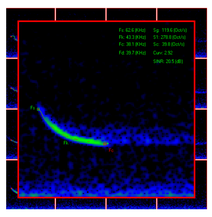
Bat species surveys in pine and oak forests; a comparison with conservation implications

Setting up mobile survey
Photo Credit: Zachary Gotthardt



Red bat call in SCANR®

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Red bat-*Lasirius borealis*
Photo Credit: Allison Kelley

Abstract

Populations of Chiropterans have experienced massive regional declines in recent years. The northern long-eared bat (*Myotis septentrionalis*) has recently been classified as federally threatened and may be faced with local extinction on Long Island. While many factors have contributed to these declines, such as the introduction of white-nose syndrome (WNS), caused by the fungus *Pseudogymnoascus destructans,* and habitat loss, it is believed that the conservation of bats through habitat protection is most optimally implemented at the local level by local governments and wildlife organizations. In order for this type of conservation to occur, it first must be determined what types of habitats the bats are most likely to be found in, to allow for more focused conservation efforts. Acoustic surveys, shown to be a viable method of characterizing bat populations on a local scale, were conducted in a variety of habitats at Brookhaven National Laboratory (BNL). Calls were sorted by species using two programs: Sonobat®, which automatically identified the calls using full spectrum acoustic analysis of bat echolocations, and SPECT'R®, which required us to manually identify the species by looking at a graph of each call. We found that from the mobile surveys there is a significant relationship between big brown bats (*Eptesicus fuscus)* and the planted white pine (*Pinus strobus*) forests as well as red bats (*Lasiurus borealis)* and pitch pine (*Pinus rigida*)/mixed oak- heath forest. For other species and the static surveys, there was not enough data to make a conclusion. This knowledge can be used to protect the areas that will be most beneficial to bat conservation and the data can be used to continue the long term studies conducted at BNL to determine the effects WNS has on local bat populations.

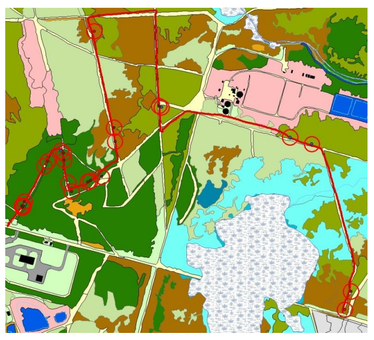
Introduction

Many bat populations are in severe decline because of several factors like urbanization, deforestation, and more recently, white nose syndrome (WNS) (*Pseudogymnoascus destructans*). Once we have a clearer picture of the habitats bats prefer on Long Island, implementing local conservation strategies to protect those areas will be an easier feat. The purpose of this study is to use a combination of offsite and onsite mobile acoustic surveys along with onsite static acoustic surveys to gather information about the habitats the local bat populations prefer regarding forest type and proximity to water. When this data is combined with global positioning system (GPS) data, we can see the areas and habitat types the bats favor.

Static survey locations

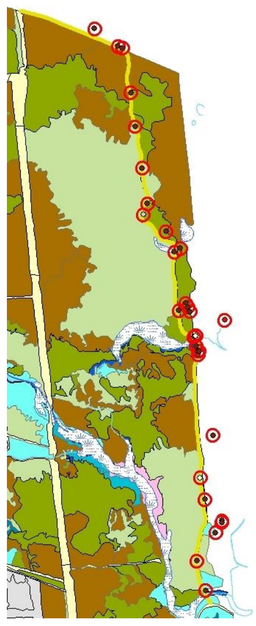
Mobile Survey: Western Boundary

Mobile Survey: Middle Path



Mobile Survey :860 Path

Static survey set up



Mobile Survey: Z-Path

Methods

Study Area: Brookhaven National Laboratory, Long Island, New York
Study Period: June 2015 to August 2015
Static Surveys:

- Four Song Meter SM2BAT+ ®detectors made by Wildlife Acoustics® were deployed for a minimum of four nights at different locations around BNL and recorded bat calls in 10 minute off/on intervals until sunrise.

Mobile Surveys:

- Bat calls were recorded continuously using a BAT AR125-FG® recorder made by Binary Acoustic Technology ®mounted on a vehicle as we drove predetermined, onsite routes.
- Routes were driven between 21:00 and 22:30 each night while maintaining a speed between 5 and 10 miles per hour.

Species Determination:

- The two programs SonoBat and Snapshot Characterization and Analysis Routine (SCANR®) were used to determine the species of bat that made each call.
- Each call was linked to a GPS coordinate and mapped in ESRI® ArcGIS® along with the survey routes and static sites.

Setting up mobile survey
Photo Credit: Allison Kelley

Results

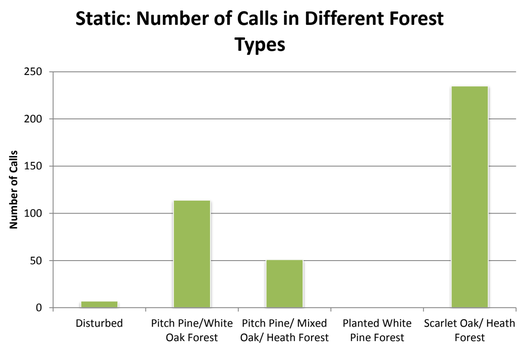
None of the data was found to be normally distributed so the nonparametric Kruskal-Wallis test was preformed on the data sets.

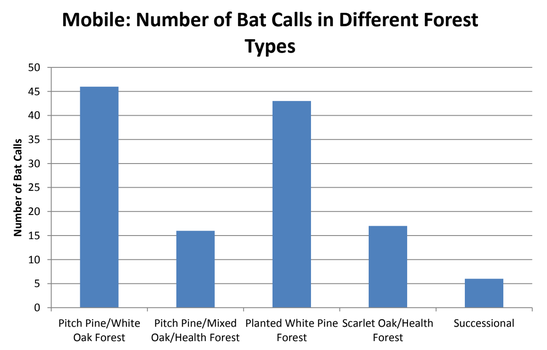
Mobile Surveys:

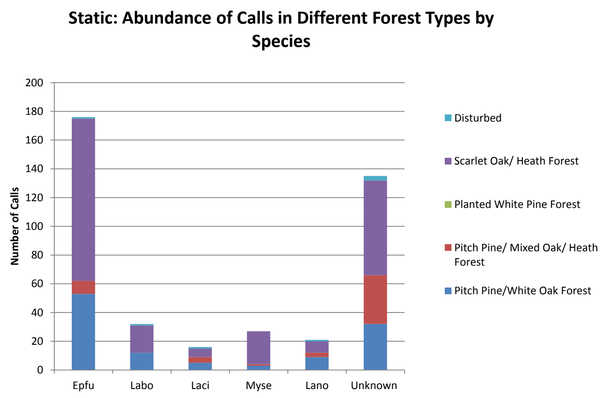
- Big brown bat was statistically more likely to be found in white pine/low-bush blueberry forest (p-value=.006).
- Red bat was statistically more likely to be found in pitch pine/ white oak/ red oak/ low-bush blueberry forest (p-value=.027).

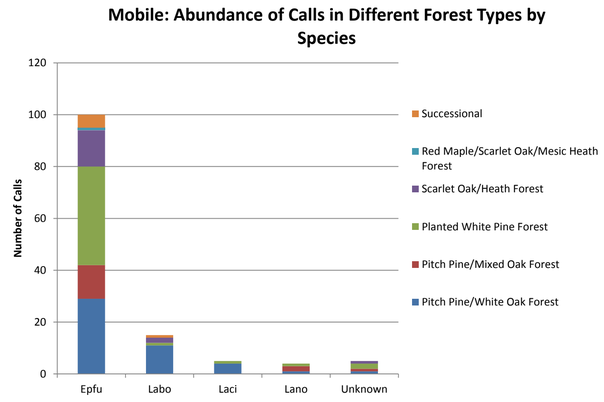
Static Surveys:

- No species was found to be statistically linked to a particular forest type.









Discussion

Conservation Implications:
The results of the data analysis from the static and mobile surveys contradict each other. The mobile survey results show that forest type does affect where big brown bats and red bats are more likely to be found but the static results show there is no relationship between forest type and bat prevalence. This could be because:

1. The forest types were not all adequately represented; the white pine forest had only one survey location.
2. Bat prevalence is influenced by other factors like proximity to water or roads. Bats may prefer being near water and roads (especially those with streetlights) because both attract insects.
3. Bat prevalence is also influenced by other factors in a habitat like how open it is. Big brown bats prefer to forage in more open areas which may explain their call abundance on the mobile surveys. Northern long-eared bats prefer to forage in tighter spaced which may explain their calls' scarcity.

Based on our results and other sources, we believe conservation efforts should be focused on preserving areas that have been documented to host higher bat populations like near water sources. Habitat diversity is also important to consider because more habitat types leads to more food sources and roosting areas.

It is worthwhile to note that the results found for *E. fuscus* may be more reliable because they had the highest numbers. This is attributed to the fact that they have been less impacted by WNS because they roost in smaller groups

Experimental problems:

- Detector placement near trees, roads, or buildings caused a lot of background noise to be recorded with the bat call. This made the call harder for Sonobat® to identify.
- Small sample size (only one summer of data collection) may have also impacted our conclusions.

Acknowledgements

We would like to thank Kathy Schwager, Tim Green, and Jennifer Higbie for all their support and assistance throughout our research and data collection.
This project was supported in part by the U.S. Department of Energy, Office of Science, Office of Workforce Development for Teachers and Scientists (WDTS) under the Science Undergraduate Laboratory Internships Program (SULI).