Welcome to the seventh newsletter for the Canadian Bat Box Project! This past summer was the final field season for this 3-year project, but we are brainstorming research directions based on the results of this study. Even though the project in its present form is ending, I can still add records to our database of when bats return to your bat box this spring as the final publication of results is still at least a year or two away. We expect results from our final batch of guano samples this June, and I will email the results to the submitters and summarize them in this fall's newsletter.

Have you ever heard of Bracken Cave? It is the summer (~March to October) home of more than 15 million Mexican free-tailed bats (*Tadarida brasiliensis*), making it the world's largest bat colony and one of the largest concentrations of mammals on earth. There is now a live cam at Bracken Cave so you can watch the emergence of millions of bats as they spiral out of the cave at dusk for their nightly insect hunt.

If you would like more bat-related news, consider joining the Ontario Bat Network (OBN) email group (ontario_bats+subscribe@googlegroups.com) or Facebook group. The Ontario Bat Network offers a platform for bat enthusiasts to come together, share knowledge, promote opportunities in bat work, and collaborate on initiatives aimed at supporting bat populations in Ontario. The OBN hosts an annual meeting where bat enthusiasts come together to discuss recent advancements in bat research across a variety of fields. You can check out the OBN Youtube Channel to see presentations from previous OBN meetings.

To date we have received 1,521 survey responses from across Canada, including all provinces and almost every territory. Very impressive – thank you to all who submitted! This project and our work in New Brunswick were featured by CBC News last August.

In this Issue:

Impact of Wind Energy on Bats.....2-5
What Actually Happens to an Evicted Bat?.....5-7
Impact of Noise Pollution on Bats.....8-10
Weird Roosts of Bats in Canada.....11-12
Bat Boxes Across Canada.....13-16

For those who have not yet registered your bat box with the program, please do – your information adds a valuable component to this nation-wide project! The surveys will remain open until spring 2024. Please consider contributing an article, pictures, or an article idea to this newsletter by emailing Karen Vanderwolf: *kjvanderw[at]gmail[dot]com*

Thanks to our supporters and partners:

Environment and Climate Change Canada
Environnement et Changement climatique Canada

LIBER ERO FELLOWSHIP PROGRAM

Parks Canada Parcs Canada

Ontario

Funding for this project was provided in part by the Government of Ontario.

Mersey Tobeatic Research Institute

NB Wildlife Trust Fund / Fonds de Fiducie de la Faune du N.-B.

CANADIAN WILDLIFE HEALTH COOPERATIVE

Beaverhill Bird Observatory

ACAP SAINT JOHN

National Capital Commission
Commission de la capitale nationale
Canada

ONTARIO PARKS

NEW BRUNSWICK MUSEUM / MUSÉE DU NOUVEAU-BRUNSWICK

Thanks to James Pagé for editing the newsletter.

The impact of wind energy on bat species in Canada and possible mitigation strategies

By Emily Becker

Emily Becker started as a volunteer with the Bat team at the Canadian Wildlife Federation checking bat boxes around the Ottawa area in late 2022 & was lucky enough to be brought on as a Bat Research Technician in the summer/fall of 2023. During that time, she participated in bat captures & tracking studies & is looking forward to learning more about bats & participating in future research.

Bats in Canada eat a lot of insects, and during the buggy summer months, we want to keep them around as much as possible. Unfortunately, bats face many challenges. Culprits such as White-Nose Syndrome and habitat loss are of great concern, but there is also another that requires our attention, wind turbines.

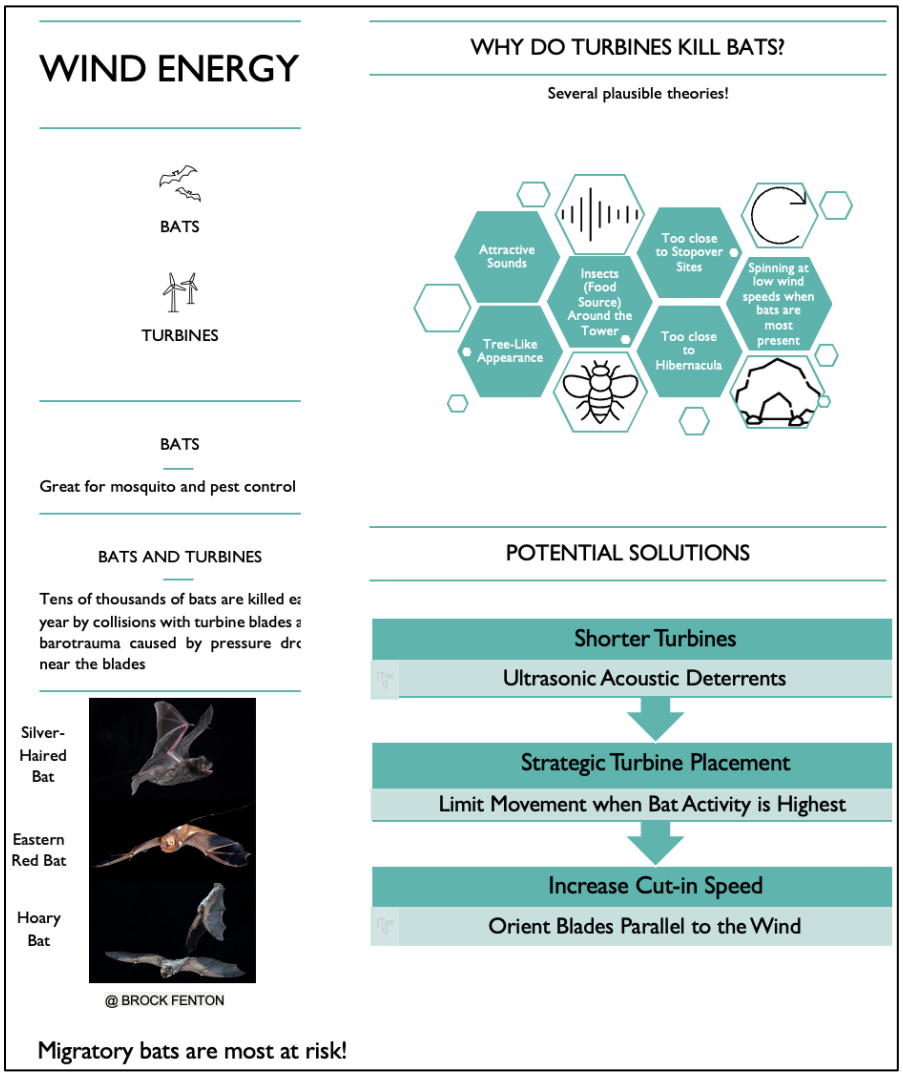
Studies on the link between bat mortality and wind turbines started about 25 years ago. An estimated tens of thousands of bats are killed each year in Canada by collisions, and mortality spikes during the migration period between late summer and early fall. Tree- dwelling bat species that migrate in the fall, such as Hoary bats (*Lasiurus cinereus*), Eastern Red Bats (*Lasiurus borealis*) and Silver-haired Bats (*Lasionycteris noctivagans*) are especially at risk of collisions and turbine-related barotrauma. Barotrauma is caused by sudden drops in pressure around the blades and can severely damage bats' lungs. The three migratory bat species were assessed by experts as endangered species in Canada in fall 2023. The comment period on this decision is open until May 16, 2024.

Hoary bat; Jared Hobbs | Red bat; Chris Godwin-Sheppard | Silver-haired bat; Cori Lausen

There are a few theories for why bats go towards turbines, but no concrete answers. The most plausible explanations are that bats mistake the tower for a tall tree and are unable to avoid the turbine blades once they are close, they may be drawn to the turbines because of a mechanical sound, or there may be high concentrations of insects around the base of the towers that bats are attracted to. Additionally, wind farms may be constructed close to migratory stopover sites, where bats may stop to rest and feed during migration, or hibernation sites, which may explain why large populations of bats are not avoiding the farms and instead, end up within striking distance of turbines. Bats do not fly in high winds and may attempt to fly between turbines during times of slow rotation. This may explain why there are higher mortality rates at lower wind speeds.

Bats are long-lived but most species only have 1 – 2 pups per year. Therefore, it is important to mitigate the impact of wind turbines because bats cannot produce offspring quickly enough to stabilize their numbers. This means that it takes bats longer to recover from population losses. Fortunately, there are some promising strategies to decrease bat mortality:

1. Turbine Movement: Stopping turbines from spinning during times of high bat activity, for example, during migration seasons, would limit collisions and only have a small impact on energy production.
2. Increase cut-in speed: The cut-in speed is the wind speed that causes turbines to start rotating to generate energy and is usually between 3.5 – 4 m/s. Studies suggest bats are more likely to collide with turbines at lower wind speeds, so collisions may decrease by increasing the cut-in speed for when the wind is stronger.
3. Shorter turbines: bats are more likely to collide with taller turbines, and so, considering turbine height during construction could be a way to decrease collisions.
4. Ultrasonic acoustic deterrents (UADs): By emitting certain frequencies that disturb bats, it may be possible to deter them from flying near turbines and potentially limit the effectiveness of bat echolocation such that they cannot hear/interpret the location of insects near the tower, and this may deter them from getting within striking distance of the blades.
5. Strategic Turbine Placement: Avoid known hibernation sites and migratory routes when constructing wind farms to minimize interactions between turbines and large clusters of bats. This may be difficult however, considering not much is known about their migratory pathways.
6. Orient Blades Parallel to the Wind: Depending on how the blades are oriented, it is possible that lower wind speeds can cause



blades to turn before the cut-in speed and this creates a collision hazard for bats. By turning the turbines so that they are parallel to the wind, it is possible to prevent this from happening and ensure that the blades only begin turning at a speed that minimizes the risk to bat species.

By implementing some or all these changes, it is possible to significantly decrease the risk to bats with marginal impacts on energy production and profits. Bat species are crucial for pest control in Canada, but wind power is also an important source of renewable energy. Wind turbines also impact birds. We need to find a way to promote emissions-free energy sources while also limiting negative impacts to wildlife.

If you would like to learn more about bat species in Canada, current research that is being done, and how you can help, check out helpthebats.ca.

What actually happens to an evicted bat?
By James Pagé

James has been with the Canadian Wildlife Federation (CWF) for more than ten years, working on species at risk. He works on various projects at CWF, including turtle recovery work, rare species surveys, endangered bat recovery and community science. Working with the developers at iNaturalist.org, James has also been the lead in the creation and management of iNaturalist Canada.


James radiotracking bats

As many people know, bats will sometimes take up residence in human buildings, be it barns, sheds, and yes even our attics. Out of the 19 species of bat in Canada, only a handful are known to do this. Most commonly these are the Little Brown Myotis (aka Little Brown Bat), the Big Brown Bat, the Yuma Myotis and sometimes the Northern Myotis. These are typically summer roosts, meaning the bats will leave for the winter to hibernate in caves; however, sometimes the big brown bat will stick around and hibernate in a heated building.

Even though bats don't generally pose a problem for the home, when an owner finds out about their guests, the bats are often evicted. Typically, this is done very humanely using a one-way door that lets bats leave but does not give them the ability to get back in. These types of evictions must be done at the proper time of year - early spring before females give birth or very late summer-to-fall, which is after pups are able to fly.

While an eviction of this type isn't thought to directly harm bats, it's not well known what actually happens to them. Are they able to find a new home? Do they stay nearby? Do they use a bat box if one is put up nearby? Do these bats end up surviving at all?

To answer these critical questions, we sought out a colony of Little Brown Myotis; a species known to use buildings as roosts, and one of the bat species hardest hit by White-nose Syndrome, a disease that has caused massive population declines. Over two consecutive years, we caught bats at a cottage site where a planned humane eviction was taking place. We outfitted several bats with small radio transmitters and followed their movements for two weeks straight, starting a few days before the planned eviction to see what they do under normal circumstances. These radio transmitters are small tags (about the size of a watch battery) that weigh less than 5% of the bat's weight and are attached with surgical glue that fall off after two to three weeks.

Little Brown Myotis tagged and ready to go

Radio telemetry is a common way to track all sorts of wildlife. A VHF (very high frequency) antenna, like a small version of the old antennas that would be seen on people's homes, is attached to a receiver that is tuned to pick up the frequency of the individual transmitter. When the antenna is close enough and pointed in the right direction, the clicking of the transmitter (tag) can be heard to pinpoint the location – the closer to the tag, the louder the sound.

Over the course of the next two weeks, the bats led us through forest, over lakes, down ATV trails, and to cottages and the nearby town as we followed their daily movements. We were tracking during the day, meaning the places we located the bats were their roost sites and where they ended their activities the night before. These stayed relatively consistent for many of the bats, returning to the same new site they found after leaving the cottage. And here's what we found about the Little Brown Myotis we were able to track:

1. These bats move around in terms of where they sleep during the day (called roost switching), even without being evicted from their roost.
2. How far they moved (the distance between roosts) increased after they were evicted. Meaning they were travelling farther to find a place to stay. But it varied quite a bit from one individual to another, with most staying within a few hundred metres but some going up to two km and one over 5km away. We're pretty sure these new spots were already known to the bats, and they just headed there after they were disturbed by the eviction.
3. Little Brown Myotis tended to use human structures (buildings and bat boxes) much more than natural structures (i.e. trees), both before and after the eviction. We found the same to be true at another site where an eviction wasn't happening, where bats were moving around but exclusively using buildings.
4. These bats are persistent, finding ways to foil the eviction and get back in via new entries. It's important to mention that the bats were behind the exterior walls and open soffits, so

sealing up every hole was impossible without replacing the entire siding and adding soffits, which wasn't done.

5. Bat boxes started getting used after the eviction. Within seven days of the eviction, newly installed bat boxes were being used by a handful of bats. And they continued to be used for a second and third year.

These are things we found for the bats we were able to track. But there were a few bats in both years we put tags on and were never able to find again. This is common with bat tracking, whether an eviction happens or not. We can't say what the impact was on these bats, but we suspect they simply flew to areas we weren't able to find or went beyond our 10 km search radius. Our equipment can only detect tags up to 500 metres away and there are many areas that are inaccessible.

Maybe the most important aspect of this initiative was that, after learning more about the bats and where they were roosting, the owner wasn't so concerned with them being there. In fact, he didn't redo the eviction and allowed the bats to stay for those that were able to get back in. And the bat boxes on site have become part of the Canadian Bat Box Project, contributing valuable data on occupied boxes!

Eviction doesn't always have to be the answer. Bats can make pretty good neighbours – they're quiet, don't chew through wires or walls the way mice do and they help control the mosquito population for us. An ideal situation for the bats is, like our cottage owner, to leave them there if they're not causing a problem. An interior chamber can even be built to keep the house guests to a certain section of the attic, along with a drop sheet to catch any guano (bat droppings) that might build up. And guano makes for a great fertilizer.

To answer the question of what happens to bats after being evicted? If done at the right time of year, bats seem to be able to cope and move to a new roost or make use of bat boxes. But if this new roost is another building and subsequent eviction, as some point down the line they'll run out of places to go.

Little Brown Myotis using a newly installed bat box after eviction

Music to our ears, stress on theirs: the impact of noise pollution on echolocating bats by Sepidar Golestaneh

Sepidar completed her BSc at the University of Ottawa in Biology, with a focus on animal behaviour, ecology, and evolution. She is currently an MSc student at the University of Waterloo studying population trends and pre-hibernation behaviours of hibernating bats in eastern Canada.

While the term "blind as a bat" is a myth, echolocation compliments vision, and helps bats navigate through their environments. Think of when you watch a movie and you put on subtitles, or when you're driving to an address you've never been to before and you turn down the radio to help you "see" better. It's a similar concept with sound with echolocating bats! Sight and sound are complimentary. So, what happens when there's extra noise? We might be used to it: the sound of cars whirring by in the later hours of the night, a summer music festival outdoors... Well, noise pollution not only has negative impacts on human health, but can also alter the behaviour, physiology, and overall well-being of wildlife.

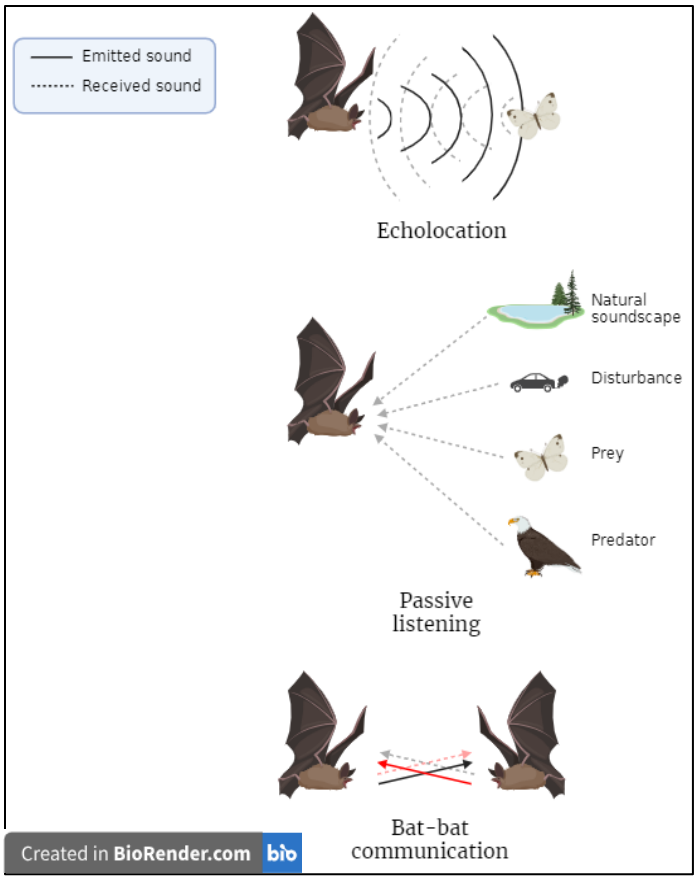
Bats are exceptional animals in terms of their hearing and auditory capabilities. They are sensitive to a diversity of sound frequencies and are among the loudest animals in the world! Bats can make sounds up to 137 dB, equivalent to a jet plane taking off. For context, humans exposed to sustained sound at 85 dB or higher can experience permanent hearing loss. We just don't hear bats when they make sounds this loud because many bats communicate in ultrasonic frequencies (>20kHz; that is, frequencies higher than humans can hear!). While bats are sensitive to a diversity of frequencies, they are most attuned to those of their own species as this helps them identify individuals of their own type and communicate more effectively with them. Moreover, many bats eavesdrop on other bats that have different call frequencies to gain information on things like nearby resources. Like most animals, including ourselves, bats will also use general sounds around them to paint a picture of what is going on in their surrounding environment, like the presence of a predator, disturbances like highway traffic, etc.

Despite how impressive bat hearing is, bats are not exempt from negative impacts of noise pollution. One way that noise pollution impacts bats is by influencing the efficiency at which they navigate and "see" the world. Sound travels in waves in the environment. When these soundwaves hit something, they reflect off this surface and result in an echo. Echolocation refers to the process where an animal will actively send out sound signals and use these returning soundwaves to gather highly detailed information about their surrounding environment. Echolocating animals can learn the position and distance of an object depending on the direction of the returning soundwaves and how long it took these echoes to reach the animal. Echolocation

can provide information as detailed as the shape and textures of objects. Echolocating bats use echolocation to navigate through their environment and find things to eat!

When noise pollution occurs, there are many more soundwaves in the environment. This makes it much harder for echolocating bats to filter through all the noise and pick out the information they need to accomplish a certain task, like navigation or foraging. The same goes for bats that rely on passive listening to orient themselves: more noise muddles the sounds created by prey or predator and makes it harder for bats to find prey or avoid predators. Some studies show that with lots of noise pollution, bats experience much greater difficulty catching prey or drinking water because the returning soundwaves they use to orient themselves become distorted and lost with the other noise. Not only does noise pollution affect how efficient bats are at foraging and finding food, but it can also impact how well they can communicate with each other. To try and mitigate this, bats often end up vocalizing more intensely and more frequently and use up a lot more of their energy. This extra stress and lower success at finding food highlights how noise pollution is quite tough on bats' bodies.

While bats are nocturnal and most active at night, they are still present in the daytime ("out of sight, out of mind" as the saying goes!). Bats roost and rest the day away until sunset. We don't fully understand the impact of daytime noise pollution on roosting bats yet, but exposure to chronic noise pollution has the potential to cause physiological stress on bats' bodies, like lowering their immune response, and cause noise induced hearing loss. Depending on the time of year, bats may be more susceptible to the consequences of noise pollution. In the summer months when adult females roost together, exposure to chronic noise increases the likelihood of mothers abandoning their pups and consequently reduces pup survival. During the winter hibernation period, noise can increase the frequency at which bats will experience metabolism spikes (what we call "arousal periods") and increases the rate at which bats use up their stored energy (fat reserves). The faster bats go through their fat reserves,

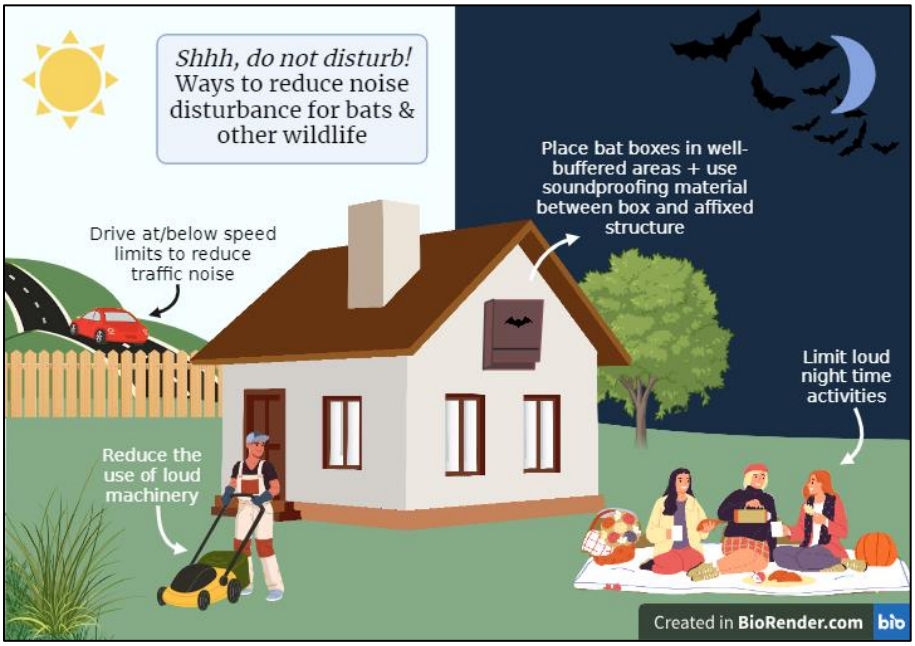


the less likely they are to survive the winter since they may use up all of their available energy before spring.

Noise pollution might seem like a pretty big issue for a single person to tackle, but there are ways we can help! Unlike many other types of pollution, noise pollution doesn't persist in the environment, so when the stimulus for that noise is gone, we are closer to re-establishing the natural soundscape. This makes mitigating the effects of noise pollution much easier. While most of us might be sleeping through the night, for all you night owls out there, try and limit noise levels for outdoor gatherings. The bats and your next-door neighbours will greatly appreciate it! If you drive a vehicle, go at the posted speed limit, since driving at higher speeds makes considerably more noise. For other large machinery and motorised tools, try and limit their use near bat roosts.

Regarding bat boxes and noise, try placing bat boxes in quiet areas or areas with ample sound buffering between bat roosts and sources of noise. Think of places with trees, vegetation, and other flora, or other sound barriers like fences, walls, or embankments. You can also install soundproofing material (e.g., acoustic foam boards, insulation panels, etc.) between bat roosts and human-occupied spaces to minimize disturbances to both bats and humans. This approach not only prioritizes the well-being of bats but also mitigates the potential for human-wildlife conflicts stemming from noise disruptions.

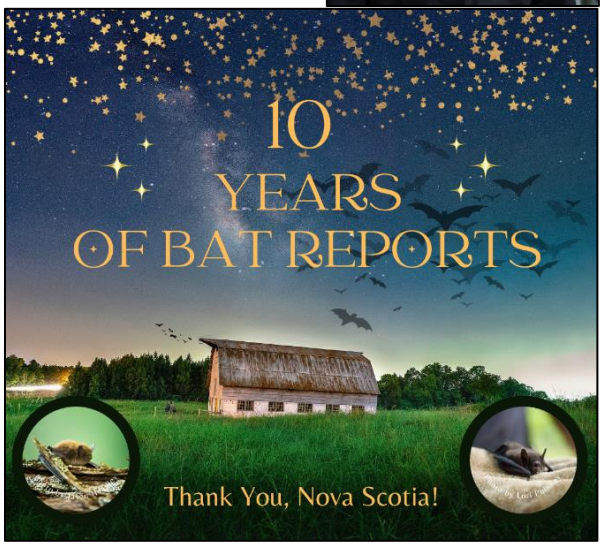
While bats might not initially come to mind when pondering relatable animals, it's worth taking a moment to consider their perspective. Next time you stroll outside or prepare for bed, think about the serenity you experience amidst natural sounds. Just as you cherish these moments, bats likely value their own auditory landscape. Their perception of noise, vital for navigation and communication, parallels our own appreciation for tranquility. This realization fosters empathy and a deeper connection to the intricate rhythms of the natural world.



<u>Weird roosts of bats in Canada</u> by Lori Phinney

Lori Phinney is the Species at Risk Program Coordinator with the Mersey Tobeatic Research Institute (MTRI), based in Nova Scotia. MTRI works to conserve biodiversity through research, collaboration, and public education. Lori coordinates several projects on at-risk bats, snakes, and turtles.

Public bat reports are more important than ever. Since the invasion of white-nose syndrome (WNS) and increase in wind energy development, bats are facing an increasing number of threats in Canada. Through public bat reports, we can use **both community science and conservation** to help support bat research, monitoring, and education. The collection of public bat reports began in Nova Scotia in 2013, when bat populations nearly disappeared as WNS invaded. Since then, we have received **nearly 6,000 public reports to date as of 2023 – a total of 10 years of data**!



Across the years, we learned where people see bats in Nova Scotia. For example, **165 occupied bat boxes were reported** in the last decade, and some even contributed to the Canadian Bat Box Project! We identified some previously unknown sites used by bats to breed, as well as which areas of the province have high numbers of reports, such as Kings County.

Alongside these observations, we noticed a surprising number of unusual sightings. The public occasionally report bats found using **tarps, hot tub covers, fences,**

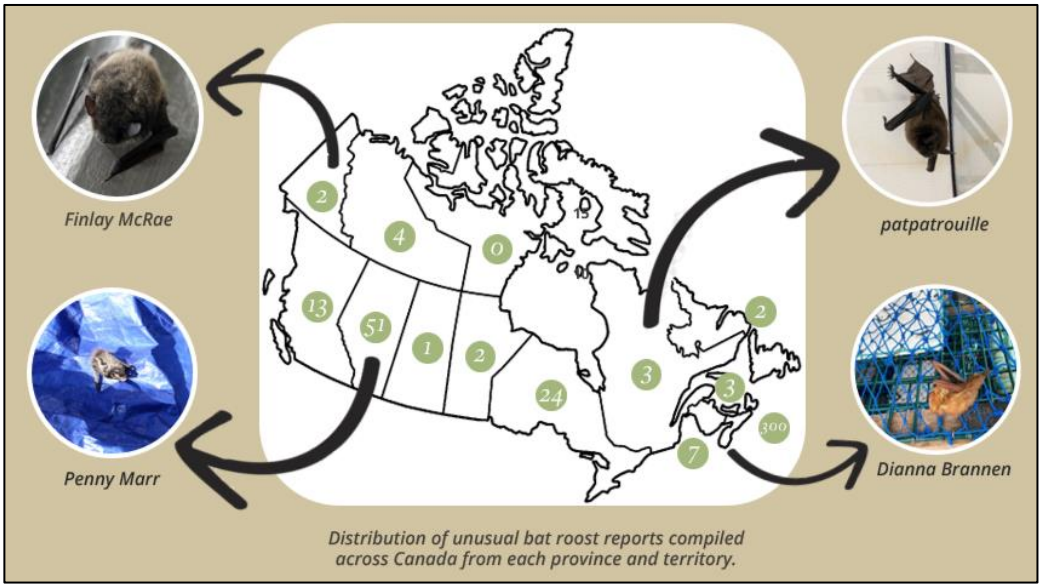
Reports of bats in Canada using unusual roosts including pool, patio umbrella, plant pot, and fence. Photos from Shy817, Emily Gorda, Atilla Fust, Derek Hale, and chris1976.

plant pots, and more. The most frequently reported unusual roost has been **patio umbrellas,** with **nearly 200 sightings in Nova Scotia**. Once we realized this, we soon connected with other Canadian bat biologists and learned this was also the case in other provinces and territories. Consequently, we initiated a project to document "weird roosts of Canadian bats."

Do you have an observation of an unusual bat roost?

Please contact us!
Lori.Phinney@merseytobeatic.ca

Have you seen a bat in a weird roost? We are still looking for more reports of bats in atypical roosts. To date, we have **approximately 400 weird roost reports across Canada**. Commonly known bat roosts include trees, buildings, caves, mines, bat boxes, bridges, and rock crevices. Anything beyond these we have deemed "non-traditional roost types" and want to hear about. If you have seen this before, please reach out to lori.phinney@merseytobeatic.ca. We are collecting reports prior to 2024 including details of when and where you saw bats, plus photos. We do not need specific location details to maintain your privacy, a general location works in place of exact details such as county or town, rather than your street address. Thank you to everyone who submitted a sighting!



Distribution of unusual bat roost reports compiled across Canada from each province and territory.

Bat Boxes Across Canada: pictures with the caption in *italics* are occupied by bats

Lori Phinney, Nova Scotia

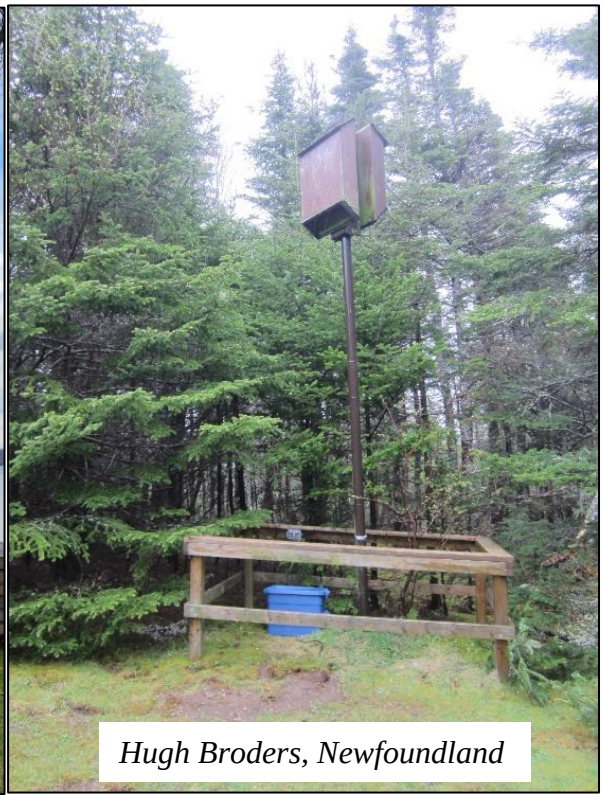
New Brunswick

Mark Ott, Ontario

Tessa McBurney, Prince Edward Island

Ontario

Ontario



Hugh Broders, Newfoundland

J. Thomson, Alberta

Ontario

Yukon

Staffan Lindgren, British Columbia

British Columbia

Ontario

Jim Leslie, Alberta