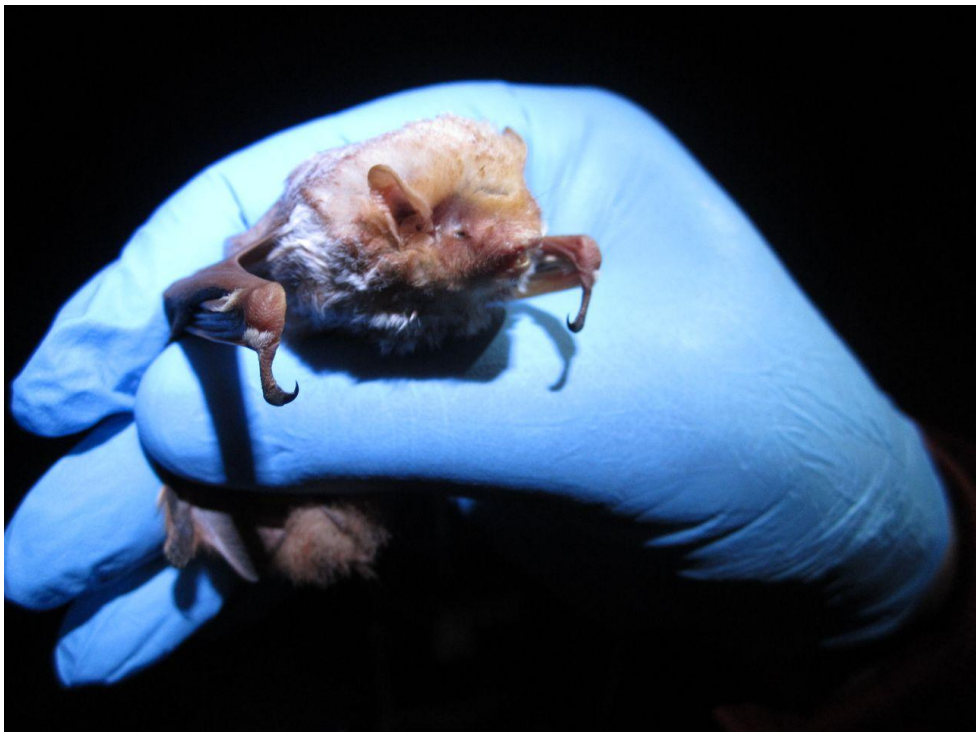
Mist-net Assessment of Bat Diversity in the Hiawatha National Forest: Summer 2012



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EXECUTIVE SUMMARY

Many areas in Michigan possess winds adequate for the efficient generation of wind energy. Some of these areas have also been documented to provide habitat for wildlife, including bats. Bat fatalities at wind turbines due to collisions with turbine blades and monopoles, as well as due to barotrauma, have been documented throughout North America, including the Midwestern United States. Preliminary research suggests that informed siting and operation of wind turbines can minimize impacts to bats. Siting decisions can be informed by knowledge of the distribution of bats in the landscape and this can be particularly important in the case of rare species. Due to the potential for fatalities of bats at future wind turbines, mist-netting was conducted to determine if which species were using portions of the Upper Peninsula of Michigan associated with the Hiawatha National Forest.

Mist-netting in the project area resulted in capture of a variety of bat species, including the big brown bat, eastern red bat, little brown bat, and northern long-eared bat. No Indiana or evening bats were netted in the Project Area.

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INTRODUCTION

Many areas in Michigan possess the quality of winds necessary for the efficient generation of wind energy both on-shore and off-shore (Wind Energy Resource Zone Board, 2009; Michigan Great Lakes Wind Council, 2009). Some of these areas have also been documented to provide habitat for wildlife, including bats. Bat fatalities at wind turbines in North America have been documented at various frequencies, depending on the site and situation, with higher frequencies being reported in the Eastern United States (National Academy of Sciences 2007). Strickland et al. (2011) reviewed reported fatality rates and found them to vary from 0.07-39.7 fatalities/MW/Year, with the highest rates associated with forested, mountain ridge tops. Fatalities can result from either direct interaction with turbines, i.e. bats struck by turbine blades or colliding with monopoles (Kunz et al., 2007; Horn et al., 2008), or from barotrauma, i.e. lung damage resulting from rapid decompression due to turbulence associated with wind turbines (Baerwald et al. 2008). The concern regarding bat fatalities due to wind energy development applies to a variety of bat species known to be subject to such risk, but is especially a concern for threatened or endangered species due to their conservation status. However, only a handful of known fatalities of a Federally-listed bat species (the Indiana bat, *Myotis sodalis*) have been reported from wind farms in the Midwest.

Understanding bat activity patterns in areas that hold potential for wind farm development will help inform wind developers and resource managers as to the risk of bat fatalities as well as inform the specific placement of turbines within a proposed project area. Due to the potential for bat fatalities at future wind energy facilities and the consequent need for careful planning, the Michigan Department of Natural Resources contracted Michigan Natural Resources (MDNR) to collect information on bat activity in the upper peninsula of Michigan (hereinafter “the project area”).

Nine species of bats live in Michigan, including the five species that are most commonly killed at wind turbines. The nine Michigan species are eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), eastern pipistrelle (*Perimyotis subflavus*), big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), Indiana bat (*M. sodalis*), northern long-eared bat (*M. septentrionalis*), and evening bat (*Nycticeius humeralis*). With the exception of the Indiana bat and the evening bat, all of these species may be detected in the central upper peninsula of Michigan. The eastern pipistrelle is listed as a species of "special concern" by the Michigan Natural Features Inventory. Furthermore, Michigan's Wildlife Action Plan labels this species, as well as the eastern red bat, hoary bat, silver-haired bat, and northern long-eared bat, as species of "greatest conservation need".

Some monitoring data have already been collected in the central portion of the upper peninsula of Michigan using mobile acoustic bat surveys. These surveys involved the placement of bat acoustic detectors on vehicles and driving along transects through survey areas. We expanded this monitoring effort through mist-netting; a different method that allows access to more remote areas and habitats and unambiguous identification of individual bats.

By monitoring the species composition and relative abundance of bats in this area, where we currently have very relatively little knowledge of bats, wind energy developers can significantly reduce negative impacts to bats by siting wind turbines in areas with low concentrations of bats. This information will also be useful to local planning agencies as they develop guidelines for wind turbine siting.

The objectives of the efforts reported here were:

1. Monitor the bat species present in the central Upper Peninsula of Michigan during the breeding season.
2. Monitor the relative abundance of bats present in the central Upper Peninsula of Michigan during the breeding season.

STUDY SITE DESCRIPTION AND METHODS

Study Site Description

Research was conducted along the acoustic driving survey routes previously surveyed by the United States Department of Agriculture Forest Service (USFS) in the Hiawatha National Forest. The routes included the following counties: Mackinac, Chippewa, Delta, and Schoolcraft (Figs. 1 and 2). The land use / land cover of the project area consists mainly of forest with scattered wetlands. The natural vegetation in this area is generally described as mesic northern forests, dry-mesic forest, and poor conifer swamp. The forest overstory found in the project area included maple (*Acer* spp.), oak (*Quercus* spp.), beech (*Fagus* spp.), black spruce (*Picea mariana*), and hemlock (*Tsuga canadensis*). Historically, the project area was vegetated with beech-sugar maple-hemlock forest, mix conifer swamp, pine barren, and hemlock-white pine (Albert 2008).

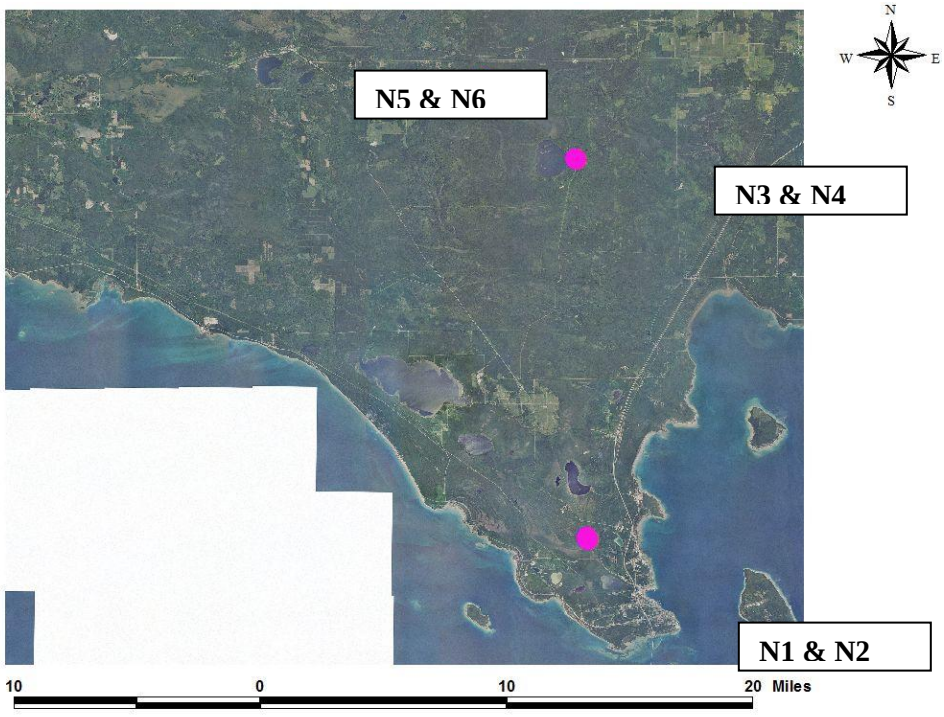

Figure 1. Mist-netting sites (pink dots) were established in the eastern upper peninsula of Michigan. Bats were netted at the sites in the summer of 2012.

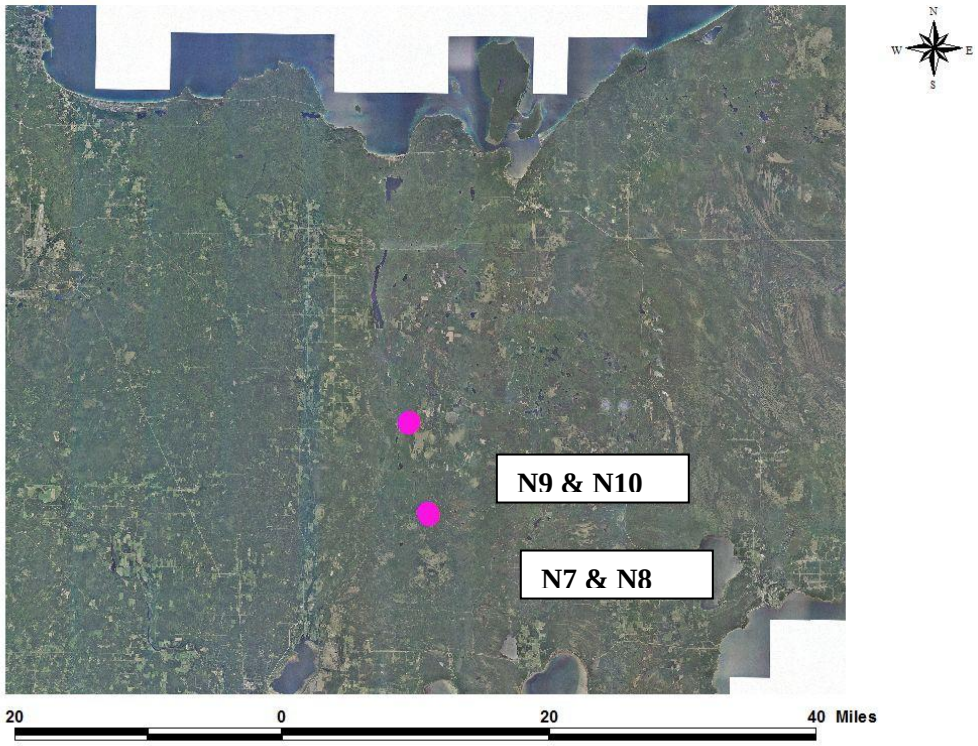

Figure 2. Mist-netting sites (pink dots) were established in the western upper peninsula of Michigan. Bats were netted at the sites in the summer of 2012.

Mist-netting Protocols

Mist-netting was used to determine the diversity of species in the Hiawatha National Forest. Netting procedures followed the US Fish and Wildlife Service (USFWS) (2007) guidelines for netting of Indiana bats to determine the presence, or likely absence, of this species. These procedures, as used in this study, are summarized as: 1) netting was conducted during the period of 28 July – 8 August 2012; 2) for each sampling location a net set of 2 triple-high mist nets were used (i.e. each pole set-up consisted of 3 12-meter wide, stacked mist nets for an effective height of 21 feet); 3) within a sampling location (i.e. net set), each triple-high net was at least 90 meters from its twin; 4) within a woodlot, net sets were spaced as far apart as possible, while still meeting requirements for high probability of capture (proximity to potential roost trees, within travel corridors, etc.); 5) nets were opened at dusk and monitored for at least 5 hours; 6) netting was not conducted on rainy nights (no excessively windy or cold nights were

encountered during the netting period); and 7) nets were checked for bats as often as practicable (usually every 30 minutes), allowing for prompt processing of captured bats.

Each bat captured was initially identified to species or group via general appearance and verified by checking the individual's morphological characteristics with the field key contained in Baker (1983). The following data were recorded for each bat captured: species, gender, reproductive condition, stage of maturity, forearm length, ear length, tragus length, and weight. One individual bat escaped while field staff were extricating it from the net. A positive species identification based on field characteristics (size and coat color) of the individual was made before the escape; the bat was included in the tally of captures, though detailed information was not collected.

Due to the threat of white nose syndrome (WNS), Bat Conservation International WNS Summer Bat Survey Protocols (Tyburec 2010) were followed to avoid possible contamination of individual bats; however; no suspected evidence of WNS was found in any captured bat.

RESULTS AND DISCUSSION

Mist-netting

Thirty-two bats of four species were captured during mist-netting in the project area. In order of capture frequency, these were: northern long-eared bat, eastern red bat, little brown bat, and big brown bat (Table 1). No Indiana or evening bats were netted in the project area. The result that neither species was captured in the area is consistent with the known historic occurrence of these species in the state.

Table 1. Number of captures, by species, at each netting site and associated natural community type.

Sampling Point	Date of 1st net night	Date of 2nd Net Night	Michigan Natural Community	little brown bat	big brown bat	northern long-eared myotis	eastern red bat
N1	7/28/12	7/29/21	Poor Conifer Swamp				
N2	7/28/12	7/29/12	Poor Conifer Swamp				
N3	7/30/12	7/31/12	Mesic Northern Forest	2			
N4	7/30/12	7/31/12	Mesic Northern Forest				
N5	8/1/12	8/2/12	Dry-mesic Northern Forest		1	5	1
N6	8/1/12	8/2/12	Dry-mesic Northern Forest			3	4
N7	8/3/12	8/4/21	Mature Pine Plantation	1		2	1
N8	8/3/12	8/4/12	Mature Pine Plantation			2	
N9	8/5/12	8/6/12	Mesic Northern Forest	2		5	1
N10	8/5/12	8/6/12	Mesic Northern Forest			2	
			Totals =	**5**	**1**	**19**	**7**

CONCLUSIONS

We sampled a diversity of habitats in the Upper Peninsula of Michigan. Thirty-two bats of four species were captured during mist-netting in the project area (northern long-eared bat, eastern red bat, little brown bat, and big brown bat). In previous surveyed efforts, using mobile acoustic monitoring, the USFS did not detect little brown bats; this finding provided some of the impetus for performing the current effort. We did successfully document this species in the project area.

In general, our survey results suggest that collisions of currently endangered bat species with turbine blades or monopoles would be unlikely in this project area due to the likely absence of Indiana bats and evening bats from the sampled areas. However, collision risk may increase as more species are potentially reclassified as endangered species due to White-nose Syndrome, such as northern long-eared bats and little brown bats.

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