CREATING A SPECIES INVENTORY AND CHARACTERIZING ACTIVITY PATTERNS OF BATS IN THE UNIVERSITY OF IDAHO EXPERIMENTAL FOREST USING ACOUSTIC MONITORING

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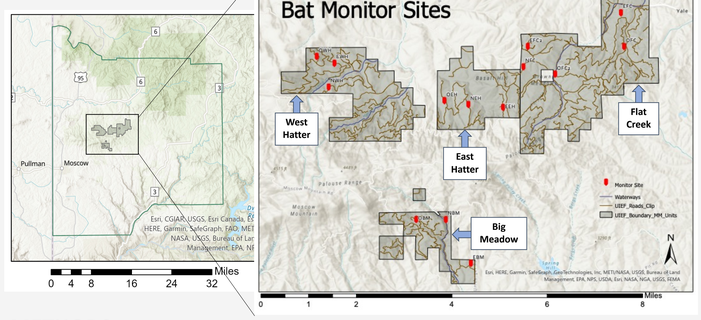
INTRODUCTION & OBJECTIVES

There are 1,400 species of bats worldwide which make up 20% of all mammalian species. Of these, approximately 80% are data deficient, threatened, or declining in numbers.[1] This is due to a variety of threats opposing bats, including habitat loss, human conflict, and white-nose syndrome (WNS).[2,3] There are 14 species of bats living in Idaho, all of which are insectivorous and half of which belong to the genus Myotis.[4] The current understanding of their population status and activity across the state is limited. With white-nose syndrome having reached the southeastern corner of Idaho in 2021,[5] it is more important now than ever to have foundational knowledge of the status and activity patterns of bats in Idaho. The results of this study can guide wildlife and land managers to make informed decisions for bats in Idaho. The main objectives of this study are described below:

Objective 1: Create a species inventory of bats detected in the UIEF.
Objective 2: Compare nightly peaks in activity levels between species.
Objective 3: Assess variables that may affect bat activity across the study area, including precipitation, temperature, reproductive season, and habitat type.

STUDY AREA

- Data was collected in the University of Idaho Experimental Forest (UIEF).
- Four main units: West Hatter, East Hatter, Flat Creek, and Big Meadow
- 8,300 acres



METHODS

- Data was collected May 27th - August 9th, 2022.
- 14 Audiomoth monitors[6] were stationed in the four main units of UIEF.
- Monitor locations were strategically selected to maximize detection.
- Monitors were placed at least 10m from water and 10-300m away from a road to minimize noise and ensure accessibility.
- Locations were representative of the three classifications of bat habitat: open, edge, and narrow[7].
- Monitors recorded for one minute in ten-minute intervals from 7:30pm to 6:00am.
- Maintenance every 2-3 weeks to replace batteries and SD cards.
- Recordings were processed through Kaleidoscope Pro[8], which conducted an automatic species identification and filtered out recordings that did not have a bat call.
- Automatic identifications were all manually verified.
- A species inventory was assembled.
- Data analysis will include an ANOVA test and time series test to determine what variables are influencing activity. Variables to be tested include temperature, precipitation, time of night, reproductive season, and habitat type.

CURRENT RESULTS & SPECIES OBSERVED

As of now, all bat calls recorded have been automatically and manually identified. The next step for this project is to verify the identification of *Antrozous pallidus and Corynorhinus townsendii* calls with a professional and begin data analysis. 692 detections, which account for 15% of bat calls recorded, could not be identified. 410 of these unidentifiable calls, almost 60%, are likely a Myotis species. We've found that there is a distinct peak in activity between 9-10pm in general bat activity, but we have not yet explored if that is true for each species. It also seems that there is an increase in activity over the course of the study period. Statistical tests such as a time series and ANOVA will evaluate if these observations are significant and, if so, what may influence those trends.

ANALYSIS

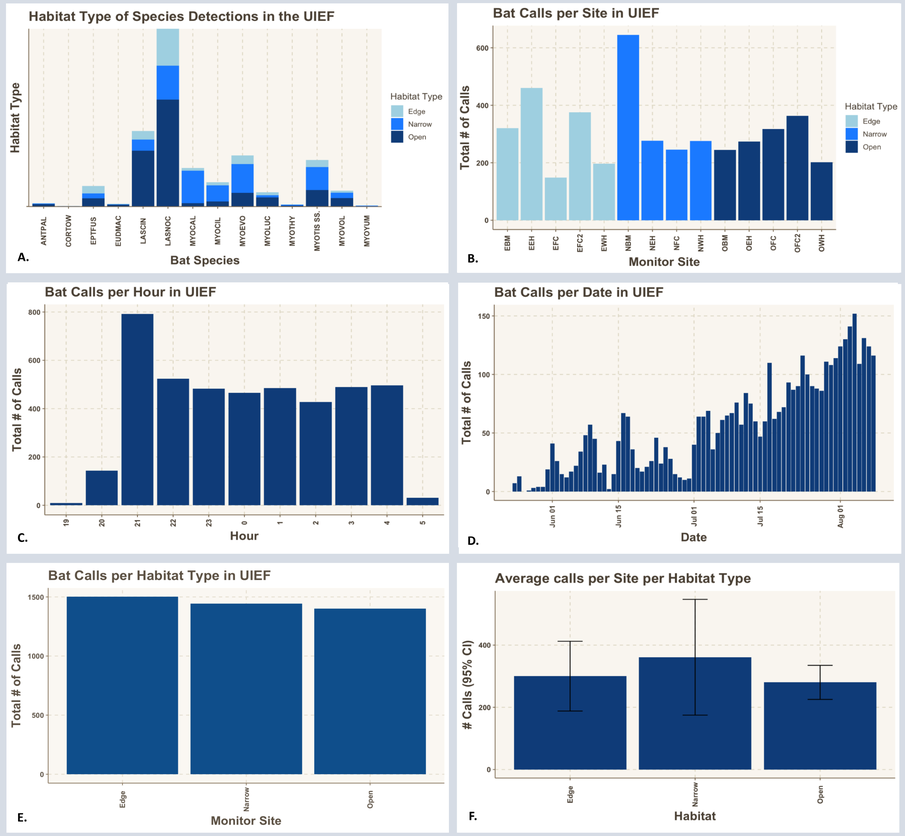


Figure A. *L. noctivagans* and *L. cinereus* were the most detected species. This figure may suggest that Myotis species were more commonly found in narrow habitat, whereas non-Myotis species could be found more in open habitats. Refer to Table 1 to interpret species names from their abbreviation. **Figure B.** The narrow habitat in Big Meadow recorded the highest number of bat calls. This location was in an old-growth cedar forest near a creek and hiking trail. Unfortunately, there were a few data gaps for some monitors in late June due to SD cards unexpectedly running out of memory. This will be taken into consideration during analysis. Site names are represented by habitat type and unit name (example: EBM = Edge, Big Meadow). **Figure C.** From 9-10pm, around dusk, there was a peak in total bat activity. **Figure D.** There was an increase in bat activity observed between May 27th and August 9th. Further data analysis will explore what factors contribute to this increase. **Figure E.** There was a similar number of detections for edge, narrow, and open habitat types. **Figure F.** The overlapping 95% confidence intervals show that there is not a significant difference in the average number of calls between the three habitat types.

SPECIES INVENTORY

Table 1. There were 13 bat species detected in the UIEF. Of these, *C. townsendii* and *A. pallidus* were identified with low confidence. *P. hesperus* was not detected at all[4]. *L. noctivagans* was the most commonly detected species, accounting for more than one third of all calls recorded.

Scientific Name	Common Name	Abbreviation	Occurrence	# of Total Acoustic Detections
Lasionycteris noctivagans	Silver-haired bat	LASNOC	Present	1555
Lasiurus cinereus	Hoary bat	LASCIN	Present	574
Myotis evotis	Long-eared myotis	MYOEVO	Present	532
Myotis californicus	California myotis	MYOCAL	Present	381
Myotis ciliolabrum	Western small-footed bat	MYOCIL	Present	235
Eptesicus fuscus	Big brown bat	EPTFUS	Present	232
Myotis volans	Long-legged myotis	MYOVOL	Present	129
Myotis lucifugus	Little brown myotis	MYOLUC	Present	121
Antrozous pallidus	Pallid bat	ANTPAL	Present?	26
Euderma maculatum	Spotted bat	EUDMAC	Present	23
Myotis thysanodes	Fringed myotis	MYOTHY	Present	17
Myotis yumanensis	Yuma myotis	MYOYUM	Present	10
Corynorhinus townsendii	Townsend's big-eared bat	CORTOW	Present?	7
Parastrellus hesperus	Canyon bat	PARHES	Absent	0

4,534 bat calls recorded

13 species detected

HEAR FOR YOURSELF!

Scan here to listen to a recording of a foraging *Lasionycteris noctivagans* collected in edge habitat in East Hatter on 07/03/22 at 12:30am. Sound edited by Eli Isbell to be within human auditory range.

HABITAT TYPES

Habitat types are classified based on how sound travels through the landscape[7]. Pictures were taken at monitor sites in UIEF.

Open | Edge | Narrow

LIMITATIONS

The manual identifications were performed by a self-taught undergraduate student who primarily referenced the Montana Natural Heritage Program[9] guide and Humbolt State University's Bat Lab[10] guide for identifying bats found in Montana and California.

FURTHER WORK TO BE COMPLETED

At this point, all bat calls have been identified, so data processing is complete except for verifying the results of a couple species with a professional. As shown in the project timeline at the bottom of the poster, the next step is data analysis. This will consist of performing statistical tests to explore the validity of empirical observations. The results will be shared at the UI Undergraduate Symposium and documented in a senior thesis paper which will be presented in May of 2023.

SCAN HERE FOR WORKS CITED

DATA COLLECTION | DATA PROCESSING | **DATA ANALYSIS** | PRESENT SENIOR THESIS