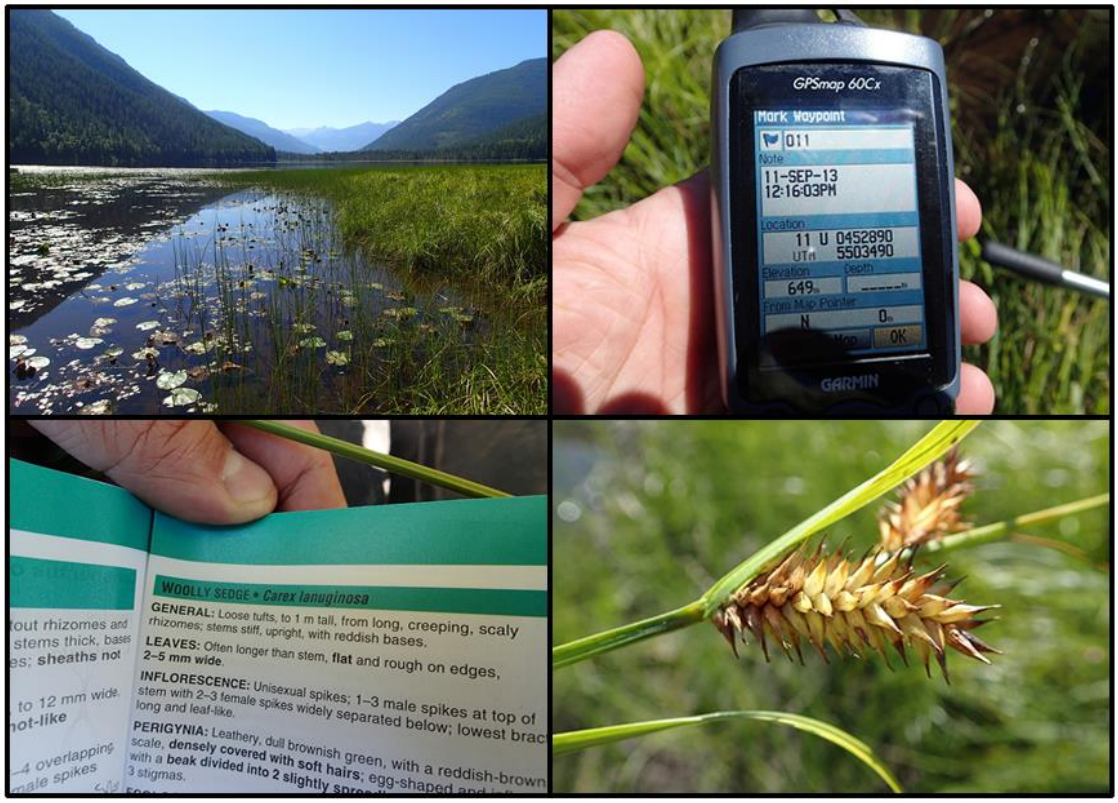
SWAMP Phase 2

Slocan Wetland Assessment and Monitoring Project



Prepared for:

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SWAMP
Slocan Wetland Assessment & Monitoring Project

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Glossary

The following is a list of terms and acronyms that are commonly used throughout this document.

ArcGIS	A Geographic Information System software package used for making and viewing digital maps.
BEC	Biogeoclimatic Ecosystem Classification. A provincial system of defining ecosystem types at a variety of scales, from landscape level to site specific.
Ecosystems-at-risk	Provincial system that tracks the status of ecosystems and uses a variety of rank factors to determine which are at risk.
Edaphic	Nature of soils based on texture, drainage, or chemical properties.
Edatopic Grid	A two-dimensional table using the soil nutrient regime and soil moisture regime for ecosystem classification to the site series level.
Ericaceous	The heather family; also vascular plants that are tolerant of acidic growing conditions.
Hydrodynamic Index	Five categories that describe the magnitude of vertical and lateral water movement in wet soils.
Hydrophytic	Plants adapted to growing in a partial or entire aquatic environment.
Gleysol	Soils of the Gleysolic order have properties that indicate prolonged periods of intermittent or continuous saturation with water and reducing conditions during their genesis.
Organic	Soil type that is comprised of plant and animal residues at various states of decomposition. Generally greater than 40cm in depth to be called an organic soil.
Regosol	Young soils with little or no horizon development.
Peat	Accumulation of partially decayed organic material.

Orthophoto	A series of digital airphotos that have been geometrically corrected and combined into a seamless image.
RISC	Resources Information Standards Committee. Provincial program that creates standardized procedures and methodologies for data collection, analysis and presentation.
SMR	Soil Moisture Regime. The average amount of soil water available for evapotranspiration by vascular plants.
SNR	Soil Nutrient Regime. The amount of essential soil nutrients available to vascular plants.
SWAMP	Slocan Wetlands Assessment and Monitoring Project
TRIM	Terrain Resource Inventory Mapping. Digital base mapping developed by the provincial government.

Acknowledgements

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1.0 Introduction

The Slocan Wetlands Assessment and Monitoring Project (SWAMP) is a collaboration of three societies, Slocan Solutions, Slocan River Streamkeepers and Slocan Lake Stewardship, working with the BC Wildlife Federation, the Fish and Wildlife Compensation Program, Selkirk College and the Regional District of Central Kootenay, to provide an integrated watershed approach to wetland understanding and management. Slocan Solutions Society is the fiscal manager of the program.

The long term goal of SWAMP is to utilize existing mapping and inventory data as base layers and to develop a detailed and comprehensive habitat assessment of flora and fauna of the watershed. SWAMP is a multi-year initiative to establish a community based monitoring program to assess the abundance, distribution, and ecological integrity/function of wetlands and riparian habitat throughout the Slocan watershed.

Phase 1 of the project (completed during the winter of 2013) involved collecting all existing information as to the type and extent of wetlands in the Slocan Valley, and developing an assessment method that was applicable for multiple levels of experience and education. Phase 2 (completed during the summer and fall of 2014) involved the assessment of 50 wetland plots from four wetland complexes and several other smaller wetlands. The assessments utilized a multi-disciplinary approach to classify each wetland and assess habitat suitability for mammals, birds, reptiles and amphibians. A separate, but integrated, assessment of invertebrate diversity to determine ecosystem health was also completed. In addition, two volunteer training workshops were held and numerous community outreach events were attended.

The focus of Phase 3 (to be completed in 2015) is to perform detailed assessments on additional wetlands and present the results to the communities, with a focus on wetland mapping and characterization. Assessments will incorporate lessons learned from Phase 2, including less reliance on professional specialists, and more emphasis on characterizing ecosystem functions. Target wetlands will include a wide distribution of sample sites, with a continued goal of attempting to inventory and classify the full range of wetlands that occur in the Slocan watershed, with a focus on private property. An improved community involvement and training program will be undertaken in Phase 3 to increase the knowledge of community members and the capacity of volunteers to contribute local knowledge of the location and importance of wetlands.

This report contains the results of the wetland mapping, classification, and wildlife habitat assessments performed for SWAMP.

1.1 Study Area

The study area includes the full Slocan River watershed, from the Kootenay River at the south, to the watershed divide north of Summit Lake, including the villages of Slocan, New Denver, Winlaw and Silverton, and the numerous unincorporated communities in between such as Passmore, Slocan Park and Krestova (Figure 2.0-1).

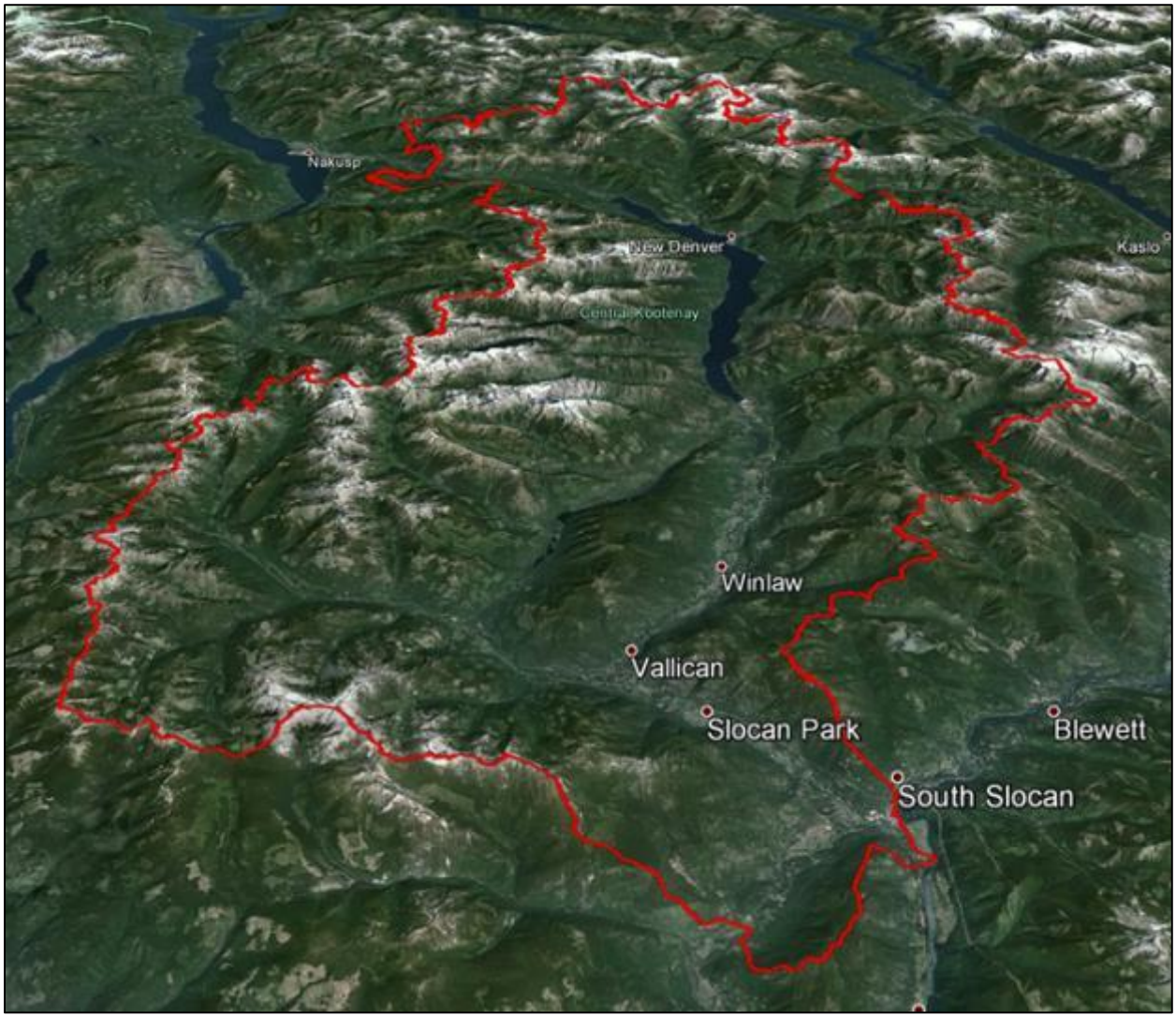


FIGURE 1.0-1. SWAMP STUDY AREA (ADAPTED FROM GOOGLE EARTH).

1.2 Introduction to Wetlands

A wetland is defined as: *land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation and various kinds of biological activity which are adapted to a wet environment* (National Wetlands Working Group 1988). (Canadian System of Wetland Classification 1997)

Wetland ecosystems are found where soils are saturated by water for enough time that the excess water and resulting low oxygen levels influence the vegetation and soil. The water influence can be either seasonal or year-round and occurs either at or above the soil surface or within the root zone of plants. Wetlands can be found in depressions, or areas of flat or undulating terrain. There are two broad categories of wetlands as described by the Canadian System of Wetland Classification (National Wetlands Working Group 1997):

"Organic wetlands:

- Organic wetlands are more simply referred to as peatlands. Peatlands contain more than 40 cm of peat accumulation on which organic soils (excluding Folisols[1]) develop. This depth limit is consistent with soil classification standards established by the Canada Soil Survey Committee (1978).

Mineral wetlands:

- Mineral wetlands are found in areas where an excess of water collects on the surface and which for geomorphic, hydrologic, biotic, edaphic (factors related to soil), or climatic reasons produce little or no organic matter or peat. Gleysolic[2] soils or peaty phases of these soils are characteristics of these wetlands.

- Mineral wetlands are found in mineral soil areas associated with shallow water, which is generally less than 2 m deep. In some of these wetlands, vegetation is lacking and soils are poorly developed as a result of frequent and drastic fluctuations of water levels, wave action, water flow, turbidity, or a high concentration of salts or other toxic substances in the water or in the soil.

- Mineral wetlands include mineral soil areas that are modified by water control structures (e.g. dams) or that are tilled and planted but if allowed to revert to their original state, become saturated for long periods and are then associated with wet soils (e.g. Gleysols) and hydrophytic vegetation."

The development of wetlands is a dynamic function of climate, hydrology, chemistry, geomorphology, and biology (National Wetlands Working Group 1997). Wetlands are not generally stable ecosystems, rather they are constantly evolving over time (hundreds or thousands of years) as soils develop and

[1] Soils of the Folisolic order are composed of upland organic (folic) materials, generally of forest origin, that are either 40 cm or more in thickness, or are at least 10 cm thick if overlying bedrock or fragmental material (Agriculture and Agri-Food Canada 2014a).

[2] Soils of the Gleysolic order have properties that indicate prolonged periods of intermittent or continuous saturation with water and reducing conditions during their genesis. Saturation with water may result from either a high groundwater table or temporary accumulation of water above a relatively impermeable layer, or both (Agriculture and Agri-Food Canada 2014b).

water regimes change, resulting in communities that often contain aspects of different wetland types, as well as transitional areas where they are indeterminate between one class or association and another. Therefore, multiple characteristics of wetlands, due to the interaction of various environmental factors, are required to place them in specific classes and associations.

1.3 Wetland Classification

Wetlands in Canada are classified based on the Canadian System of Wetland Classification using five classes: bog, fen, marsh, swamp, and shallow open water (National Wetlands Working Group 1997), and further refined into associations based on the Wetlands of British Columbia (MacKenzie & Moran 2004). The following section describes the main characteristics of each wetland class to aid identification. Upon completion of the Phase 2 of SWAMP (mapping and field sampling), detailed descriptions of all actual wetland classes and associations will be provided.

Environmental conditions that have affected wetland development are used to classify wetlands (National Wetlands Working Group 1997), including:

- Morphology – surface forms, pattern, elevation
- Water source
- Water chemistry (nutrients, base saturation, pH)
- Basin depth and shape
- Plant communities and their structure
- Peat and sediment characteristics
- Soil type (organic, gleysol, etc.)

Figure 1.3-1 (adapted from the Wetlands of British Columbia) provides an overview of the main environmental features for each wetland class (also known as Site Class), as well as the typical vegetation cover and species groups. Figure 1.3-2 (adapted from the Wetlands of British Columbia) depicts the edatopic grid that shows the range of soil moisture, soil nutrients, pH, and hydrodynamic index (water flow and permanence) that each wetland class typically occurs within. Note that shallow open waters do not fit the conceptual model presented in the edatopic grid, and are not included (MacKenzie & Moran 2003). The following sections describe the five wetland classes, primarily based on the Wetlands of British Columbia (MacKenzie & Moran 2003).

Site Realm/ Group	Site Class	Environmental features	Cover types	Species groups
Wetland Realm	Bogs	***Wet or Very Wet SMR*** +/- ombrotrophic pH < 5.5 > 40 cm fibric/mesic peat	Conifer treed or low shrub	Sphagnum mosses, ericaceous shrubs, and conifers
	Fens	Groundwater-fed pH > 5.0 > 40 cm fibric/mesic peat	Graminoid or low shrub	Deciduous shrubs, sedges, and brown mosses
	Marshes	Mineral soils or well-humified peat Protracted shallow flooding (0.1–2.0 m)	Graminoid or forb	Large emergent sedge, grass, forb, or horse-tail species
	Swamps	Mineral soils or well-humified peat Temporary shallow flooding (0.1–1.0 m) Significant water flow	Tall shrub or forested	Conifers, willows, alders, forbs, grasses leafy mosses
	Shallow waters	Permanent deep flooding (0.5–2 m)	Aquatic	Aquatic species Emergent vegetation < 10% cover

FIGURE 1.3-1. SUMMARY OF CHARACTERISTICS FOR WETLAND SITE CLASSES (ADAPTED FROM WETLANDS OF BRITISH COLUMBIA).

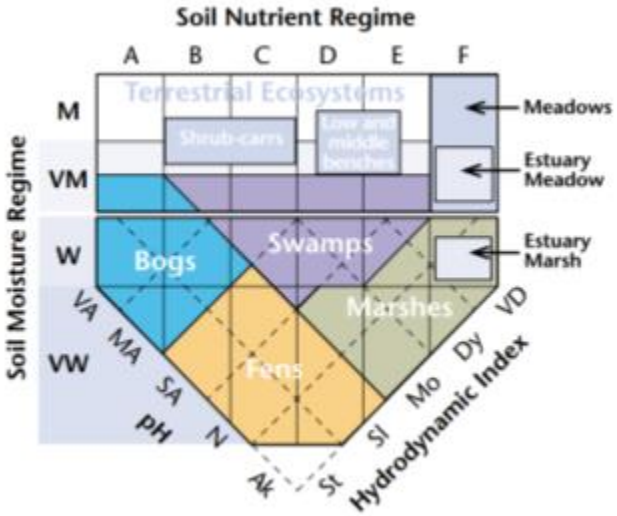


FIGURE 1.3-2. SITE CLASS DISTRIBUTION ON THE MODIFIED EDATOPIC GRID (ADAPTED FROM WETLANDS OF BRITISH COLUMBIA).

1.3.1 Bog

A bog is a nutrient-poor, *Sphagnum*-dominated peatland ecosystem in which the rooting zone is isolated from mineral-enriched groundwater, soils are acidic, and few minerotrophic plant species occur (MacKenzie & Moran 2003). Bogs may or may not contain a cover of slow growing woody, ericaceous shrubs or small stunted trees, generally occurring on hummocks or raised domes (Figure 1.3-3). A thick cover of *Sphagnum* (peat moss) is dominant, while other species that are tolerant of acidic, low nutrient conditions also occur. Bogs are typically located in closed basins (where precipitation is the primary water source), on the edges of larger peatlands, or as raised domes (normally within fens). Soils are deep peat deposits, generally with poorly decomposed upper layers, that remain saturated throughout the year. While some groundwater flow may occur, it is generally limited, resulting in little input of nutrients. (MacKenzie & Moran 2003)

FIGURE 1.3-3. EXAMPLE OF A STUNTED HEMLOCK BOG FROM NORTHWESTERN BC.

1.3.2 Fen

A fen is a nutrient-medium peatland ecosystem dominated by sedges and brown mosses, where mineral-bearing groundwater is within the rooting zone and minerotrophic plant species are common (MacKenzie & Moran 2003). Fens rely on steady groundwater inflow that provides relatively high nutrient contents, and maintains the watertable near the peat surface for most of the growing season, resulting in soils with richer nutrient regimes. They develop on a variety on landscape positions,

including basins, lake and river margins, and seepage slopes. These sites are characterized by non-ericaceous shrubs, sedges, grasses, reeds, and brown mosses (MacKenzie & Moran 2003), while tall shrubs and trees are absent (Figure 1.3-4). Fens are the most commonly occurring wetland type in BC, occurring in all but the warmest regions. (MacKenzie & Moran 2003)

FIGURE 1.3-4. EXAMPLE OF A MID-ELEVATION FEN FROM NORTHERN BC.

1.3.3 Marsh

A marsh is a permanently to seasonally flooded non-tidal mineral wetland dominated by emergent grass-like vegetation (MacKenzie & Moran 2003). Marshes typically contain simplistic vegetation communities that are dominated by a small number of species, often in response to specific water regimes or other favourable conditions. (Figure 1.3-5) Shrubs, trees and bryophytes (moss) are generally absent or very sparse, while aquatic plants often occur. Marshes occur in dynamic hydrological systems, where there are significant fluctuations in water levels through the year. They are generally nutrient rich and more frequently occur in warmer climates. Marshes occur in a variety of landscape positions, but most often as pond and lake margins and river backwaters as a component of a larger wetland complex. Peat accumulation is generally limited due to the occurrence in warmer climates and the dynamic water levels, both of which promote decomposition of organic material, resulting in most marshes being comprised mainly of mineral soils. Marshes are generally flooded in the spring, while drier months may see a persistent high water table, or substantial drying and substrate exposure.

FIGURE 1.3-5. EXAMPLE OF A CATTAIL MARSH FROM SOUTHWESTERN BC.

1.3.4 Swamp

A swamp is a nutrient-rich wetland ecosystem where significant groundwater inflow, periodic surface aeration, and/or elevated microsites allows growth of large trees or tall shrubs under subhydric conditions (MacKenzie & Moran 2003). Swamps are dominated by conifer or broadleaf trees (often on mounded microsites), or tall shrubs (Figure 1.3-6). Herbaceous species are variable, and can range from thick to sparse covers, while bryophytes are generally limited. Tree dominated swamps typically occur as transitional areas between water or other wetlands and upland terrestrial communities, while shrub dominated swamps occur in a wide variety of conditions. Swamps range from moderate to rich communities that have significant groundwater flow and water tables that remain near or above the surface throughout the growing season. They typically occur on mineral soils that have a surface layer of well decomposed organic material. (MacKenzie & Moran 2003)

FIGURE 1.3-6. EXAMPLE OF A SWAMP WETLAND FROM CENTRAL INTERIOR BC.

1.3.5 Shallow Open Water

Shallow open water wetlands are aquatic wetlands permanently flooded by still or slow-moving water and dominated by rooted submerged and floating-leaved aquatic plants (MacKenzie & Moran 2003). These aquatic wetlands are simplistic communities that typically have less than 10% cover of emergent species (Figure 1.3-7). Shallow open water wetlands occur as a component of still or slowly moving waterbodies, and are normally a small component of a larger wetland or aquatic complexes. Aquatic wetlands typically occur in water that is less than two metres deep (deeper water limits light penetration and the ability for most rooted emergent species to grow).

FIGUREE 1.3-7. EXAMPLE OF A SHALLOW OPEN WATER WETLAND FROM LITTLE SLOCAN LAKES.

2.0 Methodology

The following sections describe locations and methodology for initial wetland inventory and classification work.

2.1 Ecosystem Mapping

Preliminary mapping of key wetlands has been on-going since 2012. Mapping originated with the Slocan River Sensitive Ecosystems Inventory (SEI) project that focused on lowland areas along the Slocan River and included wetland, riparian, aquatic, and terrestrial ecosystems. Wetland specific mapping was completed for SWAMP Phase 1 in key large complexes throughout the study area, and ground truthed for accuracy during Phase 2. To date, both mapping exercises have used the SEI classification system that is currently limited to identifying wetlands to the Federal Class level (Table 2.1-1). Mapped wetlands that were ground truthed during the 2014 field season also contain classification to the provincial site series level when possible. The provincial wetland layer is used for remainder of the study area that has not yet been assessed.

The provincial wetland layer shows 189 wetlands in the Study Area comprising an area of 557 hectares. Of those, 131 are classified as marshes and 58 classified as swamps.

TABLE 2.1-1. APPLICABLE SEI WETLAND, RIPARIAN AND FRESHWATER CLASSES AND SUBCLASSES (ADAPTED FROM DURAND 2012)

RI: Riparian		Ecosystems associated with and influenced by freshwater
RI	fh: high bench	High bench floodplain terraces
RI	fm: medium bench	Medium bench floodplain terraces
RI	fl: low bench	Low bench floodplain terraces
RI	ff: fringe	Narrow, linear community along watercourses that generally lack floodplains and floodplain communities
RI	ri: river	River and creeks, including gravel bars
WN: Wetland		Terrestrial – freshwater transitional areas.
WN	ms: marsh	Graminoid or forb-dominated nutrient-rich wetlands
WN	sp: swamp	Shrub or tree-dominated wetlands
WN	ow: shallow water	Permanently flooded, water less than 2m deep at mid-summer
WN	fn: fen	Herbaceous or shrub wetlands, moderate nutrients, wet throughout growing season.
WN	bg: bog	Acidic, sphagnum dominated, closed basin wetlands
FW: Lakes and Ponds		
FW	pd: pond	Open water > 2 m deep and generally < 50 ha.
FW	la: lake	Open water > 2 m deep and generally > 50 ha.

2.2 Sample Locations

There were two proposed objectives for initial field sampling:

1. Classification and mapping of key lowland wetland complexes that are known to be of high value and/or have a higher potential to be threatened by various land uses (logging, development, etc.).

2. Classification and mapping of as many types and conditions of wetlands as possible, including higher elevation and alpine areas to determine the full breadth of ecosystems that occur in the study area.

Target wetlands for objective one focused on areas that have been mapped through SWAMP Phase 1 and the Slocan River Sensitive Ecosystems Inventory. These areas are already known to be important complexes and generally accessible. While they contain repetitions of similar wetland types, they include a variety of conditions (disturbed vs natural) and are distributed throughout a large portion of the study area, with the exception of largely occurring only in low to mid elevation areas. Figure 2.2-1 provides an overview map of the target wetlands. Detailed maps of the target wetlands and descriptions of the wetland types and their condition, is presented in Section 3.

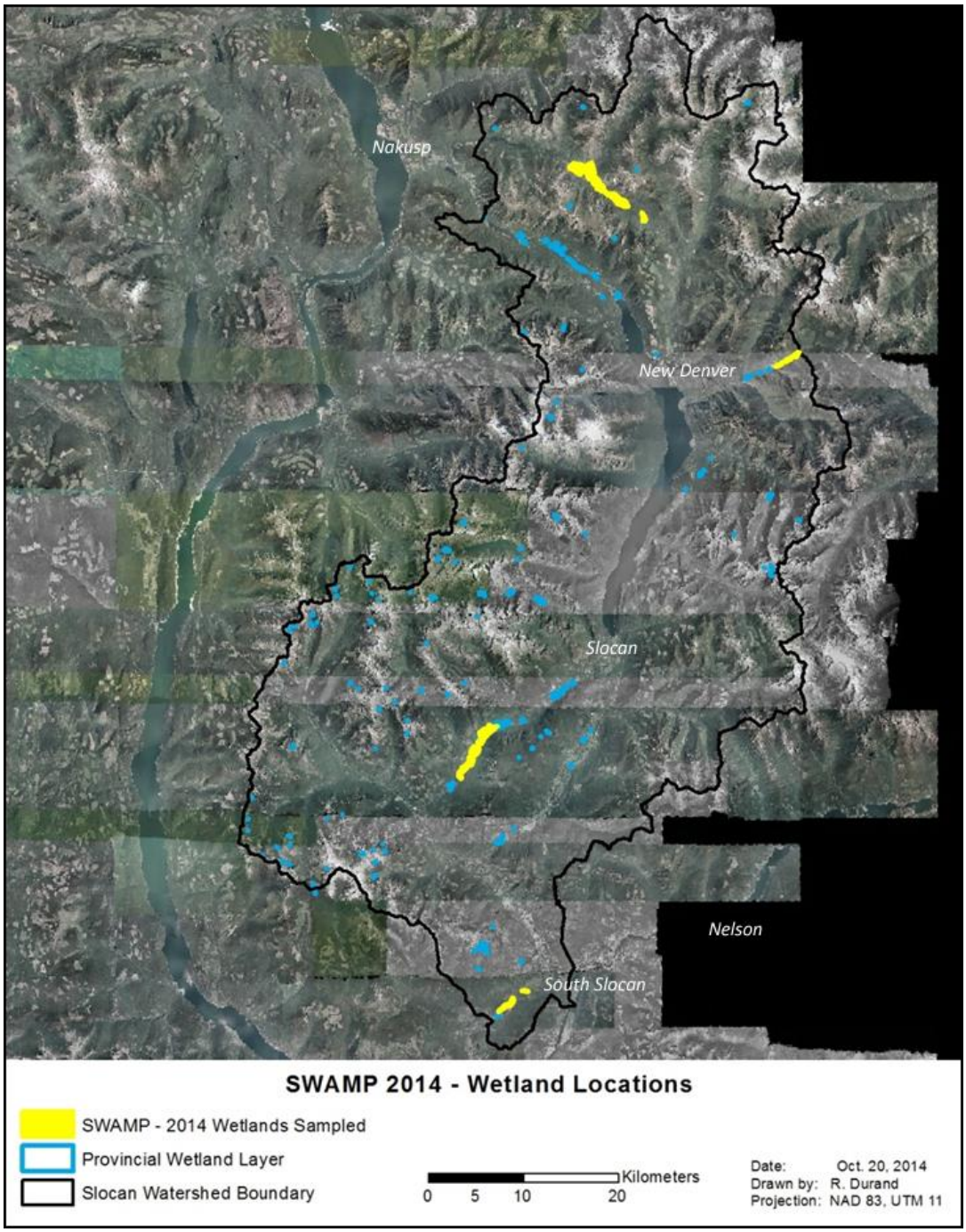
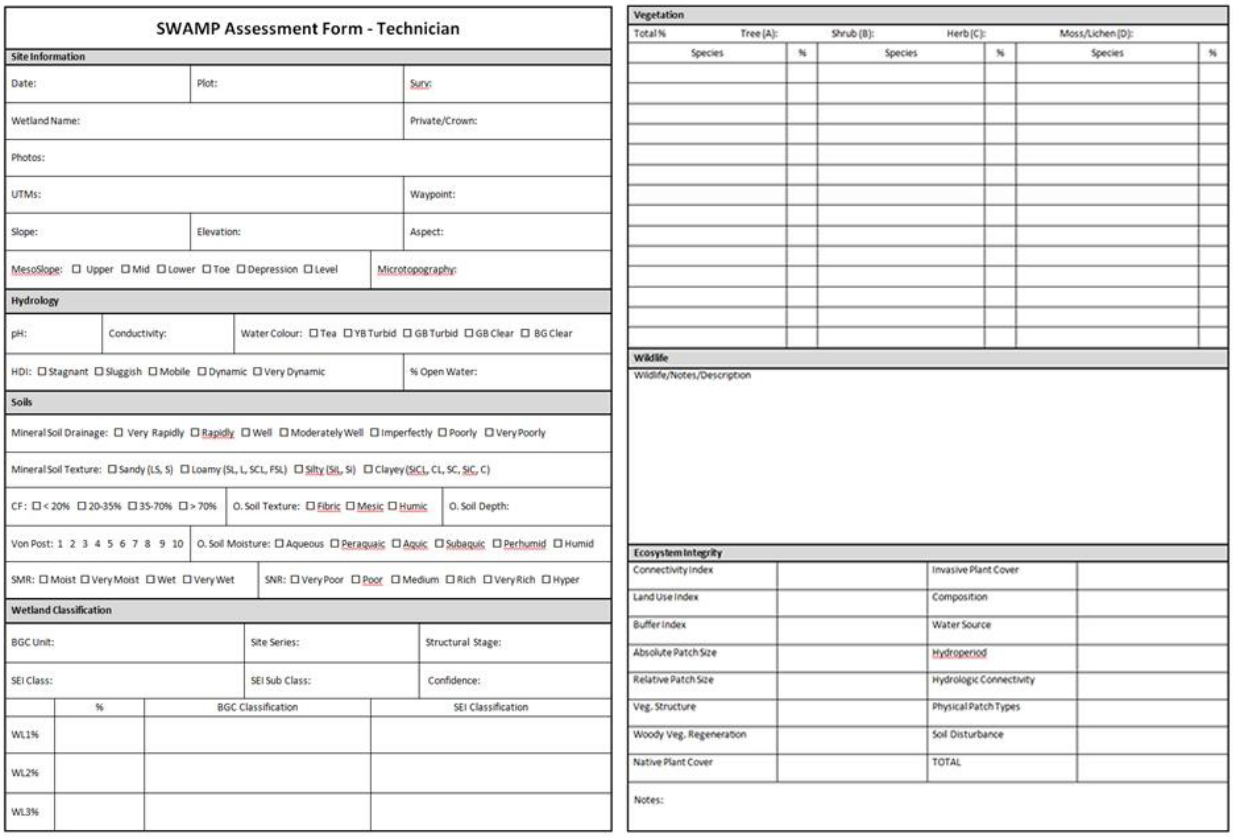


FIGURE 2.2-1. SWAMP TARGET WETLANDS FOR 2014.

2.3 Wetland Classification

Wetland classification was completed as per provincial methodology. Custom forms (Figure 2.3-1) were created for SWAMP, primarily adapting the standard Site Visit Form and using procedures from the Field Manual for Describing Terrestrial Ecosystems; Second Edition (BC MOF 2010). Additional information was collected to classify ecosystems to the site association level as per Wetlands of BC; A Guide to Identification (MacKenzie & Moran 2004). For wetlands that could not be classified to a site association or site series level, generic federal wetland classes were used.



SWAMP Assessment Form - Technician

Site Information

Date:	Plot:	Surv:
Wetland Name:		Private/Crown:
Photos:		
UTMs:		Waypoint:
Slope:	Elevation:	Aspect:
MesoSlope: ☐ Upper ☐ Mid ☐ Lower ☐ Toe ☐ Depression ☐ Level		Microtopography:

Hydrology

pH:	Conductivity:	Water Colour: ☐ Tea ☐ YB Turbid ☐ GB Turbid ☐ GB Clear ☐ BG Clear
HDI: ☐ Stagnant ☐ Sluggish ☐ Mobile ☐ Dynamic ☐ Very Dynamic		% Open Water:

Soils

Mineral Soil Drainage: ☐ Very Rapidly ☐ Rapidly ☐ Well ☐ Moderately Well ☐ Imperfectly ☐ Poorly ☐ Very Poorly		
Mineral Soil Texture: ☐ Sandy (LS, S) ☐ Loamy (SL, L, SCL, FSL) ☐ Silty (SiL, Si) ☐ Clayey (SiCL, CL, SC, SiC, C)		
CF: ☐ < 20% ☐ 20-35% ☐ 35-70% ☐ > 70%	O. Soil Texture: ☐ Fibric ☐ Mesic ☐ Humic	O. Soil Depth:
Von Post: 1 2 3 4 5 6 7 8 9 10	O. Soil Moisture: ☐ Aqueous ☐ Peraquaic ☐ Aquic ☐ Subaquic ☐ Perhumid ☐ Humid	
SMR: ☐ Moist ☐ Very Moist ☐ Wet ☐ Very Wet	SNR: ☐ Very Poor ☐ Poor ☐ Medium ☐ Rich ☐ Very Rich ☐ Hyper	

Wetland Classification

BGC Unit:	Site Series:	Structural Stage:
SEI Class:	SEI Sub Class:	Confidence:

	%	BGC Classification	SEI Classification
WL1%			
WL2%			
WL3%			

Vegetation

Total % Tree (A): Shrub (B): Herb (C): Moss/Lichen (D):

Species	%	Species	%	Species	%

Wildlife

Wildlife/Notes/Description

Ecosystem Integrity

Connectivity Index		Invasive Plant Cover	
Land Use Index		Composition	
Buffer Index		Water Source	
Absolute Patch Size		Hydroperiod	
Relative Patch Size		Hydrologic Connectivity	
Veg. Structure		Physical Patch Types	
Woody Veg. Regeneration		Soil Disturbance	
Native Plant Cover		TOTAL	

Notes:

FIGURE 2.3-1. SWAMP FIELD FORM

2.4 Wildlife Habitat Assessments

Wildlife Habitat Assessments (WHA) were performed in the four target wetland complexes by experienced professionals. Four species groups were targeted, with the specific species assessed determined by the professionals based on their local knowledge. The species were also selected as indicators, with each species occupying specific habitat types within the wetlands, and utilizing the habitat in different ways depending on the time of year. The assessments were completed following provincial guidelines for habitat suitability assessments using the standardized FS882 field from and

accompanying methodologies from the Field Manual for Describing Terrestrial Ecosystems; Second Edition (BC MOF 2010). However, these methodologies were primarily designed for mammals, so adaptations were made as appropriate to work for species groups.

An additional assessment was made of invertebrates under SWAMP in the same target wetlands. However, as this assessment was specific to particular ecosystem types and conditions, and the protocol used was a trial for a new national standard, the methodologies and results are contained in a separate report.

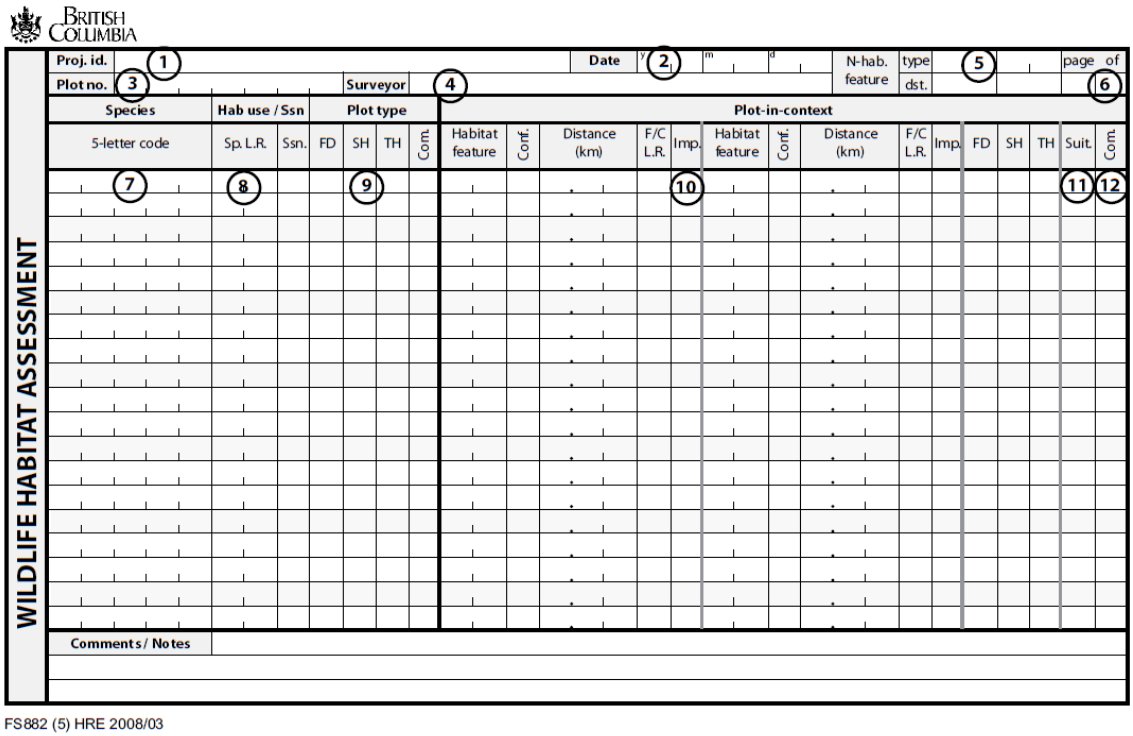
The general methodology for the WHA assessments involved biologists assessing plots at the same location or in the same general vicinity as SWAMP ecosystem plots. The biologists were typically accompanied with a SWAMP technician or volunteer. At each plot, the location was recorded, along with a general description of the site and dominant vegetation. A rating was then assigned to each species, along with the life requisite and/or season being assessed. Ratings were given, based on a scale of 1 to 6 for the ability of a given ecosystem to meet the species needs (life requisites) for thermal cover, security and food. Figure 2.4-1, adapted from MOF 2010, shows the 6 rank system for assessing habitat suitability for a given species and season. Not all species were assessed for all life requisites, as the importance for each one varies by species.

Plot in context adjustments were then made to either increase or decrease the ratings of the plot based on adjacent land use, disturbances, or habitat. Final life requisites were then determined, and a final suitability rating given. The final suitability rating is an indication of the potential use by a given species. Figure 2.4-2 provides an example of a WHA form. Species observations, along with any evidence of use (tracks, bedding sites, dens, scat, etc.), were recorded when found.

TABLE 5.5 Relative quality classes for assessing the plot type quality relative to the best in British Columbia

Class Quality	Suitability/ capability	Lower limit (%)	Upper limit (%)	
1	High	>75	≤100	Equivalent
2	Mod. high	>50	≤75	Slightly less
3	Moderate	>25	≤50	Moderately less
4	Low	>5	≤50	Substantially less
5	Very Low	>0	≤5	Much less
6	Nil	0	0	Habitat or attribute is absent

FIGURE 2.4-1. 6 RANK RATING SYSTEM USED FOR WHA.



BRITISH COLUMBIA

WILDLIFE HABITAT ASSESSMENT

Proj. id. (1)									Date (2) y m d						N-hab. feature type dst. (5)						page of (6)	
Plot no. (3)				Surveyor (4)																		
Species		Hab use / Ssn		Plot type				Plot-in-context														
5-letter code		Sp. L.R.	Ssn.	FD	SH	TH	Com.	Habitat feature	Conf.	Distance (km)	F/C L.R.	Imp.	Habitat feature	Conf.	Distance (km)	F/C L.R.	Imp.	FD	SH	TH	Suit.	Com.
(7)		(8)			(9)							(10)									(11)	(12)
Comments / Notes																						

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FIGURE 2.4-2. EXAMPLE OF A WHA FORM.

Once the suitability ratings table has been developed for each species, season and ecosystem type, the values can be transferred to the GIS. For pure ecosystems, the rating is simply added for each species and season. For compound ecosystems (mapped polygons that have 2 or 3 ecosystem types), the values are entered for each ecosystem type, then expressed as a weighted average of the deciles (percentage of each ecosystem type) to give a single value for the polygon.

This WHA system allows for a consistent habitat assessment method and rating system to be utilized by multiple disciplines. The ratings tables for each ecosystem type can then be applied to any mapped polygon in the study area to generate maps or other assessments of the habitat value of a given area. The ecological integrity assessments performed at the wetland ecosystem area can then be used to either increase or decrease the final habitat rating to reflect the quality/condition of the ecosystem.

2.5 Ecosystem Integrity

The following ranking system was used to consistently rank the ecological integrity of wetlands throughout the study area. It was adapted from rapid assessments procedures developed for the US Environmental Protection Agency by NatureServe (Faber-Langendoen et al. (2012a & 2012b) for use in the SWAMP project.

The method is described by Faber-Langendoen et al. (2012b) as:

> "The intent of ecological integrity based rapid assessment methods (RAMs) is to evaluate the complex ecological condition of a selected ecosystem using a specific set of observable field indicators, and to express the relative integrity of a particular occurrence in a manner that informs decision-making, whether for restoration, mitigation, conservation planning, or other ecosystem management goals (Stein et al. 2009). These Level 2 assessments are structured tools combining scientific understanding of ecosystem structure, composition, and processes with best professional judgment in a consistent, systematic, and repeatable manner (Sutula et al. 2006).
>
> Level 2 assessments rely primarily on relatively rapid (ca. 2–4 hours) field-based site visits, but this may vary, depending on the purposes of the assessment. They provide the opportunity to do direct, ground based surveys of ecosystem occurrences. RAMs are widely available for wetlands because of the need for mitigation and restoration tools, and they are used by many state wetland programs (Fennessy et al. 2007). Typically three to five metrics are identified for each of the ecological factors, with each metric designed to assess a major ecological factor or attribute."

The ranking system used a combination of office (GIS analysis and airphoto interpretation), field assessments, and analysis of field data (mainly vegetation lists and percent cover). Each wetland plot included an ecological integrity rank, while the final rank was generated in the office for the entire complex based on all the individual plot ranks and the GIS analyses.

The system used a four rank (occasionally 5 rank) assessment with Excellent (A), Good (B), Fair (C) and Poor (D) entered on the score card for each metric (Table 5.2-3). The rank was then converted to a numeric value (A = 5, B = 3.75, C = 2.5, D = 1.25) and the average multiplied by a weighted value to generate a total for each of six ecological factors. The total of all the ecological factors determined the Ecological Integrity Rank for a given wetland. For wetlands that occurred as complexes where multiple plots are surveyed, the Ecological Integrity Rank is an average of all plots. Table 2.5-1 presents the scorecard, while a smaller version was included on the SWAMP field forms due to size limitations on the form.

TABLE 2.5-1. ECOLOGICAL INTEGRITY RANK SCORECARD (ADAPTED FROM FABER-LANGENDOEN ET AL. 2012B)

SWAMP Ecological Integrity Scorecard			
RANK FACTORS	**ECOLOGICAL FACTORS**	**METRICS**	**RANK**
Landscape Context	Landscape	Connectivity Index	
		Land Use Index	
		Landscape Rank = Total x 0.10	

	Buffer	Buffer Index	
		Buffer Rank = Total x 0.15	
Size	Size	Absolute Patch Size	
		Relative Patch Size	
		Size Rank = Total x 0.15	
Condition	Vegetation	Structure	
		Regeneration	
		Native Plant Cover	
		Invasive Plant Cover	
		Composition	
		Vegetation Total x 0.24	
	Hydrology	Water Source	
		Hydroperiod	
		Hydrologic Connectivity	
		Hydrology Rank = Total x 0.24	
	Soil	Physical Patch Types	
		Soil Disturbance	
		Soil Rank = Total x 0.12	
ECOLOGICAL INTEGRITY RANK			

3.0 Results

A total of 50 ecosystem sample plots were established in the study area. The plots were primarily situated in the four target wetlands, with an additional 7 plots placed in additional wetlands throughout the study area (Figure 3.0-1 and Table 3.0-1). Wildlife Habitat Assessment plots ranged from a total of 22 to 31 and were spread throughout the four target wetlands based on suitable habitat for the focal species of interest. The following sections describe the results in detail.

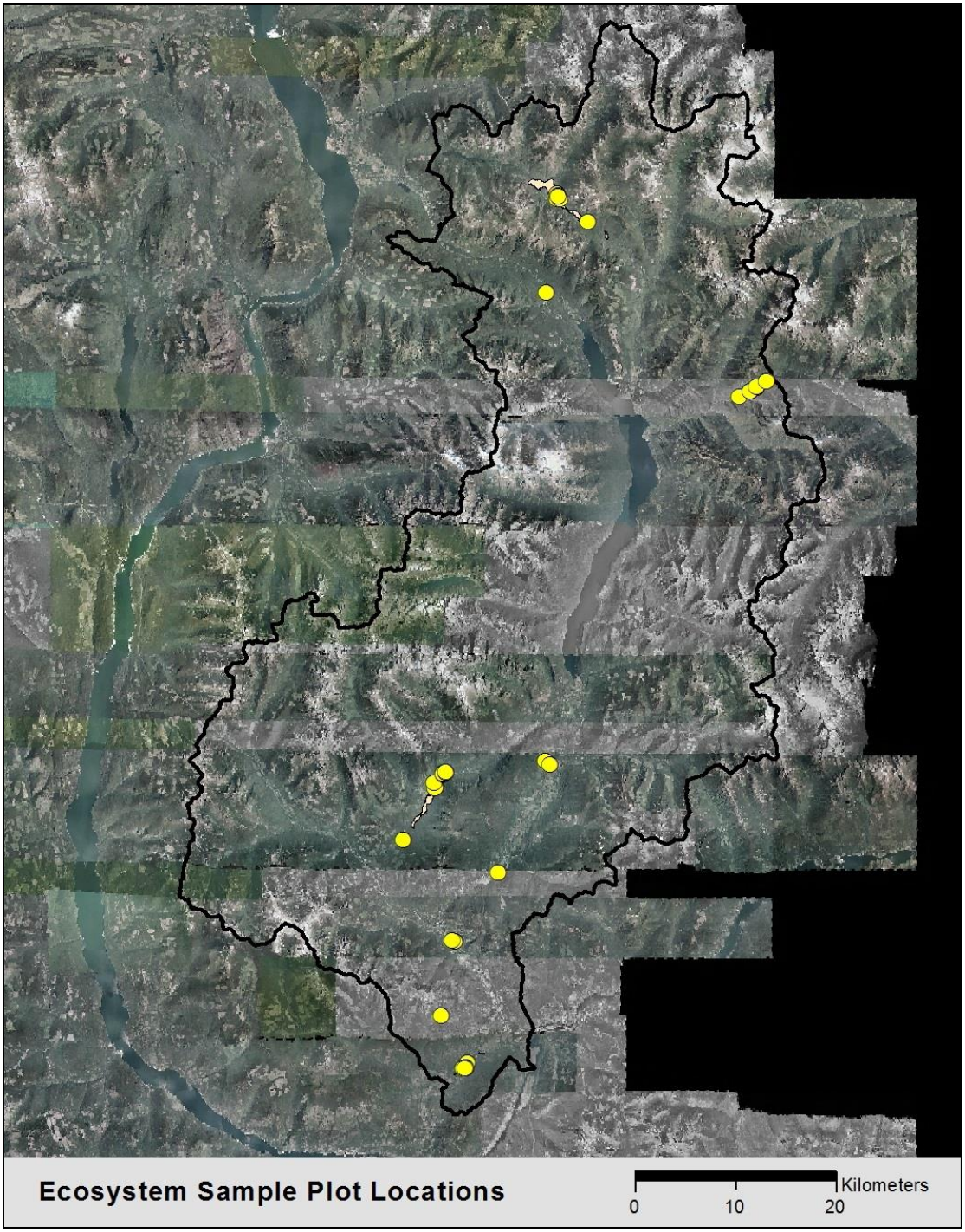

FIGURE 3.0-1. LOCAL OF ECOSYSTEM SAMPLE PLOTS.

Wetland	Ecosystem Plots	Mammal WHA	Bird WHA	Reptile & Amph. WHA
Beaver Lakes	12	9	6	13
Little Slocan Lakes	13	8	5	8
Pass Creek	8	7	5	7
Seaton Creek	10	3	6	3
Slocan Island	2			
Wright Bowles	2			
Hunter Siding	1			
Mtn. above Pass Creek	1			
Pedro Creek	1			
Total	**50**	**27**	**22**	**31**

TABLE 3.0-1. SUMMARY OF SAMPLE PLOT LOCATIONS

3.1 Ecosystem Classification and Mapping

Table 3.1-1 presents a summary of the location and type of wetlands sampled for the SWAMP project. Sample plots ranged from detailed assessments following provincial protocols, to simplified visual assessments that were limited to the SEI wetland class and subclass. In general, it was found that the provincial wetland classification system poorly describes the majority of the wetland types found in the study area. While some could be classified to the provincial site series level, many types, including several re-occurring swamp associations, could not be classified. In some locations the inability to classify was related to historic disturbances (logging, roads, etc.) or more recent modifications (flooding from beaver dams), while treed swamps in particular were poorly described in the existing classification system, or were not classifiable at all. Appendix 1 contains a list of plants identified during SWAMP Phase 2, while Appendix 2 contains an expanded summary of the wetland ecosystem plot data.

TABLE 3.1-1. SUMMARY OF ECOSYSTEM PLOT LOCATIONS

Plot	Date	Name	Easting	Northing	Site Series	Structural Stage	Wetland Class
JD-002	9/17/2014	Beaver Lakes	464276	5561276	Wm01	2b	Marsh
JD-003	9/17/2014	Beaver Lakes	464234	5561078	Wm01	2b	Marsh
JD-004	9/17/2014	Beaver Lakes	464299	5560893	WN:fn	2b	Fen
MM-004	7/15/20104	Beaver Lakes	464276	5561276	WN:sp	7	Swamp
RD-05	6/24/2014	Beaver Lakes	464231	5561307	Ws10	7mC	Swamp

RD-06	6/24/2014	Beaver Lakes	464322	5560878	Wf05	2b	Fen
RD-07	6/24/2014	Beaver Lakes	464278	5560764	RI:fm	7mC	Floodplain
RD-08	6/24/2014	Beaver Lakes	464534	5560767	WN:sp	3b	Swamp
RD-09	6/24/2014	Beaver Lakes	467308	5558491	Wm01	2b	Marsh
TEBL01	9/13/2014	Beaver Lakes	464224	5561314	WN:sp	3b	Swamp
TEBL03	9/13/2014	Beaver Lakes	464334	5561161	WN:fn	2b	Fen
TEBL04	9/13/2014	Beaver Lakes	464368	5561059	WN:sp	7mC	Swamp
NVT-01	7/12/2014	Hunter Siding	463152	5551502	Ws02	3b	Swamp
TE101	8/14/2014	Little Slocan Lakes	453152	5503592	WN:sp	3b	Swamp
TE102	8/14/2014	Little Slocan Lakes	452973	5503609	Wm05	2b	Marsh
TE103	8/14/2014	Little Slocan Lakes	452903	5503513	WN:fn	2b	Fen
TE104	8/14/2014	Little Slocan Lakes	452838	5503406	WN:ms	2b	Marsh
TE105	8/14/2014	Little Slocan Lakes	452168	5502227	WN:sp	5C	Swamp
TE106	8/14/2014	Little Slocan Lakes	452106	5502088	WN:sp	5C	Swamp
TE107	8/14/2014	Little Slocan Lakes	451945	5502658	WN:sp	5C	Swamp
RD-15	9/11/2013	Little Slocan Lakes	452836	5503410	Wm02	2b	Marsh
RD-16	9/11/2013	Little Slocan Lakes	452976	5503603	Ws	3b	Swamp
RD-17	9/13/2013	Little Slocan Lakes	452902	5503511	Wm01	2b	Marsh
RD-19	8/9/2014	Little Slocan Lakes	453150	5503590	Ws	3a	Swamp
RD-20	8/9/2014	Little Slocan Lakes	453150	5503686	Ws02	3b	Swamp
RD-21	8/9/2014	Little Slocan Lakes	448903	5496968	Wmo1	2b	Marsh
RD-18	6/20/2014	Mtn. above Pass Creek	452667	5479459	Wf	2b	Fen
JAPC015	7/14/2014	Pass Creek	455322	5474745	WN:sp	3b	Swamp
RD-10	7/17/2014	Pass Creek	455023	5474224	WN:sp	3b	Swamp
RD-11	7/10/2014	Pass Creek	455116	5474249	WN:ms	2b	Marsh
RD-12	7/10/2014	Pass Creek	455115	5474207	WN:sp	6mC	Swamp
RD-13	7/10/2014	Pass Creek	454616	547448	WN:sp	3b	Swamp
RD-14	7/10/2014	Pass Creek	454895	5474149	FW:pd		Pond
RD-23	7/10/2014	Pass Creek	455069	5474203	Ws	3b	Swamp
SW-001	7/6/2014	Pedro Creek	458417	5493678	WN:sp	3b	Swamp
MM-009	7/16/2014	Seaton Creek	485210	5542739	WN:sp	3b	Swamp
MM-010	7/16/2014	Seaton Creek	484084	5542049	WN:sp	3b	Swamp
MM-011	7/16/2014	Seaton Creek	484095	5542038	WN:sp	3b	Swamp
MM-012	7/16/2014	Seaton Creek	482437	5541121	FW:pd		Pond

MM-013	7/16/2014	Seaton Creek	483456	5541655	WN:sp	3b	Swamp
RD-01	6/6/2014	Seaton Creek	484150	5542031	Wf05	2b	Fen
RD-02	6/6/2014	Seaton Creek	483480	5541657	Ws01	3b	Swamp
TE3FK01	9/12/2014	Seaton Creek	483513	5541614	WN:sp	3b	Swamp
TE3FK02	9/12/2014	Seaton Creek	484164	5542063	WN:sp	3b	Swamp
TE3FK03	9/12/2014	Seaton Creek	485115	5542606	WN:sp	3b	Swamp
RD-22	9/23/2013	Slocan Island	463113	5504795	Fm	6tM	Floodplain
RD-24	9/23/2013	Slocan Island	463502	5504474	Fm	5tC	Floodplain
RD-03	6/7/2014	Wright Bowles	454027	5486841	Fm02	6oM	Floodplain
RD-04	6/7/2014	Wright Bowles	453781	5486902	Fm	6tM	Floodplain

Ecosystem sample data were used to update the ecosystem mapping of the four target wetland complexes. Revised maps and descriptions of each target complex are contained in the remained of this section.

Pass Creek

The Pass Creek wetland complex is located the southwest corner of the study area. It is dominated by willow and alder swamps (Figures 3.1-1 and 3.1-2), with a large complex of marsh and shallow open water occurring along Goose Creek (Figures 3.1-3 and 3.1-4),. Young to mature mid bench floodplain forests occur throughout the complex, as do extensive areas of herbaceous (introduced and native grasses) or shrub dominated areas that were previously cleared and likely farmed. The wetlands have evidence of extensive past disturbance (tree cutting and clearing) and many are currently modified by beaver activity. No wetlands in the complex could be classified to the site series level. Figure 3.1-5 presents an ecosystem map of the sampled portion of the Pass Creek wetland complex showing the dominant ecosystem types.

FIGURE 3.1-1. SEDGE, ALDER SWAMP WETLAND IN THE PASS CREEK COMPLEX.

FIGURE 3.1-2. WILLOW SWAMP WETLAND IN THE PASS CREEK COMPLEX.

FIGURE 3.1-3. SHALLOW OPEN WATER AND ALDER SWAMP WETLAND IN THE PASS CREEK COMPLEX.

FIGURE 3.1-4. BEAVER POND AND WILLOW SWAMP IN THE PASS CREEK COMPLEX.

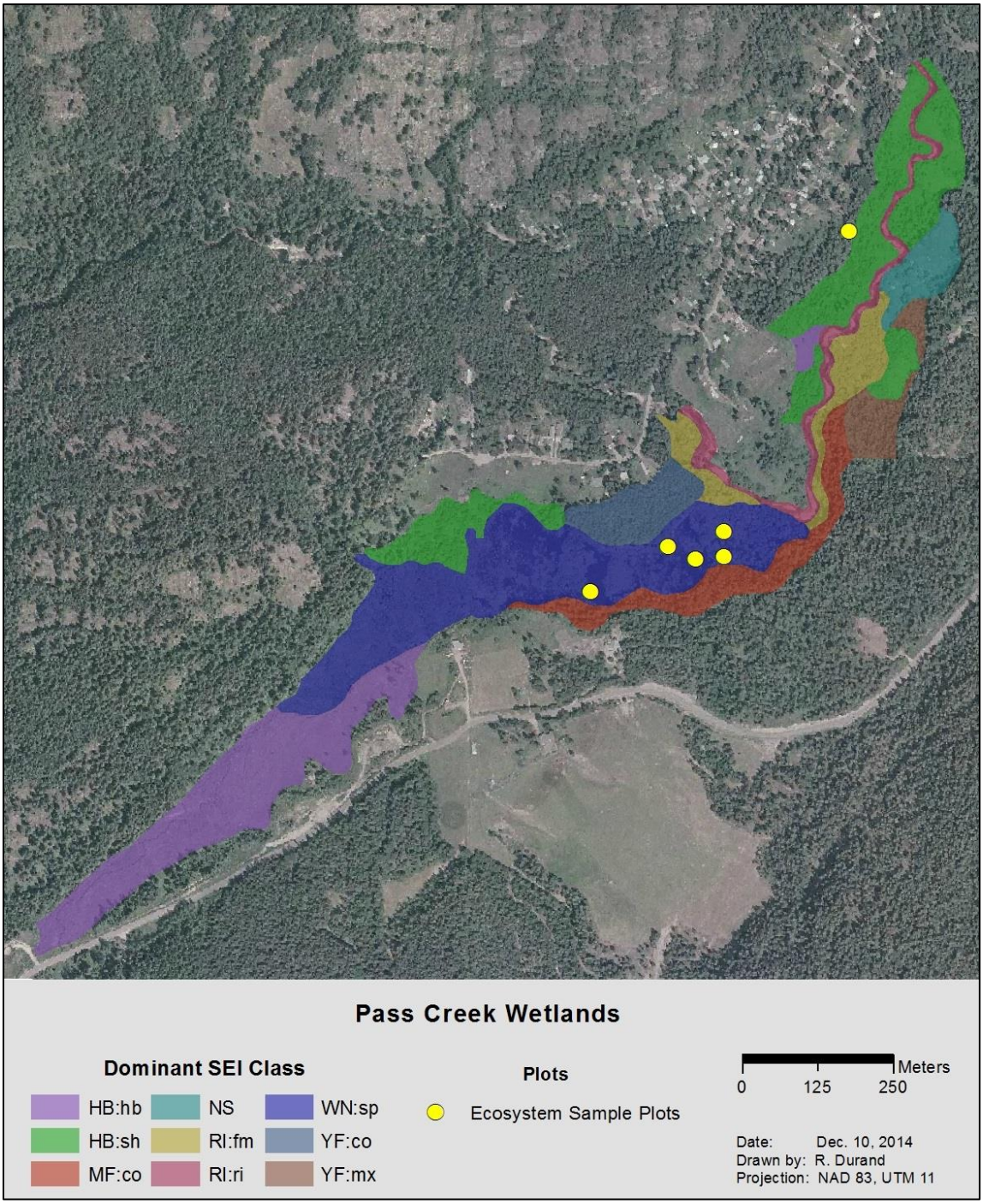

FIGURE 3.1-5. PASS CREEK WETLANDS.

Little Slocan Lakes

The Little Slocan Lakes wetland complex is one of the largest wetlands in the Slocan Valley, with the lake portions alone comprising roughly 150 hectares (Figure xx). The complex contains two small lakes which

are connected by the Little Slocan River. This area contains a variety of wetlands, including shrub and treed swamps, multiple types of marsh, and shallow open water (Figures 3.1-6 to 3.1-10). It also contains low and mid bench floodplains, creeks, and the lakes. While the complex appears to be relatively intact, there is evidence of considerable historic logging and the existing marsh and swamps in the north end may have been cleared for farming or pasture. Classified wetlands include Wm01 (beaked sedge – water sedge), blue-listed Wm02 (swamp horsetail – beaked sedge), Wm05 (cattail marsh), and Ws02 (mountain alder – hardhack – Sitka sedge) along with unclassified marshes, shallow open water, treed swamps, and fens. Or particular interest, a blue-listed fern (*Dryopteris crisata)* was found in several of the swamps in the Little Slocan Lakes. Figure 3.1-11 presents an ecosystem map of the sampled portion of the Little Slocan Lakes wetland complex showing the dominant ecosystem types.

FIGURE 3.1-6. EMERGENT HORSETAIL MARSH AND SHALLOW OPEN WATER WETLANDS IN THE LITTLE SLOCAN LAKES COMPLEX (R. DURAND PHOTO).

FIGURE 3.1-7. SHALLOW OPEN WATER WETLAND IN THE LITTLE SLOCAN LAKES COMPLEX (R. DURAND PHOTO).

FIGURE 3.1-8. TREED SWAMP AND MARSH WETLANDS IN THE LITTLE SLOCAN LAKES COMPLEX (T. EHLERS PHOTO).

FIGURE 3.1-9. BEAKED SEDGE MARSH IN THE LITTLE SLOCAN LAKES COMPLEX (R. DURAND PHOTO).

FIGURE 3.1-10. UNCLASSIFIED CATTAIL, SEDGE, ALDER SWAMP IN THE LITTLE SLOCAN LAKES COMPLEX (R. DURAND PHOTO).

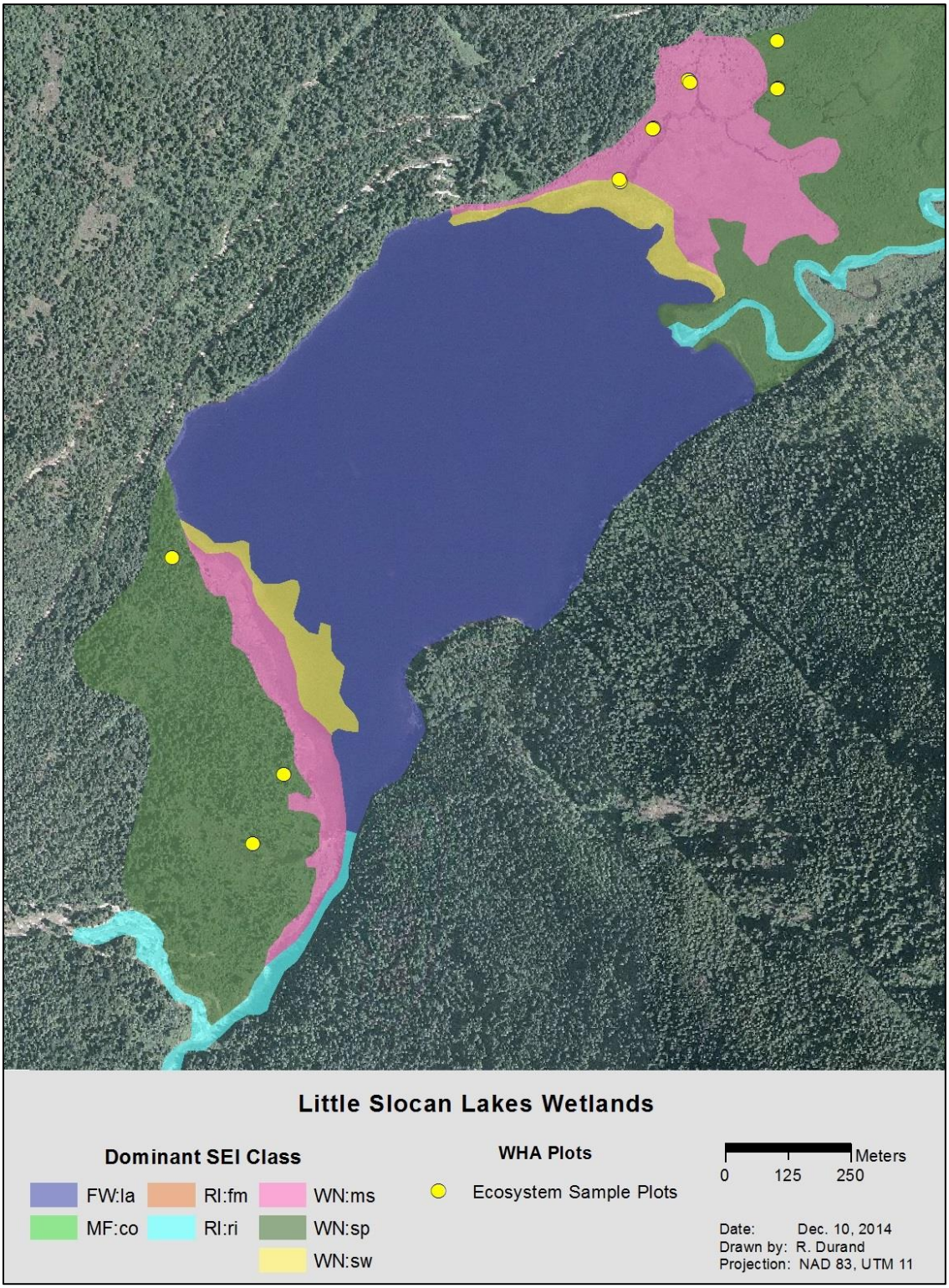

FIGURE 3.1-11. LITTLE SLOCAN LAKES

Seaton Creek

The Seaton Creek wetland complex is the highest elevation wetland targeted in this study. It occurs as a narrow linear complex along Highway 31A between New Denver and Kaslo. The complex consists of a series of beaver controlled ponds, swamps, fens and marshes (Figures 3.1-12 to 3.1-14). The complex appears to have been heavily modified by the highway construction, and historic logging and mining activities. Classified wetlands include Ws01 (mountain alder – skunk cabbage – lady fern) and Wf05 (slender sedge – common hook-moss). Figure 3.1-15 presents an ecosystem map of the sampled portion of the Seaton Creek wetland complex showing the dominant ecosystem types.

FIGURE 3.1-12. SEDGE FEN FROM THE SEATON CREEK COMPLEX (R. DURAND PHOTO).

FIGURE 3.1-13. RICH ALDER, FERN SWAMP FROM THE SEATON CREEK COMPLEX (R. DURAND PHOTO).

FIGURE 3.1-14. SEDGE MARSH AND ALDER SWAMP FROM THE SEATON CREEK COMPLEX (R. DURAND PHOTO).

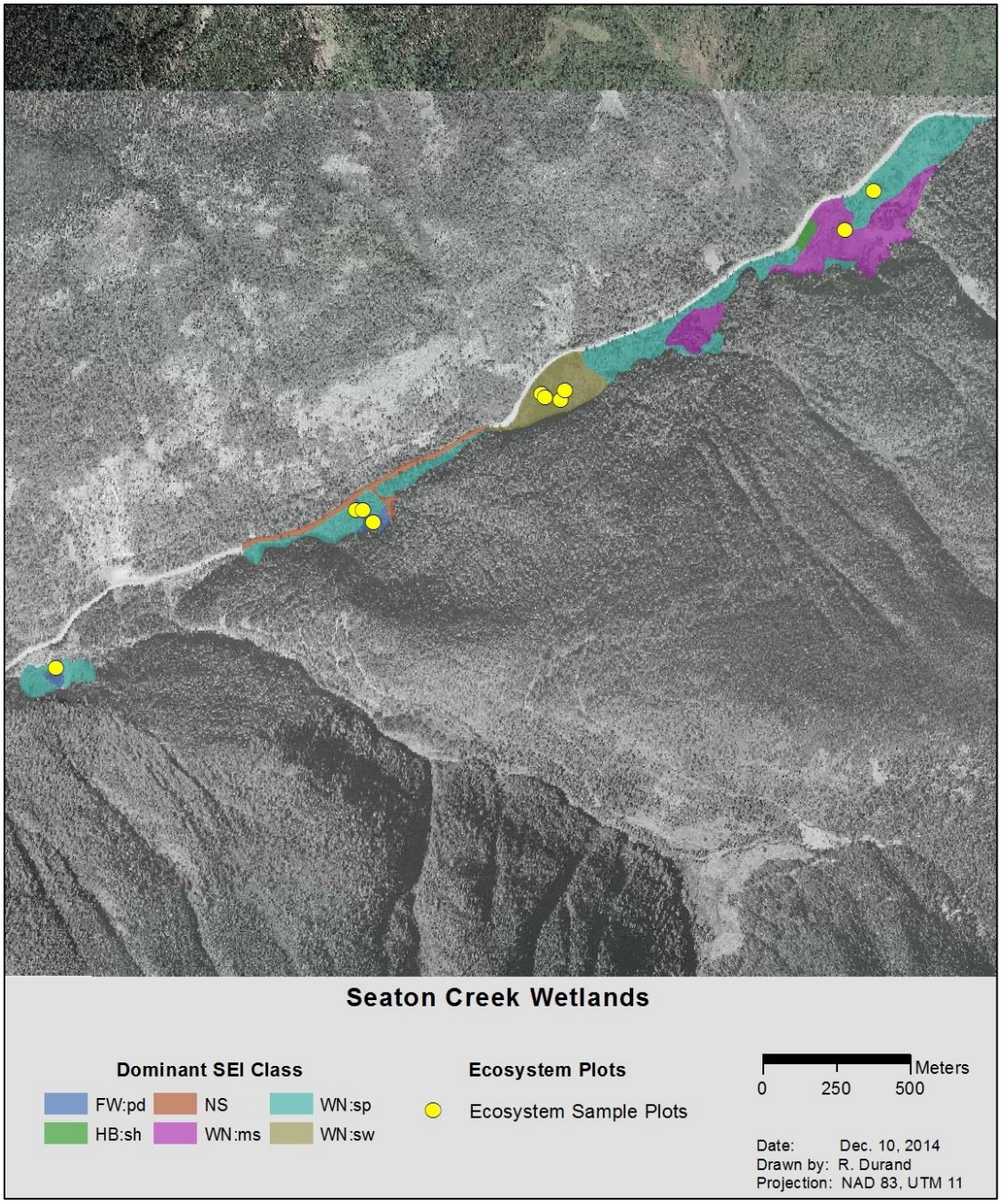

FIGURE 3.1-15. SEATON CREEK WETLANDS

Beaver Lake

The Beaver Lake complex is the largest, at roughly 420 hectares, targeted in the SWAMP project. It has numerous wetland types mixed with floodplain forest and upland forest. Marshes, shallow open water, shrub and treed swamps, and fens all occur (Figures 3.1-16 to 3.1-22). Similar to the other target

wetland complexes, many of the sample wetland types could not be classified. Classified wetlands include Wm01 (beaked sedge – water sedge), Wf05 (slender sedge – common hook-moss), and Ws10 (western redcedar – spruce – skunk cabbage). Although portions of the upland forest have been logged, and a forest service road runs adjacent and upslope to the entire complex, the wetlands are considered to be in good to excellent condition. Figure 3.1-23 presents an ecosystem map of the sampled portion of the Beaver Lake wetland complex showing the dominant ecosystem types.

FIGURE 3.1-16. WESTERN RED CEDAR, SKUNK CABBAGE SWAMP FROM THE BEAVER LAKE COMPLEX (R. DURAND PHOTO).

FIGURE 3.1-17. OLD GROWTH WESTERN RED CEDAR, SEDGE SWAMP FROM THE BEAVER LAKE COMPLEX (R. DURAND PHOTO).

FIGURE 3.1-18. SEDGE MARSH FROM THE BEAVER LAKE COMPLEX (R. DURAND PHOTO).

FIGURE 3.1-19. COTTONGRASS FEN FROM THE BEAVER LAKE COMPLEX (R. DURAND PHOTO).

FIGURE 3.1-20. STUNTED BOG-LIKE WESTERN HEMLOCK SWAMP THE BEAVER LAKE COMPLEX (R. DURAND PHOTO).

FIGURE 3.1-21. SPRUCE, RED-OSIER DOGWOOD, WILLOW SWAMP FLOODPLAIN FROM THE BEAVER LAKE COMPLEX (R. DURAND PHOTO).

FIGURE 3.1-22. BEAKED SEDGE, WATER SEDGE MARSH FROM THE BEAVER LAKE COMPLEX (R. DURAND PHOTO).

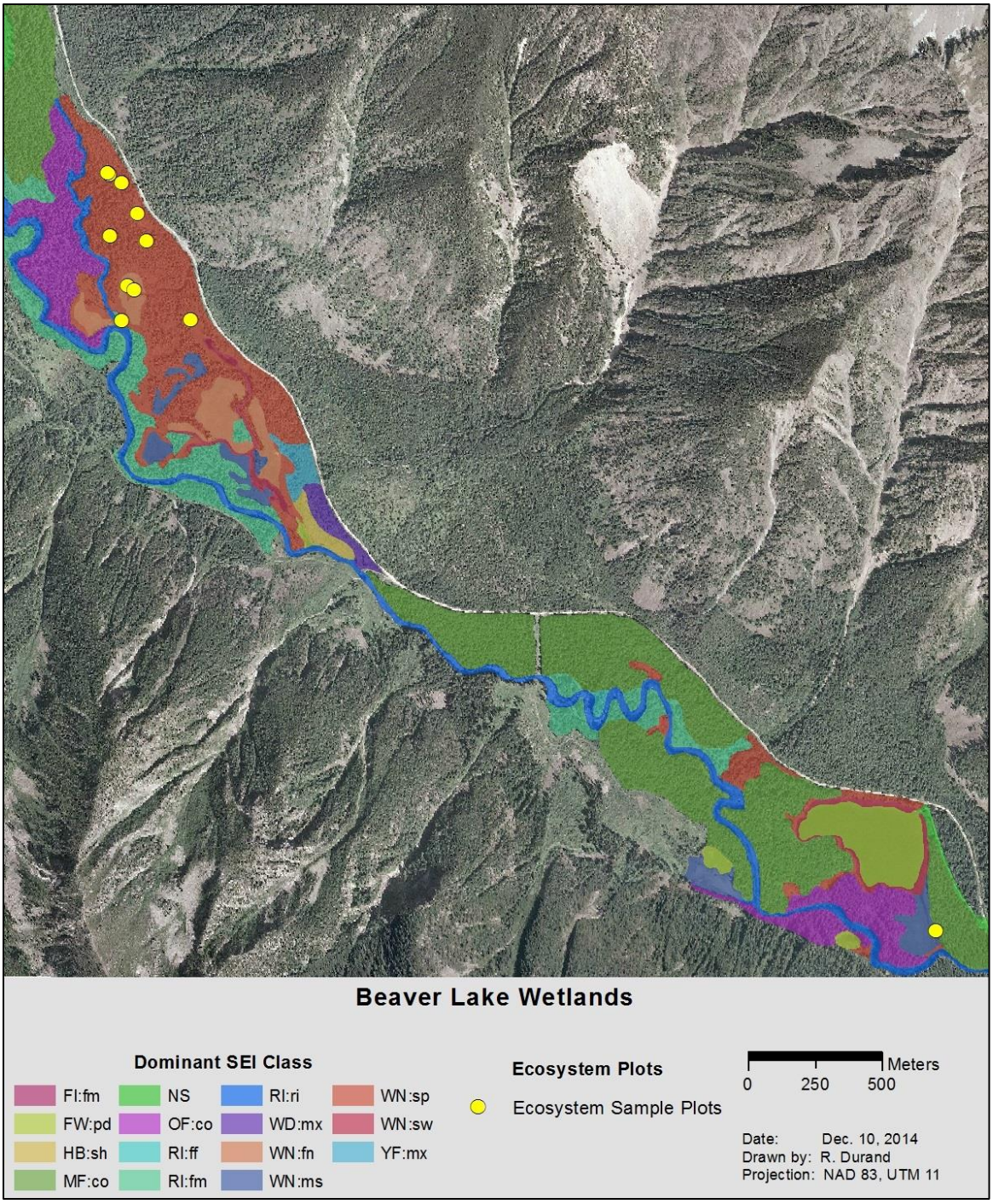

FIGURE 3.1-23. BEAVER LAKE WETLANDS

3.2 Wildlife Habitat Assessments

Table 3.2-1 lists the wildlife species that were selected for this project by local biologists. Each species was assessed in each of the four target wetlands, with the exception of the generic unspecified bat. When possible, then WHA plots were located at the same location, or in close proximity to each other and the ecosystem sample plots. However, due to logistics and species habitat needs, numerous sample plots were located in different areas of the wetlands. Figures 3.2-1 to 3.2-4 present the WHA sample locations. The results of the Wildlife Habitat Assessments are contained in Tables 3.2-2 to 3.2-4. The resultant WHA data will be used to model wildlife habitat suitability across the larger landscape in Phase 3 of the SWAMP Project as additional wetlands are mapped. Appendix 3 contains a list of observed species from the field surveys.

TABLE 3.2-1. FOCAL SPECIES FOR WILDLIFE HABITAT ASSESSMENTS

Common Name	Scientific Name	Species Code
Amphibians		
Columbia spotted frog	*Rana luteiventris*	ARALU
Pacific chorus frog	*Pseudacris regilla*	APSRE
western toad	*Anaxyrus boreas*	AANBO
long-toed salamander	*Ambystoma macrodactylum*	AAMMA
Birds		
ring-necked duck	*Aythya collaris*	BRNDU
hooded merganser	*Lophodytes cucullatus*	BHOME
Wilson's snipe	*Gallinago delicata*	BWISN
red-tailed hawk	*Buteo jamaicensis*	BRTHA
western wood-pewee	*Contopus sordidulus*	BWWPE
red-winged blackbird	*Agelaius phoeniceus*	BRWBL
Mammals		
moose	*Alces alces*	MALAL
marten	*Martes americana*	MMAAM
black bear	*Ursus americanus*	MURAM
river otter	*Lontra canadensis*	MLOCA
unspecified bat		MUBAT
Reptiles		
common garter snake	*Thamnophis sirtalis*	RTHIS

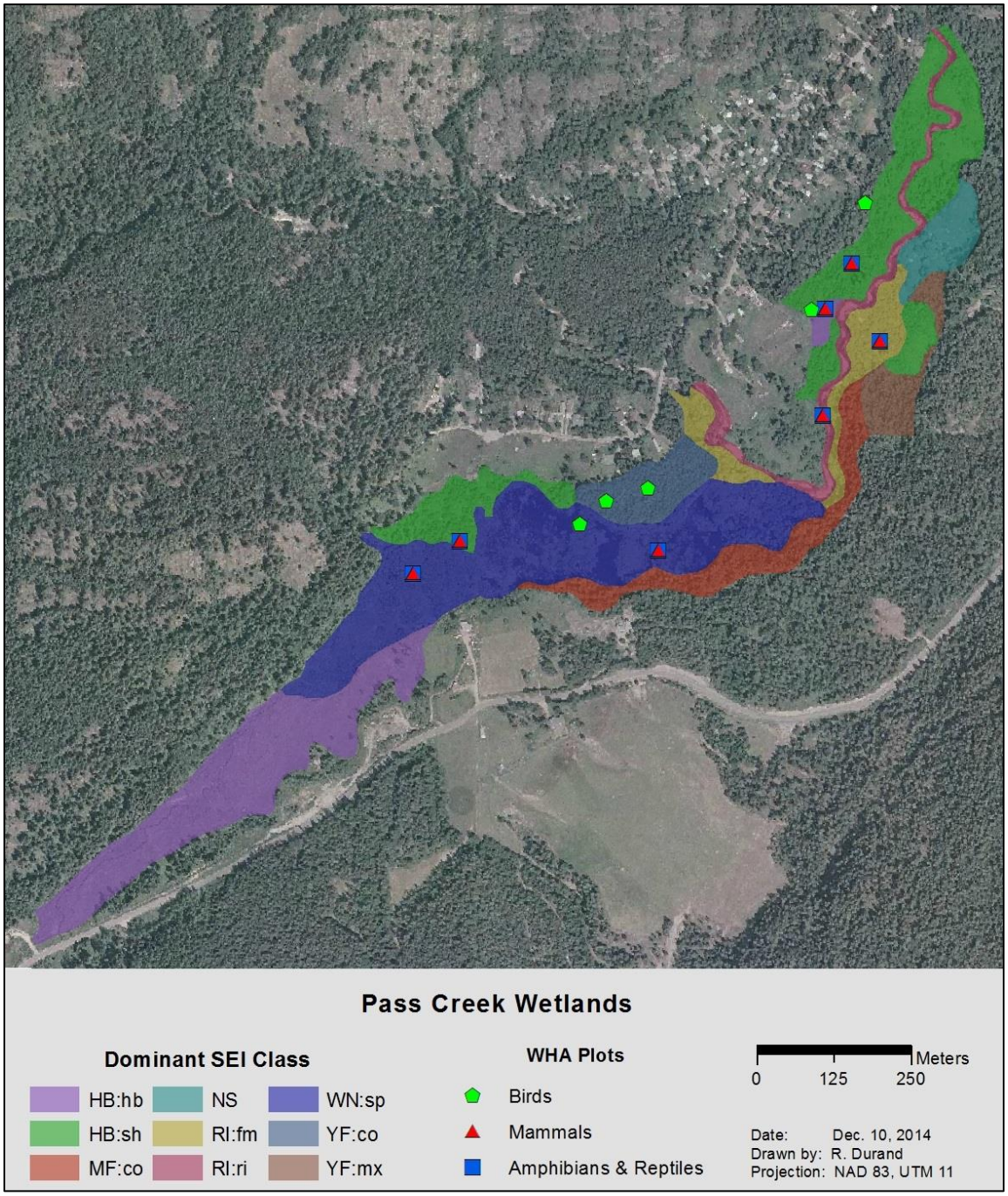

FIGURE 3.2-1. WHA PLOT LOCATIONS IN PASS CREEK WETLANDS

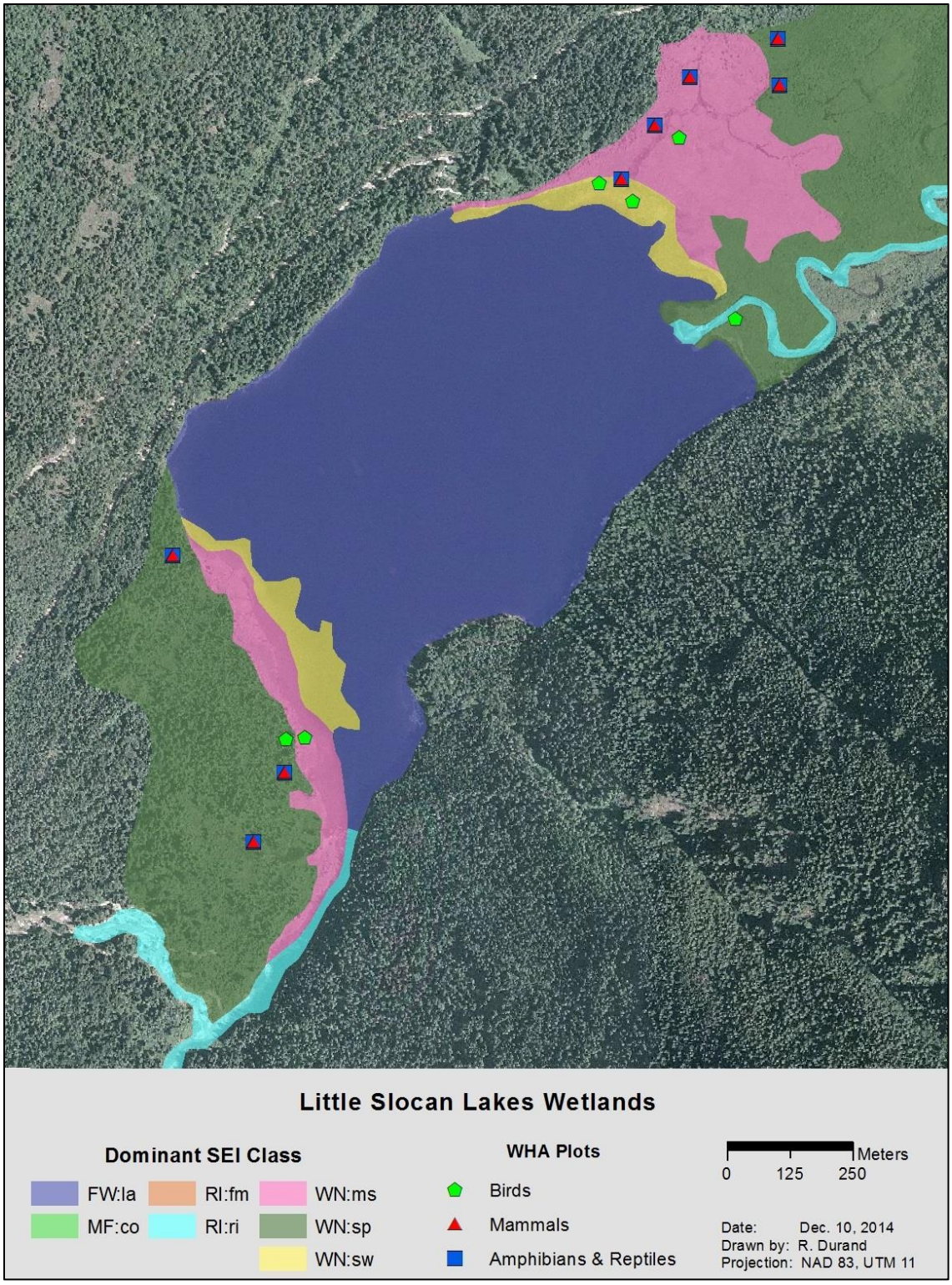

FIGURE 3.2-2. WHA PLOT LOCATIONS IN LITTLE SLOCAN LAKES

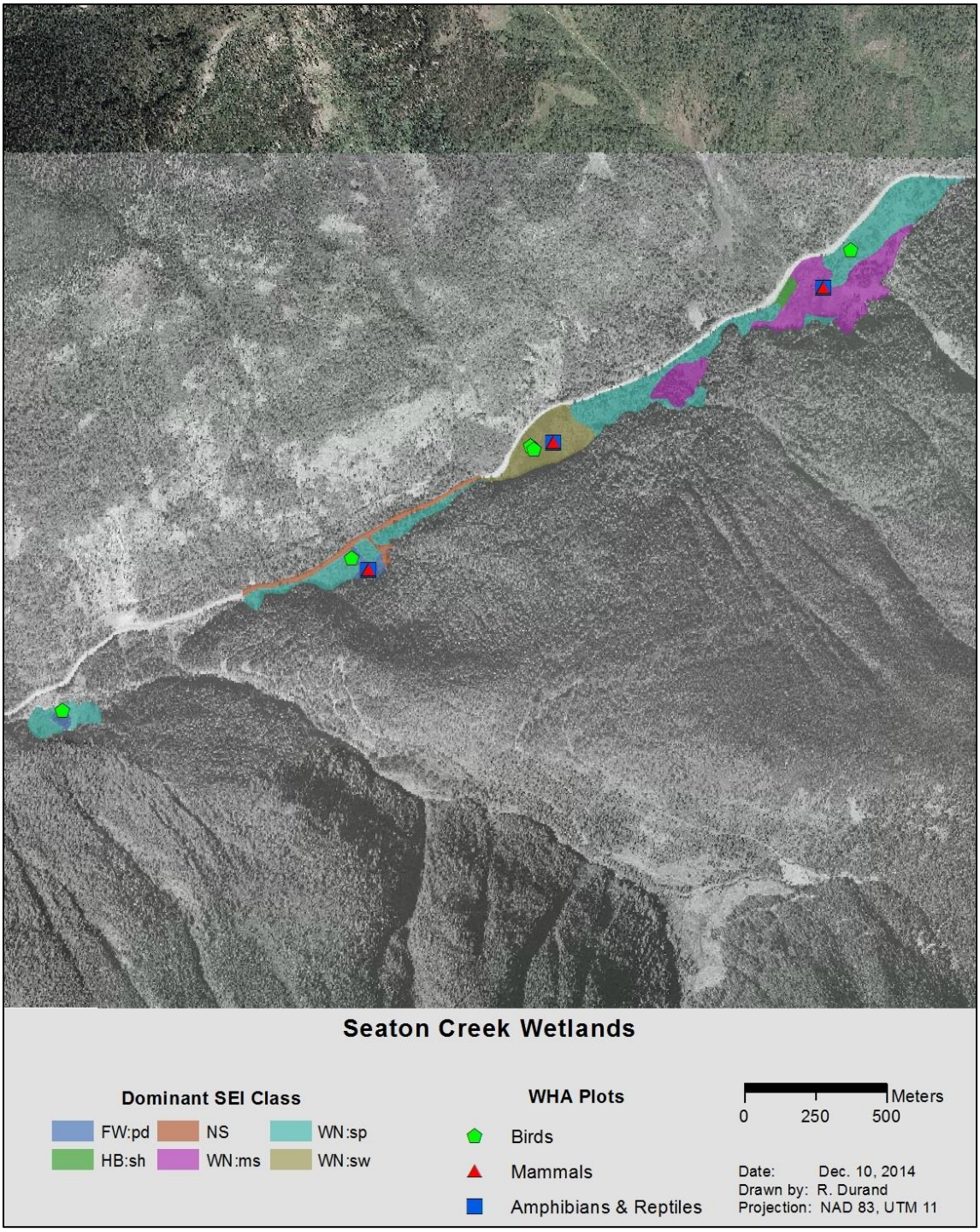

FIGURE 3.2-3. WHA PLOT LOCATIONS IN SEATON CREEK WETLANDS

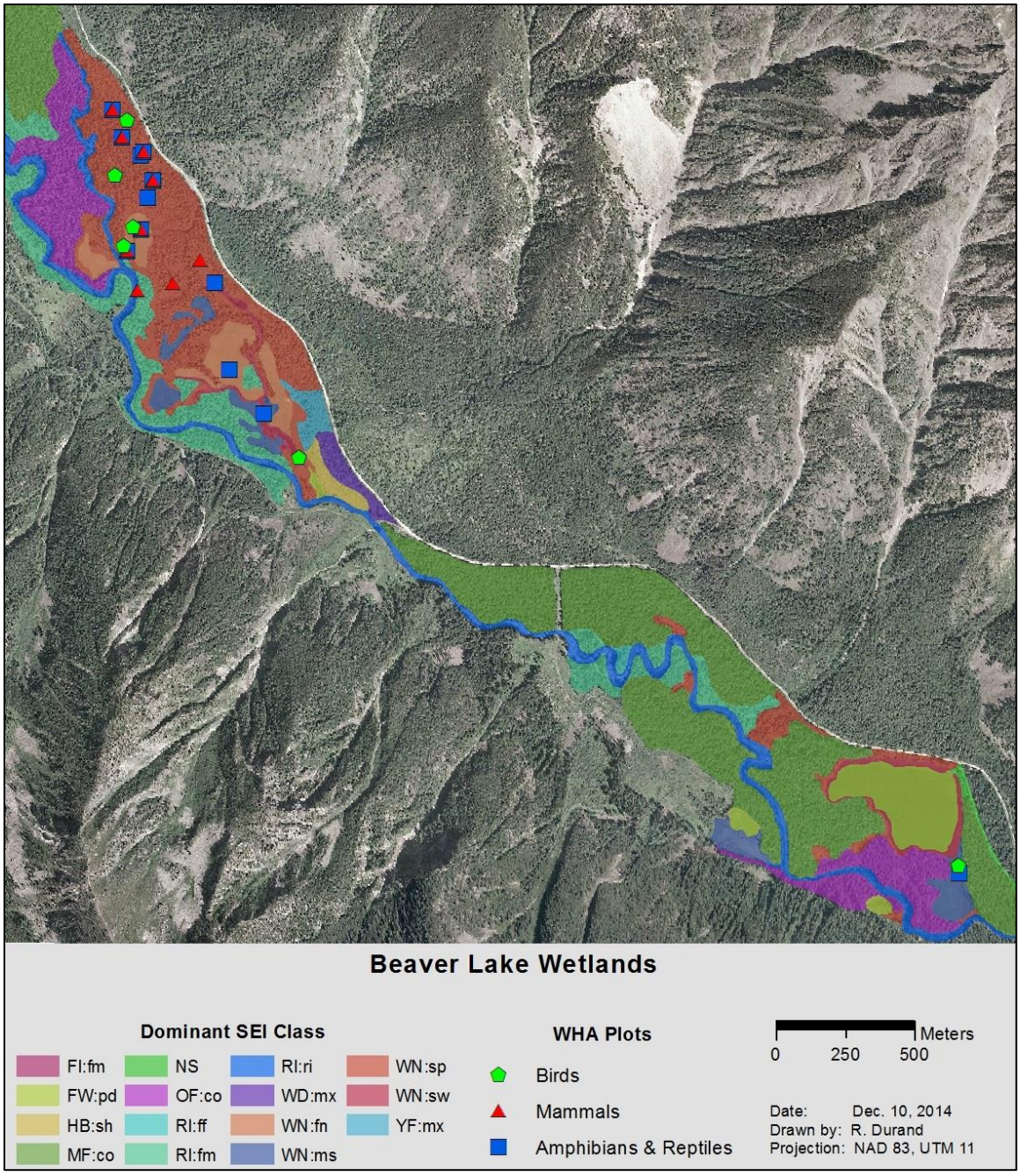

FIGURE 3.2-4. WHA PLOT LOCATIONS IN BEAVER LAKE WETLANDS

TABLE 3.2-2. MAMMAL WILDLIFE HABITAT ASSESSMENTS

Plot	Date	Wetland	Northing	Easting	MALAL P	MALAL S	MALAL F	MALAL W	MMAAM A - LI	MMAAM P - RB	MURAM P	MURAM S	MURAM F	MLOCA A - LI	MLOCA P - RB	MUBAT G - LI	MUBAT G - DE
TEBL01	9/13/2014	Beaver Lakes	5561314	464224	3	3	3	4	2	6	2	2	4	3	2	2	2
TEBL02	9/13/2014	Beaver Lakes	5561215	464259	3	3	3	4	2	6	2	3	3	3	2	3	2
TEBL03	9/13/2014	Beaver Lakes	5561161	464334	2	2	4	4	5	5	2	3	4	5	5	2	6
TEBL04	9/13/2014	Beaver Lakes	5561059	464368	2	2	2	4	2	2	2	3	3	4	2	2	2
TEBL05	9/13/2014	Beaver Lakes	5560885	464327	2	3	3	5	4	6	3	4	5	2	3	3	6
TEBL06	9/13/2014	Beaver Lakes	5560807	464275	3	3	2	3	4	6	4	4	4	3	2	4	6
TEBL07	9/13/2014	Beaver Lakes	5560664	464315	2	2	2	3	1	1	2	3	3	2	2	2	2
TEBL08	9/13/2014	Beaver Lakes	5560690	464440	2	2	1	3	1	1	2	2	2	2	2	2	2
TEBL09	9/13/2014	Beaver Lakes	5560771	464539	2	3	2	2	4	6	3	3	4	5	5	4	5
TE3FK01	9/12/2014	Seaton Creek	5541614	483513	2	2	4	5	4	6	3	4	5	3	4	2	2
TE3FK02	9/12/2014	Seaton Creek	5542063	484164	2	2	2	3	5	6	4	4	5	4	6	4	6
TE3FK03	9/12/2014	Seaton Creek	5542606	485115	2	2	2	3	4	5	3	4	4	4	4	4	5
TE100	8/14/2014	Little Slocan Lakes	5503684	453149	4	3	4	5	5	5	5	5	6	5	6	5	6
TE101	8/14/2014	Little Slocan Lakes	5503592	453152	3	3	4	5	5	5	3	3	5	2	3	4	5
TE102	8/14/2014	Little Slocan Lakes	5503609	452973	4	4	4	5	5	6	4	4	6	2	5	6	6
TE103	8/14/2014	Little Slocan Lakes	5503513	452903	4	4	5	6	4	5	4	5	6	4	5	4	6
TE104	8/14/2014	Little Slocan Lakes	5503406	452838	3	3	5	6	5	6	5	5	6	3	5	5	6
TE105	8/14/2014	Little Slocan Lakes	5502227	452168	4	3	4	5	3	6	3	3	5	2	5	4	4
TE106	8/14/2014	Little Slocan Lakes	5502088	452106	3	3	4	5	3	4	3	4	4	4	4	3	3
TE107	8/14/2014	Little Slocan Lakes	5502658	451945	4	4	5	4	2	3	3	4	3	3	5	3	3
TE108	8/15/2014	Pass Creek	5474184	454987	3	3	3	4	4	5	4	4	5	3	5		
TE109	8/15/2014	Pass Creek	5474199	454666	3	3	3	4	5	5	4	4	3	5	5		
TE110	8/15/2014	Pass Creek	5474147	454591	3	3	3	4	5	6	4	5	5	4	6		
TE111	8/15/2014	Pass Creek	5474401	455254	3	3	3	4	4	4	3	5	5	2	2		
TE112	8/15/2014	Pass Creek	5474573	455258	5	5	5	5	5	6	5	5	5	3	6		
TE113	8/15/2014	Pass Creek	5474647	455300	3	3	4	5	4	5	2	2	2	5	6		
TE114	8/15/2014	Pass Creek	5474521	455346	3	4	4	5	4	6	2	3	3	4	6		

TABLE 3.2-3. BIRD WILDLIFE HABITAT ASSESSMENTS

Plot	Date	Wetland	Northing	Easting	BRNDU LI	BRNDU RE	BHOME LI	BHOME RE	BWISN LI	BWISN RE	BRTHA LI	BRTHA RE	BWWPE LI	BWWPE RE	BRWBL LI	BRWBL RE
JABL001	7/15/14	Beaver Lake	5558599	467268	2	2	2	4	2	3	5	5	4	4	3	3
JABL002	7/15/14	Beaver Lake	5561276	464276	5	5	5	5	5	5	4	4	5	5	5	5
JABL003	7/15/14	Beaver Lake	5561078	464234	5	6	5	6	5	6	4	4	5	5	5	5
JABL004	7/15/14	Beaver Lake	5560893	464299	5	5	5	5	3	3	4	4	4	4	3	3
JABL005	7/15/14	Beaver Lake	5560826	464263	6	6	6	6	6	6	5	5	3	4	3	3
JABL006	7/15/14	Beaver Lake	5560063	464896	2	3	2	4	2	2	4	4	3	3	3	3
JATF007	7/16/14	Seaton Creek	5542739	485210	6	6	6	6	6	6	4	4	4	4	5	5
JATF008	7/16/14	Seaton Creek	5542049	484084	5	5	5	5	4	4	5	5	5	5	4	5
JATF009	7/16/14	Seaton Creek	5542038	484095	3	4	4	5	4	5	5	5	5	5	4	4
JATF010	7/16/14	Seaton Creek	5541121	482437	4	4	4	5	4	4	5	5	5	6	4	4
JATF011	7/16/14	Seaton Creek	5541655	483456	2	4	3	4	5	5	6	6	5	5	4	5
JAPC012	7/17/14	Pass Creek	5474284	454971	5	5	5	5	4	4	5	5	2	2	4	4
JAPC013	7/17/14	Pass Creek	5474226	454861	2	3	2	4	3	3	5	5	2	2	2	2
JAPC014	7/17/14	Pass Creek	5474263	454904	4	5	4	5	4	5	5	5	3	3	3	4
JAPC015	7/17/14	Pass Creek	5474572	455236	6	6	6	6	6	6	4	4	5	5	5	5
JAPC016	7/17/14	Pass Creek	5474745	455322	5	5	5	5	5	5	5	5	4	4	3	3
JALS017	8/26/14	Little Slocan	5503398	452793	5	5	5	5	5	5	4	4	4	5	4	5
JALS018	8/26/14	Little Slocan	5503489	452952	2	3	2	4	2	2	4	5	2	2	2	3
JALS019	8/26/14	Little Slocan	5503362	452860	5	5	5	6	4	5	5	5	2	3	3	4
JALS020	8/26/14	Little Slocan	5503129	453064	5	5	5	5	4	4	5	5	5	5	5	5
JALS 021	8/26/14	Little Slocan	5502293	452171	4	5	4	3	4	4	4	5	3	4	4	4
JALS 022	8/26/14	Little Slocan	5502296	452208	6	6	6	6	6	6	5	5	3	3	5	5

TABLE 3.2-4. REPTILE AND AMPHIBIAN WILDLIFE HABITAT ASSESSMENTS

Plot	Date	Wetland	Northing	Easting	ARALU LI	ARALU RE	APSRE LI	APSRE RE	AANBO LI	AANBO RE	AAMMA LI	AAMMA RE	RTHIS LI	RTHIS RE
14	9/17/14	Seaton Creek	5541614	483513	1	1	3	1	3	1	3	1	1	3
15	9/17/14	Seaton Creek	5542063	484164	1	1	3	1	3	1	3	1	1	3
16	9/17/14	Seaton Creek	5542606	485115	1	1	3	1	3	1	3	1	1	3
98	9/17/14	Beaver Lake	5561148	464325	1	1	3	1	3	1	3	1	1	3
99	9/17/14	Beaver Lake	5561060	464368	4	4	1	4	1	4	1	4	5	5
100	9/17/14	Beaver Lake	5560999	464351	1	3	1	3	1	4	1	3	3	5
101	9/17/14	Beaver Lake	5561314	464224	1	1	2	1	2	1	3	1	1	3
102	9/17/14	Beaver Lake	5561215	464259	2	3	3	3	2	3	3	3	3	4
103	9/17/14	Beaver Lake	5561161	464334	4	6	1	6	1	6	1	6	4	6
104	9/17/14	Beaver Lake	5561059	464368	3	4	1	4	1	4	1	4	4	4
105	9/17/14	Beaver Lake	5560885	464327	1	1	3	1	2	1	2	1	1	3
106	9/17/14	Beaver Lake	5560807	464275	3	4	2	4	2	4	2	4	4	4
JD001	9/17/14	Beaver Lake	5558572	467269	1	1	3	1	3	1	3	1	1	3
JD002	9/17/14	Beaver Lake	5560693	464591	3	2	3	2	3	2	3	2	2	3
JD003	9/17/14	Beaver Lake	5560222	464768	1	1	3	1	2	1	3	1	1	3
JD004	9/17/14	Beaver Lake	5560380	464645	2	2	3	2	3	2	3	2	2	3
TE100	8/14/14	Little Slocan	5503684	453149	2	4	2	3	3	4	2	2	3	4
TE101	8/14/14	Little Slocan	5503592	453152	2	2	2	2	3	3	2	2	2	4
TE102	8/14/14	Little Slocan	5503609	452973	3	4	3	4	3	5	3	4	4	5
TE103	8/14/14	Little Slocan	5503513	452903	2	1	2	1	2	1	2	1	3	5
TE104	8/14/14	Little Slocan	5503406	452838	1	1	3	1	3	1	3	1	1	5
TE105	8/14/14	Little Slocan	5502227	452168	3	4	3	3	3	4	3	3	4	5
TE106	8/14/14	Little Slocan	5502088	452106	1	1	2	1	3	2	3	1	1	5
TE107	8/14/14	Little Slocan	5502658	451945	3	5	2	5	2	5	3	5	5	5
TE108	9/01/14	Pass Creek	5474184	454987	1	1	3	1	3	1	3	1	1	3
TE109	9/01/14	Pass Creek	5474199	454666	1	1	1	1	2	2	1	2	1	3
TE110	9/01/14	Pass Creek	5474147	454591	1	1	1	1	2	2	3	1	2	4
TE111	9/01/14	Pass Creek	5474401	455254	1	6	3	6	3	6	2	6	1	1
TE112	9/01/14	Pass Creek	5474573	455258	4	6	2	6	3	6	2	6	3	3
TE113	9/01/14	Pass Creek	5474647	455300	3	4	2	3	3	4	3	3	4	5
TE114	9/01/14	Pass Creek	5474521	455346	3	4	2	3	3	4	2	3	3	3

3.3 Ecosystem Integrity

The ecological integrity ranking system uses a combination of office (GIS analysis and airphoto interpretation), field assessments, and analysis of field data (mainly vegetation lists and percent cover). The data form the ecosystem sample plots were used to create for the entire complex based on all the individual plot ranks and the GIS analyses.

The system uses a four rank (occasionally 5 rank) assessment with Excellent (A), Good (B), Fair (C) and Poor (D) entered on the score card for each metric (Table 5.2-3). The rank is then converted to a numeric value (A = 5, B = 3.75, C = 2.5, D = 1.25) and the average is multiplied by a weighted value to generate a total for each of six ecological factors. The total of all the ecological factors determines the Ecological Integrity Rank for a given wetland. For wetlands that occur as complexes where multiple plots are surveyed, the Ecological Integrity Rank is an average of all plots. Tables 3.3-1 to 3.3-4 contains the results of the ecological integrity ranking for each wetland complex.

TABLE 3.3-1. ECOLOGICAL INTEGRITY SCORECARD FOR PASS CREEK.

SWAMP Ecological Integrity Scorecard			
RANK FACTORS	**ECOLOGICAL FACTORS**	**METRICS**	**RANK**
Landscape Context	Landscape	Connectivity Index	C
		Land Use Index	C
		Landscape Rank = Total x 0.10	0.25
	Buffer	Buffer Index	B
		Buffer Rank = Total x 0.15	0.56
Size	Size	Absolute Patch Size	B
		Relative Patch Size	C
		Size Rank = Total x 0.15	0.54
Condition	Vegetation	Structure	C
		Regeneration	B
		Native Plant Cover	B
		Invasive Plant Cover	C
		Composition	C
		Vegetation Total x 0.24	0.72
	Hydrology	Water Source	A
		Hydroperiod	B
		Hydrologic Connectivity	A
		Hydrology Rank = Total x 0.24	1.1
	Soil	Physical Patch Types	A
		Soil Disturbance	B
		Soil Rank = Total x 0.12	0.53
ECOLOGICAL INTEGRITY RANK			B (3.70)

TABLE 3.3-2. ECOLOGICAL INTEGRITY SCORECARD FOR LITTLE SLOCAN.

SWAMP Ecological Integrity Scorecard			
RANK FACTORS	**ECOLOGICAL FACTORS**	**METRICS**	**RANK**
Landscape Context	Landscape	Connectivity Index	A
		Land Use Index	B
		Landscape Rank = Total x 0.10	0.44
	Buffer	Buffer Index	A
		Buffer Rank = Total x 0.15	0.75
Size	Size	Absolute Patch Size	A
		Relative Patch Size	B
		Size Rank = Total x 0.15	0.40
Condition	Vegetation	Structure	C
		Regeneration	B
		Native Plant Cover	B
		Invasive Plant Cover	B
		Composition	B
		Vegetation Total x 0.24	0.84
	Hydrology	Water Source	A
		Hydroperiod	A
		Hydrologic Connectivity	A
		Hydrology Rank = Total x 0.24	1.2
	Soil	Physical Patch Types	A
		Soil Disturbance	A
		Soil Rank = Total x 0.12	0.6
ECOLOGICAL INTEGRITY RANK			B (4.23)

TABLE 3.3-3. ECOLOGICAL INTEGRITY SCORECARD FOR SEATON CREEK.

SWAMP Ecological Integrity Scorecard			
RANK FACTORS	**ECOLOGICAL FACTORS**	**METRICS**	**RANK**
Landscape Context	Landscape	Connectivity Index	C
		Land Use Index	B
		Landscape Rank = Total x 0.10	0.32
	Buffer	Buffer Index	D
		Buffer Rank = Total x 0.15	0.19
Size	Size	Absolute Patch Size	C
		Relative Patch Size	C
		Size Rank = Total x 0.15	0.53
Condition	Vegetation	Structure	C
		Regeneration	B
		Native Plant Cover	C
		Invasive Plant Cover	C

		Composition	C
		Vegetation Total x 0.24	0.66
	Hydrology	Water Source	B
		Hydroperiod	B
		Hydrologic Connectivity	C
		Hydrology Rank = Total x 0.24	0.80
	Soil	Physical Patch Types	C
		Soil Disturbance	D
		Soil Rank = Total x 0.12	0.23
ECOLOGICAL INTEGRITY RANK			C (2.73)

TABLE 3.3-4. ECOLOGICAL INTEGRITY SCORECARD FOR BEAVER LAKE.

SWAMP Ecological Integrity Scorecard			
RANK FACTORS	**ECOLOGICAL FACTORS**	**METRICS**	**RANK**
Landscape Context	Landscape	Connectivity Index	A
		Land Use Index	B
		Landscape Rank = Total x 0.10	0.44
	Buffer	Buffer Index	B
		Buffer Rank = Total x 0.15	0.56
Size	Size	Absolute Patch Size	A
		Relative Patch Size	A
		Size Rank = Total x 0.15	0.75
Condition	Vegetation	Structure	A
		Regeneration	A
		Native Plant Cover	A
		Invasive Plant Cover	A
		Composition	A
		Vegetation Total x 0.24	1.20
	Hydrology	Water Source	A
		Hydroperiod	A
		Hydrologic Connectivity	A
		Hydrology Rank = Total x 0.24	1.20
	Soil	Physical Patch Types	A
		Soil Disturbance	B
		Soil Rank = Total x 0.12	0.53
ECOLOGICAL INTEGRITY RANK			A (4.68)

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Appendices

Appendix 1. List of plants identified during SWAMP Phase 2

Scientific Name	Common Name
Trees	
Abies lasiocarpa	subalpine fir
Betula papyifera	paper birch
Picea engelmannii / P. glauca x engelmannii (hybrid)	Englemann spruce, interior spruce (white spruce x Engelmann spruce)
Pinus contorta	lodgepole pine
Populus balsamifera subsp. trichocarpa	black cottonwood
Populus trremuloides	trembling aspen
Thuja plicata	western redcedar
Tsuga heterophylla	western hemlock
Pinus monticola	white pine
Shrubs	
Acer glabrum	Douglas maple
Alnus incana	mountain alder
Alnus crispa	sitka alder
Amelanchier alnifolia	saskatoon
Arctostaphylos uva-ursi	kinnikinnick
Betula glandulosa	scrub birch
Cornus stolonifera	red-osier dogwood
Corylus cornuta	beaked hazelnut
Crataegus douglasii	black hawthorn
Lonicera involucrata	black twinberry
Lonicera ciliosa	orange honeysuckle
Kalmia microphylla	western bog-laurel
Mahonia aquifolium	tall Oregon-grape
Oplopanax horridus	devil's club
Oxycoccus oxycoccos	bog cranberry
Rhamnus purshiana	cascara
Ribes glandulosum	skunk currant
Ribes lacustre	black gooseberry
Rosa nutkana	Nootka rose
Rubus parviflorus	thimbleberry
Rubus pedatus	five-leaved bramble
Salix sp.	willow
Salix bebbianna	Bebb's willow
Salix drummondiana	Drummond's willow
Salix scouleriana	Scouler's willow
Salix sitchensis	Sitka willow
Sambucus caerulea	blue elderberry

Sambucus racemosa	red elderberry
Spiraea douglasii	pink spirea, hardhack
Symphoricarpos albus	common snowberry
Vaccinium sp.	blueberries, huckleberries
Vaccinium caespitosum	dwarf blueberry
Vaccinium membranaceum	black huckleberry
Vaccinium ovalifolium	oval-leaved blueberry
Vaccinium scoparium	grouseberry
Viburnum edule	highbush cranberry

Herbs

Angelica arguta	sharptooth angelica
Aralia nudicaulis	wild sarsparilla
Athyrium filix-femina	lady fern
Botrychium multifidum	leathery grape fern
Botrychium virginianum	rattlesnake fern
Calamagrostis canadensis	bluejoint
Callitriche palustris	spring water-starwor
Carex aquatilis	water sedge
Carex aquatilis var. aquatilis	water sedge
Carex bebbii	Bebb's sedge
Carex crawfordii	Crawford's sedge
Carex cusickii	Cusick's sedge
Carex deweyana	Dewey's sedge
Carex disperma	soft-leaved sedge
Carex flava	yellow sedge
Carex lasiocarpa	slender sedge
Carex lenticularis var. lipocarpa	Kellogg's sedge
Carex linticularis	lenticular sedge
Carex utriculata	beaked sedge
Carex viridula	Greenish Sedge
Cicuta douglasii	Douglas' water-hemlock
Circaea alpina	enchanter's-nightshade
Cirsium arvense	Canada thistle
Comarum palustre	marsh cinquefoil
Cornus canadensis	bunchberry
Disporum hookeri	Hooker's fairybells
Dryopteris cristata	crested wood fern
Eleocharis palustris	common spike-rush
Eleocharis palustris	common spike-rush
Epilobium angustifolium	fireweed
Epilobium sp.	willowherb
Equisetum arvense	common horsetail
Equisetum fluviatile	swamp horsetail
Equisetum hyemale	scouring-rush

Eriophorum chamissonis	Chamisso's cotton-grass
Fragaria virginiana	wild strawberry
Galium palustre	marsh bedstraw
Galium trifidum	small bedstraw
Galium triflorum	sweet-scented bedstraw
Geum macrophyllum	large-leaved avens
Gymnocarpium dryopteris	oak fern
Heracleum lanatum	cow-parsnip
Iris pseudacorus	yellow iris
Juncus articulatus	jointed rush
Juncus balticus	Baltic rush
Juncus effuses var. pacificus	common rush
Juncus tenuis	slender rush
Lemna minor	duckweed
Lilium columbianum	tiger lily
Lkalmia microphylla	western bog-laurel
Lysichiton americanus	skunk cabbage
Lythrum salicaria	purple loosestrife
Mimulus guttatus	yellow monkey-flower
Mimulus lewisii	pink monkey-flower
Myosotis laxa	small-flowered forget-me-not
Myriophyllum spp.	water-milfoil
Nuphar lutea	yellow pond lily
Nuphar polysepala	Rocky Mountain pond-lily
Osmorhiza chilensis	sweet-cicely
Persicaria amphibia var. spiculacea	water smartweed
Phalaris arundinacea	reed canarygrass
Platanthera dilatata (Habenaria dilatata)	white bog-orchid
Poa spp.	bluegrass
Polystichum munitum	sword fern
Potamogeton gramineus	grass-leaved pondweed
Potamogeton sp.	pondweed
Potentilla palustris	marsh cinquefoil
Pteridium aquilinum	bracken fern
Pyrola asarifolia	pink wintergreen
Ranunculus flammula var. ovalis	lesser spearwort
Ranunculus gmelinii	small yellow water-buttercup
Ranunculus repens	creeping buttercup
Ranunculus sp.	buttercup
Ranunculus sp.	buttercup
Sagittaria latifolia	wapato
Scirpus lacustris	great bulrush
Scirpus microcarpus	small-flowered bulrush
Scutellaria galericulata	marsh skullcap
Senecio triangularis	arrow-leaved groundsel

Smilacina racemosa	false Solomon's seal
Smilacina stellata	star-flowered false Solomon's seal
Sparganium angustifolium	narrow-leaved bur-reed
Spiranthes romanzoffiana	hooded ladies' tresses
Streptopus amplexifolius	clasping twistedstalk
Taraxacum officinale	common dandelion
Tellima grandiflora	fringecup
Thalictrum occidentale	western meadowrue
Tiarella trifoliata	foamflower
Trientalis latifolia	broad-leaved starflower
Typha latifolia	common cattail
Urtica dioica	stinging nettle
Utricularia minor	lesser bladderwort
Veratrum viride	Indian hellebore, false hellebore
Veronica beccabunga	American speedwell
Viola sp.	violet

Moss and Lichens

Aulacomnium palustre	glow moss
Brachythecium spp.	feathermosses
Campylium sp.	star-moss
Drepanocladus sp.	hook-mosses
Hylocomium splendens	step moss
Mnium sp.	leafy mosses
Sphagnum sp.	peat-moss
Pleurozium schreberi	red-stemmed feathermoss
Polytrichum spp.	haircap mosses
Rhytidiadelphus spp.	
cladonia spp.	
Cladina spp.	

Algae

Chara sp.	stonewort

Appendix 2. Summary of Wetland Plot Data

Plot	Date	Name	Easting	Northing	Aspect	Elevation	Slope	Soil Moisture Regime	Hydrodynamic Index
JD-002	9/17/2014	Beaver Lakes	464276	5561276	999	889	0	8	Sl
JD-003	9/17/2014	Beaver Lakes	464234	5561078	999	889	0	8	Sl
JD-004	9/17/2014	Beaver Lakes	464299	5560893	999	881	0	8	Sl
MM-004	7/15/20104	Beaver Lakes	464276	5561276	999	889	0		
RD-05	6/24/2014	Beaver Lakes	464231	5561307	999	883	0	8	Sl
RD-06	6/24/2014	Beaver Lakes	464322	5560878	999	877	0	8	Mo
RD-07	6/24/2014	Beaver Lakes	464278	5560764	999	880	0	7	Mo
RD-08	6/24/2014	Beaver Lakes	464534	5560767	999	885	0	8	Mo
RD-09	6/24/2014	Beaver Lakes	467308	5558491	999	859	0	8	Mo
TEBL01	9/13/2014	Beaver Lakes	464224	5561314	999		0		
TEBL03	9/13/2014	Beaver Lakes	464334	5561161	999		0		
TEBL04	9/13/2014	Beaver Lakes	464368	5561059	999		0		
NVT-01	7/12/2014	Hunter Siding	463152	5551502	999	655	0	8	Sl
TE101	8/14/2014	Little Slocan Lakes	453152	5503592	999		0		
TE102	8/14/2014	Little Slocan Lakes	452973	5503609	999		0		
TE103	8/14/2014	Little Slocan Lakes	452903	5503513	999		0		
TE104	8/14/2014	Little Slocan Lakes	452838	5503406	999		0		
TE105	8/14/2014	Little Slocan Lakes	452168	5502227	999	657	0		
TE106	8/14/2014	Little Slocan Lakes	452106	5502088	999		0		
TE107	8/14/2014	Little Slocan Lakes	451945	5502658	999	662	0		
RD-15	9/11/2013	Little Slocan Lakes	452836	5503410	999	648	0	8	Mo
RD-16	9/11/2013	Little Slocan Lakes	452976	5503603	999	651	0	8	Mo
RD-17	9/13/2013	Little Slocan Lakes	452902	5503511	999	659	0	8	Mo
RD-19	8/9/2014	Little Slocan Lakes	453150	5503590	999	654	0	8	Sl
RD-20	8/9/2014	Little Slocan Lakes	453150	5503686	999	654	0	8	Sl
RD-21	8/9/2014	Little Slocan Lakes	448903	5496968	999	652	0	8	Sl
RD-18	6/20/2014	Mtn. above Pass Creek	452667	5479459	999	1586	3	8	Sl
JAPC015	7/14/2014	Pass Creek	455322	5474745	999	575	0	7	Mo
RD-10	7/17/2014	Pass Creek	455023	5474224	999	576	0	8	Sl
RD-11	7/10/2014	Pass Creek	455116	5474249	999	575	0	8	Sl

RD-12	7/10/2014	Pass Creek	455115	5474207	999	580	0	6	Sl
RD-13	7/10/2014	Pass Creek	454616	547448	999	573	0	8	Mo
RD-14	7/10/2014	Pass Creek	454895	5474149	999	570	0	8	Sl
RD-23	7/10/2014	Pass Creek	455069	5474203	999		0	8	Mo
SW-001	7/6/2014	Pedro Creek	458417	5493678	999	508	0	8	Mo
MM-009	7/16/2014	Seaton Creek	485210	5542739	999	1049	0		Mo
MM-010	7/16/2014	Seaton Creek	484084	5542049	999	1008	0		Mo
MM-011	7/16/2014	Seaton Creek	484095	5542038	999	1008	0		
MM-012	7/16/2014	Seaton Creek	482437	5541121	999	901	0		
MM-013	7/16/2014	Seaton Creek	483456	5541655	999	945	0		Mo
RD-01	6/6/2014	Seaton Creek	484150	5542031	999	1003	0	7	Mo
RD-02	6/6/2014	Seaton Creek	483480	5541657	999	949	0	8	Mo
TE3FK01	9/12/2014	Seaton Creek	483513	5541614	999		0		
TE3FK02	9/12/2014	Seaton Creek	484164	5542063	999		0		
TE3FK03	9/12/2014	Seaton Creek	485115	5542606	999		0		
RD-22	9/23/2013	Slocan Island	463113	5504795	999	541	0	4	
RD-24	9/23/2013	Slocan Island	463502	5504474	999	525	0	5+	
RD-03	6/7/2014	Wright Bowles	454027	5486841	999	499	0	5	
RD-04	6/7/2014	Wright Bowles	453781	5486902	999	488	0	5	

Plot	Soil Nutrient Regime	Meso Slope Position	Hydrogeomorphic Position	Moisture Subclass Organic Soil	Organic Soil Texture	Organic Horizon Thickness	Von Post	Mineral Soil Texture	Drainage
JD-002		L		Aqueous					
JD-003		L		Aqueous					
JD-004		L		Aqueous					
MM-004		L							
RD-05	D	L		Aqueous	Humic	40+	8		
RD-06	D	L	Fluvial	Aqueous	Mesic	200+	5		
RD-07	D	L	Fluvial					Silty	Poorly
RD-08	M	L	Fluvial	Aqueous	Mesic	5		Silty	Poorly
RD-09	D	L	Fluvial					Silty	Very Poorly
TEBL01		L							

TEBL03		L							
TEBL04		L							
NVT-01	D	L	Fluvial						
TE101		L		Aqueous					
TE102		L		Aqueous					
TE103		L		Aqueous					
TE104		L							
TE105		L							
TE106		L							
TE107		L							
RD-15	D	D	Lacustrine	Humid	Humic	5	9	Loamy	Very Poorly
RD-16	D	L	Lacustrine	Perhumid	Humic	200+	9		
RD-17	D	L	Lacustrine	Perhumid	Humic	150+	9		
RD-19	D	L	Lacustrine	Peraquic	Mesic	110	7		
RD-20	D	L	Lacustrine	Aqueous	Mesic	100+	6		
RD-21	D	L	Fluvial	Peraquic	Humic	120+	8		
RD-18	B	L	Seepage Slopes	Aqueous	Fibric	40+	3		
JAPC015	D	L	Fluvial	Aqueous					
RD-10	D	L	Fluvial	Aqueous					
RD-11	D	L	Fluvial	Aqueous					
RD-12	D	L	Fluvial	Peraquic					
RD-13	D	L	Fluvial	Aqueous	Mesic	40+	6		
RD-14		L	Fluvial	Aqueous					
RD-23	D	L	Fluvial	Aqueous	Humic	40	9		
SW-001	B	L	Fluvial					Silty	Poorly
MM-009		L	Fluvial						
MM-010		L	Fluvial						
MM-011			Fluvial						
MM-012		L	Fluvial						
MM-013		L	Fluvial						
RD-01	C	L	Lacustrine	Aquic	Mesic	10	5	Loamy	Imperfectly
RD-02	D	L	Fluvial	Peraquic				Silty	Poorly
TE3FK01		L							

TE3FK02		L							
TE3FK03		L							
RD-22	C	L	Fluvial					Sandy	Well
RD-24	C	L	Fluvial					Sandy	Mod. Well
RD-03	D	L	Fluvial	Perhumid				Silty	Well
RD-04	C	L	Fluvial	Perhumid				Sandy	Rapidly

Plot	Site Series	Structural Stage	Wetland Class	Wetland Association	Modifier	WL1-%	WL1-Class	WL1-Association	WL2-%
JD-002	Wm01	2b	Marsh						
JD-003	Wm01	2b	Marsh						
JD-004	WN:fn	2b	Fen						
MM-004	WN:sp								
RD-05	Ws10	7mC	Swamp						
RD-06	Wf05	2b	Fen						
RD-07	RI:fm	7mC	Floodplain						
RD-08	WN:sp	3b	Swamp						
RD-09	Wm01	2b	Marsh			60	Wm	Wm01	40
TEBL01	WN:sp		Swamp						
TEBL03	WN:fn	2b	Fen						
TEBL04	WN:sp	7mC	Swamp						
NVT-01	Ws02	3b	Swamp						
TE101	WN:sp	3b	Swamp						
TE102	Wm05	2b	Marsh						
TE103	WN:fn	2b	Fen						
TE104	WN:ms	2b	Marsh						
TE105	WN:sp	5C	Swamp						
TE106	WN:sp	5C	Swamp						
TE107	WN:sp	5C	Swamp						
RD-15	Wm02	2b	Marsh						
RD-16	Ws	3b	Swamp						
RD-17	Wm01	2b	Marsh						
RD-19	Ws	3a	Swamp						

RD-20	Ws02	3b	Swamp						
RD-21	Wmo1	2b	Marsh			80	Wm	Wm01	20
RD-18	Wf	2b	Fen						
JAPC015	WN:sp	3b	Swamp			7	WN:sp		3
RD-10	WN:sp	3b	Swamp			7	WN:sw		3
RD-11	WN:ms	2b	Marsh			6	WN:sp		4
RD-12	WN:sp	6mC	Swamp						
RD-13	WN:sp	3b	Swamp						
RD-14	FW:pd		Pond						
RD-23	Ws	3b	Swamp	Alder-sedge		90	Ws		10
SW-001	WN:sp	3b	Swamp						
MM-009	WN:sp	3b	Swamp						
MM-010	WN:sp	3b	Swamp						
MM-011	WN:sp	3b	Swamp						
MM-012	FW:pd		Pond						
MM-013	WN:sp	3b	Swamp						
RD-01	Wf05	2b	Fen			70	Ws01		20
RD-02	Ws01	3b	Swamp			80	Ws01		10
TE3FK01	WN:sp	3b	Swamp						
TE3FK02	WN:sp	3b	Swamp						
TE3FK03	WN:sp	3b	Swamp						
RD-22	Fm	6tM	Floodplain						
RD-24	Fm	5tC	Floodplain						
RD-03	Fm02	6oM	Floodplain						
RD-04	Fm	6tM	Floodplain						

Plot	WL2-Class	WL2-Association	WL3-%	WL3-Class	WL3-Association	Water Colour	pH
JD-002							
JD-003							
JD-004							
MM-004							
RD-05						Green-Blue Turbid	6.6

RD-06						Green-Blue Clear	7.4
RD-07							6.1
RD-08						Green-Blue Clear	6.6
RD-09	WN:sw					Green-Blue Clear	7.1
TEBL01							
TEBL03							
TEBL04							
NVT-01							
TE101							
TE102							
TE103							
TE104							
TE105							
TE106							
TE107							
RD-15						Green-Brown Clear	7.8
RD-16							
RD-17						Green-Brown Clear	7.6
RD-19						Green-Brown Clear	7.1
RD-20						Green-Brown Clear	7.4
RD-21	Ws	Ws02					7.5
RD-18						Green-Brown Clear	7.2
JAPC015	Wm05						
RD-10	WN:sp						
RD-11	WN:ms						
RD-12							
RD-13						Blue-Green Clear	7.2
RD-14							
RD-23	OW					Green-Brown Clear	7.6
SW-001							
MM-009							7.6
MM-010							
MM-011							

MM-012							7.8
MM-013							
RD-01	FW:pd	10	Wf05			Green-Brown Clear	7.9
RD-02	FW:pd	10	WN:ms			Green-Brown Clear	6.9
TE3FK01							
TE3FK02							
TE3FK03							
RD-22							
RD-24							
RD-03							
RD-04							

Plot	Conductivity	Percent Open Water	Tree Cover	Shrub Cover	Herb Cover	Moss/Lichen Cover
JD-002			0	0	95	0
JD-003			0	0	60	0
JD-004			0	0	80	1
MM-004						
RD-05	176	15	15	15	50	15
RD-06	15	60	0	0.1	50	30
RD-07	26	5	16	70	40	15
RD-08	19	85	0	70	30	0
RD-09	78	45	0	0	55	0
TEBL01						
TEBL03		15	2	15	65	50
TEBL04			30	40	80	70
NVT-01		10	0	40	80	0
TE101						
TE102			0	30	100	0
TE103						
TE104						
TE105			15	30	80	7
TE106						

TE107			30	60	60	80
RD-15	65	50	0	0	50	0
RD-16		0	0	70	65	10
RD-17	72	15	0	0.1	90	0.1
RD-19	98	10	0	70	70	0
RD-20		10	0	50	85	0
RD-21			0	0	90	0
RD-18	13	5	0	0.1	80	60
JAPC015						
RD-10						
RD-11						
RD-12						
RD-13	68	30	0	65	50	0.1
RD-14						
RD-23	95	30	0	40	65	5
SW-001		5	0	50	70	0
MM-009			0	45	50	5
MM-010			0	80	70	0.1
MM-011			0	25	35	0
MM-012						
MM-013		10	0	75	95	0
RD-01	250	5	0	1	50	80
RD-02	290	40	0	40	80	5
TE3FK01			0.1	10	30	10
TE3FK02		10	0	30	80	5
TE3FK03		5	4	35	70	5
RD-22			20	35	40	15
RD-24			25	40	40	20
RD-03			15	50	60	0.1
RD-04			30	10	20	0.1

Appendix 3. List of wildlife identified during SWAMP Phase 2

Species	Beaver Lake	Seaton Creek	Pass Creek	Little Slocan
Birds				
American Goldfinch			1	
American Robin	1	1	1	
Belted Kingfisher	1			1
Black-capped Chickadee	1	1	1	1
Brown-headed Cowbird			1	
Cassin's Vireo			1	
Cedar Waxwing	1	1	1	1
Chestnut-backed Chickadee	1			1
Common Goldeneye			1	
Common Loon	1			1
Common Raven			1	1
Common Yellowthroat	1	1	1	1
Dark-eyed Junco				1
Eastern Kingbird			1	
Great Blue Heron			1	1
Hammond's Flycatcher			1	
Hooded Merganser			1	
Lincoln's Sparrow		1		
MacGillivray's Warbler	1	1		
Mallard			1	1
Northern Flicker		1		
Northern Waterthrush	1		1	
Orange-crowned Warbler		1		
Osprey	1			1
Pacific Wren			1	
Pileated Woodpecker				1
Pine Siskin	1		1	1
Red-breasted Nuthatch	1		1	1
Red-eyed Vireo			1	
Red-naped Sapsucker	1			
Sharp-shinned Hawk				1
Solitary Sandpiper	1			
Song Sparrow	1	1	1	1
Spotted Sandpiper		1		
Steller's Jay	1			1
Swainson's Thrush	1	1	1	
Turkey Vulture			1	
Varied Thrush	1			
Vaux's Swift	1			
Veery			1	
Violet-green Swallow	1		1	

Species	Beaver Lake	Seaton Creek	Pass Creek	Little Slocan
Western Wood-Pewee	1			
Willow Flycatcher	1	1		
Wood Duck				1
Yellow Warbler	1	1	1	
Yellow-rumped Warbler				1
Mammals				
Moose	1			1
Black Bear	1	1	1	1
Whitetail Deer	1	1	1	1
Otter				1
Muskrat				1
Beaver	1	1	1	1
Mountain Goat	1			
Red Squirrel	1			
Coyote		1		
Elk			1	
Amphibians				
Western Toad	1			1
Pacific Chorus Frog	1	1	1	1
Columbia Spotted Frog	1	1	1	1
Long-toed Salamander	1			
Reptiles				
Common Garter Snake				1
Western Terrestrial Garter Snake			1	
Fish				
Rainbow Trout		1		