MATERIALS AND METHODS

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

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 forested environments.
- Niqqually 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.

RESULTS

Niqqually to Paradise transect
- We recorded 7,292 high quality calls on the Niqqually to Paradise transect, of which, 186 were identified as bats (Table 1). We detected 8 of the 11 known bat species found 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 evolans, 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 Niqqually to Paradise elevational transect, with the most detections in riparian areas (r=1.89, DF=15.38, p=0.039, Figure 4).

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

<table>
<thead>
<tr>
<th>Site 1A</th>
<th>Site 1B</th>
<th>Site 2A</th>
<th>Site 2B</th>
<th>Site 3A</th>
<th>Site 4A</th>
<th>Site 4B</th>
<th>Total</th>
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<td>19</td>
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<td>18</td>
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</tbody>
</table>

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 autoclassification is correct.
- Based on modeled detection probabilities for Pacific Northwest bats, we expect to detect 11 species and detect 8.
- 3 species were not detected on the transect: Townsend’s Big-eared bat (Corvornis townsendii) Small-footed myotis (Myotis coddabrum) 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.

ACKNOWLEDGEMENTS

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REFERENCES


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, Niqqually 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 bat 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 [2,3].
- 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].
- Fd 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.
- 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].