

***Bat Hibernacula Identification and White-Nose Syndrome Surveillance at
Devils Tower National Monument***

2017 Investigators Annual Report

CESU Cooperative Agreement P17AC00996

Prepared by:

Ian Abernethy, Lead Vertebrate Zoologist

Wyoming Natural Diversity Database
University of Wyoming
1000 E. University Ave, Department 3381
Laramie, Wyoming 82071



Prepared for:

Rene Ohms

Chief of Resource Management
Devil's Tower National Monument
Devil's Tower, WY 82714

March, 2018

Contents

Introduction.....	3
Objectives	4
Proposed Methods	4
2017 Progress Report	5
Acknowledgements	5
Literature Cited.....	6

Introduction

Many aspects of winter ecology of bats are poorly understood, especially in the western United States (Johnson et al. 2017, Klug-Baerwald et al. 2017). Basic questions of distribution and habitat selection of bats in winter are largely unknown, leaving a considerable knowledge gap for a critical portion of their annual lifecycle. Most temperate bat species spend a considerable portion of the year hibernating, with some species spending upwards of 8 months in hibernation (Klug-Baerwald et al. 2017). For bats to survive overwinter, hibernacula must maintain specific microclimate conditions, making these features inherently rare on the landscape (Perry 2013). In eastern North America, bats typically hibernate in large numbers within caves and abandoned mines (Perry 2013, Klug-Baerwald et al. 2017). As a result, researchers have traditionally assumed that bats across the continent use similar features for hibernacula. However, these features are not ubiquitous on the landscape, yet bat populations persist on the landscape. In Wyoming, where caves and abandoned mines exist in areas with suitable geology and topography, surveys for hibernating bats rarely find congregations of bats larger than 50 individuals (Beard 2016). This suggests that bats are likely using some other landscape features for hibernacula. Indeed, recent studies have provided clear evidence that some bat species that occur in western North America hibernate in a number of different landscape features (i.e. nontraditional hibernacula) including rock crevices, talus fields, root wads of large trees, and within karst formations (Neubaum et al. 2006, Klug-Baerwald et al. 2017). This suggests that these features likely play an important role in population persistence for bat species that occur in the west, including in Wyoming.

The predominant threat to bats in North America is WNS. The disease is caused by the fungal pathogen *Pseudogymnoascus destructans* (Pd; formerly *Geomyces destructans*) and affects hibernating bats (Lorch et al. 2011). Since its discovery in New York in 2005, WNS has killed at least 5.7–6.7 million bats in North America (Froschauer and Coleman 2012). In affected areas, mortality rates of up to 100% have been documented (Frick et al. 2010). The disease continues to spread west from the eastern and southeastern US. Although WNS has not yet been documented in bats in Wyoming, it has been documented in the adjacent state of Nebraska and recently made a large geographical advancement to Washington (whitenosesyndrome.org 2017). As the range of the disease continues to expand across the country, it could impact bats in Wyoming in the near future. Because WNS affects hibernating bats during winter, it is critical to understand where bats in Wyoming are hibernating and if these sites are conducive to the growth of Pd.

Devils Tower National Monument (DETO) is located in the Black Hills region, an area known to have a large and diverse bat population. Considerable bat research has taken place at DETO during summer (Griscom and Keinath 2012, Keinath and Abernethy 2016, Abernethy et al. 2017), but winter ecology of bats at DETO is largely unknown. Acoustic monitoring at DETO indicates that several bat species are present and active at the monument year round. However, there are no known caves or abandoned mines within a bats nightly flight range, suggesting bats are using hibernacula on or adjacent to DETO. Additionally, geologic substrate present on DETO including rock crevices on the tower itself and a large talus field at the base of the tower may provide nontraditional hibernation sites. The proposed research will shed light on use of nontraditional hibernacula by bats at DETO specifically but will provide insight to use and selection of these sites that will be applicable to researchers and land and wildlife managers across the Intermountain West. Given the importance of hibernacula to the persistence of bats, resource managers are interested in identifying and characterizing

nontraditional hibernation sites and surrounding habitat that may influence selection and use of these features. Once these structures have been identified, they may be protected through management actions such as limiting human activity or other activities that may otherwise negatively impact bat populations. Additionally, characterization of roost structures and local habitat attributes promoting their occupancy may inform forest management practices in the region which will in turn benefit bats in Wyoming.

Objectives

- 1) Identify which bat species hibernate at DETO.
- 2) Locate and characterize hibernation sites used by bats.
- 3) Determine if environmental conditions within hibernation sites is suitable for growth of the causative agent of White-nose Syndrome.
- 3) Characterize habitat surrounding hibernation sites to identify important landscape and microhabitat components that influence hibernation site selection.
- 4) Evaluate all bats captured in mist-nets for signs of White-nose Syndrome (WNS) infection.

Proposed Methods

We will capture bats using mist nets deployed in single-high arrays over water sources and double-high arrays in flight corridors. We will focus capture efforts in areas that are known to be frequented by bats based on previous survey efforts (Griscom and Keinath 2011, Keinath and Abernethy 2016). All captured bats will be measured (forearm length, ear length), weighed, sexed, aged, and identified to species. We will fit any captured bat of sufficient mass with with 0.22-0.27-gram Holohil LB2x or LB2xT VHF radio transmitters (Holohil Systems Ltd. 112 John Cavanaugh Drive, Carp, Ontario, Canada K0A 1L0) that were less than 5% of bat body mass (Aldridge and Brigham 1988). Bats of insufficient mass will be released at the site of capture following processing. Procedures for transmitter attachment will follow those approved for Indiana Bat (United States Fish and Wildlife Service 2015). To attach the transmitter, a small patch of hair between the scapula approximately the size of the transmitter (8 mm X 2.8 mm) will be carefully trimmed to expose the skin using small sterilized scissors and cleaned using a disposable alcohol pad. A small amount of surgical adhesive (Perma-Type Surgical Cement; <http://www.perma-type.com/accesil.html>) will be applied to the trimmed area and allowed set for 5 - 10 minutes, after which the flat side of the transmitter will be placed on the adhesive with the antenna facing the posterior end of the bat. Once the adhesive is set, the bat will be released at the capture location. As specified by the terms of our permit, all survey protocols follow the “2015 Range-wide Indiana Bat Survey Guidelines” (United States Fish and Wildlife Service 2015) and equipment will be decontaminated following the most recent National White-Nose Syndrome Decontamination Protocol. Survey methods will also conform to recommended guidelines (e.g., Kunz and Parsons 2009, Sikes et al. 2011) and follow recommendations in Wyoming’s bat conservation plan (Hester and Grenier 2005) for documentation and followed WNS protocols presented in Wyoming’s WNS strategic plan (Abel and Grenier 2011).

Radio tagged bats will be tracked to roosts every day until the signal is lost or the transmitter falls off. Roosts will be located using standard VHF telemetry methods. We will recorded features of roosts including structure (e.g. rock crevice, interstitial space in boulder field) and location.

2017 Progress Report

No field activities were completed in 2017 due to logistical constraints. However, considerable progress made in a number of areas. Specifically, we modified all necessary state and federal permits authorizing capture of bats for this specific study. We obtained Institutional Animal Care and Use Committee (IACUC) approval for the protocol to be implemented for this work as well concurrence from the NPS IACUC. Additionally, we entered into the Section 7 consultation process with the United States Fish and Wildlife Service's Wyoming Ecological Field Office and it was determined that no further consultation was required. Field activities commenced in March of 2018 and will continue through 2019. All permits and authorizations required to carry out this project have been obtained for 2018.

Acknowledgements

This project will not be possible without logistical support from Rene Ohms and Amy Hammesfahr. Rene was principally responsible for obtaining the necessary funding and permits, while Amy will assist in capture and tracking of radio collared bats.

Literature Cited

- Abel, B., and M. Grenier. 2011. A strategic plan for White-nose Syndrome in Wyoming. Wyoming Game and Fish Department, Lander, Wyoming.
- Abernethy, I. M., Z. P. Wallace, and D. A. Keinath. 2017. Bat roost and habitat use at Devils Tower National Monument Final Report. University of Wyoming, Laramie Wyoming, Report prepared by the Wyoming Natural Diversity Database for Devils Tower National Monument.
- Aldridge, H., and R. M. Brigham. 1988. Load carrying and maneuverability in an insectivorous bat - A test of the 5-percent rule of radio-telemetry. *Journal of Mammalogy* **69**:379-382.
- Beard, L. 2016. Surveillance of Hibernating Bats and Environmental Conditions at Caves and Abandoned Mines in Wyoming. Pages 97-113 *in* A. C. Orabona, editor. Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report. Wyoming Game and Fish Department.
- Frick, W. F., J. F. Pollock, A. C. Hicks, K. E. Langwig, D. S. Reynolds, G. G. Turner, C. M. Butchkoski, and T. H. Kunz. 2010. An emerging disease causes regional population collapse of a common North American bat species. *Science* **329**:679-682.
- Froschauer, A., and J. Coleman. 2012. North American bat death toll exceeds 5.5 million from white-nose syndrome. United States Fish and Wildlife Service.
- Griscom, H. R., and D. A. Keinath. 2011. Inventory and status of bats at Devils Tower National Monument. Report prepared for the USDI National Park Service by the Wyoming Natural Diversity Database - University of Wyoming, Laramie, WY.
- Griscom, H. R., and D. A. Keinath. 2012. Inventory and status of bats at Devils Tower National Monument. Report prepared for the USDI National Park Service by the Wyoming Natural Diversity Database - University of Wyoming, Laramie, WY.
- Hester, S. G., and M. B. Grenier. 2005. A conservation plan for bats in Wyoming. Wyoming Game and Fish Department Nongame Program, Lander, WY.
- Johnson, J. S., J. J. Treanor, M. J. Lacki, M. D. Baker, G. A. Falxa, L. E. Dodd, A. G. Waag, and E. H. Lee. 2017. Migratory and winter activity of bats in Yellowstone National Park. *Journal of Mammalogy* **98**:211-221.
- Keinath, D. A., and I. M. Abernethy. 2016. Northern long-eared *Myotis* roost site selection in Devil's Tower National Monument. Report prepared for the Department of Interior, National Park Service by the Wyoming Natural Diversity Database, University of Wyoming, Laramie, Wyoming.
- Klug-Baerwald, B. J., C. L. Lausen, C. K. R. Willis, and R. M. Brigham. 2017. Home is where you hang your bat: winter roost selection by prairie-living big brown bats. *Journal of Mammalogy* **98**:752-760.
- Kunz, T. H., and S. Parsons. 2009. Ecological and behavioral methods for the study of bats. Second Edition edition. The Johns Hopkins University Press, Baltimore, Maryland.
- Lorch, J. M., C. U. Meteyer, M. J. Behr, J. G. Boyles, P. M. Cryan, A. C. Hicks, A. E. Ballmann, J. T. H. Coleman, D. N. Redell, D. M. Reeder, and D. S. Blehert. 2011. Experimental infection of bats with *Geomyces destructans* causes white-nose syndrome. *Nature* **480**:376-U129.
- Neubaum, D. J., T. J. O'Shea, and K. R. Wilson. 2006. Autumn migration and selection of rock crevices as hibernacula by big brown bats in Colorado. *Journal of Mammalogy* **87**:470-479.
- Perry, R. W. 2013. A review of factors affecting cave climates for hibernating bats in temperate North America. *Environmental Reviews* **21**:28-39.
- Sikes, R. S., W. L. Gannon, and M. Amer Soc. 2011. Guidelines of the American Society of Mammalogists for the use of wild mammals in research. *Journal of Mammalogy* **92**:235-253.
- United States Fish and Wildlife Service. 2015. 2015 Range-wide Indiana Bat summer survey guidelines. United States Fish and Wildlife Service Midwest Region, <http://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html>.

whitenosesyndrome.org. 2017. Updated white-nose syndrome map March 15, 2017.

https://www.whitenosesyndrome.org/sites/default/files/resource/wns_map_20170315_1.jpg.