Lamprey River Watershed Acoustic Bat Survey 2018

Conducted in Nottingham, Lee, Epping, and Raymond, NH

Prepared for
Lamprey Rivers Advisory Committee

Prepared by
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Summary

Normandeau Associates, Inc. (Normandeau) conducted an ultrasonic acoustic survey to inventory bat species at selected locations in the Lamprey River watershed including on the North River, Little River, Lamprey River, and at a New England cottontail habitat management area. Survey sites were located in the towns of Nottingham, Lee, Epping, and Raymond, NH. The survey methods followed a protocol designed specifically to sample for the state and federally threatened northern long-eared bat (*Myotis septentrionalis*), which is also suitable to sample for New Hampshire's other seven resident bat species. Detectors were placed at seven different locations from June 30 through July 1, 2018. Bat calls were initially identified by the Kaleidoscope Pro software package and manually reviewed to confirm the presence of the following species at one or more locations:

- big brown bat (*Eptesicus fuscus*)
- eastern red bat (*Lasiurus borealis*)
- hoary bat (*Lasiurus cinereus*)
- silver-haired bat (*Lasionycteris noctivagans*)
- eastern small-footed bat (*Myotis leibii*), listed as endangered by New Hampshire
- little brown bat *(Myotis lucificugus*), listed as endangered by New Hampshire
- tricolored bat (*Perimyotis subflavus*), listed as endangered by New Hampshire

The KPro software also identified northern long-eared bat calls with insignificant presence values (>0.05), and when calls were manually reviewed, the presence of this species at two of the survey locations (Epping 2 and Raymond 1) could not be ruled out.

Project Overview

Normandeau Associates (Normandeau) conducted an ultrasonic acoustic survey for the Lamprey Rivers Advisory Committee (LRAC) to inventory the bat species in the Lamprey River watershed. Survey locations were selected by LRAC and consisted of locations along the North River, Little River, and Lamprey River, as well as at a New England cottontail habitat management area. Survey sites were located in the towns of Nottingham, Lee, Epping, and Raymond, NH. Although this inventory was conducted at the request of LRAC to gather information about the bat species present in the Lamprey River watershed, rather than to meet a regulatory requirement, it followed the USFWS [2018 Range-wide Indiana Bat Summer Survey Guidelines](#) (Guidelines). These Guidelines also provide a standard protocol for surveying for the state and federally threatened northern long-eared bat and most bat surveys currently conducted in New Hampshire follow this methodology. These methods are also suitable for detecting the other seven bat species considered to be residents in the state, including the eastern small-footed bat, little brown bat, and tricolored bat, which are listed as endangered by the State of New Hampshire. Note that the survey area is not within the known summer

range of the Indiana bat (*Myotis sodalis*), the only other federally endangered species in the Northeast region.

Methods

As noted above, the survey was conducted in conformance with the methods and approach outlined in the Guidelines. As required, the field survey and the data analysis were conducted by personnel trained and qualified to conduct their respective tasks.

Habitat Assessment

The general suitability of the habitat at each survey site was assessed by examining recent aerial photography (Google Earth™) prior to deploying the detectors. In the field, habitat characteristics were examined to confirm suitability in all locations where acoustic detectors were placed. Brian Emlaw, biologist, conducted the desktop assessment and on-site observations of the vegetation within the project area were conducted by Jamie O'Brien, biologist.

Detector Deployment

Normandeau conducted surveys using equipment from Binary Acoustic Technology. This included 1) IFR-V Field Recorders, full-spectrum ultrasonic acoustic detectors; and 2) AR125-EXT ultrasonic receivers, microphones designed specifically for ultrasonic monitoring and analysis. The microphones were attached to the inside of a 45-degree angle PVC elbow to protect them from precipitation.

Following definitions provided by the Guidelines, seven survey sites were categorized as linear survey location and one site was categorized as non-linear. The linear survey sites were the riverside locations and required two detector nights (one detector deployed for two nights) of survey effort per survey site. For non-linear sites, the Guidelines require eight detector nights of survey effort per 123-acre habitat block, and four detectors were deployed for two nights at the New England cottontail habitat area. The survey used a total of eleven detectors, placed in suitable roosting habitat at the pre-selected survey locations. All acoustic detectors were deployed to collect data on two nights with suitable weather conditions as described in the Guidelines, yielding twenty-two detector nights of data for the survey.

The sampling locations were selected based on a combination of factors including access, proximity/opportunity for minimal human disturbance, an open cone of detection for the microphones to sample, and apparent bat habitat quality (e.g., mature trees, snags, hollows and crevices, and wetland habitat). The detector set-up adhered to specifications detailed in the 2018 Guidelines.

To ensure that the detectors were functioning correctly during every survey period, settings were checked upon retrieval of the detector in a similar fashion as to when they are deployed: 1) the microphones were checked for proper recording of sounds and archiving of data onto the internal drive/USB; and 2) the program recording times and acoustic range were verified.


sample deployed detector

Call Analysis

The entire call analysis process was managed via Normandeau's ReBAT® data management system, which tracks each acoustic recording file after upload throughout the call analysis process and stores all results in a MySQL database. Each acoustic file was processed as required by the 2018 Guidelines using Kaleidoscope Pro version 4.0.0 (KPro), which is one of the USFWS-approved automated bat call classification software packages. The software analyzes bat calls and determines the probability ("likelihood of presence p (probability) value") that a call was made by a certain bat species. Any probability less than 0.05 is statistically interpreted to mean that the call belongs to that species. For quality control and to confirm the presence of all species, a manual review of the call sonograms was conducted by Stephen Lindsay, a trained bat acoustic expert and call analyst, for final determination.

Mr. Lindsay reviewed all calls identified by the automated analysis (KPro) as one of the three myotids, tricolor bat, or eastern red bat to determine if these designations were correct. The calls of these species have a high degree of overlap and are more readily misidentified by KPro than the calls of big brown, silver-haired, and hoary bats; however, Mr. Lindsay also reviewed a subset of the latter species' calls to verify that these species were indeed present. Manual review confirms or refutes species identified by KPro when the call quality allows for such determinations. Some poor quality calls

might not be identifiable and some calls might be categorized by the analyst as "unknown high frequency." These calls are also generally of poor call quality and/or contain characteristics for multiple species. Because of this ambiguity, these calls cannot be ruled out as belonging to a particular species with a high frequency call, which includes the three myotids, tricolor bat, and eastern red bat. Additionally, some calls are designated as 'MYSP40k_E', which are also typically of poor call quality, but can be distinguished as belonging to the myotid group. The calls of the three myotid species have a high degree of overlap. Particular call characteristics are used to make a determination regarding species identification.

Sample sonograms

6.5ms	10.09ms
60.62 Khz	**43.35** Khz
38.44 Khz	**40.78** Khz
little brown bat	tri-colored bat
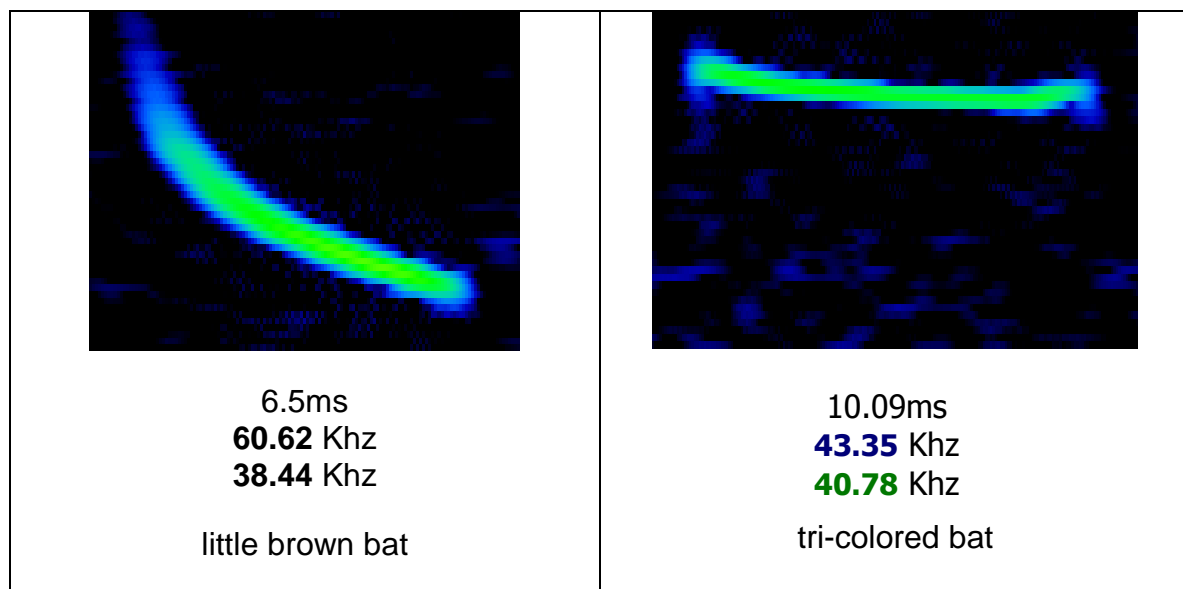
Results

Overall Habitat Assessment

The survey area contains predominantly low density residential development interspersed with large blocks of undeveloped forest and riparian habitat. Tree cover at the survey sites consisted primarily of red maple (*Acer rubrum*), eastern hemlock (*Tsuga canadensis*), eastern white pine (*Pinus strobus*), paper birch (*Betula papyrifera*), yellow birch (*Betula alleghaniensis*), gray birch (*Betula populifolia*), black birch (*Betula lenta*), American beech (*Fagus grandifolia*), green ash (*Fraxinus pennsylvanica*), northern red oak (*Quercus rubra*), white oak (*Quercus alba*), shagbark hickory (*Carya ovata*), American sycamore (*Platanus occidentalis*), American hophornbeam (*Ostrya virginiana*), and basswood (*Tilia americana*). Average diameter at breast height (DBH)

was approximately 6-12 inches with larger trees scattered throughout. Some snags and multiple wetland types (potential bat drinking areas) were identified at most survey sites.

Deployment Details

The survey was conducted from June 30 – July 1, 2018 and the detectors were programmed to run from 19:32 UTC until 6:01 UTC the following morning. The detectors were placed in eleven different locations throughout the survey area. The detectors were placed at least 200 meters apart, per USFWS guidelines. Details of the survey for each of the recording nights included specifications of the detectors and microphones used, descriptions of the individual habitat in each of the locations where each detector was placed, and the hourly weather conditions from Pease Air Force Base / Portsmouth (KPSM).

Discussion

White nose syndrome was first detected in the United States in the winter of 2006-2007 in caves where bats hibernate in upstate New York. The disease is caused by the *Pseudogymnoascus destructans* fungus. The fungus causes metabolic changes in bats that result in an inability to endure the rigors of winter and hibernation. Mortality in affected bats is nearly 100%. The New Hampshire bats most affected by white nose syndrome are non-migratory cave-dwelling species: little brown bat, northern long-eared bat, small-footed bat, tri-colored bat, and big brown bat. Little brown bats were formerly the most common bat species in New Hampshire and they have been hit hardest by the disease. They are now listed as state endangered.

In addition to the stress of white nose syndrome, bats face increasing challenges due to the widespread use of pesticides, habitat loss, and fatal encounters with utility windmills. This study provided a necessary baseline against which one can compare future bat species assessments.

This study did not assess the *number* of bats of each species; it assessed the presence of at least one individual. It is interesting to note that all species of expected bats occur with greater frequency along the Lamprey River compared to recent (2015-2017) statewide results.

Year	number of locations	big brown bat	eastern red bat	hoary bat	silver haired bat	eastern small-footed bat	little brown bat	northern long-eared bat	eastern tricolored bat
2015	341	35.0%	30.9%	27.9%	22.6%	0.6%	30.3%	6.8%	0.9%
2016	80	33.8%	25.0%	22.5%	21.3%	5.0%	26.3%	11.3%	2.5%
2017	110	38.2%	39.1%	38.2%	27.3%	6.4%	31.8%	8.2%	0.9%
average		**35.6%**	**31.7%**	**29.5%**	**23.7%**	**4.0%**	**29.5%**	**8.7%**	**1.4%**

| **LRAC** | **11** | **100%** | **100%** | **100%** | **81.8%** | **9.1%** | **100%** | **18.2%** | **36.4%** |