

# A Continuation of Subsonic Acoustic Monitoring of Differing Forests in Western Boone County, Kentucky

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## Introduction

Bat species as a whole play a crucial role in the habitats they inhabit through serving not only their role in the food chain, but also as pollinators, seed dispersers, and pest control through the consumption of mosquitos (Kasso et al. 2013, Gonsalves et al. 2013). In addition to these roles, bats are excellent bioindicators and are able to indicate the condition of their surrounding ecosystems through their behaviors (Kasso et al. 2013). Bats species are optimal bioindicators due to their global range, their sensitivity to environmental stressors such as temperature and water quality changes, and their predictable behaviors in response to environmental stressors (Jones et al. 2009). As Boone County is undergoing urbanization and industrial development, Boone County Conservation District has begun collecting baseline information regarding the biodiversity and population densities of the County's bats. Stationary subsonic acoustic data collection was collected at Boone Cliffs State Nature Preserve, Dinsmore Woods State Nature Preserve, and Conservancy Park Belleview along with mobile data collection throughout western Boone County in order to determine the presence of multiple bat species within the County. Data collected from the large canopy forest at Boone Cliffs State Nature Preserve, the late successional hardwood forest at Dinsmore Woods State Nature Preserve, and the early successional habitat at Conservancy Park Belleview, may also aid in seeing species diversity within different habitats of Boone County. Additionally, this research can assist in the long term monitoring of the forest health of Boone County's natural areas, as well as how bat biodiversity has changed over the years.



**Figure 1.** The Anabat Swift Passive Detector was used for all stationary data collection. Data was then run through the software EchoClass to determine species presence.

## Methods

- ❖ Stationary data collection was conducted June-July of the summer of 2021 at Boone Cliffs Nature Preserve, Dinsmore Woods Nature Preserve, and Conservancy Park Belleview.
- ❖ Stationary data collection was conducted by placing the Anabat Swift Passive Detector out for a total of 8 days in a forested area containing forest-canopy openings for each site chosen (Figure 1).
- ❖ Automobile data collection was conducted for a total of two hours in one night by placing a microphone connected to the Anabat Walkabout Active Bat Detector on top of a truck. A route highlighting roads near open forest corridors and water sources was chosen using the OKI Environmental Mitigation Model Web Application (Figure 2). The 22 mile route was driven at 20 miles per hour.
- ❖ Pedestrial mobile data collection was conducted in one night by walking a predetermined route in Boone Cliffs State Nature Preserve. Data was collected using the Echo Meter Touch 2 Pro devices attached to an iPhone.
- ❖ Once data was collected, it was run through two software, Kaleidoscope and EchoClass. EchoClass was used to determine species presence within an area while Kaleidoscope was used to view spectrograms of the bat calls.

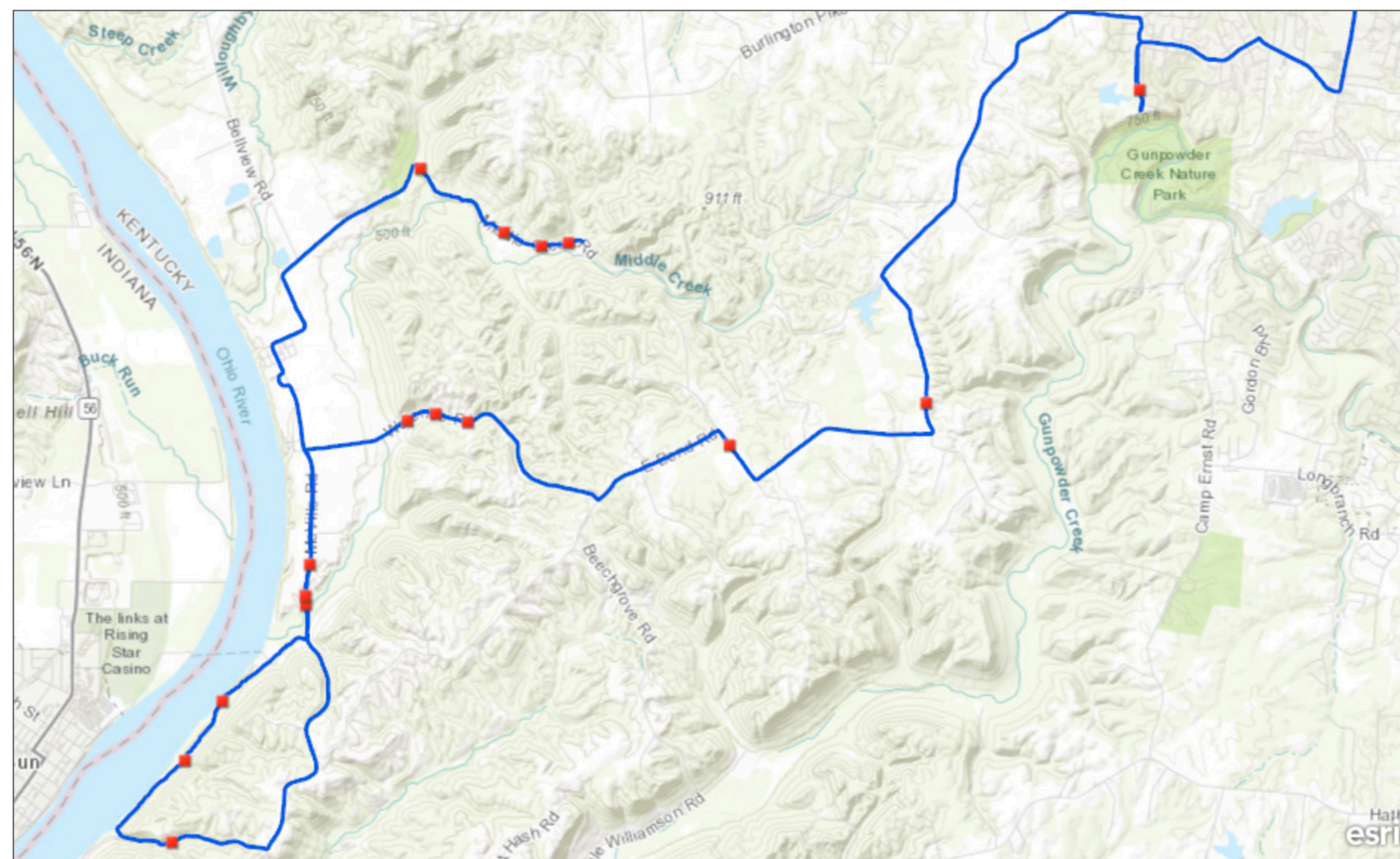
## Results

**Table 1.** The EchoClass software confirmed bat species present in each of the stationary acoustic data collection sites.

Location	Little Brown Bat	Tricolored Bat	Gray Bat	Northern Long-eared Bat	Hoary Bat	Eastern Red Bat
Boone Cliffs	X	X	X	X		
Dinsmore Woods	X	X		X	X	
Conservancy Park				X		X



**Figure 3.** Northern Long-eared Bat (left), Eastern Red Bat (center) and the Gray Bat (right). Photos obtained by MerlinTuttle.org.



**Figure 2.** ArcGIS Online map of the mobile driving data collection route taken on July 7<sup>th</sup> 2021 with the Anabat Walkabout. The 22 mile mobile driving route is shown with a blue polyline and red squares specify where the Anabat Walkabout indicated that bat calls were being recorded.

## Analysis

- ❖ A total of six unique species were found within the three stationary study sites.
- ❖ EchoClass determined four species of bat to be present in Boone Cliffs; the Little Brown Bat (*Myotis lucifugus*), the Tricolored Bat (*Perimyotis subflavus*), the endangered Gray Bat (*Myotis grisescens*), and the endangered Northern Long-eared Bat (*Myotis septentrionalis*) (Table 1, Figure 3).
- ❖ EchoClass determined four species of bat to be present in Dinsmore Woods; the Little Brown Bat (*M. lucifugus*), the Tricolored Bat (*P. subflavus*), the Hoary Bat (*Lasiurus cinereus*), and the endangered Northern Long-eared Bat (*M. septentrionalis*) (Table 1).
- ❖ In Conservancy Park, EchoClass determined the Eastern Red Bat (*Lasiurus borealis*), and the endangered Northern Long-eared Bat (*M. septentrionalis*) to be present (Table 1, Figure 3).
- ❖ Though bats were visually observed during the pedestrian mobile data collection, EchoClass did not determine any species present, as EchoClass requires a certain amount of bat calls to be detected before positively identifying said calls.
- ❖ EchoClass did not determine any species present during the automobile data collection.

## Discussion

While it had previously been found that bats were present at Boone Cliffs and Dinsmore Woods, some surprising differences within years were observed. In data from 2020, the only species detected at Boone Cliffs was the Gray Bat during the same time of year, while in 2021, four species were detected (Table 1). This could be due to differing monitoring locations, biophysical attenuation, equipment error, other environmental factors, or it could be a sign that bat biodiversity is increasing within the area. Though the 2020 and 2021 data collection indicated that four species of bats were present in Dinsmore Woods, the species between years differed even though the same data collection location was used (Table 1). This could be due to a difference in the time of year data collection occurred. The differences in species present over time can also provide insight into interspecies interactions and population sizes. In Conservancy Park two species of bats were present (Table 1). One of the bats detected was the Federally Endangered Northern Long-eared Bat (Table 1). This demonstrates that reclaimed areas, even in their earlier stages, can be important habitat for many bat species. Furthermore, now that it is established that bat species are present in the area, there is a possibility to continue data collection in the area through the years and eventually show the change in species present. Future research should include mist netting at Dinsmore Woods and Boone Cliffs in addition to acoustic data collection, as mist netting can help provide information regarding the population size and demography of local bat populations. Additionally, it is recommended that the mobile driving route be extended to over 30 miles, and that the pedestrian mobile collection be extended to multiple nights. In order to gather more data from the pedestrian mobile collection, citizen science can also be incorporated in order to engage the community while collecting additional data.

## References

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