



Identifying and securing hibernation habitat for bats in the Columbia Basin in response to risk of White Nose Syndrome



Year 1 Summary

by

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Executive Summary

Bat detectors were used to acoustically monitor the East and West Kootenays for winter bat activity and for species diversity just prior to and just after the hibernation period. Potential hibernation sites were also mistnetted, and internal observations were made of some mines to determine bat use. Capture and mistnetting took place in the fall and winter to track bats to hibernacula and to understand winter bat ecology, including roost selection, and behaviours such as mating, roost switching, and foraging.

A total of 38 sites were monitored between mid Sept. 2011 and mid April 2012. A total of 265 bats were captured of 5 species, and 18 bats of 3 species were radiotracked. Several new winter roosts were determined using radiotelemetry, and a number of other hibernacula were confirmed. Species diversity active in winter was verified with capture: the most active species are *Myotis californicus*, *Lasiorycteris noctivagans*, and *Corynorhinus townsendii*. Some *Eptesicus fuscus* were detected/observed. Large numbers of *Myotis yumanensis* were active late into fall and early in spring, but none of this species was captured during winter, suggesting they may not be active in winter months. Other bat species thought to be hibernating species in the Kootenay region include: *Myotis lucifugus*, *M. evotis*, *M. thysanodes*, *M. volans*, *M. septentrionalis*, yet these species were not captured during winter, and only a few acoustic recordings were made mid-winter that could be a these other myotis species. Many of these other *Myotis* species had left the main fall study area in the West Kootenay (Creston) by mid-Sept., with the exception of *M. thysanodes* that seemed to be present into October and greater than normal detections of this species suggests that it was increasing in numbers in the area, perhaps just temporarily during mating/migration.

Winter roosts of *M. californicus* were rock crevices and mines. Winter roosts of *L. noctivagans* were rock crevices, snags, trees and mines. The greatest number of winter bat passes was at Reeves McDonald Mine in the Pend O'Reille, but attempts to access this mine mid-winter were not successful due to the extreme depth and steep angle of the mine shafts. It is likely that this is a major bat hibernaculum for at least 3 species.

Introduction

Overview

Ten of the 11 species of bats known from the Columbia Basin hibernate; however, how many species hibernate in the Basin is still uncertain. A new fungal disease (White Nose Syndrome; WNS) of hibernating bats has already decimated some eastern US bat populations, and is spreading west more quickly than anticipated. Evidence suggests humans can spread the fungal spores (e.g. mud on boots) and efforts to educate the public, caving and geocaching communities are required to slow WNS spread.

The longer that the West remains WNS-free, the greater the chance a prevention strategy will be in place to save our bats. In Sept. 2010 the first WNS breakthrough (fungicidal drug) was announced. To save bats from WNS using this new method requires knowing where bats hibernate. A goal of this project is to use acoustic ultrasound recordings, capture and radiotelemetry to locate bat hibernacula, determine which species overwinter in the Columbia Basin, and describe overwintering behaviour such that degree of vulnerability to WNS can be evaluated. It is likely that dams flooded low elevation bat hibernacula (e.g. caves, mines, snags, old growth trees); despite this, potential low elevation bat hibernacula still exist in the Columbia Basin. However, much of this potential winter habitat is not protected. For example, several low elevation mines in the West Kootenay have been found to house hibernating bats. Yet, abandoned mine closures are occurring without consideration of bats (e.g. several in Ymir in 2009).

Hibernating bats are vulnerable to disturbance; several hibernacula of the threatened Townsend's Big-eared bat in the Columbia Basin are active geocaching sites. Goals of this project include: working with government officials to make appropriate decisions regarding methods of mine closures; collaborate with other groups (e.g. B.C. Geocaching Association, B.C. Bat Action Team) to educate the public on the serious threats that face hibernating bats. Bats are the primary consumers of night-time insects, including forest pests such as spruce budworm moth, and have the slowest reproductive rates of any small mammals; a drastic population decline of bats will have noticeable ecological effects. The over-arching goals of this research project are to secure habitat, save bats, and preserve species diversity.

Background

The WNS threat.—White Nose Syndrome (WNS) is a new fungal disease which causes bats to starve to death during hibernation. A common species of bat, the little brown myotis, has already been extirpated from the epicenter of this fungal outbreak, near Albany, New York, and further extirpations and species extinctions are predicted^{1,2}. Since its discovery at a single cave in 2006, the WNS fungus has been spreading across North America, and is currently found as far west as Oklahoma, in a total of 19 states.

The presence of WNS was officially announced in Canada in spring 2010. It is in 4 Canadian provinces and anticipated in Manitoba in the near future³.

What can be done.— WNS research is in its infancy, with new prevention strategies and possible solutions on the horizon. In Sept. 2010, a US lab announced a new fungicidal drug that could be administered to WNS-infected bats⁴. Bacterial flora is also being investigated with the potential of inoculation strategies⁵ and understanding whether winter feeding staves off WNS⁶. To benefit from these research findings, we need to know where bats hibernate in the Columbia Basin and whether they feed mid-winter.

Protecting Winter Bat Habitats.— Important low elevation winter habitat for bats would undoubtedly have been flooded by dams in the Columbia Basin (ie. caves, rock crevices, snags, large girth trees with defects), but many low elevation mines in this region exist and may have in part mitigated for some of this habitat loss. Unfortunately, mines have and continue to be sealed for public safety. In B.C., bats are rarely considered in these closures. The collapse rather than gating of mine openings can result in the loss of important habitat for bats overwintering in the Columbia Basin. A number of low elevation mines in the Columbia Basin have already been found to contain overwintering bats (pers. obs.; T. Hill, FWCP, pers. comm.). Many more mines that we have located using the BC MinFile have already been closed, including several mines in the Ymir area, closed in 2009. Bats were not considered in these closures. Unfortunately, to date there have been no agreements in place between Ministry of Energy, Mines and Petroleum Resources, Ministry of Agriculture and Lands, Ministry of Tourism, Culture and Arts, and Ministry of Environment regarding bats and mines.

Habitat Enhancement.—Bat habitat enhancement to promote bat populations is being encouraged continent-wide. The Columbia Basin is the richest area of the province for abandoned underground mines⁶ and thus holds the most promise of any region in B.C. to enhance winter bat habitat through bat-friendly mine closures. White Nose Syndrome has a 90-100% kill rate once it gets into a hibernaculum. In the eastern US, this has resulted in the deaths of hundreds of thousands of bats in a single cave. However, western caves/mines are thought to house much smaller groupings of bats. Keeping the density of potential hibernacula high in the Columbia Basin may help to keep numbers of bats in any one cave/mine low, which may be advantageous in a number of ways including containment opportunities.

Objectives of this Project

We cannot protect winter habitat for bats if we do not know where they spend the winter. We also cannot implement WNS solutions (e.g. fungicidal drugs) unless we know where bats are hibernating. An objective of this project is to locate bat hibernacula for future habitat protection and to enable WNS prevention/treatments.

We don't know which bats are at risk of WNS until we know what species overwinter here, and whether their winter behaviour makes them susceptible to WNS. Fourteen of the 16 species of bats in B.C., and ten of the 11 species of bats in the Columbia Basin compensation area, hibernate making them potentially vulnerable to WNS die-off. Objectives of this project are:

- a. to identify which bat species overwinter in the Columbia Basin,
- b. determine whether winter foraging is occurring,
- c. describe winter behaviours that may influence WNS-susceptibility, including foraging, clustering, and microclimate selection.

We cannot protect bat hibernacula without public education and government cooperation. Educating the public to avoid WNS contamination of our hibernacula buys time during which fungal research will continue and other WNS prevention/treatments may arise.

Objectives of this project are:

- a. to continue working with B.C. Bat Action Team and government ministries to have bats considered in all mine closures;
- b. continue efforts to educate the public about the importance of bats, vulnerability of hibernating bats to disturbance, and WNS risks associated with caving, mine exploration, geocaching, etc.

Methods

Acoustic monitoring was conducted with ultrasound bat detectors (Anabat, Titley, Australia and SM2BAT, Wildlife Acoustics, Massachusetts) to identify areas of substantial bat activity during winter, determine likely species overwintering in the Columbia Basin, and examine behavioural patterns important to determination of WNS vulnerability.

Consultation with local residents/biologists helped locate potential hibernacula (e.g. mainly mines). In both East and West Kootenay, examination of low elevation mines and caves for overwintering insects (potential winter food supply for bats) and bats was conducted.

Mistnets were strung in areas of high activity, such as mine entrances. Flying bats were captured and fitted with a transmitter <5% of body mass, and where possible less than 3% (using Permatype surgical nontoxic latex adhesive). Radiotelemetry was conducted to locate hibernacula, determine important winter habitat, and describe overwintering behaviour. Some

transmitters used were temperature sensitive to determine body arousal patterns during hibernation. Presence/absence of tagged bats in roosts and temperature of bat was logged using one of the following receivers: HABIT (Vancouver), Australis Logger (Australia), or LOTEK SRX400 (Canada).

Plastic was laid in 3 mines and regularly checked for feces. The mines selected for this were known from previous acoustic monitoring to have bats flying in and out of them, but rarely have bats day roosting in them.

Bats were banded in winter and spring (all species except *Corynorhinus townsendii*). This is being done to keep track of individuals at sites that will be visited repeatedly during this project and for long term monitoring, population estimates and potential determination of migration/breeding routes.

Results

Many sites were examined for likelihood of having bats in winter, or to be used by bats in winter due to open water and suitable winter habitat (e.g. trees, snags and/or rock crevices, mines or caves nearby). Of these sites, 38 were selected for inclusion in this winter project Year 1 (Table 1). Depending on the site, the following sampling methods were employed: acoustic monitoring using bat detectors, microclimate monitoring, fecal collection using plastic lining, internal observations, or mistnetting (see Table 1).

In total, in East and West Kootenay, 20 mines were examined and 18 of these showed some use by bats (e.g. bats acoustically detected or seen inside). All mines were relatively low in elevation (<920 m). The greatest number of winter bat passes was at Reeves McDonald Mine in the Pend O'Reille, but attempts to access this mine mid-winter were not successful due to the extreme depth and steep angle of the mine shafts. It is likely that this is a major bat hibernaculum for at least 3 species.

Although data are still being collected from detectors in the field, and much acoustics data remains to be analyzed, it appears that 2 high elevation sites had no bat activity during winter: Kootenay Lake Pass (Stagleap Provincial Park), and Retallick, with elevations of 1700 m and 1080 m despite calm open water available all year round and rocky terrain for potential roost sites. This may in part be due to high snow loads, or colder temperatures. Lack of bat activity mid-winter in the Gerrard area may also be explained by high snow loads, despite low elevation (<750m), open water, and many potential mine hibernacula in the area.

Most acoustic data have yet to be analyzed. However, preliminary analysis shows that species most active in winter as verified by captures are: *Myotis californicus*, *Lasionycteris noctivagans*, and *Corynorhinus townsendii*. Some *Eptesicus fuscus* were detected/observed but none were

captured. Large numbers of *Myotis yumanensis* were active late into fall and early in spring, but none of this species was captured during winter, suggesting they may not be active in winter months. Some 40 kHz bat passes (*M. lucifugus* or *M. volans*) were detected at a few locations mid-winter, but most of the 40 kHz activity did not occur again until April. Forty kHz bat activity (*M. lucifugus* or *M. volans*) ceased by mid-Sept. in the main study area (Creston), suggesting that these species had left the area to mate/hibernate. In contrast, *Myotis thysanodes* activity was present into October and greater than normal detections of this species suggests that it was increasing in numbers in the area, perhaps just temporarily during mating/migration. One nonreproductive female *M. thysanodes* was radiotracked in late Sept. and found to roost in a ponderosa pine snag up Boulder Creek north of Sirdar. However, it is suspected this tag was shed prematurely since the signal remained at this snag for the duration of the transmitter's life.

During the course of the fall, winter and spring (20 Sept. - 25 April 2012), 248 bats were captured in 39 nights of mistnetting, and 5 species were captured: *M. thysanodes*, *M. yumanensis*, *M. californicus*, *Lasionycteris noctivagans*, *Corynorhinus townsendii*. There was a sex bias in captures, with 130 males being captured and 113 females captured (Capture details in Appendix 1). During winter (1 November – 30 March) there were 58 bats captured -- 43 males and 15 females. Of these, 37 were obviously adults and 19 were young of the year; age was difficult to discern in winter as epiphyses have fused in many juveniles, however, examining toothwear helped to resolve age class. Eighteen bats were radiotracked in the West Kootenay (Table 2); nine were tracked in fall, and nine were tracked mid-winter.

Some captures in the latter part of the winter were offered water and mealworm insides. No bats accepted water (n = 28), regardless of whether they were emerging from a roost at dusk. Of 14 captures offered mealworm insides, 10 accepted this food, and 4 refused. A dark fecal plug was evident in one *L. noctivagans*, but this bat was not offered food.

In fall, two bats were successfully radiotracked to potential hibernacula (one postlactating female *C. townsendii* and one male *M. yumanensis*). For further details about the *C. townsendii* hibernaculum, see Thomas Hill's FWCP report March 2012. The *M. yumanensis* male tracked in the fall, was captured 17 October 2011 at Pedro Naturals on the Creston Valley Wildlife Management Area, a known night roost for this species, just north of Sirdar. It day-roosted in a rock crevice in the ditch of the road on the uphill side a few hundred metres from its capture site. It disappeared from this area on 26 October 2011, and its signal was located on the west side of the Creston Valley directly across from Pedro Naturals (airplane used to locate signal). A helicopter drop was needed to find this roost, and this took place 2nd November 2011. The signal was located under a large boulder in a boulder field. The signal appeared to be coming from under the ground/boulder and there was no way to get into this roost so it could not be confirmed that the transmitter was still attached to the bat. It is possible this was not a hibernaculum for this bat as it was already under snow at the time of its discovery. This roost was at ~1800m in elevation.

Winter roosts of *M. californicus* were rock crevices and mines. Winter roosts of *L. noctivagans* were rock crevices, snags (Ponderosa pine), trees (Doug fir) and mines. With the exception of one *L. noctivagans* in *Syringa*, all transmittered *L. noctivagans* moved roosts and/or aroused from hibernation approximately once per week. Radiotransmitters did not have enough battery life to assess arousal/movement patterns in *M. californicus*.

Table 1. Sites in the West and East Kootenay included in Year 1 of the winter bat monitoring project. Method of sampling refers to whether the site was: monitored acoustically with a bat detector; internal observations were conducted to determine the presence of bats; plastic lining was used to collect feces by bats in winter; mistnetting was conducted to capture flying bats and confirm species, determine mass, reproductive status, etc.

<u>Location</u>	<u>Coordinate</u>	<u>Specific Site</u>	<u>Type of Site</u>	<u>Methods of sampling</u>	<u>Additional information</u>
Lardeau		Lardeau South Mine	mine, roost	internal observation, some internal temperatures, plastic lined for feces, and mistnetting	bat feces collected mid-winter; Townsend's big-eared bats captured and observed; hibernating insects
Lardeau		Lardeau North Mine	mine, roost	internal observation, acoustic and plastic lined for feces, and internal temperature	bat feces collected mid-winter; Townsend's big-eared bats and Californian myotis bats observed in previous years; 2012 Californian myotis bat capture and radiotracking; hibernating insects
Lardeau	11 U 502998 5557802	Lardeau Channel	slow moving channel of water open year-round	acoustic	
Creston		Bridge night roost on Hwy3	night roost bridge	acoustic	construction on bridge prevented spring monitoring
Castlegar	11 U 435485 5466673	Syringa Prov Park	campground with fly-ways near lake; rock crevice roosts in area	acoustic and mistnetting	mistnetted many times with few captures; radiotracked silverhaired bats to rock crevice roosts mid-winter
Castlegar	11 U 469338 5448528	Salmo-Castlegar corner railroad bridge	bridge night roost over railway track	acoustic	
Kootenay Pass	11 U 497057 5434316	Stagleap Prov Park	small lake high elevation, frozen in winter	acoustic	several years of acoustic monitoring; no bat activity mid-winter

<u>Location</u>	<u>Coordinate</u>	<u>Specific Site</u>	<u>Type of Site</u>	<u>Methods of sampling</u>	<u>Additional information</u>
Kaslo	11 U 507192 5528522	Kaslo Deck	house deck near edge of Kootenay Lake	acoustic	
Retallick	11 U 485368 5542737	Retallick Mine/Ponds	open ponds, water available year-round; near mines	acoustic	open calm water accessible all winter by several mines, but no bats recorded mid-winter
Crawford Bay	11 U 513425 5502108	Crawford Bay Bridge	bridge night roost over creek	acoustic	monitored in fall and spring; major night roost for Myotis, likely Yuma or Little Brown
Twin Bays		Twin Bays Mine	mine, roost	internal and acoustic	Educational Sign installed; hibernating insects
Wyndell area, north		Transformer Mine	mine, roost	internal observations and acoustic	Townsend's Big-eared bats observed/captured fall, spring; silverhaired (or big brown) and Californian myotis (or Yuma) detected; further mistnetting in winter should be done to verify species; hibernating insects
Trail	11 U 454912 5431348	Ft. Shepherd	flyway along Columbia River near rock habitat	acoustic	monitored fall, winter, spring for several years; a lot of winter bat activity, some 40 kHz bat activity; difficult to net and radiotrack due to no motorized access in winter, so not yet netted in winter
Creston	11 U 525336 5458723	powerline above Pedro Naturals	powerline near rock habitats and Duck Lake	acoustic (one night only)	

<u>Location</u>	<u>Coordinate</u>	<u>Specific Site</u>	<u>Type of Site</u>	<u>Methods of sampling</u>	<u>Additional information</u>
Pend O'Reille		Reeves McDonald mine	mine, roost	acoustic	extremely high rates of winter bat activity; access difficult but not impossible, and needs to be netted to confirm silverhaired vs. big brown bats, and Yuma vs. Californian Myotis
Creston	11 U 525308 5458162	Pedro Naturals on CVWMA	natural shallow caves	internal and acoustic	needs more monitoring mid-winter; fall and spring suggests some night roosting; spring/fall captures/observations of Yuma, Californian myotis and Townsend's big-eared
Nelson	11 U 472712 5482512	Taghum bridge roost	night roost bridge	internal observation and acoustic	
Kimberley	11 U 557912 5496301	Tony's property at St Mary Lake	open water in winter at edge of lake near rock habitat	acoustic	open water, calm -- one of few places this occurs on this lake; good rock habitat nearby; Californian myotis (or Yuma) and Silverhaired (or Big Brown) detected mid-winter. Suitable for netting and should be netted in winter yet.
Ft Steele		Copper King Mine	mine, roost	acoustic, and plastic lined for feces	bat feces collected end of winter; Educational Sign installed; hibernating insects
Kimberly		Dominion Mine	mine, roost	acoustic	internal observation by Dave Lewis; acoustic detection of Townsend's Big-eared
Bull River near Ft Steele	11 U 619626 5484814	Aberfeldie Dam	reservoir near rock habitat, patches seem to stay open much of	acoustic	

<u>Location</u>	<u>Coordinate</u>	<u>Specific Site</u>	<u>Type of Site</u>	<u>Methods of sampling</u>	<u>Additional information</u>
			winter		
Nelway-Salmo		Nelway mine	mine, roost	acoustic and mistnetting	Townsend's Big-eared bats observed/captured fall, spring; silverhaired (or big brown) and Californian myotis (or Yuma) detected; further mistnetting in winter should be done to verify species
Slocan City	11 U 465682 5513282	Valhalla Prov Park	near lake shore in trees	acoustic	
Pass Creek		Krestova cracks	natural shallow caves/crevices	acoustic, and internal temperatures	Californian myotis detected
Beasley		Queen Victoria Mine	mine, roost	acoustic, internal, internal and external temperatures	hibernating insects in mine; >15 hibernating bats, 3 species
Castlegar	11 U 455686 5460345	Iron CK	trail near boulder habitat with open water in winter due to small spring; may freeze periodically	acoustic (a few nights only) and mistnetting (but no captures)	
Ainsworth		Albion mine	mine, very deep with water and dam at back	acoustic	hibernating insects in mine
Woodbury		Woodbury lower south mine	mine	acoustic and internal obs and temps, and plastic, and mistnetting	bat feces collected throughout winter; Californian myotis detections inside mine; a lot of hibernating insects in mine
Woodbury		Woodbury lower middle mine	mine	mistnetting	extremely deep water in mine preventing internal examination. Californian myotis captured.

<u>Location</u>	<u>Coordinate</u>	<u>Specific Site</u>	<u>Type of Site</u>	<u>Methods of sampling</u>	<u>Additional information</u>
Woodbury		Woodbury upper mine	mine	acoustic	hibernating insects in mine but small opening partially closed by wooden gate; deep water in bottom of mine
Trail		Casino Mine	mine	acoustic (a few nights only) and mistnetting (no captures though)	gated. Californian Myotis detected.
Meadow Creek		Marblehead	quarry	acoustic and mistnetting (no captures though)	no captures, but further efforts should continue as Big Brown bats detected here mid-winter
Gerrard	11 U 480424 5595423	Gerrard Bridge	open calm water accessible all winter under bridge at river/lake confluence	acoustic	
Nelson	11 U 473181 5483242	Marsden Face	year-round open water; edge of water with ponderosa pine and rock habitat	acoustic	
Creston	11 U 541526 5439385	Mt. Thompson Mine	mine, roost	acoustic and internal observations and temperatures	Townsend's Big-eared bats hibernate here (6 - 8 bats); Educational sign posted
Meadow Creek	11 U 501100 5563918	Meadow CK near bridge	slow moving shallow creek open year-round near rock habitat	acoustic and netted (no captures)	
Creston	11 U 534142 5442696	Gamma's Adit	mine	acoustic (only a few nights)	owner has gated this with wooden gate; likely still allows bats in/out
Balfour	11 U 491393 5494568	Kokanee Creek Park	campground with fly-ways near lake	acoustic (only a few weeks)	no winter bat activity detected, likely because no trees or rock habitat

Table 2. Radiotracked bats. See Table 1 for reproductive codes.

Bat ID	Area	Site	Date Transmitter Applied	Species	Sex	Reproductive Status	Age	Day Roost(s)
110923-02	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	PL	A	Condo and Hay Barn, Creston
110922-09	Creston	Pedro	22/09/2011	<i>M. thysanodes</i>	F	nulli	A	Ponderosa Pine snag up Boulder Creek
110922-17	Creston	Pedro	22/09/2011	<i>Corynorhinus townsendii</i>	F	Lact	A	Rock boulder field up Cory Creek (See Thomas Hill's March 2012 FWCP report for further details on this bat)
110923-00	Creston	Tzakis roost	23/09/2011	<i>Corynorhinus townsendii</i>	F	PL	A	Building attic in Creston; winter roost not determined (See Thomas Hill's March 2012 FWCP report for further details on this bat)
111008-06	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	F	nulli	A	Condo and Hay Barn, Creston
111008-19	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	M	10%	A	Condo only; winter roost not determined
111015-01	Creston	Pedro	15/10/2011	<i>M. yumanensis</i>	M	75%	A	Condo only; winter roost not determined
111016-03	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	75%	A	Condo only; winter roost not determined
111016-19	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	F	VJ	VJ	Condo only; winter roost not determined
111216-01	Castlegar	Syringa	16/12/2011	<i>Lasionycteris noctivagans</i>	M	VJ	VJ	Rock crevice = winter roost
111216-02	Castlegar	Syringa	16/12/2011	<i>Lasionycteris noctivagans</i>	F	PL	A	Rock crevice = winter roost

120121-01	Nelson	Queen Victoria Mine	21/01/2012	<i>Lasionycteris noctivagans</i>	M	25%	A?	Ponderosa Pine snag, and Mine used as winter roosts
120121-03	Nelson	Queen Victoria Mine	21/01/2012	<i>M. californicus</i>	M	75%	A	crevice in mine = winter roost
120121-04	Nelson	Queen Victoria Mine	21/01/2012	<i>M. californicus</i>	M	60%	A	crevice in mine = winter roost
120121-05	Nelson	Queen Victoria Mine	21/01/2012	<i>M. californicus</i>	M	40%	A	crevice in mine = winter roost
120122-05	Nelson	Queen Victoria Mine	22/01/2012	<i>M. californicus</i>	F	PL	A	crevice in mine = winter roost
120208-05	Nelson	Queen Victoria Mine	08/02/2012	<i>Lasionycteris noctivagans</i>	F	PL	A	Ponderosa Pine snag, and Mine used as winter roosts
120223-01	Lardeau	North Mine	23/02/2012	<i>M. californicus</i>	M	67%	A	rock crevice and mine = winter roosts

Discussion

We located several bat hibernacula, although most of these were roosts of single bats. We successfully determined which species overwinter in the Columbia Basin. Acoustic analyses have only begun and thus this list may change; to date the following species are known to hibernate and fly periodically during winter in both East and West Kootenay: *Myotis californicus*, *Eptesicus fuscus*, *Lasionycteris noctivagans*, *Corynorhinus townsendii*. It is possible that other species will be found at some sites after the bulk of the passive acoustic data have been analyzed. Weather patterns likely correlate with bat activity patterns and that too has yet to be analyzed.

Species diversity active in winter was verified with capture: the most active species are *Myotis californicus*, *Lasionycteris noctivagans*, and *Corynorhinus townsendii*. Some *Eptesicus fuscus* were detected/observed. Large numbers of *Myotis yumanensis* were active late into fall and early in spring, but none of this species was captured during winter, suggesting they may not be active in winter months. Other bat species thought to be hibernating species in the Kootenay region include: *Myotis lucifugus*, *M. evotis*, *M. thysanodes*, *M. volans*, *M. septentrionalis*, yet these species were not captured during winter, and only a few acoustic recordings were made mid-winter that could be a these other myotis species. Many of these other *Myotis* species had left the main fall study area in the West Kootenay (Creston) by mid-Sept., with the exception of *M. thysanodes* that seemed to be present into October and greater than normal detections of this species suggests that it was increasing in numbers in the area, perhaps just temporarily during mating/migration.

Roost use by these species is as follows: *Myotis californicus* – mines and rock crevices; *Eptesicus fuscus* – unknown, captures of this species are needed yet; *Lasionycteris noctivagans* – mines, rock crevices, doug fir, ponderosa pine snags; *Corynorhinus townsendii* – mines and caverns under boulder fields. Although likely not a hibernaculum, *M. yumanensis* was found to have crawled under a large boulder in a boulder field at the start of winter. The greatest number of winter bat passes was at Reeves McDonald Mine in the Pend O'Reille, but attempts to access this mine mid-winter were not successful due to the extreme depth and steep angle of the mine shafts. It is likely that this is a major bat hibernaculum for at least 3 species.

Plastic laid in mines (n = 3; Lardeau north, Lardeau south, Woodbury Lower South) was used to collect feces from bats throughout winter. Feces were regularly collected from plastic and this suggests feeding is taking place in winter. These fecal pellets have yet to be analyzed genetically to confirm they are bat, to determine species of bat, and to determine whether the insects in the feces are the type found hibernating in the mines. There are black clusters of hibernating dipterans in most mines in the Kootenays. In many mines there are also moths (2

species seen, but mostly Tissue Moth - *Triphosa haesitata*, as identified by Libby Avis, Royal BC Museum). The Lardeau mines also contained small numbers of other insects, including some beetles, but the predominant hibernating arthropod was harvestmen in most mines. Bat detectors with stereo microphones were deployed in 2 of the mines that contained plastic. Preliminary analyses indicate that bats fly into these mines at night and leave again within a few minutes. Lack of day-roosting bats supports this hypothesis that in winter, bats, in particular *Myotis californicus*, fly into mines at night to forage on hibernating insects. An attempt at getting infrared video footage of this feeding was not successful because the standard trail video camera equipment would not trigger by the small body size of the bats, and in complete darkness recording was not successful. Infrared lights, and perhaps an ultrasound triggered camera (instead of motion/IR) is needed and currently this equipment is not budgeted for purchase; if it can be obtained on loan from somewhere, the video documentation of foraging bats in mines during winter could be possible.

Three main study sites were used for mistnetting and radiotracking: Syringa Provincial Park, Queen Victoria mine, and Lardeau/Meadow Creek mines. Despite making 6 mistnetting attempts in Syringa, the study site not associated with mines, bats were only captured on one attempt. At this location bats were found to use only rock crevice roosts, but more extensive tracking in winter would likely yield tree/snag roosts also because of the fact that *L. noctivagans* has been seen in a crevice of a tree mid-winter in this area while winter hiking (T.H. pers. obs.). Most captures and radiotracking took place at Queen Victoria mine. Here, *L. noctivagans* moved between trees and the mine for roosts. It is not clear whether bats would be hibernating in this area if the mine was not present. The mine might replace rock crevice use for *L. noctivagans*, increasing the winter range. It is equally possible that mines have replaced flooded lower elevation natural shallow caves or deep crevices that would have housed hibernating insects for mid-winter foraging by *M. californicus* and perhaps other species.

Foraging, clustering, and microclimate selection may all impact susceptibility to White Nose Syndrome (WNS). Because bats that were observed were not clustering, and if they were it was only in pairs, clustering does not seem to be a behaviour of bats that hibernate in low elevation mines in Kootenays. This, together with the possibility that winter foraging is taking place, means that *M. californicus*, *L. noctivagans*, *C. townsendii*, and perhaps *E. fuscus* may be at low risk of mortality from WNS. Genetic analyses to confirm winter feeding is needed, and until this is verified, this conclusion cannot be made. Microclimates of several roosts were documented, but these data have yet to be analyzed.

Several outreach components were part of this research. Through 2 public presentations (Rossland and Creston) we informed attendees about this research project, results to date, but most importantly, about White Nose Syndrome and how to avoid accidentally bringing this fungus into the mines/caves of the Columbia Basin. We have also installed educational signs into 3 mines in the West Kootenay and 1 mine in the East Kootenay so that as people enter these bat roosts they can learn about WNS and make a decision not to enter based on potential contamination and/or disturbance to bats in winter. We have also been working with the

Ministry of Environment to establish guidelines for the Ministry of Energy and Mines regarding prevention of WNS cross-contamination. These discussions have been successful to date and materials regarding best management practices for bats have been sent to Ministry of Energy and Mines (to Anne Moody, Senior Reclamation Inspector) by MOE (Purnima Govindarajulu, Small Mammal Specialist). Because MEM is responsible for abandoned mines, we plan to work further with this ministry consider bats in mine closures. We have also been in email contact with the past and current Presidents of BC Geocaching Association (Kelly Constant and Kathy Costello). They have been very receptive and have agreed to post on their website information regarding White Nose Syndrome, preventing contamination of underground areas, and disturbance of hibernating bats. The posting of this material is slated for spring 2012.

Upcoming Work

As this is a continuing project, more monitoring, capture and radiotracking is slated to start late summer 2012. Some summer reconnaissance will take place to locate ideal mistnetting locations and mid-elevation mines for monitoring. The main objectives of this research remain the same, but year 1 results have moulded year 2 plans, such that increased emphasis on fall tracking will take place, in an attempt to locate hibernacula for *M. yumanensis*, a species likely to cluster in large numbers during hibernation, and may therefore be at risk of high mortality from White Nose Syndrome.

The recent assessment of *M. lucifugus* by COSEWIC as endangered species⁷ (March 2012) increases the importance of locating hibernacula of this species, and as such, field work will begin earlier in September before this species disappears from the West Kootenays in order to determine where this species migrates for the fall/winter mating/hibernation.

Winter monitoring will focus on trying to monitor some mid elevation mines to determine whether they are used by bats like low elevation mines are. Additionally, mistnetting and tracking will take place at Reeves McDonald Mine as it seems this mine may be an important bat hibernaculum in the province; species verification is needed to know what species hibernate there. The Reeves McDonald and Queen Victoria mines may warrant gating to ensure these mines are not human safety hazards but remain available to bats. The Copper King mine in the East Kootenay is also a candidate for gating given that it is accessible to humans and is used by at least 2 species of bats throughout winter.

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Appendix 1. Bat captures associated with year 1 of this winter monitoring project. Reproductive status refers to the following: PL = post-lactating with evidence of nursing a pup in recent past; nulli = non-reproductive with no signs of past reproduction; NR = non-reproductive but may have reproduced in past; VJ = volant juvenile (young of year) so not expected to be reproductive; percentages refer to the amount of stored sperm still retained in epididymes of males, and if 100%, whether testes are still descended and evident is indicated. Age = adult or young of year (VJ = volant juvenile). Reddened or bleeding vaginas may be sign that mating had just occurred prior to capture. Males are banded on left forearms and females on right forearms.

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
110923-01	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	M	100%; no testes	A	33.4	5.3	
110923-02	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	PL	A	34.4	5.3	transmitted
110923-03	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	Nulli	A	34.8	5.6	
110923-04	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	M	VJ	VJ	36	5.6	
110923-05	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	PL + swollen vagina	A	35.6	7.4	
110923-06	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	Nulli	A	35.6	5.8	
110923-07	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	NR	A	32.7	6.5	
110923-08	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	NR	A	35	6.6	
110923-09	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	VJ	VJ	35.6	6.6	
110923-10	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	PL	A	34.3	6.5	
110923-11	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	Nulli	A	34.9	5.7	
110923-12	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	Nulli	A	35.1	5.5	
110923-13	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	Nulli	A	35.1	6.3	
110923-14	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	Nulli	A	32.95	4.8	
110923-15	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	Nulli	A	36	5.8	
110923-16	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	Nulli	A	34.2	5.1	
110923-17	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	Nulli	A	36	5.2	
110923-18	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	M	100%; no testes	A	32.1	4.9	
110923-19	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	Nulli	A	34.4	5.5	

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
110923-20	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	Nulli	A	35.1	5.9	
110923-21	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	Nulli	A	34.7	6.3	
110923-22	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	Nulli	A	34.5	5.9	
110923-23	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	VJ	VJ	33.6	4.8	
110923-24	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	NR	A	34.3	6.3	
110923-25	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	Nulli	A	34.9		
110923-26	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	M	75%	A	34.4	4.9	
110923-27	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	NR	A	35	5.7	
110923-28	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	NR	A	35.4	5.2	
110923-29	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	NR	A	35	6.1	
110923-30	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	NR - but vagina bleeding	A	35.5	6.9	
110923-31	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	PL	A	35.3	6.8	
110923-32	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	VJ	VJ	35.2	6.4	
110923-33	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	M	88%	A	33.7	5	
110923-34	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	PL	A	35.4	5.9	
110923-35	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	NR	A	34.5	6.7	
110923-36	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	VJ	VJ	35.4	5.4	
110923-37	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	VJ	VJ	34.5	5.4	
110923-38	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	VJ	VJ	34.4	5.3	
110923-39	Creston	Condo	23/09/2011	<i>M. yumanensis</i>	F	NR	A	33.7	5.5	
110922-xx	Creston	Pedro	22/09/2011	<i>Corynorhinus townsendii</i>	M?	?	?			possible mate for other COTO in roost at this time

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
110922-00	Creston	Pedro	22/09/2011	<i>Corynorhinus townsendii</i>	F	PL - had just mated	A			possible mate for other COTO in roost at this time -- she oozed sperm from vagina upon capture
110922-01	Creston	Pedro	22/09/2011	<i>Corynorhinus townsendii</i>	M	very scrotal testes	A	42.6	10.3	
110922-02	Creston	Pedro	22/09/2011	<i>M. yumanensis</i>	M	VJ	VJ	34.5	5.3	
110922-03	Creston	Pedro	22/09/2011	<i>M. yumanensis</i>	M	100%; no testes	A	34.6	5.7	
110922-04	Creston	Pedro	22/09/2011	<i>Corynorhinus townsendii</i>	M	100%, small testes	A	42	9.8	
110922-05	Creston	Pedro	22/09/2011	<i>M. yumanensis</i>	F	nulli	A	34.3	7.2	
110922-06	Creston	Pedro	22/09/2011	<i>Corynorhinus townsendii</i>	M	100% + large testes	A	42.7	10.5	
110922-07	Creston	Pedro	22/09/2011	<i>M. yumanensis</i>	M	NR	A	32.8	5.5	
110922-08	Creston	Pedro	22/09/2011	<i>M. yumanensis</i>	M	100%; no testes	A	35.6	6.3	
110922-08B	Creston	Pedro	22/09/2011	<i>M. yumanensis</i>	M	100%; no testes	A	33.7	5.8	
110922-09	Creston	Pedro	22/09/2011	<i>M. thysanodes</i>	F	nulli	A	40.97	7.1	transmitted
110922-10	Creston	Pedro	22/09/2011	<i>M. yumanensis</i>	M	75%	A	34.3	6.7	
110922-11	Creston	Pedro	22/09/2011	<i>Corynorhinus townsendii</i>	M	100%, small testes	A	43.9	10	
110922-12	Creston	Pedro	22/09/2011	<i>Corynorhinus townsendii</i>	M	100%, small testes	A	42.01	10.1	
110922-13	Creston	Pedro	22/09/2011	<i>Corynorhinus townsendii</i>	F	Nulli	A	43.45	13.3	

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
110922-14	Creston	Pedro	22/09/2011	<i>M. yumanensis</i>	M	100%; no testes	A	32.8	5.4	
110922-15	Creston	Pedro	22/09/2011	<i>Corynorhinus townsendii</i>	F	nulli	A	43.4	9.4	
110922-15	Creston	Pedro	22/09/2011	<i>Corynorhinus townsendii</i>	M	100%; medium-sized testes	A	43.8	11.4	
110922-17	Creston	Pedro	22/09/2011	<i>Corynorhinus townsendii</i>	F	Lact	A	45.3	14.2	transmitted
110923-00	Creston	Tzakis roost	23/09/2011	<i>Corynorhinus townsendii</i>	F	PL	A	45.4	12.6	transmitted; In roost were many volant pups, about 12 total bats
110921-00	Lardeau	North Mine	21/09/2011	<i>Corynorhinus townsendii</i>	M?	?	?			these 2 bats possibly mating?
110921-01	Lardeau	North Mine	21/09/2011	<i>Corynorhinus townsendii</i>	F	PL	A			these 2 bats possibly mating?
111002-01	Twin Bays	Twin Bays Mine	02/10/2011	<i>Corynorhinus townsendii</i>	M	100%; no testes	a			saw cordelaine salamanders
111007-01	Creston	Pedro	07/10/2011	<i>Corynorhinus townsendii</i>	F	NR - but swollen vagina	a	44.1	13.3	

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
111007-00	Creston	Pedro	07/10/2011	<i>Corynorhinus townsendii</i>	M?	?	A?			these 2 bats possibly mating? One cordelaine salamander in pedro also, northmost hole
111007-02	Creston	Pedro	07/10/2011	<i>Corynorhinus townsendii</i>	F	nr	vj	44.3	13.1	these 2 bats possibly mating?
111007-03	Creston	Pedro	07/10/2011	<i>M. yumanensis</i>	M	100%; no testes	a	33.2	6.2	
111007-04	Creston	Pedro	07/10/2011	<i>M. yumanensis</i>	M	50%	a	34.15	6.3	
111007-05	Creston	Pedro	07/10/2011	<i>M. yumanensis</i>	M	75%	a	35.3	5.7	
111007-06	Creston	Pedro	07/10/2011	<i>M. yumanensis</i>	M	88%	A	34.3	5.7	
111007-07	Creston	Pedro	07/10/2011	<i>Corynorhinus townsendii</i>	M	100%; no testes	a	43.6	10.3	
111007-08	Creston	Pedro	07/10/2011	<i>Corynorhinus townsendii</i>	M	100%; no testes	a	46.1	11	
111007-09	Creston	Pedro	07/10/2011	<i>M. yumanensis</i>	M	88%	A	33.7	6.3	
111008-01	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	M	vj	vj	33.4	5.4	
111008-02	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	F	vj	vj	34.5	6.2	
111008-03	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	M	85%	a	34.3	4.9	
111008-04	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	M	75%	a	33.7	5.8	
111008-05	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	F	vj	vj	34.9	6	
111008-06	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	F	nulli	a	34.15	6.2	transmitted
111008-07	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	?	vj	vj	35.8	6.2	
111008-08	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	M	vj	vj	34.7	5.8	
111008-09	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	M	vj	vj	33.3	5.4	

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
111008-10	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	F	vj	vj	34.6	6.4	
111008-11	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	M	vj	vj	34.8	5.8	
111008-12	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	M	vj	vj	34.5	6.2	
111008-13	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	M	vj	vj	32.65	5.7	
111008-14	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	34.4	5.2	
111008-15	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	35.4	5.8	
111008-16	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	33.4	5.7	
111008-17	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	35.1	6.5	
111008-18	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	F	VJ	VJ	34.9	6.1	
111008-19	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	M	10%	A	34.4	6	transmitted BAND:Lt Blue 107
111008-20	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	33.6	5.5	
111008-21	Creston	Condo	08/10/2011	<i>M. yumanensis</i>	F	VJ	VJ	36.1	6.5	
111011-01	Nelson	Queen Victoria Mine	10/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	33.86	7.3	
111013-01	Creston	End of the road	13/10/2011	<i>M. yumanensis</i>	M	60%	A	34.1	5.5	BAND:UC0505
111013-02	Creston	End of the road	13/10/2011	<i>M. yumanensis</i>	M	75%	A	33.7	6.5	BAND:UC0507
111013-03	Creston	End of the road	13/10/2011	<i>M. yumanensis</i>	M	50%	A	35.1	6.1	BAND:UC0509
111013-04	Creston	End of the road	13/10/2011	<i>M. yumanensis</i>	M	80%	A	35.6	6.1	BAND:UC0511
111013-05	Creston	End of the road	13/10/2011	<i>M. yumanensis</i>	M	90%	A	33.5	5.9	BAND:UC0513
111013-06	Creston	End of the road	13/10/2011	<i>M. yumanensis</i>	M	50%	A	34.4	6.2	BAND:UC0515?
111013-07	Creston	End of the road	13/10/2011	<i>M. yumanensis</i>	M	80%	A	not measure	not measu	BAND:UC0515?

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
								d	red	
111013-08	Creston	End of the road	13/10/2011	<i>M. yumanensis</i>	M	not checked	A	34.7	not measured	BAND:UC0519?
111013-09	Creston	End of the road	13/10/2011	<i>M. californicus</i>	M	vj	vj	31.1	not measured	
111013-10	Creston	End of the road	13/10/2011	<i>M. yumanensis</i>	M	100%; no testes	A	33.3	6.1	BAND:UC0517
111015-01	Creston	Pedro	15/10/2011	<i>M. yumanensis</i>	M	75%	A	34.8	5.9	transmitted BAND:UC0537
111015-02	Creston	Pedro	15/10/2011	<i>M. yumanensis</i>	M	75%	A	33.7	6.2	BAND:UC0533
111015-03	Creston	Pedro	15/10/2011	<i>Corynorhinus townsendii</i>	M	100%; no testes	A	43.5	10.8	
111015-04	Creston	Pedro	15/10/2011	<i>M. yumanensis</i>	M	75%	A	33.9	6.5	BAND:UC0535
111015-05	Creston	Pedro	15/10/2011	<i>M. yumanensis</i>	M	75%	A		6	BAND:UC0523
111015-06	Creston	Pedro	15/10/2011	<i>M. yumanensis</i>	M	25%	A	34.1	6.4	
111015-07	Creston	Pedro	15/10/2011	<i>M. yumanensis</i>	M	25%	A	35	6.3	BAND:UC0531
111015-08	Creston	Pedro	15/10/2011	<i>M. yumanensis</i>	M	50%	A	34.2	6.3	BAND:UC0539
111015-09	Creston	Pedro	15/10/2011	<i>M. yumanensis</i>	?	not checked	not checked	34.9	6	BAND: likely missed, not banded?
111015-10	Creston	Pedro	15/10/2011	<i>M. yumanensis</i>	M	not checked	A	34.3	6.2	BAND:UC0521

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
111015-11	Creston	Twin Bays Mine	15/10/2011	<i>Corynorhinus townsendii</i>	M	100%; no testes	A			2 small frogs in mine, photographed; no more salamanders; one myotis high at back; lots of harvestmen
111016-01	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	F	vj	vj	35.3	6	
111016-02	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	75%	a	34.08	6.1	BAND:UC0541
111016-03	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	75%	a	34.66	6.4	transmitted BAND:UC0543
111016-04	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	34.3	5.9	
111016-05	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	34	5.6	
111016-06	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	35.1	6.1	
111016-07	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	33.89	5.6	
111016-08	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	75%	A		5.9	BAND:UC0545
111016-09	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	40%	A	32.8	5.6	BAND:UC0547
111016-10	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	35.5	6.1	
111016-11	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	34.6	5.9	
111016-12	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	34.05	6	
111016-13	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	34.4	6.1	
111016-14	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	F	VJ	VJ	33.5	6.2	
111016-15	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	20%	a	34.3	5.9	
111016-16	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	33.6	5.7	
111016-17	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	34.28	5.6	
111016-18	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	34.4	5.9	

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
111016-19	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	F	VJ	VJ	35.9	6.2	transmitted
111016-20	Creston	Condo	15/10/2011	<i>M. yumanensis</i>	M	VJ	VJ	33.6	5.4	massive (~10mm diameter) whole in right wing
111107-03	Lardeau	North Mine	07/11/2011	<i>M. californicus</i>	M	75%	A	31.9	6	
111107-04	Lardeau	North Mine	07/11/2011	<i>M. californicus</i>	M	75%	A	31.9	5.6	
111107-01	Nelson	Queen Vic	07/11/2011	<i>Corynorhinus townsendii</i>	F	NR	A			
111107-02	Nelson	Queen Vic	07/11/2011	<i>Corynorhinus townsendii</i>	F	NR	A			
111107-00	Nelson	Queen Vic	07/11/2011	<i>Corynorhinus townsendii</i>	?					
111107-05	Lardeau	South Mine	07/11/2011	<i>Corynorhinus townsendii</i>	M	100%; no testes	A			
111109-01	Nelway	Nelway (Kevin Maloney) mine	09/11/2011	<i>Corynorhinus townsendii</i>	M	95%	A		10.7	
111109-02	Nelway	Nelway (Kevin Maloney) mine	09/11/2011	<i>Corynorhinus townsendii</i>	M	85%	A		10.1	
111109-03	Creston	Transformer Mine	09/11/2011	<i>Corynorhinus townsendii</i>	M	90%	A			
111110-01	Nelson	Queen Victoria Mine	10/11/2011	<i>Lasionycteris noctivagans</i>	M	VJ	Vj	41.2	11.3	BAND:UC0525
111110-02	Nelson	Queen Victoria Mine	10/11/2011	<i>M. californicus</i>	M	vj	vj	33.1	5.7	BAND:LT BLUE 108
111110-03	Nelson	Queen	10/11/2011	<i>Lasionycteris</i>	M	vj	vj	42.7	12.1	no silver in hair BAND:UC0527

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
		Victoria Mine		<i>noctivagans</i>						
111110-04	Nelson	Queen Victoria Mine	10/11/2011	<i>M. californicus</i>	M	60%	A	33.1	5.8	BAND:LT BLUE 106
111110-05	Nelson	Queen Victoria Mine	10/11/2011	<i>M. californicus</i>	M	85%	A	33.8	5.9	BAND:LT BLUE 104
111110-06	Nelson	Queen Victoria Mine	10/11/2011	<i>M. californicus</i>	F	PL	A	32.8	7	BAND:LT BLUE 109
111110-07	Nelson	Queen Victoria Mine	10/11/2011	<i>M. californicus</i>	F	vj	vj	32.4	5.3	
111110-08	Nelson	Queen Victoria Mine	10/11/2011	<i>M. californicus</i>	F	nulli	A	34.5	6.5	BAND:LT BLUE 105
111110-09	Nelson	Queen Victoria Mine	10/11/2011	<i>Lasionycteris noctivagans</i>	M	25%	A	41.6	14.3	BAND:UC0529
	Creston	Condo	05/11/2011	<i>no captures</i>						
	Creston	Pedro	03/11/2011	<i>no captures</i>						
111126-xx	Nelson	Queen Victoria Mine	26/11/2011	<i>Lasionycteris noctivagans</i>						day roosting - one silverhaired observed inside
111126-xx	Nelson	Queen Victoria Mine	26/11/2011	<i>Corynorhinus townsendii</i>						day roosting - 4 COTO observed inside

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
111216-01	Castlegar	Syringa	16/12/2011	<i>Lasionycteris noctivagans</i>	M	VJ	VJ	40.8	10.1	transmitted BAND:UC0549
111216-02	Castlegar	Syringa	16/12/2011	<i>Lasionycteris noctivagans</i>	F	PL	A	43.3	14	transmitted BAND:UC0512
	Castlegar	Syringa	26/12/2011	<i>no captures</i>						
	Meadow Creek	marblehead	28/12/2011	<i>no captures</i>						
	Meadow Creek	marblehead	28/12/2011	<i>no captures</i>						a few bats heard; nice night, no wind slight moon no precip
	Castlegar	Syringa	30/12/2011	<i>no captures</i>						
	Creston	Mt Thompson Mine	13/01/2012	<i>Corynorhinus townsendii</i>						6 bats roosting in mine, 2 in one cluster; temp logger installed
120121-01	Nelson	Queen Victoria Mine	21/01/2012	<i>Lasionycteris noctivagans</i>	M	25%	VJ?	41.8	11.3	transmitted BAND:WCS251
120121-02	Nelson	Queen Victoria Mine	21/01/2012	<i>Lasionycteris noctivagans</i>	M	vj	vj			
120121-03	Nelson	Queen Victoria Mine	21/01/2012	<i>M. californicus</i>	M	75%	a	33.56	5.2	transmitted BAND:WCS203

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
120121-04	Nelson	Queen Victoria Mine	21/01/2012	<i>M. californicus</i>	M	60%	a	33.03	4.8	transmitted BAND:WCS201 rebanded; Lt Blue 106 original
120121-05	Nelson	Queen Victoria Mine	21/01/2012	<i>M. californicus</i>	M	40%	a	42.9	10.5	transmitted BAND:WCS255
120121-06	Nelson	Queen Victoria Mine	21/01/2012	<i>M. californicus</i>	F	vj	vj	32.7	4.4	BAND:WCS202maybe
120122-01	Nelson	Queen Victoria Mine	22/01/2012	<i>Lasionycteris noctivagans</i>	M	vj	vj	41	9.3	BAND:WCS257
120122-02	Nelson	Queen Victoria Mine	22/01/2012	<i>Lasionycteris noctivagans</i>	M	vj	VJ	40.89	9.9	BAND:WCS261
120122-03	Nelson	Queen Victoria Mine	22/01/2012	<i>Lasionycteris noctivagans</i>	M	25%	a	40.65	9.1	BAND:WCS259
120122-04	Nelson	Queen Victoria Mine	22/01/2012	<i>M. californicus</i>	M	60%	A	32.5	4.8	BAND:WCS205
120122-05	Nelson	Queen Victoria Mine	22/01/2012	<i>M. californicus</i>	F	PL	A	33.9	6.2	transmitted BAND:WCS204
120122-06	Nelson	Queen Victoria Mine	22/01/2012	<i>Lasionycteris noctivagans</i>	M	15%	A	41.4	10.8	BAND:UC0529
120123-01	Nelson	Queen Victoria Mine	23/01/2012	<i>M. californicus</i>	F	PL	A	33.7	5.2	BAND:WCS206
120123-02	Nelson	Queen Victoria Mine	23/01/2012	<i>Lasionycteris noctivagans</i>	M	20%	A	40.6	9.8	BAND:UC0503

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
		Victoria Mine		<i>noctivagans</i>						
120123-03	Nelson	Queen Victoria Mine	23/01/2012	<i>Lasionycteris noctivagans</i>	M	NR	VJ	40.86	11.1	
	Castlegar	Syringa	25/01/2012	<i>no captures</i>						
	Woodbury	lower south mine	29/01/2012	<i>no captures</i>						
120130-01	Nelson	Queen Victoria Mine	30/01/2012	<i>Lasionycteris noctivagans</i>	M	vj	vj	41	7.9	BAND:UC0525
120130-03	Nelson	Queen Victoria Mine	30/01/2012	<i>Corynorhinus townsendii</i>	M	vj	vj	42	8.7	
120130-04	Nelson	Queen Victoria Mine	30/01/2012	<i>M. californicus</i>	M	60%	A	32.2	4.3	BAND:WCS207
120130-05	Nelson	Queen Victoria Mine	30/01/2012	<i>M. californicus</i>	F	vagina reddish and oozy	A	32.57	4.7	BAND:WCS208
120130-06	Nelson	Queen Victoria Mine	30/01/2012	<i>M. californicus</i>	M	60%	A	32.8	4.6	BAND:WCS209
120130-07	Nelson	Queen Victoria Mine	30/01/2012	<i>M. californicus</i>	F	PL	A	32.7	5.5	BAND:WCS210
120130-08	Nelson	Queen Victoria Mine	30/01/2012	<i>M. californicus</i>	M	40%	a	34.9	5	BAND:WCS211
	Lardeau	Meadow	04/02/2012	<i>no captures</i>						

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
		Ck, Marblehead and Mine north								
120208-01	Nelson	Queen Victoria Mine	08/02/2012	<i>M. californicus</i>	F	PL	A	33.2	4.8	BAND:WCS212
120208-02	Nelson	Queen Victoria Mine	08/02/2012	<i>Lasionycteris noctivagans</i>	M	vj	vj		8.5	BAND:UC0525
120208-03	Nelson	Queen Victoria Mine	08/02/2012	<i>Lasionycteris noctivagans</i>	F	vj	vj	41.99	9.2	BAND:WCS300
120208-04	Nelson	Queen Victoria Mine	08/02/2012	<i>Lasionycteris noctivagans</i>	M	vj	vj	41.7	10	BAND:WCS265
120208-05	Nelson	Queen Victoria Mine	08/02/2012	<i>Lasionycteris noctivagans</i>	F	PL	A	41.7	13.7	transmitted; Had just mated!! She oozed white thick semen from vagina in net as struggling, reddened vagina. BAND:WCS264
	Castlegar	Syringa	09/02/2012	<i>no captures</i>						
120210-01	Meado	Lardeau	10/02/2012	<i>Corynorhinus</i>	M	90%	A	43.7	8.7	

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
	w Creek	both mines + Marblehead		<i>townsendii</i>						
120213-01	Nelson	Queen Victoria Mine	13/02/2012	<i>M. californicus</i>	M					escaped
120213-02	Nelson	Queen Victoria Mine	13/02/2012	<i>M. californicus</i>	M	vj	vj	32.2	4.5	BAND:WCS213
120213-03	Nelson	Queen Victoria Mine	13/02/2012	<i>M. californicus</i>	M	vj	vj	36.2	3.4	BAND:WCS215
120213-04	Nelson	Queen Victoria Mine	13/02/2012	<i>M. californicus</i>	M	70%	A	32.5	4.5	BAND:WCS217
120213-06	Nelson	Queen Victoria Mine	13/02/2012	<i>Lasionycteris noctivagans</i>	M	25%	A	40.6	9.3	BAND:WCS259
120213-08	Nelson	Queen Victoria Mine	13/02/2012	<i>Lasionycteris noctivagans</i>	M	20%	A	42.1	9.9	BAND:WCS269
	Woodbury	lower south mine	19/02/2012	<i>no captures</i>						
120223-01	Lardeau	Meadow Ck, Marblehead and Mine north	23/02/2012	<i>M. californicus</i>	M	67%	A	32.6	4.4	transmitted BAND:brite green 01
	Nelson	Queen Victoria	14/03/2012	<i>no captures</i>						

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
		Mine								
120310-01	Mirror Lake	at Brody's house	10/03/2012	<i>M. californicus</i>	M	vj	vj	33.7	not weighed	BAND:grey 51
	Castlegar	Syringa	14/04/2012	<i>no captures</i>						
120418-01	Creston	Pedro	18/04/2012	<i>Corynorhinus townsendii</i>	F	PL	A	45.33	11	bare patch from transmitter in fall
120418-02	Creston	Pedro	18/04/2012	<i>Corynorhinus townsendii</i>	M	80%	A	43.16	9.6	
120418-03	Creston	Pedro	18/04/2012	<i>M. californicus</i>	F	PL	A	34.69	5.4	BAND:royal blue 02
120418-04	Creston	Pedro	18/04/2012	<i>M. yumanensis</i>	M	5%	A	33.81	5.5	BAND:WCS196
120418-05	Creston	Pedro	18/04/2012	<i>M. yumanensis</i>	F	PL	A	33.39	5.8	BAND:WCS198
120419-01	Woodbury	lower south mine	19/04/2012	<i>Corynorhinus townsendii</i>	M	90%	A	44.86	9.4	
120419-02	Woodbury	lower south mine	19/04/2012	<i>M. yumanensis</i>	M	10%	A	34.61	5.1	BAND:WCS159
120419-03	Woodbury	lower south mine	19/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	34.45	6	BAND:WCS200
120417-01	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	35.56	6.5	BAND:UC0550
120417-02	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	34.58	5.6	BAND:UC0514
120417-03	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	34.28	5.7	BAND:UC0516
120417-04	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	35.02	5.2	BAND:UC0518
120417-05	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	34.74	6.5	BAND:UC0520
120417-06	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP(NULLI)	A	33.36	4.9	BAND:UC0522
120417-07	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP(NULLI)	A	35.59	6.4	BAND:UC0524
120417-08	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	34.92	6.1	BAND:UC0526
120417-09	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP(NULLI)	A	36.52	6.4	BAND:UC0528

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
120417-10	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	35.41	5.8	BAND:UC0530
120417-11	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	33.69	5.9	BAND:UC0532
120417-12	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	34.74	5.4	BAND:UC0534
120417-13	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP(NULLI)	A	34.67	5.7	BAND:UC0536
120417-14	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	34.98	5.9	BAND:UC0538
120417-15	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	35.56	6	BAND:UC0540
120417-16	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	M	90%	A	34.46	5.4	BAND:WCS299
120417-17	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	34.73	5.5	BAND:UC0542
120417-18	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP(NULLI)	A	35.17	6	BAND:UC0548
120417-19	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP(NULLI)	A	35.84	5.8	BAND:UC0546
120417-20	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP(NULLI)	A	34.66	5.6	BAND:UC0544
120417-21	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	36.16	5.7	BAND:WCS152
120417-22	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	35.07	5.6	BAND:WCS154
120417-23	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP(NULLI)	A	34.74	5.4	BAND:WCS156
120417-24	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	35.47	6.1	BAND:WCS158
120417-25	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	M	20%	A	34.9	5.6	BAND:WCS151
120417-26	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP(NULLI)	A	34.69	6	BAND:WCS160
120417-27	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP(NULLI)	A	35.71	5.7	BAND:WCS162
120417-28	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	34.93	5.6	BAND:WCS164
120417-29	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	36.09	6.2	BAND:WCS166
120417-30	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	M	75%	A	34.54	5.1	BAND:WCS153
120417-31	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	34.7	5.5	BAND:WCS168
120417-32	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	34.96	5.4	BAND:WCS170
120417-33	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	36.62	5.3	BAND:WCS172
120417-34	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	33.7	5.7	BAND:WCS174
120417-35	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	35.99	5.9	BAND:WCS176
120417-36	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	35.36	5.8	BAND:WCS178

Bat ID#	Area	Site Name	Date	Scientific Name	Sex	Reproductive Status	Age	Forearm Length (mm)	mass (g)	Individual Comments
120417-37	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP(NULLI)	A	34.89	5.4	BAND:WCS180
120417-38	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	35.71	6.2	BAND:WCS182
120417-39	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	34.71	5.3	BAND:WCS184
120417-40	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	M	10%	A	33.81	4.8	BAND:WCS155
120417-41	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	34.97	5.9	BAND:WCS186
120417-42	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	35.38	5.6	BAND:WCS188
120417-43	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	34.7	5.5	BAND:WCS190
120417-44	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	M	0%	A	34.39	5.4	BAND:WCS157
120417-45	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	34.46	5.6	BAND:WCS192
120417-46	Creston	Condo	17/04/2012	<i>M. yumanensis</i>	F	NOP (PL)	A	34.66	5.9	BAND:WCS194