ENDANGERED SPECIES GRANT PROJECT REPORT—INDIANA

Impacts of White-Nose Syndrome on a Bat Community Near the Indianapolis Airport

A Northern long-eared bat being extracted from a mist net.

Current Status

Year one of a 1.5-year project

Funding Sources and Partners

DNR Wildlife Diversity Program (USFWS Endangered Species Grant E13R01), Indiana State University, Indianapolis Airport Authority

Project Personnel

Principal investigator, Joy O'Keefe
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Background and Objectives

White-nose syndrome (WNS) is a disease that affects many species of bats that hibernate in caves. The disease is caused by a fungus that was likely introduced to the United States in 2006. Since then, six species of bats have suffered population declines, as documented by cave surveys. It has been suggested that declines of highly affected species might influence the composition of bats on the landscape. One prediction stated that the little brown bat will be wiped out of the Northeast and Midwest because of WNS. This is a bold prediction because the little brown bat was common before the onset of the disease.

WNS was detected in Indiana in 2011, but it is possible the fungus was present earlier. At the end of winter 2012-2013, WNS had been detected in 34 caves in 10 counties. At least 16 of these are major habitat in which bats hibernate. However, to date, we have not detected a significant change in bat populations during summer survey work at a long-term study site in central Indiana.

It is important to measure effects of WNS in a well-studied bat community so impacts of WNS can be distinguished from other factors that might affect bat community composition. Indiana State University has gathered data on the bat community near the Indianapolis International Airport since 2002. Additional survey data are available from 1997-1999. These data were collected to fulfill the obligations of a Habitat Conservation Plan between the U.S. Fish and Wildlife Service (USFWS) and the Indianapolis Airport Authority. Each summer, from May 15 to Aug. 15, we monitor 10 net sites along the East Fork of White Lick Creek, near Plainfield. Seven bat species are routinely captured at this study site: big brown bat, little brown bat, Northern long-eared bat, Indiana bat, tricolored bat, Eastern red bat, and evening bat. The first five species are known to be impacted by WNS.

For the proposed study, our objectives are to measure changes in the number of bat species present (species richness), to count individuals of each species (species abundance), and to assess reproductive condition changes. We will measure the change in these variables over time to see if WNS is a factor. We first aim to compare species richness and abundance by year using capture data collected in summers 2002–2014. We will also measure changes in reproductive rates by assessing the proportion of the population of adult females that are pregnant, lactating, post-lactating, and non-reproductive; further, we will look for year-to-year changes in the timing of each reproductive state (e.g., are pregnant females detected earlier or later in the season as a function of WNS or climatological factors?). Additional factors, such as changing weather patterns and climate change, may have significant effects on bat populations. Thus, we will also account for these factors in our analyses.

Big brown bat is the study's most commonly captured species.

Dr. Joy O'Keefe and master's student Zach Kaiser prepare a mist net for a night of sampling bats.

"Wing scoring" a bat to check for damage from white-nose syndrome.

Ph.D. student Scott Bergeson, master's student Joey Weber, and Giorgia Auteri prepare a net for a night of sampling bats.

Methods

Mist-netting Surveys—We will compile capture data from the airport site for 2002–2013 and will collect additional capture data in 2014. We will standardize capture data by using only data from the 10 semi-permanent net sites, each of which is netted three times per summer. Net effort varies slightly from one survey to the next, so we will calculate capture rates per net-night (one single-high 6-12 meter net open for five hours) for each site and night. We will record sex, age, reproductive condition, mass (g), forearm length (mm), and wing damage due to WNS for all captured bats. Degree of ossification of the finger joints will be used to assess age (juvenile or adult) and adults will be banded with a unique aluminum forearm band. WNS wing-damage index data have been collected for this project since 2011. While handling bats, we will follow the guidelines of the American Society of Mammalogists for use of wild mammals in research, and all bats will be released at the point of capture. We will follow current WNS decontamination protocols as specified by USFWS.

Analysis—We plan to develop an index that approximates the potential impacts of WNS on a particular summer colony of bats. The index will be calculated by a weighted estimate of proximity of a summer colony to a wintering population of bats in which WNS is known to be present.

Progress

Over the 15 years of work at this project area, 2,980 bats were captured. The most common bat captured in all years was the big brown bat, making up 54% (ranges from 40-64% in each year) of all bats caught averaged across years. The second most common species captured in mist nets was the Eastern red bat, making up 12% (range 6-20%) averaged across years. The third and fourth most common species are the tricolored bat (8.4%, range 1-17%) and the Indiana bat (8.1%, range 4-16%). The Northern long-eared bat, little brown bat, and evening bat make up the remainder of bats captured at this site.

Our hypothesis is that WNS will impact bat health

Early summer	Year	98	99	02	03	04	05	06	07	08	09	10		11	12	13
	Non Reproductive					1										1
	Pregnant		1	19	31	31	14	14	8	10	8	10		21	14	22
	Lactating			1	4			1		4		4			8	4
	Post Lactating															

Middle summer	Year	98	99	02	03	04	05	06	07	08	09	10		11	12	13
	Non Reproductive														5	1
	Pregnant			2					6		2	1		1	7	2
	Lactating	14	11	28	18	17	15	10	18	20	27	11		21	29	15
	Post Lactating	2	3		1		5				2	10		2	11	7

Late summer	Year	98	99	02	03	04	05	06	07	08	09	10		11	12	13
	Non Reproductive														3	3
	Pregnant										1				3	
	Lactating			2	7	2	1	12	14	11	4	1			2	1
	Post Lactating	9	10	3	12	4	20	13	6	2	5	14		11	29	18

and thus alter timing of reproduction. We present some sample data for big brown bats at the airport (Table 1). Before WNS appeared in Indiana, there was one instance of a pregnant female being caught in July, but most pregnant females were detected before July. Since WNS has been observed in Indiana, there have been nine records of pregnant females being caught after July; in 2012, a pregnant female was detected as late as Aug. 1.

Non-reproductive adult females were detected in both 2012 and 2013, whereas non-reproductive females were observed only once before detection of WNS in Indiana (Table 1).

Northern long-eared bat (a pregnant female)