

Bats of Thickson's Woods

Pilot Study and Public Education Program



2015 Final Report

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Published by Hawk Owl Publishing

Summary

In 2015, a pilot bat study was conducted at the Thickson's Woods Nature Reserve under the auspices of the Matt Holder Environmental Education Fund. The goals of this project were to learn about bats in the Reserve and to engage the public in bat conservation. A series of public walks was conducted, with simultaneous, formalised acoustic transects conducted by volunteer, Jessica Kroes, approximately weekly from June through August 2015.

A total of five species was identified within the Reserve. The most numerous bats were Big Brown or Silver-haired (305 sequences), two species with highly overlapping call repertoires that are difficult to distinguish. Second most numerous were Eastern Red Bats (66 sequences). Other species identified were Hoary, Little Brown, and Tri-colored Bats.

Bats were detected throughout the survey period, indicating that Thickson's Woods is a valuable site for at least Big Brown, Silver-haired, and Eastern Red Bats. Hoary Bats were detected in low numbers during formal surveys, but were repeatedly observed informally during public events, suggesting they may also make use of the site. The presence of Little Brown and Tri-colored Bats, both rare and threatened species, is significant despite the low numbers. Public engagement efforts were highly successful, with a total of 180 people attending a series of events through the year to listen to talks about bat ecology and to see native bats in flight.

We plan to continue this project in 2016, to include further public events and repetition of the formal transects, incorporating lessons learned in 2015. We will also explore possibilities of expanding the project with the use of a static detector and capture surveys.

Thanks to Thickson's Woods Land Trust Board members for supporting the ongoing research.



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Limitations: Ecological assessments provide a snapshot of a site at a particular time. Observations can be used to draw conclusions as to the likely presence or absence of species and their use of the site. It is neither definitive nor complete. Seasonality, weather conditions and intra-site variation may also affect survey results.

For more information about Thickson's Woods and the programs offered by the Matt Holder Environmental Education Fund go to www.mattholderfund.com

Cover illustration: Big Brown Bat (*Eptesicus fuscus*) on a tree. © Toby Thorne 2014

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1. Introduction

1.1. Objectives

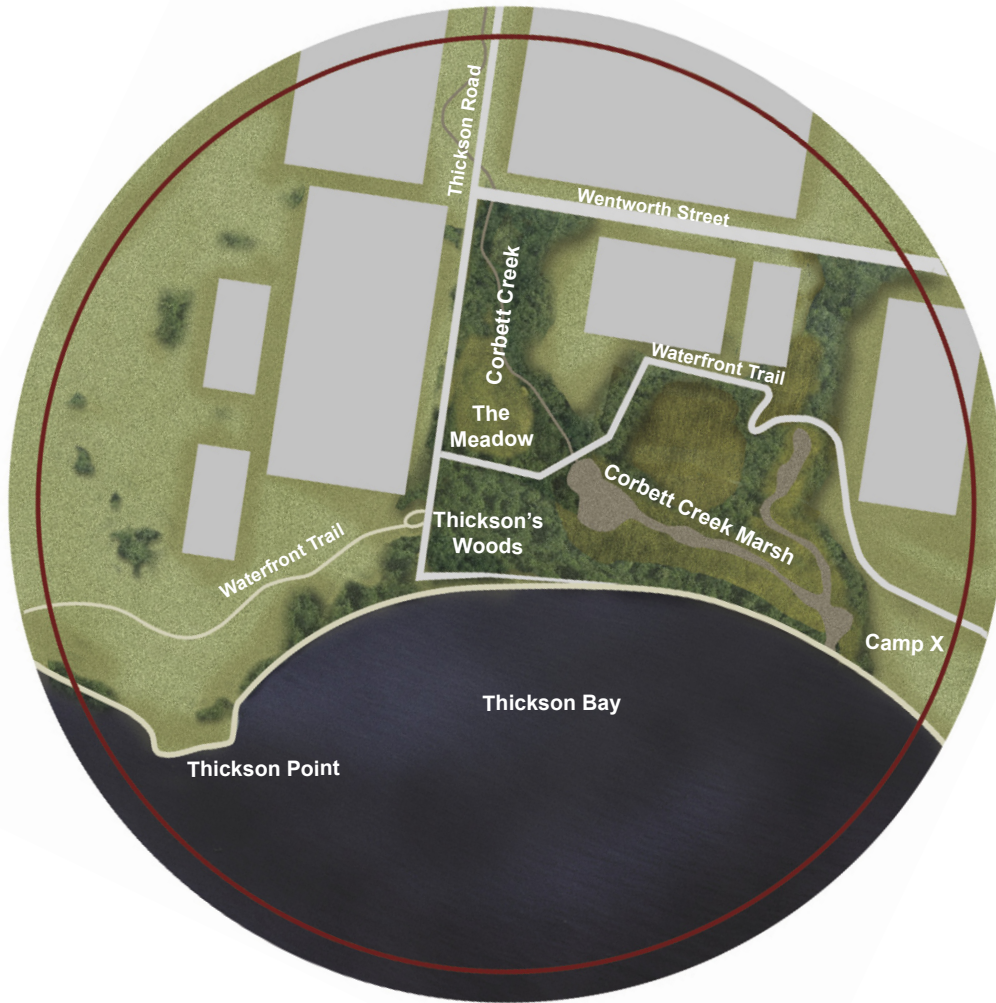
- 1.1.1. To inventory bat species present in Thickson's Woods, the adjoining meadow and immediate surroundings.
- 1.1.2. To locate areas of high bat activity within the Reserve.
- 1.1.3. To monitor seasonal variation in species presence and activity.
- 1.1.4. To engage members of the public and promote in bat ecology and conservation.

1.2. Study Site

- 1.2.1. Thickson's Woods Nature Reserve is a privately-owned conservation area located on the north shore of Lake Ontario in Whitby, Ontario, on the eastern outskirts of the Greater Toronto Area (GTA). Thickson's Woods initially consisted of a 6.9 hectare old-growth, mixed-species woodlot containing pine, beech, aspen, birch, poplar, oak, and maple. The woodlot was purchased in 1983 by the Thickson's Woods Land Trust, which was formed for this purpose. The Reserve was expanded in 2001 with the purchase of an adjacent 3.2 hectare meadow to the north of the woods. A small waterway, Corbett Creek, flows through the meadow before emptying into a medium-sized, open-water wetland to the east of the meadow and woodlot
- 1.2.2. The close proximity of the Thickson's Woods Nature Reserve to the highly populated GTA results in relatively high numbers of visitors to the Reserve, which has multiple public trails and is a popular site with naturalists. The majority of interest in wildlife at the Reserve has focused on its avifauna, in particular the prevalence of rarer bird species travelling along the lakeshore during migration periods. At various points in the history of the Reserve, attention has also been paid to some other aspects of the flora and fauna of the woods and meadow.
- 1.2.3. To the best of our knowledge, no particular attention has previously been paid to bats in Thickson's Woods, beyond the observations of local residents, several of whom have found bats roosting within their properties.

The Matt Holder Environmental Education Fund was established to find and encourage young people with an interest in the natural world, and is currently focused on projects within the Thickson's Woods Nature Reserve. Bats were identified as a group on which to focus in 2015. Well-attended public events were held approximately monthly throughout the summer, educating attendees about bat biology, and assisting them in watching and listening to bats around the woods. Additionally, more formal surveys were established to more accurately quantify bat activity in the Reserve. This report summarises the methodology and results of these surveys.

Thickson's Wood Nature Reserve



Aerial view of Thickson's Woods Reserve and surrounding area

2. Methodology

2.1. Data Collection

- 2.1.1. Bat activity was monitored on an approximately weekly basis through the months of June, July, and August. Sampling began on June 10, 2015 and was concluded on August 21, 2015.
- 2.1.2. Transects were not clearly delineated, however three consistent survey locations; outlined in Figure 1, included the meadow (Zone 17N Easting: 669017 Northing: 4857859), the intersection of the Waterfront Trail and Corbett Creek (Zone 17N Easting: 669180 Northing: 4857894), and the southeast corner of the Thickson's Woods trail at its junction with McIntosh Avenue (Zone 17N Easting: 669163 Northing: 4857691). Additional survey locations were added every survey night when high levels of bat activity were found. These included, but were not limited to, the intersection of Crystal Beach Road and McIntosh Avenue (17N Easting: 669195 Northing: 4857600), Crystal Beach Road and Corbett Avenue (17N Easting: 669064 Northing: 4857515), and the southwest corner of the Thickson's Woods trail at its junction with Corbett Avenue.
- 2.1.3. Temperature, relative humidity, and percent moon illumination was recorded half an hour after sundown at the beginning of each field visit. Volunteers stopped at each survey location for a duration of five minutes with the bat detector programed to "auto record". Additionally, "auto recording" continued between primary survey locations. If a bat was detected the surveyor would stop for one minute or until activity ceased. Surveys were not completed if high winds or precipitation persisted.
- 2.1.4. Bat echolocation sounds were recorded using an Echo Meter Touch ultrasonic microphone module (Wildlife Acoustics, U.S.A.) attached to an iPad Mini. Recording was controlled using the Wildlife Acoustics 'Echo Meter Touch Bat Detector' applications (versions 1.1 – 1.7) running on iOS. The app was set to automatically trigger recordings. Recordings were saved as .wav files for data analysis.

2.2. Data Analysis:

- 2.2.1. Following the completion of all 2015 surveys, the data were collated for species identification and analysis. Many files contained extraneous noise, often caused by the surveyor moving through ground cover, and did not contain information of interest. In order to reduce time spent on further analyses, the data were first filtered using software to automatically identify files containing potential bat signals (Sonobat Batch Scrubber 5.4; settings: high grade, exclude calls <20 kHz).
- 2.2.2 Files passed by the filter were then subjected to manual review. Files were visualised as spectrograms and parameters were measured (Sonobat 4.0.5 Base). Aural review

was also conducted where necessary. Where no bat signals were present, the file was marked as 'noise'. Where bat signals could be discerned but not identified to species the file was marked as 'unidentified bat'. Otherwise the calls present were identified to species or species group. The majority of Big Brown and Silver-haired Bat calls were grouped into a single category due to the large overlap in call parameters by these species. Similarly, calls by *Myotis* species were combined into a single category due to the larger overlap by these species.

3. Results

3.1. Surveys:

3.1.1. A total of 8 surveys were conducted in 2015. These are summarised in table 1.

3.2. Data Summary:

A total of 3932 ultrasonic sound files were recorded across 8 nights. Automatic filtering identified 1248 files that contained potential bat signals. Manual analysis showed that a further 785 of these files contained only extraneous noise. The remaining 463 files are summarised in Table 2, and in Figures 1 and 2.

3.3. Environmental Correlates

3.3.1. A variety of environmental conditions were recorded, and are discussed in the appendix.

2015	Survey Start	Survey Duration (Mins)	Moon Illumination %	Air Temperature °C	Relative Humidity %	Cloud Cover %	Wind Speed km/hr	Wind Direction	Big Brown or Silver-haired passes per min.	Red Bat Passes per min.	Total bat Passes per min.
June 10	21:16	33	39	18	72		33	NW	0.06	-	0.30
June 25	21:15	14	61	15	89	100	3	S	0.21	0.36	0.57
July 2	21:43	46	100	16	63	0	9	NNW	1.02	0.11	1.43
July 9	21:26	47	41	17	88		3	SW	2.28	0.13	2.43
July 23	21:43	56	45	21	46		12	NNW	0.73	0.05	0.89
July 29	21:36	31	96	24	85	50	4	SE	0.18	1.03	1.36
Aug 8	20:50	115	33	18	73	0	N/A	N/A	0.60	0.11	0.89
Aug 21	21:35	44	39	16	86	75	3	W	0.68	-	1.02

Table 1: Summary of surveys conducted, with timings and local weather conditions

	2015	June 10	June 25	July 2	July 9	July 23	July 29	Aug 8	Aug 21	Grand Total
Big Brown Bat	-	-	-	-	-	1	-	-	-	1
Big Brown or Silver-haired Bat	2	3	47	107	41	6	69	30		305
Eastern Red Bat	-	5	5	6	3	34	13	-		66
Hoary Bat	5	-	-	-	-	-	-	2	-	7
Little Brown Bat	-	-	-	1	-	2	-	-	-	3
Tri-colored Bat									1	1
Unidentified Bat	3	-	14	45	5	3	18	14		100
Grand Total	10	8	66	114	50	45	100	45		485

Table 2: Species total by survey night.

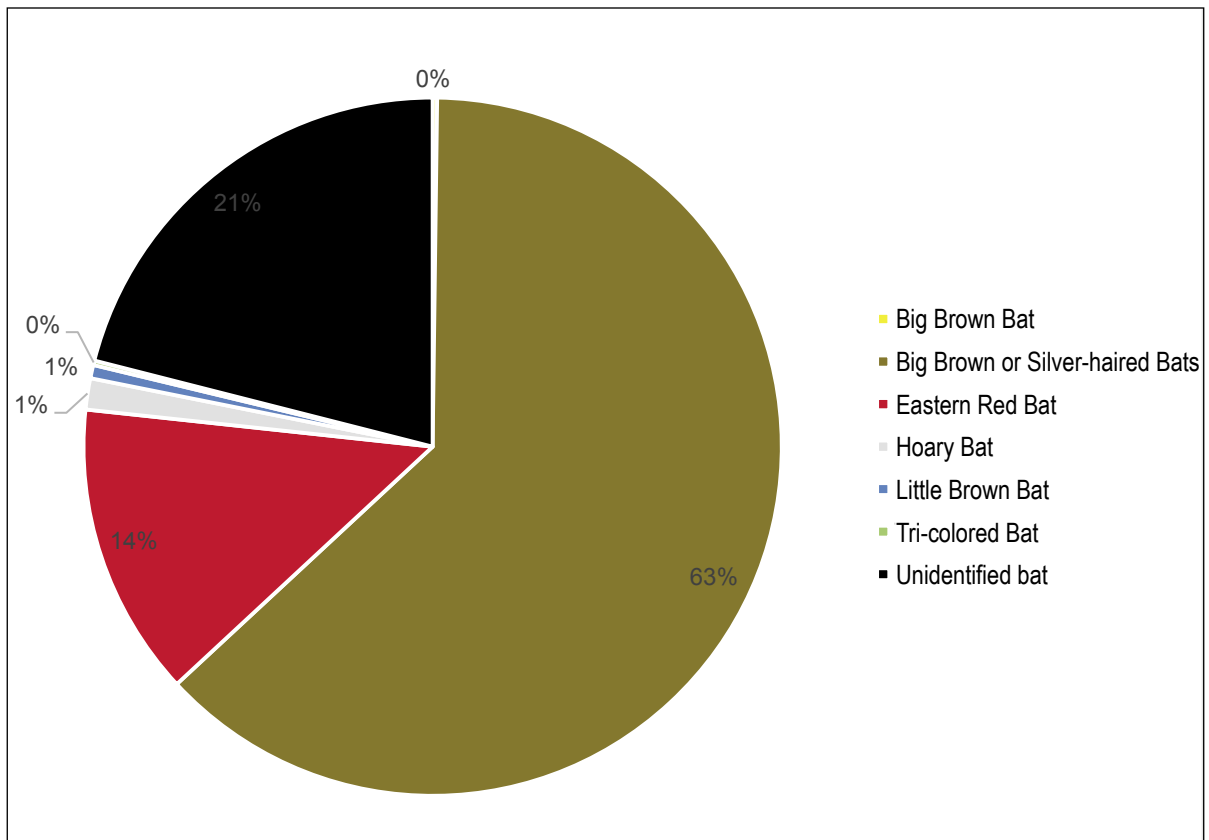


Figure 1: Breakdown of total bat sequences recorded by species

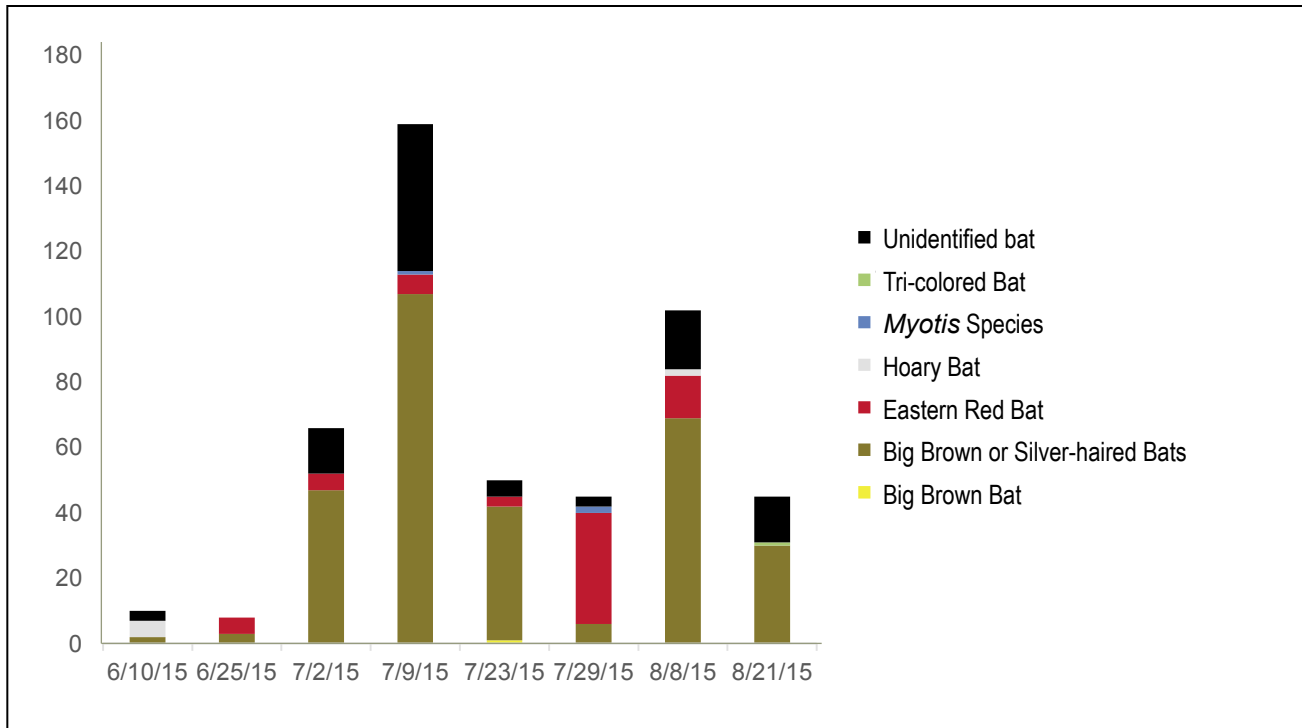


Figure 2: Breakdown of total bat sequences recorded by species by survey

4. Species Discussion

4.1. Big Brown and Silver-haired Bats

4.1.1. Both Big Brown Bats and Silver-haired Bats are widespread in Ontario. The difficulty in separating these species via acoustic analysis leads to difficulty in interpreting our data, confounded by their differing ecology. However, the presence of a large number of signals from this species group is consistent with other sites across southern Ontario where they account for the majority of bats encountered. Both species are larger bats and predominantly forage in open spaces close to cover. Both species also roost readily in trees, although Big Brown Bats often roost as groups whereas Silver-haired Bats are typically solitary.

4.1.2. It is likely that a large proportion of the signals recorded from this species group are from Big Brown Bats, which are known to roost in nearby buildings. However, incidental observations outside the data covered by this report suggest that Silver-haired Bats are also present. Capture surveys would be the most definitive means to confirm the presence of both species and attempt to quantify relative abundance, although abundance might vary seasonally due to migration by Silver-haired Bats.

4.1.3. Further investigation is required to determine a true relationship between Big Brown/Silver-haired Bat activity and cloud cover.

4.2. Eastern Red Bat

- 4.2.1. This species is widespread across southern Ontario. Published references frequently refer to it as a rural species less commonly encountered in urban areas. However, this claim lacks substantiation and Eastern Red Bats are increasingly encountered at urban sites. For example, unpublished data from T. Thorne indicates a significant presence of Eastern Red Bats in central Toronto in 2015.
- 4.2.2. Eastern Red Bats typically roost alone in trees. Their roosts can be difficult to identify or protect, but it is highly possible that this species may roost in or around Thickson's Woods.
- 4.2.3. Although our Eastern Red Bat dataset seems to be heavily influenced by a single survey night with uncharacteristically high Eastern Red Bat activity, the relationships between air temperature, moon phase, and bat activity warrant further investigation.

4.3. Hoary Bat

- 4.3.1. Hoary Bats are another widespread species in southern Ontario. They are reliably observed foraging along the lakeshore to the immediate south of the woods. It is surprising that Hoary Bats are less frequently encountered in the transect data. This might reflect the design of the transect or another aspect of the methodology and should be revisited before drawing further conclusions about this species.

4.4. Other Species

A small number of signals of *Myotis* species were also recorded. These calls were relatively short in length and of limited quality, which precluded identification to species level. All *Myotis* species are provincially endangered and are protected as Species at Risk. Although the numbers recorded at Thickson's were low, the presence of *Myotis* bats suggests further investigation could be worthwhile, with further surveys targeted to these species to evaluate their activity at this site.

5. Outreach

5.1. Public Bat Walks

- 5.1.1. We held our first public bat walk and bat monitoring demonstration on April 30, 2015. Throughout the spring and summer we hosted 5 public bat walks at Thickson's Woods. The combined attendance for the bat walks was 180. Attendance during these events increased throughout the season and we anticipate greater turnouts when we restart the public walks in 2016.



A cool night on April 30th for our first Bat Walk

5.2. Other Events

1.2.1. We promoted local bat conservation during the Thickson's Woods Land Trust annual Fall Festival in September 2015. In conjunction with the Ontario Specialized Species Centre we displayed two species of bats at our booth during the daytime and led a public bat walk in the evening. Our exhibit was popular, reaching a further 600 people during the festival.



Our Booth exhibiting live bats was well attended at the Thickson's Woods Fall Nature Festival



Visitors to our booth got to touch live bat wings

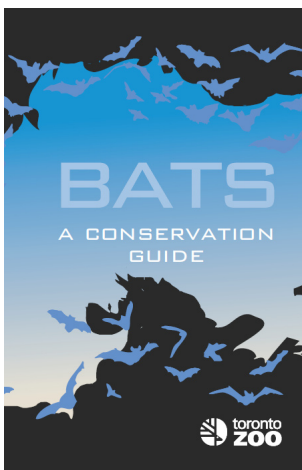
6. Publications

6.1. Bats: A Conservation Guide

6.1.1. In collaboration with the Toronto Zoo's Conservation, Education and Wildlife division, we published *Bats: A Conservation Guide*. This 32 page booklet includes information about the bats of Eastern Canada, tips for attracting bats to your property, blueprints for the construction of bat boxes. This booklet also aims to dispel the myths about bats that have led to their persecution.

6.2. Bats of Ontario

6.2.1. In 2016 we will publish *Bats of Ontario* by Toby Thorne, a comprehensive guide to the 8 species of bats that occur in Ontario. This guide also include information on ecolocation with sonograms and is fully illustrated with photographs and life-size artwork by Fiona Reid.



Available from www.mattholderfund.com



7. Future Directions

7.1. Quality of recordings:

- 7.1.1. Analysis of our recordings revealed multiple quality issues. Most extraneous noise appeared to result either directly from surveyor noise, e.g. clothes rustling, brushing against the microphone enclosure, or as indirect surveyor noise, e.g. noise from moving through long grass and undergrowth
- 7.1.2. To address these issues we will develop an improved protocol for volunteer surveyors, information about minimising surveyor noise.

7.2. Transect:

- 7.2.1. Multiple issues were encountered with transects in 2015, in particular the identification of a suitable route and a suitable methodology for pausing at listening points. Attempts to address these issues led to variability in the methodology of the surveys, but we considered these variations justified in order to maximise survey effectiveness.
- 7.2.2. In the 2016 surveys, we will use information from 2015 to develop a fixed transect route that will be surveyed consistently throughout the season. We will investigate the possibility of producing a GPS track file or placing physical way markers for volunteers conducting transects.
- 7.2.3. In 2015 transects were conducted on an approximately weekly basis, with some variation. In 2016 we will try to schedule more consistent surveys, subject to volunteer availability.
- 7.2.4. It is too early to determine the long term viability of transects at Thickson's Woods, either in terms of the value of data provided or the availability of interested volunteers to conduct surveys. We will aim to conduct a comprehensive transect survey program in 2016, followed by a review of its effectiveness and long-term viability.

7.3. Static monitoring:

- 7.3.1. Following the information gained from transects and other acoustic monitoring in 2015, in particular the presence of *Myotis* species and possible Tri-colored Bat, increased monitoring with a static bat detector would be an ideal expansion of monitoring.
- 7.3.2. A static bat detector would be deployed to automatically monitor and record bat echolocation at a fixed point in the Reserve throughout the season.
- 7.3.3. The primary limitation to using a static detector is the cost of the equipment. At the time of writing we await the results of a grant application to include the cost of a device and data analysis time. If this grant is not successful, other avenues will be explored.

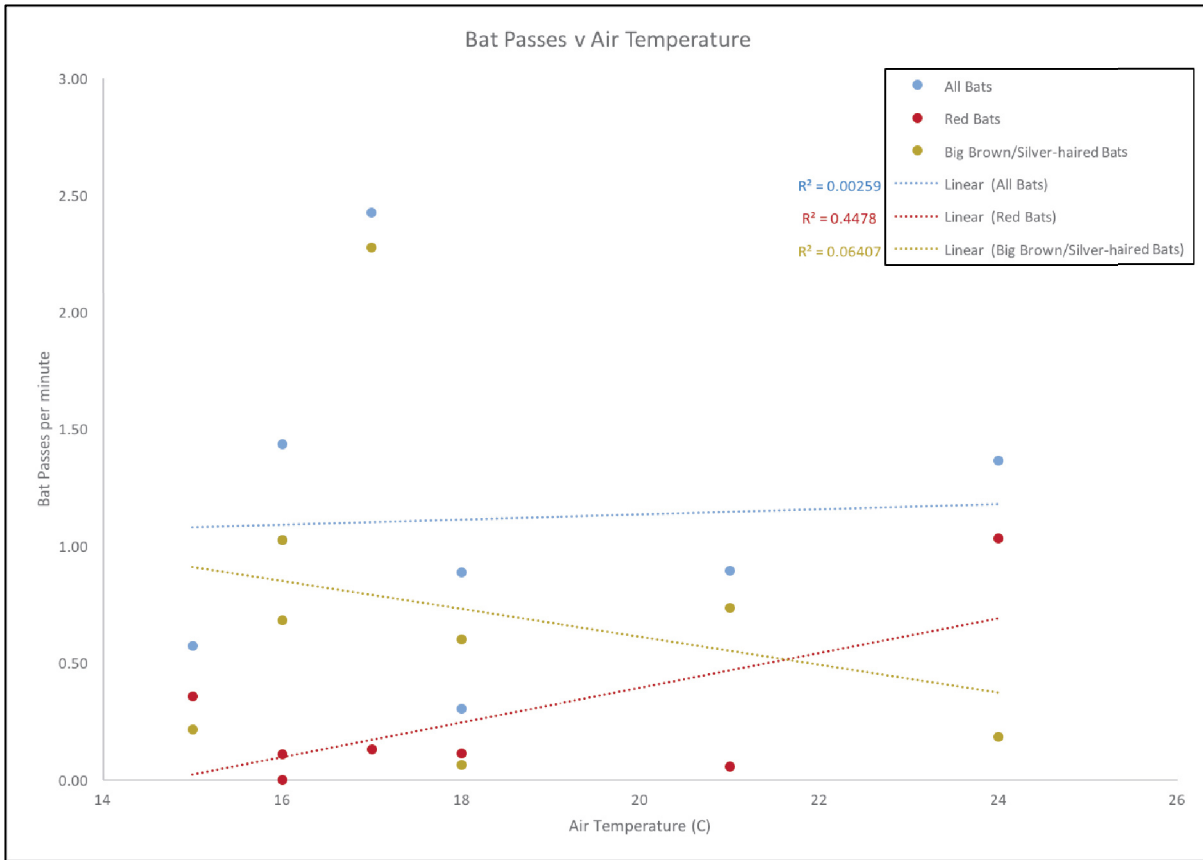
7.4. Capture of bats:

To confirm acoustic species identifications, particularly for the more difficult species, having an individual in the hand is the most reliable option. Unless roosts are known, this is best done by capturing bats in flight, but doing so requires an MNRF permit. A permit application, including Thickson's Woods, is currently underway and this option will be explored further depending on the success of this application.

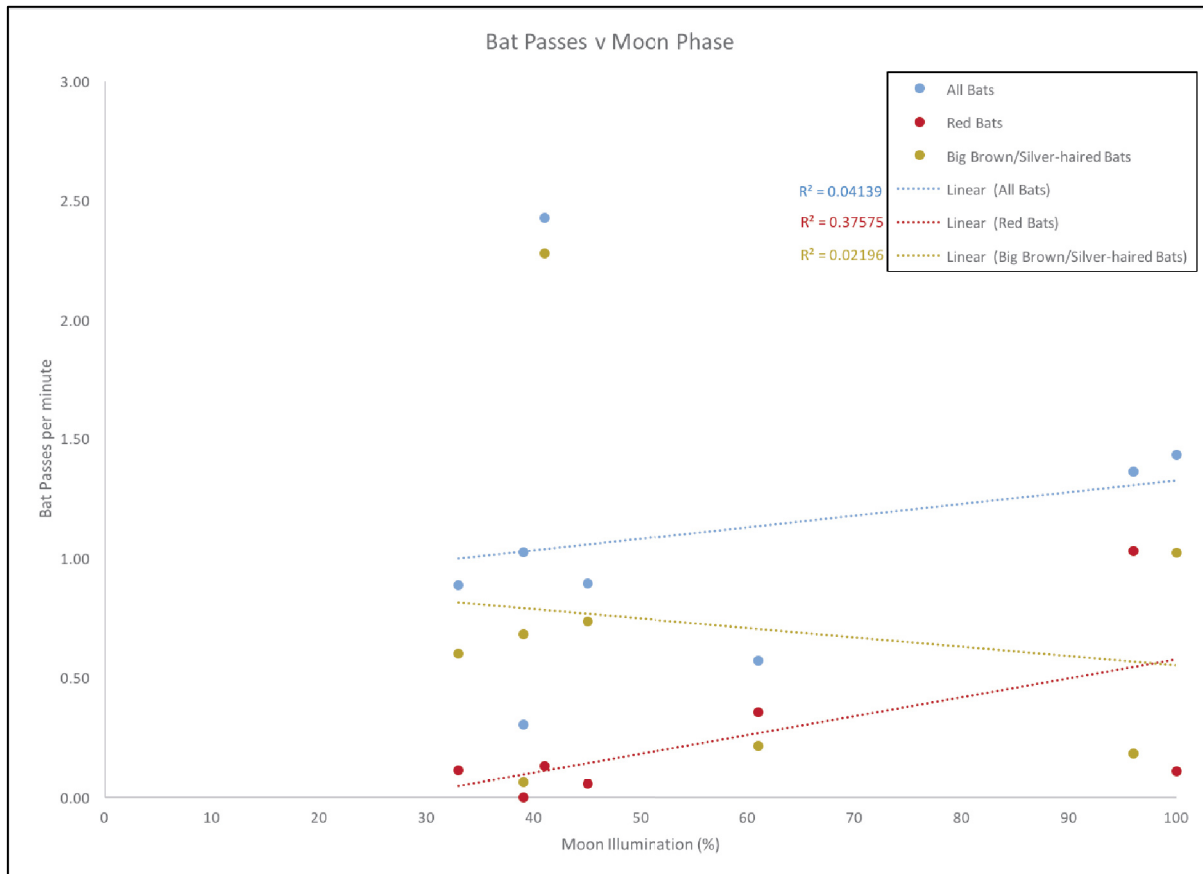
8. Appendix:

8.1. Environmental Correlates

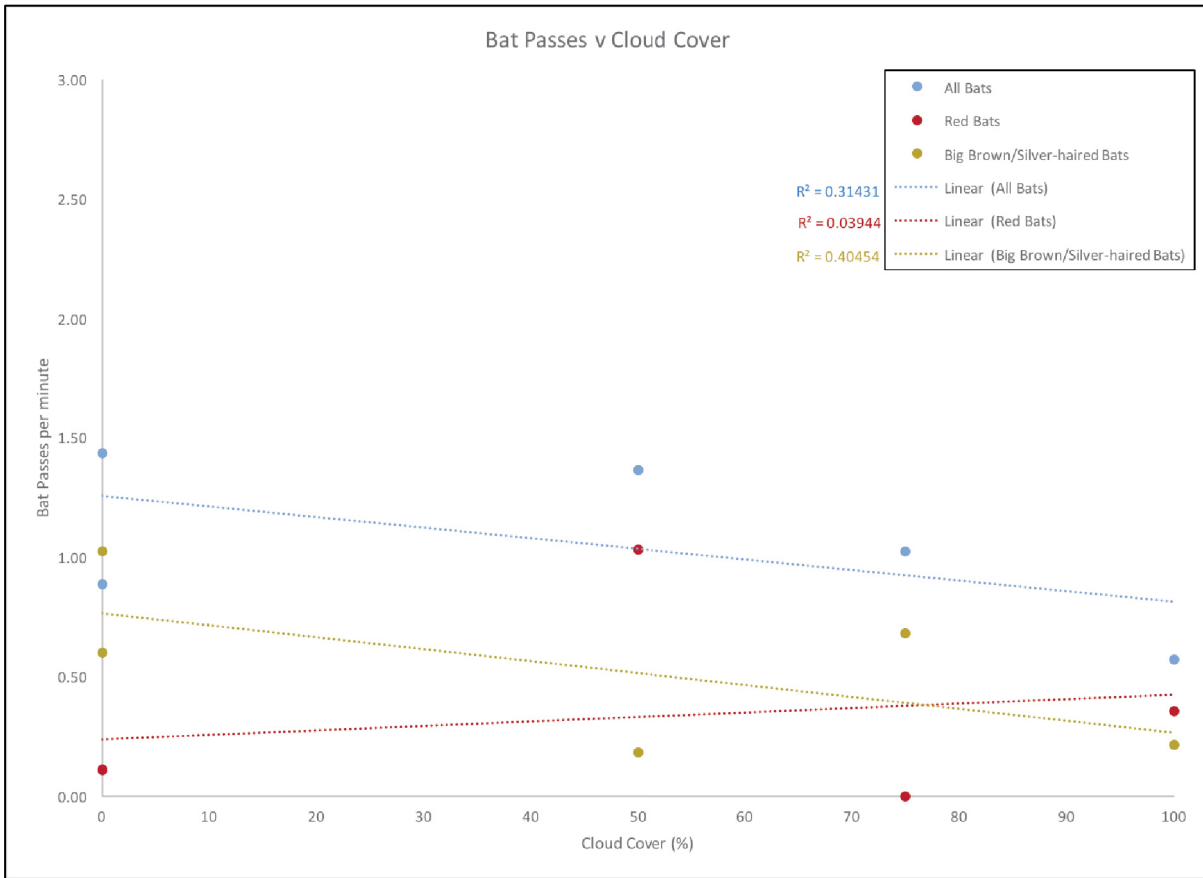
- 8.1.1. A variety of local climatic conditions are known or believed to affect bat activity. We recorded a variety of environmental correlates of potential interest at the times of the surveys. These are summarised in table 1. Our small sample size makes it impossible to draw firm conclusions about the effect of these factors, and we consider this a preliminary investigation to be addressed in more detail, for example with data from a static detector.
- 8.1.2. Air temperature: preliminary results suggest that Red Bats are more active during warmer temperatures. However, this relationship was likely influenced by the high frequency of Red Bat passes during the July 29 survey (Appendix Figure 1).
- 8.1.3. Moon phase: many bat observers believe that lunar illumination affects bat activity, which may be lower during periods of high illumination. Our results are mixed with respect to bat activity and moon illumination, though Red Bat activity during our surveys appeared to be heightened during a full or near-full moon (Appendix Figure 2).
- 8.1.4. Cloud cover: Big Brown and Silver-haired Bat passes were less frequent when cloud cover exceeded 50% (i.e. mostly cloudy or overcast; Appendix Figure 3).



Appendix Figure 1: relationship between bat activity, expressed as average passes per minute, and air temperature



Appendix Figure 2: relationship between bat activity, expressed as average passes per minute, and moon phase



Appendix Figure 3: relationship between bat activity, expressed as average passes per minute, and cloud cover