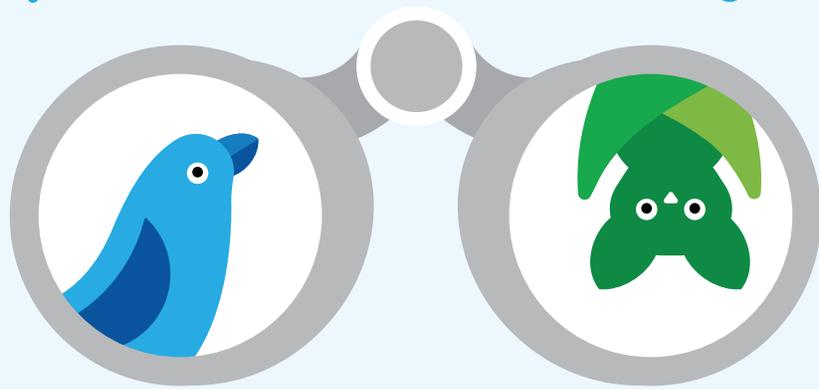


Find Your 4-H Wings



Activity
Book





Acknowledgements

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Find Your 4-H Wings



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Introduction

Dear 4-H Leader(s),

Thank you for joining us for year three of Find Your 4-H Wings! This three-year campaign, generously supported by TransCanada, has encouraged more than 200 4-H clubs like yours across Canada to get active outdoors and to learn about our winged friends.

In 2017, we're shifting our focus from birds to bats to learn about the important roles they play in our ecosystems. Did you know that bats are particularly effective for pest control? In this activity book we'll identify activities to invite them to become our neighbours!

This year's campaign objectives include:

- Learning about bats native to Canada.
- Identifying ways you can support bats and natural bat habitats.
- Sharing lessons with your community and helping people to understand the importance of bats and the role they play within ecosystems.

In addition to this activity book, your Find Your 4-H Wings bat house kit includes the following tools:

- A PowerPoint presentation that you can give to your members before heading outdoors.
- A Bat Conservation Organization approved bat house for your group to install and begin watching!

We hope you and your club enjoy this opportunity to Find Your 4-H Wings - when it comes to learning about our winged friends, the sky is the limit...literally!



Facts About Bats

Why Bats?

Bats are the only mammal capable of true flight.

- There are nearly 1,000 bat species found worldwide; this means that bats make up a quarter of all mammal species on earth.
- Bats can live for a very long time, most for well over 20 years. Such a long life is unusual for such a small mammal.
- Bats are **nocturnal**.
- Most bats use echolocation to hunt.

Okay, cool but they are still kind of creepy.

- Creepy!? Canadian bats play a huge role in natural pest control! They help keep the creepy crawlers at bay as they primarily feed on insects.
- In fact, a bat can eat from 50 to 100 per cent of their body weight every day!
- Still creeped out? There are only three kinds of bats who feed on blood and none reside in North America.

TALK ABOUT IT!

Why do bats have such a bad reputation? Why do so many people find them creepy?

Mmm. I don't like bugs. So that's good I guess.

- Bats play a huge role in pest management, and we're not just talking about pesky mosquitos. A small colony of bats can eat more than 600 million bugs a year and they eat everything from beetles to leafhoppers to moths. They also help protect crops and decrease insecticide use.
- Bats eating bugs not only means there are less of them but it means fewer of them are laying eggs that become damage-causing larvae.
- In addition to managing pests in an area, some insects are able to hear the calls of a bat, and will avoid inhabiting nearby!

MEGA-Bats & MICRO-Bats

Mega-bats, also known as flying foxes, are only found in the tropics. There are about 150 different types of mega-bats and are characterized by their larger size, dog-like faces and bigger wing span. Very few mega-bats use echolocation. They primarily eat fruit, flowers, nectar and pollen and can travel long distances for food.

In this activity book, we will focus on micro-bats as they are more common in Canada. With over 1,000 different species, micro-bats are significantly more diverse creatures. All micro-bats use a type of tracking and locating method, known as echolocation, which we'll talk about later in the book. While most micro-bats eat insects, some will eat fruit and several other types of prey.



Facts About Bats

Bats in Canada

Bats inhabit every region in Canada, except for the tundra. Generally they keep south of the end of the tree line. In Canada, we have 18 or 19 different types of bats. They are all **insectivores**.

	Little Brown Bat	Big Brown Bat	Hoary Bat	Red Bat
Image				
Where do they live?	Most widely distributed bat in Canada. Most prevalent in Eastern Canada	Southern parts of Quebec, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia	Alberta, Ontario, New Brunswick, Nova Scotia, and Southern British Columbia, Manitoba, Saskatchewan and Quebec	Southern Canada from Alberta to Nova Scotia
Average Size	Wingspan - 22-27 cm Weight 5-14 grams	Wing span - 28-33 cm Weight - 14-16 grams	Wingspan - 40cm Weight - 26g	Wingspan Weight 10-14 g
Normal Diet	Moths, wasps, beetles, gnats, mosquitoes, midges, mayflies and more	Moths, beetles and wasps	Large insects such as wasps, dragonflies, beetles and moths	Moths, beetles and flies
Migrate or Hibernate	Both! Many bats in Canada will hibernate a few hundred kilometres to hibernation sites	Hibernate	Migratory - travel from Canada to southern states in the United States or to Bermuda	Migratory
Natural Roosts	Rock crevices, cliffs, mines and buildings	Rock crevices, cliffs, mines and buildings	Roosts alone on trees, prefers coniferous forests	Trees and shrubs roosts alone
Winter Roosts	Caves and old mines	Buildings and mines	Migratory	Migratory
Bat House User	Yes	Yes	Unknown	Unknown



Facts About Bats

Bat Reproduction

Female bats will have one or two (rarely more) pups (baby bats) each year.

- Female bats are largely philopatric, meaning they return to the place where they were born to give birth. In contrast, male bats disperse from their original environment.
- Bats that hibernate will often mate in the fall. Females will then store sperm in their uterus over the winter, ovulating in the spring when it warms up and the bat awakes from hibernation. This phenomenon is known as delayed- fertilization.
- Gestation is about 60 days.
- Baby bats or, “pups” weigh nearly a quarter of their mothers’ mass, and grow quickly.
- Young bats will consume their mother’s milk until they are three to four weeks old, and are able to fly, usually three to four weeks.

Bat Echolocation

Despite the common saying, “blind as a bat”, bats generally have great vision. Nonetheless, because they are nocturnal and hunt at night when it’s dark, bats rely on echolocation more than sight.

Echolocation is the use of high-frequency sounds to navigate and communicate. When the sounds that bats send out bounce off of objects, it returns an echo to a bat, which helps them identify objects in their way. They are so finely skilled, that they can identify items as fine as a human hair!

LOOK IT UP!

What other animals use echolocation?

The sounds that they make are emitted through their mouth and nose, and then the echoes hit the objects and return to their ears.

Most Canadian bats produce echolocation calls well above the threshold of human hearing; however some insects can hear the calls and may try and evade getting caught. In fact, some moths will produce a clicking sound to mix the bats up.

To humans, bats emit sounds very quickly but the actual pulse rate varies. For example, the Little Brown Bat emits an echolocation pulse (or call) about 20 times a second, whereas the Hoary Bat produces about four pulses a second.

THINK ABOUT IT!

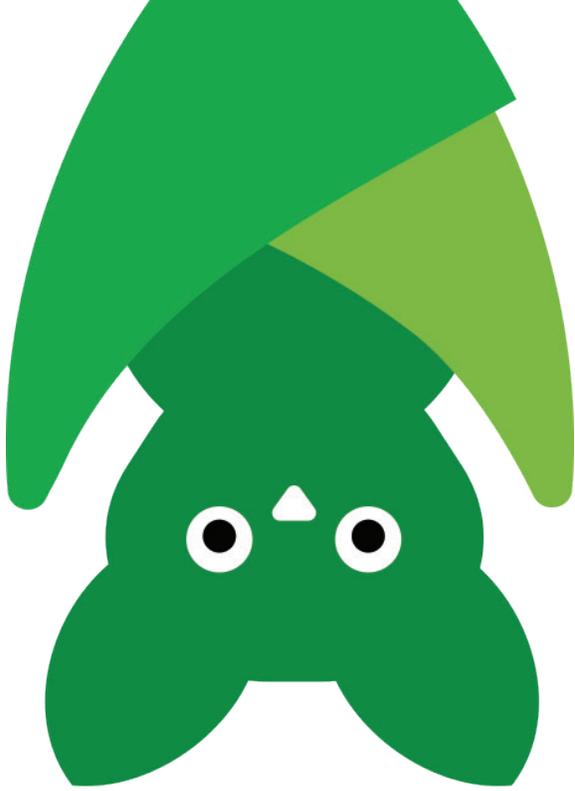
Scientists learn a lot from the natural world. What might be something that engineers invented, as inspired by bats and other species who use echolocation?

Hint: A technology that uses sound waves to “see” underwater or in the dark.

SONAR!

SONAR is a great example of how scientists and engineers use the natural world to inform their work!

Facts About Bats



Bats' Winter Plans

Most bats in Canada hibernate, however there are several species like the hoary bat or the red bat that will migrate south

When bats go into hibernation, their body temperature will lower, their heart rate will slow and their metabolism drops dramatically. While they still hibernate, some types of bats like the big and the little brown bat are still active on warmer days in the winter.

Bats that hibernate and live in buildings will often migrate in the autumn to hibernate in a cave or a mine. Spaces where many bats gather together for hibernation are known as hibernacula. Bats that hibernate are at great risk of being found by predators, not only because they will first be found very still and inactive, but also because when awoken, they use a lot of energy.

Confusingly, the silver-haired bat is known as a 'migratory-hibernator' and migrates south only to hibernate.

Other Bat Facts

When active and hunting, a small bat's heart can beat up to 1,100 times a minute. Once they rest, however, the same small bat's heart rate can fall to 200 beats a minute or to just five beats per minute when sleeping!





Bat Habitats

Roosts

Bats spend their non-active hunting time in protected places known as roosts. Depending on the bat, they may hide in foliage, crevices (like rocks, trees and buildings) or hollows. Bats often choose different roosts based on day, night and hibernation location. Day roosts for example are safe locations for bats to sleep and night roosts are warm areas used to rest or digest before they go foraging again.

Bats usually hang from their hind claws, allowing them to be immediately ready for flight. In fact they have a lock-like feature on their hind foot that allows them to comfortably hang on all of their weight without using any muscles and energy.

What they'll avoid

Bats are very sensitive to disturbances. Special efforts should be made for hibernating bats and mothers about to birth as they are particularly sensitive to noise and movements.

Efforts to study bats can lead to declines in their numbers. As harder to observe mammals, there is less known about bats in Canada than other animals. In fact, scientists are uncertain about where 50 per cent of the world's bat population spends their day time!

Bat Houses

If your club participated in Find Your 4-H Wings last year, you probably experienced building your own birdhouse. Curious why there's no bat house to build this year?

Bats are finicky and they won't roost just anywhere. Learn more about the different desirable characteristics our choosey tenants prefer

- Bats are particular about the sizes of their houses and prefer tight spaces. The best bat houses have multiple chambers, which allows for a variety of temperatures.
- Bats need walls with a surface to cling to. Some commercial bat boxes will staple screens inside, though without supporting evidence, researchers are uncertain if bats like these commercial solutions.
- Bats need a well-sealed box. One that is nailed together without seams will warp and separate under the elements, allowing unwanted ventilation.
- Bats like habitats with an open bottom design. Once upon a time, bat houses were more box-like, and were closed at the bottom. With research, they've evolved to be open bottomed, to ensure they are the sole users of the boxes.
- Bats need durable homes that can withstand weather and other harsh elements. The most successful houses have roofs with shingles and are painted to protect the wood.



Bat Habitats

Bat Houses

Consider the spaces that bats typically like to roost. Bat houses should mimic the small spaces in which they hide, like rock crevices, tree hollows and between bark and tree trunks. That's why the spaces inside are tight and small.

The most successful bat houses keep heat in and are caulked and painted to keep air and water out. They should be a colour that will benefit from some solar heating – lighter in hotter temperatures and darker coloured in cooler climates. Bat houses typically use the rough side of wood on the inside. Can your members identify why?

Most bats in Canada prefer to be near fresh water, like streams, rivers or lakes. They should be installed in a location where they are not vulnerable to predators.

DO IT!

Have your group mount a bat house – either the one you got from 4-H, one you built – or both! Find tips and tricks in the activity section!

How to Identify Bat Habitats

Once bats have moved in, they can be tolerant of your observations, so long as you do it from a distance. Avoid touching the houses and don't use bright lights for more than 10 seconds at a time.

Stand underneath a bat house, shine a flashlight up; see if you can see and count the bats. If the bat house is up quite high, someone can hold the flashlight and another can look using binoculars.

Even though Find Your 4-H Wings has provided your club with a top-of-the-line bat house designed by the Organization for Bat Conservation, you might need to conduct your own experiments over a few months to figure out the perfect location for the bat house. If you can construct a second box, it is recommended to experiment with some of the following variables or elements, to see what set-up appears to be best utilized by bats in your ecosystem:

- Colour of the bat house – light versus dark.
- Varied amounts of sun exposure.
- Height from the ground.
- Amount of overhang from roofs on buildings.

DO IT!

As we learn more about bat habits our understanding of the species and their needs and preferences improve. Once you've installed your bat house, register it and keep an eye on it!

It's hard to know how many bats we're losing in Canada because it's hard to know how many bats there actually are in Canada. That's where YOU can come in. Find details about citizen science and bat watching project in the Activity Section!



Threats to Bats

White-nose Syndrome

Now that you know that bats are pretty special, both in how they operate AND their value to local ecosystems, you need to know that bats are endangered.

White-nose Syndrome (WNS) is wiping out bat colonies across North America. The syndrome is a fungus that grows on the noses and wings of certain bats; hence the name, White-nosed Syndrome. WNS spreads rapidly among bats that traditionally hibernate in caves and mines together. The disease is believed to disrupt the hibernation of the bats, causing them to use too much energy in the cold of winter. Instead of sleeping, they awake, use energy and subsequently die of dehydration and/or starvation before spring.

The WNS fungus was brought to North America from Europe in the mid 2000s. While bats in Europe aren't terribly affected by WNS, North American bats have been devastatingly affected by the disease. In fact, it is believed that WNS has killed nearly six million bats within eight years.

What is being done? Scientists around the world are working together to better understand the disease. Many provincial governments, academic institutions and other organizations are working together to better understand how damaging WNS has been to bat populations and identify ways to rid caves of the disease.

There are three ways you can help tackle the threat of WNS:

1. Avoid disrupting bat hibernation, which means staying out of caves and mines where they may be sleeping in the winter. Human presence can wake them early and help spread the fungus.
2. Be on the watch for peculiar bat behaviour – or dead bats – in the winter time. If you see a bat struggling, report the sighting to your provincial natural resource department.
3. Help spread the word about the importance of bats and the threat of White-nose Syndrome.

LOOK IT UP!

If White-nosed Syndrome affects bats during hibernation, look up whether European bats hibernate.

TALK ABOUT IT!

Can you think of other species who, when newly introduced, were greatly affected by strains of diseases brought to them from another part of the world?



Activities

ACTIVITY: Visit a Naturalist

There are many people who have dedicated their lives to conservation. You can learn a lot from these people and they are often very happy to share their knowledge with you.

Identify a naturalist in your community. Some places to look include:

- Provincial park staff
- Parks Canada staff
- Local watershed organizations
- Nature Conservancy of Canada Website (“Where We Work”)
- College and university conservation programs
- Local science teachers

You never know who might be a bat enthusiast until you ask!

Once you’ve identified someone, invite them to meet with your club to explain what they do, where they work and what they know about bats.

The expert may want to come to your club house to give a presentation, or may want to take you out to check out a habitat in your community.

Discussion:

- What type of activities do naturalists enjoy doing?
- Did you learn a lot? What was the coolest thing you learned from the naturalist?



Activities

ACTIVITY: Gleaning and Hawking

Bats hunt in two ways. Hawking is when they catch insects in mid-air. Gleaning is when they skim the surface of things, like water, the ground or foliage for their prey. Bats also drink water in a gleaning type manner as they skim the surface of water.

Have members try both hawking and gleaning for their snack.

Hawking Materials:

- Donuts
- String
- Food preparation gloves
- Someplace to dangle string and donut from, like a bar, clothesline or doorway.

Instructions:

Tie small donuts on a string and hang it a head level for 4-H members. Without using their hands, have 4-H youth run towards the donuts, trying to get a bite and eat some of it each time. After trying to get bites while moving, allow them to hover by their donut to eat it.

Gleaning Materials:

- Cheerios, grapes, smarties or similar small treats
- Clean surface
- Clean toy sand shovel

Instructions:

Sprinkle a handful of food treats onto a clean surface like a table or desk. Have members walk with their shovel on the surface of the table, trying to collect cheerios as they move quickly by. Have them imagine lowering to collect food and then raising into the air again.

Discuss:

- Was hawking and gleaning your food and drink difficult? Why?
- What parts of a bat's anatomy allow them to be well-suited to eating in these ways?



Activities

ACTIVITY: Going Batty

Bat anatomy is unique! To better understand bat movements and their abilities, have members dress as bats!

Materials:

- Bath towel
- 2 small sandwich bags

Instructions:

- The bath towel and two small sandwich bags simulates both the span and transparency of a bat's wings.
- Bat wings do not have feathers; rather they are made of thin, tough and semi-translucent skin. Ask members if they know what translucent means.
- Have members put their hands into the sandwich bags and poke their thumbs through the bags. Bats use their thumbs, which stick out from their wings, to grab onto walls and trees.
- Then have members drape the towels over their shoulders, holding the edges to create wings. Just like bats, all of the members probably look a little bit different, with different towel patterns.
- In order to fly, a bat moves its wings in the same way a person would move his or her arms to swim the butterfly stroke – big circular motions. Look at a YouTube video of a butterfly stroke online. Have students practice this maneuver by flying around the room.
- Finally, when certain bats sleep, they wrap their wings around themselves and hang upside down. Have members wrap their arms and towels close to their bodies and pretend to sleep – but maybe encourage them to stay upright! (Note: Flying Foxes sleep this way; Canadian bats do not).

Discuss:

- Does a bat's anatomy explain any of their unique behavioural traits?
- What do you think the coolest thing about bats is?

Adapted from: <http://www.scholastic.com/teachers/lesson-plan/bat-cave-7-science-activities>



Activities

ACTIVITY: For the Love of Bats!

Bats have an image problem. Some people think they are scary and aggressive creatures while others think they are dirty and disease carrying animals!

As a group, explore the benefits of bats and then create a campaign to educate other people about the benefits of bats! Create posters or buttons or social media pages, and share them in your community. Discuss why bats are important and why their habitats should be protected and their species conserved.

Help dispel myths about bats! Present to other members in your club or peers at school about the importance of bats in your community and how everyone can be involved in bat conservation!

Materials:

- Pen, paper and creativity!

Discussion

- What would you like people to better understand about bats?
- What myths about bats have you learned about? What would you like to share with others?
- What is the best way to share the importance of bats with others in your community?



Activities

ACTIVITY: Echo! Location!

Echolocation is the search method that bats use to identify their tiny insect prey in the dark night.

When a bat is flying, it makes a series of high-pitched squeaks that humans can't hear. The sounds hit an object and bounce back to the bat, like an echo. The bat is able to tell the size and distance of the object just from the echo. This allows the bat to lock in on its prey, swoop down and catch it.

Materials:

- Blindfold

Instructions

- Choose one member to be the 'bat' and blindfold him or her. Then, identify another member to be the bat's 'prey.' Arrange all members, including the 'prey,' in a circle with the 'bat' in the centre.
- The 'bat' should call out "Echo!" from the center of the circle. The prey should respond "Location."
- Similar to the game, "Marco! Polo!" the 'bat' will continue to call out "Echo", moving slowly toward the location of the 'prey,' as the 'prey' responds.
- Once the 'bat' has found the 'prey,' he or she stops and takes off the blindfold. Allow other members to take turns at being the 'bat' or the 'prey.'

Discussion:

- Was it easy using just your ears to locate your 'prey'?
- The blindfold may reinforce the myth that bats are blind. Bats can see. Why do you think they primarily use their ears to track their food instead of their eyes?
- What do you think prey does when they hear a bat?



Activities

ACTIVITY: Big Ball Echolocation

Another echolocation activity!

Materials:

- Beach ball(s)
- Blindfolds
- Open space, about 10 feet to the wall

Instructions:

- Blindfold a member as the bat. Give them the beach ball.
- Stand the 'bat' about 10 feet away from the wall and ask them to throw the ball at the wall.
- Have someone grab the ball and bring it back to the bat.
- If the 'bat' thinks the wall is more than a step away, they should step forward. Based on their hearing and senses, ask the 'bat' to keep throwing the ball and moving towards the wall until they are within an arms-reach.
- The goal is to figure out where the wall is by throwing the ball at it!

Discussion:

- Was this easy or hard?
- In addition to the sounds, what other senses did you use?
- The blindfold may reinforce the myth that bats are blind. Bats can see. Why do you think they primarily use their ears to track their food, instead of their eyes?
- Do you think this is something like how bats really find their prey?



Activities

ACTIVITY: Citizen Science

Bats can be tricky to spot and that's one of the reasons researchers have a hard time collecting information about them. You can help! With extra eyes scanning the sky for our insect-eating friends, we can learn more about their populations and their preferences, helping scientists to better help and support them.

There are various different public initiatives in Canada who are seeking your efforts in counting bats.

- The Neighbourhood Bat Watch at Batwatch.ca
- Community Bat Programs of BC and the BC Bat Count at bcbats.ca.
- Register an Installed Box with the Canadian Wildlife Federation at cwf-fcf.org.

Once you've decided which organization to support, read through their protocols thoroughly. Each of these resources have instructions for effective information gathering.

In addition to watching your own bat house, are you able to identify other bat roosts in your community?



Activities

ACTIVITY: Build a Bat House

There are many excellent sources of bat house designs. Rather than giving you all of the instructions, you can review some of these reputable web-resources. Have your group research each design and decide on which one would be best to do together.

Check out these resources:

Community Bat Programs of BC's "Bat House Basics"

The "Got Bats?" initiative is a network of community bat projects across British Columbia carried out in partnership with the Ministry of Environment. The goals of this network are to:

1. Increase the number of known roost sites in human-made structures.
2. Encourage landowners to protect their bat roost sites or use bat-friendly exclusion methods and install bat-houses.
3. Promote the Annual Bat Count program to monitor bat populations.
4. Enhance bat habitat by encouraging the installation and monitoring of bat-houses.

Find out more at: Bat Houses <http://www.bcbats.ca/index.php/bat-houses>.

The Canadian Wildlife Federation's "Help the Bats" Program

Canada is fortunate to be home to thousands of wildlife species and vast areas of land and water on which they depend. Unfortunately many of these species are at-risk, due in part to human activities. Help the Bats is the CWF's efforts to support bat conservation.

Find out more at: <http://cwf-fcf.org/en/explore-our-work/endangered-species/help-the-bats/>

The National Wildlife Federation's "Garden for Wildlife" Program

The National Wildlife Federation is an American organization dedicated to wildlife protection and the development of conservationists. Their Garden for Wildlife Program helps people restore habitat and wildlife populations in their backyard and personal ecosystems. Since 1973, the program has been educating and empowering people to turn their own small piece of the Earth such as their yards and gardens into thriving habitat for birds, butterflies and other wildlife.

Find out more at: Build a Bat House - <http://www.nwf.org/garden-for-wildlife/cover/build-a-bat-house.aspx>



Activities

ACTIVITY: Mounting Your Bat House

Whether it is the bat house we supplied you with, or one that you built yourself, finding the proper location to mount your bat house is important!

Materials

- Bat house
- Hammer and nails, or a hand held drill and screws
- Ladder

Instructions and Tips

Install the bat house in the late spring or early summer. Bat houses installed much later will not be well used until the following season.

- It should be mounted 12 to 20 feet or higher on buildings
- Bats enjoy a mix of habitats, but appreciate water access. Try to mount near rivers, lakes or ponds.
- Mount your bat house where it can get several hours of early day sunlight but is not subject to dawn to dusk sunlight.
- Did you know bats are less attracted to bat houses on trees? They avoid them for a few reasons:
 - o It's easy for predators to access the houses.
 - o The branches cause obstruction to exiting bats which drop down and then up quickly into flight.
 - o The shade obstructs the sun.



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- Hoary Bat: https://en.wikipedia.org/wiki/Hoary_bat
- Little Brown Bat: https://en.wikipedia.org/wiki/Little_brown_bat
- World of Bats: <http://billbatboy.ca/many-different-types-of-bat-species-with-images/>
- Got Bats? B.C. Community Bat Project FAQ: http://bcbats.ca/attachments/bat_FAQ.pdf
- The Bat: <http://www.thecanadianencyclopedia.ca/en/article/bat/>
- Bat Science Experiments: <http://preschoolpowolpackets.blogspot.ca/2015/10/bat-science-experiments-echolocation.html>
- Bat Week 2016: <http://batweek.org/index.php/about/about-bat-week>

Books

- The Natural History of Canadian Mammals - Donna Naughton
- The Bat House Builder's Handbook - Merlin Tuttle, Mark Kiser, Selena Kiser. Updated 2013

Photos

- Little Brown Bat <http://www.thebatcave.ca/page69/page69.html>
- Big Brown Bat <http://www.thebatcave.ca/page82/page82.html>
- Hoary Bat <http://www.thebatcave.ca/page93/page93.html>
- Red Bat <http://www.thebatcave.ca/page80/page80.html>