Inventory and habitat enhancement of Western Screech and Flammulated Owls in the Bridge Coastal Study Area Final Report

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Prepared For: British Columbia Hydro Bridge Coastal Fish and Wildlife Restoration Program

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Executive Summary

The Bridge Coastal Fish and Wildlife Restoration Program's goal is to address the effects of hydroelectric development on the fish and wildlife inhabiting the Bridge-Coastal Generation Area. The program's strategic plan emphasizes improving the knowledge base on rare, endangered and threatened species within hydroelectric footprint. Identification of species distribution and habitat use is imperative to the conservation of biodiversity and enhanced production. Thus, in 2006, call playback techniques were used to assess active territories in the Seton and Bridge watersheds, of the threatened Western Screech-owl (*Megascops kennicottii*) and the Flammulated Owl (*Otus flammeolus*), a species of special concern.

Eight Flammulated Owl and seven Western Screech-owl transects were established. These transects were surveyed three times from 19 May to 16 July resulting in 13 active Flammulated and nine Western Screech-owl territories. The Flammulated Owl territories detected on Carpenter and Seton Lakes extend the known distribution of the species. Additionally, one Flammulated Owls nesting occurrence was identified near Carol Lake in the Bridge River drainage. Of the nine Western Screech-owl territories defined, three represented breeding pairs which successfully fledged young. These were located in the township of D'arcy, on the Highline Road above Anderson Lake and on the Cayoosh River near Lillooet.

The Western Screech-owls in this region fall between the distribution centers of the threatened *M. k. kennicottii* and the endangered *M. k. macfarlanei* subspecies. Knowledge of subspecies distribution facilitates informed decision-making when considering population status, viability and recovery. Thus, at eight of the territories, the male territorial call was recorded and call structure was compared to that of recordings from the two recognized subspecies in British Columbia. There was a significant difference between all four regions in three of six frequency variables examined. The Bridge/Seton owls exhibited call characteristics in common with both the Northern Vancouver Island and Okanagan Valley owls, making it difficult to taxonomically classify these owls into either the interior or coastal subspecies. However, the Bridge/Seton owls occupy habitat most similar to the Okanagan owls, and their classification should follow that which affords the most protection for the subspecies. Until this taxonomic question is answered with certainty, they should be treated as *M. k. macfarlanei*.

A public outreach intern hired from the N'Quatqua Band office was responsible for creating and organizing an educational program presented within the local communities. Fifteen nest boxes, donated by the Northwest Wildlife Preservation Society, were distributed at the presentations. As a result of this work, educational articles appeared in the St'at'imc Runner and Bridge River-Lillooet News. Audio-visual presentations on the identification, ecology, and habitat enhancement of local threatened owl species were given in Lillooet, D'arcy, Seton-Portage, and Bridge River, reaching approximately 65 people. The public outreach component raised awareness for conservation efforts concerning local threatened/endangered owl species and encouraged involvement of local homeowners through the use of nest boxes.

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1.0 Introduction

1.1. Hydroelectric Impacts

The implementation of the Mission/Terzaghi (1948) and Seton (1956) dam and subsequent water diversions created loss of habitat and habitat alterations. The Mission Dam, and later, the Terzaghi Dam, formed Carpenter Reservoir, and according to the Bridge Coastal Fish and Wildlife Restoration Program (BCRP) strategic plans, resulted in the loss of 4,437 ha of the original Bridge River valley and 232 ha of adjacent hillsides (BCRP 2004). Seton Reservoir was raised by 2 m, resulting in a loss of 27 ha of terrestrial land (BCRP 2004).

Hydroelectric wires, steep gradients, barriers, development of train tracks and roads have limited establishment of riparian and upland habitat. Periodic spill over events at the Terzaghi Dam and fluctuating water levels in Downton, Carpenter and Seton Reservoirs have affected succession of riparian habitat (Figure 1). Flooding events resulted not only in removal of suitable habitat for riparian specialists such as the cavity nesting Western Screech-owl (*Megascops kennicottii*), but also diminished the amount of suitable habitat available for the Flammulated Owl (*Otus flammeolus*).

1.2. Goals and Objectives

In accordance with BCRP objectives, funding was awarded in 2006 to inventory for two listed species, the Western Screech and Flammulated Owl within the Bridge River and Seton watersheds. Selected survey areas contained suitable habitat based on modeling and visual assessment and/or historical records providing justification for intensive, species-specific surveys. Secondary objectives included, (1) monitoring to determine Flammulated and Western Screech-owl breeding status and habitat use, (2) artificial habitat enhancement, (3) Flammulated Owl habitat analysis, (4) analysis of the geographic variation in Western Screech-owl vocal signatures, and (5) recommendations for habitat conservation. Knowledge of the distribution and habitat needs of rare and endangered species has been identified as a strategic objective of BCRP, the Lillooet Land Resources Management Plan (LLRMP 2004) and will be important to the continued development of the St'át'imc Land and Resource Management Plan (SLRA 2004).

1.3. Species Information

1.1.1. Western Screech-owl

In British Columbia there are two subspecies of Western Screech-owls recognized, the interior (*M. k. macfarlanei*) and coastal subspecies (*M. k. kennicottii*). The distribution center of the interior subspecies of Western Screech-owl in B.C. is in the Okanagan Valley, though they are also found in the Shuswap and the Kootenays (Beaucher and Dulisse 2004, Davis and Weir 2006). They can be found in low elevation forests (<600m), frequently close to water. They breed in either deciduous or mixed deciduous-coniferous forests. Mature black cottonwood (*Populus trichocarpa*) trees characterize nest sites (Cannings et al. 1987). The coastal subspecies is found along the Pacific Coast ranges from Alaska to Oregon and prefers mixed forests of big leaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), Douglas-fir (*Pseudotsuga menziesii*) and

western hemlock (*Tsuga heterophylla*) (Cannings and Angell 2001). Both subspecies are cavity nesters and their diet varies from insects to small mammals.

The interior subspecies (*M. k. macfarlanei*) is listed as endangered under the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Species at Risk Act (SARA). Provincially, it has been red-listed and is managed under the Identified Wildlife Management Strategy (IWMS) (MWLAP 2004). The coastal subspecies (*M. k. kennicottii*) is listed as a Species of Special Concern under SARA and blue-listed provincially by the Conservation Data Centre (CDC). Two historical records of Western Screech-owls were noted in the study area in 1999/2000 (K. Wright, personal communication) and were suspected to be the endangered interior subspecies based on habitat association. Survey effort in 2005 delineated 3 territories of Western Screech-owls (Hausleitner and Young 2005).

1.1.2. Flammulated Owl

The Flammulated Owl was designated as a Species of Special Concern by COSEWIC in 2001 and listed on Schedule 1 of SARA. Provincially the owl is blue-listed by CDC. Typical Flammulated Owl breeding habitat is mature Interior Douglas-fir (IDF) forest with scattered large ponderosa pine (*Pinus ponderosa*) (McCallum 1994). Multiage-class stands with snags containing pre-existing woodpecker cavities are chosen for nesting and roosting. Regenerating thickets of Douglas-fir with adjacent shrub or grassy areas provide forage habitat (Cannings and van Woudenberg 2004). As the Flammulated Owl is an insectivore, it migrates south in the winter to follow its food supply (McCallum 1994). The distribution of Flammulated Owls in British Columbia is found in the southern and central interior of the province with some observations in the East Kootenays (Cannings and van Woudenberg 2004).

In 2004, a Flammulated Owl responded to a Northern-Spotted Owl call playback survey on Carpenter Lake (Young 2004). Hausleitner and Young (2005) found 18 potential Flammulated Owl territories on Carpenter Lake.

Figure 1. Carpenter Lake Reservoir near Gold Bridge, July 2005. Fluctuating water levels impede establishment of successional riparian vegetation and deciduous trees.

1.4. Bioaccoustic Recording

All Screech-Owls (*Megascops*) are separated taxonomically to some degree by voice (Konig et al. 1999). As such, dialectal variation among populations may give insight into the taxonomic relationships between groups where current sub specific designations are questionable. Presently nine subspecies of Western Screech-owl (*Megascops kennicottii)* are recognized in North America (Gehlbach 2003). Cannings and Angell (2001) suggested the need to study geographic variation in the vocalizations of this species, as the current sub specific designations may not represent the true meta-structure of the species. This requires sampling calls from numerous individuals within microgeographic regions to differentiate individual versus regional variation in call structure (Galeotti and Pavan 1991, Galeotti et al. 1993, Appleby and Redpath 1996).

Tripp (2004) investigated individual and regional variation in the territorial calls of the two subspecies of Western Screech-owl in British Columbia. Recordings of males were collected from northern and southern Vancouver Island populations of the coastal subspecies (*M.k. kennicottii*) and compared to the south-central B.C. subspecies (*M.k. macfarlanei*) (Figure 2). These were used as reference to analyze the territorial calls obtained in the Bridge and Seton watersheds.

The primary objective was to discern whether the Bridge/Seton watershed owls were more similar in call structure to the interior (red-listed) or coastal subspecies (blue-listed). The Western Screech-owls detected in the BCRP area were associated with riparian habitat, suggestive of the interior subspecies *M.k. macfarlanei* (Hausleitner and Young 2005). Determining the subspecies of Western Screech-owl in BC hydro's footprint would provide important information for management and conservation of this listed species.

2.0 Study Area

The Bridge River and Seton watersheds are situated in the Cascades Forest District. Lower elevation slopes in the study area were characterized by IDF biogeoclimatic (BEC) zone. Engleman-Spruce-Subalpine-Fir and Montane Spruce zones were typical of upper elevation slopes (>1100 m) (Young 2004). South facing slopes presented a mixture of Douglas-fir and ponderosa pine. The riparian within the study area would be classified primarily as low and middle bench flood classes (MacKenzie and Moran 2004) with the main tree species being black cottonwoods and big leaf maple. The Cascades Forest District is in a rain shadow; average annual precipitation in Lillooet is 33 cm. Mean temperature from April-August is17 ˚C (Environment Canada 2004).

Environmental effects such as fire and insect infestation coupled with anthropogenic disturbances due to timber harvest and hydroelectric development have created a mosaic of different aged forest stands within the study area.

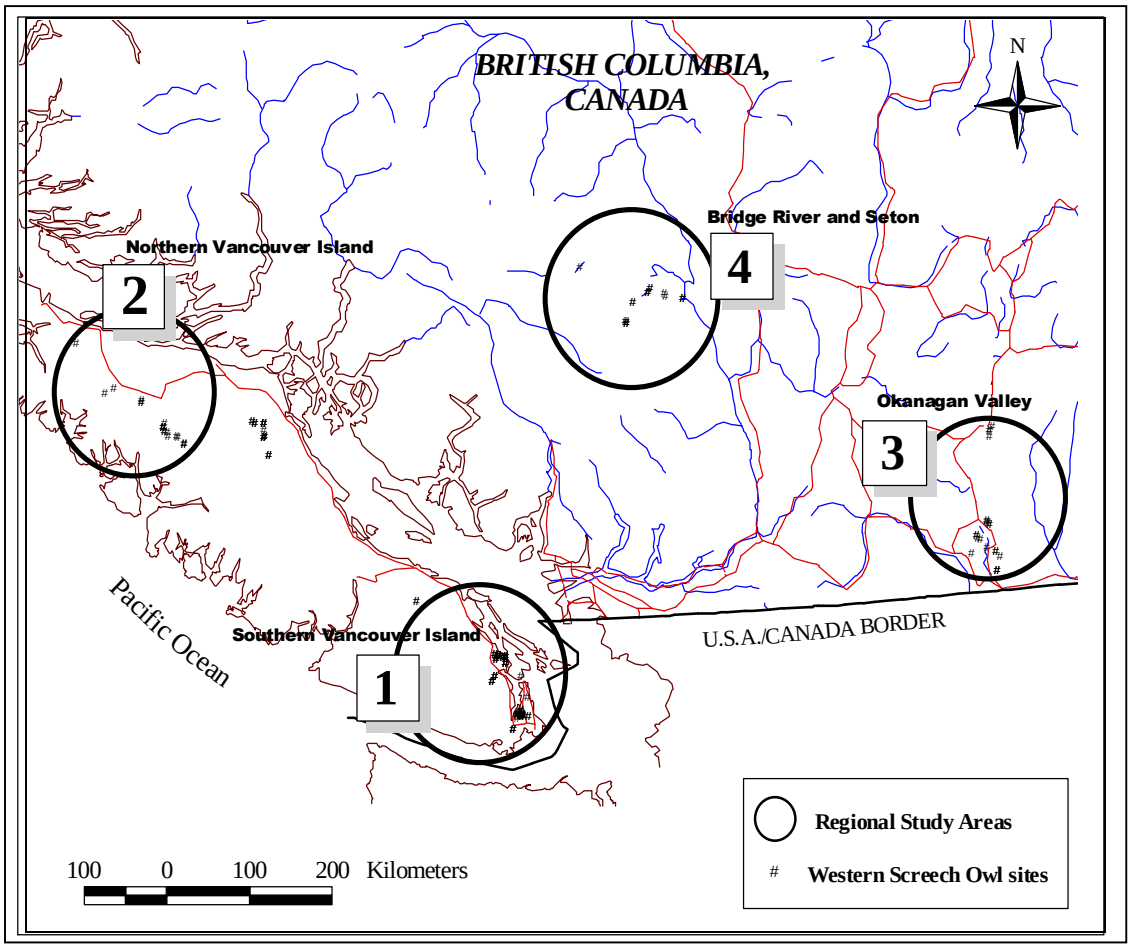

Figure 2. Study area locations of Western Screech-owl territories for bioaccoustic analysis. Four distinct regions are shown in large circles: southern Vancouver Island (Region 1) and northern Vancouver Island (Region 2), south-central mainland (Region 3) and the Bridge and Seton Watersheds (Region 4).

3.0 Methods

3.1. General Methods

Owl populations were inventoried using provincial protocols, which include call-playback methods along pre-determined routes (Hausleitner 2006). Territorial calls of the targeted species were broadcast at stations along roadsides using vehicles and on Seton Lake by boat during the breeding season (19 May-6 July) when owls are most territorial. Daytime reconnaissance was conducted prior to each survey to mark survey points, enhance survey safety and optimize acoustics.

Call playback surveys began at sunset and continued until the area was covered. The average road transect consisted of approximately 14 survey points placed approximately 500 m apart covering a linear distance of 7 km. At each station surveyors listened for 2-3 min, and then broadcast the territorial call of the targeted species two to three times. Each call lasted 1.0-1.5 min and was broadcast using a megaphone attached to a portable CD player. A minimum time of 15 min was spent broadcasting and

listening at each station. Additional time was added to survey stations to identify unknown sounds or compensate for loud background noises.

Owl observation numbers do not reflect the actual number of owl territories/sites detected as resident owls were likely to be detected more than once during the three repetitions conducted along each transect. To correct this territory numbers were estimated based on owl home range sizes and simultaneous call events.

3.2. Transect Descriptions

Transects and sample station locations were determined using Flammulated Owl habitat suitability modeling provided by Ministry of Environment, visual habitat assessment and existing known owl detections within the identified watersheds. Fourteen transects were surveyed; six were for Western Screech-owls and eight for Flammulated Owls (Table 1). Five of the Flammulated Owl and three of the Western Screech-owl transects were also surveyed in 2005. Multiple repetitions of transect within and between years are recommended to estimate owl occupancy (Hausleitner 2006). The transects descriptions are as follows:

Flammulated Owl Transects

Carpenter Lake: Seven transects were located along the Gold Bridge-Lillooet road on the north side of Carpenter Lake and the northeastern 5 km portion of Downton Lake. Call-playbacks broadcast on the north sides of Carpenter Lake from Terzaghi Dam to Gold Bridge and 3 km of the south side near Gold Bridge. Habitat suitability was classified as low and moderate for Flammulated Owls. Biogeclimatic zone is IDF dk2 and IDF dk2b.

Seton Lake: The habitat on the lakeshore had been subject to natural disturbance due to fires in 2000 and 2004. Salvage logging has removed much of the available habitat. Two repetitions were conducted by boat from 500 m southwest of the power lines at the Bridge River power station to the BC Hydro picnic site at the east end of Seton Lake. Surveys were conducted about 100-200m from the shoreline and stations were approximately 500 to 800 m (chose a greater distance apart due to excellent acoustics on lake) apart in suitable habitat on both north and south sides of lake. Habitat suitability was classified as high, moderate and low based on habitat modeling. North side of lake was drier than south with higher proportion of ponderosa pine. Biogeoclimatic zone is IDF ww.

Western Screech-owl Transects

Gold Bridge: Transect targeted black cottonwood riparian habitat near the town site of Gold Bridge and included coverage on the Hurley Forest service road towards Pemberton (< 2 km before Gold Bridge-Lillooet road), points on the Gold Bridge Dam road towards turn off to La Joie Dam, and on Carpenter Lake road towards Gun Creek.

Seton-Portage/Highline: Transect started on the road towards Shalath (one station north and one south of school and continued through Seton-Portage with three stations on Spyder Creek road and two stations on the Seton-Portage Road.

Additional points were located on the Seton River at the north end of Anderson Lake and on the Highline road. Three drainages (Six mile, Sundquist and an unnamed creek) were targeted on the Highline road ending with a sample station at the 2005 Western Screech-owl detection site northeast of Connel Creek. Habitat targeted consisted primarily of black cottonwoods on Seton River and big-leaf maple drainages. Drainages were within the IDF ww BEC zone on Anderson and Seton Lakes.

D'arcy/Highline: Transect targeted black cottonwoods in and around the townsite of D'arcy. Sample stations in town were located near the fish hatchery, Red Barn campground and on D'arcy Creek where the Highline road intercepts the train tracks. Sample stations on the Highline road included the big-leafed maple or black cottonwood drainages of Scutt, McGillivary (three stations) and Connel creek. Drainages were found within the IDF ww BEC zone on Anderson Lake.

Carpenter Lake spotchecks: Transect targeted drainages entering the north side of Carpenter Lake. Sample stations were located on Bridge River, Viera Creek, Cedarvale Creek, Bighorn Creek, Jones Creek and the first 5 km section of Marshall Creek road from the junction with Carpenter Lake. Riparian and black cottonwood habitat patches were targeted.

Seton Drainages: Conducted spot checks at two of three drainages accessible between Machute and the Lillooet boat launch on south side of Seton Lake. Both stations had large veteran black cottonwoods and deciduous trees with a soft edge to IDF ww BEC zone.

Cayoosh: Nest site was located east of BC Hydro Campground along trail on the south side of Cayoosh Creek. An additional spotcheck was conducted at black cottonwood patch where the Cayoosh meets the Fraser (site of detection September 2005).

3.3. Data Collection

Survey description included start and end Universal Transverse Mercater Units (UTM's), habitat and route access descriptions. At each survey station survey name, surveyors present, date, station coordinates (NAD 83 UTM), time of sunset, and start and end times of broadcast were recorded. Additionally, wind speed using the Beaufort scale, precipitation (none, drizzle, light rain, heavy rain) and temperature (ºC) were recorded (Hausleitner 2006). Incidental observations recorded were extraneous noise, and any raptor or wildlife observations.

When an owl was detected the species, gender, age (adult or juvenile), response time (exact time elapsed between the first broadcasted call and the first detected owl response), type of detection (visual or acoustic), type of call, duration of each call (a call is defined as a series of vocalizations with < 2 minutes of silence between calls), direction of call, and estimated distance to the owl were recorded. Coordinates were projected for owls that could not be safely approached at night. Additionally, any movements and behavioural observations were recorded.

Table 1. Survey dates, responses of targeted species, and recordings at transects surveyed in the BC Hydro footprint May-July 2006.

Transect Name	Survey Date			Target Species	Individual Response	Recordings Obtained
	Rep 1	Rep 2	Rep 3			
Carpenter Lake 1 (CA)	May 27	June 19	July 5	FLOW[a]	3 FLOW	N/a
Carpenter Lake 2 (CB)	May 29	June 17	July 6	FLOW	2 FLOW	N/a
Carpenter Lake 3 (CC)	May 23	June 7	June 21	FLOW	4 FLOW	N/a
Carpenter Lake 4 (CD)	May 24	June 6	June 22	FLOW	1 FLOW	N/a
Carpenter Lake 5 (CE)	June 4	June 18/ 24	July 3	FLOW	2 FLOW	N/a
Carpenter Lake 6 (CF)	May 22	June 5	July 2	FLOW		N/a
Carpenter Lake 7 (CG)	May 21	June 9	N/a	FLOW		N/a
Seton Lake	June 20	June 29	N/a	FLOW	1 FLOW	N/a
Carpenter Lake spot checks	May 28	June 16	June 23	WSOW[b]		
Cayoosh (CY)	May 25	June 27	N/a	WSOW	3 WSOW	May 25
Goldbridge (GB)	May 20	June 3	July 1	WSOW	1 WSOW	
Seton/Highline (SP)	May 30	June 25/ 29	July 6	WSOW	5 WSOW	May 30 (Shalath) June 25 Highline) June 29 (Spyder)
D'arcy/Highline (HI)	June 1/ 2	June 26	July 6	WSOW	5 WSOW	June 1 (2 territories in D'arcy)
Seton Lake Drainages	June 20	June 28	N/a	WSOW	2 WSOW	June 20 (Machute, no-name)

[a] Flammulated Owl
[b] Western Screech-owl

3.4.Monitoring and Habitat Analysis

When logistically possible, daytime surveys and dusk detections were conducted to follow up nighttime responses. This was used to help determine habitat use, pair and breeding status. Habitat analysis was performed for Flammulated Owl detections from 2005 and 2006 to further model habitat use of this species in the Carpenter/Bridge watershed. Owl detections were plotted in ArcGis 9.0 along with the associated Forest Inventory Cover map and biogeoclimatic map. Forest Cover maps separate the forest into polygons that are composed of stands containing trees of approximately the same species, age and size. Age and heights are based on an average estimated by basal area of the leading and second tree species (Canada-BC Information Sharing Protocol 2002). Polygon attribute data used in this analysis were percent dominant tree species, crown closure, age class and height class. The forest polygons analyzed were those within a 212 m-radius buffer of all Flammulated Owl detections. This buffer was based on the territory size of radio-marked Flammulated Owls in central Colorado (Linkhart and Reynolds 1997). Home range sizes in British Columbia are poorly documented, however those reported fall within this area. Home range reported from 2 nests in British Columbia was 2.2 and 37 ha (Cannings and van Woudenberg 2004).

3.5. Bioacoustics Recording and Analysis

Territorial calls of adult male Western Screech-owls were recorded from eight territories from the Bridge and Seton Watersheds. A Singer directional microphone and Marantz PMD670 digital recorder were used to obtain recordings. All calls were recorded at 48Hz.

Recordings were analyzed as described by Tripp (2004). Six variables demonstrating the strongest ability to distinguish between owl populations were used for analysis. These included total length of call (measured in seconds), number of notes per call, number of notes per second, mean frequency at start of call (measured in Hz), mean frequency at end of call (Hz) and frequency at peak amplitude of the entire call (Hz). Spectrograms of each call were created for measurement of variables in AviSoft SASLab 3.2. Parameters were consistent with methods by Tripp (2004) to enable comparison of results between studies. These variables were then compared with those collected by Tripp (2004) for owls in three other regions in British Columbia, Southern Vancouver Island, Northern Vancouver Island, Okanagan Valley (Figure 1).

Data was entered in Excel and descriptive statistics were applied in Excel (Analyse-It), while univariate (ANOVAs and Tukey Tests) and multivariate statistics (discriminant function analysis) were conducted in Statistica. For univariate and multivariate statistical analyses, only the seven owls with >25 call samples were included.

3.6.Wildlife Habitat Areas

Wildlife Habitat Areas (WHAs) are areas managed for species that have been designated under the Forest and Range Practices Act (FRPA) as “Identified Wildlife” (MWLAP 2004). The goal of the strategy is to minimize the effects of forest and range practices on “Identified Wildlife” found on Crown land and to maintain their habitat as designated WHAs. This strategy allows for the general public to make recommendation for designation of WHAs (MWLAP 2004). Both the Western Screech and Flammulated

owl fall under such designation. Western Screech-owl territories found during surveys were recommended for WHA designation in order to further conserve these territories.

4.0 Results

4.1. Call Playback Surveys

Surveys were conducted on eight Flammulated and six Western Screech-owl transects between 19 May and 6 July. One hundred seventeen hours of listening time was spent at 429 stations (Table 2). Three repetitions of each survey transect were conducted to estimate owl occupancy, with the exception of two Flammulated Owl and two Western Screech-owl transects (Table 1). The Carpenter Lake 7 and Seton Lake transects received only two repetitions due to logistical constraints. Similarly at Cayoosh Creek survey effort was concluded after two repetitions as sufficient data had been obtained and additional repetitions would have caused undue stress to the owl family.

Table 2. Species-specific playback surveys indicating transect and station numbers, listening hours and owl observations in the BC Hydro footprint, May-July 2006.

Owl Species	Transects	Stations	Listening Time (hours)	Owl Observations*
Flammulated	8	297	76.1	26
Western Screech	6	132	40.5	18
Totals	14	429	116.6	44

* Includes incidental observations

4.2. Owl Observations

All owl species detected were noted regardless of whether or not they were targeted. Of the 76 owl observations, the Flammulated Owl was the most common detection (34%, $n = 26$) followed by the Western Screech-owl (24%, $n = 18$), the Great Horned Owl (*Bubu virginianus*) (21%, $n = 16$) and the Northern Saw-whet (*Aegolius acadicus*) (13%, $n = 10$). The Barred owl (*Strix varia*) made up only 7% ($n = 5$) of detections. There were no Northern Spotted (*Strix occidentalis*) or Pygmy Owl (*Glaucidium gnoma*) detections (Figure 3).

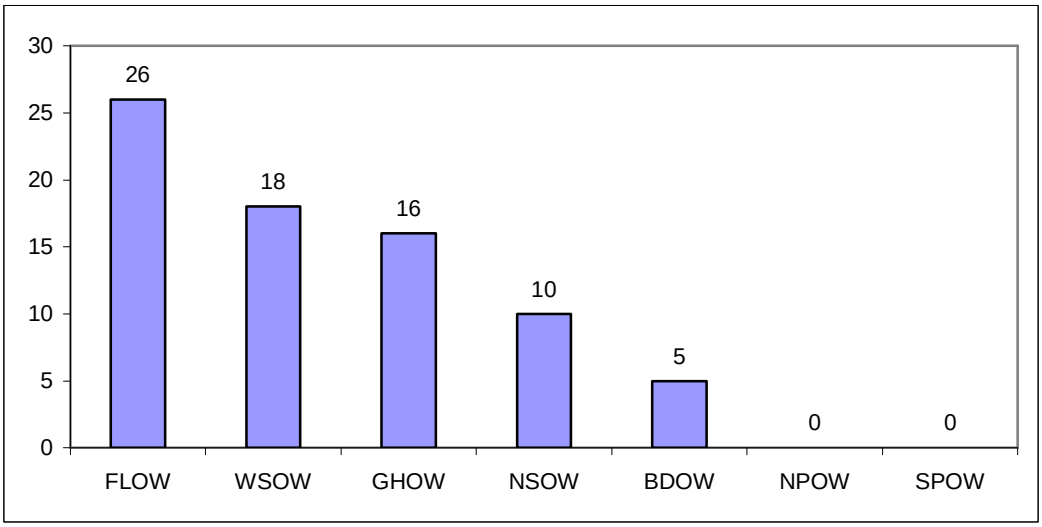

Figure 3. Species-specific owl observations within the BC Hydro Footprint, May-July, 2006.

4.3. Owl Territories

Owl territories were estimated assuming territoriality during the breeding season and using knowledge of species-specific home range sizes. In some instances multiple owls at a single station could be distinguished as they called simultaneously. The assumptions we used in this analysis are that owls did not move greater distances than their typical home range size between repetitions and conspecifics were not found within the same territory. Given these assumptions, we defined four Barred, 13 Flammulated, nine Great Horned, nine Western Screech, and seven Northern Saw-whet active territories in 2006. A territory may have contained a single bird, non-breeding or breeding pair. Daytime follow-ups to confirm these territories were conducted for the targeted taxa.

4.4. Monitoring/Habitat Use

Daytime follow-ups were conducted when logistically possible, resulting in the discovery and description of a Flammulated and Western Screech-owl nest. A Flammulated Owl nest was discovered near Carol Lake with a female sitting in the nest cavity entrance on 17 and 18 June. The habitat was typical of other Flammulated Owl projected locations we visited in the IDF biogeoclimatic zone. The dominant tree species were Douglas-fir and lodgepole pine (*Pinus contorta*). The understory was fairly sparse with Soopolallie (*Shepherdia Canadensis*) and common snowberry (*Symphoricarpos albus*) as the main shrub species. Pine grass (*Calamagrostis rubescens*) and heart leaved arnica (*Arnica cordifolia*) were the main forb species (Figure 4). The nest tree was a live Douglas-fir approximately 35 m in height with a dbh of 96 cm. The cavity was at a height of approximately 30 meters and the entrance was 10-12 cm in diameter. It was formed by a broken branch and facing southeast.

During a dusk follow-up of another Flammulated Owl territory on Carpenter Lake a single male roost site was detected. The owl flew from perch to perch after solicitation and called for 40 minutes after dusk. No other call was heard and no prey deliveries observed. The territory was on a steep (55º) south-facing slope in very open Douglas-fir and Ponderosa Pine forest (IDF db). The little shrub understory present consisted of Saskatoon (*Amelanchier alniflia*) and common snowberry. Bluebunch wheatgrass (*Pseudoroegneria spicata*) was the dominant grass species.

Figure 4. Breeding territory of a Flammulated owl near Carol Lake, June 2006.

The Flammulated Owl habitat analysis resulted in 73 forest polygons associated with the 2005 owl detections and 53 for 2006. Polygons with the dominant tree layer composed of Douglas-fir (> 50% composition) were the most prevalent; 90% in 2005 and 97% in 2006. A high proportion of polygons were Douglas Fir dominant (80-100% composition) with 30-50% crown closure, stand age 121-250 years and tree heights of 10.5-28.4 m (Table 3). Ponderosa pine dominated polygons made up the remaining proportion and these were characterized by a crown closure of 20-40% with trees 121-250 years age and heights of 10.5-28.4 meters. All Flammulated Owl detections were found within the IDF dk2 and IDF dk2b biogeoclimatic zones.

Three of nine Western Screech-owl territories defined successfully fledged young. A daytime follow-up and habitat assessment was conducted on the Western Screech-owl nest site on Cayoosh Creek near Lillooet (Figure 5). The stand was composed primarily of mature black cottonwood and a scattering of Douglas-fir. The understory was thick with woody debris and Douglas maple (*Acer glabrum*), rose (*Rosa* spp.), snowberry, Oregon grape (*Mahonia aquifolium*), thimbleberry (*Rubus parviflorus*), alder (*Alnus* spp.) and western flowering dogwood (*Cornus nuttallii*). Bordering the stand within 100 m was a small meadow. Cayoosh creek ran just beyond the meadow 200 m from the nest tree. The nest tree was a dead cottonwood 10 m in height with a dbh of 41 cm. The cavity height was 8 m and was facing northwest. The entrance was 3.5-4 cm in diameter and was an excavated woodpecker cavity (Figure 5). The pair fledged at least one juvenile (discovered 27 June).

A territory on Anderson Lake fledged one young (discovered 25 June). This Western Screech-owl location was described in 2005. It was in a dry draw adjacent to the hydroelectric line. The habitat was primarily IDF with some big leaf maple and white

birch (*Betula papyrifera*) interspersed. An additional territory in the town site of D'arcy fledged one young (discovered 6 July). The site was a cluster of big leaf maple on D'arcy Creek adjacent to a Douglas-fir Forest. Meadow/urban areas were within 200 m of the territory.

Dusk visits were also conducted 30 May and 24 June near Shalath at a territory that fledged two juvenile Western Screech-owls in 2005. The male called at dusk for 35-50 minutes. He flew from perch to perch. No additional calls were heard and no prey deliveries were made. The habitat was in a dry creek bed with the main tree species being big leaf maple, willow (*Salix* spp.), white birch and ponderosa pine. Bordering the draw was a typical IDF BEC zone. The male was found roosting in tightly spaced Douglas-fir second growth 6-m above the ground.

Table 3. Summary of forest stand characteristics for Douglas-fir dominated polygons located within a 212m buffer of 2005 and 2006 Flammulated Owl detections.

Forest characteristics for Douglas-fir dominated polygons	Proportion of Polygons for 2005 Owl Detections	Proportion of Polygons for 2006 Owl Detections
Polygons composed of 80-100% Douglas-fir trees	70 %	61%
Polygons with 30-50% Crown Closure	72%	61%
Polygons with trees 121-250 years of age	82%	71%
Polygons with trees 10.5-28.4 meters	82%	83%

4.5. Bioacoustics Recording and Analysis

A total of 210 territorial calls from eight male Western Screech-owls (range of 9-30 calls per territory depending on the quality and sample size of the recording) were recorded. Only the seven owls with ≥ 24 call samples were included in statistical analyses (Table 5). A series of one-way ANOVAs were conducted comparing the six variables from our study site (Interior Seton) to male owls of the Southern Vancouver Island, Northern Vancouver Island, and Okanagan Valley. Three frequency variables, frequency (pitch) at start of call, mean frequency at end of call, and mean frequency at peak amplitude were significantly different ($p < 0.001$) between the four regions (Table 5). The Okanagan Valley owl calls were most easily distinguished from the other three regions by lower call frequency values for all three variables (Table 5). The Interior Bridge/Seton watershed study area owls appeared to be somewhere between the Okanagan Valley and Northern Vancouver Island in their call frequency characteristics.

Table 4**.** Male Western Screech-owl mean territorial call measures and associated one-way ANOVA's amongst four study areas (Southern Vancouver Island, Northern Vancouver Island, Okanagan Valley and Bridge /Seton). Variables that were significant between study areas after sequential Bonferroni correction of p-values <0.05 are indicated in bold.

	Southern Vancouver Island	**Northern Vancouver Island**	**Okanagan Valley**	**Bridge/ Seton**		
Variables	Mean (*n*=13)	Mean (*n*=9)	Mean (*n*=10)	Mean (*n=7*)	F-value (3, 38)	p-value
#Notes/Call	11.31	11.68	11.35	11.41	0.06	0.981
#Notes/Second	6.40	6.51	6.48	1.67	0.48	0.702
Total Length of Call (sec)	1.76	1.80	1.76	6.79	0.41	0.750
Mean Freq. at Start (Hz)	672.94	627.72	593.47	640.67	18.01	**<0.001**
Mean Freq. at End (Hz)	675.69	645.30	603.56	637.07	10.99	**<0.001**
Freq. at Peak Amp. (Hz)	697.66	678.55	634.99	652.32	7.16	**0.001**

All three frequency variables measured from Western Screech-owl territories on Southern Vancouver Island were significantly different (p <0.01) from the Okanagan Valley owls (Figure 4). In addition, the Okanagan Valley owls were significantly different from the Northern Vancouver Island owls (Figure 4). In contrast, Northern Vancouver Island and the Bridge River/Seton owls had the most overlap in call frequency characteristics with no significant difference for all three variables.

In addition to male calls, one recording captured a female vocalizing. We were only able to measure the frequency variables for the one sample for comparison to females from other regions. Very few studies in North American have provided measurements for female screech-owl vocalizations. When compared to the single female examples provided in Tripp (2004), the female from the Bridge/Seton study area was closest in call pitch (frequency) at 880 Hz to a female from Campbell River (869 Hz) recorded in 2002. In contrast, a female from Duncan had a higher pitched call at 939 Hz (Frequency at Peak Amplitude) and a female from the Okanagan Valley had a lower FPA of 841 Hz. Sample sizes were not large enough for any of the females recorded for a statistically significant comparison.

One pattern that stood out during measurements of call variables from the Bridge/Seton owls was the reappearance of a raised final note in the call. This pattern was observed in seven of the eight owls recorded. It may indicate a degree of reproductive isolation, but would require genetic analysis for confirmation.

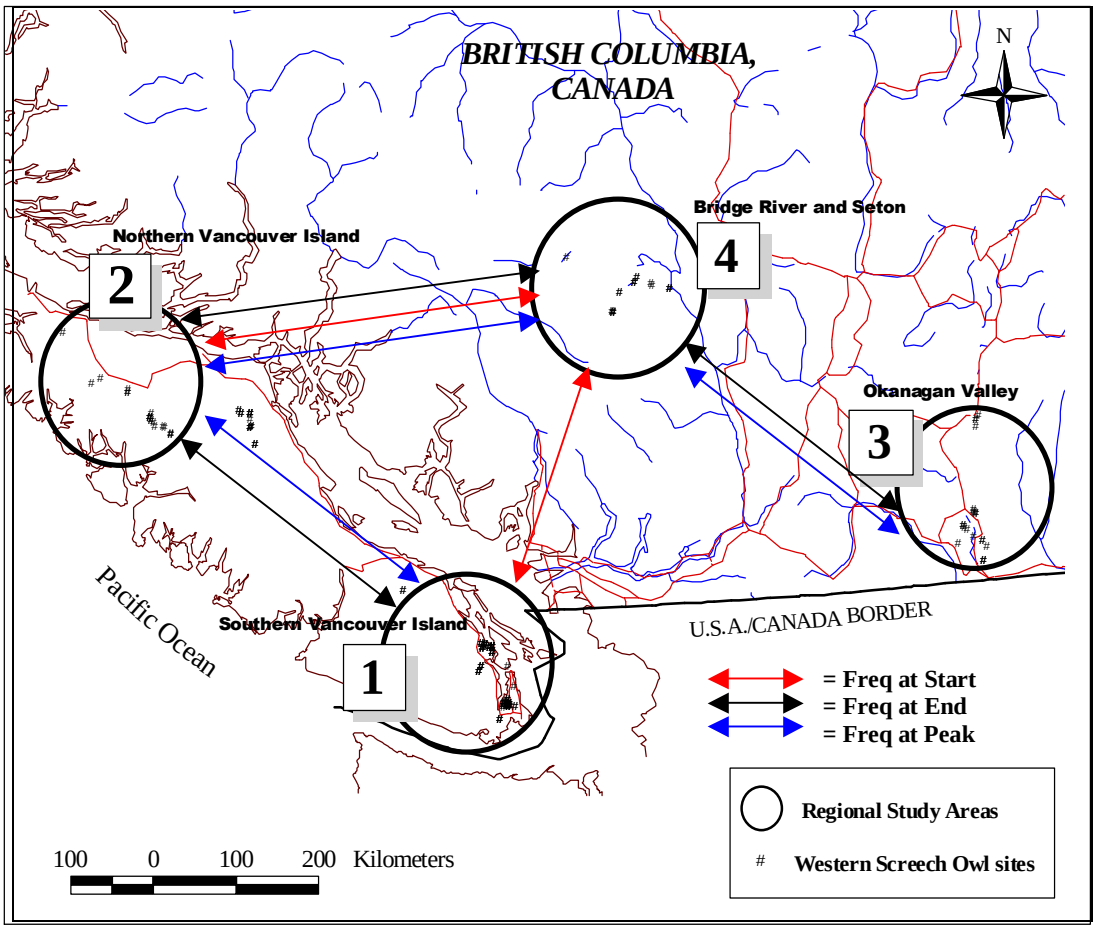

Figure 5. Results of Tukey Tests depicted by coloured arrows. Arrows indicate the study areas that did NOT have a significant difference between the three measured frequency variables (Frequency at Start of Call, Frequency at End of Call and Frequency at Peak Amplitude).

4.6. Wildlife Habitat Areas

Locations from all Western Screech-owl detections have been submitted to regional biologists from Ministry of Environment for consideration as WHAs. Crown land surrounding the Cayoosh breeding pair has been captured under WHA designation (Hobbs 2006, pers. comm.). The 8 additional territories are currently under review and designation is pending results from bioaccoustic analysis.

4.7. Incidental Observations

Noteworthy incidental species observations include the endangered Peregrine Falcon (*Falco peregrinus*) in the Bridge River Canyon.

Figure 6. Western Screech-owl female at cavity entrance, Cayoosh Creek May 2006.

5.0 Community Outreach/Habitat Enhancement

5.1. Public Outreach Internship

The public awareness component of the project involved partnering with the D'arcy N'Quatqua band to hire an intern, Jolene Patrick, to assist with the public outreach facet of the project. The N'Quatqua First Nations provided an office space and use of audiovisual equipment for presentations. The internship ran from 1 June to 30 June and Jolene was responsible for writing and releasing a press release (Appendix I), coordinating and advertising presentation times within local communities and producing and executing a presentation on the identification, ecology and habitat enhancement of local owl species. The presentations were advertised in the local communities through newspaper advertisements and posters. "Owl Ecology and Habitat Enhancement", was presented by Jolene Patrick in Lillooet, Bridge River, Seton/Shalath, and D'arcy from 27 June to 30 June 2006 (Appendix III). Approximately 65 people were in attendance.

Jolene also produced an educational pamphlet regarding the proper placement and care of artificial nest boxes. The distribution of artificial nest boxes to specific homeowners was done at the community presentations and made up the habitat enhancement portion of the project. Homeowners were carefully screened to ensure the utmost care and placement of nest boxes was followed (Figure 7). The results of this initiative were two-fold in that they encouraged homeowner stewardship and provided additional nesting structures.

Additionally, as part of our reporting process, monthly progress reports were submitted to First Nations Bands within the study area, local interest groups, MOE personnel and the Conservation Data Center.

Figure 7. Faye Mitchell of the Bridge River Band holding a Flammulated Owl nest box she put up on her property June 2006.

5.2. Published Articles

Press releases were submitted to the Bridge River News, St'at'imc Runner and the Lillooet-Bridge River News. Articles appeared in the Bridge River News, Lillooet-Bridge River News ("Night time is the right time for owl biologists" August 2, 2007), the St'at'imc Runner, and the Northwest Preservation Societies, "News and Views".

5.3. Volunteer Nights

Two members of the Lillooet Naturalist Society attended a vocalization recording at the Cayoosh nest site on 25 May 2006.

6.0 Discussion

A priority of the BCRP Strategic Plan is to identify limiting factors for species impacted by hydroelectric development. This requires identification of species life cycle requirements, habitat range and ecological constraints. Assessing these limiting factors for endangered species or species of concern is especially important for their conservation or recovery. This inventory initiative was significant in designating areas occupied by the Western Screech and Flammulated owls within BC hydro's footprint. Additionally, it served as a basis for recommendation for habitat enhancement (Manning et al. 2007), restoration (K.North 2006, pers. comm.) for both species, and creation of WHAs for the Western Screech-owl.

6.1. Western Screech-owl

According to Konig *et al.* (1999), vocalizations are the most important interspecific isolating mechanisms in owls. Thus, different vocal patterns are an important characteristic for distinguishing taxa. Due to the importance of vocal characteristics in the taxonomy of *Megascops* and other members of this phylogenetic group, an understanding of regional and individual variation in those species is essential.

Bioaccoustic analysis was unable to provide enough supporting evidence to clearly classify the seven owls recorded into either the interior or coastal subspecies. The four regions examined exhibited a significant difference among three of six frequency call variables. The Bridge/Seton territorial calls had characteristics in common with both the Northern Vancouver Island and Okanagan Valley populations. These similarities may reflect a clinal variation in call structure along a population gradient, similar to that observed for Western Screech-owls on Vancouver Island (Tripp 2004). However, the Bridge/Seton owls occupy habitat most similar to that of Western Screech-owls in the Okanagan (Hausleitner and Young 2005). Habitat use of the two subspecies is very different (Cannings and Angell 2001), and the loss of nesting habitat is recognized as a limiting factor for *M. k. macfarlanei* (COSEWIC 2002). Until further investigation, the classification of Western Screech-owls in Bridge/Seton should be *M. k. macfarlanei*, that which affords the subspecies the most protection.

As a result of increased inventory effort in 2006, three additional territories and three breeding pairs were identified. A nest tree was identified on Cayoosh Creek and the site was designated a WHA. The majority of breeding records for *M. k. macfarlanei* come from the Okanagan Valley (Cannings 2004, Beucher and Dulisse 2004), and should these be recognized as *M. k. macfarlanei* will provide additional, important breeding territories for the subspecies.

6.2. Flammulated Owl

This second year of Flammulated Owl surveys served to meet provincial protocol for multiple repetitions of transects within and between years (Hausleitner 2006). Owls detected during these multiple surveys likely represent mate advertisement by new arrivals and territorial boundary displays by established males (Reynolds and Linkhart 1987, van Woudenberg and Christie 1997). Indeed, van Woudenberg and Christie (1997) reported the number of birds detected between years, and the numbers of calling birds versus nest sites varied within their study area. This discrepancy may be due to the presence of non-breeding and migrating birds. Nevertheless, our surveys help confirm

that Flammulated Owls are using the forested slopes along the Bridge/Carpenter watershed.

Habitat analysis of the 2005 and 2006 Flammulated Owl detections described the broader habitat characteristics of occupied sites in this region. Owl detections were predominantly in the IDF dk2 and IDF dk2b biogeoclimatic zones. These associated biogeoclimatic zones imply that the south facing slopes where many of our owl detections occurred will have a large component of Ponderosa Pine along with the dominant Douglas-fir layer (Lloyd et al. 1990). The high proportion of polygons dominated by Douglas-fir age class 121-250 years with low canopy closure further supports the claim that Flammulated Owls are associated with older, dry Douglas-fir/Ponderosa Pine forests (Cannings and van Woudenberg 2004). These results are consistent with other studies that showed Flammulated Owls nesting in older Douglas-fir/Ponderosa pine habitats at a higher proportion than younger forests (Linkhart and Reynolds 1997).

The habitat analysis should be viewed with caution. Firstly, owl detections from census surveys only determine presence/absence of owls, not nesting locations or specific habitat selection. Owls may have moved from their home territory in response to solicitation. Secondly, exact territory boundaries of the detected Flammulated Owls could not be known with certainty and these boundaries could vary yearly. Conducting nest searches and using nest locations would help further refine territory boundaries and designate habitat selection. Additionally, the query used in ArcMap included all polygons that intersected the 212m buffers regardless of the proportion of polygon that fell inside the buffer. This would greatly inflate the amount of polygons associated with the Flammulated Owl detections. We were also limited by the forest cover data available, as it did not provide a description of secondary vegetation composition within the polygons. This level of information could only be acquired through vegetation inventories for each owl detection location.

6.3. Limiting Factors

Habitat loss is listed as the primary threat to both the Flammulated and Western Screech-owl in British Columbia. Although their habitats differ within the BC Hydro footprint, both owls have been affected by hydroelectric development. As cavity nesters and small owls, both the Flammulated and Western Screech-owl benefit from the presence of wildlife trees and a multi-layered understory for nesting and roosting.

Due to its association with riparian areas, the Western Screech-owl is most at threat from direct hydroelectric operations. Fluctuating water levels in the reservoir inhibit successional growth of riparian habitat along the reservoir and its tributaries. Urban development has been most pronounced in lowland riparian habitat in the Okanangan, the core of the breeding distribution of *M. k. macfarlanei*.

In British Columbia the Flammulated Owl faces threats from forest harvesting and fire suppression that result in landscape changes. The harvest of mature forests with subsequent modification into closed-canopied forests throughout the owls range can create an undesirable, high-density forest with lack of large nest trees (McCallum and Gehlback 1988, Erickson and Toweill 1994). Fire suppression in the USA has resulted in change in Ponderosa pine stands towards more shade tolerant Douglas-fir forest types, which is less suitable habitat for Flammulated Owls (Reynolds et al. 1989). The Flammulated Owl has also been characterized as a species with a low reproductive potential adapted to a stable environment (McCallum 1994). This would make it sensitive to habitat changes and population declines due to its low fecundity.

7.0 Recommendations

The Flammulated and Western Screech-owl are recognized under the Identified Wildlife Management Strategy, and can be managed under the "Identified Wildlife Provisions" of the Ministry of Environment (MWLAP 2004). Wildlife Habitat Areas are designated around nest occurrences, thus future nest search initiatives would be necessary to determine these species nest occurrences in the BCRP area.

An increase in available riparian habitat coupled by careful management of nesting structures could help encourage the growth of the Western Screech-owl populations in the area. Future studies should consider genetic analysis of the four Western Screech-owl populations; Southern Vancouver Island, Northern Vancouver Island, Okanagan Valley and Bridge /Seton for further clarification of subspecies distribution. If call structure coincides with differences in genetic structure of populations, call variation could become a significant non-invasive tool to delineate taxonomy of Western Screech-Owl subspecies in North America. Until further research has been conducted, the Western Screech-owls in this region should be managed in the interim as the endangered subspecies, based on habitat association. The nest site on Cayoosh Creek has been identified for a Wildlife Habitat Area.

Additionally, many Flammulated Owl records throughout its range have occurred on ungulate winter ranges (UWRs) and these provisions could offer protection to Flammulated Owl habitat (MWLAP 2004). Critical ungulate winter habitat is described as mature and old Douglas-fir dominated forest with partly closed and multi-layered canopy, on moderately steep, south facing slopes (Armleder et al. 1994, Manning et al. 2004). In this approach, it would be important to ensure the presence of critical Flammulated Owl habitat components within the UWRs. An analysis of Flammulated Owl occurrences and UWRs within the BC Hydro footprint could help designate areas where habitat conservation efforts should be focused. Designation of Flammulated Owl nests and their associated habitats would also be necessary for this initiative. Funding support by BCRP has helped bridge the knowledge gap on the Flammulated Owl but more research is needed particularly on productivity and impacts of logging in this region.

8.0 Acknowledgements

The research activities, habitat enhancement, public outreach and report were executed with financial support from Bridge Coastal Fish and Wildlife Restoration Program. Thank you to Andrew MacDonald and Scott Allen for facilitating the research effort and smoothly handling logistics. We wish to thank the St'at'imc First Nations for allowing us access to their lands, welcoming us into their communities, and providing letters of support for the project. Thank you to the N'Quatqua First Nations and in particular intern Jolene Patrick. Jolene worked efficiently with very little direction and produced a superior product. The local knowledge and friendship we gained through the internship was a highlight for us. Thank you to Cliff Casper for the night trips in his boat and accommodating our schedule.

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Appendix I. Financial Statement

	BUDGET		ACTUAL	
	BCRP	**Other**	**BCRP**	**Other**
INCOME				
Total Income by Source	($62,860.00)	($5,170.00)	($44,695.98)	($5,470.00)
Grand Total Income (BCRP + Other)	($68,030.00)		($50,165.98)	
EXPENSES	Note: Expenses must be entered as negative numbers (e.g. - 1000, etc.) in order for the formulas to calculate correctly			
Project Personnel				
Biologist (contractor)	($25,200.00)		($16,200)	
Biologist (contractor)	($21,900.00)		($13,800.00)	
Biologist (contractor)	($3,500)		($3,500)	
Technicians (employee)			($1,200.00)	
Outreach Coordinator (intern-contract)	($2,500.00)		($2,500.00)	
MOE GIS support		($1,650.00)		($1,650)
MOE volunteer		($800.00)		($800.00)
NWPS Volunteer		($400.00)		($400.00)
Materials & Equipment				
Vehicle and Fuel	($6,810.00)		($5,110.92)	
Recording Material	($1,000.00)	($500.00)	($692.18)	($500.00)
Field Materials and Supplies (boat rental)	($250.00)		($170.00)	
Safety Equipment		($700.00)		($700.00)
Survey Maps		($150.00)		($150.00)
Inventory Equipment		($400.00)		($400.00)
Analysis Equipment		($250.00)		($250.00)
Nest Boxes		($320.00)		($320.00)
Administration				
First Nations Band Office Admin				($300.00)
Contracting	($300.00)		($300.00)	
Project Budgeting	($300.00)		($300.00)	
Invoicing	($600.00)		($600.00)	
Office Supplies	($500.00)		($322.88)	
Total Expenses	($62,860.00)	($5,170.00)	($44,695.98)	($5,470.00)
Grand Total Expenses (BCRP + Other)	($68,030.00)		($50,165.98)	
BALANCE (Grand Total Income - Grand Total Expenses)	$0.00		$0.00	

Appendix II. Performance Measures-Actual Outcomes

Project # 06.W.BRG.01

Performance Measures

Using the performance measures applicable to your project, please indicate the amount of habitat actually restored/enhanced for each of the specified areas (e.g. riparian, tributary, mainstream).

Performance Measures – Target Outcomes												
Project Type	**Primary Habitat Benefit Targeted of Project (m^2)**	**Primary Target Species**	Estuarine	In-stream Habitat – Mainstream	In-stream Habitat – Tributary	Riparian	Reservoir Shoreline Complexes	Riverine	Lowland Deciduous	Lowland Coniferous	Upland	Wetland
Impact Mitigation												
Fish passage technologies	Area of habitat made available to target species											
Drawdown zone revegetation/stabilization	Area turned into productive habitat											
Wildlife migration improvement	Area of habitat made available to target species											
Prevention of drowning of nests, nestlings	Area of wetland habitat created outside expected flood level (1:10 year)											
Habitat Conservation												
Habitat conserved – general	Functional habitat conserved/replaced through acquisition and management	Western Screech/ Flammulated Owl			*		*		*	*	*	
	Functional habitat conserved by other measures (e.g. riprapping)											
Designated rare/special habitat (subset)	Rare/special habitat protected	Western Screech/ Flammulated Owl			*		*		*	*	*	
Maintain or Restore Habitat forming process												
Artificial gravel recruitment	Area of stream habitat improved by gravel placement											
Artificial wood debris recruitment	Area of stream habitat improved by LWD placement											
Small-scale complexing in existing habitats	Area increase in functional habitat through complexing											
Prescribed burns or other upland habitat enhancement for wildlife	Functional area of habitat improved											
Habitat Development												
New habitat created	Functional area created											

* Due to the socio-economic impacts associated with targeted species, consultation between various government and non-government agencies is required prior to management decisions that lead to habitat conservation. A Wildlife Habitat Area has been created for Western Screech-owls on Cayoosh Creek (See Recommendations).

Owl Surveying and Habitat Enhancement for two of BC's Vulnerable Owls.

Press Release

June, 21st 2006

Doris Hausleitner, of Seepanee Ecological Consulting and Vicky Young, of Eco-Vision Consulting, have become experts in the art of owl surveying. In 2004, 2005, and again in 2006, they have been contracted to survey for owls by BC Hydro's Bridge Coastal Fish and Wildlife Restoration Program (BCRP).

The previous year's efforts included surveying for Northern Spotted Owls. The goal this year is to inventory and enhance the habitat of 2 species of owl in the BC Hydro footprint. The owls to be surveyed are the small and scrappy Western Screech Owl (*Megascops kennicotii)*, and the tiny and illusive Flammulated Owl (*Otus flammeolus)*. Both the Western Screech Owl and Flammulated Owl are on the Provincial blue list and are considered Species of Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Species at Risk Act (SARA).

The Western Screech Owl in the region falls between the species range of the coastal and interior sub-species. Western Screech Owls do not screech as their name would suggest. Instead they have a low repetitive call that resembles a bouncing ball. As part of their research, Doris and Vicky are collecting digital recordings of these calls in an attempt to identify which sub-species is within the Bridge River and Seton watersheds.

Flammulated Owls, unlike most other owl species, have dark eyes and migrate yearly. Since their main diet consist of insects they must follow their food source south during the winter months. For such a small owl it has a big, ventroloquial call that can travel great distances so it is hard to pinpoint the location of the owl giving the call.

Surveying for owls involves setting up transect lines within the owls' territory and designating sites along the line where call playbacks are done. The tools Doris and Vicky use to survey include: a "hoot flute" and discman (to broadcast owl calls and elicit a response), a GPS and headlamps (so they can always find their way back to camp when navigating the rugged terrain in the dark). The peak time to survey for these nocturnal owls is just after sunset and just before sunrise during the breeding period. The breeding period starts in spring and early summer and is when males are most territorial and more prone to respond to call playbacks. To date, this years surveying has already detected 10 Western Screech owls with breeding pairs in the town of D'Arcy and near Lillooet and 12 Flammulated Owls. Through knowledge of the distribution of the owls we can manage or lessen the impacts we have on them. Future management or aid for other endangered species can also benefit from these studies.

Habitat availability has been identified by BCRP as a limiting factor to the owls' survival. Suitable habitat includes old growth forests, riparian zones (areas near a source of water), and mixed deciduous and coniferous forests. These forests contain the necessary locations for owls to forage and nest in. Previous hydroelectric developments and current timber harvesting have decreased the availability of nesting sites.

Areas to be enhanced are located in the Bridge and Seton Watersheds. Enhancement efforts will include erecting hand made nest boxes in designated owl habitats. Both owls are cavity nesters and do not make their own nests. Instead they choose secondary nesting sites, which woodpeckers have already excavated or natural nesting sites such as in dead trees (snags). Both owls are known to take to nest boxes when they are placed accurately, and may return year after year. The nest boxes were made by a group of elementary students from the lower mainland and the material was donated by the Northwest Preservation Society. These nest boxes will provide alternative artificial housing for the owls when natural housing may be sparse and will hopefully increase productivity of these vulnerable species.

Collaborations with the N'Quatqua First Nation assisted in the public outreach of the project. Presentations will be given to local communities of Lillooet, Bridge River, and D'Arcy on the biology of the owls and habitat enhancement efforts. It is hoped that local homeowners or groups will volunteer to put up and care for an owl nest box. Through efforts such as this we are working together to preserve and maintain the natural balance and bring back these owls into the night.

Funding provided by:

BC hydro
FISH & WILDLIFE
BRIDGE COASTAL RESTORATION PROGRAM

Contributions by Ministry of Environment, N'Quatqua First Nations, and the Northwest Preservation Society

For more information please contact:

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Appendix III: Example of a presentation poster

BC hydro

FISH & WILDLIFE

BRIDGE COASTAL RESTORATION PROGRAM

& the Lillooet Naturalist Society

Presents

Owl Ecology and Habitat Enhancement

Free Presentation by Jolene Patrick
Biologists Doris Hausleitner and Vicky Young
will be answering questions

Learn how to identify local owl species, the threats they face and what is being done to help them. Emphasis on Western Screech and Flammulated Owls

Where: Lillooet Friendship Centre

When: Tuesday, June 27th @ 7:30 pm

Please bring a Non-Perishable Food Item for the Lillooet Food Bank

For Further Information contact: Jolene Patrick- Public Outreach Intern ########

Appendix III

This slide acknowledged BCRP contributions and was in the opening sequence for presentations in D'arcy, Seton-Portage/Shalath, Bridge River and Lillooet.