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FOR GENERATIONS

Report Title: *Peace River Wildlife Surveys - Preliminary Inventory of Bat Species in the Peace River Corridor (2005)*
Project: Peace River Site C Hydro Project
Prepared By: Keystone Wildlife Research Ltd. & Kingbird Biological Consultants Ltd.
Prepared for: BC Hydro

NOTE TO READER:

This is a report on a study commissioned toward the development of engineering, environmental and technical work conducted to further define the potential Site C project.

For environmental studies, the focus is on the development of an environmental and socio-economic baseline around the area of the potential Site C Project. Baseline studies are generally a survey of existing conditions within a project study area.

This report and other information may be used for future planning work or an environmental assessment or regulatory applications related to the potential Site C Project.

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PEACE RIVER WILDLIFE SURVEYS –

Preliminary Inventory of Bat Species in the Peace River Corridor

Prepared by:

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and

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Prepared for:

BC Hydro

Field Work: 2005
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Preliminary Inventory of Bat Species in the Peace River Corridor

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EXECUTIVE SUMMARY

Keystone Wildlife Research Ltd. was contracted by BC Hydro and Power Authority to complete a preliminary inventory of bat species in the Peace River Valley. Sample sites were selected between Hudson's Hope and the Alberta border. Nine species of bats potentially occur in the Peace River Corridor, including Californian myotis, little brown myotis, long-eared myotis, long-legged myotis, northern myotis, silver-haired bat, big brown bat, hoary bat and eastern red bat.

This study was conducted as a baseline study, commissioned by BC Hydro toward the development of an environmental baseline around the area of the potential Site C Project. Baseline studies are preliminary to and not intended to be environmental effects assessment studies. Baseline studies are generally surveys of existing conditions within a project study area.

Mist-net and detector surveys were completed between August 22 and 29, 2005. Eight bats were captured in 36.5 netting nights of effort, corresponding to a capture rate of 0.13 bats/ netting night. Eight bats of three species were captured in mist-nets, including five little brown myotis, one long-eared myotis and two long-legged myotis.

Detector surveys were completed at 16 sites. The total sampling time ranged from 50 to 225 minutes per site, totalling 2125 minutes of acoustic monitoring for all sites. Bats were detected at all 16 sampling sites. Calls were recorded at 30 and 40 kilohertz, confirming the presence of *Myotis* species and large bats.

More intensive surveys are required in the Peace River Corridor to determine the species present, to identify roosting habitat and to determine the relative activity of roosting / foraging areas.

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1.0 INTRODUCTION

In 2005, BC Hydro initiated a field study program designed to fill in information gaps for species occurring in the Peace River Corridor, between Hudson's Hope and the Alberta border. Bats were identified as a component of this field program due to the limited inventory data. Field studies were developed to study bats in the Peace River Corridor with the following objectives:

- to determine the bat species present within the Peace River Corridor;
- to develop draft habitat suitability ratings to determine the potential distribution of bat species in the Peace River Corridor.

This study was conducted as a baseline study, commissioned by BC Hydro toward the development of an environmental baseline around the area of the potential Site C Project. Baseline studies are preliminary to and not intended to be environmental effects assessment studies. Baseline studies are generally a survey of existing conditions within a project study area.

Four species of bats have been recorded in the Boreal White and Black Spruce (BWBS) biogeoclimatic zone, within the Boreal Plains Ecoprovince (Nagorsen and Brigham 1993). These include the little brown myotis (*Myotis lucifugus*), the big brown bat (*Eptesicus fuscus*), the silver-haired bat (*Lasionycteris noctivagans)*, and the northern myotis (*Myotis septentrionalis*). Two additional species are found in the BWBS zone, but have not been reported in the Boreal Plains ecoprovince. These include the long-eared myotis (*Myotis evotis*) and the long-legged myotis (*Myotis volans*). Nagorsen and Brigham (1993) reported locations for both the little brown bat and the northern myotis along the Peace River Corridor. The Californian myotis, eastern red bat and hoary bat have not been documented in the area.

Surveys for bats in 2005 were designed to determine the presence and diversity of bat species in the Peace River Corridor. A preliminary assessment of habitat use within the study area was also completed.

2.0 BACKGROUND

British Columbia's Peace River Corridor is ecologically distinct from the surrounding boreal regions because of the climatic influence of the Rocky Mountains and the presence of a large river. The rich floodplain habitats and surrounding agricultural landscapes may influence bat species presence and activity.

Knowledge about bats in the Peace River Corridor is limited to early collections at Hudson's Hope in 1931 (mentioned in Nagorsen and Brigham 1993), specimens from the general region in 1977-1981 (in Caceres and Pybus 1997) and studies of silver-haired bats and big brown bats (Schowalter *et al.* 1978 and Schowalter and Gunson 1979, cited in Nagorsen and Brigham 1993). There is also a growing body of literature on bats in boreal ecosystems, including research in the BWBS biogeoclimatic zone at the Liard River located about 700 km northwest of Dawson Creek (Wilkinson *et al*. 1995; Vonhof *et al*. 1997) and Prophet Rivers located 250 km northwest of Fort St. John (Crampton *et al.* 1997). In Alberta, at least four studies have been conducted in the boreal mixedwood forests in northwestern Alberta (Patriquin and Barclay 2003), northcentral Alberta (Crampton and Barclay 1998), and northeastern Alberta (Hubbs and Schowalter 2003; Stefan 2004).

Nine species of bats potentially occur in the Peace River Corridor (Table 1), based on Nagorsen and Brigham (1993) and the studies mentioned above. Details of each species' distribution are discussed below. All 9 species are insectivores and will forage anywhere insects congregate, including in open forests, over slow-moving water or ponds, and along cliffs. Body size, manoeuvrability, and flight speed does vary between species and smaller, more maneuverable bats can forage in dense forests, while larger species tend to fly over the canopy or along cliff edges (Nagorsen and Brigham 1993).

Table 1. Bat species potentially occurring in the Peace River Corridor, BC, listed by size.

Species	Common name	Existing records from north eastern BC	Average weight and range (g) [1]
Myotis californicus	Californian Myotis	Yes	4.4 (3.3-5.4)
Myotis evotis	Long-Eared Myotis	Yes	5.5 (4.2-8.6)
Myotis lucifugus	Little Brown Myotis	Yes	6.2 (6.2–10.2)
Myotis septentrionalis	Northern Myotis	Yes	6.5 (5.0–10.0)
Myotis volans	Long-legged Myotis	Yes	7.2 (5.5-10.0)
Lasionycteris noctivagans	Silver-haired bat[2]	Yes	9.0 (5.8-12.4)
Lasiurus borealis	Eastern Red Bat[2]		(7.0-16.0)
Eptesicus fuscus	Big Brown Bat[2]	Yes	15.2 (8.8-21.9)
Lasiurus cinereus	Hoary Bat[2]	Yes	28.4 (20.1-37.9)

[1] Data from Nagorsen and Brigham (1993) except eastern red bat (Patriquin 2001).
[2] Species considered "big bats"

All 9 species are known to roost in trees, with some also documented as using buildings, rock crevices, or cliffs. In boreal forests, the limited research done to-date on roost selection by little brown myotis, northern myotis, and silver-haired bats suggests that bats predominantly roost in dying or dead balsam poplar (*Populus balsamifera*) and trembling aspen (*P. tremuloides*) trees (Vonhof *et al*. 1997; Crampton and Barclay 1998). Roost sites include cracks, cavities, foliage clusters (hoary and red bats), and loose bark, on trees or snags that are larger in height and diameter than other available trees, and are in old, open forest stands (Barclay and Brigham 1996).

All bats in BC breed in the late summer or fall, prior to hibernation. Females store sperm over the winter, and fertilization occurs in the spring. Most pregnant female bats gather in maternity colonies of the same species, and the young are born in June or July. The developmental rate of the foetus is temperature dependent; thus in cooler climates, birth may occur later in the summer. In the Liard area in 1995, bats gave birth between the last week of June and the first week of July, with the first post-lactating female captured in late July (Wilkinson *et al*. 1995). In the same region in 1997, bats were lactating throughout July and the first post-lactating female was caught in August (Vonhof *et al*. 1997).

2.1 Review of Known Species Distributions

Californian Myotis *(Myotis californicus)*

The Californian myotis is generally considered to be a southern bat, ranging to central BC and the Alaska panhandle (Nagorsen and Brigham 1993). Wilkinson *et al*. (1995) reported this species in the Liard area, where it was the second most commonly-captured species after little brown myotis. To our knowledge, Californian myotis has not been documented elsewhere in northeastern BC or in Alberta.

Long-Eared Myotis *(Myotis evotis*)

The long-eared myotis has also been reported in the Liard River area (Vonhof *et al*. 1997). Generally, this species is considered a more southern and western counterpart to the northern myotis (Nagorsen and Brigham 1993). Differentiation between these species using physical characteristics is very difficult and is generally based on colouration (Brigham and Nagorsen 1993; Burles 2004). Genetic analyses are currently underway for the long-eared and Keen's myotis (*Myotis keenii*, a coastal long-eared bat species). These data can be used to genetically differentiate between the long-eared species (Keen's myotis, northern myotis and long-eared myotis).

Little Brown Myotis *(Myotis lucifugus*)

The little brown myotis is widely distributed and common (Nagorsen and Brigham 1993). It has been recorded in boreal forests in BC (Prophet River - Crampton *et al.* 1997, Liard River – Vonhof *et al*. 1997), and in the mixedwood boreal forest across northern Alberta (Crampton and Barclay 1998; Hubbs and Schowalter 2003; Patriquin and Barclay 2003).

Northern Myotis *(Myotis septentrionalis*)

The northern myotis is currently Blue-listed (of special concern) in BC and Alberta, due to lack of information on distribution, its perceived rarity, and suspected requirement for mature and old forests (BC CDC 2005; Caceres and Pybus 1997; Nagorsen and Brigham 1993). It is widely distributed across the north central US, and southern Canada east of the Rocky Mountains (BC CDC 2005). It is believed to be associated with boreal forests and to occur across north eastern BC and northern Alberta (Nagorsen and Brigham 1993; Caceres and Pybus 1997).

Locations of this species in BC include Hudson's Hope in 1931 (Nagorsen and Brigham 1993), and the Revelstoke area (SW BC) in the 1980s (Nagorsen and Brigham 1993) and 1990's (Caceres 1998). Recently, reproductive populations have been found at Prophet and Liard Rivers (Crampton *et al*. 1997; Vonhof *et al*. 1997). Locations from western Alberta include the Peace River valley, Grand Prairie, and the Spirit River (Caceres and Pybus 1997). The northern myotis is also found in the mixedwood boreal forests of northern Alberta (Crampton and Barclay 1998; Hubbs and Schowalter 2003; Patriquin and Barclay 2003), and two known hibernacula have been located in Wood Buffalo National Park and Cadomin Cave, Alberta (Caceres and Pybus 1997).

Long-legged Myotis *(Myotis volans*)

The long-legged myotis is widespread across southern and western BC, but has also been reported from northwestern and northern BC (Kispiox and Atlin) (Nagorsen and Brigham 1993), and southern Alberta north to Jasper and Cadomin (Holroyd and Van Tighem 1983). Reproductive populations have been found at Liard River (Vonhof *et al*. 1997), showing that this species is obviously tolerant of northern climes. However, the long-legged myotis was not found in surveys of the mixedwood boreal forest in Alberta (Crampton and Barclay 1998; Hubbs and Schowalter 2003; Patriquin and Barclay 2003) or at the Prophet River in BC (Crampton *et al*. 1997).

Silver-haired Bat *(Lasionycteris noctivagans*)

The silver-haired bat has been captured in mixedwood boreal forests (Crampton and Barclay 1998; Hubbs and Schowalter 2003; Patriquin and Barclay 2003). The species was not captured at the Prophet (Crampton *et al*. 1997) and Liard (Vonhof *et al*. 1997) rivers, but was possibly heard on detectors. There is at least one record of a silver-haired bat around the Peace River / Taylor area (Nagorsen and Brigham 1993).

Eastern Red Bat *(Lasiurus borealis*)

A foliage-roosting bat of southern and eastern Canada and the U.S., the eastern red bat was first documented in the Fort McMurray area of Alberta in 2001 (Patriquin 2001). Calls have recently been recorded in the same area (Stefan 2004). The distribution of this bat in northern BC and Alberta is unknown, and it is included as a potential species in the Peace River area based on the Alberta locations and its affinity for boreal forests.

Big Brown Bat *(Eptesicus fuscus*)

There are records of big brown bats from the Peace River/ Taylor area (Nagorsen and Brigham 1993) and Jasper National Park (Holroyd and Van Tighem 1983). However, this bat has not been captured in any other recent study in northeastern BC or northern Alberta. Calls have been reported in mixedwood boreal forests (Crampton and Barclay 1998; Hubbs and Schowalter 2003), the Liard River (Vonhof *et al*. 1997), and possibly at the Prophet River (Crampton *et al*. 1997).

Hoary Bat *(Lasiurus cinereus)*

The hoary bat is another foliage-roosting bat that has been captured and recorded in mixedwood boreal forests in central and eastern Alberta (Crampton and Barclay 1998; Hubbs and Schowalter 2003), and at 3 sites at the Liard River (Vonhof *et al*. 1997). The hoary bat was not recorded at the Prophet River (Crampton *et al*. 1997). The species is generally found in the southern half of BC (Nagorsen and Brigham 1993).

3.0 METHODS

Field-sampling for bats occurred in August 2005, at sites along the Peace River Corridor from Hudson's Hope to the Alberta border (Figure 1). Potential sites were identified on airphotos and forest cover maps based on habitat features (mature balsam poplar stands, wetlands, backchannels, side creeks, etc.) and accessibility. Candidate sites were then visited during the day to assess habitat quality and their potential for mist-netting.

Sites suitable for mist-netting were selected along the valley-bottom to identify species that were using this area. All sites were in the Boreal White and Black Spruce moist warm (BWBSmw1) subzone variant. Ground Inspection Forms (GIFs) were completed at terrestrial sampling sites (Appendix 1). When human structures that could provide bat habitat (buildings and bridges) were incidentally encountered, they were inspected for evidence of use, including presence of bats, guano pellets, and staining.

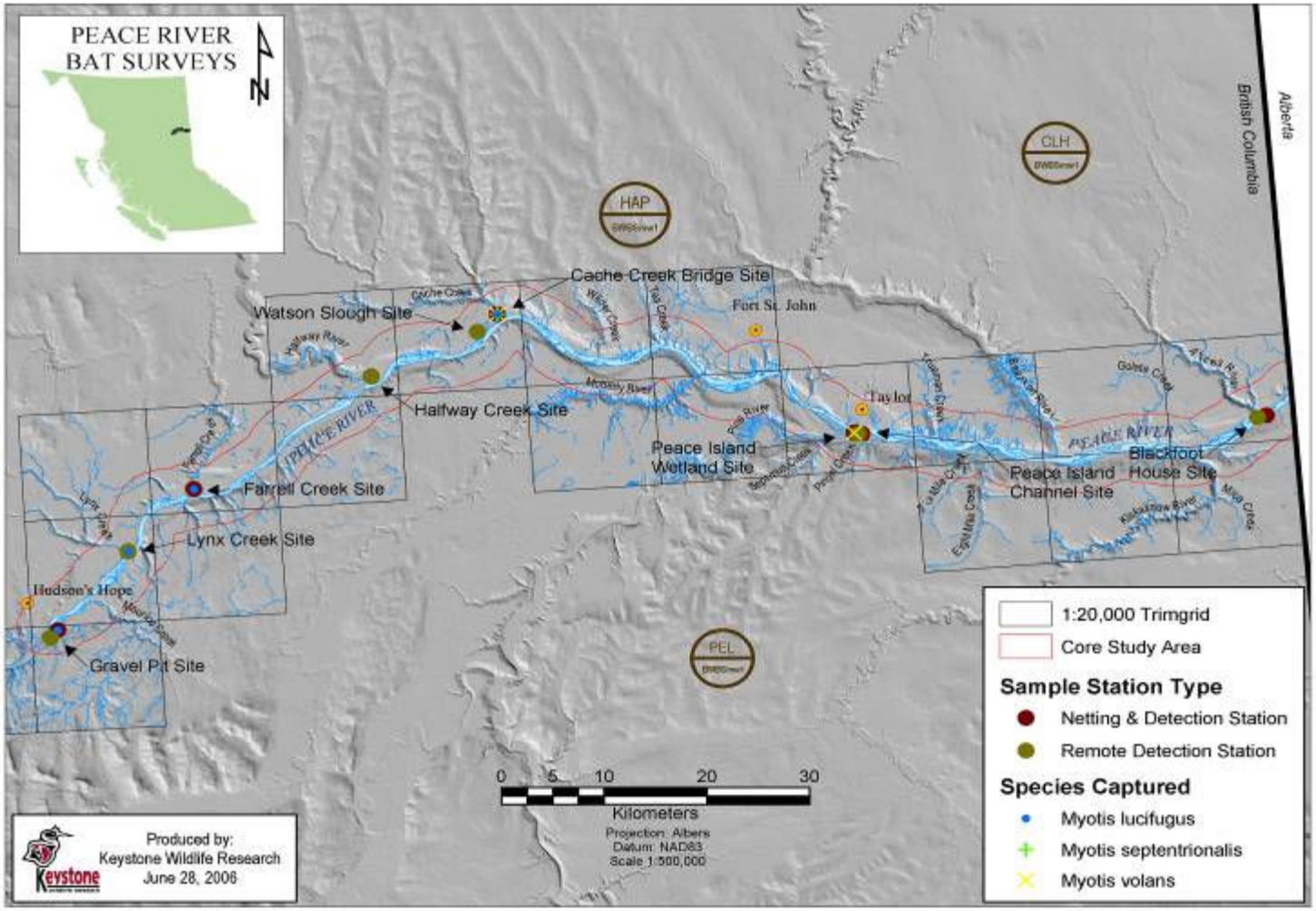

Figure 1. Sampling sites for the 2005 Peace River Bat Inventory Project.

Mist-nets and bat detectors were used for sampling, as outlined by BC's Resource Inventory Committee Standards (RIC 1998). Three to five nets were set up at each site. Mist nets were 2 m high by 6, 9 or 18 m wide. Nets were set up across slow-moving creeks, ponds, wetlands, forest gaps, and forest trails. A net-night is defined as one 2x6 m net-equivalent set up for 1 night (RIC 1998); thus the 18 m net resulted in 3 net-nights of effort for each night it was used. Nets were opened at dusk (20:30 – 20:45), and monitored approximately every 10 minutes for 3-4 hours, depending on the amount of activity.

Captured bats were removed promptly from nets, kept in cloth bags for a brief period of time (30 minutes maximum, due to cold temperatures and late time of year), handled for identification purposes only, and then released on-site. Weight, sex, age, reproductive condition, and forearm length (mm) were recorded for each captured bat. To assist with species identification, the foot and ear length (mm) and the presence of a keel on the calcar was also recorded for some species. The identification key in Nagorsen and Brigham (1993) was used to confirm species. Reproductive condition was determined for males by the presence of enlarged testes, and for females, by visual examination and gentle palpation of the abdomen and nipples (Racey 1988). Age was determined based on the degree of ossification of the finger joints (RIC 1998).

Concurrent with mist-netting, bat activity was sampled at the netting site with 2 handheld tuneable bat detectors (QMC Mini-3 Bat, Ultra Sound Advice, UK) set at 30 and 40 kilohertz (kHz). The 40 kHz detector sampled activity of *Myotis* species (little brown, California, long-legged, long-eared and northern) and the 30 kHz detector detected larger bats (silver-haired, big brown, eastern red and hoary bat). Attempting to differentiate between the calls of the silver-haired bat and big brown bat is of debatable value (see Betts 1998 versus RIC 1998), while the calls of the hoary bat should sound different due to the lower frequencies of the sweep and constant-frequency segments of the call (RIC 1998). The calls of eastern red bat can be heard at both 30 and 40 kHz.

A remote detector (Anabat, Titley Electronics, Australia) was also set up each night in stands that were not suitable for netting. Calls were recorded after dusk on a cassette tape for 45 or 90 minutes. The calls were transcribed from the recording at a later date.

The number of passes and feeding buzzes was recorded onto standard RIC forms for both species groups (*Myotis* species and big bat species) in 5-minute intervals (RIC 1998). A pass was defined as an uninterrupted series of echolocation calls as a bat travelled past a microphone and a buzz was the buzzy sound of accelerating calls as a bat homed in on its insect prey.

4.0 RESULTS AND DISCUSSION

Based on the small sample size and the timing of the study, the results reported in the following section are speculative and based on initial observations and professional judgement. Additional work is required to develop more defensible results.

4.1 Capture Rate

Eight bats were captured from August 22 to 29 (eight nights) at five different sites. Three to six nets were used at each site, totalling 5.5 to 12 net-nights of effort per site (Table 2). Sample conditions were not ideal, with temperatures below 10°C on four nights and light rain experienced on one night (Appendix 1). Inclement weather conditions, including strong winds, precipitation and temperatures below 10°C (5°C farther north) will reduce bat activity and may influence survey results (RISC 1998).

Table 2. Capture rate of bats at different sampling sites in the Peace River Corridor.

Site	Date	Effort (Net-nights)	Bat captures	Capture rate (bats/net-night)
Blackfoot*	2005 Aug 22	5.5	0	0
Peace Island Wetland*	2005 Aug 23	8.5	1	0.12
Peace Island Channel	2005 Aug 24	6	0	0
Cache Creek	2005 Aug 25	12	4	0.33
Farrell Creek	2005 Aug 26	9	1	0.11
Halfway Creek*	2005 Aug 27	7.5	0	0
Lynx Creek*	2005 Aug 28	7.5	1	0.13
Gravel Pit Swamp*	2005 Aug 29	7.5	1	0.13
Total		63.5	8	0.13

* indicates netting nights with inclement weather conditions

4.2 Species Presence

Eight bats of three species were captured in mist nets, including five little brown bats, one northern myotis and two long-legged myotis (Table 3). The little brown myotis has been previously documented in the area, and was confirmed to be present and reproducing. The prominence of little brown bats in the population may be due to their relative abundance, but also likely reflects their generalist habits combined with the relative ease of capture of this species, as they fly low over water (Nagorsen and Brigham 1993). Long-legged myotis had not been previously detected in the area and the presence of a volant juvenile confirms the presence of a breeding population. The presence of the northern myotis was determined based on physical characteristics (definite brown colour of the ears, nose and flight membranes) and the expected distribution of the species. The long-eared myotis has nearly black skin and is believed to be a more southern species (Nagorsen and Brigham 1993).

Table 3. Capture location, species, sex, reproductive condition, age, and size of bats captured in the Peace River Corridor, Aug. 22-29, 2005.

Site	Species[1]	Sex	Reproductive condition[2]	Age[3]	Weight (g)	Forearm length (mm)	Comments
Peace Island Wetland	Long-legged myotis	M	Non-reproductive	Adult	7	38	no keel, foot = 8 mm
Cache Creek	Little brown myotis	F	Post-lactating	Adult	8.5	39.5	no keel, foot = 9 mm, ear = 12 mm
Cache Creek	Little brown myotis	F	Non-reproductive	Juvenile	8	37.5	foot = 9.75 mm, no keel
Cache Creek	Northern myotis	M	Non-reproductive	Adult	6.25	39	long ear = 15 mm, foot = 9 mm, small keel, brown ears and nose.
Cache Creek	Long-legged myotis	M	Non-reproductive	Juvenile	7	37.5	keel, foot = 6 mm
Farrell Creek	Little brown myotis	F	Pregnant	Adult	13	38	no keel, foot = 9 mm
Lynx Creek	Little brown myotis	M	Non-reproductive	Adult	10.5	38.5	no keel
Gravel Pit Swamp	Little brown myotis	M	Non-reproductive	Adult	9.5	39	no keel, foot = 9 mm

The reproductive condition of the bats captured included a post-lactating female, two volant juveniles, 4 non-reproductive males and a pregnant female. The lack of externally-visible testes in the males was surprising, since bats breed in the fall prior to hibernation (Nagorsen and Brigham 1993). In the Peace River region, the end of August is the onset of fall. The presence of a female in the late stages of pregnancy was also unusual this late in the season (Nagorsen and Brigham 1993).

The weights recorded for bats captured during inclement conditions (cold temperatures) are not representative since those bats were not held long enough to clear their digestive tracts. These include the adult male long-legged myotis and the two adult male little brown bats. The recorded weights of the other captured bats are within the range reported by Nagorsen and Brigham (1993) for each species. Wilkinson *et al*. (1995) and Crampton *et al*. (1997) reported that bats in northern regions may be larger than southern populations. Our findings cannot support or deny this finding.

No big bats were captured during netting sessions but two different calls were detected at 30 kHz on bat detectors. This may indicate that both silver-haired and big brown bats are present. Some calls were also heard simultaneously at 30 and 40 kHz, which is characteristic of calls of the eastern red bat. This species has been recorded and captured in the Fort McMurray area of north eastern Alberta (Stefan 2004). The potential presence of eastern red bat in the Peace region would represent a large range extension.

4.3 Activity Levels

Activity data was collected at 16 sites (netting and remote). Recording began between 20:35 and 20:55 and continued for up to 2.25 hours. The total sampling time ranged from 50 to 225 minutes per site, totalling 2125 minutes of acoustic monitoring. Bats were detected at all 16 sampling sites and activity levels varied considerably between sites and species group (big bats and *Myotis*). Due to the small sample size, only limited inferences can be made about activity levels associated with each sample site.

Myotis species were recorded at all sites, with particularly high activity at Lynx Creek (Table 4). In total, 484 *Myotis* passes and 39 buzzes were recorded for a foraging rate of 0.08 buzzes/pass (Table 5). Little to no big bat activity was detected at forested sites. High big bat activity was recorded at Watson Slough (large wetland) and at Halfway River (Table 4). In total, 250 big bat passes and 24 buzzes were recorded, for a foraging rate of 0.10 buzzes/pass (Table 5). Overall activity levels of bats were considered quite high, given the late time of year (late August) and the cool evening temperatures, averaging 10.6 ºC (range 5-16 ºC) at dusk and 8.75 ºC (3 – 14 ºC) at net take-down.

Table 4. Bat activity for each species group for 5 sites with high activity levels.

Big bat sites	Big bat activity rate (calls/minute)1	*Myotis* sites	*Myotis* activity rate (calls/minute)
Watson Slough	0.96	Lynx Creek Channel	0.93
Halfway River Wetland	0.83	Peace Island Balsam poplar	0.55
Halfway River Channel	0.33	Farrell Creek Balsam poplar	0.52
Cache Creek Bridge	0.12	Lynx Creek Forest	0.45
Farrell Creek Channel	0.12	Halfway Creek Channel	0.25

[1] Calls includes both passes and foraging buzzes.

Table 5. Summary of habitat type and bat activity at each detector sample site.

Sample Site	Habitat type	*Myotis* Activity		Big Bat Activity	
		Pass	Buzz	Pass	Buzz
Aspen_Forest_2005_08_29	Aspen Forest	12			
Blackfoot_House_2005_08_22	Edge Habitat	5		4	
Blackfoot_Wetland_2005_08_22	Wetland	20	2	7	
Cache_Creek_Bridge_2005_08_25	Slow Moving Creek	24	2	25	2
Farrell_Creek_Channel_2005_08_26	Slow Moving Creek	8	2	23	
Farrell_Creek_Poplar_2005_08_26	Balsam poplar floodplain	41			3
Gravel_Pit _Swamp_2005_08_29	Wetland	2		6	
Halfway_Creek_Channel_2005_08_27	River	42	10	58	2
Halfway_Creek_Wetland_2005_08_27	Wetland	19	16	71	1
Lynx_Creek_Channel_2005_08_28	Slow Moving Creek	102		1	10
Lynx_Creek_Forest_2005_08_28	Edge Habitat	102		1	
Peace_Island_Channel_2005_08_24	River	4		8	
Peace_Island_Poplar_2005_08_23	Balsam poplar floodplain	19		3	1
Peace_Island_Poplar_2005_08_24	Balsam poplar floodplain	55		1	
Peace_Island_Wetland_2005_08_23	Wetland	26		1	5
Watson_Slough_2005_08_25	Wetland	3	7	41	
Total		484	39	250	24

The pattern of activity can suggest whether a site is used for roosting or foraging. An initial post-dusk burst of activity suggests roosting activity, while activity throughout the sampling period suggests foraging or commuting. Three sample sites showed a distinctive pattern of activity. Peace Island Poplars and Farrell Creek Poplars appeared to provide roosting habitat, while Lynx Creek Channel was used primarily for foraging (Figure 2).

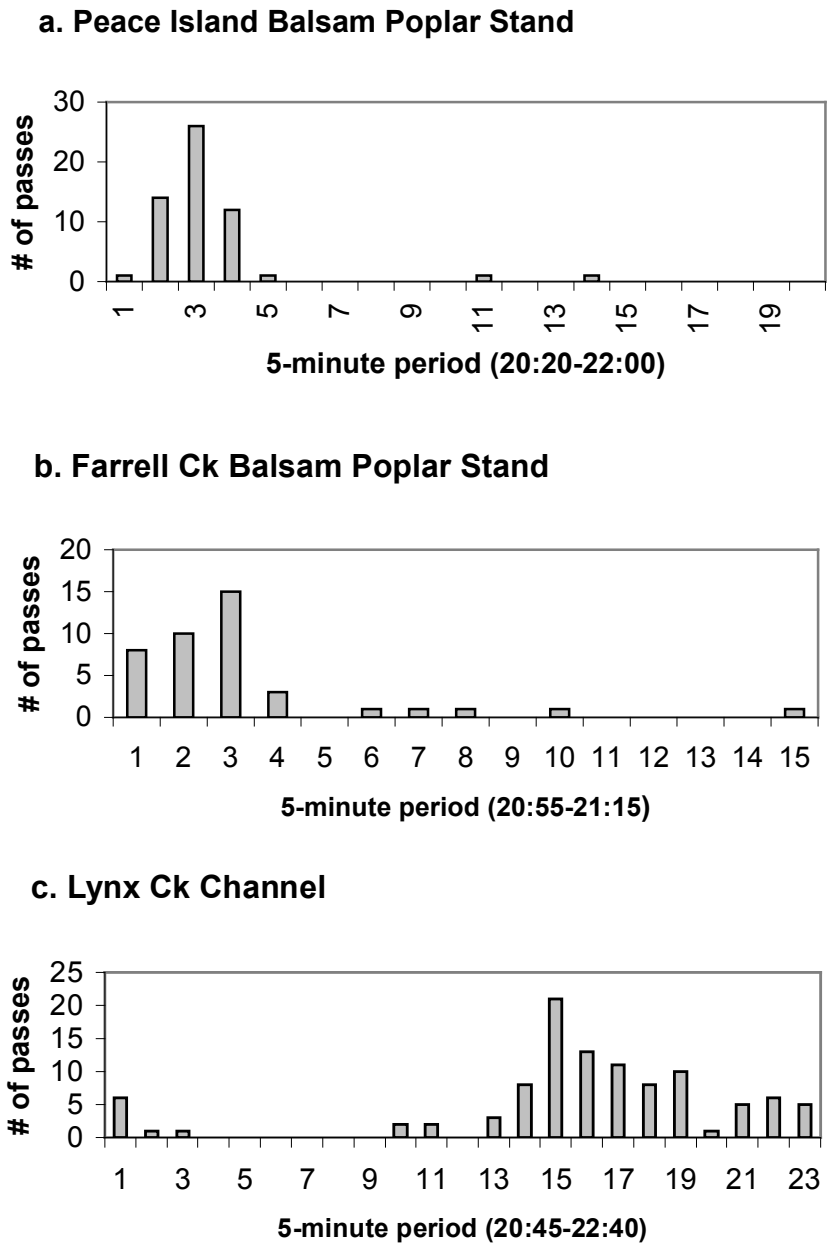

Figure 2. Timing of activity of bats at (a) Peace Island balsam poplar stand, (b) Farrell Creek balsam poplar stand, and (c) Lynx Creek Channel.

4.4 Preliminary Habitat Assessment

4.4.1 Roosting Habitat

Most bat species in BC roost in hollows, trees, cavities, buildings, rock crevices or the foliage of trees and shrubs (Nagorsen and Brigham 1993). Bats in the Liard River area and in northern Alberta were documented roosting in deciduous trees, caves, and old houses (Vonhof *et al*. 1997; Wilkinson *et al*. 1997; Crampton and Barclay 1998). Research on roosts in the Sub-Boreal Spruce zone near Prince George also found non-maternity roosts in lodgepole pine trees (*Pinus contorta*) (Psyllakis 2001), and roosts in conifers are well-documented in other southern areas (e.g., Barclay and Brigham 1996; Kellner and Rasheed 2002).

A draft ratings table (Appendix 2) was produced for roosting habitat in the study area based on the potential for each ecosystem unit to provide roosting structures. Assumptions include:

- old forests are more suitable than young forests since they are more likely to contain large trees with hollows and cavities
- balsam poplar trees are more suitable than other tree species based on their potential size and propensity to develop cavities and loose bark
- riparian habitats are more suitable than non-riparian habitats since they are more likely to contain balsam poplar.

Most abandoned buildings in the area showed evidence of roosting by bats, although no live bats were observed. Based on the amounts of guano, the abandoned building near Blackfoot Creek Provincial Park was likely used as a maternity colony. Guano and a dead unidentifiable *Myotis* juvenile suggest that the staff house at Peace Island Park also houses a maternity colony. Many old buildings around the Hudson's Hope Visitor Centre also contained guano.

The bridges examined (Cache Creek, Farrell Creek, Halfway Creek) had variable amounts of guano on the ground below them. These bridges likely provided night roost sites for bats, as the large structures hold heat and are known to be used as night roosts in other parts of the province (e.g., Kellner and Rasheed 2002).

4.4.2 Foraging Habitat

Nocturnal flying insects, including moths, flies, caddisflies, midges, beetles, grasshoppers, ants and termites are the important prey for bat species in BC (Nagorsen and Brigham 1993). Studies on bat habitat use identified riparian habitats as having the greatest bat activity (Lunde and Harestad 1986; Thomas 1988; Grindal and Brigham 1999; Seidman and Zabel 2001). This reflects superior conditions such as higher insect abundance (Thomas 1988), and calm, slow-moving water that does not interfere with echolocation (von Frenckell and Barclay 1987).

A draft ratings table (Appendix 2) was produced for foraging habitat in the study area based on the potential for each ecosystem unit to provide feeding habitat. Assumptions include:

- stagnant / slow-moving water has more potential to produce prey species than forested sites and is more suitable for foraging
- open, old forests are more suitable than young dense forests.

5.0 RECOMMENDATIONS FOR FUTURE WORK

Significant results include the confirmation of a reproductive population of long-legged myotis, a species that has not been previously documented in the region, the capture of the Blue-listed northern myotis, and the potential detection of eastern red bat. Based on these results, the high levels of bat activity observed at several sites, and the initial assessment of bat habitat in the Peace River Corridor, the following recommendations are made:

1. Conduct a more intensive inventory program to identify the species present in the area and their reproductive status.

   Sampling should be planned for late June to early August, to occur during the peak of reproductive activity. Because netting sites are limited by topography, and several species are rarely caught by nets, sampling should involve a combination of mist-netting, acoustic detection and searches of potential roost structures.

   Effort should also be made to positively identify the big bat species in the area. Silver-haired bat, big brown bat, and eastern red bat may be captured with increased mist-netting effort. Confirming presence of the hoary bat could be accomplished by a) always sampling with a tuneable detector set at 20 kHz, and b) analyzing bat calls recorded from an Anabat detector (spectrograms of calls of hoary bat are easily identified).

2. Identify roosting habitat in the Peace River Corridor. Habitat for maternity colonies is particularly important, given that maternity roosts are essential for the survival of bat populations.

   Currently, there is no area-specific information available on roost site selection. Inferences can be made from research on roosting preferences of northern myotis in the Liard area and little brown myotis and silver-haired bat in northern Alberta. However, studies to determine the use of habitats in the Peace area are required.

   A telemetry study focusing on lactating females is recommended. Studies will focus on the long-legged myotis, for which there is no information on roost selection in northern habitats; northern myotis, a Blue-listed species thought to be dependent on old forests (Cannings *et al.* 1999) but also documented to roost in an old cabin (Wilkinson *et al.* 1995); and little brown myotis, which has flexible roosting habits, but is known to use tree roosts and is easily captured. If capture rates are low the study should focus on identifying roosting habitat for all species.

3. Determine the relative activity of roosting / foraging areas**.** Baseline data on activity levels should be collected using bat detectors. Those data can be used to verify the assumptions for the preliminary habitat assessment.

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7.0 LITERATURE CITED

Barclay, R.M., and R.M. Brigham, eds. 1996. Bats and Forests Symposium. B.C. Minist. For. Res. Program, Working Pap. No. 23. 292pp.

Betts, B.J. 1998. Effects of interindividual variation in echolocation calls on identification of big brown and silver-haired bats. J. Wild. Manage. 62:1003-1010.

British Columbia Conservation Data Centre (BC CDC). 2005. Species Summary: *Myotis septentrionalis*. B.C. Minist. of Sustainable Resour. Manage. Available: http://srmapps.gov.bc.ca/apps/eswp/ (accessed Sep 9, 2005).

Burles, D. 2004. Bat work in the Skeena region. Western Bat Working Group Newsletter. Spring 2005. http://www.wbwg.org/Spring%202005%20WCBWG%20News.pdf (accessed Sep 14, 2005).

Cannings, S.G., L.R. Ramsay, D.F. Fraser, and M.A. Fraker. 1999. Northern long-eared myotis. Pp 69-70 *in* Rare Amphibians, Reptiles, and Mammals of British Columbia. Wildl. Branch and Resour. Inv. Branch, BC Minist. Environ., Lands, and Parks, Victoria BC. 198pp.

Crampton, L.H. and R.M.R. Barclay. 1998. Selection of roosting and foraging habitat by bats in different-aged aspen mixedwood stands. Cons. Biol. (12): 1347-1358.

Crampton, L.H., K. G. Poole and C. Shurgot. 1997. Bat Inventory of the Prophet River Territory, Northeastern British Columbia. Timberland Consultants Ltd. Nelson, B.C. Rept. to Fish and Wildlife Branch B.C. Ministry of Environment, Lands and Parks, Peace Subregion, Fort St. John, B.C.

Caceres, M. C., and M. J. Pybus. 1997. Status of the Northern Long-eared Bat (*Myotis septentrionalis*) in Alberta. Alberta Environmental Protection, Wildlife Management Division, Wildlife Status Report No. 3, Edmonton, AB. 19 pp.

Caceres, C. 1998. The Foraging and Roosting Ecology of the *Myotis* bats of the Interior Wet-belt, British Columbia. Prepared for: Parks Canada, Columbia Basin Fish and Wildlife Compensation Program. 33 pp.

Grindal, S.D. and R.M. Brigham. 1999. Impacts of forest harvesting on habitat use by foraging insectivorous bats at different spatial scales. Ecoscience 6: 25-34.

Holroyd, G.L., and K.I. Van Tighem. 1983. Ecological (Biophysical) Land Classification of Banff and Jasper National Parks Vol. III. Canadian Wildlife Service and Parks Canada, Calgary, AB.

Hubbs, A. and T. Schowalter. 2003. Survey of Bats in Northeastern Alberta. Alberta Sustainable Resource Development, Fish and Wildlife Division. Alberta Species at Risk Report No. 68. Edmonton, AB. 18pp.

Kellner, M. and S. Rasheed. 2002. Campbell River Bat Project: Inventory and Habitat Enhancement. Prepared for BC Hydro Bridge Coastal Fish and Wildlife Restoration Program.55pp.

Lunde, R.E. and A.S. Harestad. 1986. Activity of little brown bats in coastal forests. Northw. Sci. 60: 206- 209.

Nagorsen D.W. and R.M. Brigham. 1993. Bats of British Columbia. Royal British Columbia Museum Handbook. UBC Press, Vancouver, BC. 164pp.

Patriquin, K.J. 2001. Red bat (*Lasiurus borealis*) captured in northeastern Alberta. Northw. Nat. 85:28-30

Patriquin, K.J. and R.M.R. Barclay. 2003. Foraging by bats in cleared, thinned and unharvested boreal forest. J. Appl. Ecol. 40:646-657.

Psyllakis, J. M. 2001. Bat Roosting and Foraging Ecology in Naturally Disturbed Habitats. MSc. Thesis, University of Regina, Regina, Saskatchewan. 74 pp.

Racey, P.A. 1988. Reproductive assessment in bats. Pp. 31-43 ***in*** Kunz, T.H. (ed.) Ecological and Behavioural Methods for the Study of Bats. Smithsonian Institution Press, Washington, D.C. 533 pp.

Resource Inventory Committee (RIC). 1998. Inventory Methods for Bats. BC Ministry of Environment, Lands, and Parks. Version 2.0. Victoria, B.C. 51 pp.

Schowalter, D.B. W.J. Dorward and J.R. Gunson. 1978. Seasonal occurrence of silver-haired bats (*Lasionycteris noctivagans*) in Alberta and British Columbia. Can. Fld-Nat. 92:288-291.

Schowalter, D.B. and J.R. Gunson. 1979. Reproductive biology of the big brown bat (*Eptesicus fuscus*) in Alberta. Can. Fld-Nat. 93:48-54.

Seidman, V.M. and C.J. Zabel. 2001. Bat activity along intermittent streams in northwestern California. J. Mammal. 82: 738-747.

Stefan, C. 2004. Bat surveys in northeastern Alberta. Western Bat Working Group Newsletter, Spring 2005. http://www.wbwg.org/Spring%202005%20WCBWG%20News.pdf (accessed Sep14, 2005).

Thomas, D.W. 1988. The distribution of bats in different ages of Douglas-fir forests. J. Wildl. Manage. 52: 619-626.

Von Frenckell, B. and R.M.R. Barclay. 1987. Bat activity over calm and turbulent water. Can J. Zool. 65: 219-222.

Vonhof, M.J., S. McNalley, and A. Yu. 1997. Roosting Habitat Requirements of Northern Long-Eared Bats (*Myotis septentrionalis*) in Northeastern British Columbia: the Fort Nelson River and Highway 77 Area. Echo Biological Consulting, Inc. Calgary, AB. Rept. to BC Ministry of Environment, Lands and Parks, Fort St. John, B.C.

Wilkinson, L.C, P.F.J. Garcia, and R.M.R. Barclay. 1995. Bat Survey of the Liard River Watershed in Northern British Columbia. Rept. to B.C. Ministry of Environment, Lands and Parks, Victoria, B.C. 39 pp.

APPENDIX 1 – BAT CAPTURE, DETECTION AND HABITAT DATA FOR SAMPLING SITES

Table 1. Bat Netting Station Data from August 22 to August 29, 2005.

Survey Name	Visit Date	Species	UTM Zone	UTM Easting	UTM Northing	NAD	Stratum	CC - start	Wind - start	Precip - start	Temp - start	Lunar Phase	CC - end	Wind - end	Precip - end	Temp - end	Time - Open	Time - Close	Capt Mech#
Blackfoot_Wetland_2005_08_22	2005-08-22		10	683670	6223823	83	wetland	2	0	N	8	TQ	1	0	N	6.5	20:45	23:45	9m*2m net
Blackfoot_Wetland_2005_08_22	2005-08-22		10	683670	6223823	83	wetland	2	0	N	8	TQ	1	0	N	6.5	20:45	23:45	6m*2m net
Blackfoot_Wetland_2005_08_22	2005-08-22		10	683670	6223823	83	wetland	2	0	N	8	TQ	1	0	N	6.5	20:45	23:45	18m*2m net
Peace_Island_Wetland_2005_08_23	2005-08-23		10	643452	6223700	83	wetland	1	0	N	8	TQ	1	0	N	5.5	20:45	0:00	6m*2m net
Peace_Island_Wetland_2005_08_23	2005-08-23	M-MYVO	10	643422	6223623	83	wetland	1	0	N	8	TQ	1	0	N	5.5	20:45	0:00	18m*2m net
Peace_Island_Wetland_2005_08_23	2005-08-23		10	643422	6223623	83	wetland	1	0	N	8	TQ	1	0	N	5.5	20:45	0:00	18m*2m net
Peace_Island_Wetland_2005_08_23	2005-08-23		10	643422	6223623	83	wetland	1	0	N	8	TQ	1	0	N	5.5	20:45	0:00	9m*2m net
Peace_Island_Channel_2005_08_24	2005-08-24		10	644180	6223480	83	backchannel	1	1	N	10	SQ	1	0	N	9	20:45	22:30	9m*2m net
Peace_Island_Channel_2005_08_24	2005-08-24		10	644180	6223480	83	backchannel	1	1	N	10	SQ	1	0	N	9	20:45	21:45	18m*2m net
Peace_Island_Channel_2005_08_24	2005-08-24		10	644180	6223480	83	backchannel	1	1	N	10	SQ	1	0	N	9	20:45	22:30	9m*2m net
Cache_Creek_2005_08_25	2005-08-25	M-MYLU	10	609184	6237542	83	creek	1	1	N	16	SQ	1	1	N	12	20:45	00:15	18m*2m net
Cache_Creek_2005_08_25	2005-08-25	M-MYLU	10	609184	6237542	83	creek	1	1	N	16	SQ	1	1	N	12	20:45	00:15	18m*2m net
Cache_Creek_2005_08_25	2005-08-25	M-MYSE	10	609184	6237542	83	creek	1	1	N	16	SQ	1	1	N	12	20:45	00:15	9m*2m net
Cache_Creek_2005_08_25	2005-08-25	M-MYVO	10	609184	6237542	83	creek	1	1	N	16	SQ	1	1	N	12	20:45	00:15	9m*2m net
Cache_Creek_2005_08_25	2005-08-25		10	609184	6237542	83	creek	1	1	N	16	SQ	1	1	N	12	20:45	00:15	9m*2m net
Cache_Creek_2005_08_25	2005-08-25		10	609184	6237542	83	creek	1	1	N	16	SQ	1	1	N	12	20:45	00:15	9m*2m net
Farrell_Creek_2005_08_26	2005-08-26	M-MYLU	10	578866	6220370	83	creek	3	0	N	13.5	SQ	2	2	N	12	20:45	00:00	18m*2m net
Farrell_Creek_2005_08_26	2005-08-26		10	578866	6220370	83	creek	3	0	N	13.5	SQ	2	2	N	12	20:45	00:00	9m*2m net
Farrell_Creek_2005_08_26	2005-08-26		10	578866	6220370	83	creek	3	0	N	13.5	SQ	2	2	N	12	20:45	00:00	9m*2m net
Farrell_Creek_2005_08_26	2005-08-26		10	578866	6220370	83	creek	3	0	N	13.5	SQ	2	2	N	12	20:45	00:00	9m*2m net
Farrell_Creek_2005_08_26	2005-08-26		10	578866	6220370	83	creek	3	0	N	13.5	SQ	2	2	N	12	20:45	00:00	9m*2m net
Halfway_River_2005_08_27	2005-08-27		10	596615	6231494	83	creek	4	0	LR	15	SQ	4	1	N	14	20:40	00:00	18m*2m net
Halfway_ River_2005_08_27	2005-08-27		10	596615	6231494	83	creek	4	0	LR	15	SQ	4	1	N	14	20:40	00:00	9m*2m net
Halfway_ River_2005_08_27	2005-08-27		10	596615	6231494	83	creek	4	0	LR	15	SQ	4	1	N	14	20:40	00:00	9m*2m net
Halfway_ River_2005_08_27	2005-08-27		10	596615	6231494	83	creek	4	0	LR	15	SQ	4	1	N	14	20:40	00:00	9m*2m net
Lynx_Creek_2005_08_28	2005-08-28	M-MYLU	10	572154	6214116	83	creek	4	1	N	9.5	SQ	4	1	N	8	20:30	00:30	9m*2m net
Lynx_Creek_2005_08_28	2005-08-28		10	572154	6214116	83	creek	4	1	N	9.5	SQ	4	1	N	8	20:30	00:30	9m*2m net
Lynx_Creek_2005_08_28	2005-08-28		10	572154	6214116	83	creek	4	1	N	9.5	SQ	4	1	N	8	20:30	00:30	9m*2m net
Lynx_Creek_2005_08_28	2005-08-28		10	572154	6214116	83	creek	4	1	N	9.5	SQ	4	1	N	8	20:30	00:30	18m*2m net
Gravel_Pit_Swamp_2005_08_29	2005-08-29		10	564974	6206085	83	wetland	2	1	N	5	FQ	1	1	N	3	20:45	23:15	9m*2m net

Survey Name	Visit Date	Species	UTM Zone	UTM Easting	UTM Northing	NAD	Stratum	CC - start	Wind - start	Precip - start	Temp - start	Lunar Phase	CC - end	Wind - end	Precip - end	Temp - end	Time - Open	Time - Close	Capt Mech#
Gravel_Pit_Swamp_2005_08_29	2005-08-29		10	564974	6206085	83		2	1	N	5	FQ	1	1	N	3	20:45	23:15	9m*2m net
Gravel_Pit_Swamp_2005_08_29	2005-08-29		10	564974	6206085	83		2	1	N	5	FQ	1	1	N	3	20:45	23:15	9m*2m net
Gravel_Pit_Swamp_2005_08_29	2005-08-29	M-MYLU	10	564974	6206085	83		2	1	N	5	FQ	1	1	N	3	20:45	23:15	18m*2m net

Table 2. Bat Species Capture Data from August 22 to August 29, 2005.

Date	Scientific Name	Common Name	Location UTM (NAD 83)			Capture Mechanism	Sex	Age Class	Reproductive Condition	Average Forearm Length (mm)	Weight (g)	Bands
			Zone	Northing	Easting							
23-Aug-05	*Myotis volans*	Long-legged Myotis	10	643422	6223623	18m*2m net	male	adult	not reproductive	38	7	none
25-Aug-05	*Myotis lucifugus*	Little Brown Myotis	10	609184	6237542	18m*2m net	female	adult	post-lactating	39.5	8.5	none
25-Aug-05	*Myotis lucifugus*	Little Brown Myotis	10	609184	6237542	18m*2m net	female	juvenile	not reproductive	37.5	8	none
25-Aug-05	*Myotis septentrionalis*	Northern Long-eared Myotis	10	609184	6237542	9m*2m net	male	adult	not reproductive	39.0	6.25	none
25-Aug-05	*Myotis volans*	Long-legged Myotis	10	609184	6237542	9m*2m net	male	juvenile	not reproductive	37.5	7	none
26-Aug-05	*Myotis lucifugus*	Little Brown Myotis	10	578866	6220370	18m*2m net	female	adult	pregnant	38.0	13	none
28-Aug-05	*Myotis lucifugus*	Little Brown Myotis	10	572154	6214116	9m*2m net	male	adult	not reproductive	38.5	10.5	none
29-Aug-05	*Myotis lucifugus*	Little Brown Myotis	10	564974	6206085	18m*2m net	male	adult	not reproductive	39.0	9.5	none

Table 3. Bat Detection Data from August 22 to August 29, 2005.

Survey Name	Visit Date	Det Type	Band	Reciever	UTM Zone	UTM Easting	UTM Northing	NAD	Stratum	Site Series	Structural Stage	GIF
Blackfoot_Wetland_2005_08_22	2005-08-22	Mini-3 Bat	Narrow	Hand Held	10	683670	6223823	83	wetland	WD	2	LS107
Blackfoot_House_2005_08_22	2005-08-22	Anabat	Broad	Remote	10	682813	6223633	83	cultivated field	CL	2	
Peace_Island_Wetland_2005_08_23	2005-08-23	Mini-3 Bat	Narrow	Hand Held	10	643422	6223623	83	wetland	SM	3a	LS109
Peace_Island_Balsam poplar_2005_08_23	2005-08-23	Anabat	Broad	Remote	10	643452	6223584	83	balsam poplar floodplain	$ac-a	5	LS110
Peace_Island_Channel_2005_08_24	2005-08-24	Mini-3 Bat	Narrow	Hand Held	10	644180	6223480	83	backchannel	RI		
Peace_Island_Balsam poplar_2005_08_24	2005-08-24	Anabat	Broad	Remote	10	643850	6223500	83	backchannel	$ac	6	
Cache_Creek_Bridge_2005_08_25	2005-08-25	Mini-3 Bat	Narrow	Hand Held	10	609184	6237542	83	creek	RI		
Watson_Slough_2005_08_25	2005-08-25	Anabat	Broad	Remote	10	607161	6235774	83	wetland	WS	3	LS118
Farrell_Creek_Balsam poplar_2005_08_26	2005-08-26	Anabat	Broad	Remote	10	578770	6220443	83	balsam poplar floodplain	AH	5	LS120
Farrell_Creek_Channel_2005_08_26	2005-08-26	Mini-3 Bat	Narrow	Hand Held	10	578866	6220370	83	creek	RI		
Halfway_ River_Balsam poplar_2005_08_27	2005-08-27	Anabat	Broad	Remote	10	596615	6231494	83	balsam poplar floodplain	$ac	3b	LS122
Halfway_ River_Channel_2005_08_27	2005-08-27	Mini Bat	Narrow	Hand Held	10	596627	6231464	83	creek	RI		
Lynx_Creek_Channel_2005_08_28	2005-08-28	Anabat	Broad	Remote	10	572166	6214100	83	creek	RI		
Lynx_Creek_Forest_2005_08_28	2005-08-28	Mini Bat	Narrow	Hand Held	10	572150	6214120	83	balsam poplar floodplain	$ac	5	LS124
Gravel_Pit _Swamp_2005_08_29	2005-08-29	Mini Bat	Narrow	Hand Held	10	564974	6206085	83	wetland	SM	2b	
Gravel_Pit _Forest_2005_08_29	2005-08-29	Anabat	Broad	Remote	10	565000	6206250	83	Aspen Forest	$ap	5	LS127

APPENDIX 2 – DRAFT RATINGS TABLE FOR BAT ROOSTING AND FORAGING HABITAT

Table 1. Map code, site series number and ecosystem name of habitat units mapped in the study area

Map Code	Site Series #	Ecosystem Name
AM	01	SwAt - Step moss
AM: ap	01$	$At - Creamy peavine (seral association)
AS	00	SwAt – Soopolallie
BL	04	Sb - Lingonberry - Coltsfoot
BL: al	04$	$At - Labrador tea (seral association)
BT	08	Sb - Labrador tea – Sphagnum
CB	00	Cutbank
CF	00	Cultivated field (incl. pastures)
ES	00	Exposed soil
Fm02	09	ActSw - Red-osier dogwood
GB	00	Gravel bar
GP	00	Gravel Pit
LA	00	Lake
LL	02	Pl - Lingonberry - Velvet-leaved blueberry
LL: ak	02$	$At - Kinnikinnick (seral association)
MI	00	Mine
OW	00	Shallow open water
PD	00	Pond
RE	00	Reservoir
RI	00	River
RN	00	Railway
RO	0	Rock
RW	0	Rural
RY	0	Reclaimed Garbage dump
RZ	0	Road surface
SC	6	Sw - Currant – Bluebells
SC: ab	05$	$At – Black Twinberry (seral association)
SC: ep	05$	$Ep – red-osier dogwood (seral association)
SE	00	Sedge Wetland
SH	07	Sw - Currant – Horsetail
SH: ac	07$	$Ac – Cow parsnip (seral association)
SH: ep	07$	$Ep – Ep-Dogwood (seral association)
SO	05	Sw - Currant - Oak fern
SW	03	Sw - Wildrye – Peavine
SW: as	03$	$At - Soopolallie (seral association)
TS	10	Tamarack - Sedge – Fen
UR	00	Urban
WH	00	Willow – Horsetail – Sedge – Riparian Wetland
WS	00	Willow – Sedge – Wetland
WW	00	Fuzzy-spiked Wildrye - Wolf willow

Table 2. Preliminary habitat ratings for bat roosting habitat in the Peace River Valley

Site Series	Structural Stage	Rating	Comments
01	1-4	6*	
	5	4*	
	6	3*	
	7	2*	
05, 06, 07, 02, 03, 04, 08	1-5	6*	
	6-7	4*	
01$	1-4	6*	
	5	2*	Based on the assumption that 5 is the maximum seral stage for this site series
02$, 03$, 04$, 05$, 06$	1-4	6*	
	5-7	2*	
07$, bench	1-4	6*	
	5	2*	
	6-7	1	

*presence of emergent trees/snags can increase rating to 1 or 2

Table 3. Preliminary habitat ratings for bat foraging habitat in the Peace River Valley

Site Series	Structural Stage	Rating	Comments
00 SE, TS, WH	2-3	1	
07, 08, 07$	1-3	5	
	4-5	3	
	6-7	2	
01, 04, 05, 06	1-3	5	
	4-5	6	
	6-7	3	
02, 03	1-3	5	
	4-5	6	
	6-7	4	Bats are known to forage extensively in dry pine forests in other area; these sites may be more valuable.