College of Agricultural Science | Department of Fisheries and Wildlife

BAT MONITORING IN NORTH COAST AND CASCADES NETWORK SUMMER 2019

Emily Barnett
Anastacia Grigorov
Rayanne Mock
Alexis Levorse
Tara Chestnut

MATERIALS AND METHODS

Study Area: Mount Rainier National Park and North Cascades National Park Service Complex (Figure 1)

Figure 1. Map of study area, Mount Rainier National Park and North Cascades National Park Service Complex

Bat Acoustic Monitoring

- Bat echolocation calls recorded with Pettersson D500x ultrasonic detectors in potential foraging habitat from May to September 2019 (Figures 2 & 3).
- Seven elevational transects at ~300m intervals from 610m to 1525m in riparian and forest openings
- Nisqually to Paradise transect had 6 stations that were sampled 3 times (Figure 4)
- Calls processed with SonoBat version 4.30
- Calls sorted by species and location along each transect.

Figure 2 (above). Petterson D500 ultrasound detector. Detectors were programmed on site and placed into weatherproof containers, with holes cut for the microphone wire.

Figure 3 (right). Microphones were mounted on 3m poles and secured to trees using paracord. Boxes with detectors were locked to tree and camouflaged to prevent disturbance by visitors.

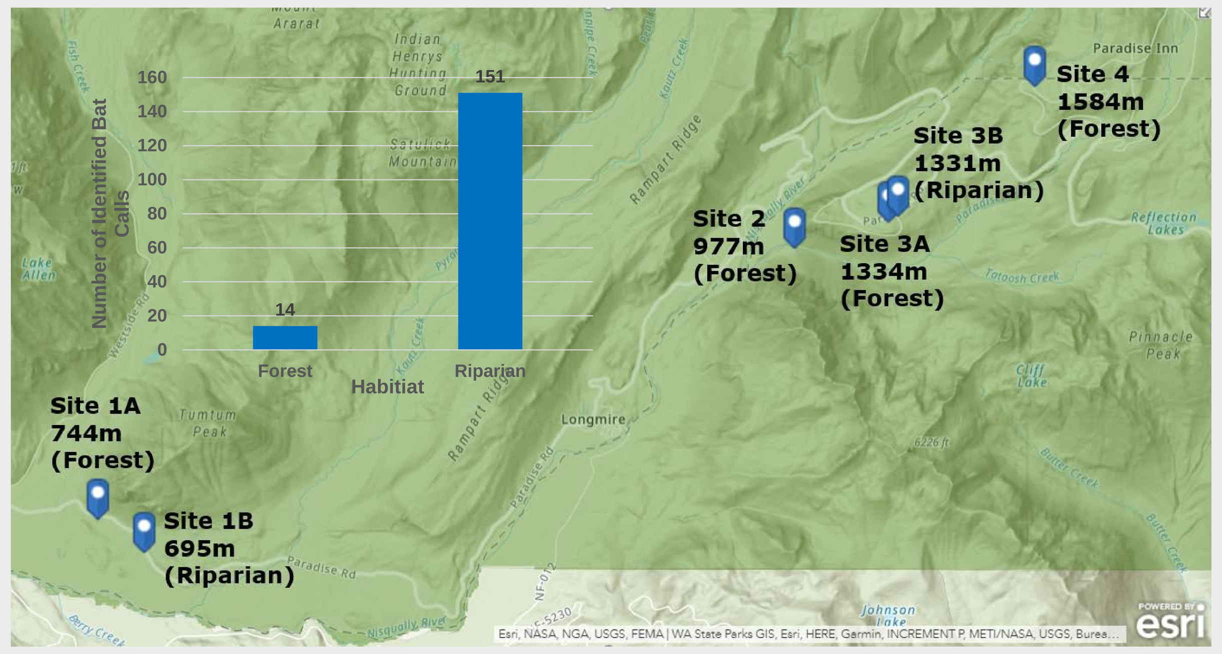

Figure 4. Map of Nisqually to Paradise elevational transect in forested and riparian habitats, southwest corner of Mount Rainier National Park, with the number of bat calls identified by habitat type.

RESULTS

Nisqually to Paradise transect

We recorded 7,292 high quality calls on the Nisqually to Paradise transect, of which, 186 were identified as bats (Table 1). We detected 8 the 11 known bat species known from western Washington:

- Big brown bat (*Eptesicus fuscus, EPFU)*
- Hoary Bat (*Lasiurus cinereus, LACI)*
- Silver-haired bat *(Lasionycteris noctivagans, LANO)*
- California myotis (*Myotis californicus, MYCA)*
- Western long-eared myotis (*Myotis evotis, MYEV)*
- Little brown bat (*Myotis lucifugus, MYLU)*
- Fringed myotis (*Myotis thysanodes, MYTH)*
- Long-legged myotis (*Myotis volans, MYVO)*

We detected bat calls at 4 of the 6 locations on the Nisqually to Paradise elevational transect, with the most detections in riparian areas ($t=1.89$, $DF=15.38$, $p=0.039$, Figure 4).

Table 1: Bat species identified on Nisqually to Paradise elevational transect, Mount Rainier National Park, May-Sept 2019

	Site 1A (Forest)	Site 1B (Riparian)	Site 2 (Forest)	Site 3A (Forest)	Site 3B (Riparian)	Site 4 (Forest)	Total
EPFU	0	0	0	0	1	0	**1**
LACI	0	30	0	0	4	0	**34**
LANO	0	3	1	0	18	0	**22**
MYCA	0	4	14	3	0	0	**21**
MYEV	0	0	5	7	3	0	**15**
MYLU	0	70	0	0	5	0	**75**
MYTH	0	1	0	4	0	0	**5**
MYVO	0	4	1	0	8	0	**13**
Total	**0**	**112**	**21**	**14**	**39**	**0**	**186**

DISCUSSION

- **Total number of bat detections and bat diversity was highest in riparian habitats (Figure 4)**, likely due to bats concentrating in optimal foraging habitat, where flying insect prey are hatching from aquatic systems [5]
- Total number of detections is a reflection of relative bat activity, not number of individuals because bat detectors cannot identify individuals, e.g. did 1 bat fly past 10 times or did 10 different bats fly past?
- Calls must be manually vetted to confirm Sonobat auto-classification is correct.
- Based on modeled detection probabilities for Pacific Northwest bats, we expected to detect 11 species and detected 8
- 3 species were not detected on the transect:
  - Townsend's Big-eared bat *(Corynorhinus townsendii)*
  - Small-footed myotis (*Myotis ciliolabrum*)
  - Yuma myotis (*Myotis yumanensis*)
- Big brown bat was detected only once at one site. The predicted probability of occurrence within our study area ranges from less than 10% to 70% [5] so it is difficult to know if the species was not detected due to poor habitat suitability or for other reasons, such as a local decline. Recent reports of a novel virus and mortality due to DDT exposure may warrant consideration of more targeted monitoring [6,7]

CONCLUSIONS

- Bats' vulnerability to multiple stressors can be exacerbated by disease, and responses can vary at different spatial scales and by season.
- Acoustic monitoring provides information on bat species distribution and seasonal activity, and can be used to identify changes to distribution at local, regional and national spatial scales to inform conservation.

References

[1] Washington Department of Fish and Wildlife. Washington State Bat Conservation Plan. https://wdfw.wa.gov/publications/01504
[2] Froschauer, A., Blomker, R., Chestnut, T. 2018. White-nose Syndrome Fungus Detected in Second County in Washington State. White-nose Syndrome Response Team. https://www.whitenosesyndrome.org/blog/white-nose-syndrome-fungus-detected-in-second-county-in-washington-state-2

[3] Dzal, Y., L. P. Mcguire, N. Veselka, and M. B. Fenton. 2010. Going, going, gone: the impact of white-nose syndrome on the summer activity of the little brown bat (Myotis lucifugus). Biology Letters 7:392–394.

[4] Rodhouse, T. J., P. C. Ormsbee, K. M. Irvine, L. A. Vierling, J. M. Szewczak, and K. T. Vierling. 2012. Assessing the status and trend of bat populations across broad geographic regions with dynamic distribution models. Ecological Applications 22:1098–1113.

[5] Grindal, S. D., J. L. Morissette, and R. M. Brigham. 1999. Concentration of bat activity in riparian habitats over an elevational gradient. Canadian Journal of Zoology 77:972–977.

[6] Emerson, G. L., R. Nordhausen, M. M. Garner, J. R. Huckabee, S. Johnson, R. D. Wohrle, W. B. Davidson, K. Wilkins, Y. Li, J. B. Doty, N. F. Gallardo-Romero, M. G. Metcalfe, K. L. Karem, I. K. Damon, and D. S. Carroll. 2013. Novel Poxvirus in Big Brown Bats, Northwestern United States. Emerging Infectious Diseases 19.

[7] Buchweitz, J. P., K. Carson, S. Rebolloso, and A. Lehner. 2018. DDT poisoning of big brown bats, Eptesicus fuscus, in Hamilton, Montana. Chemosphere 201:1–5

ABSTRACT

White-nose syndrome (WNS) is a deadly disease to bats introduced to North America from Europe. The detection of WNS in bats in King County, WA in 2016 prompted the National Park Service to mobilize region-wide bat monitoring and disease surveillance. One of the goals of the Pacific West Region WNS response plan was to implement acoustic monitoring to determine the distribution of bat species and evaluate changes in distribution as WNS spreads. From May to September 2019, we conducted acoustic monitoring at 61 unique sites at two North Coast and Cascades Network (NCCN) parks, Mount Rainier National Park and North Cascades National Park Service Complex). We report results from one of seven elevational transects, Nisqually to Paradise at Mount Rainier National Park. We detected 8 of 11 species known to western Washington. We also detected more bat calls and higher species diversity in riparian habitats compared to forest openings.

INTRODUCTION

- Bats represent 20% of global mammal diversity and provide key ecosystem services such as pest control and pollination. It is estimated that bats save farmers in the US $3 billion each year in pest control services [1].
- Bats are vulnerable to a number of stressors including habitat loss, wind turbine strikes, climate change, and emerging infectious diseases [1,2].
- WNS is a disease caused by the fungus *Pseudogymnoascus destructans* (Pd) [2].
- WNS affects bats during winter hibernation and has resulted in over 75% mortality in some hibernating areas [2].
- Pd was first found on bats in the winter of 2006/07 and has cause declines in some bat populations and changes in bat activity in the northeastern United States [2].
- For example, along the Hudson River, NY, little brown bat (*Myotis lucifugus*) summer activity decreased by 78% between 2007 and 2009, while hoary bat (*Lasiurus cinereus*) activity increased slightly [3].
- Acoustic monitoring is the best tool available to monitor bat species distribution and changes at local, regional and landscape scales [4].

ACKNOWLEDGEMENTS

We would like to thank our supervisor Tara Chestnut for this internship opportunity, as well as Alexis Levorse and Brendan Allen for their daily support as crew leads. We would also like to thank interns Portia Hardy, Cory Zaller-Edmonds, and Najee Shahid for their significant contributions to this project. We are grateful for the support of Jenny Urbina and Taal Levi for their work in the lab screening for white-nose, as well as the National Park Service White-nose Syndrome Servicewide Fund Source for funding our internship. Finally, we'd like to express our appreciation to the National Park Service for providing housing and financial support.

Oregon State University