NATURAL FORCES DEVELOPMENTS LP

Bat Surveys

Benjamins Mill Wind Project - Appendix J

January 2022 – 21-1722

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1.0 Introduction

The Proponent engaged the expertise of Dillon Consulting Ltd. (Dillon) to conduct biophysical surveys for the Benjamins Mill Wind Project (the Project) including bat surveys to identify species that may be present in the area.

For the purpose of this assessment, the spatial boundaries (i.e., the Study Area) have been identified as the area encompassing the access roads (including a 250m buffer), each proposed wind turbine generator and substation location (plus a 250 m radius surrounding each turbine).

1.1 Scope of Work

Natural Forces understands that one of the key environmental concerns associated with wind projects is the potential for effects to bats (i.e., mortality). As such Dillon consulted with the Nova Scotia Department of Natural Resources and Renewables (NSDRR) regarding the level of effort for the acoustic survey program. The 2021 bat acoustic program methodology was developed in consultation with NSDRR.

Surveys were designed to capture the breeding season and extend through the fall migration period (June 1 until October 15, 2021; inclusive). This approach allowed for collection of data which could capture bat activity levels during the vulnerable periods (i.e., breeding and migration) while considering seasonal and temporal variations.

2.0 Methods

2.1 Field Survey

Six acoustic survey stations were installed within the Study Area of the proposed Project as a mechanism to capture the various terrain and habitat types within the Study Area (Figure 11 of the main document). Each station was equipped with a Wildlife Acoustics SM3BAT ultrasonic bat detector and omnidirectional microphones (i.e., SMM-U1/U2). Each bat detector included the following programmed settings:

- Trigger Frequency Minimum: 16 kHz;
- Trigger Frequency Maximum: 192 kHz;
- Trigger Level: Automatic (12dB);
- Trigger Wind Setting (recording continues until no trigger is detected): 3 seconds, or when the maximum file duration (i.e., 15 seconds) was reached;

- Sample Night: from dusk to 5 hours after dusk; and
- Gain Level: Automatic (12dB).

Acoustic detectors were mobilized on May 28, 2021 and demobilized on October 20, 2021, and programed to collected bat activity from June 1 through to October 15 (inclusive) in accordance with the aforementioned parameters.

Of the six acoustic monitoring stations, two were associated with the existing meteorological tower (MET); one at ground level and one approximately 30 m above ground as a mechanism to capture activity data within the blade sweep area. The remaining four acoustic monitoring stations were mounted at ground level (<2 m high) and captured activity data along the Study Area, turbine clusters and unique habitat types. Table J-1 includes representative photos for each acoustic monitoring station, as well as a spatial description for each monitoring station relative to the Study Area and the locations are shown on Figure 15 of the EA Registration Document.

Table J-1: Summary Table of Bat Monitoring Stations and Their Location in the Study Area

Acoustic Station ID	Representative Photo	Station Height	Description
Bat A		Ground Level	Acoustic station "Bat A" was located in an open area with some small immature birch trees and next to a sizable cliff of bedrock outcropping, which could be a potential bat roosting location. Northeast corner of the subject property. The tree was used to elevate the microphone to approximately 1.8 m above ground level.

Acoustic Station ID	Representative Photo	Station Height	Description
Bat D		Ground Level	Acoustic station "Bat D" was located in an open area that was part of a clear-cut hardwood stand. The area is revegetated by immature deciduous trees and shrubs. Northwest corner of the subject property. The monitor was set on top of a boulder, and the tree was used to elevate the microphone to approximately 2.3 m above ground level.
Bat E		Ground Level	Acoustic station "Bat E" was located in an open area adjacent to a treed swamp and a watercourse. South of the subject property. The branch on the tree was used to extend and elevate the microphone to approximately 1.8 m above ground level.

Acoustic Station ID	Representative Photo	Station Height	Description
Bat F		Ground Level	Acoustic station "Bat F" was located in an open area next to the road with exposed boulders and adjacent to mature softwood trees. East side of the subject property. The branch on the tree was used to extend and elevate the microphone to approximately 1.8 m above ground level.
MET Tower		Ground Level and ~30 m Above Ground	Acoustic station "MET Tower" was located in the centre of the Study area in a relatively flat and open area that was recently clear-cut with minimal re-vegetation. Attached to the MET tower near the centre of the Site. One of the microphones was located at ground level, while the other was elevated to a height of approximately 30m, by way of a pulley system installed on the MET Tower.

2.2 Analysis

Bat acoustic data was analyzed using the automated software Kaleidoscope Pro (Wildlife Acoustics) with the following settings:

- Minimum number of pulses = 2;
- Division Ratio = 8;
- Time Expansion Factor = 1;
- Duration = 2 – 500 ms; and,
- Frequency Range = 16 – 120 kHz.

Using the automated species identification feature provided by Kaleidoscope Pro, each acoustic file was first identified to species and species groups (where possible), or identified as either NOID (i.e., pulses recorded but unable to identify species) or NOISE (i.e., no pulse recorded). Species/species groups were identified based on maximum frequency, minimum frequency, call duration and shape (Jones & Siemers 2010).

When bats are far from the detectors or at an angle that reduces detectability, calls can become fragmented where the higher frequency components of the calls are not recorded. This confounds the ability to reliably differentiate several species with overlapping call parameters. For example, several Myotis species can be differentiated based on the maximum frequency of their calls, but not the minimum frequency (Agranat 2012). Although call shape can also aid in differentiating Myotis species, shape varies considerably with habitat structure as bats modify their calls for better long-distance detection in more open habitat and to reduce interference from echoes generated in more cluttered habitat (i.e., within woodlands) (Jones & Siemers 2010). As such, based on the auto ID generated by Kaleidoscope Pro, each of the acoustic files (including NOISE and NOID) were manually reviewed and subsequently classified as follows (van Zyll de Jong 1985):

- LANO/LABO – Silver-haired Bat (abbreviated LANO) and Eastern Red Bat (abbreviated LABO). Both of these species are migratory and were assessed together as a group based on similarities of their calls. Silver-haired Bats produce calls with a constant frequency (CF) tail around 22 – 25 kHz. Although Eastern Red bats produce calls with a minimum frequency between 30 – 35 KHz, they also produce calls with lower minimum frequencies within the range of Silver-haired bats; therefore, these species were grouped together. Although Big Brown Bat (abbreviated EPFU) also produce calls with a CF similar to Silver-haired bat and are generally reported as EPFU/LANO, given the few sightings reported to date in Nova Scotia, all potential EPFU/LANO calls were assumed LANO; hence the species grouping of LANO/LABO. Both Silver-haired and Eastern Red Bat are considered migratory species.
- LACI – Hoary Bat (abbreviated LACI) is a migratory bat with calls that are reliably differentiated from all other species. Hoary Bat calls have lower frequency (ranging from 25 to 18 kHz) and are noticeably longer in duration compared to other bat species known to occur within the project assessment area.
- MYOTID SSP – (abbreviated MYOTID) is a species group that includes resident (i.e., non-migratory) bat species in Nova Scotia including Little Brown Myotis, Northern Myotis, and the Tri-Colored Bat. Unlike the migratory species outlined above, the Myotid species group of bats produce shorter duration calls with a minimum frequency between 40 – 45 kHz, and maximum frequencies ranging between 120 kHz and 80 kHz. Occasionally, Myotis calls can have a minimum call frequency of 35 kHz.

Ecologically, these classifications make sense as Hoary Bats are typically confined to more open habitat, the LANO/LABO group typically forage in the open and along woodland edges, and the MYOTID SSP are the most agile and therefore may be found in more cluttered environments, near water bodies, and along woodland edges (van Zyll de Jong 1985).

3.0 Results

A total of 146 bat passes were recorded during the June 1 through October 15 survey period (inclusive). Table J-2, below, provides a summary of the number of species/species group bat passes per acoustic monitoring station by month.

Breeding Period (June 1 to July 31)

Of the 146 bat passes recorded during the June 1 to October 15 monitoring period, 21% (or 31 bat passes) occurred during the breeding period. Figure J-1 below summarizes the number of bat passes per species/species group (including migratory and non-migratory species) by month. Similarly, Figure J-2 summarizes the number of bat passes (illustrated as All Bats and Migratory Bats) per detector night through the breeding period, as well as the average number of bat passes per detector night during the breeding period (illustrated as Average_All Bats and Average_Migratory Bats). The average 'All Bats' and 'Migratory Bats' passes per detector night during the breeding period was calculated at 0.08 and 0.03 bat passes, respectively.

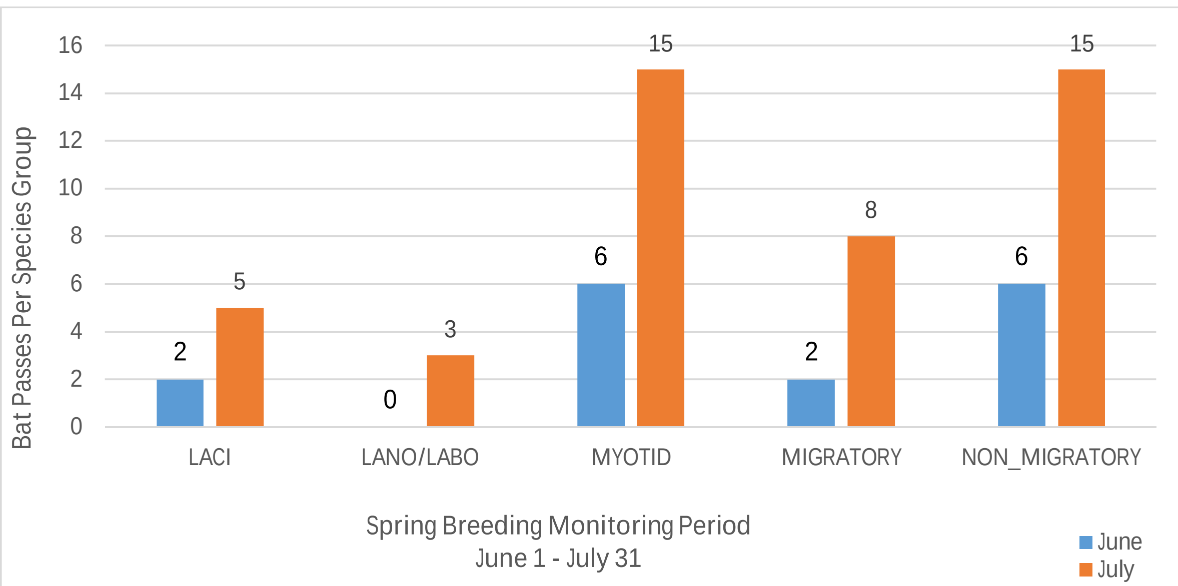

Figure J-1: Total Number of Bat Passes per Species/Species Group by Month – Spring Breeding

Table J-2: Number of Bat Passes by Species/Species Group per Monitoring Station

LOCATION A						
	June	July	August	September	Oct 1-15	Total
LACI		1	3			4
LANO/LABO		1	1			2
MYOTID	1	2	13	2	1	19
total	1	4	17	2	1	25
LOCATION D						
	June	July	August	September	Oct 1-15	Total
LACI		2		4		6
LANO/LABO			1	2		3
MYOTID		3	19	2		24
total	0	5	20	8	0	33
LOCATION E						
	June	July	August	September	Oct 1-15	Total
LACI	2	2	3	1		8
LANO/LABO			4	1		5
MYOTID	4	3	6	1		14
total	6	5	13	3	0	27
LOCATION F						
	June	July	August	September	Oct 1-15	Total
LACI			3	1		4
LANO/LABO		1	2	2		5
MYOTID	1	3	7	2		13
total	1	4	12	5	0	22
LOCATION MET						
	June	July	August	September	Oct 1-15	Total
GROUND LEVEL						
LACI			2			2
LANO/LABO				1		1
MYOTID		4	13	1		18
total	0	4	15	2	0	21
~30 m ABOVE GROUND						
LACI			2			2
LANO/LABO		1	3	1		5
MYOTID			10	1		11
total	0	1	15	2	0	18
TOTAL	8	23	92	22	1	146
%	5.48%	15.75%	63.01%	15.07%	0.68%	100.00%

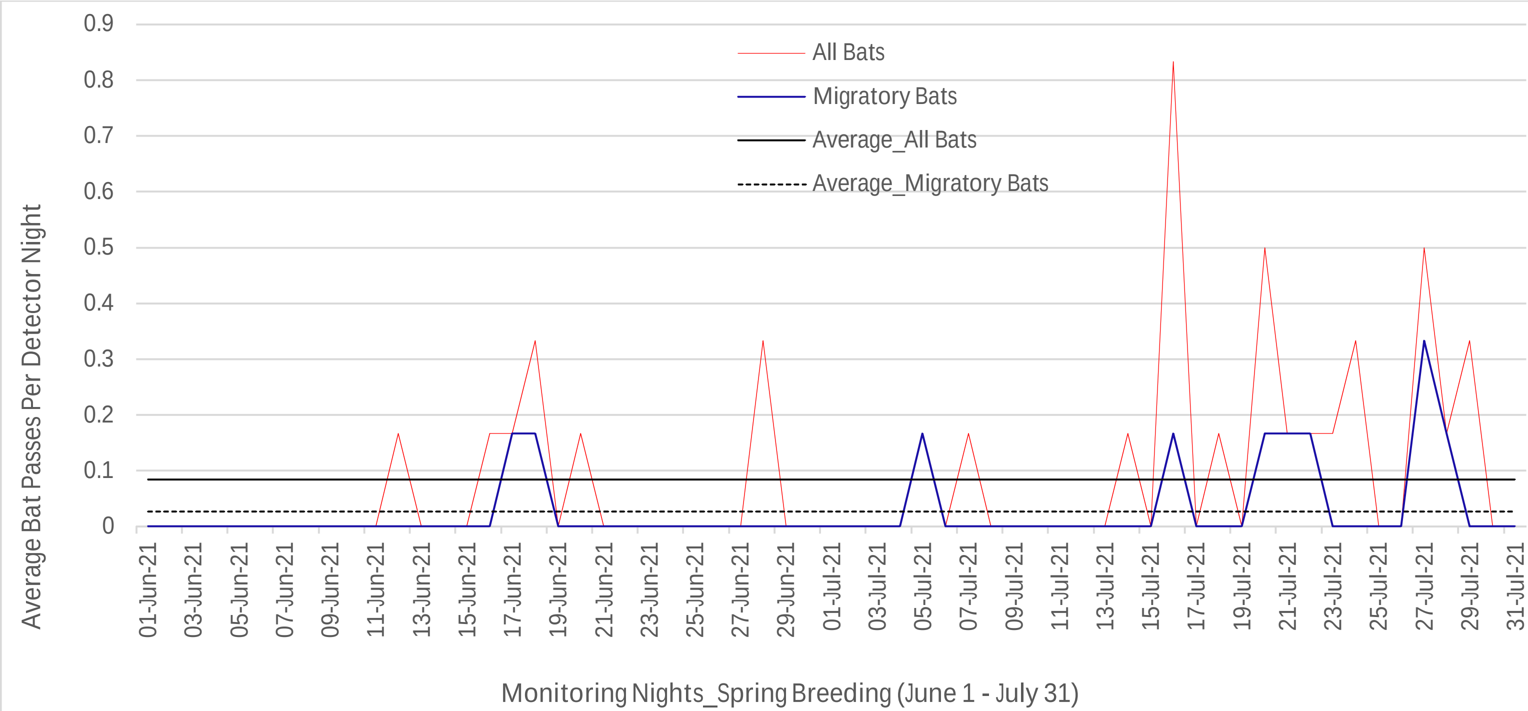

Figure J-2: Average Number of Bat Passes per Night – Spring Breeding

Fall Migration (August 1 to Oct 15)

Of the 146 bat passes recorded during the June 1 to October 15 monitoring period, 79% (or 115 bat passes) occurred during the fall migration period. Figure J-3 below summarizes the number of bat passes per species/species group (including by migratory and non-migratory species) by month. Similarly, Figure J-4 summarizes the number of bat passes (illustrated as All Bats and Migratory Bats) per detector night through the breeding period, as well as the average number of bat passes per detector night during the fall migration period (illustrated as Average_All Bats and Average_Migratory Bats). The average 'All Bats' and 'Migratory Bats' passes per detector night during the fall migration was calculated at 0.25 and 0.08 bat passes, respectively.

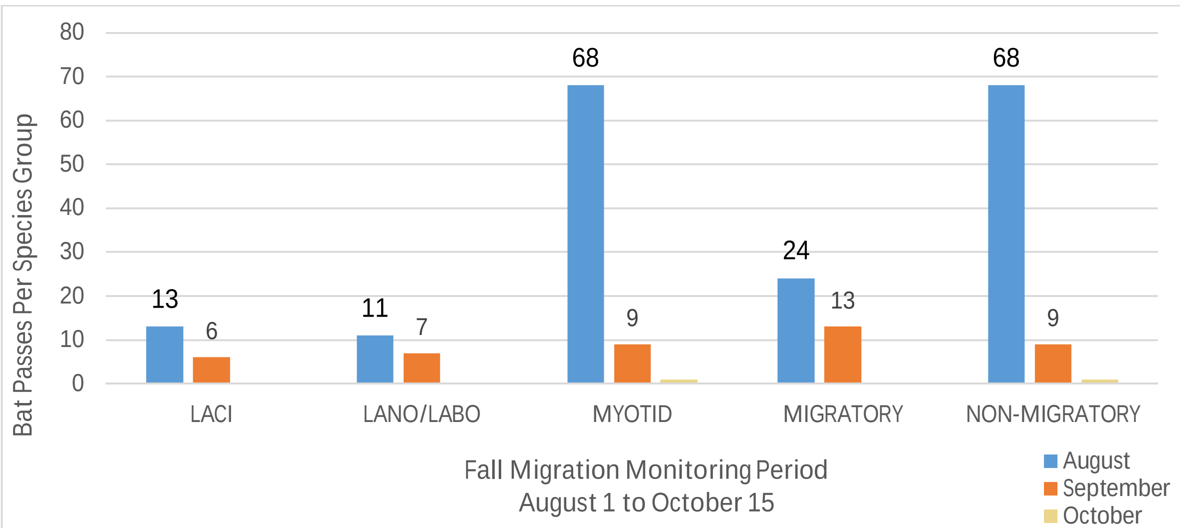

Figure J-3: Total Number of Bat Passes per Species/Species Group by Month – Fall Migration

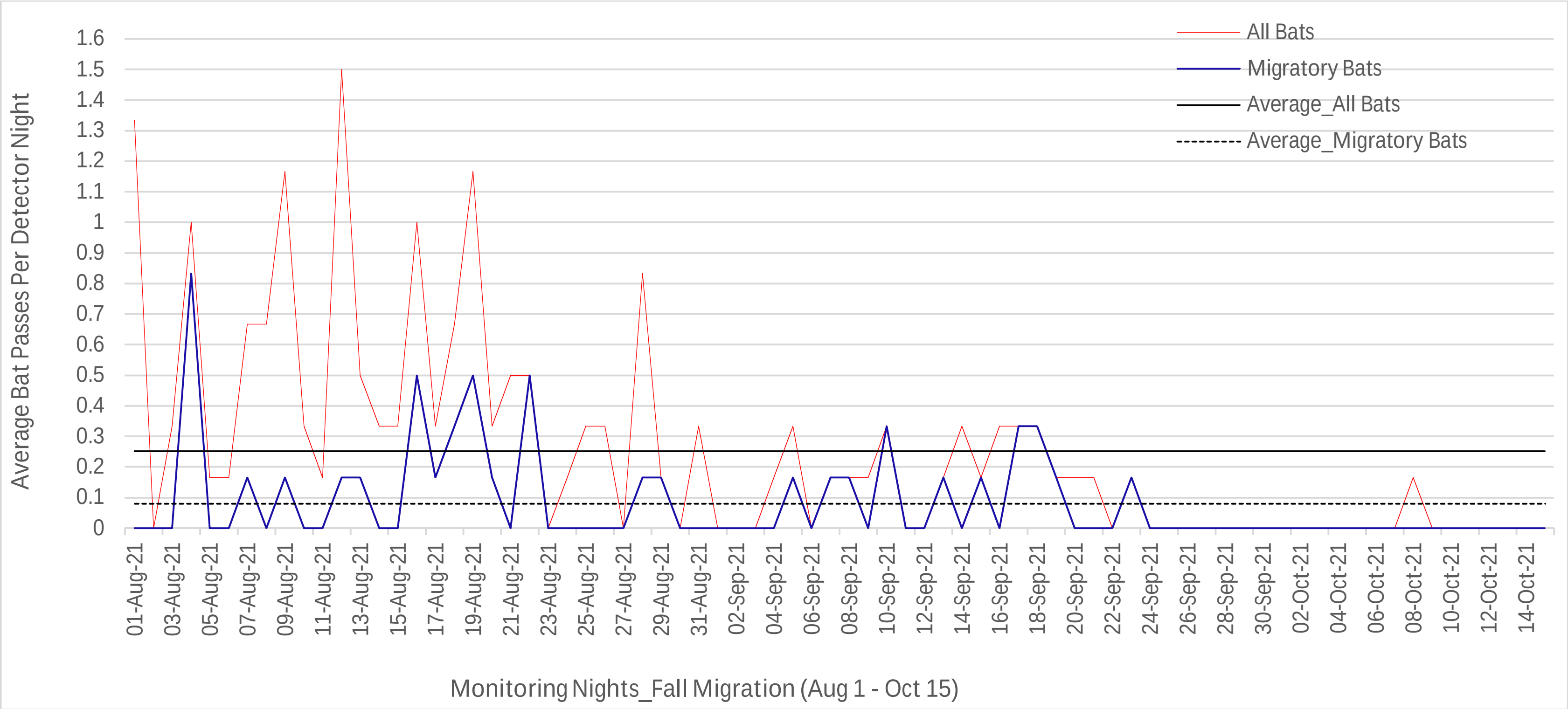

Figure J-4: Average Number of Bat Passes per Night – Fall Migration

June 1 to Oct 15 In-Aggregate

Of the 146 bat passes recorded during the June 1 to October 15 monitoring period, 94% (or 137 bat passes) were recorded during the months of July through September (inclusive). The month of August alone was responsible for 63% (or 92 bat passes) of the 146 recorded bat passes. A total of eight bat passes were recorded in the month of June, with only a single bat pass recorded between October 1 and October 15.

The total number of bat passes per species/species group (and broken down by migratory and non-migratory species) per month is presented in Figure J-5. As illustrated in Figure J-5, the MYOTID species group accounted for 68% (or 99 bat passes) of the 146 bat passes recorded during the survey period, of which 69% (or 68 bat passes) of the 99 MYOTID passes occurred during the month of August alone.

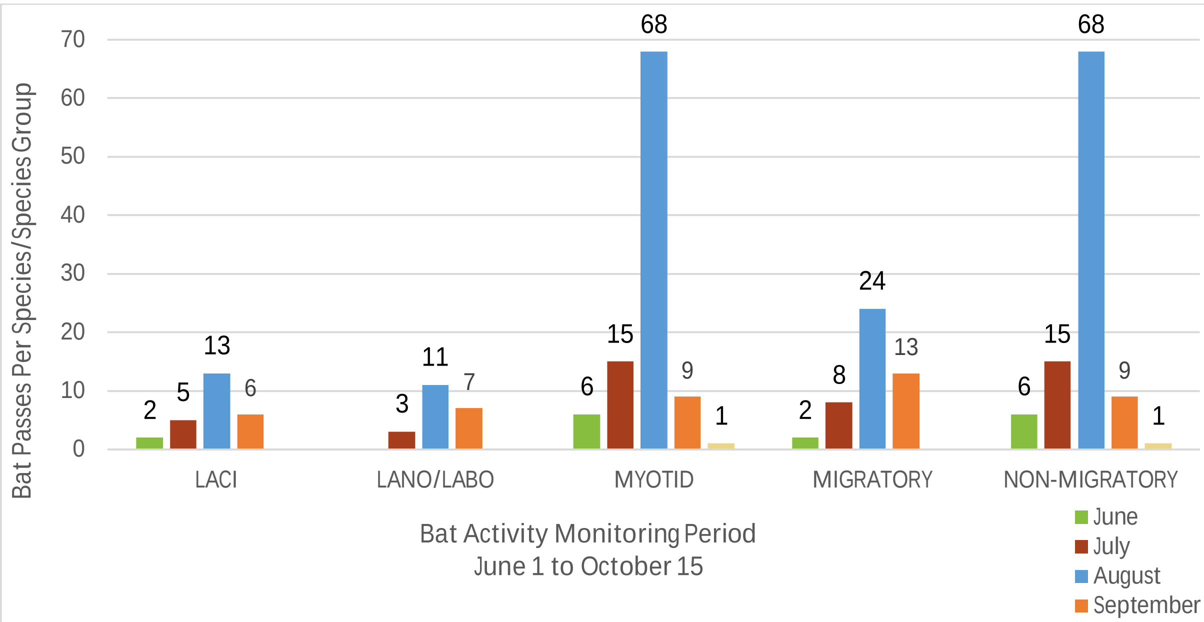

Figure J-5: Total Number of Bat Passes per Species/Species Group by Month – Survey Period

Figure J-6 summarizes the number of bat passes (illustrated as All Bats and Migratory Bats) per detector night throughout the survey period, as well as the average number of bat passes per detector night (illustrated as Average_All Bats and Average_Migratory Bats). The average 'All Bats' and 'Migratory Bats' passes per detector night during the entire survey period was calculated at 0.18 and 0.06 bat passes, respectively.

Based on Dillon's experience on similar bat acoustic programs throughout the country, both the total number of bat passes (n= 146) and the average bat passes per detector night (during the breeding period, fall migration, and entire survey period) are considered very low.

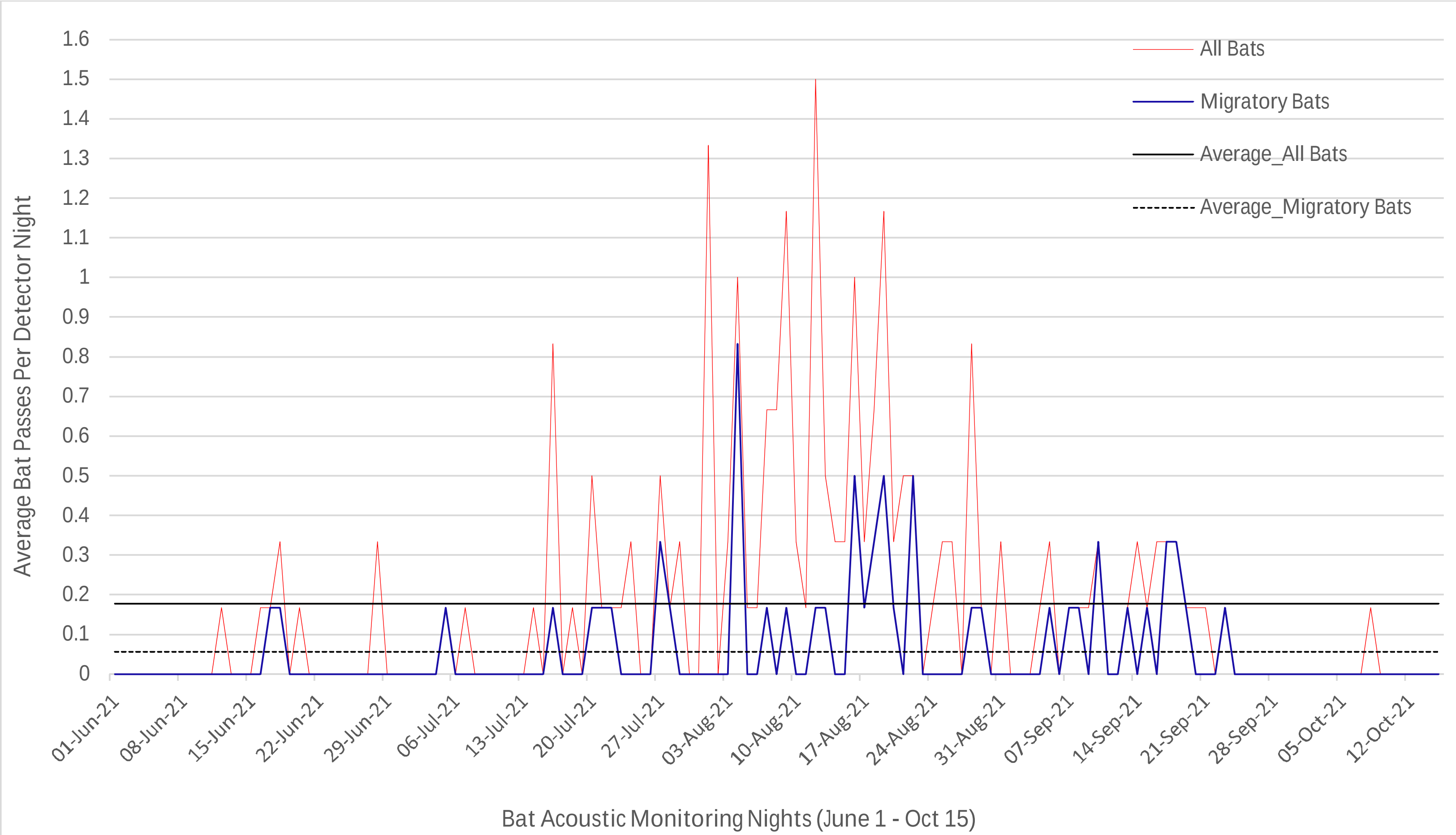

Figure J-6: Average Number of Bat Passes per Night – 2021 Survey Period

References

Canadian Wildlife Health Cooperative [CWHC]. (2021). Guide for Bat Monitoring in Atlantic Canada.

Environment and Climate Change Canada [ECCC]. (2018). Recovery Strategy for the Little Brown Myotis (Myotis lucifugus), the Northern Myotis (Myotis septentrionalis), and the Tri-colored Bat (Perimyotis subflavus) in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. ix + 172 pp.

Environment and Climate Change Canada [ECCC]. (2018c). Recovery Strategy for the Little Brown Myotis (Myotis lucifugus), the Northern Myotis (Myotis septentrionalis), and the Tri-colored Bat (Perimyotis subflavus) in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. ix + 172 pp.

Environment and Climate Change Canada [ECCC]. (2018). Recovery Strategy for the Little Brown Myotis (Myotis lucifugus), the Northern Myotis (Myotis septentrionalis), and the Tri-colored Bat (Perimyotis subflavus) in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. ix + 172 pp.

Environment Canada [EC]. (2014a). Little Brown Myotis, Northern Myotis and Tri-colored Bat. CW66-514/2014E-PDF. ISBN 978-1-100-25605-4. Accessed March 2021. [https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/gen_info/fs_chauvesouris_bats_gen-v03_0215_e.pdf]

Environment Canada [EC]. (2014b). BATS IN BUILDINGS and the Emergency Listing Order for the Little Brown Myotis (Myotis lucifugus), the Northern Myotis (Myotis septentrionalis) and the Tri-colored Bat (Perimyotis subflavus). Accessed March 2021: [https://www.canada.ca/en/environment-climate-change/services/species-risk-education-centre/fact-sheets/bats-white-nose-syndrome/buildings-emergency-listing-order.html]

Mersey Tobeatic Research Institute. (N.d.). Nova Scotia Bat Conservation. Retrieved from Bat Conservation: http://www.batconservation.ca/index.php?q=content/bat-identification
Moseley, M. (2007). Records of Bats (CHIROPTERA) at Cave and Mines in Nova Scotia. Halifax: Nova