

MAMMALS OF THE INDIANAPOLIS INTERNATIONAL AIRPORT CONSERVATION PROPERTIES, HENDRICKS COUNTY, INDIANA, WITH COUNTY RECORDS

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ABSTRACT. Mammals at the Indianapolis International Airport conservation properties were studied from 2008 until 2010 in association with on-going studies of the bat community at the site. Results from a combination of mist-netting, small mammal trapping, and observational records are reported herein. Thirty-seven of the 59 species of mammals known to occur in Indiana were documented at the conservation properties owned by the Indianapolis International Airport. Species not previously captured in Hendricks County were the masked shrew (*Sorex cinereus*), deer mouse (*Peromyscus maniculatus*), and western harvest mouse (*Reithrodontomys megalotis*). These individuals of the western harvest mouse also represent the easternmost record of this species' known range.

Keywords: Mammals, *Reithrodontomys megalotis*, Indianapolis International Airport, Hendricks County

INTRODUCTION

Biological diversity surveys are strongly encouraged by the Indiana Biological Survey of the Indiana Academy of Science. These surveys provide a valuable service by documenting the flora and fauna of the different lands throughout Indiana, both public and private. Many areas at an urban/rural interface, such as those surrounding the Indianapolis International Airport (IND), have not had a comprehensive survey of mammals.

In 1991, IND and the U.S. Fish and Wildlife Service agreed to set aside mitigation land for bat conservation (Whitaker et al. 2004). In 1997, Indiana State University and the Indianapolis Airport Authority (IAA) became partners in a series of studies aimed at ascertaining the status and biology of the federally endangered Indiana myotis (*Myotis sodalis*) on properties near IND (Sparks et al. 1998). Mist netting since 1997 has produced much data on the bat species composition of the area (Whitaker et al. 2004), and in previous years fish and herptile surveys have also been conducted on these lands (Foster et al. 2005; Ritzi et al. 2005). The purpose of this paper is to

summarize information on the mammal fauna, including the presence of three previously undocumented species in Hendricks County: the masked shrew (*Sorex cinereus*), and two species of cricetid rodent, the deer mouse (*Peromyscus maniculatus*) and the western harvest mouse (*Reithrodontomys megalotis*).

METHODS

Study site.—The Indianapolis Airport Authority (IAA) conservation lands are made up of several small woodlots within a matrix of residential, industrial and agricultural areas. The area is bordered by US Highway 40 and Indiana Highway 67 to the north and south, respectively (Fig. 1), and Indiana Highway 267 borders at the west. To the east of the study area lies the Indianapolis airport. Interstate 70 runs from east to west through the center of the area. The southern areas consist of wetlands, and the East Fork of White Lick Creek runs from north to south through the site. Most of the creek is wooded on both sides, and the open areas are primarily cultivated for agriculture or hay fields.

Sampling.—Small mammal trapping was conducted during the summers of 2008 to 2010 for a total of 7120 trap-nights. All trapping occurred from 15 May–15 August with the exceptions of

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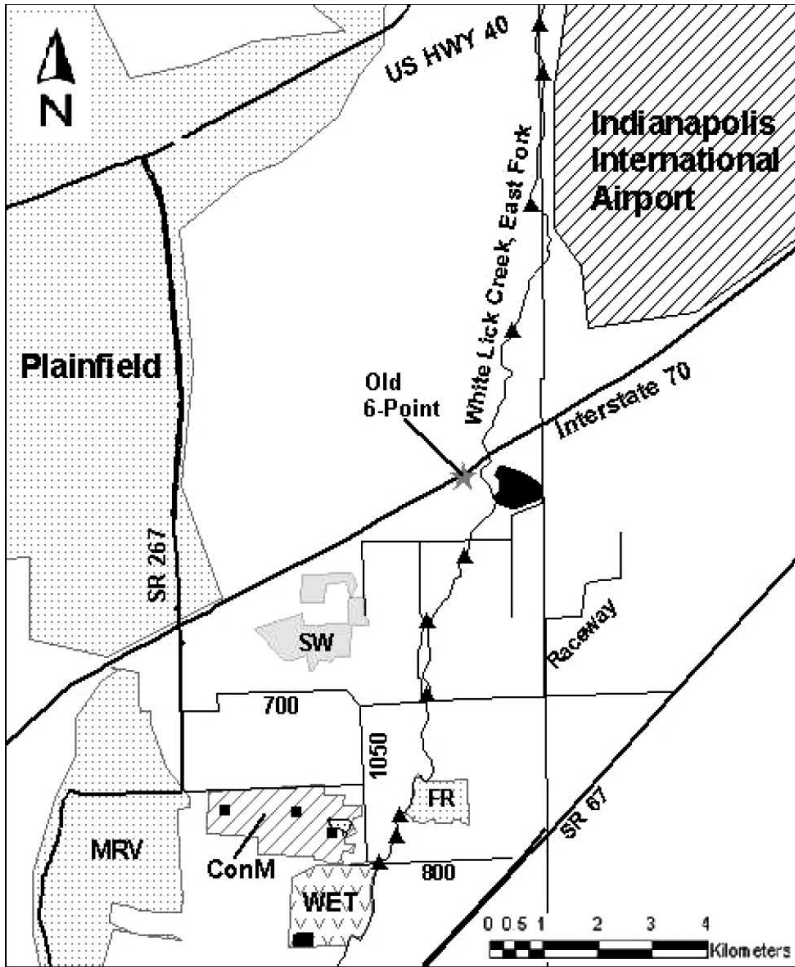


Figure 1.—Map of the Indianapolis Airport Authority (IAA) Conservation Lands. Abbreviations are as follows: ConM = Conservation Management and Red Squirrel Pond (stippled area), FR = Friendswood Golf Course, MRV = Mooresville, SW = Sodalis Woods and WET = wetlands. Black triangles represent net sites for bats along East Fork of White Lick Creek and black squares within Conservation Management denote net sites within. County roads are labeled for reference.

2009, in which trapping efforts extended until 26 August, and in 2010 occasional mole trapping began by 13 April. Most trapping was done with Sherman live traps. Snap traps were occasionally used in supplementary sampling efforts. In 2008, and to a lesser extent in 2009, one-liter pitfall traps were placed along fallen logs and other natural barriers in order to catch shrews. Mole traps were occasionally set in fresh tunnel systems, usually on the edges of small woodlots.

Bats were captured from 1997–1999 and 2002–2010 using two- and three-tier mist nets placed under adequate tree canopy over the East Fork of White Lick Creek (Fig. 1), or on trails

and near roost trees in wooded areas. All netting began no earlier than 15 May and ended no later than 15 August, with the exception of 2010 when netting began 10 April. A more detailed account of protocols used for bats can be found in Whitaker et al. (2008, 2009, 2010).

Information on larger mammals was obtained through a combination of observation, field notes, and specimens in the Indiana State University Vertebrate Collections (ISUVC). Observations were defined as witnessing live individuals directly or dead via road mortalities, but also via indirect methods such as scat presence, track or vocalizations.

Table 1.—Summary of small mammals trapped on Indianapolis International Airport Conservation Lands, Hendricks County, during 2008–2010. Total trap-nights and success rates as percentage are listed below yearly and cumulative totals. A (*) denotes that an individual was found dead and was not captured in a trap.

	Year			Total
	2008	2009	2010	
Talpidae				
<i>Scalopus aquaticus</i>	1*	1	1	3
Soricidae				
<i>Blarina brevicauda</i>	14	5	0	19
<i>Sorex cinereus</i>	8	2	0	10
Cricetidae: Arvicolinae				
<i>Microtus ochrogaster</i>	0	48	14	62
<i>Microtus pennsylvanicus</i>	0	32	27	59
Cricetidae: Neotominae				
<i>Peromyscus leucopus</i>	7	54	4	65
<i>Peromyscus maniculatus</i>	0	5	26	31
<i>Reithrodontomys megalotis</i>	0	10	3	13
Muridae				
<i>Mus musculus</i>	0	2	2	4
Dipodidae				
<i>Zapus hudsonius</i>	1	1	21	23
Sciuridae				
<i>Tamias striatus</i>	1	0	0	1
Total	32	160	98	290
Trap-nights	1211	2924	2985	7120
Captures/trap-night	0.026	0.055	0.033	0.041

RESULTS

A total of 37 species of mammals were captured or observed at this study site. A total of 290 individuals representing 11 species of small mammals were captured over a total of 7120 trap-nights at the Indianapolis International Airport Conservation Properties from 2008 through 2010 (Table 1). From 1997 through 2010, ten species of bats have been captured in mist nets (Table 2). Results are listed in systematic order below.

DIDELPHIMORPHA

Didelphidae.—Virginia opossums (*Didelphis virginiana*) are relatively abundant in the area and were observed on many occasions, most often after nightfall. We have observed them living in hollowed out trees, as well as in a rocky, underground burrow. An adult with 5 juveniles was found near the junction of Stafford and Perry roads in 2002 (ISUVC catalog #7695, 7696, 7697, 7698, 7699, 7700).

INSECTIVORA

Talpidae.—The eastern mole (*Scalopus aquaticus*) occurs frequently based on observed tunneling. In addition, one individual was found dead in 2008 on a trail near Red Squirrel Pond. In 2009 and 2010, a total of 2 moles were captured in 28 trap-nights. Both of these individuals were captured within two meters of the east fork of White Lick Creek; one in 2009 in the wetlands, and one in 2010 near the wetlands along CR 800 (Fig. 1).

Soricidae.—Two species of shrews were captured on the IAA properties: the northern short-tailed shrew (*Blarina brevicauda*) and the masked shrew (*S. cinereus*; Table 1). The individuals of *S. cinereus* ($n = 10$) represent the first record of this species in Hendricks County. Most shrews were captured in wooded areas using pitfall traps; however 3 individuals of *B. brevicauda* were captured in open areas: one in a grassy field, one in a newly planted woodlot, and the third in a very disturbed location near

I-70. Most of the *S. cinereus* were only captured in a riparian area using pitfall traps. However, one individual was captured in a Sherman trap located in a grassy area near Conservation Management. An additional individual of *S. cinereus* (ISUVC #6421) was captured in 1998.

CHIROPTERA

Vespertilionidae.—From 1997–2010, 2384 bats representing 10 species were captured (Table 2). Seven of these were captured annually, while three were rare. The most common bat present is the big brown bat (*Eptesicus fuscus*), followed by (in order of abundance) the Indiana myotis (*Myotis sodalis*), red bat (*Lasiurus borealis*), tri-colored bat (*Perimyotis subflavus*), northern myotis (*Myotis septentrionalis*), little brown myotis (*Myotis lucifugus*), evening bat (*Nycticeius humeralis*), silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*), and the gray bat (*Myotis grisescens*).

RODENTIA

Castoridae.—American beavers (*Castor canadensis*) were seen on many occasions in or near White Lick Creek. No beavers have been documented anywhere else on the project site.

Cricetidae: Arvicolinae.—At least 6 species of the family Cricetidae occur at the IAA study site, 3 in the Neotominae and 3 in the Arvicolinae. The meadow vole and the prairie vole (*Microtus pennsylvanicus* and *M. ochrogaster*, respectively) are abundant in the study area (Table 1). The muskrat (*Ondatra zibethicus*) is the only other arvicoline which occurs at the study site. Muskrats at the study area are largely limited to marshier parts of the area, as well as riparian corridor following WLC. One muskrat was taken from the IAA land in 2002 (ISUVC #7097). Two other arvicolines were not captured. Efforts have been made to capture pine voles (*Microtus pinetorum*) using pitfalls and Sherman traps sunken into soil, particularly near spots which looked ideal. The southern bog lemming (*Synaptomys cooperi*) has not been captured, despite trapping in various areas of suitable habitat.

Cricetidae: Neotominae.—The white-footed mouse (*Peromyscus leucopus*) occurs frequently, and is the only cricetid found in the wooded areas at the site. Many individuals of the deer mouse (*Peromyscus maniculatus*) have also been captured ($n = 31$), especially in areas adjacent to Interstate 70. Surprisingly, this is also a new

Table 2.—Total mist net captures of 10 bat species on the IAA conservation lands between 1997 and 2010. No netting occurred in 2000 or 2001. Numbers in parentheses represent the percent total of each species.

	Cumulative Years Netting	
	1997–2010	
<i>Eptesicus fuscus</i>	1273	(53.4)
<i>Myotis sodalis</i>	240	(10.1)
<i>Lasiurus borealis</i>	238	(10.0)
<i>Perimyotis subflavus</i>	199	(8.3)
<i>Myotis septentrionalis</i>	161	(6.8)
<i>Myotis lucifugus</i>	154	(6.5)
<i>Nycticeius humeralis</i>	102	(4.3)
<i>Lasionycteris noctivagans</i>	8	(0.3)
<i>Lasiurus cinereus</i>	8	(0.3)
<i>Myotis grisescens</i>	1	(0.04)
Total	2384	

record in Hendricks County, which is likely due to an absence of trapping efforts in agricultural fields and habitat with little to no vegetative cover. This species was rarely captured alongside any other species, especially in areas with little to no understory vegetation. *Peromyscus maniculatus* is the only species of small mammal which has been frequently seen to inhabit areas with much bare ground (Whitaker 1967, Whitaker & Mumford 2009). The two species of *Peromyscus* at the study area exhibited very little habitat overlap, with *P. maniculatus* captured only in open areas and *P. leucopus* most often captured in the woods; the only location where the two species were found together was a location adjacent to Interstate 70.

The first recorded occurrence of the western harvest mouse (*Reithrodontomys megalotis*) in Hendricks County was in 2009, in a field in the southwest portion of the wetlands (Fig. 1). Additional individuals were captured in a trenched area adjacent to Interstate 70. This species is a relatively recent immigrant into Indiana (Whitaker & Sly 1970). It exists in low numbers in the study area, with ten individuals captured in Sherman traps in 2009, and three more captured in 2010. These individuals represent a new county record for this species, as well as the eastern-most record of the species' known range (Leibacher & Whitaker 1998, Whitaker & Mumford 2009).

Muridae: Murinae.—The house mouse (*Mus musculus*) is the only Old World rodent that has been observed. No rats were found. In 2009, two

individuals were taken in snap traps from a barn. We have also seen them under piles of refuse which are frequently dumped by humans. In June 2010, two house mice were captured in Sherman traps: one reproductive male and one pregnant female.

Dipodidae: Zapodinae.—The meadow jumping mouse (*Zapus hudsonius*) was captured in all three years of the study. One male was captured in July 2008 at a north-facing slope just south of I-70 at the former six-points interchange. A reproductive female was captured in July 2009 at the same location. In 2010, 22 individuals of this species were captured, 12 female, nine male and one which was not checked. All 22 from 2010 were captured to the east of the six-points location. This spot was also trapped in 2009; however none were captured.

In 2010, 2 individuals were outfitted with radio-transmitters to find their nesting locations. The first, a female, was radio-tracked during the daytime to a nest located about halfway up a south-facing slope. The opening to the nest was about 3 centimeters in diameter and surrounded by tufts of grass and much thatch. The second individual, also a female, was tracked to a small drainage ditch at the edge of a wooded area to the south of the site. The area surrounding the opening had much bare ground and several tree roots, as well as some human trash.

Sciuridae.—We have observed 5 species of squirrels at the IND conservation lands. The fox squirrel (*Sciurus niger*) was seen most often, and the red squirrel (*Tamiasciurus hudsonicus*) was observed in more wooded areas by Red Squirrel pond and in the southern riparian areas. One individual was taken in July 2004 (ISUVC # 9036). Southern flying squirrels (*Glaucomys volans*) are seen often at night in the older growth woodlots and are occasionally captured in mist nets. Eastern chipmunks (*Tamias striatus*) are seen occasionally, and one male was captured in a Sherman trap in 2008 (Table 1). Woodchucks (*Marmota monax*) are uncommon, although they are seen relatively regularly in the riparian woodlots to the south of County road 700 (Fig. 1).

LAGOMORPHA

Leporidae.—The eastern cottontail (*Sylvilagus floridanus*) is the only species of rabbit present and is very common on the IAA-managed lands. It is not uncommon to see several at a time near roads and residential areas. In 2010, an injured

European rabbit (*Oryctolagus cuniculus*) was observed near a barn owned by IAA. It appeared to have been released and was likely wounded while crossing the road.

CARNIVORA

Canidae.—The coyote (*Canis latrans*; ISUVC #8427) has been seen on several occasions. Although this species has been recorded south of I-70, it has been most often seen to the north in more developed areas. We observed the red fox (*Vulpes vulpes*) rarely in the southern part of the conservation lands, but not to the north of I-70.

Felidae.—The only felid recorded was the introduced feral cat (*Felis domesticus*). Cats were seen quite often, and are likely affiliated to a high degree with the residential areas. In 2010, a female with 6 kittens was found near Sodalis Woods.

Mustelidae.—The long-tailed weasel (*Mustela frenata*; ISUVC #8561) was seen occasionally in the areas south of I-70. The least weasel (*M. nivalis*), though likely present, has not been observed. The mink (*M. vison*) has been seen rarely, and one was found as a road mortality near the junction of Stafford and Six-Points Road in 1998 (ISUVC #6404). Badgers (*Taxidea taxus*), scarce in Indiana, have not been seen at this location.

Mephitidae.—Striped skunks (*Mephitis mephitis*) have been rarely observed in the area, mostly dead on the road or indirectly by odor. In 2008, the senior author observed one crossing a road (CR-1050) after nightfall.

Procyonidae.—Raccoons (*Procyon lotor*) are the most abundant carnivore at IAA, and were seen in all habitat types. On several occasions, we have witnessed local residents hunting them, and they have been often found dead along roadsides.

ARTIODACTYLA

Cervidae.—White-tailed deer (*Odocoileus virginianus*) are abundant and were most often observed in the agricultural and hay fields and near the borders of open and wooded areas.

DISCUSSION

The conservation lands at the Indianapolis International Airport contain a wide variety of habitats and at least 37 of the 59 non-domesticated species of mammals known to exist in Indiana (Gikas et al. 2009; Whitaker & Mumford 2009). Three of the 37 species are newly reported records

for Hendricks County: the masked shrew (*Sorex cinereus*), deer mouse (*Peromyscus maniculatus*), and western harvest mouse (*Reithrodontomys megalotis*). Our records of *R. megalotis* at this study area represent the eastern-most record for this species.

The western harvest mouse may have arrived in Hendricks County using road right-of-ways as a dispersal path, and it is likely that they represent an eastward expansion of the individuals which Leibacher & Whitaker (1998) captured to the east of the Wabash River in Parke County. Given the small number of individuals captured, and the absence of this species in 2008, it is possible that this species arrived at the site in 2009. The small southern population is separated from the northern population by 5.2 km., and attempts at trapping in suitable habitat between these two sites have not produced this species.

The bat community at the airport has been well studied (Whitaker et al. 2004), with 10 of the 13 Indiana species captured, and 7 of the 10 species being captured annually. The silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*), and the gray bat (*Myotis grisescens*) were only seen rarely ($n = 8, 8, 1$, respectively). The silver-haired bat is a spring and fall migrant through the area, so it is expected that we would capture them in low numbers during the summer trapping. The hoary bat is probably more abundant than is suggested by these eight captures (Gehrt & Chelsvig 2004; Sparks et al. 2005). This species probably flies high and thus is seldom caught in nets (Whitaker & Mumford 2009). In 2009, we outfitted 1 female hoary bat with a radio transmitter in an attempt to track the individual; however it had left the area by the following day. In 2003, Sparks et al. (2005) tracked a juvenile hoary bat for 8 days and found it using eastern cottonwood trees as day roosts.

The most unexpected bat species captured was the 2005 capture of a gray bat (*M. grisescens*). Several gray bats taken in Indiana prior to 1980 were considered to be of accidental occurrence. In 1978, Cope & Richter (1978) caught 8 pregnant females at Sellersburg, Clark Co. Brack et al. (1982), found the maternity colony at a flooded quarry in Sellersburg (Brack et al. 1984). This colony contained about 400 individuals in 1982, but the population had increased to over 6000 bats in 2008. Gray bats have also been captured at various spots along the Ohio River

(Whitaker & Gummer 2001, Whitaker et al. 2001). This individual captured at IND appears to have been a vagrant (Tuttle et al. 2005), possibly from the Sellersburg colony.

Eight species of mammals that could reasonably occur by virtue of distribution and habitat preferences have not been recorded on the study site. The least shrew (*Cryptotis parva*) and the southeastern shrew (*Sorex longirostris*) were not captured but could likely occur. It is possible that the least shrew exists in the grassy fields but does not get captured in Sherman traps due to its low body mass. We did see a shrew fleeing a trap in 2009; however we were unable to capture it. The only masked shrew (*S. cinereus*) captured in a Sherman was in the same area in the same summer. The Norway rat (*Rattus norvegicus*), southern bog lemming (*Synaptomys cooperi*), and the pine vole (*Microtus pinetorum*) are also probable residents. The Gray squirrel (*Sciurus carolinensis*) could occur by general range, but is probably not as likely by habitat as this species usually occurs in deeper, more mature woods than that found at the IAA areas (Whitaker & Mumford 2009).

The gray fox (*Urocyon cinereoargenteus*) is likely to have occurred in the past, but may have been locally extirpated. The red fox and especially the gray fox have been decreasing throughout the state (Whitaker & Mumford 2009). This decline in species abundance could be due to a mixture of increasing development near the study site (Ordenana et al. 2010) and competition with the coyote (Major & Sherburne 1987; Sargeant & Allen 1989). The thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*) has been observed in other parts of Hendricks, Marion, and Morgan Counties (Whitaker & Mumford 2009), but none have been observed on the study site. This species is rather obvious, especially along roadsides, and would be readily observed on some of the more maintained northern parts of the study site. This species appears to not be present in the study area.

The present study was carried out on an area preserved and enhanced as a "conservation area" near the Indianapolis International Airport, particularly for the Indiana myotis. However, the area has attracted many other species, including at least 37 of the 59 mammal species known to currently occur in Indiana. This demonstrates the importance to wildlife of areas such as this. As more land becomes developed and urban sprawl continues, these areas of

conservation become increasingly important. Increased efforts should be given to preserve similar areas, and also to survey all public areas such as parks, fish and wildlife areas, etc., and also private lands in order to record presence of species. Additionally, the occurrence of three new mammal county records shows that these surveys enhance our knowledge of species ranges. Although this conservation area is at the edge of a heavily urbanized area, very little is known with regard to the effect that urban sprawl has on species composition and behavior. Much more research should be done in similar areas to determine how these “urban parks” contribute to species diversity.

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