ECOLOGICAL ASSOCIATIONS OF BATS (MAMMALIA: CHIROPTERA) IN THE

UPPER MOBILE-TENSAW RIVER DELTA, ALABAMA

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Charles Heath Kilgore

Certificate of Approval:

_____	_____
Robert S. Boyd Professor Biological Sciences	Troy L. Best, Chair Professor Biological Sciences
_____	_____
James B. Armstrong Professor Forestry and Wildlife Sciences	George T. Flowers Dean Graduate School

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Charles Heath Kilgore

A Thesis

Submitted to

the Graduate Faculty of

Auburn University

in Partial Fulfillment of the

Requirements for the

Degree of

Master of Science

Auburn, Alabama
December 19, 2008

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Charles Heath Kilgore

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Signature of Author

_____
Date of Graduation

VITA

Charles Heath Kilgore, son of Claude Marion Kilgore I and Norma Gail (Chapel) Timmons, was born 7 January 1974 in Jasper, Alabama. He graduated from Curry High School in Walker County, Alabama, in May 1992. He attended Bevill State Community College in Sumiton, Alabama, from September 1992 to May 1993. In September 1993, he enrolled in the Department of Zoology and Wildlife Sciences at Auburn University. In May 2002, he graduated with a Bachelor of Science in Wildlife Management. He worked as a field research assistant for Auburn University in the Mobile-Tensaw River Delta until being admitted into the graduate program at Auburn University in August 2003.

THESIS ABSTRACT

ECOLOGICAL ASSOCIATIONS OF BATS (MAMMALIA: CHIROPTERA) IN THE UPPER MOBILE-TENSAW RIVER DELTA, ALABAMA

Charles Heath Kilgore

Master of Science, December 19, 2008
(B.S., Auburn University, 2002)

61 Typed Pages

Directed by Troy L. Best

Relatively little is known about most of the 15 species of bats in Alabama. Especially scarce are data on species occurring in southern Alabama, including the Mobile-Tensaw Delta region. Because there are significant recent acquisitions of tracts of land into the public trust within the Mobile-Tensaw Delta region in southern Alabama, it was especially desirable to obtain an accurate biological survey. Objectives were to conduct a field survey, and to use GIS (Global Information Systems) software to identify ecological associations of bats. At each collection locality, habitat, species captured, date and time of capture, sex, age, and reproductive condition were recorded for each individual. Mist nets were used to capture bats, abandoned buildings were searched, and Alabama Department of Conservation and Natural Resources, Division of Wildlife and Freshwater Fishes provided specimens. These data were then used to create 100-m, 250-m, and 500-m buffers for spatial analysis. Seven species of bats were documented in the

Upper Mobile-Tensaw River Delta. Statistical analysis of relationships between occurrence of bats, type of timber, and age class of timber showed both positive and negative statistical relationships at all three spatial scales (100, 250, and 500 m). These varied relationships suggest that a complex matrix of multiple timber types and age classes of timber may produce the most diverse fauna of bats.

ACKNOWLEDGMENTS

I thank Michael D. Gay, John L. Hunt, Lisa A. McWilliams, Paul R. Moosman, Vikki Ashe, Jeremy A. White, Laura C. Hester, Petra Redinger, L. Michelle Gilley, and Mr. Ashe for assistance in gathering field data, preparation of specimens, or both, Harold Brayes and Jimmy Brayes of Hubbard's Landing for their endless knowledge of the Mobile-Tensaw River Delta and for their generosity, and my committee members Robert S. Boyd and James B. Armstrong for direction and support while I was conducting my research and through the writing process. I also thank the Alabama Department of Conservation and Natural Resources State Lands Division for funding, the staff of State Lands Division, Keith Gauldin, Greg Lein, Jo Lewis, and Garth Crowe for field assistance and for reference materials for the Mobile-Tensaw River Delta, and especially my advisor Troy L. Best for endless encouragement and patience without which I would never have been able to complete this research.

Style manual or journal used: Journal of Mammalogy

Software used: Microsoft Word 2003, Microsoft Excel 2003, ESRI ArcGIS, and SAS.

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INTRODUCTION

The bat fauna of Alabama includes 15 species; southeastern myotis (*Myotis austroriparius*), gray myotis (*M. grisescens*), little brown myotis (*M. lucifugus*), northern long-eared myotis (*M. septentrionalis*), Indiana myotis (*M. sodalis*), perimyotis (*Perimyotis subflavus*), big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), eastern red bat (*Lasiurus borealis*), hoary bat (*L. cinereus*), northern yellow bat (*L. intermedius*), Seminole bat (*L. seminolus*), evening bat (*Nycticeius humeralis*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), and Brazilian free-tailed bat (*Tadarida brasiliensis*; Best 2004*a*; Hall 1981; Harvey et al. 1999). Of these, two are listed as endangered by the United States Fish and Wildlife Service (*M. grisescens* and *M. sodalis*) and three are listed as "Highest Conservation Concern" by the Alabama Department of Conservation and Natural Resources (*M. grisescens*, *M. sodalis, C. rafinesquii*). Also listed by the Alabama Department of Conservation and Natural Resources, are five species of "High Conservation Concern" (*M. lucifugus*, *M. austroriparius, M. septentrionalis, L. intermedius, T. brasiliensis*), two of "Moderate Conservation Concern" (*L. noctivagans* and *L. cinereus*), and five of "Lowest Conservation Concern" (*P. subflavus, E. fuscus, L. borealis, L. seminolus, N. humeralis*; Best 2004*a*).

Relatively little is known about bats in Alabama, but considerable research has been conducted within the past 2 decades (e.g., Best et al. 1993, 1997; Best and Hudson

1996; Durden et al. 1992; Goebel 1996; Henry 1998; Henry et al. 2000; Hilton and Best 2000; Hirt 2008; Kiser 1996, 2000; Milam 1996; Thomas and Best 2000). Especially scarce are data on species occurring in southern Alabama, including the Mobile-Tensaw Delta region (e.g., Best et al. 1993; Howell 1921; La Val 1967; Linzey and Linzey 1969; Linzey 1970). Previously, *M. austroriparius* was reported from Baldwin, Conecuh, Covington, and Monroe counties (Best et al. 1993; Linzey 1970). Howell (1921:25) reported that *P. subflavus* "is scarce or absent in southern Alabama," but subsequently, *P. subflavus* was reported from Clarke (Best et al. 1993; Brennan and White 1960), Butler, Conecuh, Covington, Monroe, and Wilcox counties (Best et al. 1993). *Myotis lucifugus, M. septentrionalis*, and *M. grisescens* were reported from Conecuh Co. (La Val 1967). In addition, *M. grisescens* has been reported in south-central Alabama from "the cave near Fort Deposit" (Howell 1921:24). No *M. lucifugus, M. septentrionalis*, or *M. grisescens* was observed by Best et al. (1993) in southern Alabama, but one *M. grisescens* was observed in Conecuh Co. in November 1996 (T. L. Best, pers. comm.). There is no record of *M. sodalis* in southern Alabama (Hall 1981), but this species occurs in northwestern Florida (Thomson 1982). *Corynorhinus rafinesquii* has been reported from southern Alabama in Hale and Autauga counties (Howell 1921), two were observed in Clarke Co. on 12 November 1988, and one was observed there on 24 February 1990 (Best et al. 1993). *Tadarida brasiliensis* has been reported from Mobile, Baldwin (Linzey 1970), and several other southern counties (Howell 1921; Kiser 2000).

Because there are significant recent acquisitions of tracts of land into the public trust within the Mobile-Tensaw Delta region in southern Alabama, it is especially desirable to obtain an accurate biological survey. Considering the overall paucity of

information on bats in the region, a field survey of species present, distribution, habitats occupied, location of roost sites, etc., is highly desirable. These data would be useful in developing management plans for the area, and they would provide baseline data for comparisons and future research.

MATERIALS AND METHODS

Study area.--The Mobile-Tensaw River Delta is in southwestern Alabama along the boundary between Mobile and Baldwin counties (Fig. 1). The delta is 13.5 km wide, 56 km long, and consists of 756 km^2 of rivers, lakes, bayous, and tupelo swamps. The Mobile-Tensaw River Delta drains 115,513 km^2 of land including 86% of Alabama and portions of Georgia, Mississippi, and Tennessee (Isphording et al. 1996). The long narrow shape and extensive drainage area of the delta, coupled with an average annual rainfall of 165 cm, results in frequent and sometimes extended periods of flooding (Jeffcoat et al. 1991). Due to frequent flooding, access to the study area often was limited. Only one maintained road provided access to a small portion of the Upper Delta Wildlife Management Area. The remainder of the study area was accessible only by boat. Areas that were relatively dry and above water often were difficult to access due to extensive siltation of the delta, which results in soils that are similar in stability to quicksand.

Intensive logging during the past >80 years has left a mosaic of different-aged stands of trees in the Mobile-Tensaw River Delta. These stands of trees differ in composition of species and overall structure. This mosaic of habitats provided an opportunity to study habitat associations of organisms, especially bats, within this diverse

area. No study has been conducted specifically on bats in the Mobile-Tensaw River Delta; however, two mammalian surveys were conducted in Alabama that included this area (Howell 1921; Linzey 1970).

Data collection.--Data were obtained during May 2002-May 2004. Bats were captured in mist nets that were placed across narrow passageways over land or water (one mist net set for 1 night = 1 mist-net night), abandoned houses (fishing camps) were searched throughout the study area, and bats were shot as they flew overhead by personnel of the Alabama Department of Conservation and Natural Resources, Division of Wildlife and Freshwater Fishes. Each bat collected was identified to species, its sex and reproductive status were determined, and its age was assigned as either adult or young-of-the-year, the latter based upon degree of ossification of phalanges (Anthony 1988). The degree of ossification was determined by placing a light source behind the wing of the bat and observing the joints of the phalanges. Latitude and longitude of the collection site for each specimen was recorded using a handheld GPS (Global Positioning System) unit. All bats collected were prepared as standard voucher specimens and deposited in the Auburn University Collection of Mammals.

Spatial analysis.--Data collected in the field portion of this research were entered into database format (Excel 2003, Microsoft Corp., Redmond, Washington) and imported into ESRI ArcGIS for spatial analysis (ESRI Corp., Redlands, California). When the study area was purchased by the Alabama Department of Conservation and Natural Resources Forever Wild Program, the previous land owner (International Paper Company) provided spatial data associated with their timber-management practices (Fig. 1). These data were used to assess habitat associations of bats. For each locality, a point

was generated within ArcGIS. Three buffers (100, 250, and 500 m) were then created around each point. These buffers were used to determine area of each type of habitat that occurred within the buffer, including amount of each type of timber, age of forest, and amount of open water. These data were entered into database files (Appendices 1-7).

Statistical analysis.--Data produced by the spatial-analysis portion of this project were compiled and divided into two groups; type of timber and age of stand. There were 14 types of timbered habitat in the study area. Due to similarities of some types of timbered habitats and rarity of others, they were combined into four types for analyses; bottomland ridges, bottomland swamps, man made openings, and open water. Stands of trees ranged in age from 6 to >80 years. Data for age of stand were divided into four classes; 0-19, 20-39, 40-59, and >80 years. There was no logging during 1923-1945; thus, there was no 60-80-year age class. A multivariate analysis of variance (MANOVA; SAS Institute, Inc., Cary, North Carolina) was performed to ascertain associations among types of timbered habitat, age class of timber, and species of bat.

RESULTS

I conducted 154 mist-net nights at 71 sites and 46 searches of abandoned houses (= fishing camps; some fishing camps were searched more than once). In addition, personnel of the Alabama Department of Conservation and Natural Resources, Division of Wildlife and Freshwater Fishes, obtained specimens of bats at 46 sites. From these efforts, 25 bats were captured in mist nets, 4 were captured in fishing camps, and 145 specimens were provided by state officials (Appendix 1). This resulted in seven species of bats documented in the Mobile-Tensaw River Delta; *Myotis austroriparius* (n = 15),

Perimyotis subflavus ($n = 49$), *Lasiurus borealis* ($n = 22$), *L. seminolus* ($n = 51$), *Nycticeius humeralis* ($n = 32$), *Corynorhinus rafinesquii* ($n = 4$), and *L. cinereus* ($n = 2$).

MANOVA assessment of relationships among type of timbered habitat and presence of each species of bat within 100-m buffers revealed significant associations between presence of open water ($r^2 = 0.246$; $P < 0.001$), lowlands ($r^2 = 0.077$; $P = 0.050$), and overall type of timbered habitat ($P = 0.003$) with *P. subflavus* (Table 1). Assessment using 250-m buffers revealed significant associations between *P. subflavus* and presence of open water ($r^2 = 0.173$; $P = 0.002$) and overall type of timbered habitat ($P = 0.039$; Table 2). There were significant associations between occurrence of *M. austroriparius* and presence of lowland ridge ($r^2 = 0.078$; $P = 0.048$), lowlands ($r^2 = 0.163$; $P = 0.003$), and overall type of timbered habitat ($P = 0.018$; Table 2). For type of timbered habitat in 500-m buffers, there was a significant association with presence of *L. borealis* and overall type of timber and ($P = 0.009$). There were significant associations between *M. austroriparius* and presence of lowland ridge ($r^2 = 0.126$; $P = 0.011$), lowlands ($r^2 = 0.202$; $P = 0.001$), and overall type of timber ($P = 0.008$; Table 3).

MANOVA assessment of relationships among age of timber and presence of each species of bat within 100-m buffers revealed a significant relationship between occurrence of *P. subflavus* and overall age of timber ($P = 0.002$; Table 4). There were significant associations between *L. borealis* and the 40-59-year age class of timber ($r^2 < 0.106$; $P = 0.020$), the >80-year age class of timber ($r^2 < 0.114$; $P = 0.016$), and overall age class of timber ($P = 0.038$; Table 4). For data collected within the 250-m buffer, MANOVA assessment of relationships among age of timber and presence of each species of bat detected significant associations between the 0-19-year age class of timber ($r^2 =$

0.078; $P = 0.048$) and presence of *C. rafinesquii*, between the overall age of timber ($P = 0.011$) and *P. subflavus*, and between the >80-year age class of timber ($r^2 < 0.001$; $P = 0.989$) and overall age of timber ($P = 0.052$) with *L. borealis* (Table 5). Results of the MANOVA for age-class data that were acquired in 500-m buffers were significant associations between the 20-39-year age class of timber ($r^2 = 0.102$; $P = 0.023$), the >80-year age class of timber ($r^2 = 0.105$; $P = 0.021$), and the overall age of timber ($P = 0.045$) with occurrence of *L. borealis* (Table 6).

DISCUSSION

The survey portion of this research documented seven species of bats in the Mobile-Tensaw River Delta. These findings are similar to those of other regional surveys by Humphery (1975) and Miller (2003) in eastern Mississippi and Lance and Garrett (1997) in Louisiana. The primary difference was that each of these studies documented the big brown bat as a relatively abundant species in the respective areas of study; however, I did not capture this species in the Mobile-Tensaw River Delta.

Three additional species of bats were expected to occur in the study area, but were not observed (Best 2004*a*); *Lasionycteris noctivagans*, *Lasiurus intermedius*, and *T. brasiliensis*. Possibly, these species were not observed due to sampling techniques, seasonality of sampling, rarity of these species, or these species may not occur in the Mobile-Tensaw River Delta. There is no record of *L. noctivagans* in southern Alabama; it is migratory and occurs in northern Alabama only during autumn and winter (Cryan 2003; Hirt 2008). There is one published record of *L. intermedius* in Alabama. This individual was found near St. Thomas Elementary School in Chickasaw, northern

Baldwin County. Although there have been few studies of bats in southern Alabama (Best et al. 1993; Howell 1921; Linzey 1970; Linzey and Linzey 1969), this single record suggests that *L. intermedius* is rare in Alabama. There are many records of *T. brasiliensis* from the southern one-half of Alabama, including Mobile and Baldwin counties (Hall 1981; Kiser 2000). Because colonies of *T. brasiliensis* are known from the area (Kiser 2000), because they may fly >50 km to foraging sites (Best and Geluso 2003), and because they may forage at altitudes ≤3,000 m (McCracken 1996; McCracken et al. 1999; Williams et al. 1973), it was surprising that the species was not documented in the Mobile-Tensaw River Delta. Kiser (2000) expressed concern that the species was declining in Alabama, because all colonies were in man-made structures and were being destroyed shortly after discovery. The precarious status of this species also is supported by its designation as a species of high conservation concern by the Alabama Department of Conservation and Natural Resources (Best 2004*a*).

Worthy of special note was the capture of a young-of-the-year female *L. cinereus* at 0045 h CDT on 1 August 2002 at the edge of a slough on the north bank of Stiggins Lake. It was captured in a mist net within a mature stand of bald cypress trees (*Taxodium distichum*). Because of a lack of specimens from the southeastern United States during June-September (Cryan 2003), this appears to be the first record of reproductive activity by this species in the southeastern United States. From distributional records of female *L. cinereus* during time of parturition (mid-May until July), it appears that parturition in the species usually occurs in the northern portion of the United States and the southern one-half of Canada (Cryan 2003).

Capture of only 25 bats during 154 mist-net nights at 71 sites seems to be an especially low rate of capture for an area with many bats observed flying throughout the night. There are several possible reasons for this low number of captures. Of the 25 bats captured in mist nets, 20 were captured in spring or early summer (Appendix 1). Bats were seen flying over canopies of all ages and species of timber, in open areas, and over large and small bodies of water. However, few bats were seen using roadways and narrow waterways (creeks and other narrow bodies of water), which were habitats that were mist-netted most often due to these forest-lined flyways helping to funnel bats toward mist nets. Areas where most bats were observed flying were nearly impossible to mist net due to either altitude that bats were flying above tops of trees, size of open areas, or size and depth of bodies of open water. As weather warmed in spring and during summer months, numbers of spider webs increased substantially in wooded habitats. A plausible hypothesis as to why few bats were captured in mist nets is that bats were not using low-altitude flyways along creeks or narrow waterways within wooded habitats because of the abundance of golden orb-weaver spiders (*Argiope*) and their webs in these habitats. These large, relatively strong, webs might pose a risk to bats that used these flyways, especially when the number of webs increases during warmer months. These webs may be the primary reason bats use more open habitats. Also associated with presence of spider webs was the possibility that echolocation was more discriminating while bats were maneuvering through the web-cluttered habitats. Perhaps, focus by bats on detection of spider webs facilitated detection of mist nets as well; thus, mist nets captured few bats. In support of the hypothesis that spider webs might result in mortality

and are avoided by bats, Ladue (1993) reported a canyon bat (*Parastrellus hesperus*) that died when it became entangled in a spider web.

There is relatively little research on *C. rafinesquii* in the southeastern United States, including Alabama (Best 2004*a*, 2004*b*). During this project, four *C. rafinesquii* were discovered roosting in abandoned fishing camps in the Mobile-Tensaw River Delta. These fishing camps were abandoned houses constructed by fishermen and hunters who leased these locations from the previous landowner. When the Alabama Department of Conservation acquired this land, all fishing-hunting leases were terminated. At the time my research was conducted, plans were underway to remove these structures from state-owned properties. In an attempt to determine the importance of these structures to the local bat fauna, surveys were conducted at 17 fishing camps for a total of 46 visits (some fishing camps were visited more than one time). Only one species of bat was observed in these structures; *C. rafinesquii* was in two fishing camps, one on Bayou Zeast, just north of Interstate Highway 65 off of the Mobile River, and the other was at the mouth of Stiggins Lake, Tensaw River. These two fishing camps housed the only *C. rafinesquii* observed during this research project. Two *C. rafinesquii* were in the fishing camp on Bayou Zeast on 10 July 2002. Another was in the fishing camp at the mouth of Stiggins Lake on 9 October 2002; this bat was captured and fitted with a radiotransmitter (Model BD-2A with reed switch, Holohil Systems, Ltd., Carp, Ontario, Canada) and released into the fishing-camp building. I returned at dusk to monitor the bat; the bat left the fishing camp with radiotransmitter attached and went north to Napp Lake. On subsequent days, I returned to the fishing camp and surrounding area with a radioreceiver in attempts to locate this bat to aid in finding additional roost sites. The bat with the radiotransmitter

was not detected again using radiotelemetry; however, on returning to the fishing camp where the bat originally was captured on 23 October 2002, a *C. rafinesquii* was present with a distinct hairless spot on its back. This suggested that this was the same bat that was captured and radiotransmittered previously and may explain why it was never located after its first out-flight. Because I do not know for certain that the bat that was radiotransmittered and the one later observed with the missing hair on its back were the same, I counted these as two individuals. Since the conclusion of my research, all fishing camps have been removed from state lands located in the Mobile-Tensaw River Delta.

Statistical analysis of relationships between occurrence of bats, type of timber, and age class of timber showed both positive and negative statistical relationships at all three spatial scales (100, 250, and 500 m). These varied relationships suggest that a complex matrix of multiple timber types and age classes of timber may produce the most diverse fauna of bats. Presence of habitat complexity (gaps in canopy, open mid-story, canopy cover, cavities in trees) is important to bats; these structural components are provided by a diverse mixture of forest types (Loeb and O'Keefe 2006; Ford et al. 2005, 2006). This complexity also was detected by Gorresen and Willig (2004) in Paraguay using arcGIS spatial analysis of land use and habitat parameters.

As forest habitats in the Mobile-Tensaw River Delta recover from intensive harvesting during the coming decades, it will provide suitable habitat for bats. This unique ecosystem will maintain habitat complexity due to in propensity to change, be it from extensive flooding, hurricanes, or other intense storms. Future research should assess roost-site selection and effects of golden orb-weaver spiders on bats in the Mobile-

Tensaw River Delta. Acoustical monitoring would facilitate assessment of use of habitats, possibly even including species of bats not detected during my study.

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Fig. 1. Upper Delta Wildlife Management Area in Mobile and Baldwin counties, southwestern Alabama. Shaded areas are state-owned properties within the delta region and boundaries delineate individual stands of timber used in statistical analysis. Dots represent captures of bats during 2002-2004.

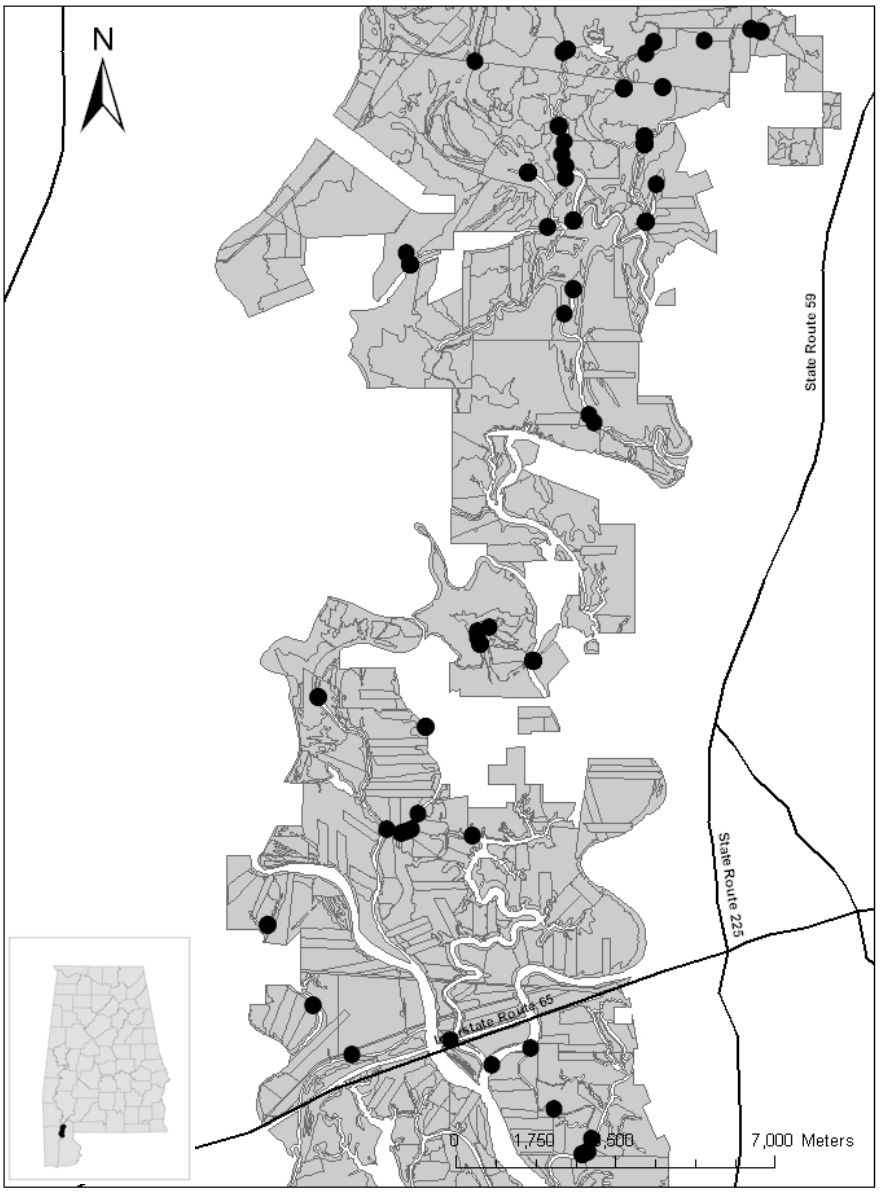

Table 1. Results of statistical analysis (MANOVA) of presence of seven species of bats and categories of habitat for 100-m buffers on the Upper Delta Wildlife Management Area, Mobile and Baldwin counties, Alabama.

	Timber type categories													
	Open water			Bottomland ridge			Bottomlands			Man-made openings			Overall	
Species	*F*	r^2	*P*	*F*	r^2	*P*	*F*	r^2	*P*	*F*	r^2	*P*	*F*	*P*
Nycticeius humeralis	0.90	0.018	0.347	0.09	0.001	0.760	0.41	0.008	0.523	0.33	0.006	0.566	0.40	0.804
Lasiurus cinereus	0.64	0.013	0.427	0.74	0.015	0.392	0.03	<0.001	0.861	0.14	0.002	0.711	0.36	0.834
Perimyotis subflavus	15.67	0.246	<0.001	0.23	0.004	0.635	4.01	0.077	0.050	0.56	0.011	0.456	4.68	0.003
Corynorhinus rafinesquii	0.10	0.002	0.757	0.37	0.007	0.543	0.44	0.009	0.509	0.21	0.004	0.646	0.27	0.896
Lasiurus borealis	4.66	0.088	0.036	0.80	0.016	0.375	3.58	0.069	0.064	0.09	0.001	0.763	1.74	0.157
Lasiurus seminolus	0.09	0.001	0.765	0.01	<0.001	0.932	0.01	<0.001	0.904	0.98	0.020	0.320	0.55	0.702
Myotis austroriparius	1.57	0.031	0.215	0.81	0.016	0.372	2.00	0.039	0.164	0.14	0.002	0.709	0.57	0.684

Table 2. Results of statistical analysis (MANOVA) of presence of seven species of bats and categories of habitat for 250-m buffers on the Upper Delta Wildlife Management Area, Mobile and Baldwin counties, Alabama.

	Timber type categories													
	Open water			Bottomland ridge			Bottomlands			Man-made openings			Overall	
Species	*F*	r^2	*P*	*F*	r^2	*P*	*F*	r^2	*P*	*F*	r^2	*P*	*F*	*P*
Nycticeius humeralis	0.01	<0.001	0.918	0.65	0.013	0.422	0.15	0.003	0.697	0.02	<0.001	0.898	0.23	0.920
Lasiurus cinereus	0.63	0.012	0.432	0.01	<0.001	0.921	0.01	<0.001	0.932	0.15	0.003	0.698	0.24	0.911
Perimyotis subflavus	10.03	0.172	0.002	0.13	0.002	0.717	2.36	0.046	0.130	0.09	0.001	0.765	2.75	0.039
Corynorhinus rafinesquii	0.00	<0.001	0.955	0.05	0.001	0.826	0.00	<0.001	0.985	0.23	0.004	0.631	0.15	0.963
Lasiurus borealis	3.39	0.065	0.071	1.04	0.021	0.312	0.68	0.013	0.413	0.33	0.006	0.570	2.53	0.053
Lasiurus seminolus	0.93	0.018	0.340	0.12	0.002	0.727	0.05	<0.001	0.832	1.89	0.037	0.175	0.82	0.518
Myotis austroriparius	2.19	0.043	0.145	4.09	0.078	0.048	9.35	0.163	0.003	0.27	0.005	0.608	3.33	0.018

Table 3. Results of statistical analysis (MANOVA) of presence of seven species of bats and categories of habitat for 500-m buffers on the Upper Delta Wildlife Management Area, Mobile and Baldwin counties, Alabama.

	Timber type categories													
	Open water			Bottomland ridge			Bottomlands			Man-made openings			Overall	
Species	*F*	r^2	*P*	*F*	r^2	*P*	*F*	r^2	*P*	*F*	r^2	*P*	*F*	*P*
Nycticeius humeralis	0.01	<0.001	0.918	0.29	0.005	0.595	0.01	<0.001	0.915	1.88	0.037	0.177	0.84	0.509
Lasiurus cinereus	0.68	0.014	0.413	0.30	0.006	0.584	0.20	0.004	0.659	0.26	0.005	0.613	0.35	0.841
Perimyotis subflavus	1.18	0.023	0.283	0.70	0.014	0.407	0.88	0.017	0.353	0.19	0.004	0.661	0.42	0.796
Corynorhinus rafinesquii	0.01	<0.001	0.937	0.12	0.002	0.731	0.01	<0.001	0.939	0.39	0.008	0.535	0.13	0.968
Lasiurus borealis	2.11	0.042	0.153	2.24	0.044	0.140	0.32	0.006	0.576	0.92	0.018	0.342	3.83	0.009
Lasiurus seminolus	0.94	0.019	0.337	0.96	0.019	0.332	0.67	0.013	0.418	3.07	0.060	0.085	1.21	0.319
Myotis austroriparius	2.55	0.050	0.116	6.94	0.126	0.011	12.21	0.202	0.001	0.54	0.011	0.465	3.91	0.008

Table 4. Results of statistical analysis (MANOVA) of presence of seven species of bats and categories of age class of timber for 100-m buffers on the Upper Delta Wildlife Management Area, Mobile and Baldwin counties, Alabama.

	Age class of timber categories													
	0-19 years			20-39 years			40-59 years			>80 years			Overall	
Species	*F*	r^2	*P*	*F*	r^2	*P*	*F*	r^2	*P*	*F*	r^2	*P*	*F*	*P*
Nycticeius humeralis	0.35	0.007	0.559	3.66	0.070	0.061	0.04	<0.001	0.845	1.55	0.031	0.218	1.12	0.360
Lasiurus cinereus	0.70	0.014	0.405	0.48	0.010	0.490	0.98	0.020	0.326	0.66	0.014	0.421	0.66	0.620
Perimyotis subflavus	0.51	0.010	0.476	3.23	0.063	0.078	0.00	<0.001	0.999	0.94	0.019	0.338	4.89	0.002
Corynorhinus rafinesquii	0.60	0.012	0.442	0.74	0.015	0.393	0.01	<0.001	0.904	0.06	0.0013	0.804	0.30	0.873
Lasiurus borealis	0.05	0.001	0.817	1.77	0.035	0.189	5.70	0.106	0.020	6.18	0.114	0.016	2.78	0.038
Lasiurus seminolus	0.35	0.007	0.555	0.37	0.007	0.543	0.05	0.001	0.818	0.00	<0.001	0.988	0.17	0.954
Myotis austroriparius	0.17	0.003	0.681	0.00	<0.001	0.991	0.24	0.004	0.628	0.04	<0.001	0.845	0.38	0.819

Table 5. Results of statistical analysis (MANOVA) of presence of seven species of bats and categories of age class of timber for 250-m buffers on the Upper Delta Wildlife Management Area, Mobile and Baldwin counties, Alabama.

	Age class of timber categories													
	0-19 years			20-39 years			40-59 years			>80 years			Overall	
Species	*F*	r^2	*P*	*F*	r^2	*P*	*F*	r^2	*P*	*F*	r^2	*P*	*F*	*P*
Nycticeius humeralis	0.27	0.005	0.603	2.53	0.050	0.118	0.00	<0.001	0.954	0.99	0.020	0.325	0.69	0.603
Lasiurus cinereus	1.50	0.030	0.226	0.05	0.001	0.828	1.06	0.021	0.307	0.60	0.012	0.442	0.83	0.512
Perimyotis subflavus	0.41	0.008	0.527	1.43	0.029	0.237	0.26	0.005	0.615	0.46	0.009	0.499	3.67	0.011
Corynorhinus rafinesquii	4.09	0.078	0.048	1.06	0.021	0.309	0.22	0.004	0.639	0.24	0.004	0.629	1.08	0.378
Lasiurus borealis	0.60	0.012	0.441	3.49	0.067	0.067	2.92	0.057	0.093	5.57	0.103	0.022	2.55	0.052
Lasiurus seminolus	1.28	0.025	0.263	0.52	0.010	0.474	0.17	0.003	0.678	0.00	<0.001	0.985	0.75	0.564
Myotis austroriparius	0.84	0.017	0.365	0.81	0.016	0.372	0.72	0.014	0.401	0.00	<0.001	0.988	1.17	0.336

Table 6. Results of statistical analysis (MANOVA) of presence of seven species of bats and categories of age class of timber for 500-m buffers on the Upper Delta Wildlife Management Area, Mobile and Baldwin counties, Alabama.

	Age class of timber categories													
	0-19 years			20-39 years			40-59 years			>80 years			Overall	
Species	*F*	r^2	*P*	*F*	r^2	*P*	*F*	r^2	*P*	*F*	r^2	*P*	*F*	*P*
Nycticeius humeralis	0.06	0.001	0.801	2.55	0.050	0.117	0.20	0.004	0.660	0.59	0.012	0.446	0.68	0.612
Lasiurus cinereus	1.30	0.026	0.259	0.00	<0.001	0.988	0.66	0.013	0.419	0.61	0.012	0.440	0.78	0.545
Perimyotis subflavus	0.44	0.009	0.511	1.14	0.023	0.291	0.98	0.020	0.326	0.93	0.019	0.339	1.24	0.306
Corynorhinus rafinesquii	2.66	0.052	0.109	0.80	0.016	0.376	0.16	0.003	0.693	0.26	0.005	0.609	0.66	0.621
Lasiurus borealis	0.06	0.001	0.806	5.47	0.102	0.023	0.93	0.019	0.340	5.64	0.105	0.021	2.65	0.045
Lasiurus seminolus	0.46	0.009	0.502	1.16	0.023	0.287	0.31	0.006	0.581	0.28	0.005	0.598	0.94	0.448
Myotis austroriparius	0.41	0.008	0.525	1.65	0.033	0.205	0.00	<0.001	0.994	1.28	0.026	0.262	0.83	0.514

Appendix 1. Collecting site, date (day, month, year), latitude, longitude, genus, species, specimen number, and method of data collection for a study of bats inhabiting the Upper Delta Wildlife Management Area, Mobile and Baldwin counties, Alabama.

Collection site	Day	Month	Year	Latitude	Longitude	Genus	Species	Specimen number	Collection method
1	21	May	2002	31.1288	87.8950	*Lasiurus*	*borealis*		Mist nets
2	21	May	2002	31.1288	87.8950	*Lasiurus*	*borealis*		Mist nets
3	21	May	2002	31.1288	87.8950	*Lasiurus*	*borealis*		Mist nets
4	21	May	2002	31.1288	87.8950	*Lasiurus*	*borealis*		Mist nets
5	21	May	2002	31.1288	87.8950	*Myotis*	*austroriparius*	C. H. Kilgore 61	Mist nets
6	21	May	2002	31.1288	87.8950	*Myotis*	*austroriparius*		Mist nets
7	22	May	2002	31.1303	87.8751	*Lasiurus*	*seminolus*		Mist nets
8	22	May	2002	31.1303	87.8751	*Lasiurus*	*seminolus*		Mist nets
9	23	May	2002	31.1211	87.8819	*Lasiurus*	*seminolus*		Mist nets
10	23	May	2002	31.1211	87.8819	*Lasiurus*	*seminolus*		Mist nets
11	23	May	2002	31.1211	87.8819	*Lasiurus*	*seminolus*		Mist nets
12	23	May	2002	31.1211	87.8819	*Lasiurus*	*seminolus*		Mist nets
13	23	May	2002	31.1211	87.8819	*Lasiurus*	*borealis*		Mist nets
14	29	May	2002	31.1330	87.8526	*Lasiurus*	*borealis*		Mist nets
15	29	May	2002	31.1330	87.8526	*Lasiurus*	*seminolus*		Mist nets
16	4	June	2002	31.1120	87.9335				Mist nets
17	5	June	2002	31.1120	87.9285				Mist nets
18	6	June	2002	31.1038	87.9141				Mist nets
19	11	June	2002	31.0071	87.9138				Mist nets
20	12	June	2002	30.9539	87.9181				Mist nets
21	12	June	2002	30.9527	87.9121				Mist nets
22	13	June	2002	30.9310	87.9013	*Nycticeius*	*humeralis*		Mist nets
23	13	June	2002	30.9317	87.9040				Mist nets
24	13	June	2002	30.9324	87.9198	*Nycticeius*	*humeralis*		Mist nets
25	9	July	2002	31.0173	87.8881				Mist nets

Appendix 1. (Continued)

Collection site	Day	Month	Year	Latitude	Longitude	Genus	Species	Specimen number	Collection method
26	10	July	2002	30.9336	87.9297				Observation in building
27	10	July	2002	30.9121	87.9542				Observation in building
28	10	July	2002	30.9390	87.9514	*Corynorhinus*	*rafinesquii*		Observation in building
29	10	July	2002	30.9390	87.9514	*Corynorhinus*	*rafinesquii*		Observation in building
30	10	July	2002	30.9570	87.9604				Observation in building
31	10	July	2002	30.9390	87.9514				Observation in building
32	11	July	2002	31.0846	87.8933				Observation in building
33	11	July	2002	31.0940	87.8939				Observation in building
34	11	July	2002	31.0936	87.8940				Observation in building
35	11	July	2002	31.0932	87.8949				Observation in building
36	11	July	2002	31.0524	87.9132				Mist nets
37	11	July	2002	31.0542	87.9105				Mist nets
38	11	July	2002	31.0538	87.9066				Mist nets
39	23	July	2002	31.0491	87.8718				Mist nets
40	24	July	2002	31.0051	87.9025				Mist nets
41	24	July	2002	31.1120	87.8744				Mist nets
42	24	July	2002	31.1022	87.8742	*Lasiurus*	*seminolus*		Mist nets
43	25	July	2002	31.0637	87.8915				Mist nets
44	25	July	2002	31.0565	87.8892				Mist nets
45	30	July	2002	30.9281	87.9474				Mist nets
46	30	July	2002	30.9295	87.9436				Mist nets
47	30	July	2002	30.9293	87.9424	*Nycticeius*	*humeralis*		Mist nets
48	31	July	2002	30.9748	87.8982				Mist nets
49	31	July	2002	30.9735	87.8982				Mist nets
50	31	July	2002	30.9724	87.9069				Mist nets

Appendix 1. (Continued)

Collection site	Day	Month	Year	Latitude	Longitude	Genus	Species	Specimen number	Collection method
51	1	August	2002	31.0891	87.9319				Mist nets
52	1	August	2002	31.0881	87.9315	*Lasiurus*	*cinereus*		Mist nets
53	27	August	2002	31.0638	87.8701				Mist nets
54	28	August	2002	31.0051	87.9025				State Lands Division
55	28	August	2002	31.1310	87.8792				Mist nets
56	3	September	2002	31.1454	87.8682				Mist nets
57	4	September	2002	31.0051	87.9025				State Lands Division
58	4	September	2002	31.1261	87.9161	*Nycticeius*	*humeralis*	C. H. Kilgore 64	State Lands Division
59	4	September	2002	31.0971	87.8988				Mist nets
60	4	September	2002	31.1001	87.9010				Mist nets
61	4	September	2002	31.1009	87.9021				Mist nets
62	4	September	2002	31.1014	87.9033				Mist nets
63	4	September	2002	31.1024	87.9077				Mist nets
64	8	October	2002	30.9390	87.9514				Observation in building
65	9	October	2002	31.0957	87.8973				Observation in building
66	9	October	2002	31.0934	87.8991	*Corynorhinus*	*rafinesquii*		Observation in building
67	9	October	2002	31.0936	87.8940				Observation in building
68	9	October	2002	31.1007	87.8918				Observation in building
69	22	October	2002	31.1281	87.8769	*Lasiurus*	*seminolus*	C. H. Kilgore 69	State Land Division
70	23	October	2002	31.0934	87.8991	*Corynorhinus*	*rafinesquii*		Observation in building
71	23	October	2002	31.1449	87.9137				Mist nets
72	9	November	2002	31.0001	87.9509	*Lasiurus*	*seminolus*	C. H. Kilgore 68	State Lands Division
73	9	November	2002	31.0001	87.9509	*Lasiurus*	*seminolus*	C. H. Kilgore 70	State Lands Division
74	9	November	2002	31.0001	87.9509	*Lasiurus*	*seminolus*	C. H. Kilgore 71	State Lands Division
75	9	November	2002	31.0001	87.9509	*Lasiurus*	*seminolus*	C. H. Kilgore 72	State Lands Division

Appendix 1. (Continued)

Collection site	Day	Month	Year	Latitude	Longitude	Genus	Species	Specimen number	Collection method
76	12	December	2002	31.0948	87.8931	*Lasiurus*	*seminolus*	C. H. Kilgore 94	State Lands Division
77	12	December	2002	31.0948	87.8931	*Lasiurus*	*cinereus*	P. R. Moosman 36	State Lands Division
78	2	February	2003	31.1325	87.8502	*Lasiurus*	*borealis*	C. H. Kilgore 95	State Lands Division
79	2	February	2003	31.1325	87.8502	*Lasiurus*	*seminolus*	C. H. Kilgore 96	State Lands Division
80	25	March	2003	31.1115	87.8770	*Nycticeius*	*humeralis*		State Lands Division
81	25	March	2003	31.1115	87.8770	*Perimyotis*	*subflavus*		State Lands Division
82	25	March	2003	31.1115	87.8770	*Lasiurus*	*seminolus*	C. H. Kilgore 73	State Lands Division
83	25	March	2003	31.1115	87.8770	*Lasiurus*	*seminolus*	C. H. Kilgore 74	State Lands Division
84	25	March	2003	31.1115	87.8770	*Lasiurus*	*seminolus*		State Lands Division
85	26	March	2003	30.9390	87.9514				Observation in Building
86	26	March	2003	30.9548	87.9621	*Lasiurus*	*seminolus*	C. H. Kilgore 75	Observation in building
87	26	March	2003	30.9548	87.9621	*Lasiurus*	*seminolus*	C. H. Kilgore 76	State Lands Division
88	26	March	2003	30.9548	87.9621	*Lasiurus*	*seminolus*	C. H. Kilgore 77	State Lands Division
89	26	March	2003	30.9548	87.9621	*Lasiurus*	*seminolus*	P. R. Moosman 32	State Lands Division
90	27	March	2003	31.0934	87.8991				Observation in building
91	27	March	2003	31.1042	87.9037	*Nycticeius*	*humeralis*	P. R. Moosman 33	State Lands Division
92	27	March	2003	31.1042	87.9037	*Nycticeius*	*humeralis*	C. H. Kilgore 80	State Lands Division
93	27	March	2003	31.1042	87.9037	*Lasiurus*	*seminolus*	C. H. Kilgore 79	State Lands Division
94	27	March	2003	31.1042	87.9037	*Nycticeius*	*humeralis*	C. H. Kilgore 82	State Lands Division
95	27	March	2003	31.1042	87.9037	*Lasiurus*	*borealis*	P. R. Moosman 34	State Lands Division
96	27	March	2003	31.1042	87.9037	*Lasiurus*	*seminolus*	C. H. Kilgore 78	State Lands Division
97	27	March	2003	31.1042	87.9037	*Lasiurus*	*seminolus*	C. H. Kilgore 81	State Lands Division
98	27	March	2003	31.1042	87.9037	*Lasiurus*	*seminolus*	C. H. Kilgore 85	State Lands Division
99	27	March	2003	31.1042	87.9037	*Lasiurus*	*borealis*	C. H. Kilgore 83	State Lands Division
100	27	March	2003	31.1042	87.9037	*Lasiurus*	*seminolus*	C. H. Kilgore 84	State Lands Division

Appendix 1. (Continued)

Collection site	Day	Month	Year	Latitude	Longitude	Genus	Species	Specimen number	Collection method
101	27	March	2003	31.1042	87.9037	*Perimyotis*	*subflavus*	P. R. Moosman 35	State Lands Division
102	27	May	2003	31.0940	87.8939				Observation in building
103	27	May	2003	31.0936	87.8940				Observation in building
104	27	May	2003	31.0932	87.8949				Observation in building
105	27	May	2003	31.0934	87.8991				Observation in building
106	27	May	2003	31.1157	87.8972				Observation in building
107	27	May	2003	31.1159	87.8966				Observation in building
108	28	May	2003	30.9336	87.9297				Observation in building
109	28	May	2003	30.9121	87.9542				Observation in building
110	28	May	2003	30.9390	87.9514				Observation in building
111	28	May	2003	30.9390	87.9514				Observation in building
112	28	May	2003	30.9730	87.9151	*Lasiurus*	*seminolus*	C. H. Kilgore 92	State Lands Division
113	28	May	2003	30.9730	87.9151	*Perimyotis*	*subflavus*	C. H. Kilgore 93	State Lands Division
114	29	May	2003	31.0811	87.8930	*Nycticeius*	*humeralis*	C. H. Kilgore 88	State Lands Division
115	29	May	2003	31.0811	87.8930	*Nycticeius*	*humeralis*	C. H. Kilgore 89	State Lands Division
116	29	May	2003	31.0811	87.8930	*Nycticeius*	*humeralis*	C. H. Kilgore 90	State Lands Division
117	29	May	2003	31.0763	87.8950	*Perimyotis*	*subflavus*	C. H. Kilgore 86	State Lands Division
118	29	May	2003	31.0564	87.8893	*Perimyotis*	*subflavus*	C. H. Kilgore 87	State Lands Division
119	29	May	2003	31.0548	87.8881	*Perimyotis*	*subflavus*	C. H. Kilgore 91	State Lands Division
120	11	June	2003	31.0771	87.8798				Mist nets
121	11	June	2003	31.0762	87.8779				Mist nets
122	12	June	2003	31.0061	87.9043				Mist nets
123	12	June	2003	31.0056	87.9046				Mist nets
124	17	June	2003	31.0934	87.8991				Observation in building
125	18	June	2003	31.0987	87.8924				Observation in building

Appendix 1. (Continued)

Collection site	Day	Month	Year	Latitude	Longitude	Genus	Species	Specimen number	Collection method
126	18	June	2003	31.1007	87.8918				Observation in building
127	18	June	2003	31.0940	87.8939				Observation in building
128	18	June	2003	31.0936	87.8940				Observation in building
129	18	June	2003	31.0934	87.8991				Observation in building
130	18	June	2003	31.0860	87.9307	*Perimyotis*	*subflavus*	C. H. Kilgore 98	State Lands Division
131	18	June	2003	31.0860	87.9307	*Perimyotis*	*subflavus*	C. H. Kilgore 99	State Lands Division
132	18	June	2003	31.0860	87.9307	*Lasiurus*	*borealis*	C. H. Kilgore 100	State Lands Division
133	18	June	2003	31.0860	87.9307	*Lasiurus*	*borealis*	C. H. Kilgore 106	State Lands Division
134	18	June	2003	31.0860	87.9307	*Perimyotis*	*subflavus*	C. H. Kilgore 107	State Lands Division
135	18	June	2003	31.0860	87.9307	*Perimyotis*	*subflavus*	C. H. Kilgore 108	State Lands Division
136	18	June	2003	31.0860	87.9307	*Nycticeius*	*humeralis*	C. H. Kilgore 109	State Lands Division
137	18	June	2003	31.0860	87.9307	*Perimyotis*	*subflavus*	C. H. Kilgore 101	State Lands Division
138	18	June	2003	31.0860	87.9307	*Nycticeius*	*humeralis*	C. H. Kilgore 102	State Lands Division
139	18	June	2003	31.0860	87.9307	*Perimyotis*	*subflavus*	C. H. Kilgore 110	State Lands Division
140	18	June	2003	31.0860	87.9307	*Nycticeius*	*humeralis*	C. H. Kilgore 103	State Lands Division
141	18	June	2003	31.0860	87.9307	*Nycticeius*	*humeralis*	C. H. Kilgore 112	State Lands Division
142	18	June	2003	31.0860	87.9307	*Nycticeius*	*humeralis*	C. H. Kilgore 104	State Lands Division
143	18	June	2003	31.0860	87.9307	*Perimyotis*	*subflavus*	C. H. Kilgore 105	State Lands Division
144	18	June	2003	31.0860	87.9307	*Perimyotis*	*subflavus*	C. H. Kilgore 111	State Lands Division
145	18	June	2003	31.0860	87.9307	*Nycticeius*	*humeralis*	C. H. Kilgore 113	State Lands Division
146	18	June	2003	31.0948	87.8765	*Perimyotis*	*subflavus*	C. H. Kilgore 114	State Lands Division
147	18	June	2003	31.0948	87.8765	*Lasiurus*	*seminolus*	C. H. Kilgore 112	State Lands Division
148	18	June	2003	31.0948	87.8765	*Perimyotis*	*subflavus*		State Lands Division
149	18	June	2003	31.0948	87.8765	*Perimyotis*	*subflavus*		State Lands Division
150	9	July	2003	30.9944	87.9261	*Lasiurus*	*seminolus*	C. H. Kilgore 115	State Lands Division

Appendix 1. (Continued)

Collection site	Day	Month	Year	Latitude	Longitude	Genus	Species	Specimen number	Collection method
151	9	July	2003	30.9944	87.9261	*Lasiurus*	*seminolus*	C. H. Kilgore116	State Lands Division
152	9	July	2003	30.9944	87.9261	*Perimyotis*	*subflavus*	C. H. Kilgore 117	State Lands Division
153	9	July	2003	30.9944	87.9261	*Perimyotis*	*subflavus*	C. H. Kilgore 118	State Lands Division
154	9	July	2003	30.9944	87.9261	*Lasiurus*	*seminolus*	C. H. Kilgore 119	State Lands Division
155	9	July	2003	30.9771	87.9277	*Nycticeius*	*humeralis*	C. H. Kilgore 120	State Lands Division
156	9	July	2003	30.9742	87.9292	*Perimyotis*	*subflavus*	C. H. Kilgore 121	State Lands Division
157	9	July	2003	30.9736	87.9307	*Nycticeius*	*humeralis*	C. H. Kilgore 122	State Lands Division
158	9	July	2003	30.9733	87.9317	*Nycticeius*	*humeralis*	C. H. Kilgore 123	State Lands Division
159	9	July	2003	30.9740	87.9350	*Perimyotis*	*subflavus*	C. H. Kilgore 124	State Lands Division
160	10	July	2003	31.1215	87.8727	*Perimyotis*	*subflavus*	C. H. Kilgore 135a	State Lands Division
161	10	July	2003	31.1215	87.8727	*Perimyotis*	*subflavus*	C. H. Kilgore 136	State Lands Division
162	10	July	2003	31.1215	87.8727	*Perimyotis*	*subflavus*	C. H. Kilgore 137	State Lands Division
163	10	July	2003	31.1136	87.8968	*Perimyotis*	*subflavus*	C. H. Kilgore 138	State Lands Division
164	10	July	2003	31.1136	87.8968	*Perimyotis*	*subflavus*	C. H. Kilgore 139	State Lands Division
165	10	July	2003	31.1136	87.8968	*Perimyotis*	*subflavus*	C. H. Kilgore 140	State Lands Division
166	10	July	2003	31.1136	87.8968	*Perimyotis*	*subflavus*	C. H. Kilgore 141	State Lands Division
167	10	July	2003	31.1136	87.8968	*Perimyotis*	*subflavus*	C. H. Kilgore 142	State Lands Division
168	10	July	2003	31.1106	87.8952	*Nycticeius*	*humeralis*	C. H. Kilgore 143	State Lands Division
169	10	July	2003	31.1078	87.8961	*Perimyotis*	*subflavus*	C. H. Kilgore 144	State Lands Division
170	10	July	2003	31.1078	87.8961	*Lasiurus*	*borealis*	C. H. Kilgore 145	State Lands Division
171	10	July	2003	31.1056	87.8950	*Perimyotis*	*subflavus*	C. H. Kilgore 146	State Lands Division
172	10	July	2003	31.1056	87.8950	*Perimyotis*	*subflavus*	C. H. Kilgore 147	State Lands Division
173	10	July	2003	31.1056	87.8950	*Lasiurus*	*borealis*	C. H. Kilgore 148	State Lands Division
174	10	July	2003	31.1032	87.8950	*Lasiurus*	*borealis*	C. H. Kilgore 149	State Lands Division
175	10	July	2003	31.1032	87.8950	*Lasiurus*	*seminolus*	C. H. Kilgore 150	State Lands Division

Appendix 1. (Continued)

Collection site	Day	Month	Year	Latitude	Longitude	Genus	Species	Specimen number	Collection method
176	10	July	2003	31.0948	87.8931	*Lasiurus*	*seminolus*	C. H. Kilgore 151	State Lands Division
177	10	July	2003	31.0948	87.8931	*Lasiurus*	*seminolus*	C. H. Kilgore 152	State Lands Division
178	10	July	2003	31.0948	87.8931	*Perimyotis*	*subflavus*	C. H. Kilgore 153	State Lands Division
179	10	July	2003	31.0948	87.8931	*Myotis*	*austroriparius*	C. H. Kilgore 154	State Lands Division
180	10	July	2003	31.0948	87.8931	*Myotis*	*austroriparius*	C. H. Kilgore 155	State Lands Division
181	10	July	2003	31.0948	87.8765	*Perimyotis*	*subflavus*	C. H. Kilgore 156	State Lands Division
182	10	July	2003	31.0948	87.8765	*Perimyotis*	*subflavus*	C. H. Kilgore 157	State Lands Division
183	10	July	2003	31.0948	87.8765	*Perimyotis*	*subflavus*	C. H. Kilgore 158	State Lands Division
184	10	July	2003	31.0948	87.8765	*Perimyotis*	*subflavus*	C. H. Kilgore 159	State Lands Division
185	10	July	2003	31.0948	87.8765	*Perimyotis*	*subflavus*	C. H. Kilgore 160	State Lands Division
186	16	July	2003	30.9190	87.8960	*Nycticeius*	*humeralis*	C. H. Kilgore 125	State Lands Division
187	16	July	2003	30.9130	87.8874	*Nycticeius*	*humeralis*	C. H. Kilgore 126	State Lands Division
188	16	July	2003	30.9107	87.8883	*Nycticeius*	*humeralis*	C. H. Kilgore 127	State Lands Division
189	16	July	2003	30.9100	87.8895	*Lasiurus*	*seminolus*	C. H. Kilgore 128	State Lands Division
190	16	July	2003	30.9107	87.8883	*Perimyotis*	*subflavus*	C. H. Kilgore 129	State Lands Division
191	16	July	2003	30.9107	87.8883	*Lasiurus*	*seminolus*	C. H. Kilgore 130	State Lands Division
192	16	July	2003	30.9100	87.8895	*Nycticeius*	*humeralis*	C. H. Kilgore 131	State Lands Division
193	16	July	2003	30.9100	87.8895	*Nycticeius*	*humeralis*	C. H. Kilgore 132	State Lands Division
194	16	July	2003	30.9100	87.8895	*Lasiurus*	*seminolus*	C. H. Kilgore 133	State Lands Division
195	16	July	2003	30.9100	87.8895	*Lasiurus*	*seminolus*	C. H. Kilgore 134	State Lands Division
196	16	July	2003	30.9273	87.9104	*Myotis*	*austroriparius*	C. H. Kilgore 135b	State Lands Division
197	23	July	2003	31.0133	87.9144	*Lasiurus*	*seminolus*	C. H. Kilgore 161	State Lands Division
198	23	July	2003	31.0108	87.9139	*Lasiurus*	*seminolus*	C. H. Kilgore 162	State Lands Division
199	23	July	2003	31.0108	87.9139	*Lasiurus*	*seminolus*	C. H. Kilgore 163	State Lands Division
200	23	July	2003	31.0108	87.9139	*Lasiurus*	*seminolus*	C. H. Kilgore 164	State Lands Division

Appendix 1. (Continued)

Collection site	Day	Month	Year	Latitude	Longitude	Genus	Species	Specimen number	Collection method
201	23	July	2003	31.0108	87.9139	*Lasiurus*	*seminolus*	C. H. Kilgore 165	State Lands Division
202	23	July	2003	31.0121	87.9145	*Nycticeius*	*humeralis*	C. H. Kilgore 166	State Lands Division
203	23	July	2003	31.0132	87.9145	*Nycticeius*	*humeralis*	C. H. Kilgore 167	State Lands Division
204	23	July	2003	31.0141	87.9118	*Nycticeius*	*humeralis*	C. H. Kilgore 168	State Lands Division
205	23	July	2003	31.0076	87.9016	*Myotis*	*austroriparius*	C. H. Kilgore 169	State Lands Division
206	23	July	2003	31.0076	87.9016	*Lasiurus*	*seminolus*	C. H. Kilgore 170	State Lands Division
207	23	July	2003	31.0076	87.9016	*Myotis*	*austroriparius*	C. H. Kilgore 171	State Lands Division
208	23	July	2003	31.0076	87.9016	*Perimyotis*	*subflavus*	C. H. Kilgore 172	State Lands Division
209	23	July	2003	31.0076	87.9016	*Myotis*	*austroriparius*	C. H. Kilgore 173	State Lands Division
210	23	July	2003	31.0076	87.9016	*Nycticeius*	*humeralis*	C. H. Kilgore 174	State Lands Division
211	23	July	2003	31.0076	87.9016	*Perimyotis*	*subflavus*	C. H. Kilgore 175	State Lands Division
212	23	July	2003	31.0076	87.9016	*Myotis*	*austroriparius*	C. H. Kilgore 176	State Lands Division
213	23	July	2003	31.0076	87.9016	*Myotis*	*austroriparius*	C. H. Kilgore 177	State Lands Division
214	23	July	2003	31.0076	87.9016	*Lasiurus*	*seminolus*	C. H. Kilgore 178	State Lands Division
215	23	July	2003	31.0076	87.9016	*Nycticeius*	*humeralis*	C. H. Kilgore 179	State Lands Division
216	23	July	2003	31.0108	87.9139	*Lasiurus*	*seminolus*	C. H. Kilgore 180	State Lands Division
217	23	July	2003	31.0076	87.9016	*Lasiurus*	*seminolus*	C. H. Kilgore 181	State Lands Division
218	23	July	2003	31.0076	87.9016	*Lasiurus*	*seminolus*	C. H. Kilgore 182	State Lands Division
219	23	July	2003	31.0076	87.9016	*Perimyotis*	*subflavus*	C. H. Kilgore 183	State Lands Division
220	23	July	2003	31.0076	87.9016	*Perimyotis*	*subflavus*	C. H. Kilgore 184	State Lands Division
221	23	July	2003	31.0076	87.9016	*Perimyotis*	*subflavus*	C. H. Kilgore 185	State Lands Division
222	23	July	2003	31.0076	87.9016	*Myotis*	*austroriparius*	C. H. Kilgore 186	State Lands Division
223	23	July	2003	31.0076	87.9016	*Lasiurus*	*seminolus*	C. H. Kilgore 187	State Lands Division
224	23	July	2003	31.0076	87.9016	*Perimyotis*	*subflavus*	C. H. Kilgore 188	State Lands Division
225	23	July	2003	31.0076	87.9016	*Lasiurus*	*seminolus*	C. H. Kilgore 189	State Lands Division

Appendix 1. (Continued)

Collection site	Day	Month	Year	Latitude	Longitude	Genus	Species	Specimen number	Collection method
226	23	July	2003	31.0076	87.9016	*Perimyotis*	*subflavus*	C. H. Kilgore 190	State Lands Division
227	23	July	2003	31.0076	87.9016	*Perimyotis*	*subflavus*	C. H. Kilgore 191	State Lands Division
228	23	July	2003	31.0076	87.9016	*Myotis*	*austroriparius*	C. H. Kilgore 192	State Lands Division
229	23	July	2003	31.0076	87.9016	*Perimyotis*	*subflavus*	C. H. Kilgore 193	State Lands Division
230	21	January	2004	31.0940	87.8939				Observation in building
231	21	January	2004	31.0936	87.8940				Observation in building
232	21	January	2004	31.0934	87.8991				Observation in building
233	22	January	2004	31.0940	87.8939				Observation in building
234	22	January	2004	31.0936	87.8940				Observation in building
235	22	January	2004	31.0934	87.8991				Observation in building
236	22	January	2003	30.9390	87.9514				Observation in building
237	24	February	2004	31.1206	87.8880				Mist nets
238	24	February	2004	31.1237	87.8875				Mist nets
239	25	February	2004	31.1206	87.8880				Mist nets
240	25	February	2004	31.1237	87.8875				Mist nets
241	1	March	2004	31.0989	87.9002				Mist nets
242	1	March	2004	31.0968	87.8986				Mist nets
243	2	March	2004	31.0989	87.9002				Mist nets
244	2	March	2004	31.0968	87.8986				Mist nets
245	2	March	2004	31.0831	87.9334				State Lands Division
246	2	March	2004	31.0936	87.8940				Observation in building
247	2	March	2004	31.0934	87.8991				Observation in building
248	2	March	2003	31.9390	87.9514				Observation in building
249	9	March	2004	31.1101	87.8770	*Lasiurus*	*borealis*	C. H. Kilgore 194	State Lands Division
250	9	March	2004	31.1101	87.8770	*Nycticeius*	*humeralis*	C. H. Kilgore 195	State Lands Division

Appendix 1. (Continued)

Collection site	Day	Month	Year	Latitude	Longitude	Genus	Species	Specimen number	Collection method
251	9	March	2004	31.1101	87.8770	*Lasiurus*	*borealis*	C. H. Kilgore 196	State Lands Division
252	9	March	2004	31.1101	87.8770	*Myotis*	*austroriparius*	C. H. Kilgore 197	State Lands Division
253	9	March	2004	31.1101	87.8770	*Lasiurus*	*borealis*	C. H. Kilgore 198	State Lands Division
254	9	March	2004	31.1101	87.8770	*Myotis*	*austroriparius*	C. H. Kilgore 199	State Lands Division
255	17	March	2004	31.1101	87.8770	*Perimyotis*	*subflavus*	C. H. Kilgore 200	State Lands Division
256	17	March	2004	31.1111	87.8783				Mist nets
257	17	March	2004	31.1105	87.8799				Mist nets
258	20	April	2004	31.1281	87.8960	*Lasiurus*	*borealis*		Mist nets
259	20	April	2004	31.1266	87.8964				Mist nets
260	3	May	2004	31.1383	87.8784				Mist nets
261	3	May	2004	31.1402	87.8787	*Lasiurus*	*borealis*		Mist nets
262	3	May	2004	31.1402	87.8787	*Lasiurus*	*borealis*		Mist nets
263	3	May	2004	31.1402	87.8787	*Lasiurus*	*borealis*		Mist nets
264	3	May	2004	31.1306	87.8633	*Lasiurus*	*borealis*		Mist nets
265	3	May	2004	31.1308	87.8635				Mist nets
266	3	May	2004	31.0936	87.8940				Observation in building
267	3	May	2004	31.0934	87.8991				Observation in building
268	18	May	2004	31.1291	87.8705				Mist nets
269	18	May	2004	31.1293	87.8708				Mist nets
270	19	May	2004	31.1206	87.8811				Mist nets
271	19	May	2004	31.1208	87.8823				Mist nets
272	20	May	2004	30.9390	87.9514				Observation in building
273	20	May	2004	30.9804	87.9426				Observation in building
274	20	May	2004	31.1206	87.8811				Mist nets
275	20	May	2004	31.1208	87.8823				Mist nets

Appendix 1. (Continued)

Collection site	Day	Month	Year	Latitude	Longitude	Genus	Species	Specimen number	Collection method
276	25	May	2004	31.1304	87.8582				Mist nets
277	25	May	2004	31.1305	87.8614				Mist nets
278	25	May	2004	31.1307	87.8614				Mist nets
279	26	May	2004	31.1400	87.9089				Mist nets
280	26	May	2004	31.1397	87.9077				Mist nets
281	26	May	2004	31.1397	87.9078				Mist nets

Appendix 2. Data assessed in multivariate analysis of variance among categories of age of timber, overall effect of age of timber, and seven species of bats for 100-m buffers on the Upper Delta Wildlife Management Area, Mobile and Baldwin counties, Alabama. Numbers below age of timber are area within the buffer (square meters).

Site	0-19 years	20-39 years	40-59 years	>80 years	*Lasiurus borealis*	*Lasiurus seminolus*	*Myotis austroriparius*	*Nycticeius humeralis*	*Corynorhinus rafinesquii*	*Lasiurus cinereus*	*Perimyotis subflavus*
1	4,804	17,668	8,492	0	1	0	1	0	0	0	0
2	0	28,200	268	0	0	1	0	0	0	0	0
3	1,765	11,005	18,606	0	1	1	0	0	0	0	0
4	79	10,766	20,398	0	1	1	0	0	0	0	0
5	12,763	0	3,493	0	0	0	0	1	0	0	0
6	0	0	0	14,130	0	0	0	1	0	0	0
7	0	0	0	16,480	0	0	0	0	1	0	0
8	0	30,259	288	0	0	1	0	0	0	0	0
9	469	0	0	21,992	0	0	0	1	0	0	0
10	0	0	28,850	0	0	0	0	0	0	1	0
11	0	14,229	15,766	0	0	0	0	1	0	0	0
12	7,300	0	14,436	0	0	0	0	0	1	0	0
13	3,504	21,796	6,043	0	0	1	0	0	0	0	0
14	0	0	0	25,000	0	1	0	0	0	0	0
15	0	0	4,581	0	0	1	0	0	0	1	0
16	11,803	0	19,572	0	1	1	0	0	0	0	0
17	0	3,731	12,562	0	0	1	0	1	0	0	1
18	1,019	0	0	19,912	0	1	0	0	0	0	0
19	0	0	21,783	0	1	1	0	1	0	0	1
20	0	0	0	15,514	0	1	0	0	0	0	1
21	0	0	16,856	0	0	0	0	1	0	0	0
22	0	0	19,326	0	0	0	0	0	0	0	1
23	2,703	0	12,500	0	0	0	0	0	0	0	1
24	0	0	19,237	0	0	0	0	0	0	0	1
25	1,864	0	10,793	0	1	0	0	1	0	0	1

Appendix 2. (Continued).

Site	0-19 years	20-39 years	40-59 years	>80 years	*Lasiurus borealis*	*Lasiurus seminolus*	*Myotis austroriparius*	*Nycticeius humeralis*	*Corynorhinus rafinesquii*	*Lasiurus cinereus*	*Perimyotis subflavus*
26	6,472	2,315	6,747	0	0	1	0	0	0	0	1
27	0	0	0	8,903	0	1	0	0	0	0	1
28	0	0	0	21,087	0	0	0	1	0	0	0
29	10,010	0	0	12,048	0	0	0	0	0	0	1
30	3,298	0	0	17,576	0	0	0	1	0	0	0
31	2,806	0	0	17,714	0	0	0	1	0	0	0
32	291	0	0	14,928	0	0	0	0	0	0	1
33	2,277	29,099	0	0	0	0	0	0	0	0	1
34	0	0	19,126	0	0	0	0	0	0	0	1
35	0	0	18,860	0	0	0	0	0	0	0	1
36	2,272	0	17,932	0	0	0	0	0	1	0	0
37	379	0	10,796	0	1	0	0	0	0	0	1
38	0	0	9,478	0	1	0	0	0	0	0	1
39	0	0	31,376	0	1	1	0	0	0	0	0
40	0	0	4,581	0	0	1	1	0	0	0	1
41	6,472	2,315	6,747	0	0	0	0	0	0	0	1
42	0	0	26,640	0	0	0	0	1	0	0	0
43	0	0	14,252	0	0	0	0	1	0	0	0
44	0	0	21,884	0	0	1	0	1	0	0	1
45	3,634	0	16,196	0	0	1	0	1	0	0	0
46	0	0	0	14,639	0	1	1	1	0	0	1
47	0	1,035	18,439	0	1	0	1	1	0	0	1
48	2,092	27,477	1,807	0	1	0	0	0	0	0	0
49	3,235	0	28,040	0	1	0	0	0	0	0	0
50	0	31,375	0	0	1	0	0	0	0	0	0

Appendix 3. Data assessed in multivariate analysis of variance among categories of age of timber, overall effect of age of timber, and seven species of bats for 250-m buffers on the Upper Delta Wildlife Management Area, Mobile and Baldwin counties, Alabama. Numbers below age of timber are area within the buffer (square meters).

Site	0-19 years	20-39 years	40-59 years	>80 years	*Lasiurus borealis*	*Lasiurus seminolus*	*Myotis austroriparius*	*Nycticeius humeralis*	*Corynorhinus rafinesquii*	*Lasiurus cinereus*	*Perimyotis subflavus*
1	22,472	104,918	59,398	0	1	0	1	0	0	0	0
2	2,913	116,239	70,209	0	0	1	0	0	0	0	0
3	18,994	103,693	73,660	0	1	1	0	0	0	0	0
4	4,698	86,102	105,549	0	1	1	0	0	0	0	0
5	56,942	0	52,749	4,787	0	0	0	1	0	0	0
6	122,816	0	0	0	0	0	0	1	0	0	0
7	24,268	0	0	130,589	0	0	0	0	1	0	0
8	0	93,973	96,828	0	0	1	0	0	0	0	0
9	14,710	0	0	157,388	0	0	0	1	0	0	0
10	106	0	181,044	0	0	0	0	0	0	1	0
11	0	95,855	95,514	0	0	0	0	1	0	0	0
12	106,466	0	53,508	0	0	0	0	0	1	0	0
13	8,122	129,650	57,454	0	0	1	0	0	0	0	0
14	0	0	0	175,069	0	1	0	0	0	0	0
15	0	45,592	64,972	0	0	1	0	0	0	1	0
16	80,082	0	116,265	0	1	1	0	0	0	0	0
17	17,625	80,443	58,629	0	0	1	0	1	0	0	1
18	54,811	0	0	103,771	0	1	0	0	0	0	0
19	0	0	171,244	0	1	1	0	1	0	0	1
20	10,624	0	0	79,456	0	1	0	0	0	0	1
21	0	1,171	164,388	0	0	0	0	1	0	0	0
22	0	0	161,654	0	0	0	0	0	0	0	1
23	20,681	0	139,303	0	0	0	0	0	0	0	1
24	45	0	160,772	0	0	0	0	0	0	0	1
25	15,617	0	132,707	0	1	0	0	1	0	0	1

Appendix 3. (Continued)

Site	0-19 years	20-39 years	40-59 years	>80 years	*Lasiurus borealis*	*Lasiurus seminolus*	*Myotis austroriparius*	*Nycticeius humeralis*	*Corynorhinus rafinesquii*	*Lasiurus cinereus*	*Perimyotis subflavus*
26	72,152	22,045	52,829	0	0	1	0	0	0	0	1
27	2,161	0	0	72,370	0	1	0	0	0	0	1
28	24,751	0	0	145,089	0	0	0	1	0	0	0
29	74,640	0	0	96,096	0	0	0	0	0	0	1
30	50,192	0	0	120,522	0	0	0	1	0	0	0
31	44,206	0	0	127,027	0	0	0	1	0	0	0
32	40,868	0	0	116,050	0	0	0	0	0	0	1
33	6,315	189,871	160	0	0	0	0	0	0	0	1
34	0	0	150,645	0	0	0	0	0	0	0	1
35	0	0	151,370	0	0	0	0	0	0	0	1
36	41,110	0	127,376	0	0	0	0	0	1	0	0
37	40,169	0	108,367	0	1	0	0	0	0	0	1
38	36,825	0	106,110	0	1	0	0	0	0	0	1
39	0	0	174,391	0	1	1	0	0	0	0	0
40	0	45,592	64,972	0	0	1	1	0	0	0	1
41	72,152	22,045	52,829	0	0	0	0	0	0	0	1
42	9,277	0	174,512	0	0	0	0	1	0	0	0
43	28,099	0	126,635	0	0	0	0	1	0	0	0
44	22,260	0	145,126	0	0	1	0	1	0	0	1
45	43,862	0	124,485	0	0	1	0	1	0	0	0
46	21,400	0	0	113,919	0	1	1	1	0	0	1
47	4,078	66,864	80,746	0	1	0	1	1	0	0	1
48	14,946	150,813	30,177	0	1	0	0	0	0	0	0
49	14,505	0	179,308	0	1	0	0	0	0	0	0
50	514	195,833	0	0	1	0	0	0	0	0	0

Appendix 4. Data assessed in multivariate analysis of variance among categories of age of timber, overall effect of age of timber, and seven species of bats for 500-m buffers on the Upper Delta Wildlife Management Area, Mobile and Baldwin counties, Alabama. Numbers below age of timber are area within the buffer (square meters).

Site	0-19 years	20-39 years	40-59 years	>80 years	*Lasiurus borealis*	*Lasiurus seminolus*	*Myotis austroriparius*	*Nycticeius humeralis*	*Corynorhinus rafinesquii*	*Lasiurus cinereus*	*Perimyotis subflavus*
1	93,340	460,933	227,931	0	1	0	1	0	0	0	0
2	8,057	505,033	248,849	0	0	1	0	0	0	0	0
3	79,029	531,221	174,140	0	1	1	0	0	0	0	0
4	138,655	362,911	282,533	0	1	1	0	0	0	0	0
5	194,891	0	282,827	122,899	0	0	0	1	0	0	0
6	82,109	0	0	360,127	0	0	0	1	0	0	0
7	139,599	0	0	547,379	0	0	0	0	1	0	0
8	56,710	204,812	493,187	0	0	1	0	0	0	0	0
9	30,748	0	0	633,591	0	0	0	1	0	0	0
10	78,295	0	624,348	0	0	0	0	0	0	1	0
11	20,108	277,769	476,126	0	0	0	0	1	0	0	0
12	293,223	91,969	267,225	0	0	0	0	0	1	0	0
13	21,000	472,130	283,997	0	0	1	0	0	0	0	0
14	0	0	0	742,243	0	1	0	0	0	0	0
15	16,760	268,711	276,740	0	0	1	0	0	0	1	0
16	315,750	147,426	320,924	0	1	1	0	0	0	0	0
17	126,195	414,181	157,442	0	0	1	0	1	0	0	1
18	278,553	0	0	310,359	0	1	0	0	0	0	0
19	9,097	83,169	641,761	0	1	1	0	1	0	0	1
20	45,482	0	0	587,636	0	1	0	0	0	0	1
21	0	100,356	629,773	0	0	0	0	1	0	0	0
22	0	0	696,482	0	0	0	0	0	0	0	1
23	85,654	0	625,427	0	0	0	0	0	0	0	1
24	94,857	0	621,777	0	0	0	0	0	0	0	1
25	169,121	0	501,931	0	1	0	0	1	0	0	1

Appendix 4. (Continued)

Site	0-19 years	20-39 years	40-59 years	>80 years	*Lasiurus borealis*	*Lasiurus seminolus*	*Myotis austroriparius*	*Nycticeius humeralis*	*Corynorhinus rafinesquii*	*Lasiurus cinereus*	*Perimyotis subflavus*
26	290,759	114,899	244,479	0	0	1	0	0	0	0	1
27	87,695	0	0	215,685	0	1	0	0	0	0	1
28	258,951	0	0	471,211	0	0	0	1	0	0	0
29	303,882	0	0	427,311	0	0	0	0	0	0	1
30	241,658	0	0	480,757	0	0	0	1	0	0	0
31	193,785	0	0	517,996	0	0	0	1	0	0	0
32	178,699	0	0	525,175	0	0	0	0	0	0	1
33	12,853	703,228	68,307	0	0	0	0	0	0	0	1
34	102,458	27,873	551,913	0	0	0	0	0	0	0	1
35	117,859	20,819	546,353	0	0	0	0	0	0	0	1
36	185,134	0	509,772	0	0	0	0	0	1	0	0
37	194,855	0	496,185	0	1	0	0	0	0	0	1
38	204,090	0	477,452	0	1	0	0	0	0	0	1
39	81,474	0	556,878	0	1	1	0	0	0	0	0
40	16,760	268,711	276,740	0	0	1	1	0	0	0	1
41	290,759	114,899	244,479	0	0	0	0	0	0	0	1
42	91,614	0	649,192	0	0	0	0	1	0	0	0
43	107,824	0	561,658	0	0	0	0	1	0	0	0
44	181,085	0	522,208	0	0	1	0	1	0	0	1
45	180,283	0	520,109	0	0	1	0	1	0	0	0
46	157,677	0	486,768	0	0	1	1	1	0	0	1
47	102,428	333,657	258,332	0	1	0	1	1	0	0	1
48	71,210	549,451	160,019	0	1	0	0	0	0	0	0
49	38,550	0	700,234	0	1	0	0	0	0	0	0
50	10,650	773,374	0	0	1	0	0	0	0	0	0

Appendix 5. Data assessed in multivariate analysis of variance among categories of habitat, overall effect of habitat, and seven species of bats for 100-m buffers on the Upper Delta Wildlife Management Area, Mobile and Baldwin counties, Alabama. Numbers below type of habitat are area within the buffer (square meters).

Site	Open water	Bottomland ridge	Bottomland	Manmade openings	*Lasiurus borealis*	*Lasiurus seminolus*	*Myotis austroriparius*	*Nycticeius humeralis*	*Corynorhinus rafinesquii*	*Lasiurus cinereus*	*Perimyotis subflavus*
1	4,443	3,867	22,293	479	1	0	1	0	0	0	0
2	2,932	0	28,468	0	0	1	0	0	0	0	0
3	24	0	29,611	1,765	1	1	0	0	0	0	0
4	157	0	31,164	79	1	1	0	0	0	0	0
5	15,144	0	16,256	0	0	0	0	1	0	0	0
6	17,270	8,993	5,137	0	0	0	0	1	0	0	0
7	14,920	10,417	6,063	0	0	0	0	0	1	0	0
8	853	30,259	288	0	0	1	0	0	0	0	0
9	8,939	5,651	16,341	469	0	0	0	1	0	0	0
10	2,550	0	28,850	0	0	0	0	0	0	1	0
11	1,404	4,303	25,693	0	0	0	0	1	0	0	0
12	9,664	8,872	12,864	0	0	0	0	0	1	0	0
13	3,561	0	27,839	0	0	1	0	0	0	0	0
14	6,400	20,792	4,208	0	0	1	0	0	0	0	0
15	26,819	3,716	865	0	0	1	0	0	0	1	0
16	25	0	19,572	496	1	1	0	0	0	0	0
17	15,107	12,562	3,731	0	0	1	0	1	0	0	1
18	10,469	12,419	8,512	0	0	1	0	0	0	0	0
19	9,617	0	21,783	0	1	1	0	1	0	0	1
20	15,886	10,315	5,199	0	0	1	0	0	0	0	1
21	14,544	1,409	15,447	0	0	0	0	1	0	0	0
22	12,074	0	19,326	0	0	0	0	0	0	0	1
23	16,197	0	15,203	0	0	0	0	0	0	0	1
24	12,163	0	19,237	0	0	0	0	0	0	0	1
25	18,744	0	12,656	0	1	0	0	1	0	0	1

Appendix 5. (Continued)

Site	Open water	Bottomland ridge	Bottomland	Manmade openings	*Lasiurus borealis*	*Lasiurus seminolus*	*Myotis austroriparius*	*Nycticeius humeralis*	*Corynorhinus rafinesquii*	*Lasiurus cinereus*	*Perimyotis subflavus*
26	15,866	9,017	6,517	0	0	1	0	0	0	0	1
27	22,497	8,903	0	0	0	1	0	0	0	0	1
28	10,313	19,143	1,944	0	0	0	0	1	0	0	0
29	9,342	11,971	77	10,010	0	0	0	0	0	0	1
30	10,526	17,576	0	3,298	0	0	0	1	0	0	0
31	10,880	17,396	3,124	0	0	0	0	1	0	0	0
32	16,181	13,798	1,421	0	0	0	0	0	0	0	1
33	24	0	29,099	2,277	0	0	0	0	0	0	1
34	12,274	0	19,126	0	0	0	0	0	0	0	1
35	12,540	0	18,860	0	0	0	0	0	0	0	1
36	11,197	8,353	9,578	0	0	0	0	0	1	0	0
37	20,225	7,295	3,501	0	1	0	0	0	0	0	1
38	21,922	5,401	4,076	0	1	0	0	0	0	0	1
39	24	0	31,376	0	1	1	0	0	0	0	0
40	26,819	3,716	865	0	0	1	1	0	0	0	1
41	15,866	9,017	6,517	0	0	0	0	0	0	0	1
42	4,760	0	26,640	0	0	0	0	1	0	0	0
43	17,148	0	14,252	0	0	0	0	1	0	0	0
44	9,516	0	21,884	0	0	1	0	1	0	0	1
45	11,571	0	19,829	0	0	1	0	1	0	0	0
46	16,761	14,639	0	0	0	1	1	1	0	0	1
47	11,926	17,390	2,084	0	1	0	1	1	0	0	1
48	1,808	1,807	27,477	308	1	0	0	0	0	0	0
49	2,788	27,429	611	572	1	0	0	0	0	0	0
50	25	0	31,375	0	1	0	0	0	0	0	0

Appendix 6. Data assessed in multivariate analysis of variance among categories of habitat, overall effect of habitat, and seven species of bats for 250-m buffers on the Upper Delta Wildlife Management Area, Mobile and Baldwin counties, Alabama. Numbers below type of habitat are area within the buffer (square meters).

Site	Open water	Bottomland ridge	Bottomland	Manmade openings	*Lasiurus borealis*	*Lasiurus seminolus*	*Myotis austroriparius*	*Nycticeius humeralis*	*Corynorhinus rafinesquii*	*Lasiurus cinereus*	*Perimyotis subflavus*
1	26,346	0	71,191	727	1	0	1	0	0	0	0
2	12,814	0	186,448	0	0	1	0	0	0	0	0
3	10,156	0	188,255	3,015	1	1	0	0	0	0	0
4	7,545	0	191,652	197	1	1	0	0	0	0	0
5	81,871	1,082	106,922	0	0	0	0	1	0	0	0
6	73,533	76,271	46,953	0	0	0	0	1	0	0	0
7	41,492	46,449	108,408	0	0	0	0	0	1	0	0
8	5,548	96,775	94,027	0	0	1	0	0	0	0	0
9	24,251	49,846	107,542	0	0	0	0	1	0	0	0
10	15,199	0	181,151	0	0	0	0	0	0	1	0
11	4,981	15,862	175,507	0	0	0	0	1	0	0	0
12	36,376	27,935	132,038	0	0	0	0	0	1	0	0
13	17,055	0	187,104	157	0	1	0	0	0	0	0
14	21,280	101,228	73,841	0	0	1	0	0	0	0	0
15	85,785	63,515	47,050	0	0	1	0	0	0	1	0
16	5,980	0	116,265	606	1	1	0	0	0	0	0
17	39,652	71,425	85,272	0	0	1	0	1	0	0	1
18	37,767	35,026	123,556	0	0	1	0	0	0	0	0
19	25,105	0	171,244	0	1	1	0	1	0	0	1
20	106,269	29,668	60,413	0	0	1	0	0	0	0	1
21	30,791	32,009	133,549	0	0	0	0	1	0	0	0
22	34,696	31,611	130,043	0	0	0	0	0	0	0	1
23	36,366	0	159,984	0	0	0	0	0	0	0	1
24	35,533	1,496	159,320	0	0	0	0	0	0	0	1
25	48,026	0	148,323	0	1	0	0	1	0	0	1

Appendix 6. (Continued)

Site	Open water	Bottomland ridge	Bottomland	Manmade openings	*Lasiurus borealis*	*Lasiurus seminolus*	*Myotis austroriparius*	*Nycticeius humeralis*	*Corynorhinus rafinesquii*	*Lasiurus cinereus*	*Perimyotis subflavus*
26	49,324	57,473	89,552	0	0	1	0	0	0	0	1
27	121,819	69,525	5,006	0	0	1	0	0	0	0	1
28	26,510	84,065	85,774	0	0	0	0	1	0	0	0
29	25,613	52,312	71,486	46,938	0	0	0	0	0	0	1
30	25,635	61,295	78,218	28,241	0	0	0	1	0	0	0
31	25,117	79,221	80,446	11,566	0	0	0	1	0	0	0
32	39,431	62,343	94,575	0	0	0	0	0	0	0	1
33	3	160	189,871	6,315	0	0	0	0	0	0	1
34	45,705	0	150,645	0	0	0	0	0	0	0	1
35	44,980	0	151,370	0	0	0	0	0	0	0	1
36	27,863	14,552	112,824	0	0	0	0	0	1	0	0
37	47,814	25,897	82,470	0	1	0	0	0	0	0	1
38	53,414	31,006	75,105	0	1	0	0	0	0	0	1
39	21,958	0	174,391	0	1	1	0	0	0	0	0
40	85,785	63,515	47,050	0	0	1	1	0	0	0	1
41	49,324	57,473	89,552	0	0	0	0	0	0	0	1
42	12,560	0	183,789	0	0	0	0	1	0	0	0
43	41,616	0	126,635	0	0	0	0	1	0	0	0
44	28,964	0	156,328	0	0	1	0	1	0	0	1
45	28,002	0	168,348	0	0	1	0	1	0	0	0
46	61,030	112,373	22,946	0	0	1	1	1	0	0	1
47	44,661	105,631	46,057	0	1	0	1	1	0	0	1
48	16,324	17,793	163,197	727	1	0	0	0	0	0	0
49	15,483	146,244	33,064	8,032	1	0	0	0	0	0	0
50	3	0	195,833	514	1	0	0	0	0	0	0

Appendix 7. Data assessed in multivariate analysis of variance among categories of habitat, overall effect of habitat, and seven species of bats for 500-m buffers on the Upper Delta Wildlife Management Area, Mobile and Baldwin counties, Alabama. Numbers below type of habitat are area within the buffer (square meters).

Site	Open water	Bottomland ridge	Bottomland	Manmade openings	*Lasiurus borealis*	*Lasiurus seminolus*	*Myotis austroriparius*	*Nycticeius humeralis*	*Corynorhinus rafinesquii*	*Lasiurus cinereus*	*Perimyotis subflavus*
1	218,918	1,254	246,608	43	1	0	1	0	0	0	0
2	31,359	0	753,882	157	0	1	0	0	0	0	0
3	14,933	0	763,838	6,626	1	1	0	0	0	0	0
4	17,024	0	645,446	803	1	1	0	0	0	0	0
5	184,778	18,751	526,031	0	0	0	0	1	0	0	0
6	343,162	195,158	247,077	0	0	0	0	1	0	0	0
7	98,420	119,177	567,802	0	0	0	0	0	1	0	0
8	87,400	254,486	443,513	0	0	1	0	0	0	0	0
9	121,059	193,493	440,097	30,748	0	0	0	1	0	0	0
10	82,754	0	702,644	0	0	0	0	0	0	1	0
11	19,706	33,981	730,045	1,666	0	0	0	1	0	0	0
12	132,980	133,151	519,082	184	0	0	0	0	1	0	0
13	20,584	0	764,657	157	0	1	0	0	0	0	0
14	43,155	347,894	394,349	0	0	1	0	0	0	0	0
15	223,188	340,602	221,608	0	0	1	0	0	0	1	0
16	15,180	0	468,351	7,262	1	1	0	0	0	0	0
17	87,580	286,191	411,626	0	0	1	0	1	0	0	1
18	196,486	98,141	490,771	0	0	1	0	0	0	0	0
19	51,372	0	729,407	4,619	1	1	0	1	0	0	1
20	152,280	197,833	435,284	0	0	1	0	0	0	0	1
21	55,269	232,939	497,190	0	0	0	0	1	0	0	0
22	88,916	100,159	596,323	0	0	0	0	0	0	0	1
23	74,316	18,039	693,043	0	0	0	0	0	0	0	1
24	68,765	21,494	695,140	0	0	0	0	0	0	0	1
25	114,346	0	671,052	0	1	0	0	1	0	0	1

Appendix 7. (Continued)

Site	Open water	Bottomland ridge	Bottomland	Manmade openings	*Lasiurus borealis*	*Lasiurus seminolus*	*Myotis austroriparius*	*Nycticeius humeralis*	*Corynorhinus rafinesquii*	*Lasiurus cinereus*	*Perimyotis subflavus*
26	151,623	222,163	411,611	0	0	1	0	0	0	0	1
27	482,018	136,052	167,328	0	0	1	0	0	0	0	1
28	55,236	173,345	505,743	51,074	0	0	0	1	0	0	0
29	54,205	163,142	454,538	113,512	0	0	0	0	0	0	1
30	62,983	184,436	449,321	88,658	0	0	0	1	0	0	0
31	73,617	206,463	437,877	67,441	0	0	0	1	0	0	0
32	81,524	250,589	450,414	2,871	0	0	0	0	0	0	1
33	1,010	68,307	703,228	12,853	0	0	0	0	0	0	1
34	103,154	10,592	569,195	1,046	0	0	0	0	0	0	1
35	100,367	11,219	555,954	1,321	0	0	0	0	0	0	1
36	90,493	33,702	476,069	45	0	0	0	0	1	0	0
37	94,357	48,818	447,368	0	1	0	0	0	0	0	1
38	103,856	55,177	422,275	1	1	0	0	0	0	0	1
39	147,046	60,968	495,911	0	1	1	0	0	0	0	0
40	223,188	340,602	221,608	0	0	1	1	0	0	0	1
41	151,623	222,163	411,611	0	0	0	0	0	0	0	1
42	44,591	0	725,382	0	0	0	0	1	0	0	0
43	115,916	0	571,572	0	0	0	0	1	0	0	0
44	82,105	0	616,729	0	0	1	0	1	0	0	1
45	85,006	0	654,285	0	0	1	0	1	0	0	0
46	140,953	441,386	203,060	0	0	1	1	1	0	0	1
47	90,981	317,268	377,148	0	1	0	1	1	0	0	1
48	23,187	29,944	679,526	725	1	0	0	0	0	0	0
49	67,937	449,317	250,917	17,227	1	0	0	0	0	0	0
50	1,375	10,135	773,374	514	1	0	0	0	0	0	0