Wetland Inventory Project
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EXECUTIVE SUMMARY

Wetlands are vital to many rare and endangered species and ecosystems in the Okanagan. Continued loss and degradation from urban development and agricultural expansion is occurring throughout the region and is of significant concern to land managers. It is thought that wetlands less that 1 Ha in size are at the highest risk as their smaller size facilitates infill and current landscape mapping overlooks these less obvious features. In addition, small wetlands are documented as having a higher conservation value: vernal ponds host fewer predators and larger shallow edge areas support greater numbers of waterfowl and emergent vegetation.

The first step in wetland protection and management is to identify features on the landscape. The focus of this inventory project was to build on current wetland mapping and to identify mapping knowledge gaps. It was a broader flagging inventory and did not include detailed wetland classification. New unmapped wetland features, specifically those within the habitat range of at-risk amphibians, were identified through an aerial-based GPS inventory. An averaged point location, photograph and basic attribute information, including type, ephemeral status, size, condition (below and above the high water mark) and surrounding land use was collected for approximately 600 wetland features. The study area was restricted to areas of high development pressure within the administrative boundaries of MoE Region 8 – Okanagan.

This new inventory information was used to quantitatively assess the number of features currently unmapped on provincial watershed base layers within the project study area. Recommendations were provided on mapping needs for the remainder of the region, scale required to capture the smaller high risk wetlands, methodology improvements and next steps.

OBJECTIVES

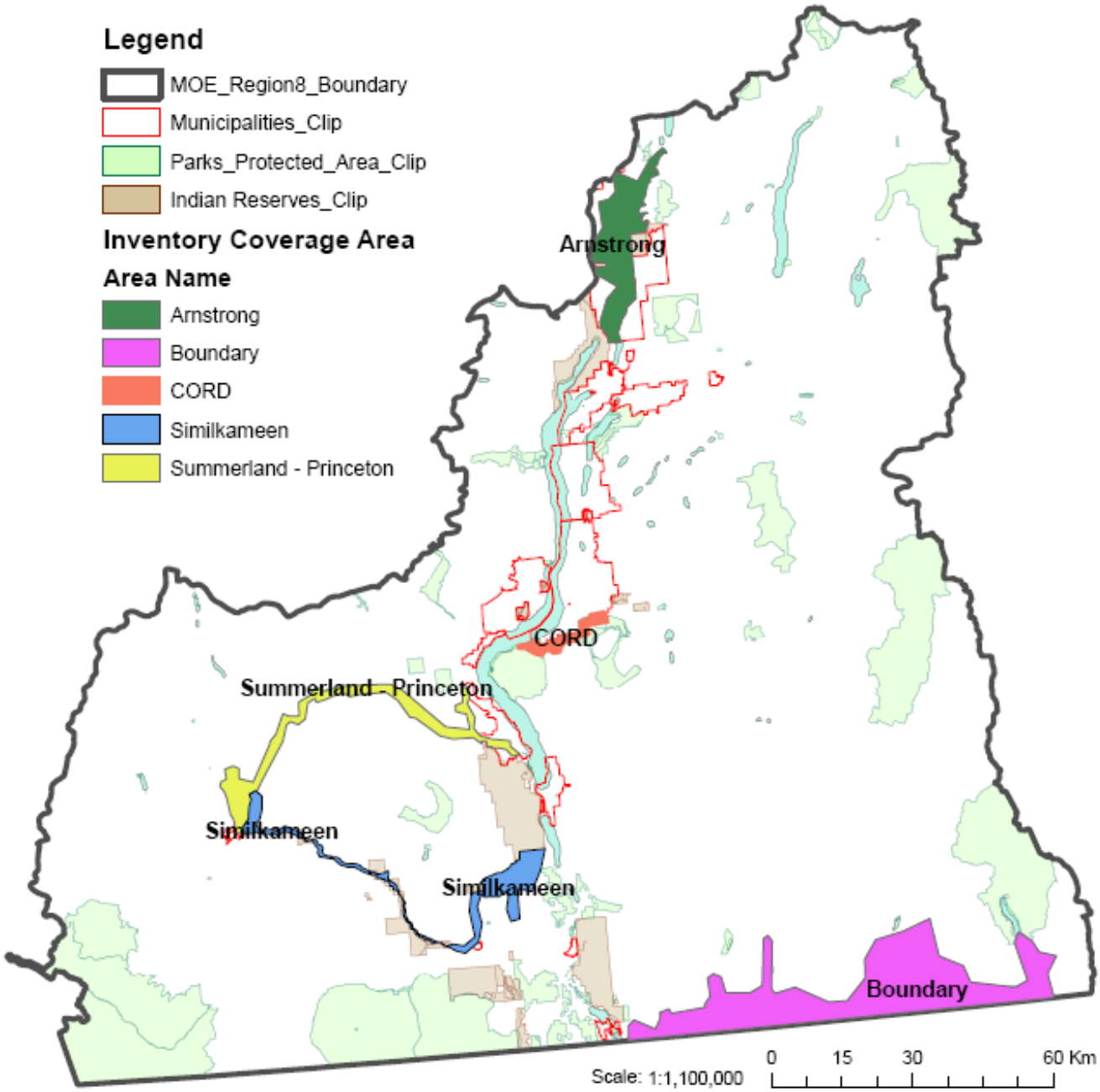
1. Quantify the number of wetland features currently unmapped within given area.

2. Identify new wetland features in areas of high development pressure.

STUDY AREA

The study area was restricted to low elevation (approximately below 1200 meters) or valley bottom areas within MOE Region 8 – Okanagan. This area was further divided into reduced inventory coverage areas due to project resources. These areas were selected based on the following criteria: presence/absence of habitat mapping, range of target at-risk amphibians, development pressure and regional distribution (Refer to Figure 1: Study Area). The total inventory area covered approximately 1485 km^2. This is the estimated area surveyed for wetland features, based on visual landmarks noted during navigation and track log recorded during inventory.

Figure 1: Study Area



METHODOLOGY

1. Project Design

A Trimble GeoXM data logger was used to inventory wetland location and input feature attribute information into a data dictionary. All positions fixes required at least four satellites. A minimum of 30 individual position fixes were collected for each wetland feature at 1 second intervals. A continuous track log was recorded at 5 second intervals. Position fixes were collected as Lat/Long in WGS 1984 datum.

The data dictionary was modeled on catalogue information from previous wetland inventory projects. Feature codes were based on non-vegetated unit codes defined in Standard for Terrestrial Ecosystem Mapping (TEM) in BC. The 30 meter buffer was selected from the urban target buffer distance recommended in Develop with Care: Environmental Guidelines for Urban and Rural Land Development in BC (Refer to Table 1: Data Dictionary).

Table 1: Data Dictionary

Position	Automatically generated from GPS	
Feature Number	Automatically generated from GPS	
Feature (Based on TEM Codes)	**OW**	Shallow open water (<2m deep)
	AK	Alkaline, shallow open water (<2m deep)
	LA	Lake (>5 ha)
	PD	Pond (<5 ha, >2m deep)
	RE	Reservoir (including sewage lagoons and dugouts)
	GC	Golf course pond
Inventory Status	New / Existing / Unknown – completed during GIS analysis	
Permanent	Yes / No / Unknown – Does it contain water year round?	
Size	**Dugout (D)**	<.25 ha
	Small (S)	<1 ha
	Medium (M)	1-5 ha
	Large (L)	>5 ha
Condition (Below HWM)	Unmodified / Modified / Infill (Infill is considered modified)	
Condition Comments	Description of modification (i.e. retaining wall, dock, garbage) Percentage of infill and type of material	
Buffer % Natural (within 30 m)	0% = all modified, 100% = all natural	
Buffer Comments	Description of buffer modification (i.e. dirt road, house, soil disturbance)	
Land Use (Dominant)	Agriculture (includes rangeland), Natural, Rural Residential, Urban Residential, Industrial, Recreation, Resource (active mining, forestry, etc.)	
Date Visited	Automatically generated from GPS	
Surveyors	Daily participants	
Photograph	Picture file number	
Comments	General comments of relevance	

2. Inventory

The inventory was conducted aerially from a Bell JetRanger helicopter based out of Penticton, BC (Canadian Helicopters). Flight routes were planned to minimize ferrying time and maximize coverage within each inventory area and with consideration for fuel sources. The pilot was responsible for navigation per the discussed flight route. Continuous adjustment was required due to varying incidence of wetland features in each area.

A range of optimal fight speed, elevation and visual spectrum were established based on literature review, Resource Information Standards Committee (RISC) standards, canvassing staff experience and a flight test. Ultimately flight details varied considerably between and within each inventory area primarily due to changes in topography and canopy cover. Flight altitude averaged from 300 to 450m above ground level. Cruising speed averaged from 40-80 knots. Visual spectrum ranged from 500m to 2000m.

The optimal crew setup was selected based on consideration for helicopter manoeuvrability, safety, fuel consumption and trial. The pilot and recorder were seated in the front of the helicopter and the photographer located behind the pilot. The recorder was responsible for working the Trimble. All participants were responsible for spotting. The pilot approached each wetland feature at an angle maximizing the opportunity for photograph prior to positioning the helicopter above the feature to collecting position data. If the wetland was spotted from the opposite side this procedure was reversed. Once the photograph was taken, the photographer called out the image reference number to the recorder. Attribute information was mostly observed by the recorder, however when the wetland feature was in a 'blind spot' information was called out by the photographer.

3. Error Analysis

Two wetland features were inventoried on the ground to provide a measure of the GPS accuracy. The ground-based position data was determined to be accurate when compared to 2007 ortho imagery. However, aerial-based position data was largely skewed from ortho imagery. Points were located anywhere from 0 – 400 meters away from the ortho image location of the wetland feature inventoried. This skew likely resulted from human error and vertical shift. Feature positions were matched to ortho imagery using inventory photographs[1].

4. GIS Analysis

The inventory data was exported to shape files in Pathfinder software and imported into ArcMap for editing. Position location was corrected to overlay the feature point with the corresponding wetland and estimated size information in the attribute table was confirmed/corrected.

The wetland inventory shape file was compared to the Corporate Watershed Base (CWB) – Linear Boundaries, Stream Network, Lakes, Wetlands and Man Made Waterbodies layers to complete the 'Inventory Status' attribution information. Features not included in the CWB were designated as 'New', features included in the CWB were designated 'Existing' and features that could not be located on the ortho imagery were designated 'Unknown'.

5. Digitizing

In 2010 a polygon layer (MoE_WI2008_poly.shp) was created by digitizing inventory points in ArcGIS following the features as displayed in the inventory photographs, 2007, 2005, 2004 and 1995 orthophoto layers and Google satellite imagery. Some wetland features were already mapped by the Corporate Watershed Base. When this mapping followed the orthophoto(s) and inventory photographs well, that mapping was traced. Otherwise the features were re-drawn. These actions have been noted in the Mapping Comments column of the attributes table. When the pond or wetland was not clearly visible on the orthophoto, or the inventory photograph could not be reconciled with the current orthophoto, a small polygon (virtual point) was digitized around the point feature.

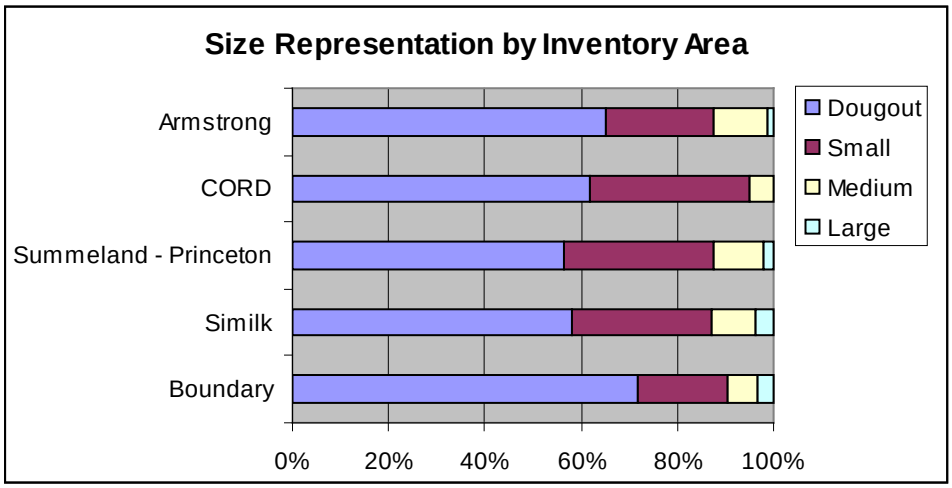
[1] Feature images are not available for 35 points (F412 – F446) in the CORD inventory area, resulting in a higher proportion of features with an 'unknown' inventory status for this area.

RESULTS

A total of 592 distinct wetland features were inventoried of which 382 (65%) were new features and 143 (24%) were existing (mapped no the CWB). The inventory status of the remaining 67 (11%) mapped features was unknown as they could not be referenced to a feature on the ortho imagery. The distribution of new versus existing features was relatively proportional across each inventory area. Over the approximated inventory area of 1485 km^2, wetland distribution was averaged at 1 feature per 2.5 km^2.

Over two-thirds of the wetland features mapped were less than 0.25 ha in size or 'dugouts'. (Refer to Figure 2: Size Representation by Inventory Area). Correspondingly over two-thirds were only visible on 2007 ortho imagery at a scale of 1:5,000.

Figure 2: Size Representation by Inventory Area



Feature types were much more varied across the study area. Alkaline ponds were found exclusively in the Boundary, Similkameen and Summerland – Princeton inventory areas, aside from one feature mapped in the Armstrong area. Shallow open water was mapped most frequently in each inventory area, however, this type of feature was especially dominate in the Armstrong and CORD areas. (Refer to Table 2: Feature Counts by Inventory Area).

Table 2: Feature Counts by Inventory Area

Feature	Number of Wetland Features					
	Armstrong	Boundary	CORD	Similkameen	Summerland – Princeton	**TOTAL**
Alkaline Pond	1	13	0	7	10	**31**
Pond	27	67	7	32	36	**169**
Lake	0	1	1	1	0	**3**
Shallow Open Water	103	100	73	37	57	**370**
Reservoir	12	0	0	1	3	**16**
Golf Course Pond	1	1	0	1	0	**3**
TOTAL	**144**	**182**	**81**	**79**	**106**	

Modifications occurred in just under 20% of the features mapped. They were noted across all feature types. Modifications included beaches, roads, docks, unrestricted livestock, garbage, fences, intakes, rock work, mud bogging, infill, and reshaping.

Buffer condition was heavily impacted. Wetland features with natural buffers (no disturbance within 30 m = 100%) were only observed for 33%. The remaining 67% of features were noted with varying degrees of disturbance within the first 30m, including: roads (paved and dirt), hay fields, residential homes, farm buildings, pump houses, soil disturbance, garbage, residential landscaping, derelict cars, fences and trails. Overall, the most common buffer modification was roads.

FOLLOW UP

1. Mapping
    - Verify inventory status of 'unknown' wetland point features – field checks required
    - Incorporate 'new' wetland feature polygons into the Corporate Watershed Base and/or community mapping network
    - Pursue funding to complete inventory of remaining low elevations areas in MoE Region 8 – Okanagan

2. Planning
    - Develop a regional wetland strategy that identifies high risk wetlands for management
    - Encourage local governments to protect wetland buffer areas through development permit areas or other legislative tools
    - Identify 'new' wetland features with highest potential for amphibian habitat and incorporate into inventory projects