Adventurers for Audible Bats: Implementing Aural Surveys with Citizen Scientists for Regional Monitoring of the Spotted Bat (*Euderma maculatum*) and Pallid Bat (*Antrozous pallidus*)

Northwestern Hub for Bat Population Research and Monitoring

2022 Project Report

Prepared By Sara Rose



ON THE COVER

Audible Bat Project survey site at the top of a steep canyon in the sage-steppe region east of Madras, Oregon. Photo by Sara Rose. Photo inset: a spotted bat captured near John Day Fossil Beds National Monument, Oregon. Photo by Tom Rodhouse.

Background

In recognition of the growing threats to western bat species, such as wind energy, habitat loss, pesticide use, climate change, and altered fire regimes, standardized regional monitoring of bats has been a top priority for land managers, wildlife agencies, and researchers for nearly a decade. The NABat protocol was designed to simultaneously monitor all bat species in a given location. As such, the equipment used, how it is deployed, and what settings are used is standardized to detect the largest number of bat species possible. This strategy of multi-species monitoring can be problematic for detecting outlier species. Spotted bats (*Euderma maculatum*) and pallid bats (*Antrozous pallidus*) are both desert dwelling, cliff roosting species which can emit sounds with frequencies around 10 kilohertz (khz). At these low frequencies, ultrasound recorders often miss bat passes, resulting in false-negatives for these species. It has become clear that a more focused effort is needed to determine the range of spotted bat occupancy. In 2019, the NW Bat Hub organized an effort to pursue spotted bats via aural surveys, aided by community volunteers (citizen scientists).

The first two seasons of this project focused solely on listening for spotted bats in central Oregon. In 2022, the project was expanded both taxonomically and geographically to include pallid bats and conduct surveys across eastern, central, and southern Oregon. The addition of pallid bats to the survey was motivated by their unique social behavior and their status as an Oregon conservation strategy species and federal species of concern. The presence of vocal pallid bats can signal the nearby presence of a maternity colony and these surveys provided an opportunity to increase our understanding of pallid bat distribution and breeding habits in the state.

The goals of this project were twofold. The first was to improve and expand our understanding of the distribution of our two target species. The second was to develop a new survey methodology for monitoring low-frequency bats.

Methods

Staff from the NW Bat Hub and community volunteers conducted aural surveys of spotted and pallid bats as an alternative to more traditional passive detector recordings used as the mainstay survey method for bat acoustic monitoring projects (e.g., NABat).

The project was conducted during 2019, 2020, and 2022. For the first two seasons of data collection, the study area was limited to public lands within Deschutes, Crook, and Jefferson counties and surveyors were only trained to listen for spotted bats. This focal area was chosen to develop and test the program because of its vicinity to the NW Bat Hub headquarters and because of the high likelihood of success given the apparent abundance of spotted bats in the area. Previous spotted bat encounter records were used to generate a preliminary species distribution model and map which underscored the importance of the Central Oregon canyons to *E. maculatum* in the region. A sampling frame was created to focus efforts in Central Oregon that consisted of 30 sample

units from the NABat master sample, which provided randomized order of grid cells to prioritize surveys (Figure 2).

For the 2022 season, the project was expanded to include documentation of pallid bat presence and to cover all appropriate habitat areas in Oregon.

A training guide and standard operating procedures were developed in 2019 and have been updated annually. Trainings were conducted at locations known to be frequented by spotted bats. The COVID-19 pandemic thwarted in-person trainings in 2020, but web-based trainings with audio recordings were developed. Safety and nighttime navigation were emphasized. Both in-person and online trainings were available in 2022. An online training was also recorded in Spanish. All training materials were made readily accessible via YouTube.

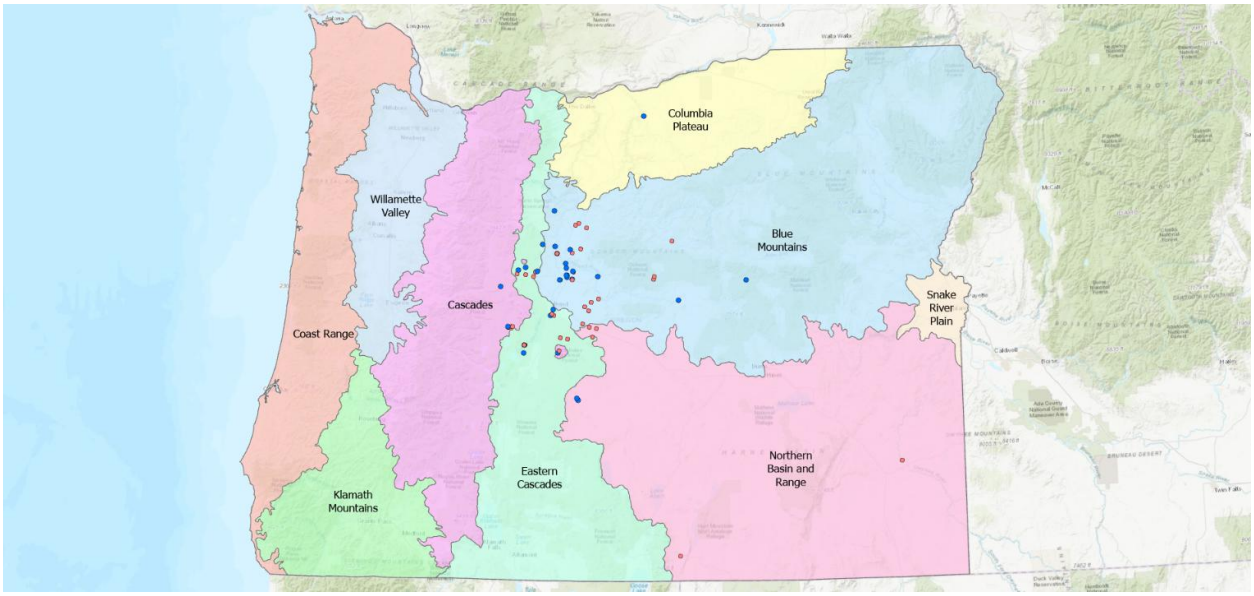
Volunteers were given access to an interactive site sign-up map to help them choose appropriate survey locations and to ensure that no locations were being over-surveyed.

Communication via cell phone before, during, and after surveys was supported as an additional safety measure, with volunteers being given the option to check in with the volunteer coordinator before and after their surveys. For volunteers who opted not to check in and out with the coordinator, they were highly encouraged to establish a check-in procedure with a friend or family member. Mobile apps and mapping tools were used to support volunteers with data entry and navigation. Data was collected using the platform CitSci, which hosts both a web interface and mobile app.

Surveys began at the end of civil twilight, allowing surveyors to safely access survey locations during daylight. Volunteers were asked to record the date, time, location, and detection target for their surveys. A detection target is the habitat feature that is likely to attract a bat to a given area. For this project, detection targets were usually cliff tops or cliff bottoms, but also included canyons and water bodies. After collecting site data, surveyors were to sit quietly and listen for the two target species. Each time they heard a bat pass by, they recorded the time and species. In instances where listeners were unsure of which species they heard, they were asked to default to spotted bats.

Results

From 2019-2020, 63 nighttime surveys were conducted by a combination of 12 volunteers and 4 NW Bat Hub staff. Spotted bat encounters were reported from 28 of the surveys conducted in 12 grid-cell sample units (57%). One member of Bat Hub staff had an incidental finding of a pallid bat and suspected that he had found a small maternity colony in 2019.



In 2022, 35 surveys were conducted by 14 volunteers and the volunteer coordinator. The surveys took place at 29 locations, 2 of which were the result of opportunistic encounters with pallid bats in Utah. Pallid bats were not detected during any of the other surveys in 2022. Spotted bats were heard during 13 surveys at 12 different locations.

In total, 98 audible bat surveys have been conducted in Oregon. Spotted bats have been encountered in 5 ecoregions: Northern Basin and Range, Blue Mountains, Columbia Plateau, Eastern Cascades, and Cascades.

From 2016 to 2021, 114 NABat sample units were surveyed using passive acoustic monitoring within the spotted bat's predicted range in Oregon. Of those, only 15 sample units had confirmed spotted bat recordings. One sample unit outside the predicted range had confirmed spotted bat calls. Aural surveys were conducted in 10 of those 114 sample units. Spotted bats were heard in 6 of those 10 sample units and for 3 of those sample units spotted bats were not detected by passive acoustic monitoring.

Discussion and Next Steps

Our survey results expanded the local knowledge about spotted bat distribution in Central Oregon and established evidence that aural surveys can be an effective technique for bats that produce audible echolocation calls. The initial expectation was that citizen science would serve as a powerful tool for conducting aural surveys at scale to serve as an economical means to vastly improve our knowledge of spotted and pallid bat range. Citizen science has proven useful for collecting data at spatial and temporal scales that would be difficult to achieve by other means. The popularity of birding has led to highly successful bird inventory projects, such as the Southern African Bird Atlas, for which over 17 million records have been collected over the course of 13 years (South African

Bird Atlas 2, n.d.). In practice, however, recruiting volunteers for night-time bat surveys in remote locations was challenging.

In 2020 and 2022, public interest in the project was high. More than 110 individuals have signed up for the project mailing list, expressing interest in volunteering. 60 people completed the training and joined the project on CitSci. Only 24 of those people ended up actually completing a survey in the three seasons of data collection. Half of the volunteers only completed one survey.

Based on our results, relying on volunteers to obtain spatially-balanced audible bat information is not likely an effective strategy moving forward. For future research, a more structured approach utilizing a mix of wildlife professionals and volunteers will be necessary. Project organizers are currently in the process of developing a protocol for incorporating these surveys into the annual NABat monitoring effort already being conducted in Oregon. It is important, though, to continue to engage the community and educate the public about the role bats play in desert ecosystems and the threats they face here in Oregon. To that end a new system for public engagement is also in process wherein aural surveys will be completed in groups during structured events. For most people, bats remain more of an idea than a tangible, experiential part of the world. In Oregon, they are rarely seen and even when they are, it is only for a brief moment. But when someone hears one fly by and they know what they are hearing, they gain an immediate appreciation for them. Public knowledge and appreciation are vitally important for conservation and the fact that two bats in Oregon can be effectively 'observed' from a distance is an incredible opportunity that should continue to be fostered and explored.