OKANAGAN WETLANDS STRATEGY: PHASE 1

OUTREACH, DATA COLLECTION, PRIORITIZATION, AND MAPPING

ECOSCAPE
Environmental Consultants Ltd.

Prepared For:
Okanagan Basin Water Board

Prepared By:
Ecoscape Environmental Consultants Ltd.

May, 2014

File No.: 13-1159

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Executive Summary

Ecoscape Environmental Consultants Ltd. was retained by the Okanagan Basin Water Board, the Regional District of Central Okanagan, and the BC Wildlife Federation to complete Phase 1 of the Okanagan Wetlands Strategy project. The scope of Phase 1 focuses on Outreach, Data Collection, Prioritization, and Mapping. The project objective was to summarize existing wetland information from throughout the three regional districts that comprise the Okanagan region (North, Central, and Okanagan-Similkameen), gather input from identified stakeholder groups, develop a wetland evaluation template, and conduct baseline mapping to identify priority wetlands for conservation and restoration opportunities.

Public outreach and communication involved conducting presentations to Fish and Game Clubs throughout the region and hosting a wetlands workshop and open house to promote interest and contribution to the data collection component of the project. An online survey was also developed to allow various stakeholders and members of the general public to provide input and help determine how people value wetlands and what priorities are important to people with regards to wetland management. The outreach data was used to develop priority criteria for wetland values and highlight specific wetlands of concern that were identified by members of the public.

Available wetland data was compiled into a Geographic Information Systems database and it was determined that there are **9,456 wetland polygons** within the study area. This number includes overlapping polygons and duplicate records which require data clean-up and refinement. The majority of the polygons had very limited wetland community data, which limited the ability to rank wetlands based on ecological value and biodiversity. Given the lack of data associated with the polygons, a template for evaluating wetlands based on adjacent landuse and potential threats was developed. The wetlands requiring the most immediate action are those that are not currently protected by conservation designation (i.e., park) or policy (i.e., Development Permit areas) and are associated with one or more of the identified threats from the background and literature review. The majority of the priority wetlands occur on Crown Land.

Summary table of wetland actions based on landuse, protection, and threat

Landuse	Level of Protection	Threat	Action			No. Wetland Polygons
			Protection	Assessment	Monitor	
Public Land	Park or Protected Area	Threat		✓	✓	674
		No Threat			✓	290
	Crown Land (Not Protected)	Threat	✓	✓	✓	5,986
		No Threat	✓		✓	273
Private Land	Within DP Area	Threat		✓	✓	580
		No Threat			✓	48
	Not Within DP Area	Threat	✓	✓	✓	1,077
		No Threat	✓		✓	85
IR Land	Policy	Threat		✓	✓	15
		No Threat			✓	1
	No Policy	Threat	✓	✓	✓	361
		No Threat	✓		✓	66
					Total	**9,456**

Threats were defined as landuse associations that include grazing, agricultural or forestry activity, recreational use, urban encroachment, and/or invasive species. Wetlands not protected by environmental development permit areas or other protected status (e.g., parks or protected areas) and associated with an identified threat were deemed to be at highest risk, thus requiring the most urgent action. These wetlands have been highlighted on regional map grids to help guide and focus inventory, assessment, and conservation actions, including protection, assessment, and monitoring. The following recommendations were developed to address priority wetlands as the project moves forward into subsequent phases:

1. Update and Refine the GIS database
   Gaps within the GIS database should be addressed as a desktop exercise.
   - Address overlapping polygons.
   - Address missing data (gaps) including unidentified wetlands.
   - Combine point data and hardcopy data with wetland polygons.
   - Run multiple iterations of the evaluation template to ensure it provides a meaningful output of priority wetlands.
   - Add additional data as it becomes available and as resources allow.
   - Utilize the data to hone in on wetlands with extraordinary values and impending threats.

2. Develop Targets and Timelines
   Set objectives, targets, and performance measures and create focal areas (most at risk or least protected) for wetland conservation and protection.
   - Develop consistent and clear management objectives across the entire region with similar rules and requirements to private landowners (e.g., DP areas and setback requirements).
   - Incorporate *No Net Loss* mandate and develop compensation requirements for those wetlands that are disturbed or degraded.
   - Utilize conservation covenants and security deposits to prevent future impacts.
   - Use specific language to guide and inform developers, land managers, planners, and environmental consultants to ensure there is a common understanding of what is required in terms of wetland conservation, development limitations, compensation or restoration requirements, and buffer establishment.

3. Conduct Field Inventory and Mapping
   Using the evaluation template, develop a short-term plan (i.e., over next 2 to 5 years) to assess, map, and complete inventories of all wetlands within the study area (or as many as is deemed feasible).
   - Utilize a standardized data collection sheet (as provided in Appendix D or equivalent provided by MFLNRO or BCWF) to ensure consistency.
   - Identify specific parties to include in this step, promote volunteer involvement, and source funding.
   - Manage data entry and updating of the database through a single organization that can provide oversight of quality assurance/quality control.

4. Refine Prioritization of Wetlands
   Revise and refine the priority wetlands as viewed from different perspectives. The priority wetlands may change as more data is collected and as more people and groups come forward with concerns or interests in wetland conservation.

5. Protect Priority Wetlands
   Begin the process of securing lands or otherwise protecting at risk wetlands from degradation or loss.
   - Promote conservation (land securement, stewardship, covenants, purchase, incentive programs for private landowners).
   - Develop incentives to maintain, restore, or enhance wetlands that occur on private land (e.g., property tax exemptions or other financial incentives).
   - Encourage voluntary compliance, self-policing, and reporting of violations within the local stewardship groups, general public, or other stakeholders (i.e., BCWF members).

6. Monitor, Restore, and Enhance Wetlands
   Develop a system of monitoring and enforcement for wetland protection. An improved inventory of wetlands will provide important baseline information to measure changes or losses over time.
   - Develop a monitoring plan for selected reference or baseline wetlands to monitor wetland conditions, modification/disturbances, and other changes over time.
   - Use reference wetlands and feedback obtained through the public workshop/open house and online survey to help coordinate group or clubs best suited to undertake detailed assessment, monitoring, and restoration activities, as applicable.

7. Education and Outreach
   Continue to educate and promote sense of value of wetlands among public groups (e.g., Wetlandkeepers and Map our Marshes workshops). Develop and deliver a targeted strategy to communicate with key groups that impact wetlands (e.g., real estate, agriculture, landowners, etc.) to help promote a sense of value of wetlands occurring on private property.
   - Organize and coordinate the consistent collection of wetland data and maintain a single database that can be readily updated as new information is gathered.
   - Make the data collected during Phase 1 and all future data publically accessible in a user-friendly format.

The results of Phase 1 provide a path forward through database refinement, assessment, inventory, and stewardship with the intention of achieving protection for wetlands at risk. The evaluation template may be refined and calibrated over time with increasing data collection which will help better identify the highest priority wetlands for conservation efforts based on landuse, protected status, and potential threats. Opportunities have been identified to involve fish and game clubs and other stakeholders to contribute to the database through assessment, inventory, and stewardship actions. During the development of the evaluation template and actions, gaps in the GIS data were identified and recommendations were provided to address those gaps in future phases of the project. A number of next steps have been developed that should be followed as the Okanagan Wetlands Strategy moves forward into subsequent phases. The inclusion of volunteer group, naturalists, outdoor enthusiasts, and other stakeholders in the collection of wetland data will promote community involvement and a sense of pride in wetland conservation and management, as well as improving the database, which will allow for more refined evaluation and prioritization in the future.

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1.0 INTRODUCTION

Ecoscape Environmental Consultants Ltd. was retained by the Okanagan Basin Water Board (OBWB), the Regional District of Central Okanagan (RDCO), and the BC Wildlife Federation (BCWF) to complete Phase 1 of the Okanagan Wetlands Strategy project. The focus of Phase 1 is Outreach, Data Collection, Prioritization, and Mapping. The objective of Phase 1 is to summarize existing wetland information from throughout the Okanagan region, gather input from stakeholder groups, and conduct assessment and mapping, to help identify and evaluate priority wetlands for conservation and restoration opportunities.

The project area includes the Regional Districts of Central Okanagan (RDCO), North Okanagan (RDNO), and Okanagan-Similkameen (RDOS) which generally encompass the entire Okanagan region (Figure 1). The information collected has been used to generate baseline maps of wetlands throughout the project area and to develop a template to evaluate wetlands based on factors including sensitivity, rarity, social and traditional values, and other important ecological and socio-economic factors. The intended outcomes of the project include:

- A comprehensive understanding of the current state of wetlands throughout the project area (i.e., RDCO, RDNO, RDOS), including inventory maps.
- Identification of the important threats facing wetlands in the Okanagan.
- A template for classifying, characterizing, and ranking wetland habitats based on the identified priorities of stakeholder groups and other biophysical criteria.
- Prioritization of inventoried wetlands to guide policy and governance recommendations.
- Recommendations for future phases of the Okanagan Wetland Strategy project, including addressing data gaps.
- Identification of a network of parties interested in the conservation of wetlands for a variety of purposes from the results of the outreach and workshops.
- Identification of opportunities to enhance Fish and Game Club and other NGO involvement in conservation and protection of wetlands in the Okanagan.

The results of the outreach, meetings, and workshops were combined with background research and literature review to develop a template for identifying and evaluating wetlands using available GIS data. Wetlands were characterized using standardized criteria based on the available literature and input from community outreach and the Technical Advisory Committee (TAC). The criteria were then used to create 'lenses' or filters to identify high priority wetlands based on the selected criteria for each lens. The resulting wetland priorities have been displayed on maps and summarized in tables to help direct protection and restoration efforts and identify wetlands of special importance or that are considered most at risk within the region.

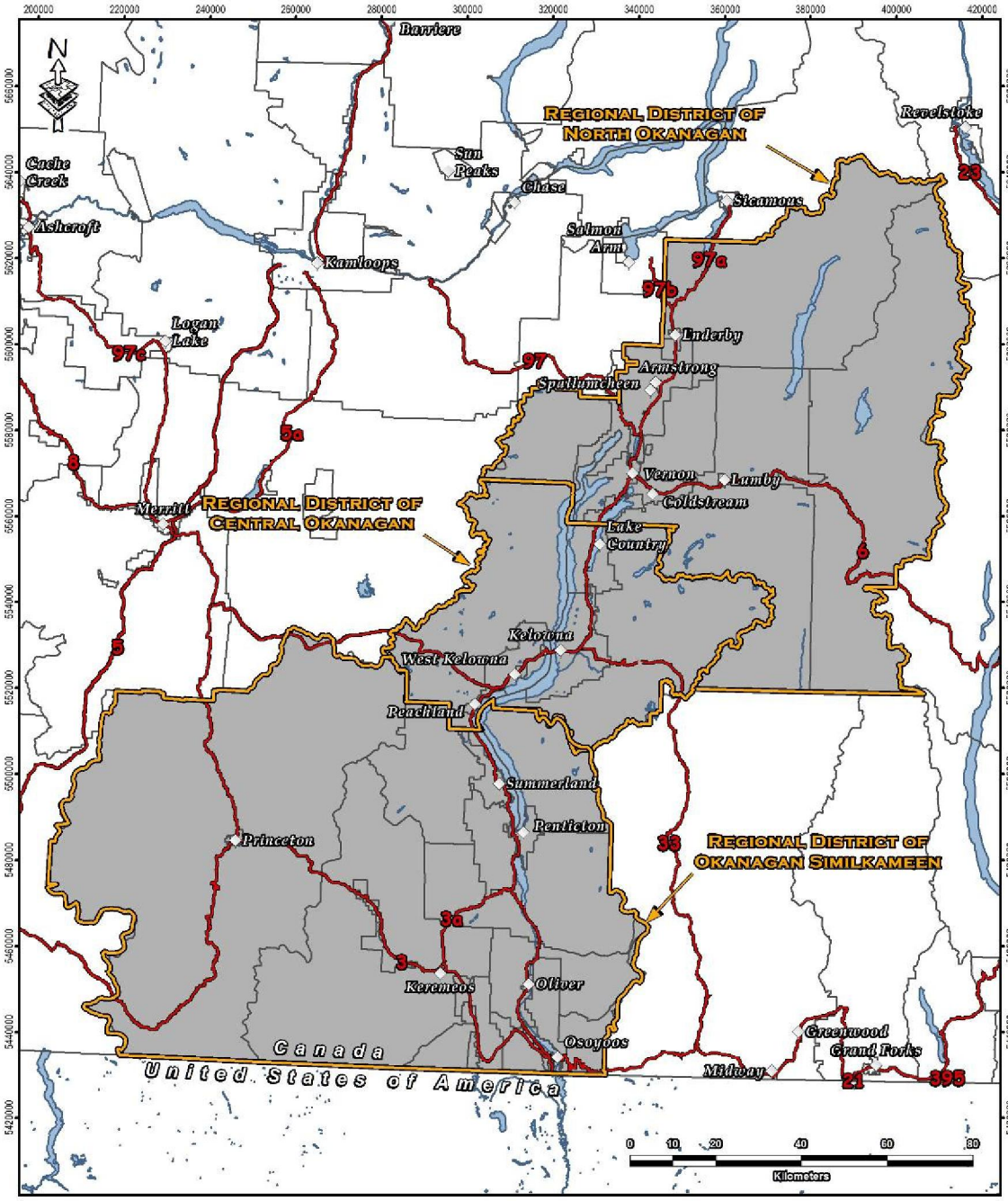

Figure 1. Overview of Study Area

2.0 PROJECT BACKGROUND

The rationale for this project is based on the understanding that wetlands are among the rarest and most sensitive ecosystems in the Okanagan, representing only about 0.2% of the regional landscape (Haney and Iverson 2009; Hawes and Schleppe 2009). In spite of their limited extents within the landscape, wetlands provide disproportionately large biological, hydrological, and socio-economic values (MacKenzie and Banner 2001). It is estimated that over 84% of low elevation wetlands within the Okanagan and Similkameen Valleys have been lost to development activities (Lea 2008). Within the City of Kelowna, the Wetland Inventory Mapping (WIM) found that wetlands and shallow open water environments cover only approximately 1% (260 ha) of the city land base (Hawes and Schleppe 2009). These areas are also known as biodiversity hotspots due to the unique habitat they provide for a wide variety of wildlife and the critical ecological services they provide in biological productivity, hydrological functions, and other socio-economic benefits (Gabor et al. 2004; Schaefer et al. 2004).

Aquatic ecosystems in the Okanagan continue to be threatened and under pressure from urbanization, encroachment, isolation, and other land development pressures (Brown et al. 2005). The most predominant threats facing Okanagan wetlands include filling and draining during urban and agricultural development, grazing, forestry activities, encroachment of invasive species, and climate change (MacKenzie and Shaw 2000, Bunnell et al. 2010). However, public awareness has improved over the years, prompting conservation, restoration, and enhancement of natural wetlands. Many constructed dugouts and other agricultural features have become functional wetlands over time and their values are recognized by various stakeholders and landuse planners as features that help compensate for the historical losses that have occurred. Mapping and monitoring of wetlands throughout the region is critical to conserving what remains of this important ecosystem type, given the rationale that if we want to protect wetlands, we first need to know where they are.

Wetland Inventory and Mapping (WIM) has been completed on all wetlands within the City of Kelowna and formed an important foundation for this phase of the project (Hawes and Schleppe 2009). The WIM database was used as a standard for wetland classification and inventory and was built upon to incorporate other quantitative and qualitative values used to develop the wetland evaluation template. The hope is that during future phases of the project, consistent mapping, inventory, and evaluation of wetlands will be completed throughout the Okanagan until each of the identified wetlands has been inventoried and assessed.

2.1 What is a Wetland?

Wetland ecosystems have distinct ecological characteristics defined by dynamic hydrological conditions (MacKenzie and Banner 2001). A wetland is generally defined as an area that is saturated with sufficient water, either permanently or intermittently, to promote wetland or aquatic processes as indicated by low oxygen levels and poorly drained soils. These conditions tend to promote the development of hydrophytic vegetation and other biological activities

associated with a wet environment (National Wetlands Working Group 1988; Wetland Stewardship Partnership 2010a). Wetlands by nature are dynamic and transitional, generally occurring along an ecotone between terrestrial and aquatic systems where ground or surface water influences biophysical processes. As per Cowardin et al. (1979), wetlands must have one of the following criteria:

- At least periodically, the land supports predominantly hydrophytic (i.e. water-loving) vegetation;
- The substrate is predominantly undrained hydric soil;
- The substrate is saturated with water or covered by shallow water at some time during the growing season of each year; and
- A water body less than 2.0 m in depth.

For the purposes of this project, wetlands were subdivided into class, form, and type, as per the Canadian Wetland Classification System (1997) and the BC Wetland Classification System (MacKenzie and Moran 2004).

Wetland Class

Wetlands are generally broken down into the following broad classes, as per the classification systems described above.

- Bog - A wetland with organic soil (predominantly poorly to moderately decomposed sphagnum moss peats) and a water table at or near the surface. Waters are generally acidic and low in nutrients. Bogs are usually carpeted with sphagnum mosses and shrubs, and may be treed or treeless.
- Fen - A wetland with organic soil (mainly moderately to well-decomposed sedge and non-sphagnum moss peats) and a water table at or near the surface. Waters are mainly nutrient rich with a near-neutral to slightly acid pH. The dominant plants are sedges, grasses, reeds, mosses, and some shrubs. Scattered trees may be present.
- Swamp – These wetlands often occur along the edges of other waterbodies. They are typically characterized by mineral soils, or occasionally peat soils, with mottling and a nutrient rich water table at or near the surface. Vegetation normally includes willows and sedges.
- Marsh – Marshes typically occur in association with shallow open water ecosystems and are characterized by cattails, bulrushes, grasses, and sedges. Floating aquatic vegetation may also occur and include duckweed and water smartweed. Soils are gleysol mineral or peat soils, influenced by fluctuating water levels.
- Shallow Open Water – These wetlands often occur in association with marshes and are characterized by intermittently or permanently inundated areas with open water up to 2 m deep. Vegetation typically includes submerged, shallow emergent, or floating aquatic plants.

Several other class categories were included that don't fall within the traditional categories described above and to more specifically address the variety of distinct wetland types found in the Okanagan. These other wetland classes are based on available GIS data and include transitional, floodplain, and modified sites as follows:

- Saline Meadow - These are characterized by the presence of alkaline salts that occur within the drawdown zone of shallow or vernal ponds and are generally characterized by unique salt-tolerant vegetation.
- Alkaline Pond – Similarly, the alkaline ponds are characterized by the presence of alkaline salts within a permanently inundated or seasonal waterbody.
- Flood Bench (Low and Mid) – The flood ecosystems are not technically wetlands, but occur on sites that are regularly influenced by high water levels and inundation that affects the vegetation present. The low and mid flood bench sites were chosen as they are most frequently inundated and are most strongly associated with wetland transitions.
- Reservoirs, Ponds, Lakes, and Golf Course Ponds – These represent constructed or modified shallow open water systems (less than 2 m in depth) that provide functional wetland habitats.

Wetland Form

The following wetland forms were selected to further describe the classes defined above. These forms are based on protocols developed with the City of Kelowna WIM (Hawes and Schleppe 2009).

- Marsh - channel, floodplain, kettle, seepage, track, shallow basin, shore, or stream;
- Shallow Open Water - basin, kettle, oxbow, or stream;
- Swamp - flat, shore, or stream.

2.2 Why are Wetlands Important?

Wetlands are known as biodiversity hotspots, which means that they provide habitat for a rich variety of plants and animals in spite of their relatively small representation across the landscape (Wetland Stewardship Partnership 2010b). Wetlands are highly productive ecosystems, and are able to filter pollutants from the aquatic environment through uptake by plants, breakdown of microbes, and infiltration into sediment and organic matter (Gabor et al. 2004). In the arid basin of the Okanagan valley this is especially true and wetlands provide unique and critical habitat to a broad range of wildlife species, including species at risk, such as the Great Basin spadefoot toad, western painted turtle, Yellow-Breasted Chat, and Tiger Salamander, as well as numerous aquatic invertebrates (Cox and Cullington 2009).

Wetlands are also known to provide many socio-economic benefits in the form of hydrological functions such as water filtration, erosion control, and flood protection (Gabor et al. 2004) and social values such as nature viewing, hunting, and spiritual and cultural importance. While the actual economic value of these environmental benefits are often difficult to measure, the

estimate of $22,000 (CDN) per hectare of wetland per year has been proposed to reflect the value of flood control, water treatment, and other recreational and wildlife habitat uses (Costanza 1997).

Given the documented high rates of wetland loss, retaining and enhancing those that remain is critical. Most of the loss is attributable to wetland draining and filling for agricultural, commercial, industrial, or residential development (Lea 2008). In addition to direct losses related to development and degradation, Okanagan wetlands are at risk of loss resulting from climate change. Longer, drier summers and reduced snowpack contribute to wetlands shrinking and drying up. Approximately 67.7% of small and/or shallow wetlands (i.e., 1 ha or less) within the southern interior of BC are at increased risk of vanishing as a result of these forecasted changes (Bunnel et al, 2010).

2.3 No Net Loss

While some wetland classes within the Okanagan are considered more common or provide fewer recreational opportunities, all wetlands are considered important and all provide functional values, be they ecological, hydrological, social, or economical. The overarching principle of the Okanagan Wetlands Strategy project, as supported by the input collected during the public outreach and from members of the TAC, is that there must be ***No Net Loss* of wetland habitats** and that efforts to conserve or restore existing wetlands and create new wetlands should be the collective goal for land managers, landuse planners, and other stewards of the environment.

The wetland evaluation template was developed to help guide planners, managers, and public stakeholders in the identification of the highest value wetlands and those that are most at risk from development, disturbance, or other forms of degradation (i.e., threats). As such, a criteria system was developed to assign categorical values to distinct characteristics and functional attributes in an attempt to prioritize wetlands. The intent was that the criteria would be used as filters for various 'lenses' to determine those wetlands that are of most concern, highest value, or most at risk, depending on the attributes of the 'lens' and therefore the highest priority for conservation or restoration actions. The lenses include perspectives from various user groups, such as local government, fish and game club members, and other land managers interested in wetland conservation.

It is important to note that the evaluation and prioritization of wetlands is determined in a relative manner and is meant to hone in on those wetlands that are at greatest risk or highest value, as compared to other wetlands in the region. The evaluation template is not meant to measure the absolute value of a wetland or to imply that some wetlands have little or no value. The danger associated with an evaluation system is that those wetlands that are deemed to be of lower priority may be perceived as being less valuable or more expendable to some. The overarching principle of *No Net Loss* must be applied when using the template and there must be an understanding that the evaluation criteria are meant to help narrow down the field of priority wetlands.

3.0 LITERATURE REVIEW

The literature review included a search for existing wetland classification, evaluation, and ranking systems that have been applied in BC, Canada, and internationally. Well established classification criteria were examined, such as Wetlands of BC (MacKenzie and Moran 2004), the Canadian Wetland Classification System (Warner and Rubec 1997), Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979), and Ducks Unlimited Enhanced Wetlands Classification system (2011). Information from the Ontario Wetland Evaluation System (OWES), the Ramsar Wetland Inventory Handbook, Washington State Wetlands Rating System, and existing local inventories, such as WIM, the Okanagan Wetlands Strategy (Urban Systems, 1998), among others, was also incorporated. A summary of sources of technical and planning information, in no particular order, that were reviewed is provided below.

- City of Kelowna Wetland Inventory Mapping (WIM) project (2009);
- Wetland Habitat Management Strategy (1998);
- Ministry of Environment Region 8 Wetland Inventory Project (2009);
- Ducks Unlimited database (Kamloops office);
- Vernon Environmental Management Areas Strategy (2008);
- BC Wetland Action Plan (2010);
- Biodiversity Conservation Analysis for the North and Central Okanagan Region (2013);
- Biodiversity Conservation Analysis for the South Okanagan-Similkameen Region (2011);
- The Status of Biodiversity in British Columbia (2008);
- Okanagan Ecoregional Assessment (2006);
- BC Wetland Trends Project: Okanagan Valley Assessment (2013);
- Okanagan-Shuswap Land and Resource Management Plan (2001);
- North American Waterfowl Management Plan (2012);
- Wetland Ways (2009), Develop with Care (2012), and other Best Management Practices;
- Official Community Plans for local governments;
- Okanagan Regional Growth Strategies (e.g., RDCO, RDNO, and RDOS);
- Okanagan First Nations planning directions and wetland policies or mandates;
- Summary of the results of the presentations, meetings, and workshops.

In addition to the technical and planning documents listed above, some of the key resources used to determine suitable criteria for wetland evaluation and prioritization are summarized below:

- Columbia Basin Riparian and Wetlands Action Plan (2012);
- Ontario Wetland Evaluation System (OWES) Southern Manual (2013);
- North American Wetlands Conservation Council Wetland Evaluation Guide (1992);
- Washington State Wetland Rating System for Eastern Washington (2007);
- Idaho Wetland Conservation Prioritization Plan (2012);
- Ducks Unlimited Canada Enhanced Wetland Classification (2011);
- Ramsar framework for wetland inventory and ecological character description (2010);

- IUCN Integrated Wetland Assessment Toolkit (2009);
- U.S. Environmental Protection Agency Methods for Evaluating Wetland Condition (2002).

Technical reports that were researched for policy, governance direction, and action planning include:

- Wetlands in BC: A Primer for Local Governments (2010);
- Green Bylaws Toolkit (2007);
- Adapting Watershed Tools to Protect Wetlands (2005);
- The Wetlandkeepers Handbook (1996);
- Operational Plan for the Small Lakes Recreational Fisheries in BC's Okanagan (2013);
- Terrestrial Habitat Conservation in Canada (2014);
- The Federal Policy On Wetland Conservation (1991);
- North American Wetlands Conservation Council Strategic Plan (2010);
- Wetlands At Risk Protection Tool (WARPT) (2010);
- Wetland Resources Action Planning (WRAP) Toolkit (2013).

A bibliography of literature, reports, and other resources reviewed during this phase of the Okanagan Wetlands Strategy project is included in the Bibliography section.

4.0 PUBLIC OUTREACH AND COMMUNICATION

The following sections provide a summary of the public outreach and communication strategy for the first phase of the project.

4.1 Overview

Outreach and communication efforts were initiated in late September 2013. A list of potential stakeholders and interest groups within the project boundary of the RDNO, RDCO, and RDOS was developed and circulated to RDCO, OBWB, and the BCWF for their review and input. This list included fish and game clubs, First Nations, municipalities, conservation partnerships (SOSCP and OCCP), naturalists groups, land trusts, non-profit organizations, provincial and federal government, Okanagan College and University of British Columbia-Okanagan (UBCO), and members of the TAC. The contact list was built upon throughout the project and groups were contacted by both email and telephone where possible. Those contacted were notified of the strategy and were invited to participate in an online public survey, to attend the workshop and open house, to contribute existing wetland data, and, in the case of naturalists clubs and fish and game clubs, requests were made to present at their monthly meetings. The outreach and communications aspect of this project primarily included the following:

- Targeted presentations to fish and game clubs affiliated with the BCWF (Region 8);
- Organization of an Okanagan Wetlands Strategy workshop and open-house held November 28, 2013;
- An online survey:https://www.surveymonkey.com/s/Okanagan_Wetlands_Strategy_Phase1; and
- Media releases and advertising associated with the above.

4.2 Targeted Presentations

Targeted presentations with fish and game clubs within the study area was one of the mandates identified by the BCWF. The intent was to schedule meetings with at least eight (8) fish and game clubs in order to:

- Gather information on interests in a region-wide wetland strategy;
- Identify any topics of interest to the clubs, such as training needs, knowledge gaps, and resources;
- Identify realistic and meaningful ways club members could participate in region-wide wetland conservation;
- Establish commitment to participate in a workshop;
- Record current or historical wetland projects (e.g. assemble list of reports, list of key contacts, and summarize information in a report); and
- Visit respective project sites (if any occur) and prepare a brief project overview (including photos of club members at their site) to be used for promotional materials for both the club and the BCWF.

Clubs presentations introduced the project, identified project partners and objectives, and promoted BCWF club involvement and value in participating in the project. Part of the presentation encouraged members to become involved with mapping while in the backcountry, or even in their neighbourhoods, and providing data that could be utilized to populate wetland fields within a master database. Hard copies of the public survey were available for individuals to complete during the meeting or take home and submit later, and the link to complete the survey online was also provided.

Ecoscape delivered presentations on the project to Region 8 BCWF affiliated groups, including a presentation at a Map Your Marshes workshop in Peachland on October 6, as well as to 11 fish and game clubs from October to January. Fish and game clubs that received a presentation and the respective dates include:

- Penticton Fly Fishers Association (October 3, 2013);
- Kelowna and District Fish and Game Club (October 9, 2013);
- Armstrong and District Fish and Game Club (October 16, 2013);
- Oceola Fish and Game Club (October 16, 2013);

- Summerland Sportsmen's Association (October 17, 2013);
- Keremeos Cawston Fish and Game Club (October 31, 203);
- Enderby and District Fish and Game Protective Association/Enderby and District Wildlife Association (November 12, 2013);
- Lumby and District Fish and Game Club (November 13, 2013);
- Vernon Fish and Game Club (November 19, 2013);
- Peachland Sportsmen's Association (November 20, 2013); and
- South Okanagan Sportsmen's Association (attended meeting January 28, 2014).

Additional clubs within Region 8 that did not receive a presentation include:

- Black Mountain Sportsmen's Association (contacted, but did not present);
- Osoyoos Wildlife Federation (contacted, but did not present);
- Princeton and District Fish and Game Association (contacted, but did not present);
- Grand Forks Wildlife Association (outside of study area).

The presentations reached an estimated 215 fish and game club members. It was also intended that information regarding the Okanagan Wetlands Strategy would be distributed on a larger scale to those members not in attendance during the meetings. While topics of interest and discussion varied between groups, common points of discussion included:

- Lack of mapping, identification of sensitive resources, and threat of impact from development;
- Conflict between managing lake water levels for red-listed vegetation species associated with wetland (south end of Ellison/Duck Lake) versus Middle Vernon Creek Kokanee;
- Potentially lost wetlands in relation to proposed reservoir development in upper watersheds (e.g., Oyama and/or Swalwell Lakes);
- Active stewardship examples of local clubs, including: constructed and enhanced wetland/back channel habitat along Middle Vernon Creek (OFGC), Bald Range Grasslands (PSA), and wetland restoration project at Ritchie Lake in the Garnet Valley (SSA http://www.soscp.org/2013/news/ritchie-lake-restoration-from-bad-to-rad/);
- Interest in results and updates on this project and wetland mapping - continued club involvement;
- Concern with provision of mapping and detailed information database to the public, as potentially offering information regarding the best hunting spots;
- Interest in DU involvement – identified by multiple members as a valuable resource and hope for collaboration with stewardship initiatives;
- Concern with level of protection for small wetlands, springs, underground seepages, and groundwater;

- What constitutes a wetland in terms of size? What about road-side ditches (example of Redwing Resort, noted to formerly be a large cattail marsh);
- Conflict between wetlands and private property and implications with government inventories and mapping (buffers, setbacks, development restrictions, land acquisition) – seen by some as an intrusion, and by others as a concern for wetland conservation. A general concern with infringing on private property rights;
- Concern regarding identification of important wetlands and then subsequent fencing and limiting of public access;
- Concern regarding forestry operations and cattle grazing;
- Concern in Lumby of apparent reduction in waterfowl use of local wetlands;
- Overlap in data being gathered by multiple organizations-interested in data consolidation and potential pooling of resources;
- Wondering if wetlands at all elevations were of interest; members at meeting indicated they should all be of interest and that all wetlands should be a priority for protection;
- Concern with invasive species additions – yellow perch, mussels, yellow flag iris, and purple loosestrife;
- Importance of land acquisition by groups such as DU, Nature Trust, and the Land Trust. Desire for provision of wetlands data to these organizations. Some individuals were concerned with land acquisition and the potential for limiting access to previously accessible wetlands valued as a hunting and fishing resource;
- Interest in stewardship and volunteer opportunities;
- What is the expectation of fish and game clubs as a group and what deliverables will be made available to them?;
- Some questions regarding budget for the project and discussion on funding.

In addition to the fish and game club presentations, Ecoscape presented the results of Phase 1 at the BC Wildlife Federation 58th Annual General Meeting and Convention April 9-12, 2014. Ecoscape presented the Phase 1 strategy to the RDCO Environmental Advisory Commission on October 3, 2013 to approximately 9 members. Kyle Hawes (Ecoscape) and Margaret Bakelaar (RDCO) presented to the RDNO Regional Growth Management Advisory Committee on November 20, 2013.

4.3 Workshop and Open House

Ecoscape coordinated an Okanagan Wetlands Strategy Workshop and Open House, which was held in Kelowna on November 28, 2013. The event was held at the Downtown Kelowna Ellis Street branch of the Okanagan Regional Library.

The event was promoted to all contacts within the list of potential stakeholders and interest groups, as well as through social media (Ecoscape, OBWB, and BCWF Facebook and Twitter accounts), and through press release distribution with the RDCO and City of Kelowna. The

Kelowna Capital News (J. Steeves) promoted the workshop and project on their website (October 27 and November 12, 2013), as well as in the paper on October 25, 2013 in an article spanning the front page and two additional pages.

The November 28, 2013 workshop had approximately 70 participants. A diverse group of attendees participated, including local and provincial government, naturalist club members, fish and game club members, BC Wildlife Federation, First Nations, agriculture, private land owners, environmental and engineering consultants, media, academic faculty and students, conservation organizations, and realtors. Specific organizations with representation included: Friends of the Oxbows, Centre for Culture and Technology, Golder Associates Ltd., RDCO, City of Kelowna, Westbank First Nation, Village of Lumby, District of Summerland, RDOS, City of Penticton, RDNO, Oceola Fish and Game Club, Keremeos-Cawston Sportsmen's Association, Mission Rod and Gun Club, McMillan Farms, Environmental Farm Plan, Ministry of Forests, Lands and Natural Resource Operations, University of British Columbia-Okanagan, Elevate Environmental Inc., South Okanagan Similkameen Conservation Program, Okanagan Collaborative Conservation Program, Urban Systems, CH2M Hill, Central Okanagan Land Trust, Central Okanagan Naturalists Club, Coldwell Banker, and Kettle River Management Plan.

The format of the event consisted of a workshop with presentations and breakout sessions from 1:30 to 4:00 pm, followed by a public open house from 4:00 to 6:00 pm. Speakers and their presentation topics were as follows:

- Dick Cannings – "Wetlands and Species at Risk"
- Neil Fletcher, BC Wildlife Federation- "Exploring Wetland Stewardship from individuals to agencies: establishing a path forward for the Okanagan."
- Josie Symonds, BC Ministry of Forests, Lands and Natural Resource Operations-"Wetlands: An Ecosystems Perspective"
- Todd Cashin, City of Kelowna-"Bridging the Science-Policy Gap: Integrating Wetlands into the Municipal Fold- The Kelowna Experience"

Key take-home messages and points of discussion that followed presentations included:

- To address and mitigate for annual loss of wetlands, we must move in the direction of wetland creation and acquisition. The allocation of resources for wetland acquisition was echoed by several workshop attendees. **Acquisition, stewardship, and protection are critical.**
- The challenge of government protection of wetlands was discussed following presentations by Neil Fletcher, Josie Symonds, and Todd Cashin. **Gaps in legislative protection** associated with a lack of inclusion of a comprehensive, inclusive wetland definition was discussed (i.e. example of "swamp" under the provincial *Water Act* and that the act was first designed in relation to water rights and connection to flowing systems). The challenge of protection for important wetland transitional areas was also

discussed. How do we clearly identify wetland boundaries for the purpose of development permit areas, riparian setbacks, and mapping for development purposes?

- The potential **conflict between protection and management** of natural versus constructed wetlands was discussed. Should they be allocated the same level of protection? Argument that a constructed wetland has the potential to provide like services and functions as a naturally occurring wetland. However, are there instances where these constructed areas can be maintained, such as is often the case for storm water management, or perhaps for a private property owner wanting to alter a constructed feature on their land.
- Concern that wetlands occurring in association with transportation and agriculture are not allocated the same level of protection as other development types and areas.
- Wetlands and natural corridors within our communities need to be recognized and valued as a resource worth protecting.
- There is a **need for more concrete rules and bylaws in place, rather than guidelines**. More **strict bylaws are required to adequately address wetland protection and management on private lands.**
- Public involvement and **increased stewardship awareness** can be achieved by embracing the concept of "show up". Take part, voice your concerns to your politicians, and get your hands dirty with on-the-ground projects.

Breakout sessions towards the end of the workshop split attendees into six (6) working groups to address six (6) key topics. While the topics were variable, points of discussion in multiple groups gravitated to common threads, such as the **need for conservation incentives for landowners and prioritization of all wetlands.** The six working group topics and some of the key discussion points are provided in Appendix A.

4.4 Okanagan Wetlands Strategy Survey

An eighteen question online survey was created (Appendix B), and distributed via email to targeted interest groups, Facebook (via OBWB and Ecoscape), Twitter (via OBWB, BCWF, and Ecoscape), in person at fish and game club presentations and workshop, and via media articles in the Capital News. Distribution of the survey was initiated the first week in October 2013.

The survey goal was to gain public and stakeholder input on wetland values and usage, perception of level of protection, identification of wetland areas of concern, conservation and stewardship interest and opportunities, and potential partnerships. This survey aided in the exercise of wetland prioritization through a variety of lenses and development of the prioritization matrix.

A total of 120 responses were received. Fish and game club members represented 48% of survey respondents, with representation from the north, central and south Okanagan. Other

respondents included municipal landuse planners, Ducks Unlimited and other Non-Government conservation organizations, engineers, provincial government biologists, regional and municipal politicians, First Nations, environmental/biological professionals, college and university professors, community associations, naturalist club members and interested members of the community. A summary of the survey and the survey results in their entirety can be found in Appendix B.

4.5 Okanagan Wetlands Strategy Media

Outreach for this project included the use of social media to encourage participation in the November 28, 2013 workshop, as well as the online survey. Additionally, wetland related news articles and links were distributed via Ecoscape's Twitter and Facebook accounts. The OBWB and BCWF also publicized the survey and workshop on their respective social media outlets.

The Kelowna Capital News promoted the workshop and project on their website (October 27 and November 12, 2013), as well as in the paper on October 25, 2013 in an article spanning the front page and two additional pages. CHBC/Global News provided television coverage of the November 28 Okanagan Wetlands Strategy Phase 1 Workshop. Ecoscape also provided an article for the Outdoor Edge Magazine, affiliated with the BC Wildlife Federation. This article was published in the March/April issue of the magazine, which is "Western Canada's most widely circulated hunting and fishing magazine. It reaches every household of every fish and game club member in all 4 western provinces." The Outdoor Edge website is: http://www.outdoorgroupmedia.com/outdooredge/

5.0 METHODOLGY

The following sections describe each stage of the Phase 1 approach.

5.1 GIS Database and Mapping

The project team compiled and refined existing Okanagan wetland mapping, inventory, classification, and other information into a single GIS database. The GIS data sources used are summarized below:

- City of Kelowna WIM (2009);
- BC Freshwater Atlas (2014);
- MOE Wetland Inventory Project (2009);
- Alkali-Saltgrass Herbaceous Vegetation Community Assessment (2011);
- SEI/TEM for the study area;
- SHIM (BX Creek, NORD, Vaseux Creek and Oliver, Prairie Creek, Winfield Creek, various dates);

- FIM (Kalamalka, Wood, Mabel, Mara, Okanagan, Osoyoos, various dates);
- LRIM (Lower Shuswap River Inventory and Mapping, 2010);
- Ducks Unlimited (DU) data (various sources).

Other data that were integrated into the database include shapefiles for parks, protected areas, and other polygons and point data related to specific wildlife areas or observations. These include:

- Environmental Development Permit (DP) Areas, as provided by each regional district;
- BC Conservation Data Centre (CDC) Red and Blue listed species occurrences;
- Non-native and invasive species occurrences;
- Terrain Resource Inventory Management (TRIM) data;
- Parks and Protected Areas;
- Roads (including forest service roads);
- Wildlife Habitat Management Areas (WHMA) as defined in the Okanagan Shuswap Land and Resource Management Plan (OSLRMP);
- Important Bird Areas (IBA);
- Land Tenure (Crown Land, private land, Indian Reserve);
- Forest Tenure;
- Grazing Tenure;
- Agricultural Land Reserve (ALR);
- Aquifers and Aquatic Points of Diversion;
- Forest Recreation Areas;
- Okanagan Biodiversity Strategy Conservation Areas (Very High Rank).

Other, non-mapping or GIS sources of data that were integrated into the database by adding columns or data fields include:

- Wetlands of concern identified by members of the public or other stakeholders.

Baseline Mapping Results

In total, there are **9,456 wetland polygons** currently identified within the study area. Some of these polygons are overlapping, which results in duplication of actual wetlands and in some cases, small or inconspicuous wetlands may have been missed. The summary provided in Table 1 indicates the distribution of wetlands across the various landuse types. The majority of wetlands (66%) occur on Crown Land. Private Lands contain about 19% of wetlands while the remaining 15% occur on Park Land/Protected Areas, or IR land.

Table 1. Summary of wetland polygons within each landuse type					
	Crown (Public)	**Private**	**Park/Protected Area**	**First Nations (IR)**	**Total**
Number of Wetland Polygons	6228	1790	995	443	9456
Percent of Wetland Polygons	65.9%	18.9%	10.5%	4.7%	100%

Table 2 summarizes the wetland polygon data sources that are available within each regional district. The City of Kelowna WIM data is the most comprehensive with detailed classification and biophysical information, while the BC Freshwater Atlas and TEM/SEI data is limited to polygons with a single label (e.g., swamp or marsh).

Table 2. Summary of wetland data sources within each Regional District.									
	FIM	**Fresh Water Atlas**	**Alkaline Saltgrass Ponds**	**LRIM**	**SHIM**	**TEM/SEI**	**WIM[1]**	**Digitized[2]**	**Total**
RDNO	254	1885	126	114	27	275	0	0	2681
RDCO	394	1010	81	0	5	204	293	5	1992
RDOS	156	2652	270	0	58	1647	0	0	4783
Total	**804**	**5547**	**477**	**114**	**90**	**2126**	**293**	**5**	**9456**

[1] Limited to within City of Kelowna.
[2] Digitized manually from publically identified wetlands.

The majority of the wetland polygon data was obtained from the Fresh Water Atlas (5,547 polygons or 59%) and the TEM/SEI (2,126 polygons or 22%). Only 293 polygons (3%) are available from the WIM dataset and these are limited to the City of Kelowna boundaries.

The majority of identified wetland polygons are classified as either marsh (4,011 polygons) or swamp (1,720 polygons) (Table 3). However, there are 3,049 'Unknown' polygons, which are not currently classified to the same standards as the rest of the data. These are generally associated with the manually digitized polygons, and polygons obtained from the FIM, LRIM, and TEM/SEI data sets that will have to be further refined to ensure they are classified to the same standard as the other data sets.

Table 3. Summary of wetland polygon classification within each Regional District.												
	Alkaline Pond	**Flood Low Bench**	**Flood Mid Bench**	**Golf Course Pond**	**Marsh**	**Pond/ Lake**	**Reservoir**	**Saline Meadow**	**Shallow Open Water**	**Swamp**	**Unknown**	**Total**
RDNO	2	1		2	1373	18	21		92	529	643	2681
RDCO		14	13		882	7		19	167	266	624	1992
RDOS	46	7	1	1	1757	90	9		143	925	1804	4783
Total	**48**	**22**	**14**	**3**	**4011**	**115**	**30**	**19**	**402**	**1720**	**3049**	**9456**

The lack of wetland classification data represented by the 3,049 'unknown' polygons prevented the effective use of a scoring or scale system to evaluate wetlands. Similarly, the 5,547 polygons represented by the Fresh Water Atlas data are limited to general classification data such as swamp or marsh. Only the 293 wetlands addressed by the WIM have detailed mapping and

classification data associated with the polygons. As such, a more broad-based method was used that made use of the limited data currently available across the entire study area to identify priority wetlands and suggest actions to address those wetlands given the data limitations (as further described in Section 5.4 below). Over time, as additional data is collected, a scale or index of wetland values may be developed to further refine the evaluation criteria.

5.2 Wetland Evaluation Template

The goal of the baseline mapping was to show all identified wetlands within the study area, given the available data described above. The evaluation template was developed to help assign prioritization for the wetlands based on criteria such as landuse information, biophysical characteristics, or social values. Categories were developed to summarize wetland information and to allow wetland characteristics to be evaluated. The criteria were compiled into a GIS database with input from the general public, stakeholder groups, workshop attendees, and the TAC. The Kelowna WIM (Hawes and Schleppe 2009) database was used as a template and foundation to develop the rest of the evaluation template. The WIM template was also used to provide a number of other data categories that could be identified by the GIS or would have to be determined in the field. Our intention was to create a database that could be queried for information from government regulators, stakeholder groups, or volunteer organizations (i.e., various lenses) to determine where the highest value wetlands occur, which are most at-risk, and which are most likely to benefit from restoration, enhancement, or conservation efforts based on available landuse data. The following section describes the categories used to evaluate wetlands. The detailed evaluation template is provided in Appendix C.

- General and Administrative Boundaries

This category includes the basic information related to the date, time, and observers that collected wetland data. It includes other basic information such as wetland name, geographic location, and legal landuse information. This data is largely publically available.

- Biophysical

Includes the wetland classification, as described in Section 2.1 (i.e., class, form), BEC zones, and primary character of the wetland (i.e., Natural, Modified/Disturbed, Constructed). This category also includes characteristics associated with size, elevation, and aspect, as well as soil profiles. Physical data can be determined using the GIS (e.g., Digital Elevation Model, BEC zones, perimeter, area, etc.). Classification data is available where WIM has been conducted (i.e., within the City of Kelowna), but is lacking elsewhere. In many areas, the only available wetland classification data is limited to swamp versus marsh and even this data has not yet been field confirmed.

- Biodiversity

Includes measures of biodiversity, such as number of communities, vegetation types and forms, as well as habitat complexity and rare species occurrences. Waterfowl, at risk species, and fisheries values are included. Other general characteristics such as ecological condition, function, and rarity, as well as riparian values are also included. Data is generally lacking for these attributes so 'proxy' indicators were used to infer biodiversity values. For example, proximity of wetlands to one another was used as an indicator of wetland 'complexes' (i.e., wetlands occurring within 750 m of each other form a larger wetland complex) and therefore as a proxy for biodiversity (OWES 2013). This is based on the assumption that a wetland complex formed from multiple wetlands provides a greater variety of habitats for a greater number of species than single, isolated wetlands (OWES 2013).

The Shoreline Development (SD) calculation was also used as a measure of the complexity of the wetland and therefore as another proxy for biodiversity (Hansson 2005).

$$SD = S/(2\sqrt{[A\pi]})$$

S = wetland perimeter
A = wetland area

Using this calculation, a perfect circle would result in SD = 1. The majority of the wetlands within the study area are roughly circular which resulted in a mean SD of 1.53. Partly this is due to the fact that the majority of the wetland polygons have not been mapped in fine detail. As such, all wetlands above the mean SD (1.53) were considered to respond 'Yes' in this category (i.e., they are considered to have high biodiversity values). These measurements of biodiversity were developed to provide quantitative measures that could be obtained using the GIS, given the limited polygon data available for wetlands within the study area.

- Hydrological

Water chemistry and watershed association are included, as well as characteristics such as connectivity to watercourse, retention capacity, flood control, association with reservoirs, aquifers, and floodplains, drinking water, and other general water quality conditions. Some of this data was obtained from public GIS sources (e.g., aquifers, floodplains, points of diversion); however, additional data collection is required to perform analysis.

- Socio-Economic

Includes various social, economic, and cultural characteristics, such as recreational, subsistence, and archaeological values. There is currently little to no data regarding wetland social values within the study area, although the publically identified wetlands can be used to infer social values. In terms of the cultural value of specific wetlands, Ecoscape received comment from WFN and ONA that this information would not be made public due to its sensitive nature. It was

discussed with WFN and ONA that a recommendation would be made to incorporate First Nations consultation into requirements prior to initiating restoration works or if development proposals are occurring in association with wetlands.

- Threats

A number of potential wetland threats were identified to represent how 'at risk' wetlands are throughout the study area. The criteria were determined using the literature and available GIS landuse data. A wetland is considered 'threatened' if it is associated with one or more of the categories described in Table 4.

Table 4. List of identified potential threats

Category	Source	Column	Description
Grazing Activity	DataBC	GRAZING	Wetland occurs within grazing tenure
Agricultural Activity	DataBC	AG_USE	Wetland occurs within ALR or other agricultural landuse
Forestry Activity	DataBC	FORESTRY	Wetland occurs within forest harvesting tenure area
Rec Site	DataBC	REC_SITE	Wetland occurs within or adjacent to Forest Recreation Site
Road Proximity	GIS	ROAD_PROX	Roadway occurs within 100 m of wetland edge
Invasive Species	DataBC	INV_SPEC_TYPE	Known occurrences of non-native or invasive wildlife and/or plants within wetland

An additional threat category related to urban landuse or encroachment should be added in the future, but at this time, data is lacking to determine that criteria throughout the study area. Additional zoning data should be compiled and standardized throughout the region.

- Restoration Potential

This category is meant to guide and focus restoration efforts and identify suitable organizations to undertake the work. The category includes values for overall potential and cost, as well as forms of possible restoration activity, such as fencing, signage, planting, invasive species removal, and improved data collection (i.e., mapping). This data is currently lacking but can be obtained following assessment and evaluation of wetlands in the field.

The wetland evaluation template criteria with sub-categories is provided in Appendix C. The template also indicates the definition of the criteria and the source of the data, if available.

Evaluation Criteria Scoring

A scoring system was considered for the evaluation criteria described above using other wetland evaluation indices as templates (i.e., OWES, Washington State Wetland Rating System). However, it was found that the scoring became overly arbitrary, subjective, biased, and debatable. Additionally, site specific data needed to fill categories to determine scores was largely lacking for the study area. As such, publically available landuse data was used to help determine wetland values, functions, and threats based on spatial information and proximity. In this way, the wetland database may be queried for wetlands with values and threats as perceived by the various 'lenses' to focus conservation efforts or direct stewardship activities.

Using the GIS data, Yes/No responses were created for each criteria where data was available. In this way, when the data is queried for a specific 'lens', the Yes/No responses can be used to filter wetlands meeting or failing to meet the lens criteria. In other words, if a given lens was used to filter wetlands with Red-listed species occurrences, all wetlands with a 'Yes' for that category would be selected. This system was intended to reduce the subjectivity and ambiguity associated with scoring while still providing a means to evaluate wetlands from the perspective of the various lenses, or from an overall view of wetlands in general. This system was also used to address the potential implication that low-scoring wetlands are considered less valuable or expendable.

Data Limitations

Experience, professional judgment, and comparisons with other wetland evaluation systems were used to the greatest extent possible. However, many of the criteria are based on interpretation and assumption. In the future, some of these criteria may be modified, deleted, other criteria added, or otherwise revised as more data is obtained. It is anticipated that the evaluation system will become more accurate as multiple iterations are completed, as additional data is compiled and improved, and as other professional and local knowledge is incorporated. As such, the evaluation template is intended to be evolving and adaptable over time and with increased input and refinement.

It should also be acknowledged that the evaluation system is open to debate and will likely change as new information is gained and future iterations of the template are used. As trends become more apparent over time, the evaluation system will become more representative of both ecological and human values. Following multiple iterations of study, the inherent bias of the template should theoretically be reduced, giving an overall better picture of the range of wetland values, risks, and conservation potential throughout the study area.

It became apparent early on in the project that data limitations would be an obstacle in meeting the objectives of scoring or prioritizing wetlands throughout the study area. The Kelowna WIM provided a good foundation for wetland classification data. However, even this dataset did not provide information on many of the hydrological and social values of interest. As such, publically

available data was used to the greatest extent possible to help infer wetland values and threats based on 'proxy' indicators. For example, grazing and forestry tenure data was used to indicate those wetlands most at risk of impacts from cattle and forest harvesting, respectively. It is acknowledged that wetlands occurring within these tenures may not actually be at risk from those impacts, but the assumption was made that the landuse associated with the wetland will provide an indication of the level of risk of impacts.

The GIS database provides a baseline of characteristics to determine wetlands at risk from various threats and those that are presumed to have the highest values in other categories. As additional data is collected, the robustness and accuracy of the evaluation template will improve. The data collection and site assessment requirements provide excellent opportunities for involvement of volunteers, NGOs, and other stewardship groups.

Future data collection and wetland evaluation should be overseen by qualified professionals or experienced volunteers to maintain consistency within the database. Following a prescribed protocol, such as the Wetlandkeepers Handbook or equivalent, will help reduce bias and provide a consistent level of wetland evaluation data collection. Using a standardized data collection template, as described below, will help ensure clear, comparable data is collected in the future.

Wetland Data Sheet

A sample wetland data sheet and key are provided in Appendix D. This sheet, or an equivalent, such as the BCWF Map Our Marshes template, should be used by all professionals or volunteers conducting wetland evaluations in order to ensure consistent data and comparable results. Wetland evaluators should strive to complete as many of the data sheet fields as possible, as well as providing GPS data and photographs. A key to the template data sheet has also been prepared which is meant to guide evaluators through the data sheet.

The data fields are intended to help populate the GIS database, but not require intensive or technical sampling of the wetland. Most of the fields can be determined simply by viewing the wetland and answering with simple Yes/No responses. Soil and water chemistry data fields are included; however, at this time these are not critical parameters to determine wetland values in the evaluation categories. All field data should be reviewed and entered by a member of the organization tasked with managing the database to ensure consistency and data quality standards are met.

The database provides a field for the most suitable organizations and stakeholder groups to collect wetland data based on regional locations and proximity. One of the main objectives of the Okanagan Wetlands Strategy is to promote involvement, participation, and stewardship of wetland conservation throughout the project area. The hope is that much of the wetland evaluation data can be collected by informed, enthusiastic, and un-biased volunteer individuals or groups that are keen to help improve the understanding and mapping of wetlands within the

Okanagan. Collecting wetland data on private land or on federal land (e.g., Indian Reserve) may require coordination between multiple parties and outreach to landowners and land managers.

5.3 Wetlands At Risk

Landuse data and identified threats were used to determine those wetlands in most dire need of assessment, evaluation, and other actions, including protection (through land acquisition, stewardship, or other means) and restoration. The prioritization levels or 'filters' based on landuse and threat are adapted from other wetland action plans. Table 5 summarizes the general filters that were used to determine actions for wetlands based on jurisdiction and level of protection. Using these broad categories, along with the presence of an identified threat (as described above), a number of actions suitable for each wetland were determined.

Table 5. Summary of wetland actions based on landuse, protection, and threat

Landuse	Level of Protection	Threat	Action			No. Wetland Polygons
			Protection	Assessment	Monitor	
Public Land	Park or Protected Area	Threat		✓	✓	674
		No Threat			✓	290
	Crown Land (Not Protected)	Threat	✓	✓	✓	5,986
		No Threat	✓		✓	273
Private Land	Within DP Area	Threat		✓	✓	580
		No Threat			✓	48
	Not Within DP Area	Threat	✓	✓	✓	1,077
		No Threat	✓		✓	85
IR Land	Policy	Threat		✓	✓	15
		No Threat			✓	1
	No Policy	Threat	✓	✓	✓	361
		No Threat	✓		✓	66
					Total	**9,456**

Wetlands were divided into broad categories based on administrative boundaries, including Public Land versus Private Land versus Indian Reserve Land. These are further divided into levels of protection through park status, DP areas, and other bylaw policy. Each landuse category is further divided into wetlands that are considered Threatened or Not Threatened. A wetland with one or more threats would become a higher priority for assessment and monitoring than one with no identified threats. Wetlands can be further prioritized based on the evaluation criteria categories. Wetlands that are deemed to have greater potential (i.e., answer 'Yes' to more criteria) for rare species, and other ecological or social values would become a higher priority for actions. Based on the landuse, level of protected status, and presence of threats, each wetland can be assigned an action, including:

- Protection: This action is for wetlands that currently have no measures of protection in place. These wetlands require protection or conservation through promotion of stewardship, land acquisition (purchase or donation), or other measures (e.g., covenants, agreements, etc.).

- Assessment: This action is for wetlands that are associated with a threat and require a site assessment and inventory to collect data, including characterization and classification of the wetland and determination of disturbance or degradation of the wetland. Assessment will also help determine suitability for restoration activities.
- Monitor: This action is for wetlands that have previously been protected or assessed and are not currently associated with an identified threat.

As indicated in Table 5, the majority of wetland polygons occur within Crown Land, are located outside of parks and other protected areas, and are associated with an identified threat. The next largest category includes wetlands that are on private land, are not identified by a DP area, and are associated with an identified threat. It is important to note that the total numbers of wetland polygons shown in the table above are not completely accurate due to overlaps and other discrepancies in the GIS data which require further refinement. However, the numbers are a close approximation of the proportion of wetland polygons within each landuse category.

To help prioritize wetland actions and display the spatial distribution of priority wetlands, criteria were selected to create priority action grids using TRIM map sheets. A 1:20,000 TRIM grid was overlaid on the study area, which includes 170 grid squares. The grid was chosen to allow more focused prioritization, for easy interpretation of the results, and for navigation to wetlands using common BC topographic maps during future assessment and inventory.

Two (2) analyses were conducted using the TRIM grid overlay. The first analysis was conducted using criteria including wetlands occurring within private land, not within a DP area, and associated with one or more threats. The second analysis was conducted using criteria including wetlands occurring within public (Crown) lands (i.e., not on private land or Indian Reserve land) and not occurring within a park or other protected area, as well being associated with one or more threats. The resulting wetlands were used to show categories of priority wetland numbers, shown on Figures 2 and 3, respectively.

The priority action grid figures depict the TRIM sheets where the wetlands occur and highlights (in colour) categories indicating which of those grids contain the highest number of high priority action wetlands.

- Red: TRIM sheets with 50 or more priority wetlands;
- Yellow: TRIM sheets with 11 to 49 priority wetlands;
- Green: TRIM sheets with 1 to 10 priority wetlands; and
- Gray: TRIM sheets with no priority wetlands.

The majority of the priority action grid sheets occur within the valley bottom and along the major drainages associated with the Okanagan, Similkameen, and Shuswap drainages. Also of note, there are no Red TRIM sheets occurring within RDCO using the private land analysis. This is likely attributable to the fact that nearly all the wetlands occurring within RDCO have been identified by the DP area mapping.

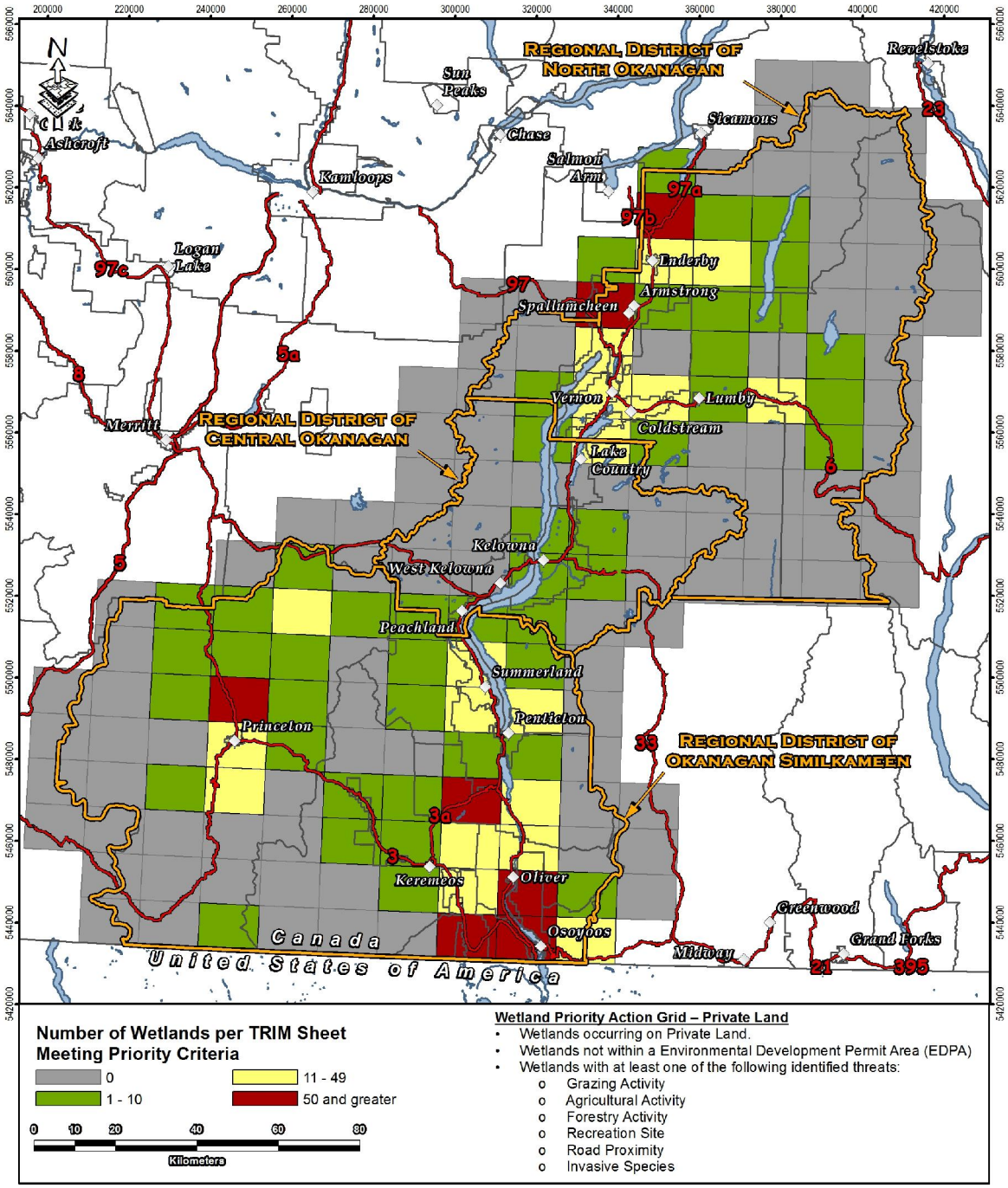

Figure 2. Wetland Priority Action Grid - Private Land

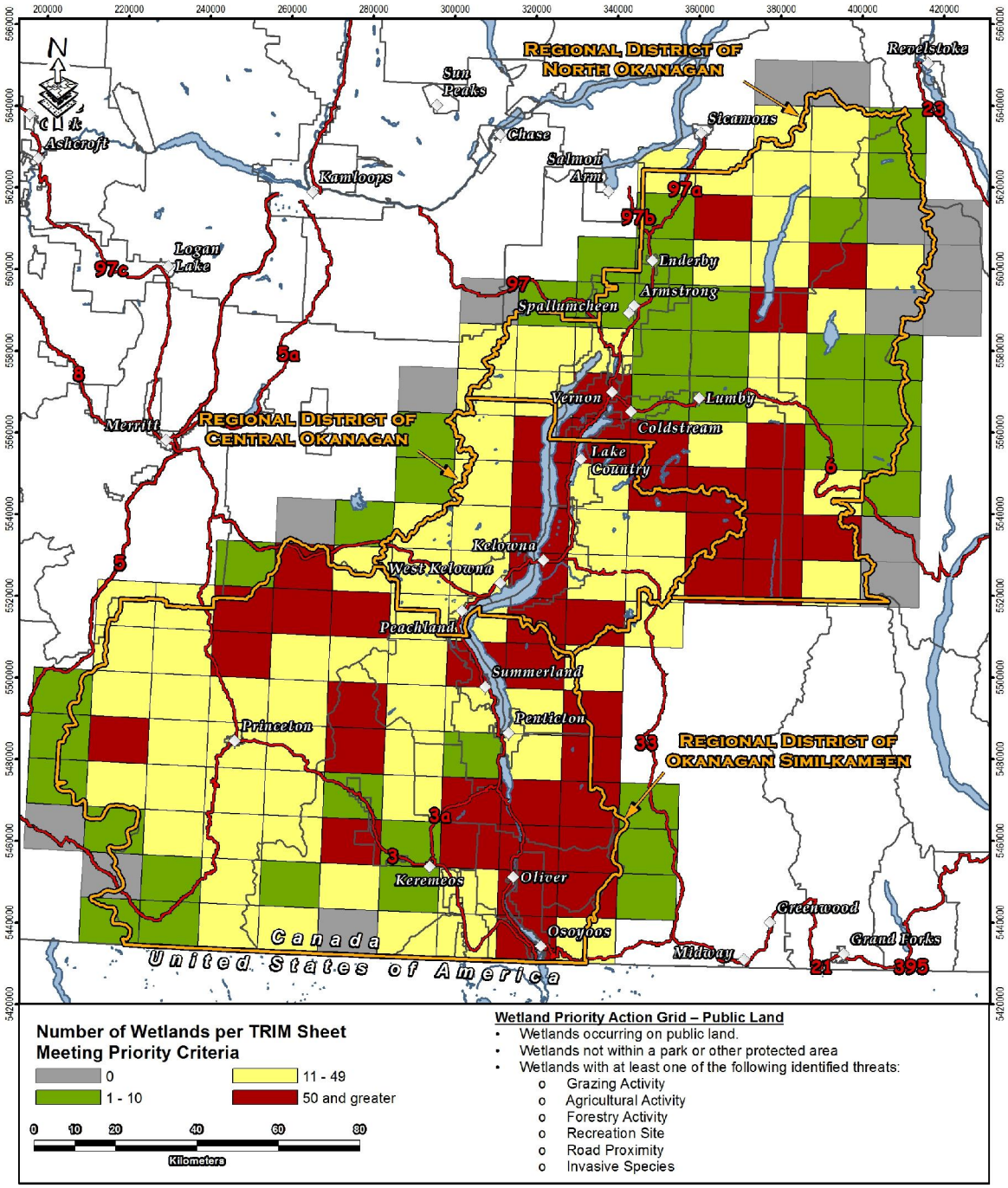

Figure 3. Wetland Priority Action Grid - Public (Crown) Land

5.4 Coarse Filter Priority Mapping

To apply the wetland evaluation template, given the available data, a certain number of criteria were selected to reflect several 'lenses' or perspectives regarding wetland management, conservation, and prioritization. Each lens has a number of output maps showing all wetlands within the study area that are considered a high priority as viewed from that specific lens. The criteria for the lenses are described below:

Local Government Lens

The local government lens was used to produce output maps with the following criteria:

- Wetlands occurring on Private Land.
  - Falling under the jurisdiction of local government.
- Wetlands with at least one Red/Blue listed CDC occurrence (i.e., plant or animal).
  - For the important at risk species values.
  - Presumably more wetlands will become associated with listed species as additional assessment and data collection is conducted.
- Wetlands that are part of a wetland complex.
  - (i.e., occurring within 750 m of another wetland).
- Wetlands with a calculated Shoreline Development score of over 1.53
  - This was used as a measure of biodiversity with more complex shorelines being considered to have higher potential for biodiversity. The 1.53 value is the mean Shoreline Development score for all wetland within the study area.
- Wetlands with at least one of the identified Threats.

All wetlands within each regional district meeting these criteria were displayed and divided into two categories: Wetlands occurring within a DP area and wetlands occurring outside of a DP area. The goal was to show wetlands of concern that are currently identified by DP areas which trigger environmental assessment and further inventory or classification as development proposals are submitted versus those that aren't. A summary of the results of the lens is provided in Table 6.

Table 6. Summary of wetlands identified with the Local Government lens criteria.

Regional District	RDNO	RDCO	RDOS	Total
Wetlands within DP Area	63	307	102	**472**
Wetlands not within DP Area	112	11	426	**549**
Total	**175**	**318**	**528**	**1021**

The results indicate that RDCO has very few wetlands (11) that meet the Local Government Lens criteria and are not covered by a DP Area. Conversely, within RDOS there are 426 wetlands that meet the criteria and are not covered by a DP Area. The priority wetlands for this lens that are not within a DP Area are suitable candidates for immediate action.

Fish and Game Club Lens

The Fish and Game Club lens was used to identify wetlands that are anticipated to have greater value for hunting, fishing, or other recreational activities. The following criteria were determined as being representative of Fish and Game Club values:

- Wetlands occurring on Crown Land or other public lands (i.e., not private land).
  - Public lands used for fishing and hunting.
- Wetlands within 100 m of a road.
  - For recreational access.
- Wetlands within a designated Recreation Area.
  - Considered a positive factor for this lens based on suitability for camping or day use.
- Wetlands that are part of a complex.
  - Wetlands occurring within 750 m of another wetland as these tend to form more diverse habitats for wildlife.
- Wetlands with a calculated Shoreline Development score of over 1.53.
  - This was used as a measure of biodiversity with more complex shorelines being considered to have higher potential for biodiversity. The 1.53 value is the mean Shoreline Development score for all wetland within the study area.
- Wetlands associated with lakes or other open waterbodies.
  - For the fish and waterfowl habitats.
- Wetlands with at least one of the identified Threats.

Table 7. Summary of wetlands identified with the Fish and Game Club lens criteria.

Regional District	RDNO	RDCO	RDOS	Total
Wetland Polygons	330	399	670	1399

The output maps depict wetlands that are likely to have the most social and recreational values for general low-impact recreation associated with the fish and game club members (i.e. hunting and fishing). Using the threats categories helps indicate high-value recreational wetlands that are also at risk of degradation and are most likely suitable for protection, restoration, or enhancement.

Ecological Lens

This lens was used to determine wetlands of concern that occur on public land and with an interest in ecological values and threats. This lens may also help indicate jurisdiction, responsibility, and policy.

- Wetlands occurring on Crown Land or other public lands
  - Lands administered at the provincial level.
- Wetlands associated with other management areas

  - Important Bird Areas (IBA), Wildlife Habitat Management Areas (WHMA), and Okanagan Biodiversity Conservation Areas (Very High Rank).
- Wetlands with at least one Red/Blue listed CDC occurrence (i.e., plant or animal).
  - For the important at risk species values.
- Wetlands that are part of a complex
  - Wetlands occurring within 750 m of another wetland as these tend to form more diverse habitats for wildlife;
- Wetlands with a calculated Shoreline Development score of over 1.53.
  - This was used as a measure of biodiversity with more complex shorelines being considered to have higher potential for biodiversity. The 1.53 value is the mean Shoreline Development score for all wetland within the study area.
- Wetlands with at least one of the identified Threats.

All wetlands meeting these criteria were displayed and divided into two categories: wetlands occurring within a Park or other Protected Area and those occurring outside of a protected area. The output maps indicate those wetlands that are of conservation concern and fall within the jurisdiction of provincial land managers and allows comparison of those that are currently protected by park status versus those that are on other Crown Land. This lens may help focus and guide the conservation of at risk wetlands within Crown Land. A summary of the results of the lens is provided in Table 8.

Table 8. Summary of wetlands identified with the Ecological lens criteria.

Regional District	RDNO	RDCO	RDOS	Total
Within Protected Area	136	192	115	443
Not Within Protected Area	984	634	1526	3144
Total	**1120**	**826**	**1624**	**3587**

The results from this lens show that the majority of the wetlands meeting the ecological lens criteria and associated with one or more threats are mostly unprotected by parks or other conservation areas. Only 443 of the 3587 wetlands meeting these criteria (i.e., 12%) occur within parks or protected areas. This highlights the importance of identifying those wetlands occurring on public lands that currently do not have protected status and may need further assessment to determine risk.

Publically Identified Wetlands

This map output shows the wetlands that were identified by members of the public through the online survey, at the open house, or through direct contact. In general, these wetlands were highlighted because they are of concern and may be considered at risk or requiring further assessment. A summary of the publically identified wetlands by region is provided in Table 9.

Table 9. Summary publically identified wetlands.

Regional District	RDNO	RDCO	RDOS	Total
Wetland Polygons	32	162	130	324

In total, there were 324 wetlands that were identified by members of the public. Of these, five wetlands (all within RDCO) had not been previously identified from the various datasets and were manually digitized. Details about the publically identified wetlands are provided in Appendix E.

Other lenses may be completed in the future, as additional data is collected. At this time, the lack of detailed information prevents completion of a similar analysis using hydrologic, cultural, or economic criteria.

5.5 Reference Wetlands

Reference wetlands can be used to facilitate calibration of the evaluation template and to initiate monitoring of wetland condition through volunteer activity. They can also be used to provide a baseline with which to compare candidate wetlands for restoration. Specific reference wetlands were not selected during this phase of the project, as further discussion is required to determine the best suited wetlands from the various stakeholder perspectives. However, certain characteristics are described to guide the selection of reference wetlands, which include:

- Representation. Wetlands that provide a good example of wetlands of concern or those that comprise the majority of wetlands within the region (e.g., cattail marsh, shallow open water, and swamp class wetlands).
- Condition: Wetlands in good ecological condition and with functional ecological processes.
- Access: Can be accessed by vehicle or foot (or at least viewed) from public roads or lands.
- Social: Wetlands with important values to people, including recreational, aesthetic, cultural, or other socio-economic values.

Using these general attributes the following wetlands are provided as examples of suitable reference wetlands within each regional district:

- RDOS:
  - Vaseux Lake wetland complex
  - Penticton oxbows
  - Okanagan River oxbows between Oliver and Osoyoos

- RDCO:
  - Casorso Swamp
  - Robert Lake
  - Wetlands at south end of Ellison (aka Duck) Lake

- RDNO:
  - Wetlands surrounding Swan Lake
  - The Commonage
  - Wetlands along the Shuswap River (e.g., upstream from Enderby)

The reference wetlands can be used as benchmarks for other wetlands that are in poor or degraded condition. Wetlands with similar characteristics in terms of elevation, wetland class, form, or type, and landscape setting (e.g., urban, rural, natural) can be compared with the reference wetlands to determine methods for restoration or enhancement. The reference wetlands described above may be substituted or eliminated depending on future input and data collection. The reference wetlands are meant to provide examples of suitable benchmarks for future phases of the project and to facilitate public discussion, input, and involvement.

6.0 STRATEGIC IMPORTANCE

Strategically, wetlands of greatest importance include those that provide critical functions such as rare wildlife habitat, regulate flooding, provide clean water and nutrients to downstream habitats, and provide important recreational activities or cultural importance. The GIS database allows users to select for wetlands that have some combination of these or other factors that may be most important, depending on the 'lens' of the user. The user may refine wetlands to determine landuse, threats, rare species presence, or First Nations significance. In this way, the database provides ways to refine wetland searches and hone in on wetlands geographically, administratively, or hydrologically.

The review, assessment, and analysis, indicated that wetlands that are the most suitable candidates for conservation efforts are those that are:

- High in biodiversity (i.e., using GIS derived data such as wetland complexes and Shoreline Development score).
- High in other important biological values, such as Red and Blue-listed species occurrences.
- High in hydrological services, such as flood control and pollution uptake.
- Important socially for recreational purposes and cultural values.

Wetlands that are most at risk are those that are:

- Within agricultural areas (e.g., ALR) or grazing and/or forest harvest tenures (from available land tenure GIS data).
- Within urban landuse areas or in close proximity to roads (determined from the GIS database).
- *Not* within a local government DP Area.
- Within or adjacent to off-road vehicle recreational areas.

Wetlands that are the highest priority for restoration activities and active stewardship are those that are important biologically, socially, and/or hydrologically AND are considered at risk based on one or more of the identified Threat criteria. Other factors to consider when prioritizing wetlands for restoration include wetlands that have the following characteristics (WARPT 2011).

- Located in priority conservation areas, such as corridors, stepping stones, or refuges (as defined by the Okanagan Conservation Strategies);
- Located within major stream headwaters, valleys, or floodplains;
- Adjacent to other existing wetlands or parks/protected areas;
- Within private land where the owner has expressed willingness to sell or donate;
- Anticipated to have relatively low restoration costs per unit area;
- Strongly appreciated by the community, stakeholders, or other groups;
- Highly ecologically significant (e.g., rare wetland type or habitat for species at risk);
- Currently unprotected or on private land;
- Highly vulnerable to development pressure (based on landuse threats);
- Highly sensitive to changes in hydrology and water quality (from pollutant inputs);
- Highly economically valuable.

Key Threats

The most significant threats facing Okanagan wetlands were identified during the assessment and outreach. The following human activities are considered those that present the greatest threats to wetlands throughout the Okanagan region.

- Agriculture;
- Forestry;
- Urban/Rural Development;
- Transportation and Utility Corridors;
- Water Development (Dams, reservoirs, extraction);
- Recreation;
- Grazing;
- Industrial Operations;
- Mining.

These activities and landuses are known to lead to the general threat categories described below. These threats are also described in the Status of Biodiversity in BC (Austin et al. 2008) and other literature (Gayton 2007, Pryce et al. 2006). The threats have strategic importance as their identification will help determine those wetlands at greatest risk. The key threat types are listed below:

- Ecosystem Conversion:
    - Urban development;
    - Agricultural development;
    - Water Diversion.
- Ecosystem Degradation:
    - Fragmentation;
    - Water regime alteration;

  - Grazing;
  - Forestry activities;
  - Road building.
- Invasive Species:
  - Plants (e.g., purple loosestrife, yellow flag iris);
  - Animals (e.g., bullfrog, yellow perch).
- Environmental Contamination:
  - Pollution;
  - Stormwater runoff;
  - Sewage;
  - Agricultural runoff (i.e., nutrients).
- Other Threats:
  - Climate change.

To address these potential threats requires improved identification and mapping of wetlands throughout the study area. This will help ensure all wetlands are inventoried and accounted for and help determine levels of threat for each wetland. Strategically, this will also help prevent overlooking small sized or otherwise inconspicuous wetlands during broad, landscape level management activities and help monitor changes in wetland areas and distribution over time (Austin et al. 2008).

7.0 GOVERNANCE FRAMEWORK

Based on the *No Net Loss* of wetlands principle, it is clear that a coordinated, consistent, inter-regional approach to wetland conservation is required. It is up to each local government to identify and define wetland ecosystems within their local bylaws, RGS, OCP, or other governing documents. Below are summaries of recommended policy direction and governance framework concepts at various governmental levels. Sources for wetland management and governance policy directions that were reviewed include:

- Green Bylaws Toolkit (2007);
- Wetland Ways: Interim Guidelines for Wetland Protection and Conservation in British Columbia (Wetland Stewardship Partnership 2009);
- Wetland Habitat Management Strategy (City of Kelowna 1998);
- A Wetland Action Plan for BC (2010);
- Wetlands in the Lower Elevations of the Southern and Central Interior of British Columbia – Workshop Summary Report (Hamilton and Furness 2012).

7.1 Federal Government

There is relatively little federally administered land within the study area. However, there are several federal laws that apply to wetland protection, including:

- *Fisheries Act;*
- *Canada Wildlife Act;*
- *Migratory Birds Convention Act;*
- *Species At Risk Act.*

The *Canadian Environmental Assessment Act* (CEAA) applies when a federal department or agency proposes a project, provides funding or financial support to a project, or otherwise issues licenses, permits, or approvals. If the act applies, it will trigger a screening process or study that normally includes environmental assessment of the subject lands. It should be noted that this policy has undergone recent changes. The federal government has also developed several polices pertaining to wetland management and conservation. Some of these include:

- The Federal Policy on Wetland Conservation (Government of Canada 1991);
- Terrestrial Habitat Conservation in Canada (Albrecht, 2014); and
- North American Wetlands Conservation Council – Strategic Plan (2010-2020).

First Nations

The *Canadian Environmental Assessment Act* also applies to First Nations Lands and Indian Reserves throughout the region, given the act is triggered by financial assistance from the federal government for a particular project. In some cases the First Nations band will conduct assessment pursuant to the act, at the bands discretion.

Some of the regional First Nations, such as Westbank First Nation (WFN) and Penticton Indian Band (PIB), have produced guidance documents and policies equivalent to local government bylaws. Within these documents are policies pertaining to the natural environment and specific policies should be in place to guide the conservation of wetlands. The WFN Community Plan, for example, identified Environmentally Sensitive Areas and requires environmental assessment prior to development.

7.2 Provincial Government

The Wetland Stewardship Partnership (2010) developed a wetland action plan for BC that can be used to guide policies and governance frameworks. The goals of the action plan include the following:

- Develop a comprehensive and reliable wetland information base to support effective planning, law-making, and policy development.
- Increase public, industry, and government awareness of the importance of wetlands and commitment to wetland protection and restoration.
- Enhance legal protection of wetlands through meaningful and effectively enforced laws and policies.
- Ensure the effective integration of wetland protection in strategic land use processes.

- Secure the protection of priority wetlands and the conservation and restoration of natural wetlands throughout the province; and
- Improve coordination and strengthen partnerships to maximize effectiveness in wetland protection and restoration.

Incorporating the above mentioned goals at a regional scale would be a positive first step in preserving the remaining wetlands within the Okanagan. Provincial management of wetlands requires concerted efforts from multiple Ministries and the enforcement of various legislature. Some of the provincial laws that help protect and manage wetlands include:

- *Water Act (Water Sustainability Act)*;
- *Wildlife Act*;
- *Waste Management Act*;
- *BC Environmental Assessment Act*;
- *Environmental Management Act*;
- Riparian Areas Regulation;
- *Drinking Water Protection Act*;
- *Park Act* (Protected Areas);
- *Land Title Act* (Conservation Covenants);
- *Forest Act*;
- *Forest and Range Practices Act* (formerly Forest Practices Code);
- *Agriculture Land Commission Act*;
- *Land Act*;
- *Range Act*.

The primary laws that relate to wetlands are the *Forest and Range Practices Act*, *Water Act*, and *Wildlife Act*. Collectively, these acts regulate logging practices, changes in and about streams (including wetlands), and protection of wildlife management areas, many of which contain wetlands. The *Forest and Range Practices Act*, in particular, provides definitions of wetland classes and how to manage riparian buffers based on wetland size, proximity, and biogeoclimatic setting. These protocol are also described in the Okanagan Operational Plan for Small Lakes (MFLNRO 2013). BC also maintains an informal (i.e., not legally binding) policy of No Net Loss of wetland habitats (Nowlan and Jeffries 1996; Wetland Stewardship Partnership. 2010a). Other similar non-legally binding policies include various Best Management Practices and guidelines for the protection of aquatic resources.

7.3 Local Government

At the local government level, there is provision in the *Local Government Act* to waive or reduce Development Cost Charges (DCC) as incentive for landowners to conserve wetlands. This act also provides opportunity to include wetlands as defined Environmentally Sensitive Areas (ESA). This designation can be included in OCPs, RGS, and DP Areas. Stormwater Management Plans can

also be used to help guide wetland management and conservation. Other relevant local government legislation or protection mechanisms are described in the Green Bylaws Toolkit (2007).

Terms of Reference may be used to define wetlands using the ESA system. The ESA system can be used to define wetlands as Very High value areas (i.e., ESA 1), based on their rarity, complexity, sensitivity, and support of biodiversity. The ESA system can also be used to provide policies on how to manage ESA 1 areas, including retention targets (i.e., 80 to 100%) and compensation or restoration requirements. The Very High value areas are the highest priority for conservation and developments must take all reasonable measures to avoid impacts to them. The ESA 1 policies can also be used to prescribe buffers (e.g., 15 m from the high water level) and compensation requirements (e.g., 2:1 compensation ratio) to help uphold the *No Net Loss* principle. Natural corridors such as riparian areas along streams, that provide connectivity with other nearby wetlands (i.e., within approximately 750 m or less) are also considered using this system, as these proximal wetlands form larger wetland complexes that provide extremely valuable biological and hydrological functions.

Local governments can also establish and maintain Development Permit (DP) Area maps that identify sensitive aquatic ecosystems, including wetlands, and aim to protect, restore, and enhance them. The inventory and ground truthing of the wetlands used for the baseline maps will form a basis for the DP Area delineation and to ensure all potential wetland habitats are identified. Some of the general principles include:

- All wetlands are identified within some type of Environmental DP Area. Proposed developments that overlap with identified DP Areas may require assessment by a Qualified Environmental Professional (QEP) prior to development activities.
- Require environmental assessment by a QEP during re-zoning applications where triggered by the DP Area associated with wetlands.
- Create well-defined policy to address wetlands during the DP process. Identify minimum setback areas (i.e., leave-strips, buffers) from the edge (i.e., defined boundary, high water level, etc.) to meet or exceed the standards of RAR and based on fish presence or connectivity to fish habitat.
- Discourage land development within or directly adjacent to wetlands. This should include residential, commercial, industrial, and agricultural activities, as well as roads.
- Maintain the natural hydrology of the wetland by preventing infilling, culverts, discharge, and other inputs, such as stormwater.
- Maintain natural water quality standards by preventing stormwater inputs, sediment, and agricultural runoff (e.g., fertilizers, animal waste).
- Manage recreational access to limit impacts and disturbance to vegetation, soils, wildlife, and water quality. This may include motorized and non-motorized access, horses, dogs, and pedestrians.
- Manage livestock access to prevent impacts to soils, vegetation, water quality, and invasive plant encroachment.

- Protect important nesting, staging, breeding, and migration habitats for wildlife, such as amphibians, waterfowl, and other wildlife.
- Protect and preserve natural wetland processes to maintain wetland functions. Beaver activity, flooding, seasonal drawdown, and groundwater recharge and discharge should be maintained.
- Restrict the use of pesticides and fertilizers in or near wetlands.
- Prevent the release of stormwater and other untreated sources of pollution or contamination.

The City of Kelowna is the first municipality within the study area to comprehensively map wetlands (Hawes and Schleppe 2009) and integrate wetland protection into their latest Official Community Plan (City of Kelowna 2011). One of the findings of the WIM effort was that numerous wetlands were discovered occurring outside of the municipal Natural Environment DP areas. As such, there were no triggers in place to alert regulators about the presence of wetlands in the proposed development areas.

This highlights the importance of ensuring all wetlands that have been identified during this phase are included within existing or new DP areas. If not, the DP areas should be amended as soon as possible to include them. The City of Vernon has developed an Environmental Management Area Strategy (2008) to help identify and manage sensitive habitats, including wetlands. At the time of writing, the RDNO was in the process of updating their DP areas to include wetlands, as identified during this phase of the project. As well, RDOS was in the process of identifying suitable Environmental DP Areas. Other governance framework recommendations include:

- Protect aquatic ecosystems using methods and processes that include DP process, covenants, zoning amendments, development servicing bylaws, and park dedication, among others.
- Provide incentives for wetland conservation, stewardship, restoration, and enhancement through property tax breaks or other financial benefits.
- Coordinate and communicate with provincial and federal government to ensure effective administration of relevant legislation including the provincial *Water Act*, *Fish Protection Act*, and the federal *Fisheries Act* (note that these laws have changed or are in the process of being changed).
- Increased public awareness of the biological and socio-economic values of wetlands to foster a greater sense of stewardship and wetland appreciation within the communities.

This phase of the Okanagan Wetlands Strategy addresses several of the goals described above, including collecting wetland information and increasing public awareness. Future policy development will require coordination between local governments within and across the regional districts. A basin-wide approach to development permitting will improve consistency of environmental assessment reviews and permitting processes.

7.4 Tools

There has been extensive work done to address wetland loss, conservation, restoration, and policy throughout the region and internationally. Provided below are a number of provincial, federal, and international toolkits and plans that are available online to guide planners, development services staff, and other landuse managers.

- Green Bylaws Toolkit;
  http://www.greenbylaws.ca/
- Wetland Action Plan for BC;
  http://bcwetlands.ca/wp-content/uploads/BCWetlandActionPlan_WSP_2010.pdf
- Wetlands in BC: A Primer for Local Governments (Wetland Stewardship Partnership);
  http://bcwetlands.ca/tools/
- Protecting British Columbia's Wetlands: A Citizen's Guide;
  http://wcel.org/resources/publication/protecting-british-columbias-wetlands-citizens-guide
- Wetlands At Risk Protection Tool (WARPT);
  http://www.wetlandprotection.org/
- Adapting Watershed Tools to Protect Wetlands;
  http://www.wetlandprotection.org/images/stories/PDFs/5_wetlandsarticle3.pdf
- US EPA Recovery Potential Indicators;
  http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/recovery/index.cfm
- Wetlandkeepers Handbook (BCWF);
  http://www.dfo-mpo.gc.ca/Library/240212.pdf
- Wetland Resources Action Planning (WRAP) Toolkit;
  http://www.wraptoolkit.org/
- IUCN Integrated Wetland Assessment Toolkit;
  http://www.iucn.org/about/work/programmes/species/our_work/about_freshwater/what_we_do_freshwater/darwin_freshwater/
- Environmental Law Institute Wetlands Program;
  http://www.eli.org/freshwater-ocean/wetlands

8.0 RECOMMENDATIONS

Based on the results of the evaluation template and accompanying baseline maps, a number of recommendations and next steps for the project have been identified.

1. <u>Update and Refine the GIS database</u>
   Gaps within the GIS database should be addressed as a desktop exercise. This includes:
   - Address overlapping polygons.
   - Address missing data (gaps) including unidentified wetlands.

- Combine point data and hardcopy data with wetland polygons Digital data obtained from DU (i.e., shapefiles) were incorporated into the database. Hardcopy (i.e., photocopied) documents were not entered into the database due to time and budgetary constraints. Point data from public input also needs to be digitized and combined with the existing database.
- Run multiple iterations of the evaluation template to ensure it provides a useful and reasonable output of priority wetlands.
- Add additional data as it becomes available and as resources allow.
- Utilize the data to hone in on wetlands with extraordinary values and impending threats.
- Identify the most 'at risk' wetlands requiring immediate action.

2. Develop Targets and Timelines

   Set objectives, targets, and performance measures and create focal areas (most at risk or least protected) for wetland conservation and protection (e.g., valley bottom wetlands that do not have protected status, are not within a DP area, are on private or agricultural land, etc.). This will ensure wetlands are identified in each regional district and member municipality DP Areas. Those outside of municipal boundaries should be protected through other measures or management techniques. These areas are under provincial or federal jurisdiction or occur on First Nation lands.
   - Develop consistent and clear management objectives across the entire region with similar rules and requirements to private landowners (e.g., DP areas and setback requirements).
   - Incorporate *No Net Loss* mandate and develop compensation requirements for those that are disturbed or degraded.
   - Utilize conservation covenants and security deposits to prevent future impacts.
   - Specific language should be used to guide and inform developers, land managers, planners, and environmental consultants to ensure there is a common understanding of what is expected and required in terms of wetland conservation, development limitations, compensation or restoration requirements, and buffer establishment.

3. Conduct Inventory and Mapping

   Using the evaluation template, develop a short-term plan (i.e., over next 2 to 5 years) to assess, map, and complete inventories of all wetlands within the study area (or as many as is deemed feasible).
   - Utilize a standardized data collection sheet (as provided in Appendix D or equivalent provided by MFLNRO or BCWF) to ensure consistency.
   - Identify specific parties to include in this step, promote volunteer involvement, and source funding.
   - The entering of data and maintenance and updating of the database should be undertaken by a single organization that can provide quality assurance/quality control.

4. Refine Prioritization of Wetlands

   Revise and refine the priority wetlands as viewed from the various lenses or from a general, broad-based perspective. The priority wetlands may change as more data is collected and as more people and groups come forward with concerns or interests in wetland conservation. Public outreach resulted in individuals identifying a desire to volunteer to help with wetland conservation and enhancement within their communities, but a champion organization and consolidated program should be established that will engage as many members of the public as possible while pooling resources for protection and enhancement works. At this point, a database of interested parties and their areas of interest for stewardship and further training has been compiled and will be provided to the BCWF.

5. Protect Priority Wetlands

   Begin the process of securing lands or otherwise protecting at risk wetlands from degradation or loss.

   - Promote conservation (land securement, stewardship, covenants, purchase, incentive programs for private landowners).
   - Develop incentives to maintain, restore or enhance wetlands that occur on private land (e.g., property tax exemptions or other financial incentives).
   - Encourage voluntary compliance, self-policing and reporting of violations within the local stewardship groups, general public, or other stakeholders (i.e., BCWF members).

6. Monitor, Restore, and Enhance Wetlands

   Develop a system of monitoring and enforcement for wetland protection. A complete inventory of Okanagan wetlands will provide important baseline information to measure changes or losses over time (Austin et al. 2008).

   - The Foreshore Inventory and Mapping (FIM) methodology provides recommendations to be repeated on a regular cycle of 5 to 8 years in order to measure rates of change (Schleppe 2010). In this way, the rate of habitat loss or degradation can be quantified and analyzed. A similar process should be considered for the wetland mapping with measures of degradation built in to facilitate the measurement of change over time. The GIS data layers will allow land use planners and managers to observe, record, and document change visually across the landscape. Furthermore, the data will be useful to determine measurable protection targets and long-term conservation goals.
   - Develop a monitoring plan for selected reference or baseline wetlands (i.e., as per Harrison and Moore 2013) to monitor wetland condition, modification, disturbance, and other changes over time.
   - Use reference wetlands from Phase 1 and feedback obtained through the public workshop/open house and online survey to help coordinate group or clubs best suited to undertake detailed assessment, monitoring, and restoration activities, as applicable. The baseline map grid will help to determine which groups should be associated with each map square.

7. Education and Outreach
   Continue to educate and promote sense of value of wetlands among public groups (e.g., Wetlandkeepers and Map our Marshes workshops). Develop and deliver a targeted strategy to communicate with key groups that impact wetlands (e.g., real estate, agriculture, landowners, etc.) to help promote a sense of value of wetlands occurring on private property.
   - Organize and coordinate the consistent collection of wetland data and maintain a single database that can be readily updated as new information is gathered.
   - Make the data collected during Phase 1 and all future data publically accessible in a user-friendly format.

8.1 Next Steps

Part of moving forward onto subsequent phases of the project includes addressing data gaps that were encountered during the data collection and outreach phase. Many of these gaps are related to the wetlands database and the lack of general information available for the many wetland polygons throughout the study area. As such, it will be key to refine and update the database in order to allow better assessment and inventory of wetland condition, values, and priorities. Important next steps for future phases of the Okanagan Wetlands Strategy project are described below.

1. Address GIS Gaps

Update and refine the GIS data. This desktop exercise includes addressing overlaps from multiple data layers, joining point data with polygon data, and generally 'cleaning up' the data. Specific tasks required for this step include:

- Identify and eliminate the approximately ~1400 overlapping polygons from multiple data sources.
- Conduct a cursory aerial photo search by TRIM grid of entire study area to identify wetlands that may have been overlooked.
- Identify priority areas where spatial extents of wetland polygons need to be modified to more accurately depict wetland boundaries.
- Populate data to address key gaps, such as urban encroachment using zoning.
- Re-draw accurate boundary where appropriate, and attach relevant data.
- Cross reference point data with polygon data and aerial photos to determine additional wetlands (i.e., FIM, LRIM, SHIM, and TEM/SEI datasets).
- Enter hardcopy data from DU and cross reference the data with appropriate wetland polygons.
- Include other data as it becomes available or as opportunities exist to manually create or refine wetland polygons.
- Address other gaps within the GIS database and data where possible.
- Use the refined wetland polygons to guide the update or creation of refined Environmental DP areas for each regional district.

2. Public Outreach

The involvement of regional fish and game club members and other interested parties should be promoted and involvement in identification of suitable wetlands for conservation or restoration encouraged.

- Develop a screening process to help determine proposed conservation or restoration projects which have the highest potential for success, group support, funding, or feasibility.
- Collect input from the fish and game clubs to help refine the lens for that group and better represent their interests.
- Organize and initiate the collection of field data by the fish and game clubs to characterize the wetlands of interest or priority. Mapping, inventory, and assessment of the wetlands can be added to the existing database.
- Distribute points and comments associated with wetlands identified in the public outreach component to planning staff at the respective regional districts. Much of the feedback was essentially complaints regarding specific locations, and given that municipal bylaws/allocation of staff time is often complaint driven, this may be an effective tool in wetland protection of areas that require immediate attention.

3. Conduct Inventory and Assessment

Conduct inventory on priority wetlands, including ground-truthing of selected reference wetlands and determine baseline conditions, refine perimeter mapping, and collect other evaluation data.

- This should begin with wetlands identified in this report, including priority wetlands as perceived from the different lenses and as shown on the priority action grid maps (Figures 2 and 3).
- Inventory should be conducted using a standard inventory data sheet, based generally on the example provided or equivalent, with other qualitative data fields to help guide the prioritization.
- This action should include involvement from the various stakeholders and parties interested in getting involved and conducting on-the-ground activities to help contribute to wetland conservation.

9.0 CONCLUSION

It is well known that losses from development and degradation have taken a severe toll on wetlands throughout the Okanagan region and there is a strong desire to not only halt the loss, but to recover lost habitats through restoration, enhancement, and construction. While many reports, inventories, and action plans have been developed over the years, there appears to be a continuing trend in wetland degradation and loss as the population in the Okanagan valley continues to expand, driving land development and conversion of natural environments into urban and agricultural uses. The results of our evaluation template and mapping suggest that a number of high priority wetlands can be identified within each regional district that require immediate action to assess and protect.

The data currently available is limited; however, publically available landuse information was utilized to determine threats facing wetlands and infer values based on proxy metrics from existing wetland polygon information. These criteria were used as a series of filters to represent wetland prioritization 'lenses'. The results of this exercise provided a number of high priority wetlands for each lens and within each regional district. This provides a reasonable starting point for determining actions to address the identified high priority wetlands. The evaluation template may be used for identifying priority wetlands based on landuse, protected status, and potential threats to help focus a course of action for each wetland, depending on the landuse characteristics.

While the evaluation template and coarse filter priority mapping at this phase of the project is broadly based, it provides a path forward and an opportunity to involve fish and game clubs and other stakeholders to contribute to the database through assessment, inventory, and stewardship actions throughout the region. During the development of the lenses, evaluation template, and recommended actions, gaps in the available GIS data were identified and recommendations were provided to address those gaps in future phases of the project. A number of next steps have been developed that should be followed as the Okanagan Wetlands Strategy moves forward into subsequent phases. The collaborative collection of wetland data will promote community involvement and a sense of pride in wetland management, as well as improving the database, which will allow for more refined evaluation and prioritization in the future. Knowing where wetlands are is critical to protecting them and the baseline mapping completed in this first phase of the Okanagan Wetlands Strategy is an important step towards that goal.

10.0 CLOSURE

This Okanagan Wetlands Strategy: Phase 1 report has been prepared for the Okanagan Basin Water Board, Regional District of Central Okanagan, and BC Wildlife Federation. If you have any questions pertaining to this report, you may contact the undersigned at your convenience.

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12.0 GLOSSARY OF TERMS AND ACRONYMS

ALR - Agricultural Land Reserve

BCWF - BC Wildlife Federation

BCWS - BC Wetland Society

BEC - Biogeoclimatic Ecosystem Classification

BMP - Best Management Practice

CDC - Conservation Data Centre

CWCS - Canadian Wetland Classification System

DEM - Digital Elevation Model

DP - Development Permit

DU - Ducks Unlimited Canada

EAC - Environmental Advisory Commission

EPA - US Environmental Protection Agency

ESA - Environmentally Sensitive Area

FIM - Foreshore Inventory Mapping

GIS - Geographic Information System

GPS - Global Positioning System

IBA - Important Bird Area

IR - Indian Reserve

IUCN - International Union for Conservation of Nature

LRIM - Lower Shuswap River Inventory and Mapping

MFLNRO - BC Ministry of Forests, Lands, and Natural Resource Operations

NGO - Non-Governmental Organization

OBWB - Okanagan Basin Water Board

OCCP - Okanagan Collaborative Conservation Program

OCP - Official Community Plan

ONA - Okanagan Nation Alliance

OSLRMP - Okanagan-Shuswap Land and Resource Management Plan

OWES - Ontario Wetland Evaluation System

PIB - Penticton Indian Band

RAR - Riparian Areas Regulation

RDCO - Regional District of Central Okanagan

RDNO - Regional District of North Okanagan

RDOS - Regional District of Okanagan-Similkameen

RGS - Regional Growth Strategy

SD - Shoreline Development index

SEI - Sensitive Ecosystem Inventory

SHIM - Sensitive Habitat Inventory Mapping

SOSCP - South Okanagan-Similkameen Conservation Program

TAC - Technical Advisory Committee

TEM - Terrestrial Ecosystem Mapping

TRIM - Terrain Resource Inventory Management

WARPT - Wetlands-At-Risk Protection Tool

WRAP - Wetland Resources Action Planning

WFN - Westbank First Nation

WHMA - Wildlife Habitat Management Area

WIM - Wetland Inventory and Mapping

APPENDIX A
Workshop Group Topics and Comments

- **Group 1: What is a priority wetland? How should they be evaluated? Should they all be priority (i.e. constructed vs. natural)? Can we afford to lose any more?**
    - All wetlands are a priority—natural and engineered or created
    - Avoid loss (not a net loss; seek to increase area of wetlands), but some flexibility to move/or change.
    - Don't get stuck on exactly what we have today – land changes.
    - Communicating the importance and value of wetlands to the community. Example message: "Size matters, but both small and large wetlands are important."

- **Group 2: Incentives for Protection vs. Regulation. What do we need to do to truly reverse the losing trend (i.e., financial/tax incentives etc.)? How do we encourage wetland conservation and enhancement?**
    - 50% of the group wanted better regulations
    - Need tools at different scales of government for no further loss
    - In addition to protection and regulation, aggressive land acquisition needed
    - Private property owners MUST have incentives- tax breaks, exceptions with BC Assessment, wetland and sensitive areas
    - Conservation Land Commission similar to ALR
    - Economic valuation of water – levy for protection
    - Economic, societal and environmental incentives needed

- **Group 3: Conflicts regarding landuse (eg. development, agriculture) and wetland conservation. How do we resolve this?**
    - Incentives-mitigation bank, conservation tax, education, land bank
    - Conflicts identified with agriculture, storm water management, infrastructure, roads, parks
    - Need defined values/functions: How to value farmland vs wetland?

- **Group 4: Mapping and Integration into landuse planning. (i.e., OCP's) and development of compliance guidelines for protection, management and restoration of wetland ecosystems).**
    - Identify existing landuse planning tools and processes.
    - Refining mapping so it can be used at a local planning scale (spatially accurate) eg. OCP – data at appropriate coverage
    - Management classification by wetland category e.g. constructed, agriculture pond created, natural, historical, historical → modified, etc.

- Then develop guidelines for each being cognizant of user needs e.g. constructed storm wetlands may need periodic maintenance.
- Rewarding for protecting ecological services (e.g. D. Zehnder program on agriculture).
- Integrate with ONA mapping and other First Nations.
- For local government– protection measures integrated into all local government services.

- **Group 5: Policy and Regulation. Are there sizable gaps in policy among municipalities regarding wetland protection? How can we improve?**
  - Need a benefit to owners to donate/conserve
  - Need to put a value to wetlands
  - Conservation covenants
  - Reduce taxes.
  - Build into BC assessment.
  - Accurately identify wetland locations/information- City of Kelowna WIM example
  - Private properties- maybe not building anything that would trigger permitting/review, but filling in wetland areas- address with soil bylaws?
  - Consistent policy up and down the valley needed – review and ascertain gaps

- **Group 6: Public awareness, education, and Stewardship. Wetlands occur prevalently on private land. How can we better communicate the values of wetlands to the general public? How can we provide more support for stewardship initiatives in wetland protection, enhancement, and management?**
  - Need to reach private property owners
  - Negotiate to protect – meeting landowner needs with community needs (eg. density bonus, purchase…).
  - Make sure the public understands the value of wetlands to community health – the positives need to be communicated in digestible bytes
  - Social media
  - Get kids outside and into wetlands- schools, parks
  - Stewardship groups- Adopt A Stream example in Kelowna
  - Art, storytelling, celebrations- wetland festivals

APPENDIX B

Survey Summary and Results

A summary of the survey questions and results is provided below.

Question 1: Name and location

Of the 120 respondents, 114 provided their name and/or geographical location. Of the 114 respondents that included their geographical location in their survey, 21% are from the north Okanagan, 63% are from the central Okanagan, 13% are from the south Okanagan, and 3% are out of the study area. An estimated 215 fish and game club members received the presentation at their monthly club meetings; hard copies of the survey, as well as handouts with the online survey link, were provided. A review of survey submissions found that 46% of survey participants were confirmed to be fish and game club members. This equates to around 26% of people attending the targeted fish and game club presentations having completed the survey.

While not all participants provided their names or organizations, the spectrum of participants included fish and game club members, Ducks Unlimited Canada, former City of Kelowna Councilor, District of Coldstream Councilor, Westbank First Nation staff, Okanagan Nation Alliance fisheries staff, Regional District North Okanagan, Regional District Central Okanagan Board members, City of Kelowna staff, engineering consultants, biological/environmental consultants, South Okanagan Similkameen Conservation Partnership, Allan Brooks Nature Centre, local media, UBCO and Okanagan College students and faculty, doctors, reclamation specialists, agricultural property owners actively farming, Central Okanagan Naturalist Club Members, Central Okanagan Land Trust members, Glenmore Community Association, District of Lake Country, BC Wildlife Federation, registered forest technicians, Friends of the Oxbows, and former provincial Ecosystems staff.

Question 2: How do you use wetlands?

This question was answered by 119 of the 120 participants. An activity as simple as walking received the highest response at 77%, followed by aesthetics at 66% and general recreation at 65%. Of the ten (10) categories presented, research received the lowest response at 17%. Figure B-1 provides an overview of wetland use results.

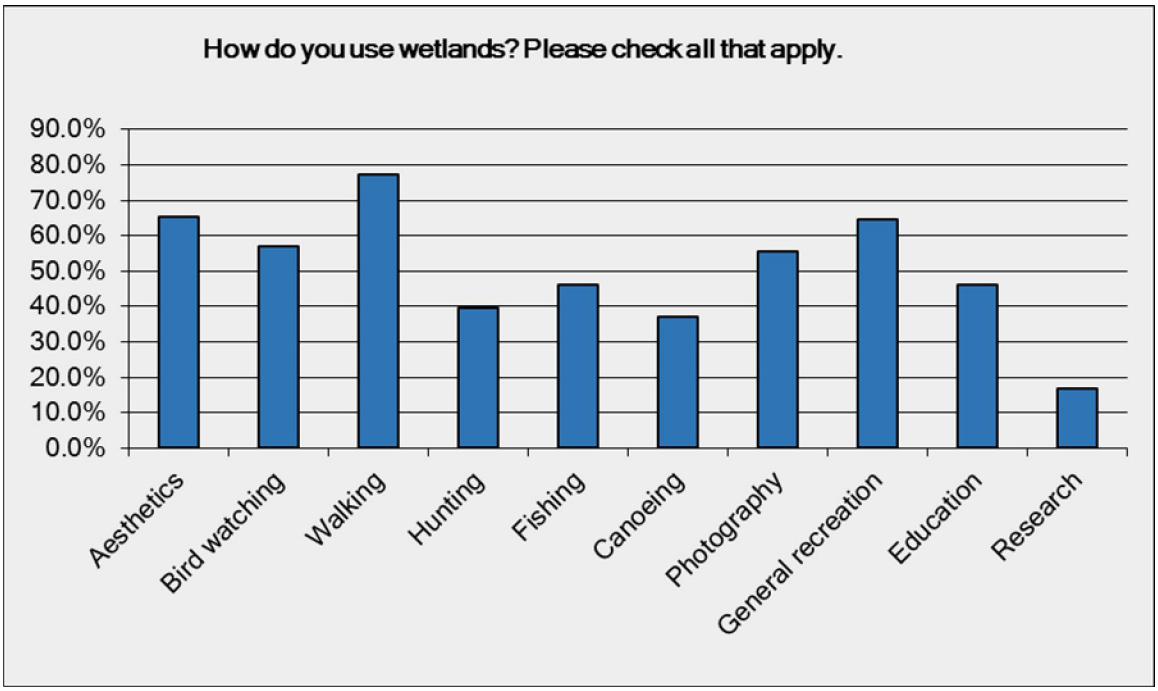

Figure B-1. Results of Okanagan Wetlands Strategy Phase 1 Survey Question 2.

Other comments provided regarding wetland use are as follows:

- Mushroom hunting
- ecology and ecosystem health
- becoming closer to nature
- exploring nature with children, grandchildren- "hoping they will remember and continue to value and enjoy these valuable habitats"
- kayaking
- traditional knowledge, ceremonies, and practices take place in wetlands
- horseback riding
- atv and snowmobile in winter
- agriculture
- observe wildlife
- general well being
- municipal benefits
- benefit to my drinking water and air
- Mostly I try to leave them alone or I pick up garbage when I see it.
- vegetation management, as an agrologist native flora & fauna, personal interest
- would like to make it available for research
- working as a grade 9 class to research Okanagan wetlands and importance to diversity and sustainability.

Question 3: What makes a wetland valuable in your opinion?

Of 120 survey respondents, 113 people completed this open-ended question. Commonalities in these responses included biodiversity, habitat value, wildlife, water storage, and water filtration and quality. Aesthetics, accessibility, landscape rarity, and recreational opportunities, including "nature in the city", were also cited as components that make wetlands valuable.

Question 4: At a regional level, we are connecting with stakeholders to prioritize resources for wetland conservation. In your opinion how important are wetlands to the following services?

A total of 118 survey respondents answered this question regarding the importance of wetlands to services including: aesthetics, biodiversity, climate change, condition of adjacent riparian and upland communities, connectivity, cultural, ecological rarity, general fish and wildlife habitat value, harvestable fish, harvestable waterfowl, harvestable wildlife, rare and endangered species (Species at Risk), recreational opportunities, resource extraction, water quality, and water storage capacity. General fish and wildlife habitat value, water quality, biodiversity, and rare and endangered species were the services which had the highest (72-79%) number of respondents rating importance of wetlands to these services as VERY HIGH. Water storage capacity was rated as VERY HIGH importance by 65% of respondents. Over 57% of respondents rated wetlands as being of LOW importance to resource extraction. Respondents were relatively evenly divided between LOW, MODERATE, HIGH, and VERY HIGH importance in the categories of harvestable fish, harvestable wildlife, and harvestable waterfowl.

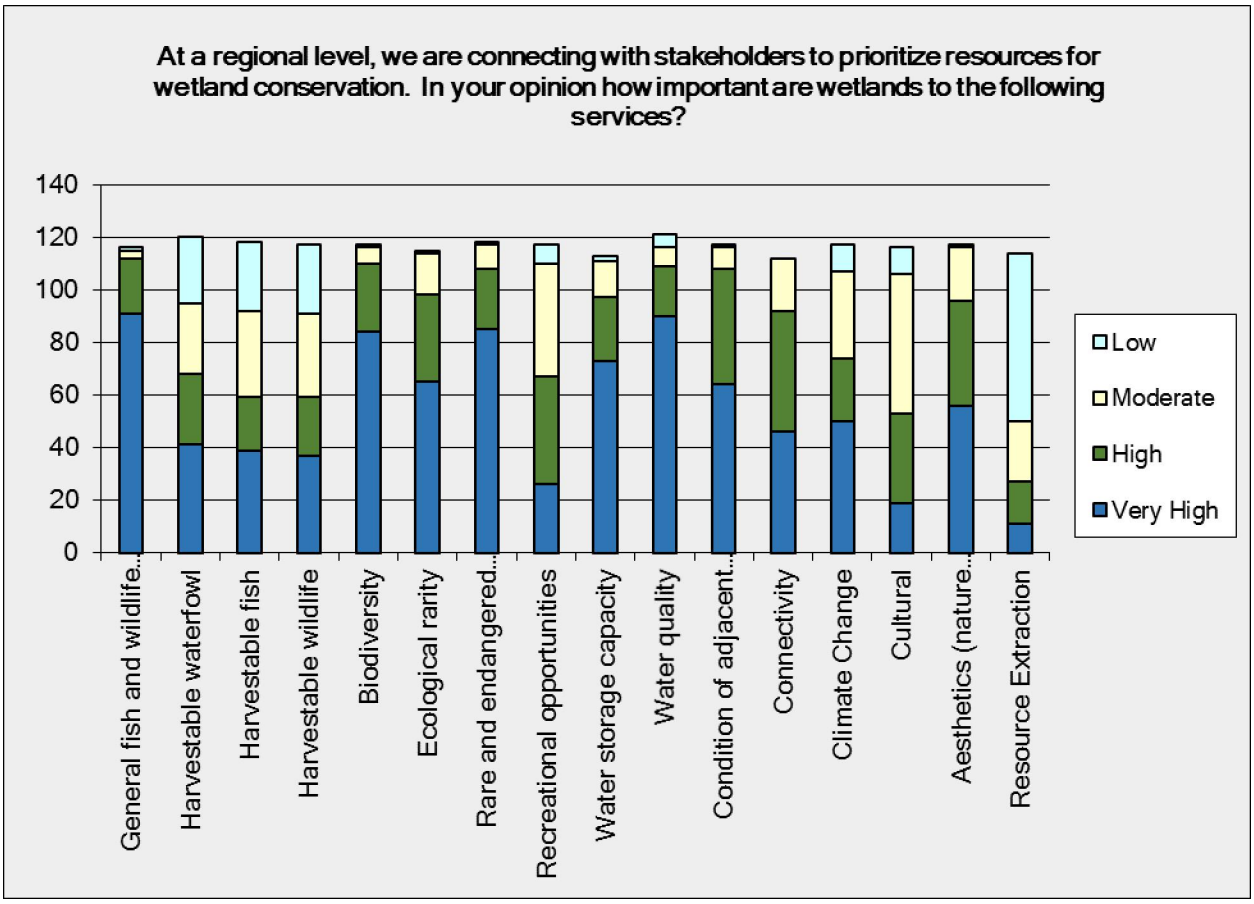

Figure B-2. Results of Okanagan Wetlands Strategy Phase 1 Survey Question 4.

Question 5: Please provide the three (3) wetland services listed above in question 4 which are of most importance to you.

This question was completed by 109 of 120 survey respondents. The most common service listed as a priority was water quality at 58%, followed by biodiversity at 48%. General fish and wildlife and water storage were identified by 22% and 20% of respondents, respectively. Aesthetics was an important service to 14% of respondents, while 13% identified ecological rarity, and 12% rated rare and endangered species (Species at Risk) as being of most importance. Harvestable wildlife was listed by 10% of respondents as being of most importance. Harvestable fish, harvestable waterfowl, climate change, and recreation were listed by 6% of survey respondents as being most important. Resource extraction was rated by one (1) person, or 0.9%, as being most important, whereas cultural values and condition of adjacent riparian and upland did not receive any response (0%).

Question 6: Please categorize the relative importance of the following wetland functions.

This question was answered by 119 survey respondents. The majority of respondents rated each wetland function as being very high in terms of relative importance. As many as 79% of

respondents identified fish and wildlife habitat as being very high, while 75% of respondents identified water quality as being of very high relative importance. Figure B-3 illustrates the number of survey respondents and categorizing of the relative importance of the eight (8) functions presented.

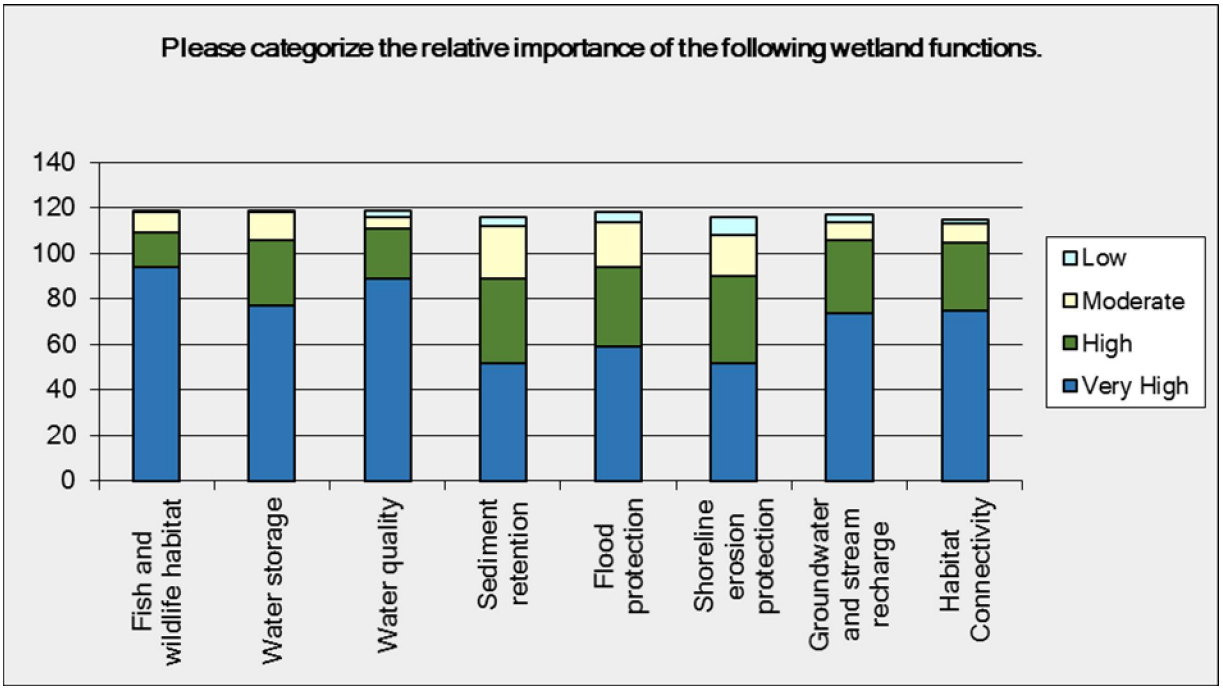

Figure B-3. Results of Okanagan Wetlands Strategy Phase 1 Survey Question 6.

Question 7: Are you aware of municipal bylaws and/or policies which protect wetlands in our communities?

Of the 119 survey respondents that answered question 7, 40% were aware of municipal bylaws or policies for wetland protection, while 26% were unaware, and 34% were unsure (Figure B-4). In addition to answering the question, 38 survey participants provided additional comments. Some indicated a desire to learn more and have the information more readily available. Others were not aware of specific bylaws or guidelines, but expressed a hope that there are protection measures in place. A common theme was concern for the lack of protection and enforcement for wetlands, and in particular those waterbodies not associated with fish-bearing streams and the provincial Riparian Areas Regulation (RAR). Some respondents indicated that wetlands seem to be a low priority and there is an overall desire for increased protection. There was also the presentation of examples where wetlands have been filled in and riparian areas developed with housing and sportsfields (Mission Creek).

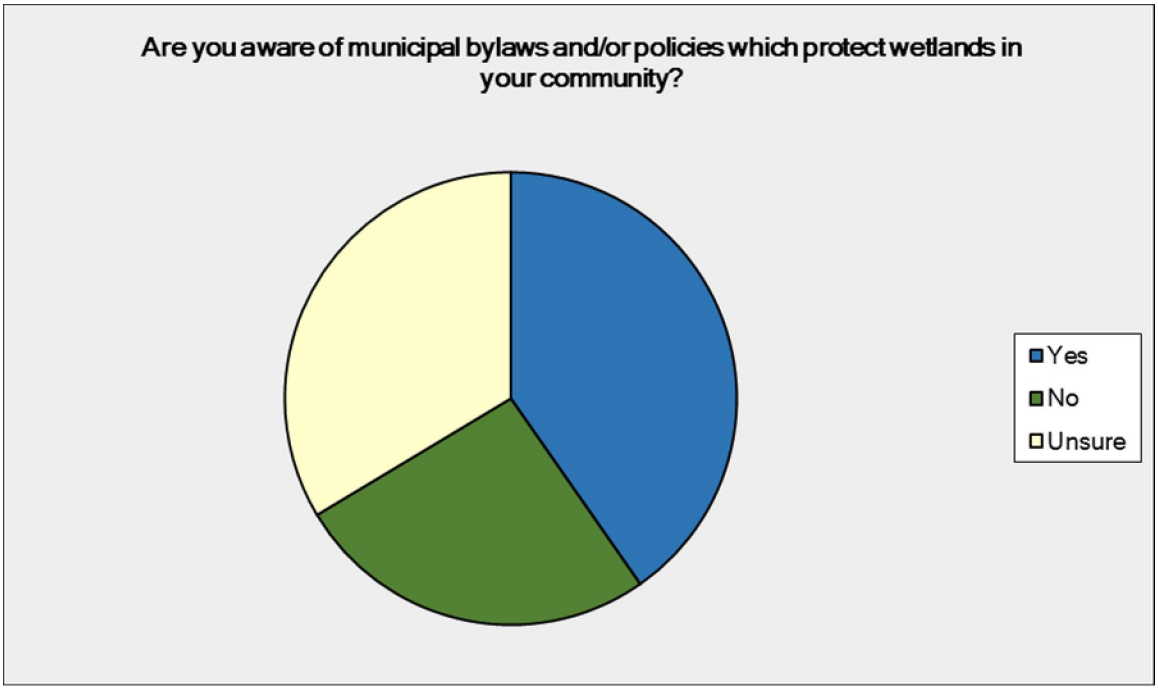

Figure B-4. Results of Okanagan Wetlands Strategy Phase 1 Survey Question 7.

Question 8: Do you feel the level of protection currently allocated for wetlands is adequate?

All 120 survey participants responded to question 8, which resulted in 0% of respondents feeling the level of protection of wetlands to be very adequate, 6% felt wetlands were adequately protected, 28% felt the level of wetland protection was somewhat adequate, 8% were unsure, and 58% of respondents felt that the current level of wetland protection was inadequate in their communities.

Of the 120 responses, 54 comments were provided. Many noted that given the loss of wetlands within the region, protection is not adequate. Development pressure was mentioned in 16 of the 54 comments, while six of the 54 comments referenced concern with agricultural rights versus wetland protection. A lack of provincial protection under the Water Act was noted, with less protection if fish are not present. Comments were also made in regards to small wetlands not receiving recognition as being valuable, and of private landowners and developers not realizing what constitutes wetland designation and why these areas are important.

Some recommendation-based comments were as follows:

- More incentive to land owners.
- More due diligence before wetlands and adjacent areas are developed.
- More can be done.
- Need to be officially recognized on government maps- accurate inventory- before they are allotted appropriate protection.

- Concerning that there is inadequate protection for upland areas where turtle nesting habitat is available.
- "There would be great benefit at all government levels from harmonization of all wetland protection and of the scope of restoration where practicable. Provincially, it would greatly facilitate the application of existing law and policy if wetlands of all types were regarded as requiring protection against any potential impacts except where it can be clearly shown that impacts of a proposed land or water use will have impacts that can be mitigated without causing long term impacts on species or the ecosystems of which they are a part."
- More buffer zone retention is needed.
- Increased public awareness of wetland values; example given that much of Kelowna was built on wetlands, but most residents are likely unaware.

Figure B-5 illustrates results from survey question 8.

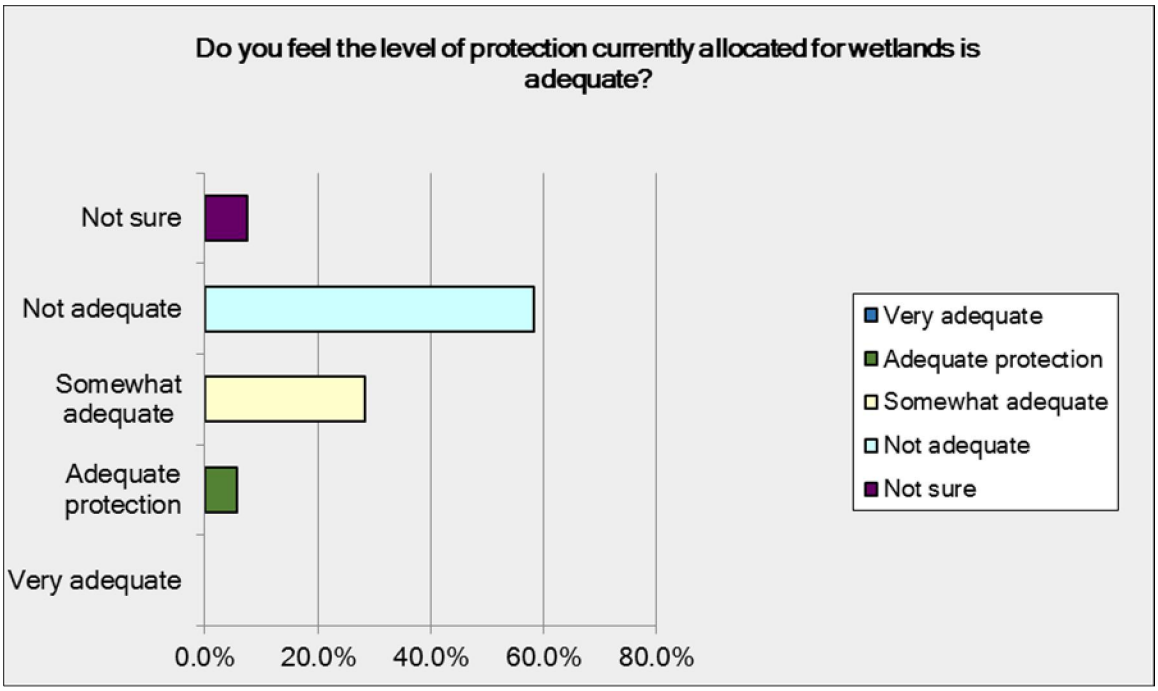

Figure B-5. Results of Okanagan Wetlands Strategy Phase 1 Survey Question 8.

Question 9: How concerned are you about the following threats to wetlands within your area? Please provide location description or UTM coordinates in the comment field if you are aware of a wetland at risk.

Question 9 was answered by 116 of 120 survey respondents. Residential development rated as the activity with the highest number of respondents selecting that they were very concerned at 57%, followed by infill of wetlands at 52%, and recreational vehicles and habitat fragmentation at 51%. Not all participants commented on each activity type. For example, only 106 respondents

commented on “Alteration to hydraulic regime”, with 42% being very concerned, 36% concerned, 15% somewhat concerned and 7% not concerned. The activity/wetland threat with the highest number of respondents not concerned was livestock grazing at 11%, closely followed by climate change at 10%.

The second part to this question requested that a location description or UTM coordinates be provided in the comment field if aware of a wetland at risk. Locations identified by the public through the survey and public presentations and workshop as being areas of concern have been mapped (Publically Identified Wetlands Map). A total of 22 respondents provided additional comments regarding wetland threats and specific areas of concern. Details about the publically identified wetlands are provided in Appendix E. Eleven (11) of the comments provided location information and are as follows:

- Invasive species in Okanagan Lake.
- Kearns Creek, intermittent and unprotected by current law.
- We live very close to a neighborhood 'duck pond' with bulrushes, etc. Chichester Park, in the Rutland area of Kelowna. This wetland seems to be healthy enough, but by mid-summer it gets choked with algae.....we've been told it due to among other things, excess fertilizers finding its way into the water....I'm not sure what can be done to lessen this source of pollution...
- Swamp Road area (Kelowna), the areas along Mission Creek (Kelowna), Okanagan Lake shorelines.
- Meighan Creek in Armstrong through Agricultural Land and Deep Creek along Otter Lake Road and impact on Otter Lake.
- Kalavista Lagoon wetland at the head of Kalamalka Lake. Longitude 119º 15'45.36" W , Latitude 50º13' 42.99"N and the RDNO Wetland at Aberdeen and Hwy 6 longitude 119º 13' 59.74"w Latitude 50º14'31.87" N
- Class 1 wetland Rawlins Lake; several water act violations associated with farming were never addressed.
- In Penticton, agricultural operations and livestock grazing are not co-located with the two creeks and oxbows.
- Wetlands adjacent to Vernon Creek as it enters Okanagan Lake, also along Coldstream Creek at Kal Lake (both have high development pressure). Wetlands surrounding Swan Lake must deal with agricultural activity nearby.
- Mill Creek in the upper reaches and after it crosses Hwy 97.
- Kelowna Nordic cross country ski trails-Riverside Trail- mud bogging in wetlands McCullough Road, within RDCO.

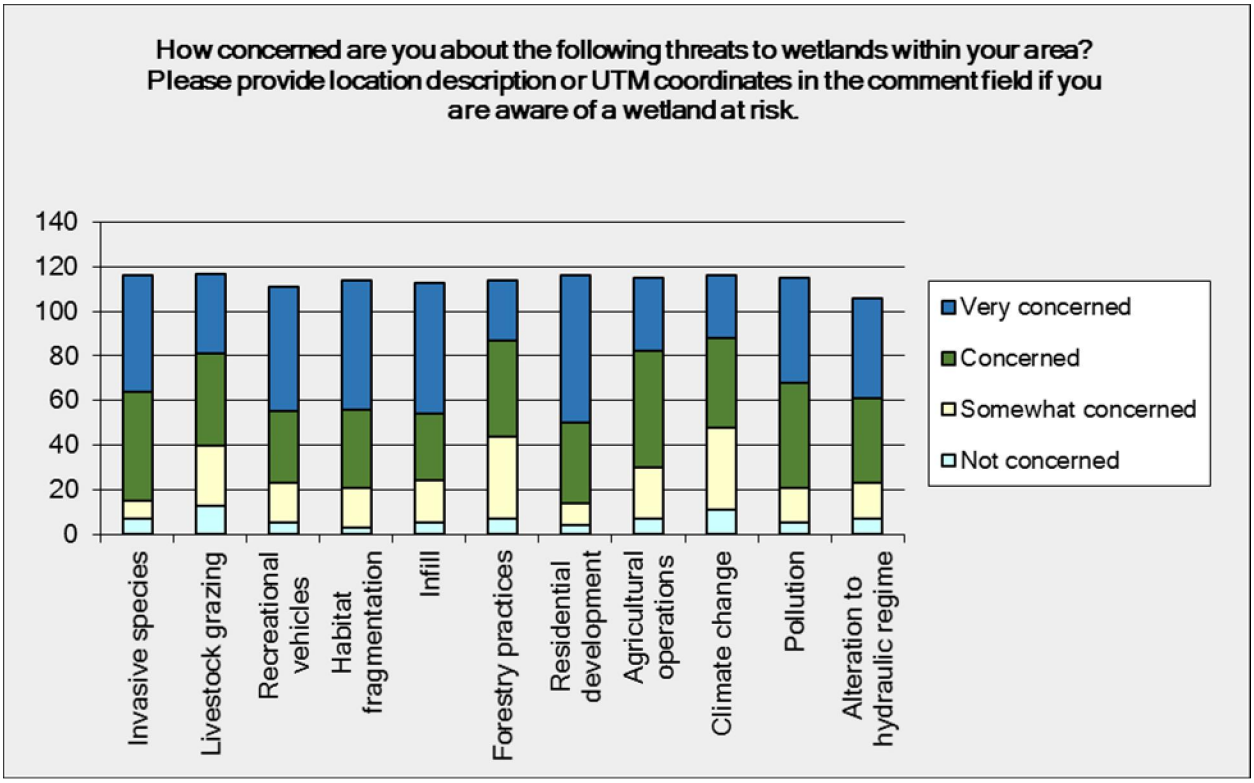

Figure B-6. Results of Okanagan Wetlands Strategy Phase 1 Survey Question 9.

Question 10: Are you aware of any wetlands that would be candidates for protection, restoration and/or enhancement? If so please provide location information (e.g. Google Earth placemark, UTM, lat/long. or general description).

A total of 100 survey respondents answered this question, with 48% responding yes, they are aware of wetlands that would be candidates for protection, restoration and/or enhancement, and 52% responding no. Of the respondents, 53 provided additional comments. This question garnered general comments, such as, "all of them" and "any within the municipal boundaries on north Okanagan communities", as well as, "all wetlands around urban developments or high impact agriculture, mining and forestry." One respondent commented that "they will not provide locations". Of the 53 comments, 37 of them related to specific locations; these comments have been interpreted and mapped.

Question 11: Are you and/or your organization interested in participating in wetland restoration and enhancement in your area?

Question 11 was answered by 107 survey respondents. Of those participants, 74% indicated they were personally interested in participating in wetland restoration and enhancement, 44% expressed that their organizations were interested, 11% were not personally interested, and 2% responded that their organization was not interested (Figure B-7). The question resulted in 32 submitted comments. Comments generally reiterated the level of commitment or provided

contact information. A list of members of the public interested in stewardship and conservation has been compiled for submission to the BCWF and OBWB.

Figure B-7. Results of Okanagan Wetlands Strategy Phase 1 Survey Question 11.

Question 12: If you answered yes to the previous question, please indicate what type of enhancement you/your group may be interested in. Please check all that apply.

A total of 91 survey respondents answered question 12, with 77% interested in riparian planting/revegetation, 66% in invasive species removal, 62% in nest box installation, 50% in wetland mapping, 46% in a policy/advisory role at a local level, 45% in a policy/advisory role at the regional level, and 41% interested in fencing (see Figure B-8). There were 22 respondents that submitted comments, with some indicating interest, but they were unable to commit due to physical or scheduling limitations, or due to a lack of leadership and organized opportunities. Several comments provided potential organizations that would be interested in supporting wetland enhancement projects. Names and contact information have been compiled and will be submitted to the BCWF and OBWB for further coordination, in an effort to protect privacy while moving forward with coordination of resources. In general, organizations which were named as having interest in participating in wetland conservation and enhancement opportunities included the following: Oceola Fish and Game Club, Friends of the Penticton Oxbows, UBCO Freshwater Science Union and Course Union, Okanagan College, Peachland Sportsmen's Association, and the Kelowna Fish and Game Club.

Respondents also suggested other activities, such as clean up/debris removal projects, public education, and legislation and monitoring to manage appropriate water extraction from surface

and groundwater. A suggestion was made to see a collaboration with UBCO (Earth Sciences), RDCO, RDNO, OBWB, irrigation districts for a wetland mapping program, possibly through the OCCP, with Allan Brooks Nature Centre and the RDCO EECO Centre providing an education role.

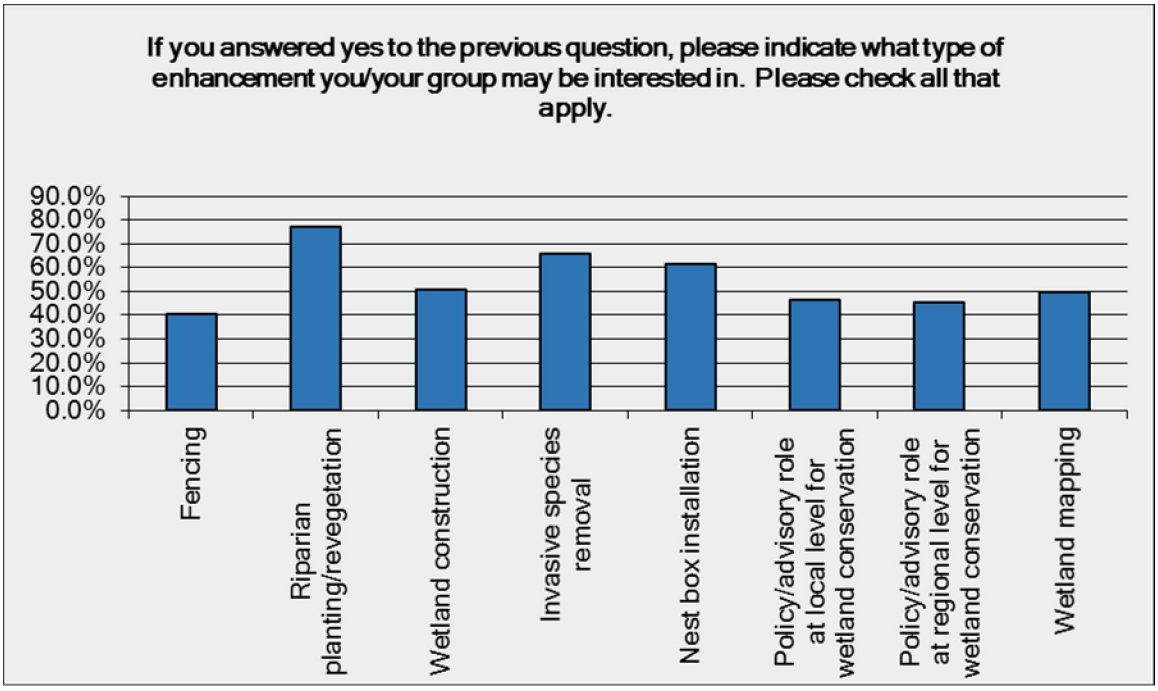

Figure B-8. Results of Okanagan Wetlands Strategy Phase 1 Survey Question 12.

Question 13- Are there barriers or challenges preventing your organization from getting involved in wetland stewardship initiatives?

There were 83 survey respondents that participated in this question. Funding was identified as the primary barrier to participating in stewardship initiatives at 58% of respondents. Lack of experience followed with 39%. A total of 28% identified interest of members as being a barrier or challenge, while 20% expressed that access to wetland sites was a challenge. A lack of volunteer retention was cited by 19% as posing a barrier, while 19% also indicated that there were no barriers to their organization's involvement in such initiatives.

There were 29 comments provided in association with this question. One respondent indicated they were suspicious of what the outcomes will be and if wetlands are on their property, what are the implications?

Of the 29 respondents, eight (8) indicated that they were not part of an organization or that they were not in a position to speak on behalf of their organization. Other barriers or challenges identified included time, age and physical ability, red tape, volunteers spread thin, need for an umbrella organization to provide guidance, capacity, and awareness of volunteer opportunities.

Figure B-9. Results of Okanagan Wetlands Strategy Phase 1 Survey Question 13.

Question 14: What resources/training could help you/your organization to become more involved in wetland stewardship initiatives?

This question was answered by 63 of 120 survey participants. Feedback is as follows (note that some repetitive comments have been removed to avoid duplication):

- CONC has some of the very finest birders in the valley. We have retired biologists, Botanists geologist, and a fine group of keen and experienced naturalists.
- Better understanding of the existing inventory and specific threats associated with them, as well as their highest specific contributions to the ecosystem.
- Wetland training.
- Mapping logging roads.
- Funding, in kind support, educational materials.
- Information regarding needs of the planned initiatives in order to plan for participation
- Access to mapping information.
- Overcoming inaction.
- Community board for restoration activities; need to act more as a community. Public education and youth/school involvement.
- Have more volunteer days open and advertise to the general public. I never seem to hear about volunteer opportunities. I would be honored to help out as a concerned citizen.
- Guidance and people teaching us as we work.
- Additional funds and identification of priority wetland restoration projects.

- Grants and wetland/bank restoration training.
- I would like more info on what opportunities are available for an individual to become involved.
- Direction at the local and regional level.
- Collaboration between organizations, sharing methods and activities
- Organized plan.
- Some funding (District of Coldstream).
- Awareness and access to information.
- Defined projects mapped out or some general guidelines /possibilities put to the Oceola fish and game club.
- More information as to what an individual and community group can do.
- Training in the procedures and formatting for seeking funds from NGO or government administered conservation funds (e.g. The Nature Trust; Wildlife Habitat Canada; The nature Conservancy of Canada, etc.
- Packaged "programs" that could be implemented by volunteers. Proposed language for proposal to Council on creating a "Stream Protection" initiative - i.e. "official" appointment or recognition of a volunteer group to lead initiative?
- Outreach representatives coming into our classrooms would be great!
- We need more capacity - volunteer base is burned out. With funding and leadership expertise, more could possibly be done.
- Local government support and cooperation; funding.
- Birds, botany, ecology.
- Updating of the booklet, Field Guide to Noxious Weeds and Other Selected Invasive Plants of British Columbia (last updated in 2007).
- Any and all that may be available. Establishing a solid network with those other organizations involved locally would be a start, so we can remain up-to-date and involved with any initiatives that we may not be aware of.
- Environmental Training/Information would be great!
- Green bylaws aiding in wetland protection/enhancement/identification as critical ecological infrastructure, wetland mapping/identification, invasive species public education policies on engagement with developers to discourage wetland destruction.
- Funding (on a consistent basis) by Municipalities and Regional Districts.
- Bird ID, GIS Training, Aquatic species ID.
- Financial, dealing with land owners.
- Revisions to legislative framework to facilitate and make wetland conservation a higher priority; coordinated approach among interested parties.
- RAR training, habitat assessment training, site assessment training.
- Experienced supervisors to break down complex tasks so that lay persons can complete them to the necessary standard. Equipment provided.

- A more volunteer-friendly attitude at the provincial level and funding.
- Identifying habitat improvement needs.
- General info for education is important.

Question 15: The BC Wildlife Federation provides wetland stewardship workshops to the public. Would your organization be interested in partnering on any of the following workshops in your community (select all that apply)?

This question was completed by 54 out of 120 survey participants, with 60% of respondents interested in the Map Our Marshes program (1 day workshop on GPS training and wetland evaluation), 59% interested in the Wetlandkeepers workshop (2.5 day workshop on appreciation, wetland classification and assessment), and 89% interested in a workshop on wetland restoration/construction project (Table B-1).

Table B-1. Results of Okanagan Wetlands Strategy Phase 1 Survey Question 15.

The BC Wildlife Federation provides wetland stewardship workshops to the public. Would your organization be interested in partnering on any of the following workshops in your community (select all that apply)?		
Answer Options	**Response Percent**	**Response Count**
Map our Marshes workshop (1 day workshop on GPS training and wetland evaluation)	60.4%	32
Wetlandkeepers workshop (2.5 day workshop on appreciation, wetland classification and assessment)	58.5%	31
Wetland Restoration/Construction project workshop	88.7%	47
Please provide comments/further details		34
answered question		53
skipped question		66

There were 34 comments submitted with this question, some expressing that they can't speak for their organization, while others commented further on their interest in participating and obtaining more information. Where contact information of these individuals was provided, information was compiled and provided to the BCWF Wetland Stewardship Program.

Question 16: Do you belong to an organization which has collected data or commissioned studies/reports on wetlands within your area? Please indicate in the comment field if you would be willing to provide this information to Ecoscape and the project team to incorporate into this review.

This question was addressed by 100 participants, with 27% indicating yes, 41% no, and 32% uncertain. The Okanagan Nation Alliance (ONA) indicated they have completed wetlands work, but reports are unavailable at this time. Groups such as Summit Environmental Consultants, some members of the Central Okanagan Land Trust and Central Okanagan Naturalists Club indicated that they would potentially be willing to share data.

Others provided examples of current or past projects, including the following: Winfield Creek Habitat Preserve, Biodiversity Conservation Strategy and Assessments on Ecocat, FIM and SHIM in north Okanagan, UBCO research projects in the hydrogeological field, water analysis of the Penticton Oxbows conducted as a class project by Todd Redding with OUC in Fall 2013, BCIT habitat assessment off McKinley Road, RDNO Wetland report, and review of RAR assessments received by City of Armstrong regarding Deep and Meighan Creeks.

Question 17: Are you and/or your organization currently involved in any wetland based projects or programs? If yes, please provide additional details below in the comment field.

This question was answered by 96 respondents, with 45% saying yes and 55% saying no. A sample of projects that survey participants are currently working on are as follows:

- Our birders are involved in stewardship issues re: Maude Roxby, Chichester wetlands stream clean ups, etc. (CONC)
- Winfield Creek Habitat Preserve (Oceola Fish and Game Club)
- Recently, we have been working on the development of the Shuswap River Watershed Plan which addresses high level policy development of ecosystem protection and preservation of water quality and quantity (RDNO)
- Chichester wetlands; restoration of Fascieux Creek at KLO Middle School restoration (CONC)
- I am currently enrolled with the COEDC agri-tourism business planning program. My concept is to connect agriculture, habitat and people. One of the ways I am exploring to do this is through educational tours teaching the benefits of how and why all 3 need to work together. Partnerships with affiliate organizations would be very beneficial for works and awareness. I would love to stay in touch to learn more and to strengthen my research.
- School district is working on studying and protecting wetland beside Clarence Fulton High School.
- We have been gifted 800 acres in south Kelowna area. It contains the headwaters of Bertram Creek. One Red Listed species of dragonfly has been found there. We are currently drafting a management plan with RDCO for this property. RDCO will manage it as a Regional Park (COLT).
- PhD research proposal to use creative and artistic methods for involving communities in environmental care. Research starting in April 2014.
- Creek fencing, wetland restoration, mapping, bioswale creation, participating in removal of invasive species (District of Coldstream).
- Oceola fish and game club work on Vernon Creek

- We will be having our 4th annual Brandts Creek Cleanup Day (Glenmore Valley Community Association).
- Our interests have been limited to the protection and restoration where feasible of the wetlands (oxbows) found between Okanagan and Skaha Lakes.
- The City of Armstrong has purchased land for a public park, immediately adjacent Meighan Creek and commissioned a QEP report on how to protect the creek/bank while developing a public park, with the thought in mind that we would like to provide a good example for homeowners along the creek.
- Okanagan Landing wetland remediation (City of Vernon).
- We helped with a walking trail at Otter Lake in partnership with the City of Armstrong years ago.
- RDNO wetland restoration and preservation of the Kalavista Lagoon.
- Participated in tree planting and noxious weed removal. Applied for funding for wetland preservation.
- Chichester Pond, Munson Pond, Robert Lake, others (CONC).
- Minimally intrusive pathway enhancement, and vegetation management in the vicinity of the large oxbow, which extends from Roy Avenue to Industrial Place and the mouth of Ellis Creek in Penticton (Friends of the Oxbows).
- While not specifically wetland oriented, we just wrapped up assisting Oceola Fish & Game club with their Kokanee spawning counts on Middle Vernon Creek, and we maintain 2 sections of Mill Creek in the Adopt-A-Stream program, and are looking to pick up more in the area.
- We have a project under consideration relative to the Vernon Urban Heronry and determining the extent of their Geographic freshwater habitat.
- Volunteered for OFGC, to check Kokanee traps on MVC. Project winding down.
- Middle and upper Vernon Creek, associated wetland areas and buffer zones (OFGC).
- Work done on property at Learmouth Rd in Coldstream by Duck's Unlimited in 2006.
- Several restoration projects: one behind FLNRO office in Penticton; another in Summerland; also participating in day to day discussions about wetland values at various sites in the context of development; RAR assessments etc.; also sponsoring workshops to increase awareness about RAR (audience: qualified environmental professionals; local government planners and politicians/advisory planning council member/bylaw officers
- Mill Creek clean up.
- The Okanagan Region Wildlife Heritage Fund Society owns a couple of Keremeos-area wetlands, as well as one in the Grand Forks area, while the COLT has covenants on some wetlands and owns others.

Working with Forestry and BC Parks on keeping 4 wheelers and destructive intruders out of the Graystokes and Myra/Idabel Park areas.

Question 18: The “we would love to hear from you question…”

This “question” was more to provide contact information for future correspondence. That being said, it garnered eight (8) comments. Responses related to survey design, encouragement for the project, potential funding suggestions, additional comment on the importance of constructed wetlands for onsite stormwater management and habitat enhancement, as well as a comment regarding provincial Ministry of Forests, Lands and Natural Resource Operations management of Mission Creek.

APPENDIX C
Wetland Evaluation Criteria

General Data and Administrative Boundaries

Criteria	Source	Column	Description	Response
Object_ID	GIS	OBJECTID		
Wetland_ID	GIS	Unique_ID		
Wetland_Name	GIS	WETLNDNAME		
Date	Field	DATE_		
Time	Field	TIME_		
Weather	Field	WEATHER		
Observers	Field	OBSERVERS		
Organization	Field	ORGANIZ		
Photos	Field	REF_PHOTO		
UTM_Zone	Field	UTM_ZONE		
UTM_Easting	Field	UTM_EAST		
UTM_Northing	Field	UTM_NORTH		
Reg_District	GIS	REG_DIST	RDCO, RDNO, RDOS	
Municipality	GIS	MUNICIPAL		
Electoral_Area	GIS	ELECT_AREA		
Legal_Description	GIS	LEGAL		
Zoning	GIS	ZONING	Rural, Residential, Commercial, Industrial, Agricultural	
Jurisdiction	GIS	JURISDIC	Federal, Provincial, Municipal	
Public_Private	GIS	PUBL_PRIV	Wetland occurs on Public (i.e., Crown) or Private Land	
Adj_Landuse_SEI	GIS	ADJ_LANDU	Agriculture, Commercial, Crown Natural, Forestry, Industrial, Institutional, Natural Park, Recreational, Residential, Rural, Transportation, Urban Park	
Protected_Status	GIS	PARK	Wetland Occurs within a Park or Protected Area	Yes No
Park Designation	GIS	Park_Type	Provinicial Park, Regional Park, Municipal Park, Other Protected Area	
Park Name	GIS	PARK_NAME		
IR_Land	GIS	ABORIGNAL_LANDS	Wetland occurs within First Nations IR Lands	Yes No
DP_Area	GIS	DP_AREA	Wetland occurs within a DP Area	Yes No
DP_Area_Type	GIS		Natural Environment, Environmental Protection, Sensitive Aquatic Area, Sensitive Terrestrial Area	
Bylaw_Policy	GIS	BYLAW	Bylaws or other policies in place to protect wetlands (e.g., OCP)	Yes No

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Biophysical Data

Criteria	Source	Column	Description	Response
Total_Area	GIS	Shape_Area	Total area of the wetland	
Open Water Area	GIS/Air Photo	OW_AREA	Total open water area of the wetland	
Perimeter_Length	GIS	Shape_Length	Total perimeter length of the wetland	
Elevation	GIS	ELEV	Elevation above sea level	
Aspect	GIS	ASPECT	Aspect (if any) of the wetland based on DEM	
Primary_Character	Field/Air Photo	PRIMARY_CH	Natural, Modified, Disturbed, Constructed	
Wetland Function	Field/Air Photo	FUNCTIONAL	Proper Functioning Condition, Functional At Risk, Non-Functional	
Class	Field/Air Photo	CLASS1	Bog, Fen, Swamp, Marsh, Shallow Open Water, Saline Meadow, Shrub-Carr, Low/Mid Bench Flood	
Sub_Class	Field/Air Photo	CLASS(2 to 5)		
Form	Field/Air Photo	FORM1	Marsh (Channel, Floodplain, Kettle, Seepage Track, Shallow Basin, Shore, Stream)	
			Shallow Water (Basin, Kettle, Oxbow, Stream)	
			Swamp (Flat, Shore, Stream)	
Sub_Form	Field/Air Photo	FORM(2 to 5)		
Type	Field/Air Photo	TYPE1	Aquatic (Floating, Submerged)	
			Forb, Grass	
			Non-Veg, Open Water	
			Low Rush, Tall Rush	
			Sedge	
			Shrub (Low, Mixed, Tall)	
			Tree (Coniferous, Hardwood, Mixed)	
Sub_Type	Field/Air Photo	TYPE(2 to 5)		
Association	Field/Air Photo	ASSOCN1	Fl02	
			Fm01, Fm03	
			Gs01, Gs02, Gs03, Gs04	
			Wf01, Wf03, Wf05, Wf, 06, Wf07	
			Wm03, Wm05, Wm06, Wm07	
			Ws01, Ws04, Ws05, Ws07, Ws08, Ws10, Ws55	
BEC_Zone	GIS	BEC_ZONE	BG, ESSF, ICH, IDF, IMA, MS, PP	
BEC_Subzone	GIS	BEC_SUBZONE	Dry Cold, Dry Cool, Dry Mild, Moist Cool, Moist Warm, Very Dry Cold, Very Dry Cool, Very Dry Hot	
BEC_Var	GIS	BEC_VAR	Cascade, Kettle, Okanagan, Shuswap, Similkameen, Thompson	
BEC_Phase	GIS	BEC_PHASE	Grassland, Steep South Facing	
Soil_Order	Field	SOIL_ORDER		
Soil_Texture	Field	TEXTURE		
Soil_Moist	Field	SOIL_MOIST		
Depth_Water	Field	DEP_TO_WAT		
Depth to Mottle	Field	DEP_TO_MOT		
Depth to Gley	Field	DEP_TO_GLE		
Organic_Class	Field	ORGA_CLASS		

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Biodiversity Data

Criteria	Source	Column	Description	Response
Shoreline Complexity (SLD)	GIS	SHORE_COMPL	Score > = 1.53 (the mean SLD from the database - see equation below)	Yes
			Score < 1.53 (the mean SLD from the database - see equation below)	No
Part of Wetland Complex	GIS	WET_COMP	Wetland complex (1 or more other wetland(s) within 750 m)	Yes
			Single Wetland	No
Wetland Community Diversity	Field/Air Photo	COMM_DIV	High Community Diversity (3 or more distinct wetland communities)	Yes
				No
Wetland Type Diversity	Field/Air Photo	TYPE_DIV	High Wetland Type Diversity (3 or more distinct wetland types)	Yes
				No
Vegetation Form Diversity	Field/Air Photo	FORM_DIV	High Vegetation Diversity (3 or more vegetation forms)	Yes
				No
Wetland Community Status	GIS		Red or Blue Listed Wetland Communities Present	Yes
				No
Important Bird Area (IBA)	GIS	IBA	Wetland occurs within an Important Bird Area (IBA)	Yes
				No
Wildlife Habitat Management Area (WHMA)	GIS	WHMA	Wetland occurs within a Wildlife Habitat Management Area (WHMA) as defined in the OSLRMP	Yes
				No
Waterfowl	Field/Public Record	WATERFOWL	Wetland provides known waterfowl breeding or staging habitat	Yes
				No
Species At Risk	Field/Public Record	(various)	Known occurences of wildlife or plant species at risk, including Red or Blue-listed (BC) and COSEWIC/SARA	Yes
				No
Fish Presence	Field/Public Record	FISH_FREQU	Known fish occurrences or spawning habitat within the wetland	Yes
				No
Wetland Rarity	Field/Air Photo	RARITY	Wetland type is rare within study area (< 25% of wetland types)	Yes
				No
Riparian Class	Field/Air Photo	QUALIFIER	The riparian community class is natural (as opposed to disturbed or developed)	Yes
				No

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* SLD = $S/(2\sqrt{A\pi})$

S= Perimeter Length

A = Total Area

Hydrological Data

Criteria	Source	Column	Description	Response
Watershed Code	Public Record	WTRSHEDCDE		
Hydrogeomorphic Character	Field/Air Photo	HYDROGEO_G	Lacustrine, Palustrine, Riverine/Fluvial, Transitional, Flood, Artificial	
Hydrodynamics	Field/Air Photo	HYDRODYNA	Very Dynamic, Dynamic, Mobile, Sluggish, Stagnant	
Wetted_Depth	Field	WET_DEPTH	Average water depth in metres	
Water Quality	Field	PH	pH	
	Field	TDS	Total Dissolved Solids (TDS)	
	Field	EC	Conductivity	
	Field	WATER_TEMP	Temperature	
Control	Field/Air Photo	CONT_STRUC	Wetland water level controlled by a structure such as a dam, berm, pump, etc.	Yes
				No
Diversion	Field/Air Photo	Point_of_Div	Wetland associated with water diversion for drinking water or other use (i.e., occuring within wetland boundary)	Yes
				No
Connectivity to Waterbody	Field/Air Photo	CONN_WC	Wetland connected permanently or seasonally to other waterbodies, including other wetland, lake, stream	Yes
				No
Inlet_Outlet	Field/Air Photo	INLET_OUTLET	Wetland has a permanent or seasonal inlet or outlet to up or downstream environments	Yes
				No
Stormwater_Input	Field/GIS	STORM_INPUT	Known stormwater or other inputs (sewer, runoff, or other untreated waters) to the wetland	Yes
				No
Downstream_Floodplain	GIS/Air Photo	DS_FLOOD	Floodplain occurs downstream from wetland	Yes
				No
Flood Attenuation	Field/GIS	FLOOD_ATT	Wetland has capacity to attenuate floods (i.e., is isolated, palustrine, and does not occur along HWL of large waterbody)	Yes
				No
Downstream Reservoir	Field/Air Photo	DS_RES	Reservoir occurs downstream from the wetland	Yes
				No
Upstream Reservoir	Field/Air Photo	US_RES	Reservoir occurs upstream from the wetland	Yes
				No
Erosion Control	GIS	EROS_CONT	Wetland provides shoreline erosion control (i.e., is lacustrine or riverine with tree, shrub, and/or emergent vegetation)	Yes
				No
Aquifer Association	GIS	AQUIFER	Wetland associated with an aquifer or other known groundwater source	Yes
				No
Pollution Uptake	Field/Public Record	POLLUT_UP	The wetland has capacity to improve water quality through nutrient and pollutant uptake (i.e., is isolated, palustrine wetland with discharge inputs)	Yes
				No

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Socio-Economic Data

Criteria	Source	Column	Description	Response
General_Rec_Value	Field/Public Record	GEN_REC_VAL	Frequent visits by walkers, hikers, dog-walkers, joggers, cyclists, etc. and presence of facilities to support those uses, such as well-developed and maintained trails, paved or groomed gravel pathways, trail maps, signage, washroom facilities, boardwalks, platforms, etc.	Yes No
Interpretive_Value	Field/Public Record	INTERP_VAL	Records of yearly visits by one or more school groups, naturalist clubs, non-governmental organizations, etc. for the purpose of studying the wetland ecosystem	Yes No
Research_Use	Field/Public Record	RESEARCH_USE	Research reports have been written on some aspect of the wetland's flora, fauna, hydrology, etc.	Yes No
Hunting	Field/Public Record	HUNT_VAL	Utilized by hunters, hunting groups, trappers, presence of hunting trails/blinds/stands, etc.	Yes No
Fishing	Field/Public Record	FISH_VAL	Utlized by fishing persons/groups; managed public fishing area; facilities located in/adjacent to wetland, catering to angling enthusiasts; ice fishing activity	Yes No
Nature_Viewing	Field/Public Record	NAT_VIEW	Nature viewing activities have led to the development of facilities or amenities catering to nature viewing, including viewing platforms or other structures, interpretive signage, trails, etc.	Yes No
Facility_Development	Field/Public Record	FACILITY	Permanently or seasonally staffed interpretation centre with facility structures including shelters, washrooms, kiosks, amphitheatre, self-guiding trails, and/or brochures available.	Yes No
Economic_Value	Public Record	ECON_VAL	The wetland is used for the extraction of economically valuable natural resources such as wood products, food, fish, furbearing mammals, etc.	Yes No
Cultural_Value	Public Record	CULT_VAL	The wetland has known cultural, spiritual, or ceremonial values to Okanagan First Nations	Yes No
Arch_Value	Public Record	ARCH_VAL	The wetland has known archaeological sites, historical portages, burial sites, artifacts, camps, etc. There is physical evidence of historic or cultural importance within the wetland boundary.	Yes No
Subsist_Use	Public Record	SUBSIST_VAL	The wetland provides human used subsistence products from fishing, trapping, or plant harvesting, etc.	Yes No
Public_ID	Public Record	PUBLIC_ID	Wetland has been identified by a member of the public or stakeholder group as being of unique importance, concern, or at risk	Yes No

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Threats

Criteria	Source	Column	Description	Response
Grazing Activity	GIS	GRAZING	Wetland occurs within grazing tenure	Yes
				No
Agricultural Activity	GIS	AG_USE	Wetland occurs within ALR or other agricultural landuse	Yes
				No
Forestry Activity	GIS	FORESTRY	Wetland occurs within forest harvesting tenure area	Yes
				No
Rec Site	GIS	REC_SITE	Wetland occurs within or adjacent to Forest Recreation Site	Yes
				No
Road Proximity	GIS	ROAD_PROX	Roadway occurs within 100 m of wetland edge	Yes
				No
Urban Encroachment	GIS	URBAN_ENC	Wetland occurs within urban landuse area (residential, commercial, industrial, etc.)	Yes
				No
Invasive Species	Field	INV_SPEC_TYPE	Known occurences of non-native or invasive wildlife and/or plants within wetland	Yes
				No

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Impacts

Criteria	Source	Column	Description	Response
Off Road Vehicle Access	Field/Air Photo	ORV_ACCESS	Evidence of disturbance or recent access within wetland from off road vehicle use, including ATVs, dirt bikes, mountain bikes, etc.	Yes
				No
Utility ROW	GIS	UTIL_ROW	Utility ROW (e.g., power line, pipeline) present within the wetland	Yes
				No
Water Extraction	GIS	WATER_EXTR	Known water extraction (e.g., pumps, pipes) from the wetland for drinking water or other points of diversion	Yes
				No
Peat Harvest	GIS	PEAT_HARV	Evidence of peat harvesting activities	Yes
				No
Infilling	Field/Air Photo	INFILL	Evidence of historical infilling of the wetland with imported soil or non-native fill material	Yes
				No
Draining	Field/Air Photo	DRAIN	Evidence of historical draining from human causes (water extraction, culvert installation, ditching)	Yes
				No
Discharge	Field	DISCHARGE	Presence of constructed discharges to wetland (stormwater, sewer, surface runoff)	Yes
				No
Change_Area	Field/Air Photo	CHANGE_AREA	Signs of reduction of wetland size from natural processes (drying, sediment accumulation)	Yes
				No
Erosion	Field/Air Photo	EROSION	Signs of erosion from soil disturbance, altered water regimes, vegetation removal, etc.	Yes
				No
Fragmented	Field/Air Photo	FRAGMENT	Wetland has been fragmented (i.e., split into two or more distinct fragments) from road, ROW, berm, or other human causes	Yes
				No
Isolated	Field/Air Photo	ISOLATE	Wetland is more than 750 m from other natural lands	Yes
				No

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Restoration Potential

Criteria	Source	Column	Description	Response
Restoration Potential		REST_POT	Restoration of the wetland will greatly enhance biological, hydrological, or socio-economic values	Yes
				No
Cost		COST	Restoration of the wetland is considered a reasonable cost based on size, degradation, etc. or requires little capital investment	Yes
				No
Fencing		FENCE	Installation of fencing will prevent degradation or promote restoration	Yes
				No
Signage		SIGN	Installation of signage will prevent degradation or promote restoration	Yes
				No
Planting		PLANTS	Planting native vegetation will prevent degradation or promote restoration	Yes
				No
Nest Boxes		NEST_BOX	Installation of nest boxes will prevent degradation or promote restoration	Yes
				No
Invasive Plant Removal		INV_REMOVE	Removal of non-native vegetation will prevent degradation or promote restoration	Yes
				No
Expansion		EXPAND	Expansion of the existing wetland through construction will prevent degradation or promote restoration	Yes
				No
Water Quality Improvement		WQ_IMPROVE	Improvements to water quality will prevent degradation or promote restoration	Yes
				No
Mapping		MAP	Mapping of the wetland boundary and inventory will prevent degradation or promote restoration	Yes
				No
Ownership		OWNER	The wetland occurs within private land held by a single owner	Yes
				No
Stewardship		STEWARD	Promoting stewardship activity will prevent degradation or promote restoration	Yes
				No
Volunteer Organziations		VOL_ORG	Names of potential volunteer organizations that are suitable for restoration activities, stewardship, conservation, etc.	
Funding Sources		FUND	P{otential volunteer organizations that are suitable for restoration activities, stewardship, conservation, etc.	

* Rows coloured gray were not used in the analysis due to lack of available data, consistency in the data, or other complications. These data fields should be addressed during future phases of the project.

APPENDIX D
Sample Wetland Data Sheet

Okanagan Wetlands Strategy
Wetland Assessment Data Sheet

1. General Information

Observers: _____ Date: _____ Time: _____
Weather: _____ Organization: _____
Regional District: RDNO RDCO RDOS Municipality: _____
UTM Location: E_____ N_____ Z_____ NAD83
Photo No: _____ Adjacent Landuse: _____
Comments: _____

2. Classification and Physical

Wetland Name: _____ Wetland ID: _____
Primary Character: _____ Wetland Function: _____
Wetland Classification: _____ Wetland Form: _____ Sub-Form: _____
Wetland Association: _____ Elevation (m): _____ Aspect: _____
Soil Order: _____ Soil Texture: _____ Soil Moisture: _____
Organic Class: _____ Depth to Water: _____ Mottled/Gleying: _____
Comments: _____

3. Biological

Wetland Veg Type(s): _____ No. Types: _____
Riparian Vegetation Type(s): _____ No. Types: _____
Waterfowl Staging (Y/N): _____ Fish Presence (Y/N): _____
Species At Risk (Y/N)*: _____ Rare Plants (Y/N)*: _____
Wetland Complex: _____ Part of Riparian Corridor (Y/N): _____
Comments: _____

* Enter wildlife and plant observations below.

4. Hydrological

Wetland Form (Palustrine/Lacustrine/Riverine): _____
Connectivity to Watercourse (Y/N): _____ Watercourse Name: _____
Control: _____ Water Depth: _____
Outlet from Wetland (Y/N): _____ Downstream Reservoir (Y/N): _____
Stormwater Input (Y/N): _____ Other Input: _____
Below Lake High Water Level (Y/N): _____ Lake Name: _____
Floodplain (Y/N): _____ Aquifer Association (Y/N): _____
Comments: _____

5. Social

General Recreation Value: _____
Cultural Significance (Y/N): _____ Archaeological Importance (Y/N): _____
Interpretive Value: _____ Research Use: _____
Hunting Use: _____ Fishing Use: _____
Nature Viewing Use: _____ Subsistence Use: _____
Facilities Present: _____
Other Economic Values: _____

6. Observed Threats

Grazing (Y/N): _____
ATV Use (Y/N): _____
Filling/Draining (Y/N): _____
Invasive Plant Species (Y/N): _____
Roads Adjacent (Y/N): _____
Agricultural Use (Y/N): _____
Water Extraction (Y/N): _____
Forest Harvesting (Y/N): _____
Invasive Wildlife Species (Y/N): _____
Discharge to Wetland (Y/N): _____
Other Observed Threats: _____

7. Wildlife Observation Data

Wetland Vegetation Data			
Common Name	Latin Name	Red/Blue Listed	Comments

Wetland Wildlife Data			
Common Name	Latin Name	Red/Blue Listed	Comments

Okanagan Wetlands Strategy
Wetland Assessment Data Sheet Key

1. General Information

- Observers: Full names or initials of observers
- Weather: Conditions during site visit (cloudiness, wind, precipitation, temperature, etc.)
- Date and Time: Day/Month/Year of site visit and time of day (24 clock)
- Organization: Name of group or organization conducting the site visit
- Photo No: Photo numbers
- Regional District: RDNO, RDCO, or RDOS
- Municipality: If within municipal boundaries, indicate which municipality. If on Crown Land, indicate 'Crown'.
- UTM Coordinates: From GPS or online resource (e.g., GoogleEarth) including Zone, Easting and Northing using NAD83 projection.
- Adjacent Landuse: Describe the adjacent or surrounding landuse with the following categories:
    - Agriculture
    - Commercial
    - Crown Natural
    - Forestry
    - Industrial
    - Institutional
    - Natural Park
    - Recreational
    - Residential
    - Rural
    - Transportation
    - Urban Park
- Comments: Add any additional comments

2. Classification and Physical

- Wetland Name: Does the wetland have an established common name?
- Wetland ID: Is there another unique ID assigned to the wetland?
- Primary Character: Describe the primary character of the wetland using the following categories
    - Natural
    - Modified
    - Disturbed
    - Constructed
- Wetland Function: Describe the wetland functional condition using the following categories:
    - Proper Functioning Condition
    - Functional At Risk
    - Non-Functional
- Wetland Classification:
    - Bog
    - Fen
    - Swamp
    - Marsh

  - Shallow Water
  - Saline Meadow
  - Shrub-Carr
  - Low Bench Flood, Mid Bench Flood, High Bench Flood
- Wetland Form/Sub-Form:
  - Marsh Channel, Marsh Floodplain, Marsh Kettle, Marsh Seepage Track, Marsh Shallow Basin, Marsh Shore, Marsh Stream
  - Shallow Water Basin, Shallow Water Kettle, Shallow Water Oxbow, Shallow Water Stream
  - Swamp Flat, Swamp Shore, Swamp Stream
- Wetland Association:
  - Fl02
  - Fm01, Fm03
  - Gs01, Gs02, Gs03, Gs04
  - Wf01, Wf01, Wf03, Wf05, Wf06, Wf07
  - Wm03, Wm05, Wm06, Wm07
  - Ws01, Ws04, Ws05, Ws07, Ws08, Ws10, Ws55
- Elevation (m): From GPS or other known source in metres above sea level
- Aspect: Does the wetland have a slope and what direction does it generally face
- Soil Order: From the Canadian System of Soil Class and BC Wetlands Classification System
  - Gleysol (Humic, Rego)
  - Organic (Fibrisols, Mesisols, Humisols, Folisols)
  - Regosol
  - Brunisol
  - Solonetzic – Accumulation of Salts
- Soil Texture:
  - Silt, Silty Clay, Silty Clay Loam, Clay Loam
  - Loamy Fine Sand, Silt Loam, Loam
  - Coarse Sand, Fine Sand, Very Fine Sand, Loamy Very Fine Sand, Coarse Sandy Loam
- Organic Class:
  - Fibric
  - Mesic
  - Humic
- Depth to Water: If digging soil pit, measure depth to water table in meters.
- Mottled/Gleying: Signs of mottling (rust-coloured blotches) or gleying (dull blue-gray colour).

3. Biological

- Wetland Vegetation Type(s):
  - Aquatic – Floating, Aquatic - Submerged
  - Forb
  - Grass
  - Non-Veg Open Water
  - Rush – Low, Rush - Tall
  - Sedge
  - Shrub – Low, Shrub – Mixed, Shrub - Tall
  - Tall Rush
  - Tree – Coniferous, Tree – Hardwood, Tree - Mixed

- No. Vegetation Types:
- Riparian Vegetation:
    - Forb
    - Grass
    - Shrub – Low, Shrub – Mixed, Shrub - Tall
    - Tree – Coniferous, Tree – Hardwood, Tree - Mixed
- Waterfowl Staging (Y/N):
- Fish Presence: Known fish presence or frequency by fish?
- Species At Risk (Y/N): Known presence of species at risk?
- Rare Plants (Y/N): Known presence of rare plants?
- Wetland Complex: Are there other wetlands within approximately 750 m?
- Part of Riparian Corridor (Y/N):
- Comments:

4. Hydrological

- Wetland Form:
    - Lacustrine: Wetlands associated with lakes and generally occurring below the high water level
    - Riverine: Occur within the river channel.
    - Palustrine: Isolated wetlands with absent or intermittent outflow
    - Transitional
    - Flood
    - Artificial
- Connectivity to Watercourse (Y/N): Is there a permanent or intermittent outflow or inflow?
- Watercourse Name: Does the wetland or associated watercourse (if any) have a legal or gazetted name?
- Control Structure: Is there a control structure at the wetland outflow (if any) such as dam, berm, or pump
- Water Depth: Average normal water depth at high water level (i.e., later spring to early summer) in meters
- Outlet from Wetland (Y/N):
- Downstream Reservoir (Y/N):
- Stormwater Input (Y/N):
- Other Input:
- Below Lake High Water Level (Y/N):
- Lake Name:
- Floodplain (Y/N):
- Aquifer Association (Y/N):

5. Social

- General Recreation Value (Y/N): Frequent visits by walkers, hikers, dog-walkers, joggers, cyclists, etc. and presence of facilities to support those uses, such as well-developed and maintained trails, paved or groomed gravel pathways, trail maps, signage, washroom facilities, boardwalks, platforms, etc.
- Cultural Significance: The wetland has known cultural, spiritual, or ceremonial values to Okanagan First Nations
- Archaeological Importance: The wetland has known archaeological sites, historical portages, burial sites, artifacts, camps, etc. There is physical evidence of historic or cultural importance within the wetland boundary.

- Interpretive or Educational Value: Records of yearly visits by one or more school groups, naturalist clubs, non-governmental organizations, etc. for the purpose of studying the wetland ecosystem.
- Research Use: Research reports have been written on some aspect of the wetland's flora, fauna, hydrology, etc.
- Hunting Use: Wetland is utilized by hunters, hunting groups, trappers, presence of hunting trails/blinds/stands, etc.
- Fishing Use: Wetland utilized by fishing persons/groups; managed public fishing area; facilities located in/adjacent to wetland, catering to angling enthusiasts; ice fishing activity
- Nature Viewing: Nature viewing activities have led to the development of facilities or amenities catering to nature viewing, including viewing platforms or other structures, interpretive signage, trails, etc.
- Subsistence Use: The wetland provides human used subsistence products from fishing, trapping, or plant harvesting, etc.
- Facilities Development: Permanently or seasonally staffed interpretation centre with facility structures including shelters, washrooms, kiosks, amphitheatre, self-guiding trails, and/or brochures available.
- Economic Use: The wetland is used for the extraction of economically valuable natural resources such as wood products, food, fish, furbearing mammals, etc.

6. Observed Threats

- Grazing: Signs of cattle access, use, or other impacts.
- Agricultural Use: Signs of agricultural use within or adjacent to the wetland, including crop growing, harvesting, mowing, etc.
- ATV Use: Signs of Off Road vehicle use within the wetland.
- Water Extraction: Signs of water diversion or extraction for human consumption purposes.
- Filling/Draining: Evidence that the wetland has been infilled or drained as a result of human activity.
- Forest Harvesting: Signs of forest harvesting practices, including road building, culverts, tree clearing, vehicle access, etc.
- Invasive Plant Species: Evidence of invasive plant encroachment and species names.
- Invasive Wildlife Species: Evidence of presence of invasive wildlife and species.
- Culverts: Presence (and number of) culverts discharging stormwater to the wetland.
- Roads Adjacent:
- Discharge to Wetland:
- Other Observed Threats:

APPENDIX E
Publically Identified Wetlands

Wetlands Identified During 2013/2014 Public Consultation Process					
Identifier	Common Name	TRIM Map Sheet	Northing	Easting	Comments
85-Q10	N end of Osoyoos Lake	082E003	5439225.507	315975.550	The north end of Osoyoos Lake was a natural flood plain for the Okanagan River and marsh lands for all types of wildlife. A housing complex has taken over the north east portion and ditching on the north west portion has decreased the wetland area.
108-Q10	Venner Meadows	082E024	5461799.123	329763.116	FSR 200 east of Okanagan Falls
88-Q10	Kearns Creek near St Andrews on the Lake	082E032	5468589.264	308587.615	Point of concern-Kearns Ck below St Andrews by the Lake, it is an over-subscribed watershed. The golfers want it for excessive lawns (golf course) to the detriment of downstream users.
158-Q10	Kearns Creek	082E032	5467433.376	308799.370	
44-Q10	Penticton Oxbows	082E043	5481617.651	312001.280	Enhancement/restoration
41-Q10	Penticton Oxbows	082E043	5481579.640	311720.403	Candidates for restoration and protection; Friends of Oxbows
17-Q10	Penticton Oxbows	082E043	5481278.160	312066.670	Restoration and enhancement opportunity
41b-Q10	Esplanade	082E053	5486982.129	313148.426	Friends of the Esplanade trying to get parkland designation
45-Q10	Upper Mission Wetlands	082E073	5517747.636	319114.508	At risk from development; associated with Cedar Creek
45b-Q10	Upper Mission Wetlands	082E073	5518382.387	319891.496	At risk from development; associated with Cedar Creek
4b-Q10	Myra Area	082E074	5512447.225	340788.816	Protection, enhancement and restoration
26-Q10	McCulloch X-Country Ski wetlands	082E075	5516339.375	344478.438	Kelowna Nordic cross country ski recreational area- active logging tenure-threat to natural drainage flow, logging activity scouring trails which may increase un-natural water flow. Evidence of complete wetland areas de-watered from logging years ago.
4c-Q10	Idabel Area	082E075	5510247.174	342760.412	Protection, enhancement and restoration
167-Q10	Kelowna Nordic XC area	082E075	5516973.100	344461.478	Concern with mud bogging along the Riverside Trail in wetlands, as well as off McCullogh Road within RDCO
6b-Q10	Powers Creek	082E082	5521410.709	311157.396	Bennett property along Powers Creek- protection and enhancement
6c-Q10	Westbank Creek	082E082	5523173.779	311576.842	Protection, enhancement and restoration
6d-Q10	Smith Creek	082E082	5522446.031	311743.547	Protection, enhancement and restoration
6e-Q10	Davidson Creek	082E082	5527698.585	312260.597	Protection, enhancement and restoration
153-Q10	Bennett Property Powers Creek	082E082	5521359.869	310634.204	Concern with RJ Bennett Property along Powers Creek-barrels and drums of chemicals
153c-Q10	Shannon Lake	082E082	5525881.341	311958.303	New stormwater pipe from Talus Ridge discharging to lake
97-Q10	wetlands associated with Mission Creek and tribs	082E083	5524544.038	323325.655	Mission Creek, an area behind Spiers Road on private property owned by a farmer. Invasive species removal occurred previously
93-Q10	Hall Rd area wetlands	082E083	5526800.900	325128.964	Multiple survey respondents identified Hall Rd area wetlands as at risk from development and an area of concern.
92-Q10	Hall Rd area wetlands	082E083	5526660.610	325108.773	Multiple survey respondents identified Hall Rd area wetlands as at risk from development and an area of concern.
92b-Q10	Fascieux Creek wetlands	082E083	5526506.374	323324.660	Multiple respondents identified Fascieux Creek wetlands as being of concern
87-Q10	Fascieux Creek wetlands	082E083	5525716.586	322552.093	Concern in general and wetlands associated with Fascieux Creek need attention
86-Q10	Mission Ck tribs and wetlands	082E083	5524364.545	322744.871	Concern with Mission Creek tributaries and lost oxbows and wetlands
74-Q10	Swamp Rd 10 acre parcel for sale	082E083	5524118.206	322494.120	Potential land acquisition, restoration, and linkage to Capital News Wetlands-described as Dehart and Swamp, but 3850 Swamp Rd also currently for sale
74b-Q10	Swamp and Dehart Rd-wetlands	082E083	5522390.907	322027.347	Potential land acquisition, restoration, and linkage to Capital News Wetlands-described as Dehart and Swamp, but 3850 Swamp Rd also currently for sale
70-Q10	Wetlands end of Sunnyside Rd	082E083	5524269.328	316393.206	Wetlands near the end of Sunnyside Road, West Kelowna on private lands Wetlands partly within Kalamoir Park, West Kelowna. Within Regional District Parks
39-Q10	Keefe Ck Okanagan Lake confluence	082E083	5529890.084	317716.693	Identified by WFN in survey as potential restoration /enhancement area
39b-Q10	McDougall Creek corridor	082E083	5523151.147	313355.990	McDougall Creek corridor-identified by WFN in survey as potential restoration /enhancement area
36-Q10	Fascieux Creek wetland	082E083	5525959.785	321310.436	Fascieux Creek Wetland seems to be deteriorating. Water quality not very good. People in the neighbourhood enjoy this area for the wildlife and come for walks everyday
25-Q10	Swamp Rd	082E083	5523954.380	322692.879	wetlands adjacent to Swamp Road of concern; restoration potential both sides of road
6-Q10	Art Ponds	082E083	5527220.711	315879.434	Protection and enhancement
6f-Q10	Keefe Creek	082E083	5529529.735	317485.542	Protection, enhancement and restoration
6h-Q10	Rotary Marsh	082E083	5530115.038	320469.432	Protection, enhancement and restoration
153b-Q10	McDougall Ck wetlands	082E083	5525732.706	313823.213	Infilling and encroachment; WFN land
155-Q10	Myra Bellevue Park Boundary	082E083	5520654.829	325431.632	Disturbance from unauthorized recreational use; off road vehicles, bikes
157-Q10	Okanagan Lake	082E083	5522573.184	317405.111	Concern with invasive species in Okanagan Lake
160-Q10	Swamp Road	082E083	5523042.663	322522.501	Concern with protection of wetlands along Swamp Road
161-Q10	Mission Creek	082E083	5524588.693	322762.618	Concern with wetlands along Mission Ck
150-Q10	Garner Pond	082E084	5526668.062	330022.949	Painted turtle habitat-concerned with adjacent farm practice of removing aquatic and riparian vegetation and shooting waterfowl; new development to southwest-where are painted turtles nesting?
151-Q10	Belgo Pond	082E084	5526503.961	329289.791	Wanting preservation and protection in the form of a park, historic site and/or wildlife preserve; painted turtle habitat-movement between Garner and Belgo Ponds.
152-Q10	Mission Creek wetlands	082E084	5525946.905	328299.673	Concern with offleash dogs impacting fish and wildlife along the Mission Creek Greenway
60-Q10	Lightblue Lake	082E093	5536855.217	325062.362	Light blue Lake in Coyote Ridge Regional Park- pump use, water license
21-Q10	Mill Creek oxbows and wetlands	082E093	5531380.650	327252.062	Concern about Mill Creek between Shadow Ridge Golf Course and Enterprise Road. There were wonderful ox-bows near the old KGE packing house and Scandia when I was growing up in the 1950's. There were fishing holes near the Mc and Fitz Packing house in what was then to me a shady canyon.
16-Q10	49 54'44" N 119 32' 57" W	082E093	5532010.006	316989.089	Protection and enhancement
16b-Q10	49 54'47" N 119 32' 48" W	082E093	5532091.239	317149.730	Protection and enhancement
6i-Q10	Brandt Creek riparian area	082E093	5533188.380	325967.096	Protection, enhancement and restoration
6j-Q10	Glenmore Highlands wetlands	082E093	5536205.830	324864.901	Protection, enhancement and restoration
6k-Q10	Robert Lake	082E093	5534685.962	327122.110	Protection, enhancement and restoration
156-Q10	Robert's Lake	082E093	5534447.000	327072.487	Concern with increasing urbanization, infill, encroachment, historic draining by the COK and would like to see lake recharged with excess water in the spring, when they flush out hydrants in the area, etc.
84-Q10	Chichester Pond	082E094	5530762.178	328226.924	concern with algae blooms, potential to lessen source of pollution

Identifier	Common Name	TRIM Map Sheet	Northing	Easting	Comments
79-Q10	395 Hereron Rd Wetlands	082E094	5533161.154	329175.640	Property owner submitted-Kelowna -eroding banks, direct water drainage from golf course (pesticides, herbicides?) -surrounding developments, filled in land, increased pavement have changed/ moved the wetland
21b-Q10	Mill Creek wetlands	082E094	5534731.654	328725.072	Wetlands and oxbows between Shadow Ridge golf course and Enterprise Way
6l-Q10	Carney Pond	082E094	5533317.491	328369.149	Protection, enhancement and restoration
154b-Q10	South end of Ellison/Duck Lake	082E094	5539196.802	328431.741	Oceola Fish and Game Club concerned with management of lake levels for vegetation (SAR) at the potential detriment to downstream stream spawning Kokanee
159-Q10	Chichester Pond	082E094	5530787.867	328035.585	Excessive algae at times; concern with upstream pollution (stormwater)
4-Q10	Graystokes Area	082E096	5537314.731	367428.704	Protection, enhancement and restoration
111-Q10	Winfield Wildlife Preserve	082L003	5545742.233	327890.490	Oceola Fish and Game Club members identified as area of concern due to adjacent development and potential alteration to hydraulic regime and quality of the wetland
110-Q10	Robinson Hill Seepage	082L003	5546913.464	327185.233	Underground seepage Robinson Hill and Pretty Rd
154-Q10	Winfield Wildlife Preserve	082L003	5545629.531	327872.058	Concern with development and changes in hydrology
166-Q10	Mill Creek	082L004	5541340.180	339344.812	Concern with upper reaches and as it crosses Highway 97
89a-Q10	Westkal Rd boat launch wetland	082L024	5565780.141	337180.884	RDNO provided potential restoration/enhancement sites
89b-Q10	near 13412 Westkal Rd	082L024	5566644.521	337596.068	RDNO provided potential restoration/enhancement sites
89c-Q10	near 13120 Westkal Rd	082L024	5566671.945	337879.719	RDNO provided potential restoration/enhancement sites
68-Q10	Marshall Fields and Vernon concerns	082L024	5568026.988	333467.307	Changes and infill to Marshall Fields in Vernon. Recent development of commercial areas over wetlands in Vernon. Enhancing riparian along BX and Vernon creeks in Vernon.
50-Q10	Kalavista Lagoon	082L024	5566478.875	338623.244	Flow altered from Coldstream Creek- drying up; invasive yellow iris; loss of habitat to Painted Turtles, Great Blue Heron
50b-Q10	Aberdeen Wetland	082L024	5567828.240	340833.050	In need of care and preservation so that the profuse weeds don't take over, a boardwalk and educational signage would greatly enhance the aesthetic, educational, and recreational value of this area that is now preserved as a natural park.
37-Q10	Vernon Ck Okanagan Lake confluence	082L024	5568484.838	332816.718	Protection/enhancement-wetlands adjacent to Vernon Creek as it enters Okanagan Lake-high development pressure
37b-Q10	Coldstream Ck and Kalamalka Lake	082L024	5566007.610	338554.114	Coldstream Creek at Kalamalka Lake (high development pressure).
37c-Q10	Swan Lake wetlands	082L024	5573784.085	338865.526	Pressure from agricultural activity
34-Q10	Swan Lake and BX Ck wetlands	082L024	5572139.411	337716.555	Protect remaining habitat from development pressure, cattle grazing
30-Q10	Coldstream Creek	082L024	5565999.520	338611.634	Area of concern
89d-Q10	Learmouth Rd and Craster Creek	082L025	5565746.170	348165.183	Potential restoration area between Craster and Coldstream Creeks near Learmouth and Hwy 6
165-Q10	Rawlings Lake	082L026	5570893.992	366127.636	Class 1 wetland- several Water Act violations with farming that were never addressed
68b-Q10	Swan Lake wetlands	082L034	5574902.561	339125.041	Motorized boat use a concern.
56-Q10	Otter Lake wetlands	082L044	5587146.806	340331.749	Enhancement opportunity
164-Q10	Deep Creek along Otter Lake Road	082L044	5589831.573	342389.603	Otter Lake impacts
2-Q10	Armstrong Wetlands	082L045	5590449.887	344273.546	Protection, enhancement and restoration
163-Q10	Meighan Creek	082L045	5588730.905	345098.944	Armstrong
72-Q10	Mt Nelson-east of Mabel Lake	082L058	5601716.168	392739.296	Mt Nelson area
28-Q10	Thompson Pond - Lake Country				Thompson Pond and an adjacent pond, Lake Country. Since paving of the gravel road there is more traffic. The pond is a migration stop-off for various shore and water birds. The property is for sale.
6g-Q10	Drought/Davidson Property				Protection, enhancement and restoration
162-Q10	Okanagan Lake shoreline				Concern with Okanagan Lake shoreline and riparian areas