

# Bat Conservation Pemberton: Understanding, Appreciating and Stewarding Bats in Pemberton, British Columbia



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## Cover Photos<sup>1</sup>

Volunteer assisting with the establishment of bat acoustic monitoring station (top left).  
Western Long-eared Myotis found on property where roost counts occurred (top right).  
Quest University intern counting bats emerging from a summer bat roost (bottom right).  
Participants at One Mile Lake for an owl and bat walk (bottom right).

## Acknowledgements

We acknowledge this project took place in the unceded traditional territory of the St'át'imc people, with surveys located on the lands of the Lil'wat, N'Quatqua and Xa'tsa Nations.

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Project coordination and delivery from the Pemberton Wildlife Association and Stewardship Pemberton Society;

Funding from the BC Conservation Foundation, Whistler Community Foundation, Pemberton Valley Supermarket and Pemberton Wildlife Association;

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<sup>1</sup> © Greg Ferguson (top left and bottom left and right) and Bruce Miller (top right).

## Bat Conservation Pemberton: Understanding, Appreciating and Stewarding Bats in Pemberton

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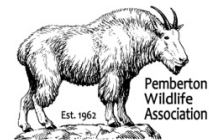
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## Executive Summary

Understanding and conserving bats and their habitats is urgently needed. This is particularly relevant in British Columbia, given the diversity of bats this area supports, their current status and the risks posed by existing and future threats. Fortunately there are a number of individuals that are working hard to help bats through a range of initiatives. This project contributed to these efforts by undertaking outreach, inventory and education on bats and their habitats for the first time in the Pemberton area.

A number of important partnerships were established through outreach and engagement that were critical to the completion and success of this project. Collaborations were formed for the benefit of bats between:

- Pemberton Wildlife Association and Stewardship Pemberton Society,
- funders,
- the general public and local groups,
- landowners,
- volunteers,
- businesses,
- local and provincial governments and
- an intern.

Such partnerships focused on relationships that supported the project with funding, administration, outreach, education, materials/equipment, advice/guidance and field activities.

Outreach and engagement also contributed to a greater awareness about bats and actions to help conserve them and their habitats in the Pemberton area among partners, others and internally. Examples of how this project increased awareness included:

- the distribution of project information to a broad range of stakeholders,
- involving volunteers and an intern in project activities,
- working closely with landowners to understand and steward bats and their habitats,
- educating residents, local governments and the general public about bat ecology and conservation and
- sharing project results.

Internal awareness about bats and the capacity to steward them were also greatly increased as a result of this project through significant support from partners, internal research, learning by doing, outreach and educational materials developed, equipment purchased and feedback obtained.

Our understanding of bats and their habitats in the Pemberton area was greatly increased through the inventory and monitoring completed during this project.

- Six bat roosts were reported or identified on private land and bats were counted at these roosts as part of the BC Annual Bat Count Program.
- Acoustic surveys of bats were completed at four stations and along one transect as part of the North American Bat Monitoring Program. Additional acoustic recordings of bats were collected at four roost sites and along two transects in and around the Village of Pemberton.
- Inventory of 46 bridges and two culverts for bat use was completed over a broad area. Guano was collected at a majority of roost sites for future analysis.

Overall, inventory completed through this project provided the first real understanding of the types, distribution and relative abundance of bats in the Pemberton area to date.

Important knowledge gained through this project indicated that there is a strong interest and willingness among project partners and the community for inventory, stewardship and conservation work on bats and their habitats in the Pemberton area. It is recommended that these relationships be maintained and new partnerships be created that will benefit bats locally and beyond.

A solid foundation has been established, through this project, to continue and expand activities completed. To do so will require continued project coordination, landowner and volunteer involvement and additional funding.

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## 1 Introduction

Pemberton is an important ecological region of southwest British Columbia (BC), comprised of a variety of landscape features, climatic conditions and habitats that still support a diversity of species. Increasing pressures from local population growth and human activities, compounded by regional and global changes, are threatening species. To conserve species and their habitats it is essential that hands-on work be undertaken to define their location, status and needs, in addition to working with others towards conservation solutions.

Bats are ecologically, socially and economically important, with BC having the richest diversity in Canada (16 species). Yet bats and their habitats are at risk, with half of BC species of conservation concern. Threats include habitat loss, pesticides, climate change and White-nose syndrome (WNS), the latter devastating eastern bat populations and detected near Seattle in 2016. Fortunately, bats have high recognition and appeal among the general public, therefore providing an excellent opportunity for stakeholder engagement, citizen science, environmental monitoring and stewardship.

Very little is known about the presence, distribution and abundance of bats and their habitats in the Pemberton area. No individuals or groups have been involved in bat education, inventory or conservation activities. The need for action to resolve these conditions is critical given the status and ongoing threats bats and their habitats face and the lack of awareness and understanding of bats in the community and beyond.

The goal of this project was to enhance partnerships and awareness and complete inventory to increase involvement, understanding, appreciation and conservation of bats and their habitats in the Pemberton area. This report outlines the methods and results of activities undertaken to achieve this goal and provides recommendations and direction for future work.

## 2 Methods

### 2.1 Partnerships and Awareness

Furthering partnerships and the involvement of multiple stakeholders (e.g., the public, citizen scientists, landowners, government agencies) in stewardship efforts for bats and their habitats in the Pemberton area was an important component of this project. This was accomplished by communicating and collaborating with others to create and/or further mutually beneficial relations. Some of the core partnerships sought focused on relationships that could support the project with:

- funding,
- administration,
- outreach,

- education,
- materials/equipment,
- advice/guidance and
- field activities.

Some examples of methods used to create partnerships through this project are provided below. Overall, collaborations formed with others were inclusive and worked to create meaningful, positive and effective change for bats and their habitats.

- A number of the project activities involved completing field work, such as inventory and monitoring, to increase our understanding and stewardship of bats; outreach to and involving volunteers and an intern was critical. Sharing project information via print and social media, newsletters, posters and word of mouth to Pemberton Wildlife Association (PWA) and Stewardship Pemberton Society (SPS) members, other groups and the general public was done to connect with potential volunteers. Collaboration with a funder and post secondary institution was undertaken to secure the help of an intern.
- To undertake roost counts and establish some acoustic survey stations for bats it was essential to connect with and work closely with landowners. Print and social media, word of mouth and existing partnerships were all important ways used to accomplish this.
- Partnering with other groups and agencies working on bats in BC was essential to completing much of the field and awareness work undertaken during this project. Establishing and maintaining these connections throughout this project and the support provided was accomplished through regular communication, coordination and a mutual desire to help bats.

Through these connections, opportunities were created to build greater awareness, appreciation, respect and stewardship of bats, their habitats and the overall environment in the Pemberton area. The following are some of the methods that were used to increase awareness and involvement of partners and others:

- Information about this project (rational, goal, call for support and participation in activities) was created and shared broadly throughout the project via print and social media, public events, presentations, word of mouth and discussions. Key groups made aware of the project through this method were landowners and local governments.
- Volunteers and the intern involved in this project were trained in bat inventory methods, educated about bat ecology and assisted directly with surveys, outreach and education.
- Landowners involved in roost counts were provided with information about surveys, bat ecology and stewardship (best management practices). The awareness of other landowners was raised through the provision of information on unusual bat behaviour or



dead bats, stewardship actions such as bat house installation, as well as habitat restoration and conservation.

In addition to an increase in external awareness, internal awareness about bat ecology, inventory, stewardship and project delivery were increased within the PWA and SPS through this project. This was accomplished through internal research, learning by doing, significant support from partners (e.g., information sharing, provision of advice/guidance) and feedback obtained from all involved in this project.

## 2.2 Inventory

The goal of inventory was to collect data on the presence, relative abundance and distribution of bats and their habitats in the Pemberton area. This data provides a starting point or baseline for understanding the status of bats in the area, as no known inventory work has been undertaken to date. Data collected and the knowledge and partnerships developed also provides the opportunity for future actions, such as education, inventory, monitoring, research and stewardship, and shared responsibility towards addressing some of the root causes of bat declines in Pemberton and beyond.

All inventory activities occurred on public/crown land and private property. Permission from government partners and private landowners was obtained prior to accessing and undertaking project activities on their lands.

### 2.2.1 Roost Counts

Roost counts were undertaken as part of the BC Community Bat Program [Annual Bat Count](#). This count is a province wide citizen science initiative started in 2012 that surveys bats annually at known day roosts in anthropogenic structures, such as houses, barns and bat houses, to increase our understanding of bat ecology, status and conservation. One of the key objectives of the count is to assess and monitor the population numbers and trends (i.e., year to year, overtime) of bats that use human structures for roosting, such as the federally endangered Little Brown Myotis (*Myotis lucifugus*). These counts and data collected are especially important with the advance of WNS and a rapidly changing climate.

Each count involves surveying roost sites following standardized methods during two designated sampling periods: two counts between June 1 to 21 (before pups can fly) and two counts between July 21 to August 15 (when pups are flying and exiting the roost with their mothers). Ideally four counts are completed at each roost, but if surveyors cannot complete all four then completing two counts during the first sampling period is of highest priority to be consistent with [North American Bat Monitoring Program](#) (NABat) protocols. This project aimed to complete four counts at each roost surveyed.

For each count, a surveyor would contact the landowner to arrange a suitable day within each sampling period to visit. Surveyors would aim to arrive at roost sites approximately 15 to 30 minutes or more before sunset, as some bats are known to emerge from their roosts before dusk. If the temperature was less than 12° C or if precipitation and/or wind were greater than low for prolonged periods of time then counts were postponed to avoid incorrect population estimates.

Surveyors would sit or stand in a location(s) where they could see roost exits clearly; being in a location where the roost exit was back light/dropped by the sky was ideal for seeing bats emerging and re-entering. The location of these observation sites were defined descriptively or through the collection of Universal Transverse Mercator (UTM) coordinates. Besides natural light or lights left on normally by landowners, no additional light was used to enhance roost and bat visibility. For each roost survey it is recommended that two or more people count to obtain a better estimate of bat numbers, especially at roosts where there are a large number of bats and/or they exit from a large area and/or multiple locations.

Surveyors often used the sounds of bats, such as scratching and squeaks, to better gauge the specific location of their activity and timing of emergence. They would then watch the roost carefully and visually count the bats emerging and also those that re-entered to ensure an accurate count of the actual number of bats present. For large colonies, surveyors used a hand clicker to help track bat numbers. If possible, the time and location of bat emergence was recorded. At roosts where many bats were observed exiting quickly and/or they were difficult to see, then emergence timing and location data was not recorded as obtaining accurate counts of bats was more important. Visual observation of roosts during counts lasted at least one hour or until it was too dark to see bats.

In addition to counting the number of bats at each roost, surveyors also recorded the following data:

- roost name,
- date,
- surveyor name(s),
- weather (start and end precipitation, cloud, wind, temperature),
- sunset time,
- moon visibility and stage,
- observer location,
- start and end time,
- time first bat emerged, pups seen and/or heard,
- time roost exit could not be seen and
- comments.

In addition to count data, the following information was collected to describe each roost surveyed:

- name,
- location (UTM coordinate and accuracy using a Garmin GPSMAP 60CSx set to North American Datum (NAD) 83),
- landowner contact details,
- expected colony type (bachelor, maternal, temporary),
- structure type (building - siding, building - roof, building - attic, building - chimney, bridge, bat house - 4 chamber, bat house - rocket box, bat house - single chamber, tree, crack, cave, mine),
- approximate roost size,
- proportion of roost surveyed,
- roost height,
- exit/entrance aspect and accessibility,
- threats/disturbance,
- dead bats present and
- guano collected.

As part of data collection, each landowner was asked to sign an agreement stating their support of counts and consent to share data collected with the BC Community Bat Program and BC Ministry of Environment and Climate Change Strategy.

Where possible, acoustic recordings of bat echolocations and guano samples were collected to aid in the identification of bat species using roosts. An increase in the number of bats emerging between the pre-pup and post-pup survey periods (difference between maximum counts) and the flight, calling and emergence behaviour of bats were used to confirm roosts as maternal colonies. No bat roosts were entered and no bats were handled.

Bat data was recorded on Annual Bat Count forms and entered into Excel, both submitted to the provincial coordinator for the BC Community Bat Program for management, analysis and reporting. The BC Community Bat Program then submitted all data to the Province of BC through its Species Inventory Database.

No additional resources or time was available to identify the location, use and characteristics of bat winter roosts/hibernacula in the Pemberton area. This was desired but not a main priority of this project or our understanding and conservation of bats in BC at this time.

### **2.2.2 Acoustic Surveys**

The use of acoustic recording equipment and analysis software, following standardized methods, has become very important in helping identify the diversity, distribution, relative abundance and status of bats via their echolocations.

The NABat, started in 2016, is central to this acoustic survey and associated conservation work. As part of this program in BC, this project used acoustic monitoring equipment to complete the following standardized surveys.

### **Station Surveys**

There were four acoustic recording devices (Wildlife Acoustics SM4BAT FS detectors) placed in each of the four quadrants that make up a NABat grid cell (standardized 10 km by 10 km area) to passively record bat echolocations following NABat sampling protocol. This resulted in the establishment of four dispersed and repeatable bat sampling stations in the Pemberton area.

For each of these stations, their location was identified using a number of approaches. The first was an office based approach where the four quadrants were viewed on Google Earth with a BC Ministry of Environment and Climate Change Strategy biologist and discussions were had with the PWA president to determine specific priority sites for detector placement. Landownership was determined for each priority location. Applicable landowners were then contacted to discuss the program (objectives, process) and obtain permission to review sites and establish detectors long-term.

Field reconnaissance was completed using the following criteria to assess the suitability of sites, followed by input from Wildlife Conservation Society of Canada staff, coordinators for the NABat in BC:

- Is the detector right beside a bat fly-way (e.g., trail, forest opening, rock cliff). Ideally no;
- Is the area around the detector uncluttered (e.g., no trees blocking the sky, no tree branches, leaves, water surfaces or edges such as trails and roads nearby (within 3 m)). Ideally yes;
- Is the detector near flat reflective surfaces, such as still water, pavement and cliff faces. Ideally no;
- Is the detector near areas with suitable roosting (mature trees, snags, rock crevices, anthropogenic structures, caves, mines). Ideally yes;
- Is the detector in or near wide-open places, such as the middle of a cultivated field). Ideally no;
- Is the detector near very fast streams or creeks that produce competing noise. Ideally no;
- Is the detector near a creek or wetland with dense vegetation that reduces access to prey and water. Ideally no;
- Is the detector near power lines or other ultrasound emitting objects or areas of high motorized or non-motorized traffic. Ideally no.
- Is the detector in a location that has a diversity of habitats and this habitat differs from other detector locations. Ideally yes;
- Is the detector in a safe location (remote, not visible, on private land). Ideally yes;

Following the identification of station locations, private landowners were contacted to confirm appropriate times to establish and remove detectors.

The four bat detectors were then programmed for deployment following NABat protocol, including location, time, gain, detector identifier and a recording time of half an hour before sunset to half an hour after sunrise. Each detector was then set up at each defined station for at least six consecutive nights between May 24 and June 30, when pups are pre-volant/not flying yet, during the same week the NABat driving transect was surveyed and when temperatures were above 10° C. Roost counts were completed in conjunction with acoustic surveys in the same survey grid cell, therefore contributing this data to the NABat.

The establishment of detectors in the field involved zap-strapping and then taping each detector microphone to the top of an extendable painter pole. This pole was then placed vertically over a piece of rebar hammered into the ground, which was supported by three to four guy wires that were also anchored to rebar hammered into the ground. Each pole, with attached microphone, was raised 12 feet above the ground to reduce background noise and echoes from the ground. Microphones were pointed slightly downward to minimize getting wet and oriented away from clutter to aid in obtaining more and higher quality bat echolocation recordings. Signs outlining the project and purpose of detectors were taped to field equipment to inform others about the project and to minimize vandalism or theft. In addition to collecting a UTM coordinate for each detector location, photos were taken of established detectors from multiple angles and a stake with flagging was placed in the ground where detectors were located. This was done to aid in placing detectors in the exact location for future surveys.

In addition to detector placement, a Kestrel D2 weather meter was placed under a plastic cover and tied to a branch approximately 2 m above the ground and out of the sun on the north side of a tree next to one of the detector stations. An app was downloaded prior to surveys and used in the field to start and end the meter recording. This was set to collect the following data every 30 minutes:

- temperature,
- relative humidity,
- heat stress index,
- dew point and
- temperature humidity index.

The date, time of deployment and collection were recorded.

Descriptive data for each station was collected and included such aspects as station location (UTM and accuracy) and directions (track log, waypoints) as needed, using a Garmin GPSMAP 60CSx set to NAD 83, main habitat type, feature sampled and distance to clutter.

Field data was entered into Microsoft Excel. Acoustic and photographic data was downloaded. All data was submitted to the BC Ministry of Environment and Climate Change Strategy and Wildlife Conservation Society of Canada. The latter analyzed acoustic data using Wildlife Acoustics Kaleidoscope Pro software along with professional assessment and submitted it to the NABat bat population database.

### **Transect Surveys**

The second sampling method used by this project, in accordance to NABat protocol, involved the establishment of a 30 to 45 km long transect along a road that passed through the selected sample grid cell. This transect was then acoustically surveyed for bats from north to south, starting approximately half an hour after sunset and driving continuously for at least 1 to 1 ½ hours at a speed of approximately 30 km/hour. Given the transect length, it passed through the grid cell and beyond and also through two of the grid cell quadrants, but did not have any major switchbacks that were within 100 m of a location that was already surveyed. This transect was surveyed during two consecutive nights, starting and ending in the same locations, between May 24 and June 30. Surveys occurred when pups were not flying yet, during the week acoustic stations were surveyed, when temperatures were above 10° C and during nights with no substantial rain or on or near a full moon. In addition to the NABat transect surveyed, two shorter transects were surveyed to collect data on the presence and distribution of bats in and around the Village of Pemberton. These transects followed some but not all the protocols used by the NABat.

A Wildlife Acoustics Echo Meter Touch 2 Pro Ultra bat detector was used to acoustically survey bats along defined transects. An app was downloaded prior to surveys and the following settings were programmed on the detector before its deployment:

- trigger min frequency = 16 kHz,
- audio division ratio = 1/20,
- nightly sessions mode = on,
- save noise files = off,
- real-time auto ID = off,
- trigger sensitivity = medium if a large amount of noise from the road (e.g., gravel) was expected or high if driving on a paved road with minimal noise,
- trigger window = 3 seconds,
- max trigger length = 15 seconds and
- sample rate = 256 kHz.

The bat detector was placed near the centre of a high-topped van using a suction-cup car mount and pointed forward (i.e., in line with the vehicle direction of travel) at a 45 degree slope. This microphone was then attached to an iPhone 6S, with sufficient memory space and battery life for the survey, using a cellularize extension cable. With applicable software, the detector and iPhone were used to record bat echolocations. A Garmin GPSMAP 60CSx set to

NAD 83 was used to record the start and end locations (UTM and accuracy) and a track log was recorded for two of the three transects surveyed.

Data collected in the field during transect surveys included:

- start and end times,
- moon phase,
- percent cloud cover,
- influence of moon description (i.e., high, medium, low, none),
- time of moonrise and sunset,
- start and end temperature,
- relative humidity (%),
- wind speed (km/h or description - low/no, moderate, high) and
- precipitation, volunteer information and comments.

Field data was entered into Microsoft Excel and acoustic data was downloaded. All data was submitted to the BC Ministry of Environment and Climate Change Strategy and Wildlife Conservation Society of Canada. The latter analyzed acoustic data using Wildlife Acoustics Kaleidoscope Pro software along with professional assessment and submitted it to the NABat bat population database.

### **2.2.3 Bridge and Culvert Surveys**

Bats are known to use bridges and culverts as roosting sites. To increase our understanding of the current and long-term presence, distribution and relative abundance of bats in the Pemberton area, it was determined that assessing these structures was important, especially given the lack of data on bats in this part of the South Coast Region.

Background information on the location of bridges and culverts in the project area was collected using online mapping applications such as Backcountry BC forest service road dynamic map and Google Earth. The location of bridges and culverts to survey were also identified during the completion of other field activities. Bridges and culverts along main roads were prioritized for surveys as they were concluded to have a higher frequency of structures, easier and safer access and allowed for more efficient use of limited resources.

In addition to road type, assessing bridges versus culverts was defined as a priority; culverts were believed to be less suitable habitats for bats because they are often smaller in size and lack suitable openings and thermal mass characteristics that bats usually require or prefer for roosting.

Surveyors downloaded bridge and culvert location maps and UTM coordinates prior to field surveys. They then drove defined roads during the day to visually assess structures for the

presence of bats through the observation of individuals and/or their guano. A light was used when necessary to inspect bridges and culverts for use. The underside on both sides of these structures was surveyed if access was available and safe.

The following data was collected at bridges and culverts assessed:

- site name,
- location using a Garmin GPSMAP 60CSx set to NAD 83,
- structure type and characteristics (opening types that bats may use),
- presence, location and approximate number of bats,
- presence, location and relative abundance of guano and its collection,
- expected colony type (i.e., temporary (nightly), bachelor, maternal),
- photos and
- comments (structure accessibility for bats, solar insolation, enhancement options).

Field data was entered into Microsoft Excel and photographs were downloaded. Data was submitted to the provincial coordinator for the BC Community Bat Program for management, analysis and reporting. Data was also submitted to the BC Ministry of Transportation and Infrastructure and Ministry of Forests, Lands, Natural Resource Operations and Rural Development through its Species Inventory Database.

### **2.2.4 Guano Sample Collection**

Guano can be used to identify bat species and may be used in future research. Samples were collected at as many roost count sites as possible and from under the majority of bridges and culverts used by bats. Samples were collected following provincial sampling protocol, which included the placement of guano in coin envelopes, allowing it to dry well before placement in a freezer and the recording of information about each sample.

Information and samples were submitted to the BC Community Bat Program for future analysis, which is dependent on sample priorities from other contributors and available funding.

## **3 Results**

### **3.1 Partnerships and Awareness**

The PWA and SPS both share a strong interest in conservation. This mutual interest saw these organizations partner for the first time to deliver a project of this scale and type. This collaboration resulted in the attainment of important charitable status funding from the Whistler Community Foundation, which among other things, allowed for the hiring of an intern



through their Environmental Youth Mentorship Grant. This would not have been possible by PWA alone.

The PWA completed the majority of project activities including the following: fundraising, outreach/education, volunteer recruitment, training/coordination, inventory and reporting. SPS assisted with outreach and completed administrative tasks associated with charitable status funds and intern involvement. This project enabled both organizations to build on their shared interests and supported future collaborative initiatives.

Partnering with the BC Community Bat Program, BC Ministry of Environment and Climate Change Strategy as well as Wildlife Conservation Society of Canada was critical to the project success. These organizations provided essential advice, educational resources, equipment and assistance with project delivery, such as the analysis of bat acoustic data. This support played a vital role in undertaking the first ever outreach, education, inventory and stewardship project for bats in the Pemberton area.

Support from the community for this project was diverse, resulting in a variety of partnerships. The BC Conservation Foundation and PWA provided important funding, while Pemberton Valley Supermarket provided a very generous gift certificate to obtain items (food) from their store. There were 6 community members that volunteered for this project, providing assistance with project coordination, outreach material development, acoustic station establishment and roost count surveys. Quest University supported the recruitment of a third year student as an intern with this project. This intern was invaluable; helping with roost counts and surveys, acoustic station removal, public education and project review.

Partnering with landowners was necessary for the completion of roost counts and the establishment of two acoustic survey stations, which were both important components of this project. Fortunately, five landowners with an interest in and concern for bats were very supportive of roost counts on their property. One business and one private landowner supported the establishment of long-term acoustic monitoring stations for bats on their properties, while also expressing interest in survey results and undertaking stewardship activities (e.g., establishing bat houses). One local business generously provided a donation of rebar to the project to help with acoustic station establishment. Outreach about the project (i.e., placement of posters) was supported by 14 community organizations and 27 local businesses. All of this support showed that the local and regional community care about bats and are willing to take action to help increase our understanding and conservation of these important species.

Through the above partnerships and outreach, this project worked to raise awareness about bats and their stewardship with the following stakeholders: PWA and SPS members, the general public, local groups, landowners, volunteers, businesses, local governments and an intern. To help accomplish this awareness, the following materials were created and shared broadly (see Appendices): bat and roost sighting poster, social media posts, project information sheet, community educational walk poster and bat fact sheet.

Some of the ways that awareness about bats was raised in the community included the following:

- Provision of information to 22 residents about bat stewardship (e.g., bat houses), management (appropriate removal) and identification, bats out during the day and risks from dead bats;
- Provision of project support and educational materials to one Signal Hill kindergarten teacher;
- Outreach to the community at four public events (Pemberton Farmers Market, Pemberton Days, PWA presentations);
- Delivery of two hands-on owl and bat education walks to 34 community members;
- Provision of presentations to two local governments (Lil'wat Nation and Village of Pemberton) on bat and bird species at risk conservation projects; and
- Sharing of project data and/or reports with funders, partners, volunteers, landowners and non-government and government organizations (BC's Annual Bat Count Program, BC's Wildlife Species Inventory database and Conservation Data Centre, NABat).

The following are some of the specific ways that awareness through this project encouraged stewardship for bats:

- The reporting of roost sites by six private landowners and unusual bat behaviour or dead bats reported by five residents;
- The willingness of a landowner to purchase a bat house and delay bat eviction until the fall, in accordance with best management practices. This despite being kept awake by the noise the bats made every night when leaving and returning to their roost above her bedroom;
- The willingness of one landowner where roost counts were completed to help with counts and care for a flightless juvenile female bat that entered her home. The latter included capturing and caring for the bat, taking it to the Lower Mainland for medical attention and releasing it back safely on her property to return to the roost/colony;
- The willingness of a local group and business to construct up to 20 bat houses for future placement in the Pemberton area;
- The donation of materials (wood, shingles) for the construction of bat houses by two private landowners and a PWA member; and
- Ongoing interest and support from the BC Community Bat Program, BC Ministry of Environment and Climate Change Strategy and Wild Conservation Society of Canada for continuing inventory, monitoring and stewardship efforts for bats in the Pemberton area.

Internal awareness about bats and our project was obtained through partnerships with others, the development of materials (see Appendices) and via feedback from the project intern, landowners, volunteers and educational walk participants.

The walks were conducted with support from SPS, fulfilling their goal to provide science-based participatory learning and engaging participants in hands-on activities that provide them with experiential learning opportunities.

## 3.2 Inventory

### 3.2.1 Roost Counts

Six roosts on five private properties distributed broadly over the Pemberton area were surveyed with data collected on the number, locations and behaviours of bats (Figure 1). One of these roosts had bats leaving two distinct locations (i.e., east and west end of roof), so this site was counted as two roosts. The location of roosts were determined through direct reports from landowners (3), an indirect report from a landowner and follow up site assessment (1), word of mouth (1) and by a call to the BC Community Bat Program (1).

A total of 21 counts were completed at the 6 roosts between June 6 to August 1, 2019. Of these counts, 17 were completed by 1 person, 4 by 2 people and 1 by 3 people. A volunteer, a landowner and an intern helped complete counts. Acoustic recordings of bat echolocations were collected at 4 of the 6 roosts surveyed.

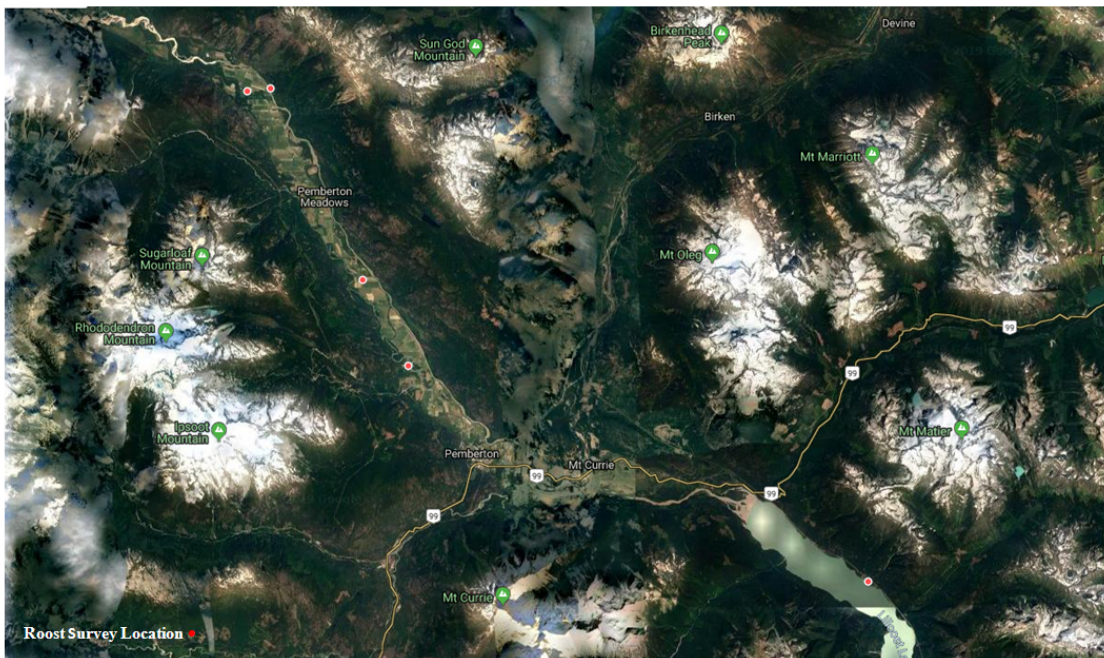


Figure 1. Location of roosts surveyed for bats during 2019 in the Pemberton area.

In addition to formal roost counts, two properties were visited to locate potential roost sites but no sites were detected. A resident reported seeing a number of bats at another property in late July but a visit to this site to talk with the landowner was not completed.

The number of bats counted during surveys varied at each roost and between roosts (Table 1). One dead and one live bat (a Western Long-eared Myotis (*Myotis evotis*)) were found out during the day on a roost count property and a bat entered a home where roost counts occurred. A roost count landowner was provided with best management practices for the removal of bats and the placement of a bat house they purchased.

Table 1. Number of bats counted at six roosts during 2019 in the Pemberton area.

Roost	Count 1	Count 2	Count 3	Count 4
Los <sup>2</sup>	NA	28	0	0
Miller	24	23	18	25
Milne	32	62	47	86
Tschopp	4	4	11	45
Zaste East <sup>3</sup>	4	5	5	6
Zaste West <sup>3</sup>	9	4	4	NA

Of the six roosts surveyed three (Miller, Milne and Tschopp) were defined as maternal roosts based on either of the following conditions:

- an overall increase in the abundance of bats between the pre-pup and post-pup survey periods (more bats counted as pups started to emerge),
- sounds heard (increase in squeaking by bats during emergence),
- bat flight seen (e.g., pup flight was slower, less erratic and individuals were seen chasing/playing with each other more) and/or
- emergence/re-emergence behaviour observed (more bats were seen flying around roosts for longer and returning inside following emergence).

The Los roost was considered a likely maternal colony based on the number of bats and guano initially observed and the duration the roost has been active (greater than ten years).

The Zaste roosts were considered likely bachelor roosts based on the smaller number of bats observed, little to no change in abundance between pre-pup and post-pup survey periods and a lack of auditory and visual observations of pups.

Roosts counted were all in buildings (homes or shop), with siding, roofs, attics and a chimney being specific areas where bats were observed emerging or known to be occupying (Figure 2). Roost heights ranged from approximately 5 to 15 m and had entrance aspects ranging from 60 (approximately NEE) to 316 (NW) degrees.

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<sup>2</sup> Bats were believed to have abandoned this roost after count two for an unknown reason.

<sup>3</sup> Bat counts were completed at two distinct locations (east and west) where bats emerged from the home.



Figure 2. Photos of buildings in the Pemberton area where bats were roosting and counted during the summer of 2019.

### 3.2.2 Acoustic Surveys

#### Station Surveys

The majority of survey equipment used to acoustically record bats at NABat stations was generously provided by the BC Ministry of Environment and Climate Change Strategy. One local business also provided in-kind support for the project through the donation of rebar.

There were two stations established on crown land (Signal Hill, Fulton Bluff) and two were located on private land (Meadows at Pemberton Golf Course, Gouin) (Figure 3). The habitat surrounding stations on crown land consisted of open forest on dry rocky hillsides. Habitat surrounding private land stations was primarily agriculture/landscaped areas bordered by shrubs, forest and water bodies.

A number of the criteria used by the NABat for locating acoustic survey stations were met including the following:

- a difference in station location and habitat type sampled within each quadrant relative to the location and habitat types of other stations,
- a lack of surrounding clutter and reflective surfaces,
- good site accessibility and
- safety of equipment.

Acoustic detectors were established at each station and a weather meter at one station (Figure 4). Detectors collected data from the evening of May 31 to the morning of June 10 (ten nights). Three volunteers and one intern assisted with acoustic station surveys; helping with field reconnaissance and detector equipment establishment and removal.



Figure 3. Location of North American Bat Monitoring Program stations surveyed for bats using acoustic equipment during 2019 in the Pemberton area.



Figure 4. Photos of bat acoustic detector equipment established at sampling stations as part of the North American Bat Monitoring Program during 2019 in the Pemberton area.

Acoustic surveys resulted in a large number of bat echolocation recordings at each station (Table 2) and the detection of nine species (Table 3). The diversity between detectors was relatively low and each detector collected at least one recording from almost all nine species.

### **Transect Surveys**

Three transects were established in the Pemberton area on public land to collect bat echolocations: one was 48 km transect up the Pemberton Meadows Road and North Lillooet Forest Service Road as part of the NABat (Figure 5) and two shorter transects in and around the Village of Pemberton (Figures 6 and 7). All transects fell within the NABat grid cell selected for surveys (ID 143274), with the 48 km transect extending over multiple cells. The NABat transect also transversed two quadrants within the selected grid cell and a diversity of habitats (e.g., farmland, forest patches, hedge rows, forest, riparian, bluff areas).

Surveys of the NABat transect were completed during two consecutive evenings (June 2 and 3), driving a gravel and paved road from north to south to minimize post-survey driving time. This road did not switch back on itself to avoid double counting. The east and central Pemberton town transects were surveyed on May 30 and June 3, respectively. These transects were on paved roads and did switch back on themselves during certain portions of the survey. One surveyor completed all four transects and environmental conditions (e.g., moon phase, temperature, wind, precipitation) were suitable for surveying. Start and end coordinates and track logs or descriptive directions were recorded for all transects.

Similar to acoustic surveys at stations, transect surveys resulted in a large number of bat echolocation recordings (Table 2) and the detection of nine bat species (Table 3).

- Eight species were detected along the NABat transect, with Little Brown Myotis, Long-legged Myotis (*Myotis volans*) and Silver-haired (*Lasiurus noctivagans*) being the most frequent.
- Five species were detected along the Village of Pemberton East transect, with Hoary (*Lasiurus cinereus*) and Silver-haired bats being the most frequent.
- Little Brown Myotis and Long-legged Myotis bats were the two species detected along the Village of Pemberton North transect.

Completing two surveys of the NABat transect and one for each of the Village of Pemberton transects is not sufficient to accurately estimate relative abundances of species, but does provide an understanding of species and their distribution in the Pemberton area.



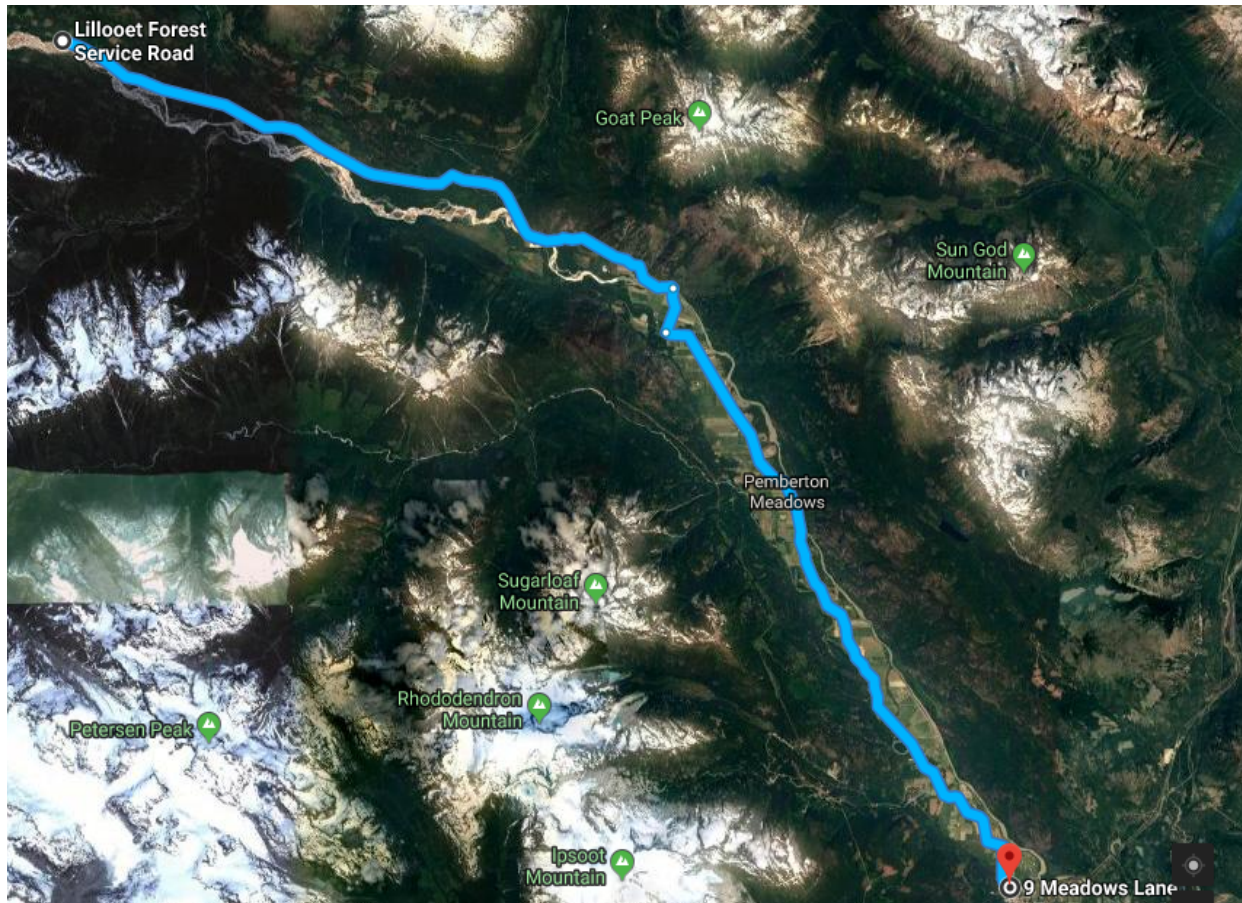


Figure 5. Location of North American Bat Monitoring Program transect (Pemberton Meadows Road and North Lillooet Forest Service Road) surveyed for bats using acoustic equipment during 2019 in the Pemberton area.



Figure 6. Location of additional transect (Village of Pemberton North) surveyed for bats using acoustic equipment during 2019 in the Pemberton area.

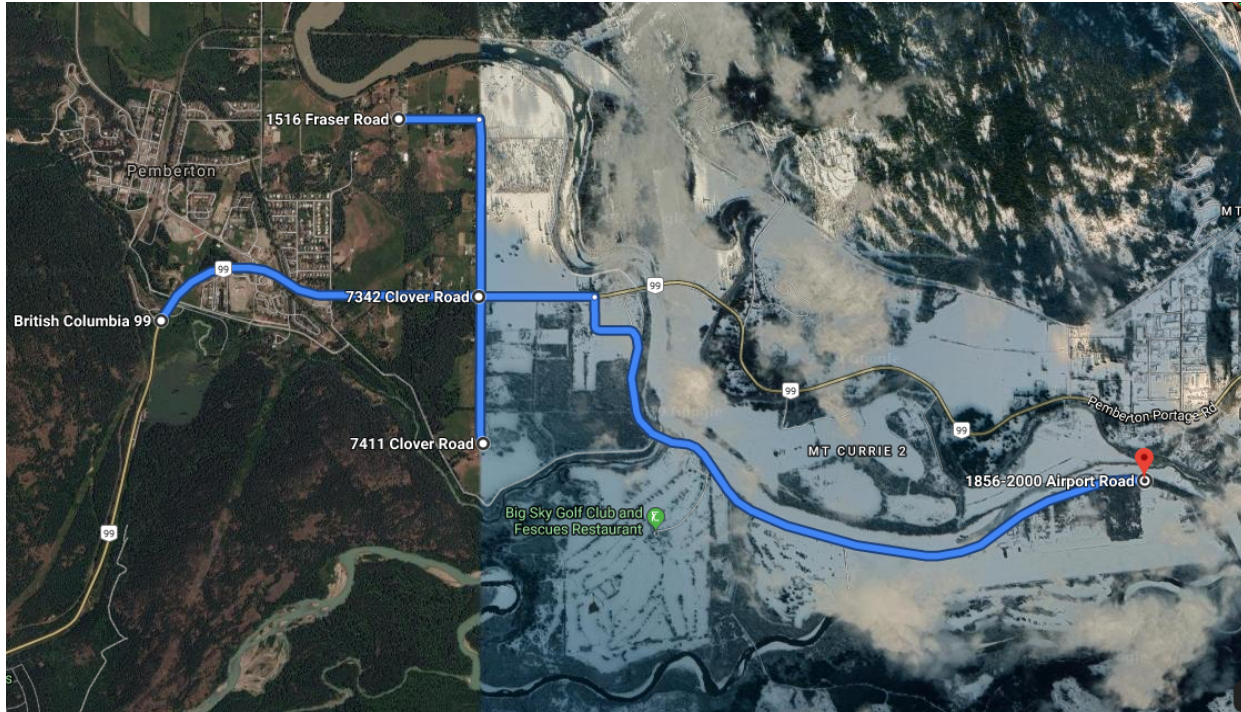


Figure 7. Location of additional transect (Village of Pemberton East) surveyed for bats using acoustic equipment during 2019 in the Pemberton area.

Table 2. Number of bat echolocations recorded during acoustic surveys at four stations and along three transects in the Pemberton area during 2019.

Station	Number of Bat Echolocations Recorded
Meadows at Pemberton Golf Course (S1)	813
Signal Hill (S2)	791
Fulton Bluff (S3)	1179
Gouin (S4)	683
Transect	
Pemberton Meadows Road and North Lillooet Forest Service Road (T1)	89 and 48
Village of Pemberton North (T2)	15
Village of Pemberton East (T3)	45

Table 3. Summary of bats acoustically detected at stations and transects surveyed in the Pemberton area during 2019 and their status in BC and Canada.<sup>4</sup>

Species	Station and/or Transect Recorded and Number <sup>5</sup>	Conservation Status
Townsend's Big-eared Bat ( <i>Corynorhinus townsendii</i> )	S1 (1), S2 (5), S3 (1), T1 (1), T3 (1)	Blue (BC)
Hoary Bat	S1 (5), S2 (11), S3 (11), S4 (2), T3 (7)	Not at risk
Silver-haired Bat	S1 (29), S2 (11), S3 (47), S4 (68), T1 (10), T3 (5)	Not at risk
Big Brown Bat ( <i>Eptesicus fuscus</i> )	S1 (7), S2 (5), S3 (38), T1 (2), T3 (1)	Not at risk
Yuma Myotis ( <i>Myotis yumanensis</i> )	S1 (10), S2 (1), S4 (12), T1 (3)	Not at risk
Californian Myotis ( <i>Myotis californicus</i> )	S1 (18), S2 (8), S3 (8), S4 (8), T1 (1), T3 (1)	Not at risk
Long-legged Myotis	S1 (3), S2 (6), S3 (2), S4 (3), T1 (10), T2 (2)	Not at risk
Little Brown Myotis	S1 (73), S2 (9), S3 (5), S4 (24), T1 (20), T2 (3)	Endangered (Federal)
Western Long-eared Myotis	S1 (7), S2 (130), S3 (35), S4 (4), T1 (4)	Not at risk
Big Brown Bat or Hoary Bat	S1 (43), S2 (51), S3 (34), S4 (3), T1 (3), T3 (10)	Not at risk
Big Brown Bat or Silver-haired Bat	S1 (99), S2 (95), S3 (171), S4 (68), T1 (13), T3 (13)	Not at risk
California Myotis or Yuma Myotis	S1 (8), S2 (7), S3 (10), S4 (5), T1 (3)	Not at risk

### 3.2.3 Bridge and Culvert Surveys

There were 46 bridges and 2 culverts surveyed to determine the presence, relative abundance and distribution of bats in the Pemberton area (Figure 8). There were 21 bridges and 1 culvert found to be used by bats, with 17 believed to be temporary night roosts and 4 maternal roosts based on the abundance of guano and/or observations of bats (Figure 9).

<sup>4</sup> Status and regional distribution of bats obtained from [BC Community Bat Program](#). Known roosting preferences for detected species can also be found at this website.

<sup>5</sup> The number of recordings for bat species likely includes the double counting of individuals, especially at acoustic stations. Number of unidentifiable recordings: S1 (44), S2 (25), S3 (12), S4 (10), T1 (58), T2 (10) and T3 (6).

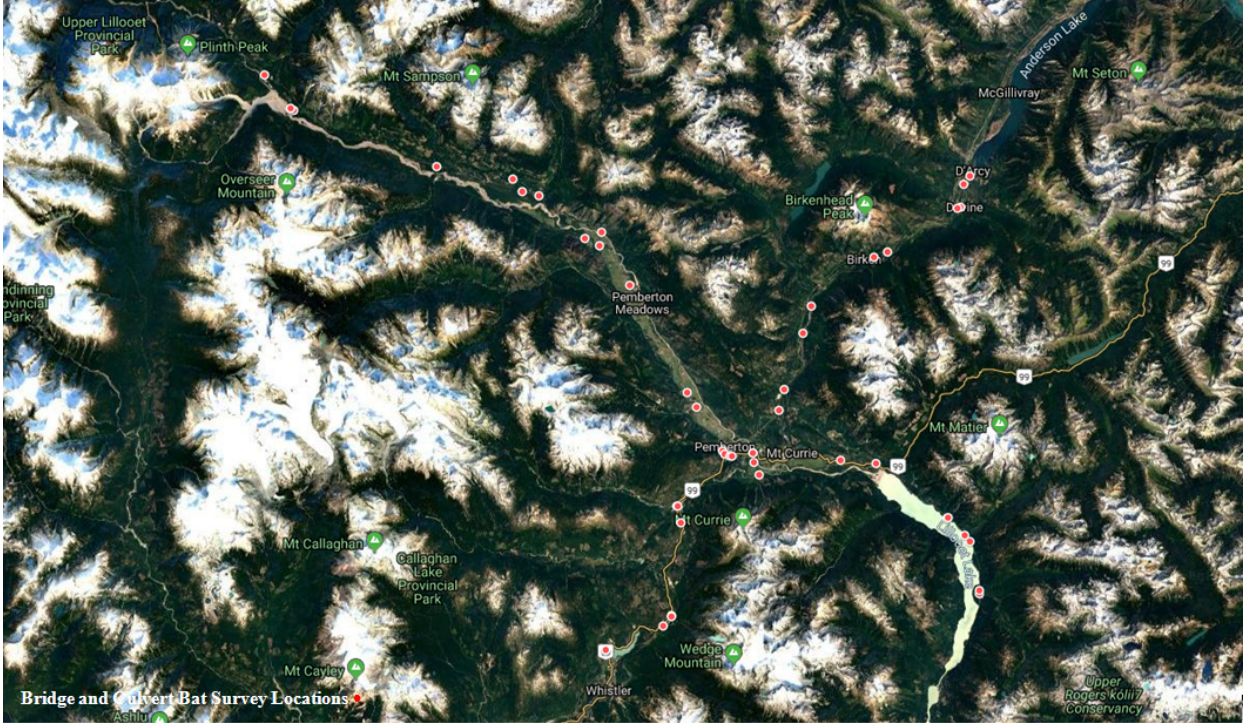


Figure 8. Location of bridges and culverts surveyed in 2019 for bat use in the Pemberton area.



Figure 9. Bridges in the Pemberton area used by bats during the summer of 2019.

### **3.2.4 Guano Sample Collection**

Thirteen guano samples were collected from bridges and culverts and five were collected from roost count sites. Information on samples and a prioritization for analysis was completed. All samples and information was submitted to the BC Community Bat Program for storage and possible analysis.

## **4 Discussion**

### **4.1 Partnerships and Awareness**

This project has contributed substantially to our understanding of bats and their stewardship in the Pemberton area.

- Partnerships provided the foundation for undertaking this project, with support coming from a diversity of stakeholders who care about bats and their habitats. With connections created, equipment purchased and knowledge gained, the groundwork has been established to undertake future work on bats in the Pemberton area.
- Connections with a number of residents, landowners, businesses and government and non-government agencies were made during this project. This provided an excellent opportunity to raise awareness about bats, their habitats and the project goal and activities.
- Sharing information, advice and resources was accomplished through outreach, surveys and education. This included the use of existing or development of new materials and activities. This work supported stewardship and conservation of bats.

Recommendations for future work on bats with regards to partnerships and awareness include the following:

- Maintaining connections established through this project with funders, landowners, volunteers and regional and provincial organizations (e.g., BC Community Bat Program, BC Ministry of Environment and Climate Change Strategy, Wildlife Conservation Society of Canada). This will help greatly in continuing education, inventory and stewardship activities for bats.
- Obtaining funding to hire an intern from Quest University to help complete project activities was invaluable. This allowed the PWA and SPS to be a mentor; helping to provide new experiences, skills and knowledge to an undergraduate student who is passionate about a career in environmental conservation. Pursuing intern involvement in future work on bats would be very beneficial.
- Community interest in helping to steward bats in the Pemberton area was considered good. This could be enhanced in the future through the construction and placement of bat houses. There were twelve landowners that expressed interest in the installation of a bat house or houses on their property. There was also a willingness of a local organization and business to significantly support the construction of such bat houses. Some materials to support this endeavor were obtained during this project and are available to undertake this work. Additional funding and volunteer support is still required but are not considered large challenges to overcome given the interest of funders, businesses and the community in bat conservation.
- Completing project outreach through a range of approaches allowed for a large number of connections to be made with a diversity of stakeholders. This created new relationships (e.g., with businesses and landowners) and partnerships or potential partnerships to help further bat education, inventory and conservation activities.

Maintaining these connections and sharing information through the systems established by this project should be continued.

- Educational walks provided to community members on owls and bats were very well attended and received by a diversity of participants. The experience gained through these walks, along with materials developed and resources available, provide good rationale for undertaking future walks.
- Although limited progress was made towards the establishment of a Bat Friendly Community in the Village of Pemberton and Lil'wat Nation, these government agencies were receptive to this initiative. Work completed through this project provides a good basis for furthering efforts towards this goal.

## **4.2 Inventory**

Inventory completed through this project has greatly increased our understanding of the type, distribution and relative abundance of bat species that live in the Pemberton area. In addition, some of the key habitats they are using (roost sites) and risks they face (landowner eviction, concerns regarding dead bats) have been identified.

Surveys were completed in a coordinated manner that followed standardized protocols. This expanded local experience and capacity. Data collected was contributed to a number of stakeholders and bat conservation initiatives (e.g., NABat, BC Community Bat Program Annual Bat Count, guano analysis for species identification and WNS detection) at the local, regional, provincial and North American wide scale.

Some specific recommendations on ways this project could be improved with regards to inventory activities undertaken are provided below under applicable sections.

### **4.2.1 Roost Counts**

As the Annual Bat Count is meant to be repeated yearly, there is a need to obtain further funding, access to count sites and volunteer support.

Although all the funding sought for this project was not received, there seems to be a general appetite among funders to support work on bats in the Pemberton area and this may increase when WNS arrives.

In addition, in-kind support through the BC Community Bat Program (e.g., letters of support, educational assistance and resources) helped greatly in securing funding, undertaking roost



counts and educating landowners and the public. This support continues to be available into the immediate future.

Landowner support for roost counts was initially low just before counts were to commence. Fortunately, six roosts were reported, which was enough to keep two surveyors busy through count weeks. As one landowner is planning to evict bats from their home this fall and bats were not seen during the second survey period at another roost, there is a desire to find an additional two roosts to replace these for future counts. Currently a landowner is known to potentially have bats roosting on their property and others may be reported through continued outreach, word of mouth and the BC Community Bat Program. As an alternative to roosts on private property, counts could be undertaken at bridge sites in the Pemberton area where bats are known to be roosting.

Although volunteer support for roost counts was much appreciated, including that from a keen landowner, it was lower than expected. The timing of surveys (evenings) and distance to roost sites may have been contributing factors to the lack of volunteer interest. To continue surveys there is a need to encourage more volunteer and landowner involvement, likely through enhanced outreach and/or possible financial compensation for driving. Volunteer support is especially relevant if four counts are to be continued at roosts and given the desire to have at least two surveyors present for each count. If there is limited support to complete roost counts, then priority should be placed on counting larger roosts to better understand changes in bat numbers over time and to support landowners with any management needs for the stewardship of a larger number of bats.

Assumptions about the types of roosts present on properties surveyed should be confirmed by a professional bat biologist. This could entail capturing bats or inspecting roosts during the late pre-pup or early post-pup periods. Two of the six roosts surveyed (Milne and Tschopp) are known to be accessible for inspection.

Collecting acoustic recordings of bats at roosts where this was not completed this year and at newly identified roosts should be a priority. These recordings will help increase understanding of bats in the Pemberton area as well as help define the importance of these roost sites, especially for at risk bat species. The Annual Bat Count supports this survey work, including the analysis of data by the BC Community Bat Program.

Although acoustic data collected at roost count sites has not been analyzed to date, annual roost count data from 2012 to 2018 in BC showed that seven species of bats use anthropogenic structures as roosts, with the most common being Little Brown Bat (55% of roosts) and second most common being Yuma Myotis (40% of roosts) (Kellner 2018). If these species are present at roosts identified in the Pemberton area, then these sites provide a good opportunity to contribute monitoring data for the population trends of these species across BC (Kellner 2018), making them a priority for counts.

It should be noted for future roost count surveys that variability in counts can exist within pre and post-pup survey periods. Some of this variability may be due to the times bats arrive and depart roost sites, weather conditions during counts and/or observer error. Completing multiple counts during each session, ensuring weather conditions are suitable and having two or more observers counting is highly recommended. In addition to more accurate counts, following these survey standards will aid in the statistical strength of data collected (e.g., ability to detect population trends of species) through the Annual Bat Count Program (Kellner 2018).

#### **4.2.2 Acoustic Surveys**

##### **Stations and Transects**

Acoustic surveys of bats in the Pemberton area was an important part of this project as they provided the first significant understanding of the types, distribution and relative abundance of bats for the area. Wildlife Conservation Society of Canada indicates that the Pemberton area provides remarkable species diversity, capturing activity from over half of the species known to reside in western Canada. These surveys were also completed following standardized methods, contributing data to similar bat survey and monitoring initiatives across North America.

Given foundational aspects of undertaking surveys has been completed (e.g., partnerships have been developed, stations and route have been defined, some important survey equipment has been purchased), continuing them is highly recommended. Conducting these surveys is important as they contribute trend data for populations of bat species that are not well represented through the Annual Roost Count Program.

Collaborating again with the BC Ministry of Environment and Climate Change Strategy and Wildlife Conservation Society of Canada to undertake surveys is desirable. The Province generously loaned very valuable equipment for surveys and the Wildlife Conservation Society of Canada is willing to advise on future surveys, analyze data and submit it to the NABat.

Volunteer support to complete surveys (two nights and two days) and funding for data analysis will be required, with additional support needed for surveys of transects in and around the Village of Pemberton.

Based on outreach completed and learning, experience and equipment acquired through this project, it is recommended that future discussions with the Lil'wat Nation and N'Quatqua First Nation be undertaken to discuss collaborating on acoustic surveys for bats. Areas of interest include Mount Currie, the community of Xeťólacw, along Portage Road and around D'Arcy. This work would contribute to greater awareness and involvement of these communities in stewardship activities for bats as well as increased understanding of bat species in the region.

### 4.2.3 Bridge and Culvert Surveys

It is recommended that acoustic recordings of bats be collected and analyzed for bridges where abundant guano or bats were observed. This data will enhance our understanding of the bat species using bridges and aid in undertaking appropriate management actions for these species.

If additional roost sites are not identified for future roost counts, then bridges being used by bats are eligible as roost count locations under the BC Annual Bat Count. Even if these bridges are not surveyed under this program, at least one count should occur during the pre and post-pup survey period to understand better the abundance of bats using each structure and if they are bachelor or maternal roosts.

Through bridge assessments it was found that many bridges, especially newer ones, lacked suitable openings for use by bats, despite often having signs of temporary or minor bat use. It is possible that bridges in the Pemberton area could be used as important locations to enhance bat populations through the placement of suitable structures underneath existing bridges or via modifications to the design and construction of new bridges. This opportunity to steward bats is considered significant given the large number of bridges that were found to be used by bats, the suitability of habitat that surrounds many bridges for bats, the success of bridge enhancement for bats that has been achieved elsewhere and the relative ease and low cost of undertaking enhancement actions. Two important resources available to assist in such works are [Bats in American Bridges](#) and [Bats and Transportation Infrastructure](#).

Through communications and data sharing with the BC Ministry of Transportation and Infrastructure, they expressed an interest in potentially supporting future work on bats in the Pemberton area. This is project dependent and could include provision of wildlife cameras and associated supplies. In addition to this assistance, funding could also be sought through their Environmental Enhancement Fund to support a collaborative project for the benefit of bats, such as bridge enhancement and/or further surveys and monitoring.

### 4.2.4 Guano Sample Collection

A number of guano samples were collected as part of this project. However, there were a few roost count sites where guano was not collected directly at the roost (i.e., Tschopps) or not at all due to accessibility concerns (i.e., Miller). It is recommended that future surveys of these roosts try to obtain guano samples for species identification through DNA analysis.

In addition to the above roost count sites, there were nine bridges where guano was not collected; eight of these were believed to be temporary night roosts and one a bachelor or

maternal roost. Collecting guano from these sites and also any additional bridges or culverts found to be used by bats is desirable, particularly bachelor or maternal roost sites.

## 5 References

Kellner, M. 2018. British Columbia Community Bat Program annual bat roost counts (2012-2017). Update. Available at:  
<https://bcbats.ca/attachments/Annual%20Bat%20Count%20Summary%202012-2017.pdf>

## 6 Appendices

Bat and roost sighting poster placed up in numerous locations in the Village of Pemberton and in Mount Currie throughout the project.




Photo credit: David Wills



**Bats are incredibly important to our local ecosystems and economy: controlling insect populations and acting as environmental health indicators.**

**White-nose syndrome**, an introduced fungal disease, has killed millions of bats across North America and is spreading west. It does not affect humans.






**We need your help** monitoring the spread of this disease to protect our bats and overall ecosystem health.

**If you find a dead bat, see winter bat activity, or know of a bat roost please contact** [info@bcbats.ca](mailto:info@bcbats.ca), [wildlife@pembertonwildlifeassociation.com](mailto:wildlife@pembertonwildlifeassociation.com) or 604-349-4760

**Your help is invaluable to us and our bats!**

Find more information at [www.bcbats.ca](http://www.bcbats.ca)

An initiative of the Pemberton Wildlife Association. Supported by Stewardship Pemberton Society, BC Community Bat Program, BC Ministry of Environment and Climate Change Strategy and Pemberton Valley Supermarket. Funded by Community Foundation of Whistler and BC Conservation Foundation.



Examples of social media project updates and roost sighting and volunteer request posts.

### Pemberton Bat Conservation

#### The PWA bat project has taken flight!

As part of the [North American Bat Monitoring Program](#) and with support from our partners, four acoustic monitoring stations have recently been established in the Pemberton area that will record bats for 7 days.

Four **transects** have been completed, one 48km in length, in the area to assess the species, relative abundance and distribution of bats. A **transect** is a fixed path along which occurrences of the species of study are counted resulting in an estimate of the density of the species.



As part of the [Community Bat Programs of BC](#), we'll be monitoring two bat roosts four times this summer.

We are looking for additional roosts to monitor and volunteer help with those surveys. Please contact [wildlife@pembertonwildlifeassociation.com](mailto:wildlife@pembertonwildlifeassociation.com) if you have any bat roost sightings or would like to volunteer.



Thank you to the [Community Foundation of Whistler](#) and [BC Conservation Foundation](#) for funding our work on bats in the Pemberton area this year. And thank you to our supporting partners, the [Community Bat Programs of BC](#), [BC Ministry of Environment and Climate Change Strategy](#), [Quest University Canada](#), and [Pemberton Valley Supermarket](#).

#### Bats and Birds!

Stewardship Pemberton (SPS) is teaming up with the Pemberton Wildlife Association to further our understanding and appreciation of bats and bird species at risk. If you know of any bat roosts, would like to know more about the work we're doing on bats / bird species at risk in the Pemberton area this year and/or would like to be involved in local monitoring activities, please contact [wildlife@pembertonwildlifeassociation.com](mailto:wildlife@pembertonwildlifeassociation.com)

Bat Conservation Pemberton project information sheet shared with community members, partners and others, such as the Village of Pemberton and Lil'wat Nation.

# Bat Conservation Pemberton

## Background

Bats are ecologically, socially and economically important. BC has the richest diversity in Canada (16 species). Yet they and their habitats are at risk, with half of BC's species of conservation concern.

Very little is known about the presence, distribution and abundance of bats and their habitats in the Pemberton area. Action is needed to resolve these conditions and conserve bats and their habitats given their status and importance.

## Goal

Increased understanding and appreciation of bats and their habitats and community involvement in stewardship and conservation activities in the Pemberton area.

## Focal Area

Pemberton area, encompassing the Lillooet, Birkenhead, and Gates River watersheds (Mount Currie, D'Arcy). Activities will focus on residential, rural, and wilderness areas.

## Community Support

- All stakeholders are asked to share project information and contact us to become involved in shared stewardship activities.
- Landowners and others (governments, businesses) are asked to report bats on their property (roosting in buildings, boxes, or trees, dead bats) and support inventory and monitoring (counts) as part of BC's Bat Community Roost Count Program.
- Volunteers are being sought to help monitor bat roosts and conduct surveys under the North American Bat Monitoring Program to define the presence, relative abundance and distribution of bats in the Pemberton area, acting as a baseline of bat 'health'.
- Landowners are being asked to conserve known roost sites and bat habitats (riparian areas, water bodies, old and dead trees, no or low lit areas), eliminate threats (cats, pesticides), and enhance habitat (placing bat houses).
- All stakeholders are asked to contact us with questions or concerns about bats (dead or sick individuals, bats in their house, roof or attic) or their habitats.

## Participants

Citizens and landowners (private, governments, businesses) with an interest in understanding and conserving bats and their habitats in the Pemberton area. Potential landowner benefits of conserving bats and their habitats include wildlife viewing opportunities, enhanced aesthetics, higher property values, long-term investment, leaving a family legacy, tax credits (ecological gifting) and increasing ecosystem services (pest control).


For further information please contact Greg Ferguson [wildlife@pembertonwildlifeassociation.com](mailto:wildlife@pembertonwildlifeassociation.com)

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Initiative of the Pemberton Wildlife Association in partnership  
with Stewardship Pemberton Society

Funded by Community Foundation of Whistler &  
BC Conservation Foundation


Supported by the Community Bat Programs of BC, BC Ministry  
of Environment & Climate Change Strategy & Quest University




Pemberton  
Wildlife  
Association  
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Community  
Foundation  
of Whistler




Community  
bat  
Programs of BC




BRITISH  
COLUMBIA  
Ministry of Environment &  
Climate Change Strategy



QUEST  
UNIVERSITY



Stewardship  
Pemberton  
Society



Stewardship Pemberton Society

Poster advertising two educational walks provided to the community on owls and bats that was placed up in numerous locations throughout the Village of Pemberton and in Mount Currie.

# Join Us!!

## One Mile Lake Owl & Bat Prowl

Learn about the creatures of the night!!

Join biologists on a walk around One Mile Lake to learn about:

- \* natural history of owls & bats
- \* efforts to conserve these species in Pemberton
- \* stewarding these unique & important species

Meet at Stewardship Pemberton Nature Centre  
Wednesday, July 10th & 24th  
8:15 to 10:00pm

Further information & to register: [wildlife@pembertonwildlifeassociation.com](mailto:wildlife@pembertonwildlifeassociation.com)

Initiative of the Pemberton Wildlife Association in partnership with Stewardship Pemberton Society  
Funded by Community Foundation of Whistler, BC Conservation Foundation, Patagonia, Bird Studies Canada & the Baillie Fund Trustees on behalf of the Ontario Eastern Bluebird Society & Pemberton Valley Supermarket

Supported by the Community Bat Programs of BC, BC Ministry of Environment & Climate Change Strategy & Quest University



Bat fact sheets provided to educational walk participants, community members and landowners.

# One Mile Lake Owl & Bat Prowl

# BC Bats

## Bats are Beneficial !!

Indicator of a healthy environment & important in controlling insect populations

Estimated to save the agricultural industry \$30M per year in Canada

Transfer nutrients from wetlands to forests - guano (bat droppings) is an excellent fertilizer

### Threats to Bats

**Habitat disturbance, loss & fragmentation:**

- removal of bats from buildings, bridges & mines
- cutting trees & riparian areas
- filling in water bodies
- noise & light pollution

**Predation:** particularly by house cats

**Pesticides:** kill bat food (insects) & can poison bats

**White-nose syndrome:** killed 6M bats in North America & 90% of little brown bats in eastern North America

**Wind farms:** bats can run into turning blades or have lungs impacted by dramatic changes in air pressure around the turbines.

### How You Can Help?

- **Protect & restore bat habitats on your property**
- **Allow bats to stay in your buildings**
  - Put up bat houses
  - Educate others about the importance of bats
- **Report bat roosts & unhealthy/dead bats to the BC Community Bat Program**
- **Do not approach or handle an injured or lethargic bat or one out during the day**

Further information: [wildlife@pembertonwildlifeassociation.com](mailto:wildlife@pembertonwildlifeassociation.com)

Initiative of the Pemberton Wildlife Association in partnership with Stewardship Pemberton Society  
Funded by Community Foundation of Whistler, BC Conservation Foundation, Patagonia, Bird Studies Canada & the Baillie Fund Trustees on behalf of the Ontario Eastern Bluebird Society & Pemberton Valley Supermarket

Supported by the Community Bat Programs of BC, BC Ministry of Environment & Climate Change Strategy & Quest University

# BC Bat Facts!

## Bats in BC

16 species are known to live in BC, half are threatened or endangered. All are primarily nocturnal.

## Size

BC bats are all small (mouse size body) & called microbats versus megabats.

The average BC bat weighs 7 loonies. The average little brown bat weighs 4 pennies.

## Diet

All bats in Canada eat only insects (insectivores). One bat can consume 1000 insects a night.

Male bats can eat half & nursing females can eat their full body weight in insects every night.

## Migration

Most bats in BC do not migrate, staying in buildings, dead trees, caves, rock crevices or mines over winter.

Silver-haired bat: migrates short distances (1000km) - called migratory-hibernator

Hoary bat: migrates long distances (5800km) - called migratory

Bats make up 25% of mammal species on Earth

Mothers have one baby (pup) in a good year - ability for populations to grow is limited.

Mothers provide all pup care

Pups feed on milk & cling to their mother or roost before beginning to forage at 3 to 4 weeks

Fur covering bat bodies range from black, brown, grey, red, white & orange

## Sight & Echolocation

Bats see as well as other mammals but not in colour.

Most bats are nocturnal using echolocation to navigate & hunt, emitting high pitch squeaks/clicks above the frequency humans can hear. Analyzing the echo from objects as fine as a hair forms a picture of their surroundings.

Bats can send out almost 200 clicks per second when feeding.

## Flight

Bats are the only mammal capable of sustained flight. Bat bones are very thin & light making it easier for them to fly.

Thumbs are free from the wing and used to cling to trees & other surfaces.

Bats hang upside down - their feet form a locking grip allowing rest when asleep & hibernating.

## Hibernation

BC bats hibernate in hibernacula (cool, humid & safe locations) from 5 to 8 months. Some bats migrate more than 1000km to hibernacula.

## Additional Information:

### Websites

BC Community Bat Program: [www.bcbats.ca/index.php](http://www.bcbats.ca/index.php)

Bat Conservation International: [www.batcon.org/](http://www.batcon.org/)

E-fauna: <http://ibis.geog.ubc.ca/biodiversity/efauna/BatsofBritishColumbia.html>

US National Park Service: [www.nps.gov/subjects/bats/index.htm](http://www.nps.gov/subjects/bats/index.htm)

Canadian Wildlife Federation: <http://cwf-fcf.org/en/explore/bats/bats-101.html>

### Books

Bats of British Columbia. 1993 R. Mark Brigham and David W. Nagorsen. Royal BC Museum Handbook.

Backyard animals: bats. 2010. Annalise Bekkering. Weigl Publishers Inc. The bat scientists. 2010. Mary Kay Carson. Houghton Mifflin Harcourt Publishing Company.

The secret life of the little brown bat. 2018. Laurence Pringle. Boyds Mills Press.

# Bat Conservation Pemberton: Understanding, Appreciating and Stewarding Bats in Pemberton

## Educational walk outline developed for owl and bat prowl.

### General

- Ask people questions about message information before giving it to them. Get them thinking and participating (active versus passive).
- Be as hands on as possible (seeing, touching, listening, acting, doing)
- Walks: Wednesday July 10 and 24, 815 to ~10pm. Sunset: July 10: 922pm and July 24: 907pm

Time	Location - Activity	Information/Message	Materials
730 - 815	Nature Centre	- Walk leaders arrive and prepare for event	Set out materials listed below
815 - 820	Nature Centre - Sign In	- Participants arrive at Nature Centre and are greeted - Sign in (waivers, photo release, volunteer and stewardship form/interest)	- Waivers - Photo release - Project descriptions - Business cards
820 - 825	Nature Centre - Introduction	<ul style="list-style-type: none"> <li>• Introduce ourselves and others</li> <li>• Introduce bat and owl species at risk projects in Pemberton</li> </ul> - Why: 1) little is known about the status (species, distribution, health, roost/nest sites) of bats and owls in Pemberton, 2) to collect status data before threats such as white nose syndrome impact species, 3) encourage education, conservation and stewardship. Data collected for national and provincial programs and used by local governments, stewardship groups, and landowners - Working on other species at risk: Great Blue Heron, Common Nighthawk, and swallows, particularly Barn	Open space
825 - 835	Nature Centre - Importance of Bats and Conservation	<b>Why are they Important and Beneficial?</b> <ul style="list-style-type: none"> <li>- Control insect populations such as pests of people, agriculture, and forestry (e.g., save Canadian agricultural industry \$30M a year)</li> <li>- Transfer nutrients from wetlands to forests and guano (bat droppings) are excellent fertilizer</li> <li>- Have been used to make medicine to help people who've had heart attacks or strokes</li> <li>- Signs of a healthy environment</li> </ul> <b>Are Bats Pests?</b> <ul style="list-style-type: none"> <li>- Are more closely related to people than rodents</li> <li>- Are not dirty, cleaning themselves frequently by grooming like cats and take special care of their wings</li> <li>- Show their teeth and squeak loudly when stressed and feel threatened and may bite</li> <li>- Don't chew buildings or wires</li> <li>- Don't fly in people's hair</li> <li>- Very few carry rabies virus. Don't approach or handle them like other animals</li> </ul>	- Open space (floor)

Time	Location - Activity	Information/Message	Materials
		<b>What are their Threats?</b> <ul style="list-style-type: none"> <li>- Habitat loss: cutting trees particularly old and riparian, filling water bodies, noise and light</li> <li>- Predation by house cats</li> <li>- Pesticides: killing their food supply and poisoning them</li> <li>- Wind farms</li> <li>- White-nose syndrome (disease caused by a fungus, wakes bats in winter, killed more than 6M bats in North America in 10 years and about 90% of little brown bats in eastern NA)</li> </ul> <b>How can you help bats?</b> <ul style="list-style-type: none"> <li>- Protect and restore their habitats on your property and elsewhere</li> <li>- Make your home safe for bats and you</li> <li>- Place up bat houses in suitable locations</li> <li>- Educate others about how amazing and important bats are</li> <li>- Don't approach an injured or lethargic bat or one out in the day</li> <li>- Report bat roosts and unhealthy and dead bats to the BC Community Bat program</li> </ul>	
835 - 845	Nature Centre	<b>Break and Safety Talk</b> <ul style="list-style-type: none"> <li>- Provide hot chocolate and cookies</li> <li>- Safety: destination, activities, duration; possible hazards (e.g., water, animals) and avoidance.</li> </ul>	- Kettle - Water - Hot chocolate - Cookies
845 - 905	Outside (stop along creek and at beach and talk about props) - Bat Natural History	<b>Bats in BC</b> <ul style="list-style-type: none"> <li>- 16 species, half are at risk (define what a species at risk is)</li> <li>- All are primarily nocturnal (define what nocturnal is)</li> <li>- A little brown bat in BC lived for 33 years, much longer than other small animals</li> </ul> <b>Mammals</b> <ul style="list-style-type: none"> <li>- Mothers have one baby (pup) in a good year (limited reproduction/population growth), take on all parental responsibility. Pups feed on milk and cling to mother or roost while growing. Begin foraging when three to four weeks old</li> <li>- Bodies are covered in fur ranging in colour from black, brown, grey, red, white, orange</li> </ul> <b>Size</b> <ul style="list-style-type: none"> <li>- BC bats are all small (mouse size body) and called microbats versus megabats</li> <li>- Average BC bat weighs about 7 loonies. Little brown bat is about 4 pennies</li> <li>- Have a large head, ears, and very large wings</li> </ul> <b>Flight</b> <ul style="list-style-type: none"> <li>- Only mammal capable of sustained flight</li> <li>- Bones are very thin and light making it easier to fly</li> <li>- Have a thumb free from the wing used to cling to trees and other surfaces</li> </ul>	- Books - Pictures: wing and bones - Fur - Weight examples (loonies, pennies)

## Bat Conservation Pemberton: Understanding, Appreciating and Stewarding Bats in Pemberton

Time	Location - Activity	Information/Message	Materials
		<p><b>Sight and What is Echolocation?</b></p> <ul style="list-style-type: none"> <li>- Most bats are nocturnal so they use echolocation to navigate and hunt. Emit high pitch squeaks/clicks (ultrasonic sounds) above the frequency humans can hear. They analyze the echo returned from objects as fine as a hair to form a picture in their brain of their surroundings</li> <li>- Can send out almost 200 clicks per second when feeding</li> </ul> <p><b>What do they Eat?</b></p> <ul style="list-style-type: none"> <li>- What do bats eat in Canada (only insects, thus called insectivores) and elsewhere?</li> <li>- One bat can consume 1000 insects (beetles, mosquitoes, moths, mayflies, midges, gnats, crane flies) a night and there can be lots of bats</li> <li>- Bats can eat half (males) to their full (nursing females) body weight in insects every night</li> </ul> <p><b>What do they do during Winter?</b></p> <p><b>Hibernation</b></p> <ul style="list-style-type: none"> <li>- Where: a hibernacula - cool (just above freezing), humid and safe location, very few in BC</li> <li>- How: store fat (few grams), reduce energy use by slowing heart rate from 200-300bpm to 10bpm and lowers body temperature to the air temperature in hibernacula, usually just above freezing</li> <li>- Duration: 5-8 months</li> </ul> <p><b>Migration</b></p> <ul style="list-style-type: none"> <li>- Most bats in BC don't migrate (stay in buildings, dead trees, caves, rock crevices, mines)</li> </ul> <p><b>Habitats</b></p> <ul style="list-style-type: none"> <li>- Needs: food, water, space, shelter, friends, low disturbance</li> <li>- Bat roosts: buildings (roofs, attics, sheds, barns), bridges, trees, rock cracks, caves, bat houses. Roost together to keep warm, often in small spaces and high up to protect themselves from predators</li> <li>- Predators: humans, cats, owls, hawks, small mammals, snakes, dogs. Especially vulnerable on moon light nights</li> </ul>	
905 - 925	Outside (stop along creek and near forest and talk about props) - Owl Natural History	<p><b>Nocturnal</b></p> <ul style="list-style-type: none"> <li>- &lt; competition, predation, roost during day</li> <li>- Convergent evolution with hawks (night time hawks, related to nighthawks)</li> </ul> <p><b>Hearing</b></p> <ul style="list-style-type: none"> <li>- Large ear drums that can be off-set, ear shape and feathers funnel sound, sound reached each ear different time, large number of hearing receptors</li> </ul> <p><b>Sight</b></p> <ul style="list-style-type: none"> <li>- Large eyes (capture light) that can't move, thus head turning, head bobbing to gauge distance, large # of rods in retina (sensitive to dim light), binocular vision, eye shine - layer of tissue at back of eye reflects light back to the retina increasing light availability</li> </ul>	<ul style="list-style-type: none"> <li>- Open space ( floor, chairs)</li> <li>- Books</li> <li>- Wing</li> <li>- Feathers</li> <li>- Taxon</li> <li>- Pellets</li> </ul>
		<p><b>Feathers and Camouflage</b></p> <ul style="list-style-type: none"> <li>- Silent: have soft serrated feather margin and fuzzy surface muffles sound of air during flight and movement</li> </ul> <p><b>Hunting</b></p> <ul style="list-style-type: none"> <li>- Day and night, mostly crepuscular, carnivores, foot size and toe arrangement</li> <li>- Pellets: swallow food whole, compact and regurgitate feathers, fur and bones, roost sites</li> </ul> <p><b>Habitats</b></p> <ul style="list-style-type: none"> <li>- Needs: food, water, space, shelter, friends, low disturbance</li> <li>- Owl nests: tree cavities, platforms, ground, burrows, usually monogamous</li> <li>- Predators: humans, cats, other owls, hawks, mammals.</li> </ul> <p><b>What are their Threats?</b></p> <ul style="list-style-type: none"> <li>- Habitat loss: cutting trees particularly old and riparian, noise and light</li> <li>- Predation and displacement by Barred Owl</li> <li>- Road mortality</li> <li>- Pesticides (highlight rodenticides)</li> </ul>	
925 - 940	Bridge Site - Bat Survey	<ul style="list-style-type: none"> <li>- Best time to look for bats is during the summer, between sunset and one hour after when bats are leaving their roosts. Usually they want a drink first so watching near an open water body is good place. Insects are attracted to lights so bats can often be seen around lights.</li> <li>- Explain equipment and how to conduct a survey</li> <li>- Do survey counting and using detector</li> </ul>	<ul style="list-style-type: none"> <li>- Phone</li> <li>- Detector</li> <li>- Books</li> </ul>
940 - 955	Hillside Site - Owl Survey	<ul style="list-style-type: none"> <li>- Explain equipment and how to conduct a survey</li> <li>- Do short survey for Barred Owl</li> </ul>	<ul style="list-style-type: none"> <li>- Phone</li> <li>- Owl calls</li> <li>- Speaker</li> </ul>
955 - 10	Nature Center - End Walk	<ul style="list-style-type: none"> <li>- Walk back to Nature Centre</li> <li>- Have a quiz, if time: 1) what is a species at risk and how can you help them? 2) where do bats live during the summer? 3) list three ways you can help bats? 4) what special features do owls have that allow them to catch prey at night? 5) how are humans and animals similar and why should we care about them?</li> <li>- Thank people for coming</li> </ul>	
10 - 1015	Nature Center	<ul style="list-style-type: none"> <li>- Answer any remaining questions</li> <li>- Clean up</li> <li>- Follow up email</li> </ul>	

Owl and bat prowls educational walk participant feedback form.

## Pemberton Wildlife Association & Stewardship Pemberton One Mile Lake Owl & Bat Prowl - Feedback

What was your favourite part of the Owl & Bat Prowl?

Your answer

What was your least favourite part?

Your answer

Did you learn anything new? If so what?

Your answer

Was any information provided valuable to you? If so what?

Your answer

Do you have any suggestions about how to improve the Owl & Bat Prowl?

Your answer

Did this walk inspire you to act to steward bats and/or owls?

Your answer

Is there any other information that you would like to provide to the Pemberton Wildlife Association and Stewardship Pemberton?

Your answer

**Thank you very much for taking the time to provide us with your feedback. Your comments are very valuable to us!**

**SUBMIT**

Never submit passwords through Google Forms.