

BATS OF ABANDONED COAL MINES IN SOUTHWESTERN INDIANA

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ABSTRACT: Double-frame harp bat traps were used to sample the bats at the entrances to 26 abandoned coal mines in ten Indiana Counties between 1984 and 1995. A total of 49 samples was collected. A total of 204 bats was captured, including 84 eastern pipistrelles (*Pipistrellus subflavus*; a mean of 1.4 per visit), 80 northern myotis (*Myotis septentrionalis*; a mean of 1.7 per visit), 39 little brown myotis (*M. lucifugus*; a mean of 0.8 per visit), and 1 big brown bat (*Eptesicus fuscus*; a mean of 0.02 per visit). Most samples yielded few or no bats. Only five samples yielded more than 3 bats. (Three samples at two entrances at a new site after this paper had been completed yielded 88 additional bats, including 2 male Indiana myotis, a Federally endangered species.)

KEYWORDS: Bats, bat roosts, coal mines, *Eptesicus*, hibernacula, *Myotis*, *Pipistrellus*.

INTRODUCTION

Coal was first discovered in Indiana along the Wabash River in 1736. Underground coal mining began in the State in the mid-1800s. As a consequence, abandoned underground coal mines underlay extensive areas of southwestern Indiana. Many of the shafts and portals at these old mines remained open when mining ceased, sometimes posing extreme public health and safety hazards to humans and other animals.

The Indiana Department of Natural Resources, Division of Reclamation's Restoration Program administers the Abandoned Mine Land Program that reclaims areas disturbed by coal mining prior to 1977. The purpose of reclamation at these sites is to reduce if not eliminate health, safety, and environmental hazards, while improving productivity and enhancing the esthetics of the landscape. To date, the Indiana Abandoned Mine Land Program has sealed nearly 300 shafts and portals.

All of the species of bats in Indiana that traditionally use caves for roosting, hibernating, or reproducing will use mines for these purposes. Some of the species of bats that might use these old mines are listed as State or Federally endangered and are, therefore, in need of protection. The Indiana Abandoned Mine Land Program is consequently required to assess these mines for use by bats prior to

reclamation and cannot destroy the habitat if Federally endangered species are found. The alternative is typically to install a "bat gate" at the entrance of the mine that prevents human entrance but still allows bats to enter and exit the mine unencumbered.

Twelve species of bats are (or recently were) known from Indiana and nine species typically use caves or mines (Mumford and Whitaker, 1982). However, the southeastern myotis (*M. austroriparius*) has not been documented in the State since 1970, and the big-eared bat (*Plecotus rafinesquii*) has not been documented since 1962. Both are considered extirpated. The following seven species currently hibernate in caves in Indiana: the little brown myotis (*Myotis lucifugus*), the Indiana myotis (*M. sodalis*), the northern myotis (*M. septentrionalis*), the gray myotis (*M. grisescens*), the big brown bat (*Eptesicus fuscus*), and the eastern pipistrelle (*Pipistrellus subflavus*). The silver-haired bat (*Lasionycteris noctivagans*) occasionally hibernates in caves or mines.

Among the bats found in Indiana, two are on the United States Fish and Wildlife Service's Endangered and Threatened Wildlife and Plants list. One, the gray myotis, is the only bat currently present in Indiana that forms maternity colonies in caves or mines. The only nursery colony of that species known in Indiana was located in 1982 (Brack, *et al.*, 1984b) in Clark County. The other Federally endangered species, the Indiana myotis, uses caves or mines for hibernation and for swarming (Brack, *et al.*, 1984a; Cope and Humphrey, 1977; Mumford and Whitaker, 1982). Male gray and Indiana myotis as well as bats of other species sometimes roost in caves in summer. The Indiana Department of Natural Resources, Division of Fish and Wildlife, considers all Federally listed species as endangered in Indiana. The evening bat (*Nycticeius humeralis*) is considered state endangered in Indiana, but it does not enter caves.

Since 1984, Indiana Division of Reclamation has funded field assessment of sites that might serve as roosts for bats. Some of these sites consist of buildings and other structures, but 26 of them contained one or more open mine entrances. The purpose of this paper is to report on bats using these entrances.

MATERIALS AND METHODS

The 26 sites were sampled a total of 49 times between 1984 and 1995, using a double-frame harp bat trap at one or more entrances. The trap was usually tended from dusk to midnight or later on one or more visits (usually 1-3). The trap was placed at the entrance to the mine, and bird netting was used around the trap to prevent bats from entering or exiting without passing through the trap. A bat detector was used to monitor bat activity in the vicinity of the entrance while the trap was in operation. The detector allowed determination of whether there were bats in the area and of the trap success relative to the number of bat calls heard. All bats were identified, their sex was checked, and they were released. Twenty-six sites were sampled in ten Indiana Counties (Table 1).

Most of the entrances were horizontal, but a few were vertical. The mines were not explored because of the danger, but the mines sampled were all those

Table 1. Bats captured in bat traps at abandoned coal mines in southwestern Indiana.

County	Number of mines		Number of Visits to Mines	<i>Pipistrellus</i> <i>subflavus</i>	<i>Myotis</i> <i>septentrionalis</i>	<i>Myotis</i> <i>lucifugus</i>	<i>Eptesicus</i> <i>fuscus</i>	Total Bats
	Sampled	with Bats						
Clay	7	5	18	54	47	27	1	129
Greene	2	1	4	1	0	0	0	1
Martin	1	1	1	0	1	0	0	1
Owen	1	0	3	0	0	0	0	0
Parke	3	2	5	8	9	2	0	19
Pike	2	2	2	19	21	10	0	50
Spencer	1	0	3	0	0	0	0	0
Sullivan	4	1	7	2	0	0	0	2
Warrick	3	0	3	0	0	0	0	0
Vigo	2	1	3	0	2	0	0	2
Totals	26	13	49	84	80	39	1	204

that appeared from the entrance to have any potential of having internal passageways that might make them suitable as bat roosts.

The most likely time to find activity at mine entrances is from late August through late October, when bats tend to gather or "swarm" at cave and mine entrances presumably for mating and/or hibernacula assessment purposes. Bats may emerge in spring from caves or mines serving as hibernacula, but bat activity at this time of year is usually less. Therefore, most of our sampling occurred in late summer and fall, but some sampling was carried out in spring and early summer. The only bats of Indiana likely to use caves or mines as maternity colonies are the southeastern myotis (probably extirpated) and the gray bat (not likely in southwestern Indiana).

RESULTS

Four species of bats totaling 204 individuals were captured at the 26 mine entrances in 49 visits (mean of 4.2 per visit). This included 84 eastern pipistrelles (1.7 per visit), 80 northern myotis (1.6 per visit), 39 little brown myotis (0.8 per visit), and 1 big brown bat (0.02 per visit). No bats at all were taken at 13 (50%) of the entrances; only one bat was taken at each of five entrances; two were taken at each of three entrances; and 3 bats were taken at one entrance. In only five (19.2%) of the sites were more than three bats taken: 34 in one visit to site 20, 26 in one visit to site 174, and 65 in six visits to site 423 in Clay County; 50 in one visit to site 228 in Pike County; and 18 in two visits to site 651 in Parke County. (The site locations are on file with the Division of Reclamation.)

DISCUSSION

Surprisingly few of the abandoned mines in southwestern Indiana were regularly visited by bats. Nothing special was noted in those mines that contained the larger numbers of bats. Perhaps conditions differed considerably inside the

mines. Several non-endangered bat species utilize underground coal mines in Indiana, but no endangered species were found to do so. Consequently, the Indiana Abandoned Mine Land Program has not been required to install bat gates. However, many or most of the bat species in the State are probably declining due to loss of habitat. The Division of Reclamation has come to realize the importance of protecting bat habitat, even if no endangered bats are currently using it. The installation of bat gates, especially in remote, rugged areas, appears to be both economically feasible and less environmentally disturbing than traditional methods of sealing mine entrances. Therefore, the Division of Reclamation is currently considering installing bat gates at five reclamation projects to protect bats and bat habitat, even though no endangered bats have been found there.

NOTE: In 1996, after this paper was written, 2 entrances at a new mine site (778) in Pike County were trapped a total of three times. A total of 88 bats was taken—44 little brown myotis, 25 eastern pipistrelles, 17 northern myotis, and 2 Indiana myotis. The latter two bats are the first individuals of an endangered species taken during this program. Both were males captured on 10 October 1996. This site will be investigated further.

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