2009		*Peromyscus leucopus*	White Oak Creek	WO-28	Low bottom area	
6/17/2009		*Sigmodon hispidus*	White Oak Creek	WO-4	Low bottom area	
6/17/2009		*Peromyscus leucopus*	Gum Hollow	GH-24	Upland hardwood	
6/17/2009		*Peromyscus leucopus*	Gum Hollow	GH-9	Upland hardwood	
6/23/2009		*Peromyscus leucopus*	Gum Hollow	GH-18A	Low bottom area	
6/23/2009		*Peromyscus leucopus*	Gum Hollow	GH-8	Upland hardwood	

Table B.1 (continued)

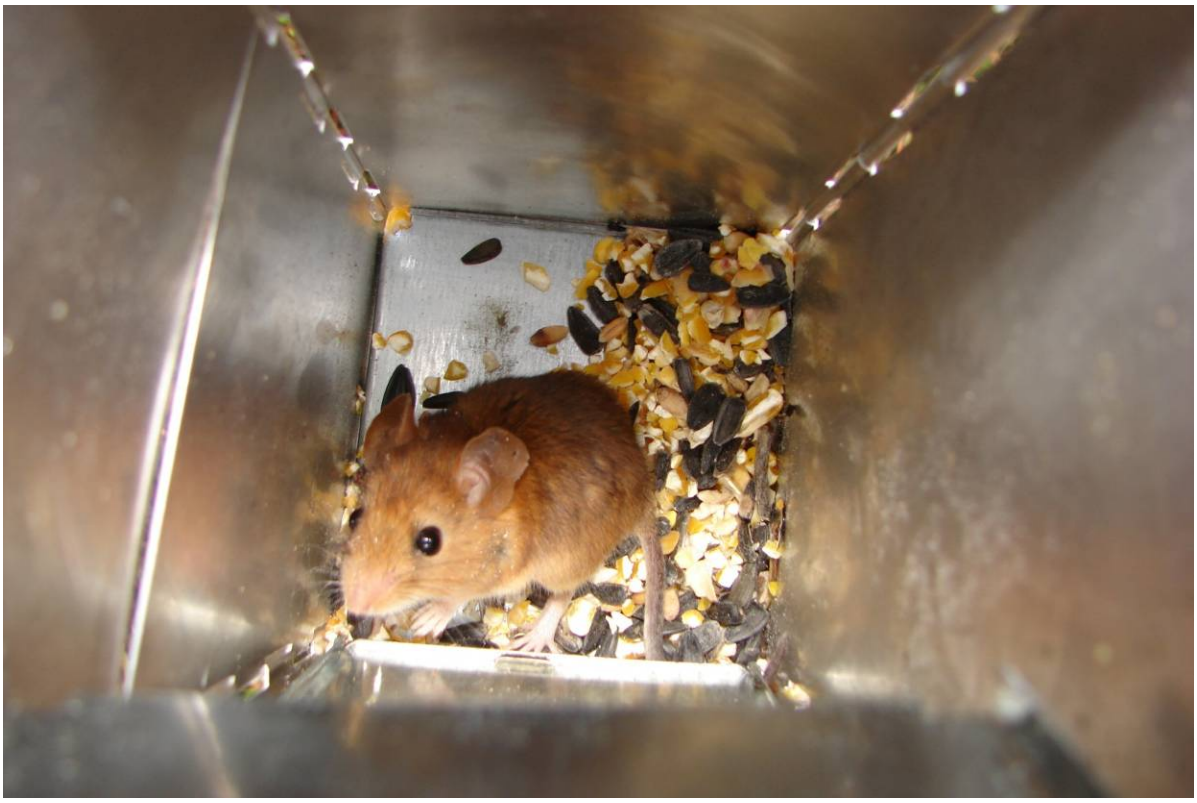
Date	Time	Species	Location	Trap number	Habitat code	Additional notes
			Terrestrial biota study (continued)			
6/23/2009		*Peromyscus leucopus*	Gum Hollow	GH-10	Upland hardwood	
6/23/2009		*Peromyscus leucopus*	Gum Hollow	GH-25	Upland hardwood	
6/23/2009		*Sigmodon hispidus*	Gum Hollow	GH-5	Upland hardwood	
6/24/2009		*Peromyscus leucopus*	Gum Hollow	GH-16A	Low bottom area	
6/24/2009		*Peromyscus leucopus*	Gum Hollow	GH-17A	Low bottom area	
6/24/2009		*Peromyscus leucopus*	Gum Hollow	GH-12	Upland hardwood	
6/24/2009		*Peromyscus leucopus*	Gum Hollow	GH-29	Upland hardwood	
6/25/2009		*Peromyscus leucopus*	Gum Hollow	GH-7A	Low bottom area	
6/25/2009		*Peromyscus leucopus*	Gum Hollow	GH-14A	Low bottom area	
6/25/2009		*Peromyscus leucopus*	Gum Hollow	GH-15	Upland hardwood	
6/25/2009		*Peromyscus leucopus*	Gum Hollow	GH-23	Low bottom area	
6/25/2009		*Peromyscus leucopus*	Gum Hollow	GH-5	Upland hardwood	
6/25/2009		*Peromyscus leucopus*	Gum Hollow	GH-29	Upland hardwood	
6/26/2009		*Peromyscus leucopus*	Gum Hollow	GH-9	Low bottom area	
6/26/2009		*Peromyscus leucopus*	Gum Hollow	GH-7A	Low bottom area	
6/26/2009		*Peromyscus leucopus*	Gum Hollow	GH-16A	Low bottom area	
6/26/2009		*Peromyscus leucopus*	Gum Hollow	GH-10	Upland hardwood	
6/26/2009		*Peromyscus leucopus*	Gum Hollow	GH-17	Low bottom area	
7/8/2009		*Zapus hudsonicius*	Gum Hollow	GH-22	Low bottom area	
7/8/2009		*Blarina brevicauda*	Gum Hollow	GH-24	Upland hardwood	
7/8/2009		*Peromyscus leucopus*	Gum Hollow	GH-19	Low bottom area	
7/8/2009		*Peromyscus leucopus*	Gum Hollow	GH-9A	Low bottom area	
7/8/2009		*Peromyscus leucopus*	Gum Hollow	GH-16A	Low bottom area	
7/8/2009		*Peromyscus leucopus*	Gum Hollow	GH-17	Low bottom area	
7/8/2009		*Peromyscus leucopus*	Gum Hollow	GH-25	Upland hardwood	

APPENDIX C. PHOTOGRAPHS OF REPRESENTATIVE SMALL MAMMALS

White-footed mouse (*Peromyscus leucopus*)
Photograph by Ron McConathy

Eastern chipmunk (*Tamias striatus*)
Photograph by Ron McConathy

Woodland vole (*Microtus pinetorum*)
Photograph by Claire Campbell



Golden mouse (*Ochrotomys nuttalli*)
Photograph by Scott Dykes

Hispid cotton rat (*Sigmodon hispidus*)
Photograph by Scott Reasor

APPENDIX D. HISTORICAL ANALYSIS OF SMALL MAMMAL TRAPPING ON THE OAK RIDGE NATIONAL ENVIRONMENTAL RESEARCH PARK

Table D.1. Historical analysis of small mammal trapping on the Oak Ridge National Environmental Research Park

1958 survey	1987 survey	1996 survey	2009–2010 survey
Southeastern shrew	Southeastern shrew	Southeastern shrew	X
Northern short-tailed shrew	Northern short-tailed shrew	Northern short-tailed shrew	Northern short-tailed shrew
Eastern chipmunk	Eastern chipmunk	Eastern chipmunk	Eastern chipmunk
Eastern harvest mouse	Eastern harvest mouse	Eastern harvest mouse	Eastern harvest mouse
White-footed mouse	White-footed mouse	White-footed mouse	White-footed mouse
Golden mouse	Golden mouse	Golden mouse	Golden mouse
Hispid cotton rat	Hispid cotton rat	Hispid cotton rat	Hispid cotton rat
Norway rat	Norway rat	Norway rat	X
Least shrew	Least shrew	Least shrew	X
House mouse	House mouse	X	X
Rice rat	Rice rat	X	X
Masked shrew	X	Masked shrew	X
Southern bog lemming	X	X	X
Meadow jumping mouse	X	X	Meadow jumping mouse
Woodland jumping mouse	X	X	X
Smoky shrew	X	X	X
Long-tailed shrew	X	X	X
Woodland vole[a]	Woodland vole[a]	Woodland vole[a]	Woodland vole[a]
X	X	Deer mouse	Deer mouse
X	X	Meadow vole	X

Note: "X" indicates the absence of the species in the pertinent study. Absence of species from the current study (2009–2010) does not indicate extirpation of these species from the Oak Ridge Reservation.

[a]Also known as pine vole or pine mouse.

APPENDIX E. OVERALL MAMMAL LIST FOR THE OAK RIDGE NATIONAL ENVIRONMENTAL RESEARCH PARK

Table E.1. Overall mammal list for the Oak Ridge National Environmental Research Park

Common name	Scientific name
Mammals	
Southeastern shrew[a]	*Sorex longirostris*
Smoky shrew[a]	*Sorex fumeus*
Northern short-tailed shrew	*Blarina brevicauda*
Rock (long-tailed) shrew[a]	*Sorex dispar*
Masked shrew[a]	*Sorex cinereus*
Least shrew	*Cryptotis parva*
Eastern mole	*Scalopus aquaticus*
Gray bat[b]	*Myotis grisescens*
Tri-colored bat	*Pipistrellus subflavus*
Silver-haired bat	*Lasionycteris noctivagans*
Big brown bat	*Eptesicus fuscus*
Eastern red bat	*Lasiurus borealis*
Evening bat	*Nycticeius humeralis*
Little brown bat	*Myotis lucifugus*
Seminole bat	*Lasiurus seminolus*
Eastern cottontail	*Sylvilagus floridanus*
Eastern chipmunk	*Tamias striatus*
Groundhog	*Marmota monax*
Eastern gray squirrel	*Sciurus carolinensis*
Southern flying squirrel	*Glaucomys volans*
Beaver	*Castor canadensis*
Meadow jumping mouse[a]	*Zapus hudsonius*
Woodland jumping mouse[a]	*Napaeozapus insignis*
Eastern harvest mouse	*Reithrodontomys humulis*
White-footed mouse	*Peromyscus leucopus*
Golden mouse	*Peromyscus nuttalli*
Deer mouse	*Peromyscus maniculatus*
Southern bog lemming[a]	*Synaptomys cooperi*
Marsh rice rat	*Oryzomys palustris*
Hispid cotton rat	*Sigmodon hispidus*
Woodland vole	*Microtus pinetorum*
Meadow vole	*Microtus pennsylvanicus*
Muskrat	*Ondatra zibethicus*
Norway rat	*Rattus norvegicus*
House mouse	*Mus musculus*
Coyote	*Canis latrans*
Red fox	*Vulpes vulpes*
Gray fox	*Urocyon cinereoargenteus*
Raccoon	*Procyon lotor*
Long-tailed weasel	*Mustela frenata*
Mink	*Mustela vison*
Opossum	*Didelphis virginiana*
Striped skunk	*Mephitis mephitis*
White-tailed deer	*Odocoileus virginianus*
Elk	*Cervus canadensis*

[a]Deemed by state as in need of management.
[b]Federally endangered.