

**Clowhom Project Water Use Plan**

**Monitor of Aquatic Wildlife in Wetland affected by Dam Operations**

**Implementation Year 6**

**Reference: COMMON-1**

**Year 2 – Rotation 2: Clowhom Lake Wildlife Census**

**Study Period: April 1, 2011 to March 31, 2012**

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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.

Air photos of the area were taken and vegetation was delineated to polygons. Ground truthing of these polygons to obtain boundaries and vegetation type was completed in 2011. A total of three wildlife censuses were completed during the study period. Hydrological data for the wetland complex has been difficult to obtain since 2006. This continued to be a problem in 2010, as no data was collected and was abandoned for the balance of the study.

Data collected during this study period is presented in this report and will be submitted to BC Hydro for inclusion in a master database and future analysis. In addition to reporting data collected in 2011/2012, the following recommendations are proposed for future works:

- Re-mark wildlife census transects in Summer 2012 to maintain permanent points of reference.
- Continue wildlife use assessments of the wetland complex.

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## **1.0 Introduction**

In 2011/2012, the shísháhlh First Nation and BC Hydro completed the 6<sup>th</sup> Year of a 20 year monitoring program to document changes in the vegetation, wildlife utilization, and hydrological characteristics of a wetland complex at the head of the Clowhom Lake reservoir. This report summarizes data collected during the second year (i.e., April 1, 2011 to March 31, 2012) of the second “rotation” of the survey cycle. Each “rotation” consists of a 4-year period.

As in previous years, the wetland complex continues to be periodically influenced by changes in reservoir levels due to hydroelectric operations. This monitoring program, as originally implemented through recommendations made in BC Hydro’s Water Use Planning (WUP) process, attempts to quantify changes in the wetland’s vegetation communities, use by wildlife, and hydrological characteristics during various times in the year and under varying lake management scenarios.

This report presents the results of the 2011/2012 sampling season, discusses challenges and success encountered, and provides recommendations for the next sampling year.

## **2.0 Study Area**

The study area for the census remains the same as delineated in 2006 and comprises a wetland complex located at the northeastern end of Clowhom Lake, approximately 500 meters upstream from the lake along the Clowhom River (**Figure 1**). This area is located in the low elevation Coastal Western Hemlock Dry Maritime biogeoclimatic subzone, which has a climate consisting of cool summers and mild winters and an average annual temperature of 8°C. The study area is back-flooded cyclically from the lake as a result of changes in reservoir storage levels. The wetland is also inundated during spring and fall freshet events that occur in the Clowhom River drainage.

The study area measures approximately 40 hectares in size and is characterized by a mix of deciduous and conifer forest of various ages, a diverse shrub and herbaceous understory, and a large area of wetland grasses and sedges along the reservoir’s shoreline. This vegetation cover has been unaltered since the census began in 2006. Details of the vegetation polygons were originally summarized and reported in Bates (2008).

## **3.0 Methods**

### **3.1 Vegetation Typing**

Aerial photos of the wetland complex are obtained using a camera mounted to a fixed wing aircraft that flies over the wetland on a clear day. These photos are taken once per census “rotation” as per the original Terms of Reference (ToR) (*BC Hydro*, 2005). A stereoscope is used in the office to view and define distinct vegetation polygons, which comprise different leading vegetation types (i.e., coniferous versus deciduous) and characteristics (i.e., color, height, and age). Polygons identified from air photos are then

ground truthed by shíshálh Nation staff to confirm polygon boundaries and vegetation types once every “rotation” (**Figure 2**). Vegetation types are based on earlier air photo and ground truthing data reported by *Bates* (2008).

### 3.2 Wildlife Census

A biologist and technician with the shíshálh Nation conduct the wildlife census. The census area is predetermined and is referenced in *Bates* (2007). The census is conducted mid to late month, is dependent on good weather (i.e., no heavy precipitation or strong wind), and is completed within 1 to 3 hours after sunrise over a one day period.

The crew follows geo-referenced transects reported by *Bates* (2007). The census begins at the designated starting transect (T1) and the field crew walks the predetermined route noting the following information: species present; habitat type detected in; and type of detection. Data collection relies on wildlife sounds and observed use.

Three censuses are conducted each year during different months determined on a seasonal rotating schedule. The staggered monthly survey times ensure that data collected is seasonally representative of the wetland over the project’s duration and that each calendar year is completed in a cost effective manner. Over the 20-year study duration, a total of five wildlife censuses are expected for each month of the year, allowing for the comparison of monthly data over multiple years.

Data is recorded in the field, translated into an Excel spreadsheet, and submitted to BC Hydro.

**Table 1.** Schedule of the second rotation for the wildlife census to be completed for the Clowhom Lake wetland complex.

Census Number	Year			
	1 (2010/2011)	2 (2011/2012)	3 (2012/2013)	4 (2013/2014)
1	June	March	August	April
2	October	July	December	May
3	January	November	February	September

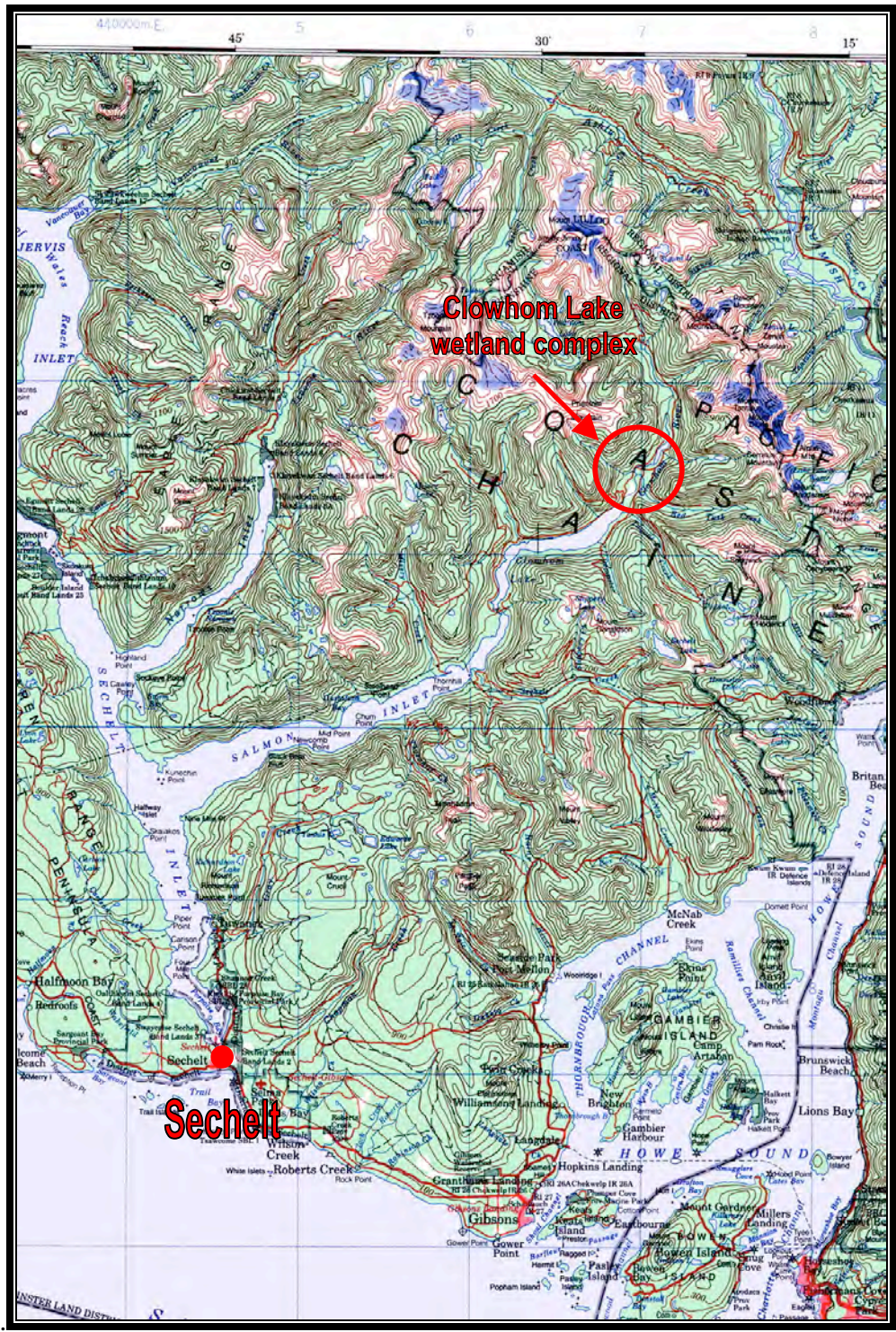


Figure 1: Location of Clowhom Lake wetland complex census area.

### 3.3 Wetland Hydrology

Initial methods used to measure water levels in the wetland complex involved the placement of two pressure transducers in 2007 and 2008. Stage recording of water levels using this method has proven ineffective, as extreme low water and freezing conditions have resulted in the loss of both transducers. Another attempt was made in 2010 and subsequently abandoned.

Stage recorders were added to the littoral lake-monitoring program at the north end of the lake in 2008. Recorded levels, coupled with reservoir level/discharge and river discharge data, will be used to estimate inundation of the wetland.

### 3.4 Data Analysis

#### 3.4.1 Vegetation Typing

Vegetation Typing is included on **Figure 2**. Comparison between 2008 and 2011 will be compiled in a separate internal memo.

#### 3.4.2 Wildlife Census

Wildlife data is entered into an Excel spreadsheet for future analysis. The format remains the same each year and is based on the format reported by *Bates (2007, 2008)*, *Bates et al (2009)* and *Bates and Ferguson (2010)*. All data will be collated as a time series in order to analyze for temporal trends in species diversity. The final data entry format will be provided to the shíshálh Nation by BC Hydro before July 2012. Data from this project will be entered in to this format to conform to other similar projects.

For each species identified during a wildlife survey, supplementary data is collected on the general vegetation community type and associated structure for the location of detection (*Bates, 2008*). This data will eventually be reported on in a summary report to facilitate comparison between species diversity and vegetation community type and structure.

## 4.0 Results

### 4.1 Vegetation Typing

Overall vegetation conditions remained unchanged in 2011. The wetland was flown in the summer of 2010 and vegetation polygons were identified on air photos. Ground truthing of delineated polygons was completed for this project period in 2011 but will be revisited in 2013.



## 4.2 Wildlife Census

Three wildlife censuses were conducted in 2011/2012: July 16 and November 11, 2011 and March 15, 2012 (**Appendix 1**).

## 4.3 Wetland Hydrology

Due to inefficiencies in stage recording devices in 2007, 2008, and 2010, no data on the wetland's hydrology is available for this reporting period. Stage recorder data added to the littoral lake-monitoring program at the north end of the lake in 2008 and reservoir level/discharge and river discharge May provide estimates of wetland inundation. These possibilities will be explored in 2012.

## 5.0 Discussion

### 5.1 Vegetation Typing

Air photos were flown in 2010. Ground truthing of the area's vegetation was completed in 2011 and the updated typing of vegetation in 2011. This process is consistent with the process adopted in the first "rotation" and will provide an updated description of the vegetation communities in the study area.

### 5.2 Wildlife Census

The 2011/2012 wildlife censuses proved successful and the protocols followed will remain the same for the 2012/2013 census.

The original ToR called for the completion of the census mid month (BC Hydro, 2005). This schedule has changed slightly, as it has been difficult at times to access the study area and on occasion field crews have been hampered by extreme weather conditions. This will have no bearing on the final outcome, assuming that each month is covered equally over the 20-year project duration.

The important component for the study's success will be continued involvement of field staff familiar with the methodology and have the skills necessary to complete the census. The pairing of a skilled biologist and technician continues to allow capacity building among the technical staff. It is anticipated that the crew will remain the same for the second "rotation" of this project and that techniques and methodology will remain unchanged.

A discussion was had among shíshálh Nation staff regarding increasing the length and/or number of surveyed transects. It was decided that at this time no further transects would be surveyed due to the coverage already obtained and the need to analyze the data collected to date.

### 5.3 Wetland Hydrology

Recording water inundation of the study area has proven difficult. The loss of stage recorders during extreme low water periods in the winter resulted in a loss of two Global Water WL transducers and one Onset logger. These transducer failures appear to be a result of freezing and caused the loss of the data. As a result of transducer failures, lake levels recorded by BC Hydro and benchmarked elevations may have to be used to infer inundation at survey times.

The issue of wetland water level recording is considered problematic. Automated data collection is frequently unreliable without the injection of large costs and equipment. As a result the recording of stage levels in the wetland was abandoned.

### 6.0 Conclusion

In conclusion, the 2011/2012 sample season was successful. Components of the wildlife use-monitoring program have yielded data within the wetland complex and identified polygons. Minor issues hampering water level data collection has been met with an opportunity to explore alternate methodologies and should continue to be challenged in an attempt to answer hypotheses proposed in the original ToR.

### 7.0 Recommendations

The Year-2 census in the second “rotation” of the wildlife use monitoring has been successfully completed. Continued use of study transects and vegetation typing has remained unchanged in 2011/2012. In order to continue the success of this program there are required and recommended activities in 2012/2013. These include:

1. Re-survey transect locations and establish new permanent benchmarks in the summer of 2013. The area continues to evolve as habitats change. Transect location for “new” crews are a concern. While not specifically identified under the ToR it is deemed essential.
2. Continue wildlife and hydrological assessments for the third year of the second “rotation” following the defined schedule (**Table 1**).

### 8.0 References

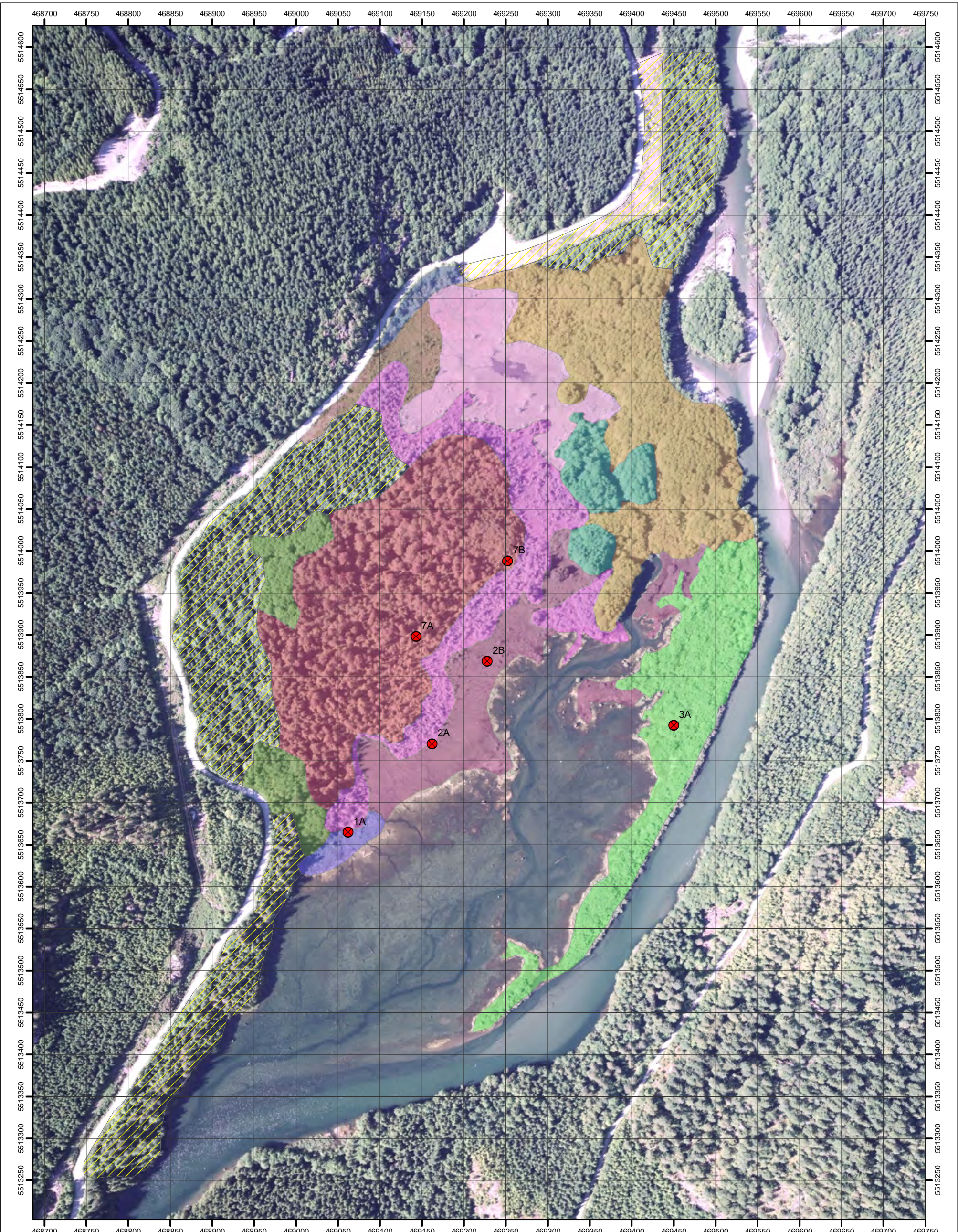
- Bates, D.J. 2007. Clowhom Lake Water Use Plan - Clowhom Lake wildlife census - Year 1. Resource Management Department, shíshálh Nation, Sechelt, BC.
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Clowhom Lake wildlife census - Year 3. Resource Management Department, shíshálh Nation, Sechelt, BC.

Bates, D.J. and Ferguson, G. 2010. Clowhom Lake Water Use Plan - Clowhom Lake wildlife census - Year 4. Resource Management Department, shíshálh Nation, Sechelt, BC.

BC Hydro, 2005. Clowhom Lake Water Use Plan - Monitoring Program Terms of Reference. BC Hydro, Burnaby, BC.

**Figure 2:** Vegetation polygons delineated from 2010 air photos. Vegetation and polygons have not changed significantly from 2006 photos.



### Clowholm Lake Cover Areas 2010

#### Legend

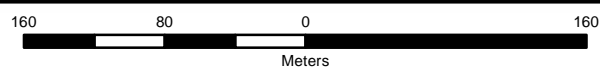
##### 2010 Cover Areas

ID



- Areas Unaffected by Flooding
- 2010 Ground Survey Points

### Overview



Scale 1:4,300

Projection: UTM NAD 1983 Zone 10N



Produced For: BC Hydro

Produced By: Chris Bates  
FSCI Biological Consulting

Date: 7/26/2011

## **9.0 Appendices**

Appendix 1. Data collected from wildlife census in 2011 and 2012.

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**Clowhom Wildlife Survey**

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Date 16/07/2011 (i.e., 16 July 2011)  
Weather Cloud Cover: 100%; Precipitation: moderate, light, and no rain; Wind:  
(calm)  
Site Conditions Lake/reservoir level: very high. Streams running through wetland were high. Wetland forest wet.  
Surveyors Greg Ferguson (Jerry Johnson in vehicle)  
Time Started 6:55 AM  
Time Finished 9:10 AM  
Elevation ~72 m  
Sunrise 5:23 AM  
Temperature (Clowhom) 10 °C  
UTM of Entrance to T1A from Clowhom Mainline: 10U 468853  
5513815 +/- 5m

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**Transect 1 (T1A to T1B) Runs East/West**

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**Time Start: 6:55 Time Finish: 7:20**

<b>Species and Number/Habitat ()</b>	<b>Habitat</b>	<b>Observation of behaviour</b>
Winter Wren (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce,	Singing
American Robin (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce,	Calling
Black-capped Chickadee (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce,	Calling
Banana Slug (2; 1; 2)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar); Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage; Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry)	Visual (one slug an albino)
Douglas Squirrel (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual (bark peeling from western red cedar)

Notes: Lake level up to tree line. Moderate rain during survey along

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**Transect 2 (T2A to T2B) Runs North/South**

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**Time Start: 7:20 Time Finish: 7:47**

<b>Species and Number/Habitat ()</b>	<b>Habitat</b>	<b>Observation of behaviour</b>
European Slug (4)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog	Visual
Cedar Waxwing (1)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog	Calling
Canada Goose (14 yng, 11 adults)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog cranberry) and Lake	Calling, visual
Unknown white moth/butterfly (2)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog	Visual
MacGillivray's Warbler (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling, visual
Pacific Sloped Flycatcher (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling

Notes: Moderate to light rain during survey along transect.

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**Transect 4 (T4B to T4A) Runs East/West**

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**Time Start: 7:48 Time Finish: 8:19**

<b>Species and Number/Habitat ()</b>	<b>Habitat</b>	<b>Observation of behaviour</b>
Spittle Bug (2)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual
Golden-crowned Kinglet (2)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling
Bear Species (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Scat with berries around base of large, cut cedar stump
Western Tanager (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling
Swainson's Thrush (2)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling, visual, one adult with berries in beak (breeding?)
Pacific Loon (1)	Lake	Calling (from the direction of station T4B)
Black-capped Chickadee (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling
Pacific Sloped Flycatcher (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling

European Slug (1; 1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage; Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)	Visual
Warbling Vireo (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Singing
Banana Slug (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce,	Visual

Notes: light rain to no rain during survey along transect.

<b>Transect 5 (T5A to T5B) Runs North/South</b>		<b>Time Start: 8:21 Time Finish: 8:35</b>
<b>Species and Number/Habitat ()</b>	<b>Habitat</b>	<b>Observation of behaviour</b>
Banana Slug (2)	Second growth forest ~20m tall, brushed, sloped, dry (spruce,	Visual
Columbian Black-tailed Deer (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce,	Tracks
Golden-crowned Kinglet (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce,	Singing, calling
Cyanide Millipede (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce,	Visual
Spotted Towhee (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce,	Calling
Swainson's Thrush (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce,	Singing, calling
Unknown white moth/butterfly (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce,	Visual

Notes: no rain during survey along transect.

<b>Transect 3 (T3A to T3B) Runs West/East</b>		<b>Time Start: 10:35 Time Finish: 11:00</b>
<b>Species and Number/Habitat ()</b>	<b>Habitat</b>	<b>Observation of behaviour</b>
Bear Species (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce,	Scat (contained grass)
Banana Slug (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce,	Visual
Winter Wren (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce,	Singing
Spittle Bug (1)	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)	Visual
Golden-crowned Kinglet (2)	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)	Singing, calling
Swainson's Thrush (1)	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)	Calling
Pacific Sloped Flycatcher (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling
Stellars Jay (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling
Unknown white moth/butterfly (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual
American Robin (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling
Cedar Waxwing (2)	Flat wetland/lake transtion zone (bog orchid, sphagnum, bog	Visual, calling
Song Sparrow (1)	Flat wetland/lake transtion zone (bog orchid, sphagnum, bog	Calling
Common Yellowthroat (1)	Flat wetland/lake transtion zone (bog orchid, sphagnum, bog	Singing

Notes: Light to no rain during survey along transect.

<b>Total Number of Species</b>	<b>24</b>	
<b>Species List</b>	Note: Includes all sign: feeding, scat, tracks, hair, calling, etc.	<b>Additional Note:</b> Some individual species observed on transects were likely repeat sightings on other transects.

- Bear Species
- Banana Slug
- Winter Wren
- Spittle Bug
- Golden-crowned Kinglet
- Swainson's Thrush
- Pacific Sloped Flycatcher
- Stellars Jay
- Unknown white moth/butterfly
- American Robin



Cedar Waxwing  
 Song Sparrow  
 Common Yellowthroat  
 Columbian Black-tailed Deer  
 Cyanide Millipede  
 Spotted Towhee  
 Western Tanager  
 Pacific Loon  
 Black-capped Chickadee  
 European Slug  
 Warbling Vireo  
 Canada Goose  
 MacGillivray's Warbler  
 Douglas Squirrel

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**Total Number of Species by Habitat Type**

<b>Number of Species</b>	<b>Habitat Type</b>
12	Second growth forest ~20m tall, brushed, sloped, dry (spruce,
3	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)
15	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage
8	Flat wetland/lake transtion zone (bog orchid, sphagnum, bog
2	Lake

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

Hummingbird Species (1)	East end of T1	Calling, visual
Raven (1)	Eastern side of lake	Calling

Notes: Many plants were in flower at time of survey. Late June to mid July is good time to undertake a plant survey of area.

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**Clowhom Wildlife Survey**

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Date	11/11/2011 (i.e., 11 November 2011)
Weather	Cloud Cover: 100%; Precipitation: light to moderate rain; Wind: 0
Site Conditions	Lake/reservoir level very low (little water in channel east of survey area). Streams running through forest and wetland were high. Patches of blown over trees in survey area present, likely caused by strong winds approximately 1 month ago.
Surveyors	Greg Ferguson and Owen Coombs
Time Started	9:00 AM
Time Finished	10:45 AM
Elevation	~72 m
Sunrise	7:15 AM
Temperature (Clowhom)	8 °C
UTM of Entrance to T1A from Clowhom Mainline:	10U 468853 5513815 +/- 5m

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**Transect 1 (T1A to T1B) Runs East/West**

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**Time Start: 9:00 Time Finish: 9:19**

Species and Number/Habitat ()	Habitat	Observation of behaviour
Golden-crowned Kinglet (2)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)	Calling
Unknown Fish Species (possible cutthroat trout) (2)	Upland mixed deciduous/coniferous forest (hemlock, cedar, maple)	Visual (in stream)
Stellars Jay (3)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling, visual
Winter Wren (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling, visual

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**Transect 2 (T2A to T2B) Runs North/South**

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**Time Start: 9:20 Time Finish: 9:33**

Species and Number/Habitat ()	Habitat	Observation of behaviour
Columbian Black-tailed Deer (1)	Flat wetland/lake transition zone (bog orchid, sphagnum, bog)	Scat (older)
Black-capped Chickadee (2)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling

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**Transect 4 (T4B to T4A) Runs East/West**

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**Time Start: 9:35 Time Finish: 10:02**

Species and Number/Habitat ()	Habitat	Observation of behaviour
Winter Wren (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual
Stellars Jay (3)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling, visual (maybe same individuals from transect T1)
Douglas Squirrel (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling (heard from transect T3)

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**Transect 5 (T5A to T5B) Runs North/South**

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**Time Start: 10:05 Time Finish: 10:14**

Species and Number/Habitat ()	Habitat	Observation of behaviour
Black-capped Chickadee (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)	Calling
Roosevelt Elk (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce, hemlock, cedar)	Scat

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**Transect 3 (T3A to T3B) Runs West/East**

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**Time Start: 10:20 Time Finish: 10:45**

Species and Number/Habitat ()	Habitat	Observation of behaviour
Spotted Towhee (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling
Golden-crowned Kinglet (6)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling, visual

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**Total Number of Species****9**

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**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.

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Golden-crowned Kinglet  
Unknown Fish Species (possible cutthroat trout)  
Stellars Jay  
Winter Wren  
Spotted Towhee  
Black-capped Chickadee  
Roosevelt Elk  
Douglas Squirrel  
Columbian Black-tailed Deer

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**Total Number of Species by Habitat Type**

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

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

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Gull Species (6)	South end of channel flowing into Clowhom Lake	Visual
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**Clowhom Wildlife Survey**

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Date	15/03/2012 (i.e., 15 March 2012)
Weather	Cloud Cover: 100%; Precipitation: moderate rain at start that tapered to light approximately half way through survey; Wind: 0 (absent).
Site Conditions	Lake/reservoir level very, very low (little water in channel east of survey area, dam maintenance). Streams running through forest and wetland were high. Approximately 2 to 3cm of snow on ground.
Surveyors	Greg Ferguson, Owen Coombs
Time Started	8:45 AM
Time Finished	10:19 AM
Elevation	~72 m
Sunrise	7:27 AM
Temperature (Sechelt)	8 °C
UTM of Entrance to T1A from Clowhom Mainline: 10U 468853 5513815 +/- 5m	

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**Transect 1 (T1A to T1B) Runs East/West**

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**Time Start: 8:45 Time Finish: 9:03**

<b>Species and Number/Habitat ()</b>	<b>Habitat</b>	<b>Observation of behaviour</b>
Varied Thrush (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling
Douglas Squirrel (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling
Roosevelt Elk (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Hair, feeding on skunk cabbage (end of transect)

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**Transect 2 (T2A to T2B) Runs North/South**

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**Time Start: 9:05 Time Finish: 9:18**

<b>Species and Number/Habitat ()</b>	<b>Habitat</b>	<b>Observation of behaviour</b>
Golden-crowned Kinglet (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling (end of transect)
Chestnut-backed Chickadee (2)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling (end of transect)

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**Transect 4 (T4B to T4A) Runs East/West**

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**Time Start: 9:20 Time Finish: 9:45**

<b>Species and Number/Habitat ()</b>	<b>Habitat</b>	<b>Observation of behaviour</b>
Grouse Species (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Heard (flew)
Pacific Wren (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling
Song Sparrow (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling
Brown Creeper (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling
Unknown Species	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Feeding on skunk cabbage
Varied Thrush (2)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Visual
Golden-crowned Kinglet (2)	Second growth forest ~20m tall, brushed, sloped, dry (spruce,	Calling

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**Transect 5 (T5A to T5B) Runs North/South**

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**Time Start: 9:45 Time Finish: 9:54**

<b>Species and Number/Habitat ()</b>	<b>Habitat</b>	<b>Observation of behaviour</b>
No species detected		

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**Transect 3 (T3A to T3B) Runs West/East**

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**Time Start: 9:58 Time Finish: 10:19**

<b>Species and Number/Habitat ()</b>	<b>Habitat</b>	<b>Observation of behaviour</b>
Grouse Species (1)	Second growth forest ~20m tall, brushed, sloped, dry (spruce,	Flight
Varied Thrush (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling
Pacific Wren (1)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling
Golden-crowned Kinglet (3)	Flat mixed deciduous/coniferous wetland forest with Skunk Cabbage	Calling

Small Hawk Species (1) Flat wetland/lake transtion zone (bog orchid, sphagnum, bog cranberry Visual

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**Total Number of Species** **11**

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**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.

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Varied Thrush  
 Douglas Squirrel  
 Roosevelt Elk  
 Golden-crowned Kinglet  
 Chestnut-backed Chickadee  
 Grouse Species  
 Pacific Wren  
 Song Sparrow  
 Brown Creeper  
 Unknown Species  
 Small Hawk Species

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**Total Number of Species by Habitat Type**

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

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

Recent Roosevelt Elk & Columbia Black-tailed Deer tracks observed east of plot (~200m upriver on north side)	Wetland and shrubs	Visual
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