

Clowhom Project Water Use Plan

Monitor of Wildlife Use in Wetlands Affected by Dam Operations

Implementation Year 11

Reference: COMMON-1

Clowhom Lake Reservoir Wildlife Census

Study Period: April 2016 to March 2017

**G. Ferguson and D.J. Bates
Resource Management Department
shíshálh Nation
PO Box 740, Sechelt, BC
V0N 3A0**

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Executive Summary

A wildlife and habitat census of a small wetland complex at the north end of Clowhom Lake Reservoir was developed and initiated in 2006 by the shíshálh Nation under the direction of BC Hydro and its Watershed Use Planning process. The wetland complex was selected for its proximity to the reservoir and to examine how changing water levels from reservoir operation influence the wetland's flora and fauna over a 20-year period.

Data collected in 2016 are provided in this summary report and submitted to BC Hydro for inclusion in a master database. The data from the census surveys will be used in future analysis of reservoir operations on an established wetland habitat and subsequent use by area wildlife.

Aerial photography was flown in October 2016. The previous acquisition of aerial photography was in 2010. The collection of aerial photography is required to monitor changes in the vegetation of the Clowhom wetland and area. Vegetation community extent and structure in this area will be confirmed by comparing the 2010 and 2016 aerial photography.

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1.0 Introduction

In 2016/2017 the shíshálh First Nation and BC Hydro completed the 11th Year of a 20 year monitoring program documenting wildlife utilization of a wetland complex. This wetland complex is located at the head of the Clowhom Lake Reservoir. This data report presents the survey data collected during the third year of the third “Rotation” in the survey cycle. Each “Rotation” consists of a 4-year period.

As in previous years, the wetland complex continues to be influenced by changes in reservoir levels due to hydroelectric operations and reservoir management at Clowhom Falls Dam. This monitoring program, as originally implemented through recommendations made in BC Hydro’s Water Use Planning (WUP) process, documents wildlife use at various times in the year following a travelling count on predetermined and permanent transect(s). The intent is to eventually relate area use, and any identified change in use to the operations of the reservoir.

This report presents the results of the 2016/2017 field-sampling season.

2.0 Study Area

The study area for the census remains the same as delineated in 2006 and is comprised of a wetland complex. The wetland is located at the northeastern end of Clowhom Lake Reservoir, approximately 500 meters upstream from the lake and adjacent to the Clowhom River mainstem (**Figure 1**). The area is located in low elevation Coastal Western Hemlock Dry Maritime (CWHdm) biogeoclimatic subzone, which has a climate consisting of cool summers and mild winters. The study area is back-flooded cyclically throughout the year by Clowhom Lake Reservoir. The back-flooding is a result of storage needs and changes in lake stage height. The wetland is also inundated during spring and fall freshet events that occur in the Clowhom River drainage.

The study area is approximately 40 hectares in size and is characterized by a mix of deciduous and conifer forest of various seral stages, a diverse shrub and herbaceous understory, and a large area of wetland grasses and sedges along the reservoir’s shoreline. Vegetation cover has been undisturbed since the census began in 2006 and details of the polygons are reported in *Bates* (2008).

3.0 Methods

3.1 Wildlife Census

A biologist and technician with the shíshálh Nation conduct the wildlife census following a predetermined schedule (**Table I**). The census area has remained unchanged and is referenced in *Bates* (2007). Census surveys were conducted mid to late month, and completed within a 3–4 hour period post-sunrise. The date, time and reservoirs stage height at the start of each survey is provided in **Table II**.

As previously reported, the crew follows geo-referenced transects (*Bates, 2007*) starting at Transect-T1. The crew walks a predetermined route, noting the following information:

- Wildlife species present;
- Habitat type detected in; and
- Type of detection.

Data collection relies on wildlife sounds and observed presence and/or use.

Three to four censuses are conducted each year during different months. Sample months were pre-determined using a seasonal rotating schedule (**Table I**). Staggered monthly survey times ensure data collected is seasonally representative of the wetland over the project's life and that each calendar year is completed. The 20-year study duration ensures that a total of five censuses are completed for each calendar month.

Data is recorded in the field, translated into an Excel spreadsheet, and attached to the annual data report.

Table I. Schedule for the third rotation (2014-2018) of the Clowhom Lake Reservoir wildlife census surveys. The schedule was changed in 2016 and adjusted in 2017 to account for poor weather in December 2016.

Field Census	Sample Rotation (3rd) (Year)			
	1 (2014/2015)	2 (2015/2016)	3 (2016/2017)	4 (2017/2018)
1	June	May	April	August
2	September	October	May	December
3	November	January	July	February
4	-	-	-	March

Within the rotation block 4 seasons are surveyed three to four times to ensure each month is covered. All census/surveys use the same transects established in *Bates (2007)* (**Figure 2**).

Table II. The date, time and reservoir stage height for each census survey conducted in the 2016/2017-field season.

Census	Date	Start time (am)	Finish Time (am)	Reservoir Stage (m)
1	April 8, 2016	7:00	9:45	51.60
2	May 16, 2016	5:34	8:20	51.81
3	July 16, 2016	5:20	8:02	51.82

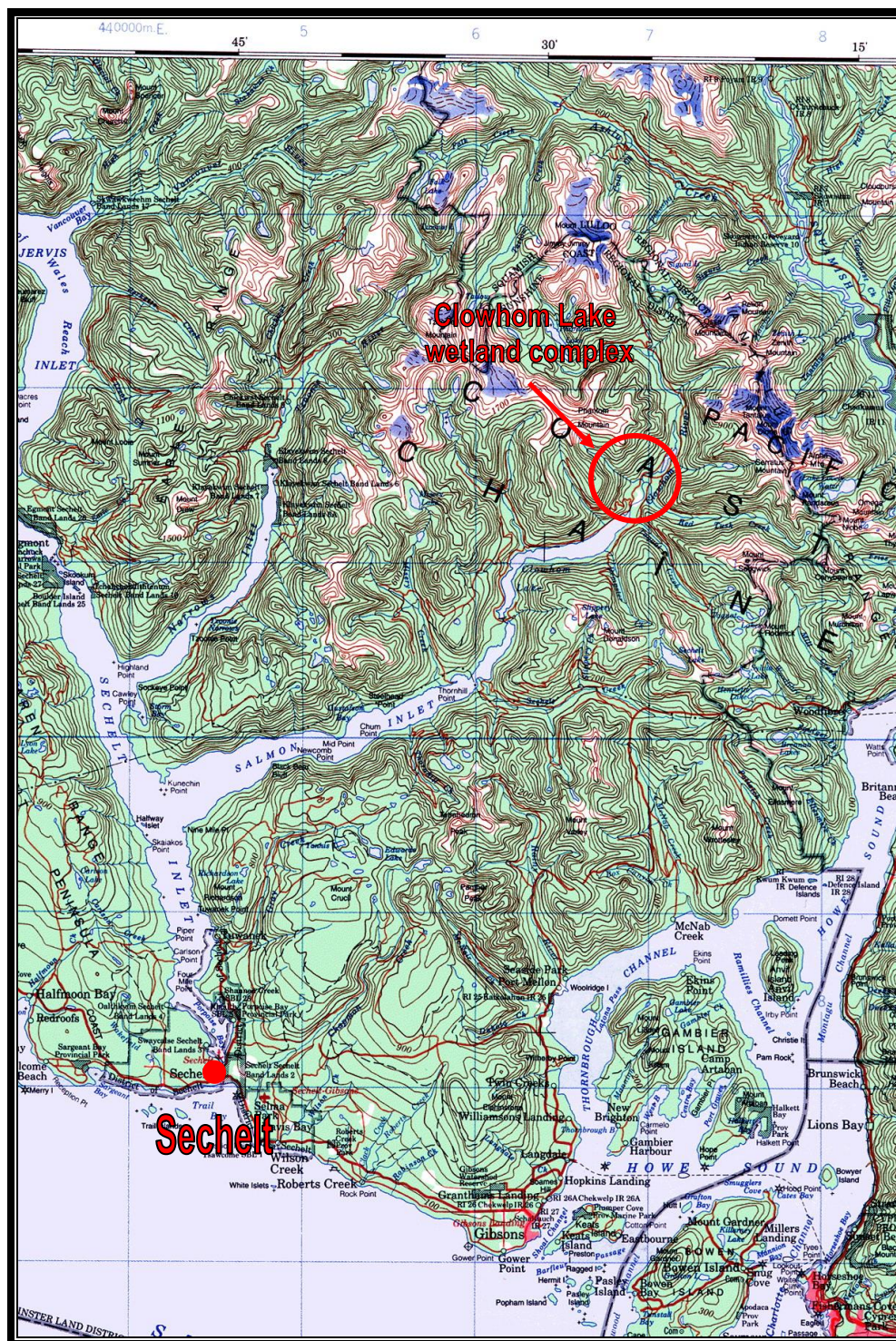


Figure 1: Location of Clowhom Lake Reservoir wetland complex census area.

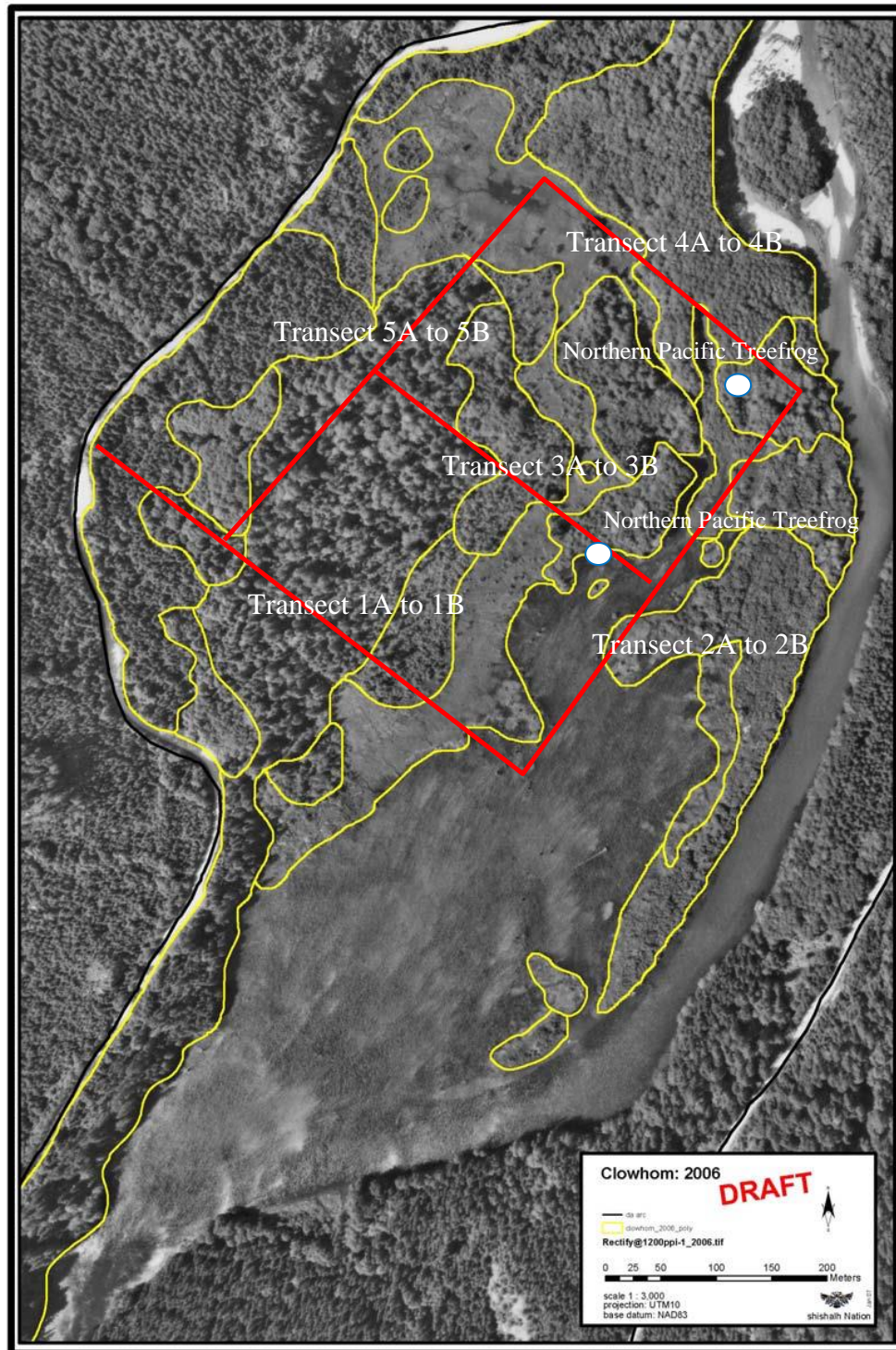


Figure 2: Approximate location of the wildlife census transects. There are 5 transects in total and the start and finish is marked with a 1.25-metre metal pole (*Bates, 2007*).



Figure 3: Aerial Photography of the Clowhom Lake wetland and the wildlife transects flown on October 11, 2016.

3.2 Data Entry

Data is entered into a spreadsheet for future analysis. The spreadsheet format remains the same as previous years and is based on a format reported by *Bates* (2007, 2008). Data will eventually be collated as a time series in order to analyze for any temporal trends in species diversity.

For each species identified during a wildlife survey, supplementary data was also collected, documenting general vegetation community type and associated structure in and around the detection (*Bates*, 2008).

4.0 Results

4.1 Wildlife Census

Three census surveys were conducted in 2016/2017. These were; April 8, May 16 and July 16, 2016. Data spreadsheets detailing the results are included in the attached Appendix (Appendix 1).

5.0 Discussion

5.1 Wildlife Census

The 2016/2017 wildlife surveys were completed, for the most part, without any problems. The original sample schedule, reported in 2015/2016, had a sample date proposed for December 2016. Poor weather that included snow and extreme freezing conditions resulted in the dropping of this date. In order to ensure the month of December is captured in the Third Rotation, the date was moved to the 2017/2018-sample schedule. Sampling protocol and continuity remains unchanged in 2016.

The original ToR called for the completion of the census mid month (*BC Hydro*, 2005) but over the course of the sample years the schedule has changed. In 2016 the field crew moved the timing back to align with the original target period. The necessity for moving the dates, in the past, was difficulty in accessing site during the winter months. Weather constraints are not predictable and there may be a necessity to alter the sample period again in the future. Efforts will always be made to maintain the approximate sample date.

The important component for the study's success is the continued involvement of field staff familiar with the methodology. The pairing of a skilled biologist (Biologist remains the same individual since start of the project in 2006) and technician continues to allow capacity building among the technical staff and consistency in the data collection. It is anticipated that the crew will remain the same for the completion of the third "rotation" and that techniques and methodology will remain unchanged.

One amphibian species was heard in the wetland during the 2016 wildlife census. A Northern Pacific Tree frog (*Pseudacris regilla*) was heard calling in the wetland/reservoir

transition zone (see location in Figure 2) on July 16, 2016 and in a mixed deciduous/coniferous forest wetland with Skunk Cabbage on April 8, 2016. This species is yellow listed with populations in BC considered secure (BC Ministry of Environment 2017).

Several amphibian species are known to utilize the wetland habitat at the head of Clowhom Reservoir with this wetland having a high diversity of wildlife species (Evelyn and Stiles 2014).

5.2 Vegetation Typing

Vegetation typing is required once during each census “rotation”. In 2016, the wetland complex was flown and new air photos produced. In consultation with BC Hydro the planned vegetation typing and field verification will be completed in 2017. Vegetation surveys to be completed in 2017 are still within the third survey rotation timeframe.

Aerial photography was flown in October 2016. The previous acquisition of aerial photography was in 2010. The collection of aerial photography is required to monitor changes in the vegetation of the Clowhom wetland and area. Vegetation community extent and structure in this area will be confirmed by comparing the 2010 and 2016 aerial photography.

6.0 Conclusion

In conclusion, the 2016/2017-sample season was considered a success. Components of the repeated wildlife use-monitoring program have yielded data within the wetland complex and identified polygons.

7.0 Recommendations

- The Year-3 census in the “Third Rotation” of the wildlife use monitoring has been successfully completed. Continued use of study transects and vegetation typing should remain unchanged and the fourth year of this rotation should be completed in 2017/2018.

8.0 References

- Bates, D.J. 2007. Clowhom Lake Water Use Plan - Clowhom Lake wildlife census - Year 1. Resource Management Department, shíshálh Nation, Sechelt, BC.
- Bates, D.J. 2008. Clowhom Lake Water Use Plan - Clowhom Lake wildlife census - Year 2. Resource Management Department, shíshálh Nation, Sechelt, BC.
- BC Hydro, 2005. Clowhom Lake Water Use Plan - Monitoring Program Terms of Reference. BC Hydro, Burnaby, BC.
- BC Ministry of Environment. 2017. BC Species and Ecosystems Explorer. BC Conservation Data Centre. <http://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/conservation-data-centre/explore-cdc-data/species-and-ecosystems-explorer>
- Evelyn, M and D. Stiles. 2014. Surveys of Species at Risk and their Associated Habitats in the Clowhom Watershed – Year 1. Prepared to Fish and Wildlife Compensation Program. Halcyon Professional Services and Sunshine Coast Wildlife Project

9.0 Appendices

Appendix 1. Data collected from wildlife census in 2016.

Clowhom Wildlife Survey		
Date	08/04/2016 (i.e., 08 April 2016)	
Weather	Cloud Cover: 0; Precipitation: None; Wind: 0 (absent).	
Site Conditions	Lake/reservoir level high with standing water present in adjacent terrestrial habitat. Majority of streams through forest in survey area were running (photo). Majority of vegetation beginning to leaf out, with salmonberry and violets in flower.	
Surveyors	Greg Ferguson, Jerry Johnson	
Time Started	7:00 AM	
Time Finished	9:45 AM	
Sunrise	6:21 AM	
Temperature	6 °C	
Transect 1 (T1A to T1B) Runs		Time Start: 7:00 Time Finish: 7:40
East/West		
Species and Number/Habitat ()	Habitat	Observation of behaviour
Varied Thrush (1,1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar), Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Pacific Wren (1,2)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar), Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Roosevelt Elk (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)	Scat (greater than 2 weeks old)
Chestnut-backed Chickadee (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
American Robin (2)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call (males)
Golden-crowned Kinglet (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Black Slug (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual (non-native)
Rufous Hummingbird (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Belted Kingfisher (1)	Lake	Call
Common Raven (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Common Merganser (1)	Lake	Visual (female)
Bufflehead (8)	Lake	Visual
Canada Goose (5)	Lake	Visual, call
Mallard (7)	Lake	Visual
Northern Flicker (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call, visual
Song Sparrow (1)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)	Call
Northern Rough-winged Swallow (1)	Lake	Visual
Tree Swallow (2)	Lake	Visual, call
Transect 2 (T2A to T2B) Runs		Time Start: 7:41 Time Finish: 8:10
North/South		
Species and Number/Habitat ()	Habitat	Observation of behaviour
Northern Flicker (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call (male and female together in area)
American Robin (1,1)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry), Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual
Song Sparrow (4)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)	Visual, call
White-crowned Sparrow (1)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)	Visual
Steller's Jay (2)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Red-breasted Sapsucker (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call, drumming
Tree Frog (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call

Pacific Wren (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Black-tailed Deer (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Scat (greater than 2 weeks old)
Transect 4 (T4B to T4A) Runs East/West		Time Start: 8:11 Time Finish: 8:49
Species and Number/Habitat ()	Habitat	Observation of behaviour
Hairy Woodpecker (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Drumming
Yellow-rumped Warbler (2)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling, visual (Audubon's)
Tree Swallow (2)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call (likely same birds seen on transect 1)
Banana Slug (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual (all white)
Small Fish Species (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual (cutthroat?)
Varied Thrush (1,1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage, Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)	Call
Golden-crowned Kinglet (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Common Raven (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual, call
Roosevelt Elk (1)	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)	Rub (greater than two weeks old)
Ruffed Grouse (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)	Call (drumming), visual
Transect 5 (T5A to T5B) Runs North/South		Time Start: 8:50 Time Finish: 9:02
Species and Number/Habitat ()	Habitat	Observation of behaviour
Golden-crowned Kinglet (2)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)	Visual, call
American Robin (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)	Call
Transect 3 (T3A to T3B) Runs West/East		Time Start: 9:17 Time Finish: 9:45
Species and Number/Habitat ()	Habitat	Observation of behaviour
Banana Slug (1,1)	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple), Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual
American Robin (1,2)	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple), Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Pacific Wren (3)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Unknown Predator (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Scat (likely cat species as too small for wolf)
Steller's Jay (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Golden-crowned Kinglet (2)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Harry Woodpecker (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual, call (male, likely same bird heard drumming on transect 4)
Song Sparrow (1)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)	Visual, call
Savannah Sparrow (1)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)	Visual
Total Number of Species	30	
Species List	Note: Includes all sign: feeding, scat, tracks, hair, calling, etc.	Additional Note: Some individual species observed on transects were likely repeat
Varied Thrush		
Pacific Wren		

Roosevelt Elk
 Chestnut-backed Chickadee
 American Robin
 Golden-crowned Kinglet
 Black Slug
 Rufous Hummingbird
 Belted Kingfisher
 Common Raven
 Common Merganser
 Bufflehead
 Canada Goose
 Mallard
 Northern Flicker
 Song Sparrow
 Northern Rough-winged Swallow
 Tree Swallow
 White-crowned Sparrow
 Steller's Jay
 Red-breasted Sapsucker
 Tree Frog
 Black-tailed Deer
 Hairy Woodpecker
 Yellow-rumped Warbler
 Banana Slug
 Small Fish Species (Cutthroat?)
 Ruffed Grouse
 Unknown Predator
 Savannah Sparrow

**Other Species Observed or Reported
 in Area (i.e., greater than 100m from
 plot area or not on transects)**

Sooty Grouse (1)	Outside of survey area (west, hillside)	Call
Northern Pygmy Owl (1)	Outside of survey area (north, hillside)	Call
Dark-eyed Junco (1)	Outside of survey area (northwest, roadside)	Call
Common Loon (2)	Outside of survey area (southwest end of lake)	Visual
Orange-crowned Warbler (1)	Outside of survey area (southwest)	Call
Hutton's Vireo (1)	Outside of survey area (north)	Call

Total Number of Species by Habitat Type

Number of Species	Habitat Type
6	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock,
4	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)
19	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
4	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)
7	Lake

Species Observed By Habitat

Species	Habitat Type
Varied Thrush	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)
Pacific Wren	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)
Roosevelt Elk	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)
American Robin	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)
Golden-crowned Kinglet	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)
Ruffed Grouse	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)
Varied Thrush	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)
Roosevelt Elk	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)
American Robin	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)
Banana Slug	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)
Varied Thrush	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Pacific Wren	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Chestnut-backed Chickadee	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
American Robin	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Golden-crowned Kinglet	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Black Slug	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Rufous Hummingbird	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Common Raven	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Northern Flicker	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Tree Swallow	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Steller's Jay	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Red-breasted Sapsucker	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Tree Frog	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Black-tailed Deer	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Hairy Woodpecker	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Yellow-rumped Warbler	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Banana Slug	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Small Fish Species (Cutthroat?)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Unknown Predator	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
American Robin	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)
Song Sparrow	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)
White-crowned Sparrow	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)
Savannah Sparrow	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)
Belted Kingfisher	Lake
Common Merganser	Lake
Bufflehead	Lake
Canada Goose	Lake
Mallard	Lake
Northern Rough-winged Swallow	Lake
Tree Swallow	Lake

Clowhom Wildlife Survey		
Date	16/05/2016 (i.e., 16 May 2016)	
Weather	Cloud Cover: 100, low; Precipitation: Mist/Drizzle; Wind: 0 (absent).	
Site Conditions	Lake/reservoir level very high with standing water present in adjacent terrestrial habitat. Possible highest water level observed (photos). Majority of streams through forest in survey area were dry. One water course had noticeable erosion likely from spring runoff.	
Surveyors	Greg Ferguson, Jerry Johnson	
Time Started	5:34 AM	
Time Finished	8:20 AM	
Sunrise	5:30 AM	
Temperature	11 °C	
Transect 1 (T1A to T1B) Runs East/West		Time Start: 5:34 Time Finish: 6:20
Species and Number/Habitat ()	Habitat	Observation of behaviour
Pacific Wren (1,1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar), Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Swainson's Thrush (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)	Call
American Robin (2,1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar), Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Chestnut-backed Chickadee (2)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)	Call
Pacific Sloped Flycatcher (1,1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar), Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Hairy Woodpecker (2)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call, drumming
Northern Flicker (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Golden-crowned Kinglet (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Bald Eagle (1)	Lake	Visual of adult flying
Marsh Wren (1)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)	Call
Spotted Sandpiper (1)	Lake	Call
Song Sparrow (1)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)	Call
Common Yellowthroat (1)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)	Call
Banana Slug (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual, juvenile
Canada Goose (6)	Lake	Call, visual
Violet-green Swallow (8)	Lake and Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call, visual
Northern Rough-winged Swallow (6)	Lake	Call, visual
Mallard (2)	Lake	Call
Goldeneye sp. (1)	Lake	Visual, female
Common Merganser (1)	Lake	Visual, male

Transect 2 (T2A to T2B) Runs North/South		Time Start: 6:20 Time Finish: 6:52
Species and Number/Habitat ()	Habitat	Observation of behaviour
Common Yellowthroat (1)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)	Call
Song Sparrow (3)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)	Call
Rufous Hummingbird (1)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)	Call
American Robin (1)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)	Visual
Vaux's Swift (3)	Lake and Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual
Swainson's Thrush (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Black-tailed Deer (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Track
Belted Kingfisher (1)	Lake	Call
Pacific Sloped Flycatcher (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Townsend's Warbler (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Transect 4 (T4B to T4A) Runs East/West		Time Start: 6:53 Time Finish: 7:24
Species and Number/Habitat ()	Habitat	Observation of behaviour
Black Bear (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Track
Chestnut-backed Chickadee (2)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Pacific Wren (4,1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage, Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)	Call, visual, family (4)
Varied Thrush (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Golden-crowned Kinglet (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Banana Slug (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual, juvenile
Pacific Sloped Flycatcher (2)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Black-tailed Deer (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Track
Roosevelt Elk (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Track, hair, old beds
Warbling Vireo (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Black Slug (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual (non-native)
Townsend's Warbler (1,1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage, Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)	Call
Western Tanager (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Transect 5 (T5A to T5B) Runs North/South		Time Start: 7:25 Time Finish: 7:44
Species and Number/Habitat ()	Habitat	Observation of behaviour
American Robin (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)	Call
Townsend's Warbler (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)	Call
Banana Slug (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual, white
Golden-crowned Kinglet (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)	Call

Transect 3 (T3A to T3B) Runs West/East		Time Start: 7:45 Time Finish: 8:20
Species and Number/Habitat ()	Habitat	Observation of behaviour
Western Tanager (1)	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)	Call, very likely same bird on transect 4
Banana Slug (1)	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)	Visual
Pacific Wren (1)	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)	Call
Golden-crowned Kinglet (1)	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)	Call
Chestnut-backed Chickadee (1)	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)	Call
Rufous Hummingbird (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual, call, likely same one previously detected (similar location)
Townsend's Warbler (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Black-headed Grosbeak (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call
Black Bear (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Track, juvenile, photo
Violet-green Swallow (15)	Lake and Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Call, visual
Northern Rough-winged Swallow (5)	Lake and Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual
Black Slug (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual (non-native)
Black-tailed Deer (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual, female
Total Number of Species	32	
Species List	Note: Includes all sign: feeding, scat, tracks, hair, calling, etc.	Additional Note: Some individual species observed on transects were likely repeat sightings
Pacific Wren Swainson's Thrush American Robin Chestnut-backed Chickadee Pacific Sloped Flycatcher Hairy Woodpecker Northern Flicker Golden-crowned Kinglet Bald Eagle Marsh Wren Spotted Sandpiper Song Sparrow Common Yellowthroat Banana Slug Canada Goose Violet-green Swallow Northern Rough-winged Swallow Mallard Goldeneye sp. Common Merganser Rufous Hummingbird Vaux's Swift Black-tailed Deer Belted Kingfisher Townsend's Warbler		

Black Bear
 Varied Thrush
 Roosevelt Elk
 Warbling Vireo
 Black Slug
 Western Tanager
 Black-headed Grosbeak

**Other Species Observed or Reported in Area
 (i.e., greater than 100m from plot area or not on
 transects)**

Sooty Grouse (1)	On hillside to southwest	Call
MacGillivray's Warbler (1,1)	Across forest service road to west, road edge	Call
Yellow Rumped Warbler (1)	Mixed deciduous/coniferous wetland forest with Skunk Cabbage to the north	Call
Northern Pacific Treefrog (1)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry) to the north	Call
Common Loon (1)	South end of lake	Call
Black-headed Grosbeak (2)	East side of lake	Call
Ruffed Grouse (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Drumming
Hutton's Vireo (1)	Road edge	Call

Total Number of Species by Habitat Type

Number of Species	Habitat Type
7	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)
5	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)
22	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
5	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)
10	Lake

Species Observed By Habitat

Species	Habitat Type
Pacific Wren	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)
Swainson's Thrush	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)
American Robin	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)
Chestnut-backed Chickadee	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)
Pacific Sloped Flycatcher	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)
Townsend's Warbler	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)
Golden-crowned Kinglet	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)
Western Tanager	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)

Banana Slug	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)
Pacific Wren	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)
Golden-crowned Kinglet	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)
Chestnut-backed Chickadee	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)
Pacific Wren	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
American Robin	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Pacific Sloped Flycatcher	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Hairy Woodpecker	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Northern Flicker	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Golden-crowned Kinglet	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Banana Slug	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Violet-green Swallow	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Swainson's Thrush	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Black-tailed Deer	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Townsend's Warbler	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Black Bear	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Chestnut-backed Chickadee	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Varied Thrush	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Roosevelt Elk	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Warbling Vireo	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Black Slug	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Western Tanager	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Rufous Hummingbird	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Black-headed Grosbeak	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Vaux's Swift	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Northern Rough-winged Swallow	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
Marsh Wren	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)
Song Sparrow	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)
Common Yellowthroat	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)
Rufous Hummingbird	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)
American Robin	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)
Bald Eagle	Lake
Spotted Sandpiper	Lake
Canada Goose	Lake
Northern Rough-winged Swallow	Lake
Mallard	Lake
Goldeneye sp.	Lake
Common Merganser	Lake
Vaux's Swift	Lake
Belted Kingfisher	Lake
Violet-green Swallow	Lake

Clowhom Wildlife Survey		
Date	16/07/2016 (i.e., 16 July 2016)	
Weather	Cloud Cover: 100; Precipitation: None to very light rain (no precipitation during majority of survey); Wind: 0	
Site Conditions	Lake/reservoir moderately high. Wetland to lake transition zone had standing water and moist soils.	
Surveyors	Greg Ferguson, Jerry Johnson	
Time Started	5:50 AM	
Time Finished	8:02 AM	
Sunrise	5:27 AM	
Temperature	15 °C	
Transect 1 (T1A to T1B) Runs East/West		Time Start: 5:50 Time Finish: 6:16
Species and Number/Habitat ()	Habitat	Observation of behaviour
Swainson's Thrush (1)	Second growth forest ~20m tall, brushed, sloped, dry	Calling
Pacific Wren (1)	Upland mixed deciduous/coniferous forest (hemlock,	Calling
Banana Slug (1)	Upland mixed deciduous/coniferous forest (hemlock,	Visual
Chestnut-backed Chickadee (1)	Upland mixed deciduous/coniferous forest (hemlock,	Calling
Pacific Sideband Snail (1)	Flat mixed deciduous/coniferous wetland forest with	Visual, alive
European/Black Slug (2)	Flat mixed deciduous/coniferous wetland forest with	Visual
Yellow-rumped Warbler (1)	Flat mixed deciduous/coniferous wetland forest with	Calling
Steller's Jay (1)	Flat mixed deciduous/coniferous wetland forest with	Visual
Belted Kingfisher (1)	Lake	Calling, visual
Canada Goose (17)	Lake	Visual
Great Blue Heron (1)	Lake	Visual
Transect 2 (T2A to T2B) Runs North/South		Time Start: 6:17 Time Finish: 6:51
Species and Number/Habitat ()	Habitat	Observation of behaviour
Song Sparrow (1)	Flat wetland/lake transition zone (bog orchid, sphagnum,	Calling
Hairy Woodpecker (2)	Flat wetland/lake transition zone (bog orchid, sphagnum,	Visual (male and female), drumming
Yellow-rumped Warbler (1)	Flat wetland/lake transition zone (bog orchid, sphagnum,	Calling, visual
Common Yellowthroat (1)	Flat wetland/lake transition zone (bog orchid, sphagnum,	Calling
Cedar Waxwing (5)	Flat wetland/lake transition zone (bog orchid, sphagnum,	Calling, visual
Evening Grosbeak (1)	Flat mixed deciduous/coniferous wetland forest with	Calling
Northern Rough-winged Swallow (2)	Lake	Calling, flying high over lake
Swallow Sp. (6)	Lake	Visual, flying high over lake
Black-headed Grosbeak (1)	Flat mixed deciduous/coniferous wetland forest with	Calling
European/Black Slug (4)	Flat wetland/lake transition zone (bog orchid, sphagnum,	Visual
Northern Flicker (1)	Flat mixed deciduous/coniferous wetland forest with	Calling
Steller's Jay (1)	Flat mixed deciduous/coniferous wetland forest with	Visual
Song Sparrow (1)	Flat mixed deciduous/coniferous wetland forest with	Calling
Downy Woodpecker (1)	Flat mixed deciduous/coniferous wetland forest with	Calling
Transect 4 (T4B to T4A) Runs East/West		Time Start: 6:52 Time Finish: 7:19
Species and Number/Habitat ()	Habitat	Observation of behaviour
Pacific Wren (1, 1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage, Upland mixed deciduous/coniferous	Calling

American Robin (1, 1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage, Upland mixed deciduous/coniferous	Calling
Steller's Jay (3)	Flat mixed deciduous/coniferous wetland forest with	Visual
Hairy Woodpecker (1)	Flat mixed deciduous/coniferous wetland forest with	Visual, calling, drumming
Ruffed Grouse (4)	Flat mixed deciduous/coniferous wetland forest with	Visual, one adult and at least three young
Banana Slug (1, 1, 1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage, Upland mixed deciduous/coniferous forest (hemlock, cedar, maple), Second growth forest	Visual
Pacific-sloped Flycatcher (1)	Upland mixed deciduous/coniferous forest (hemlock,	Calling
Transect 5 (T5A to T5B) Runs North/South		Time Start: 7:20 Time Finish: 7:35
Species and Number/Habitat ()	Habitat	Observation of behaviour
MacGillivray's Warbler (1)	Second growth forest ~20m tall, brushed, sloped, dry	Calling
Swainson's Thrush (1)	Second growth forest ~20m tall, brushed, sloped, dry	Calling
Chestnut-backed Chickadee (1)	Second growth forest ~20m tall, brushed, sloped, dry	Visual, calling
American Robin (1)	Second growth forest ~20m tall, brushed, sloped, dry	Calling
Banana Slug (1)	Second growth forest ~20m tall, brushed, sloped, dry	Visual
Transect 3 (T3A to T3B) Runs West/East		Time Start: 7:36 Time Finish: 8:02
Species and Number/Habitat ()	Habitat	Observation of behaviour
Black Bear (1)	Second growth forest ~20m tall, brushed, sloped, dry	Scat and track (older but since previous survey)
American Robin (1, 5)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar), Flat mixed	Calling, visual
Warbling Vireo (1)	Upland mixed deciduous/coniferous forest (hemlock,	Calling
Douglas Squirrel (1)	Flat mixed deciduous/coniferous wetland forest with	Calling
Pacific Wren (1)	Flat mixed deciduous/coniferous wetland forest with	Calling
Banana Slug (3)	Flat mixed deciduous/coniferous wetland forest with	Visual
Steller's Jay (2)	Flat mixed deciduous/coniferous wetland forest with	Calling
Chestnut-backed Chickadee (1)	Flat mixed deciduous/coniferous wetland forest with	Calling
Northern Pacific Treefrog (1)	Flat wetland/lake transition zone (bog orchid, sphagnum,	Calling
Red-winged Blackbird (1)	Flat wetland/lake transition zone (bog orchid, sphagnum,	Calling, visual
Mallard (1)	Lake	Visual
Merganser Sp. (common or red-breasted) (3)	Lake	Visual
Total Number of Species	32	
Species List	Note: Includes all sign: feeding, scat, tracks, hair, calling, etc.	Additional Note: Some individual species observed on transects were likely repeat sightings on other transects.
Swainson's Thrush		
Pacific Wren		
Banana Slug		
Chestnut-backed Chickadee		
Pacific Sideband Snail		
European/Black Slug		
Yellow-rumped Warbler		

Steller's Jay
 Belted Kingfisher
 Canada Goose
 Great Blue Heron
 Song Sparrow
 Hairy Woodpecker
 Common Yellowthroat
 Cedar Waxwing
 Evening Grosbeak
 Northern Rough-winged Swallow
 Swallow Sp.
 Black-headed Grosbeak
 Northern Flicker
 Downy Woodpecker
 American Robin
 Ruffed Grouse
 Pacific-sloped Flycatcher
 MacGillivray's Warbler
 Black Bear
 Warbling Vireo
 Douglas Squirrel
 Northern Pacific Treefrog
 Red-winged Blackbird
 Mallard
 Merganser Sp. (common or red-breasted)

Total Number of Species by Habitat Type

Number of Species	Habitat Type
6	Second growth forest ~20m tall, brushed, sloped, dry
6	Upland mixed deciduous/coniferous forest (hemlock,
16	Flat mixed deciduous/coniferous wetland forest with
8	Flat wetland/lake transition zone (bog orchid, sphagnum,
7	Lake

Other Species Observed or Reported in Area (i.e., greater than 100m from plot area or not on transects)

MacGillivray's Warbler (1)	West side of road in early seral habitat	Calling
Stellars Jay (1)	Across road	Calling
Common Raven	Across road	Calling
Willow Flycatcher (1)	East side of lake	Calling