

Slocan Lake Foreshore Integrated Management Planning – 2021

Wood Project# VE52823-2021A



Prepared for:

Living Lakes Canada Nelson, BC

31 March 2022



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Prepared by:

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Executive Summary

Slocan Lake, situated between the Selkirk and Valhalla mountain ranges in the west Kootenay region of BC, is an oligotrophic lake with 87 km of shoreline and a maximum depth of nearly 300 m. Slocan Lake is the largest undammed lake in Southern B.C. with inflows from various tributaries and one outlet, the Slocan River, which flows into the lower Kootenay River. Slocan Lake is within the traditional territory of the Syilx, Sinixt, and Ktunaxa First Nations. Small villages and unincorporated communities are located on the north, east and south sides of the lake while Valhalla Provincial Park is located along most of the west side of the lake. Rural properties are located around the lakeshore. The Kootenays have long been regarded as a desirable place to vacation, recreate or reside. With expanding economic growth throughout western Canada in recent years, the Kootenays have experienced an increase not only in visitors, but also in permanent and seasonal residents.

As residential and recreational pressures on Slocan Lake escalate, questions have been raised about what measures need to be taken to balance the social, cultural, ecological, and economic values of any given area. In response to these concerns, Foreshore Inventory and Mapping (FIM) was conducted in 2010 and included FIM field surveys, the development of an Aquatic Habitat Index (AHI) and corresponding Shoreline Management Guidelines (SMG). Eleven years had passed since the original FIM was conducted and there was an interest in updating the previous field surveys and corresponding analyses to evaluate rates of change (e.g., development), observe whether integrated policies have been working, identify additional important habitat and species at risk and update the Slocan Lake FIM dataset using standard Foreshore Integrated Management Planning (FIMP) methods that were updated in 2020. The following includes all three phases of FIMP for Slocan Lake: FIM survey; development of the Foreshore Habitat Sensitivity Index (FHSI, formerly called AHI) to rank the relative value of shoreline habitats; and the Foreshore Development Guide (FDG, formerly called SMG).

In 2021, a FIM survey was completed along 88,566 m of the Slocan Lake shoreline the majority of which was observed in relatively natural condition (79,392 m; 90%) while the remainder was classified as disturbed (9,174 m; 10%). The majority of the shoreline was classified as having a low level of impact (56,332 m; 64%), followed by no (17,537 m; 20%), high (7,618 m; 9%) and medium (7,079 m; 8%) level of impact. The most prevalent land use was natural area (48,428 m; 55%) followed by park (34,075 m; 36%), single family residential (3,766 m; 4%), rural (2,618 m; 3%), industrial (779 m; <1%), urban park (572 m: <1%) and transportation (327 m; <1%). Shore type classifications observed included rocky shore (55,281 m; 62%), cliff/bluff (25,346 m; 29%), gravel (5,549 m; 6%), stream mouth (1,952 m; 2%) and sand (436 m; <1%).

Aquatic vegetation was observed along 7,559 m (9%) of the Slocan Lake shoreline, all of which was submergent. Foreshore and littoral substrates consisted primarily of boulder and bedrock with lesser amounts of cobble, gravels, sand and trace amounts of fines. Large woody debris (LWD) was observed in foreshore areas of 23 of the 34 Slocan Lake shoreline segments and the number of LWD pieces ranged from 1 to 75 per segment while in littoral areas LWD was observed in in 11 segments and the number of LWD pieces ranged between 1 and 95 in segments. LWD clusters were observed at the northwest corner of the lake where LWD was recruited down steep slopes to the foreshore. The littoral area width of most of the shoreline (65,694 m; 74%) was classified as narrow (<10 m) followed by medium (10 – 50 m) (21,086 m; 24%) and wide (>50 m) (1,785 m; 2%). Nearshore riparian vegetation was mainly coniferous with small areas of herbs/grasses and landscape/lawn while riparian stage was mostly mature and young forests. Just over half of the shoreline segments have continuous riparian vegetation with abundant tree cover while remaining areas were patchy with sparse or medium tree cover.

Fish sampling was conducted in shallow water habitats of Slocan Lake in September 2021. Shorthead Sculpin (*Cottus confusus*), a fish species of Special Concern under the federal Species at Risk Act (SARA) and provincially blue-listed, were observed at the south end of Slocan Lake and near the outlet of Springer Creek. Detailed wildlife surveys were conducted during the 2010 FIM and were not resurveyed in 2021. However, 16 bird species, two amphibian species and various tracks and habitats were recorded opportunistically during the 2021 FIM surveys.

The most prevalent lineal shoreline modification was historic railway locations, which occurred along 10,540 m (12%) of the shoreline, followed by erosion protection (10,330 m; 12%), roadway including both historic and active (5,190 m; 6%), substrate modification (4,561 m; 5%) and retaining walls (1,959 m; 2%). Other shoreline modifications included groynes (n=118), pilings (n=110), retaining walls (n=66), docks (n=57), mooring buoys (n=41), stairs (n=27), sheds (n=16), pile-supported structures (n=15), boat houses (n=9), dock groynes (n=9), swim floats (n=8), marine rail (n=7), gravel boat launches (n=5), concrete boat launches (n=4), fences (n=4), boat basins (n=2), boat lifts (n=1), marinas (n=1), and a pumphouse (n=1).

Comparison between the 2010 and 2021 FIM surveys indicated that the total length of disturbed shoreline increased slightly by 80 m (0.1% of the total shoreline) and the observed shoreline rate of change was approximately 0.01% per year. Increased disturbance in previously undisturbed areas included a new dock on the southeast side of the lake and a new access point at the north end of Wragge Beach Forest Recreation Site on the west side of the lake. Between 2010 and 2021, several types of shoreline modifications increased including groynes (from 66 to 118), retaining walls (from 34 to 66) and docks (from 43 to 57). The amount of the shoreline where substrate modification was observed increased by approximately 45% (1,356 m) between years while retaining walls increased by 35% (531 m) and roadways increased by 21% (932 m) though it is possible some of these changes are because of observer differences and changes to the methodology. Increased disturbance and more shoreline modifications, however, did not result in changes to riparian area characteristics (i.e., Vegetation Band 1) nor did this result in redefining Level of Impact for delineated segments which remained unchanged between 2010 and 2021. Fewer modifications and/or changing land uses were observed in some locations. This included the former sawmill site in the Village of Slocan which has been demolished as well as areas in Rosebery and near Wragge Beach where fewer docks were observed. Conservation efforts have also been undertaken since the previous FIM survey at the north end of the lake including the protection of the Snk'mip Marsh Sanctuary and ongoing restoration of the Bonanza Biodiversity Corridor.

Most of the shoreline of Slocan Lake was ranked as High (62.0%) ecological value followed by Moderate (34.3%), Low (2.0%) and Very High (1.6%). Most shoreline areas with Very High and Moderate ecological value remained in natural condition (3.1% and 6.1% disturbed, respectively) while more disturbance was observed in shoreline areas with High and Low ecological value (12.1% and 34.2% disturbed, respectively). Overall, eight of the 26 segments that could be compared had different Ecological Rankings in 2021 than they had in 2010, however, all the rank changes were likely due to additional criteria and adjusted weighting included in the 2021 FHSI that captured more aspects of shoreline areas evaluated as having Very High ecological value (Bonanza and Wilson creek confluences), that provide habitat to aquatic species-at-risk (Springer Creek and Slocan River confluences) and/or have unique habitat features (Wragge Beach Forest Recreation Site). Large drainages that have confluences in lakeshore communities (e.g., Rosebery, New Denver, Silverton) are also areas where conservation and/or restoration efforts could be focused.

First Nations Traditional Ecological Knowledge (TEK) was incorporated into the Slocan Lake FIM, FHSI and FDG. Representatives from Sylix Natural Resources and Okanagan Nation Alliance participated in the field survey and they compiled background and generational Sylix knowledge to include value considerations,

areas of concern, and recommendations for the long-term protection of important habitats and cultural values in this report.

The Slocan Lake FDG provides development and planning guidelines that are aimed at protecting ecologically sensitive areas. Guidance is provided for landowners, regulators and other stakeholders on the permitting and review process for shoreline development. The FDG also identifies areas where development should be avoided.

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List of Acronyms and Abbreviations

- AHI Aquatic Habitat Index (now referred to as FHSI)
- DFO Fisheries and Oceans Canada
- CDC Conservation Data Center
- FIDQ Fisheries Inventory Data Query
- FDG Foreshore Development Guidelines
- FHSI Foreshore Habitat Sensitivity Index
- FIM Foreshore Inventory and Mapping
- FIMP Foreshore Integrated Management Planning
- GIS Geographic Information Systems
- GPS Geographic Positioning Systems
- HWM High Water Mark
- LiDAR Light Detection and Ranging
- LLC Living Lakes Canada
- LWD Large Woody Debris
- MFLNRORD Ministry of Forests, Lands, Natural Resource Operations and Rural Development
- OCP Official Community Plan
- RDCK Regional District of Central Kootenay
- SLSS Slocan Lake Stewardship Society
- SARA Species-At-Risk-Act
- SHIM Sensitive Habitat Inventory and Mapping
- SMG Shoreline Management Guidelines (now referred to as FDG)
- TRIM Terrain Resource Information Management
- UAV Unpiloted Aerial Vehicle
- UTM Universal Transverse Mercator
- WSC Water Survey of Canada
- ZOS Zones of Sensitivity

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Living Lakes Canada is a non-profit society that facilitates collaboration in education, monitoring, restoration and policy development initiatives for the long-term protection of Canada's lakes, rivers, wetlands and watersheds. Our mandate is to help Canadians understand, adapt and mitigate the impacts of climate change to water quality and quantity, biodiversity and healthy human communities through grassroots water stewardship activities. Living Lakes Canada bridges the gap between science and action to foster and normalize citizen- based water stewardship.

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1.0 Introduction

Slocan Lake, situated between the Selkirk and Valhalla mountain ranges in the west Kootenay region of BC, is 39 km in length, has 87 km of shoreline, a surface area of approximately 69 km², and is situated at 541 m elevation (MOE 2021). The lake is oligotrophic with a mean depth of 171 m and maximum depth of 298 m (Galena Environmental Ltd. 2011). Slocan Lake is the largest undammed lake in Southern B.C. and water levels follow a natural hydrograph (SLSS 2022). Various tributaries provide inflows to the lake, the largest being Wilson Creek, and the southern outlet of the lake is the Slocan River which flows southwest into the lower Kootenay River. Rural properties are located around the lakeshore as well as three small villages (New Denver, Silverton and Slocan) and two unincorporated communities (Hills and Rosebery). Most of the west side of the lake is located in Valhalla Provincial Park. Slocan Lake is within the traditional territory of the Syilx, Sinixt, and Ktunaxa First Nations

The Kootenays have long been regarded as a desirable place to vacation, recreate or reside. With expanding economic growth throughout western Canada in recent years, the Kootenays have experienced an increase not only in visitors, but also in permanent and seasonal residents. Along with increasing population comes a requirement for new infrastructure such as residential, commercial, and industrial developments. The geographical structure of the Kootenays (mountains and valleys) means that many of these new developments occur in valley bottoms and the most desirable locations within these valleys tend to be near lakes and rivers. Slocan Lake is no exception. As residential and recreational pressures on Slocan Lake escalate, questions have been raised about what measures need to be taken to balance the social, cultural, ecological, and economic values of any given area. The Slocan Lake Stewardship Society (SLSS) was formed in 2006 in response to these concerns. The SLSS is a science-driven organization that initiates and sponsors a wide range of aquatic, environmental and wildlife research projects to continually expand understanding and knowledge of all the ecosystems that impact the health of the Slocan Lake watershed. Advocacy and support of the SLSS led to completion of the initial Slocan Lake Foreshore Inventory and Mapping (FIM), Aquatic Habitat Index (AHI) and Shoreline Management Guidelines (SMG) (Galena Environmental Ltd. 2011, Ecoscape 2014).

The initial FIM of Slocan Lake was conducted in 2007 and additional details were collected and added to the FIM dataset in 2008, 2009 and 2010 resulting in the lake being separated into 28 shoreline segments (Galena Environmental Ltd. 2011). Most of the shoreline (91%) was in natural condition. The primary land use was natural area (90%) followed by single family dwellings (8%). Two shoreline industrial developments in Rosebery and Slocan covered approximately 1% of the shoreline. Modifications observed included groynes (n=66), docks (n=38), retaining walls (n=29), boat launches (n=4) and marinas (n=1). Approximately 11.5% and 46% of the shoreline had Very High or High aquatic habitat value, respectively (Galena Environmental Ltd. 2011). SMG for Slocan Lake were subsequently produced in 2014 based on the results of the initial FIM inventory (Ecoscape 2014).

Community planning documents, such as Official Community Plans (OCPs), have reflected the importance of preserving elements of the natural environment which epitomize the Slocan Lake foreshore. Four OCPs exist adjacent to the Slocan Lake foreshore that include the Village of Slocan, New Denver, Silverton and other rural areas located within the Regional District of Central Kootenay Electoral Area 'H' – Slocan Lake North (RDCK 2011, Village of New Denver 2007, Village of Silverton 2010, Village of Slocan 2011). RDCK (2011) and Village of Slocan (2011) OCPs include some measures to regulate development activities in and adjacent to watercourses to protect aquatic and riparian habitats. For example, the RDCK Electoral Area 'H' – Slocan Lake North OCP includes a Watercourse Development Permit Area within 30 m of the high-water mark of any watercourse for the protection of the natural environment, its ecosystems and biological diversity (RDCK 2011). The initial Slocan Lake FIM and associated SMG were completed after the three OCPs were adopted and have not been incorporated into the existing OCPs at this time.

Eleven years has passed since the original FIM surveys were concluded and there is an interest in updating the previous field surveys and corresponding analyses (e.g., FIM, AHI and SMG). It is important to determine whether any changes have occurred since the original FIM program to evaluate rates of change (e.g., development), observe whether integrated policies have been working (i.e., current OCP guidelines) and identify additional important habitat and species at risk.

The following summarizes the outcomes of each step of the process:

- Foreshore Inventory and Mapping (FIM) is a process that uses GIS, GPS and field observation to inventory and describe the land uses (e.g., residential and industrial development, etc.), shoreline modifications (e.g., docks, retaining walls, etc.), and biophysical attributes (e.g., wetlands, riparian vegetation, substrate, etc.) along the lake or reservoir shoreline. Information collected can be incorporated into a variety of land use planning documents including Official Community Plans, Shoreline Management Plans and Land and Resource Management Plans.
- 2. Foreshore Habitat Sensitivity Index (FHSI) is the core technical analysis completed using FIM and non-FIM data to determine the relative habitat value of a shoreline. The FHSI uses data collected during the FIM survey, additional field reviews (e.g., fish and wildlife surveys) and data from other sources to determine the relative habitat value of a shoreline segment (one of five Ecological Ranks are assigned) and identify zones of sensitivity. The FHSI rankings are a relative measure of habitat value or sensitivity that are waterbody-specific.
- 3. Foreshore Development Guide (FDG) is a report that used the FHSI results to recommend development guidelines that aim to protect sensitive foreshore habitats. The FDG is intended to provide background information to land managers, homeowners, developers and stakeholders when land use changes or activities are proposed that could alter the shoreline thereby affecting fish and wildlife habitat. The guidelines include the Ecological Rankings for all shoreline areas, an activity risk table and a decision-making flow chart for proposed works along the shoreline. The FDG also contains fish and wildlife habitat conservation areas and/or strategies.

The following report includes all three phases of FIMP, which includes reporting on the FIM survey, the FHSI and the FDG. In this case it is a redoing of the FIM survey (herein referred to as re-FIM) that was conducted between 2007 and 2010 but using the updated 2021 standards (Schleppe et al. 2021). Comparisons were made between 2010 and 2021, where appropriate.



Populated Place Highway Watercourse	0 1 2 Kilometers Scale: 1:110,000	LivingLakes	Slocan Lake FIMP			
Parks & Protected Areas References: DataBC Data BC Data Copen Government License (http://www.data.gov.bc.ca/) Geogratif/Geobase Open Government License - Canada (http://data.gc.ca/en/gabout-datagcca)	T	Slocan Lake	DATE: October 28, 2021 GIS FILE: 02-01-021_slocan_lak	ANALYST: QA/QC: PK CL F e_overview.mxd	igure 1	
	Overview Map	JOB No: VE52823 COORDINATE SYSTEM: NAD 1983 UTM Zone	 11N		wood.	

2.0 Methods

Methods presented herein provide a summary of the three phases of FIMP pertaining to Slocan Lake, which was previously completed between 2007 and 2010, herein referred to as the 2010 FIM survey (Galena Environmental Ltd. 2011). FIMP methods (including re-FIM comparisons) are outlined in Schleppe et al. (2021), unless otherwise specified below.

2.1 Foreshore Inventory Mapping (FIM)

2.1.1 Pre-Field Assessment

Background information was compiled and baseline field maps prepared during the pre-field assessment to help guide field data collection activities and ensure all required information was acquired.

GIS map file layers including Regional District of Central Kootenay (RDCK) legal boundaries/jurisdiction/ cadastral/zoning land uses, provincial data layers (e.g., Freshwater Atlas, TRIM, etc.), and Conservation Data Centre (CDC) BC Species and Ecosystems Explorer plants, animals and ecosystem mapping were obtained from online platforms. FIM segment breaks/points/polygons collected during the 2010 Slocan Lake survey were obtained from Living Lakes Canada. The most recent and complete set of orthophotos are from 2004/2005 for Slocan Lake, prior to the previous FIM survey and 4 of the 7 orthophoto maps have missing data resulting in blacked out portions of the lake (BC Government Online Store). These are the same orthophotos used during the original Slocan Lake FIM. Therefore, World & Bing Imagery (2018-2020 satellite imagery, colour, 0.5 m pixels) were used to prepare the base maps as they are more representative of current conditions.

Baseline maps were prepared in ArcGIS using imagery and overlay of GIS layers from the 2010 FIM analysis (e.g., segment breaks, high water mark, aquatic vegetation polygons and wetlands). The high-water mark (HWM) delineated during the 2010 FIM analysis was reviewed by using a combination of orthophotos and satellite imagery interpretation (0.5 m pixels; interpretation to within ±5 m). Small changes were made to a few areas and this was incorporated into an updated shoreline layer for Slocan Lake. Slocan Lake does not have an active hydrometric data station maintained by Environment and Climate Change Canada, so the HWM (i.e., shoreline layer) cannot be determined using staff gauge measurements (MOE 2009 as cited in Schleppe et al. 2021). In addition, there was no LIDAR available to use for HWM determination (RDCK 2021). Average littoral width was calculated during the pre-assessment by taking an average of, at minimum, three measurements from the shoreline out to the area where there was an obvious colour change on the satellite imagery that identified deeper water; these areas were also confirmed during the 2021 re-FIM survey.

The 2010 FIM segment breaks were reviewed against the more recent satellite imagery. Any changes in land use, riparian vegetation, wetlands and aquatic vegetation between the 2010 (original FIM) and current imagery (re-FIM) were identified for field verification as were any locations that may also warrant additional segment breaks. Significant changes (i.e., changes in shoreline characteristics over an area greater than 50 m) were not observed and therefore additional segment breaks were not required.

A literature review was conducted to obtain any more recent studies for Slocan Lake including previous FIM, AHI and SMG documents (Galena Environmental Ltd. 2011). This was done to ensure necessary information was collected during the FIM field surveys. Resources reviewed for fish, wildlife and ecological values included EcoCat: The Ecological Reports Catalogue, Conservation Data Centre (CDC) iMap, BC Species & Ecosystem Explorer and other web-based searches were consulted.

All digital datasets and mapping layers were loaded onto a tablet (e.g., iPad) prior to conducting the field portion of the FIM surveys (Section 2.1.2). A health and safety plan was prepared and reviewed with team members prior to conducting field surveys.

2.1.2 Field Data Collection Platform

The primary method for field data collection was a tablet (e.g., iPad) loaded with the *ArcGIS Collector*[™] application. Collector for ArcGIS is a map-driven, mobile data collection application that allows for easy and accurate field data capture. This application uses the device's GPS location services to identify your position and data can be captured in both a connected and disconnected (i.e., without Wi-Fi/cellular data) environment. Collector for ArcGIS is fully integrated with the ArcGIS platform so it can be seamlessly incorporated with other ArcGIS apps to maximize efficiency in workflows. This platform was successfully implemented and used during the Moyie and Whitetail lakes FIMP (Wood 2020a, 2020b).

Base maps developed during the pre-field assessment (Section 2.1) were loaded into the ArcGIS Collector application. The Slocan Lake data dictionary with the 2010 FIM dataset was also loaded onto the tablet for use in the ArcGIS Collector. This data dictionary included all segment line features as outlined in Schleppe et al. (2021; specifically Appendix B) which generates a layer within a file geodatabase that was then published and used by field assessors to populate. Other geometry types (e.g., point and polygon) feature layers that needed to be included in the re-FIM were created for any additional data collection that was outside of the segment break data dictionary (e.g., photographs and aquatic vegetation polygons). Photographs were directly embedded as a point location for each segment along with metadata including location (e.g., UTM), timestamp, segment number, photograph number and caption.

Field data were collected using the Slocan Lake ArcGIS Collector data dictionary in a disconnected environment. Data was exported and backed up to a laptop, cloud-based storage and Wood's internal server daily. Data were also reviewed for completeness at this time.

Additional data collection tools and back ups also included bringing the following into the field daily:

- Digital and hard copies of Excel spreadsheets with a copy of the updated data dictionary.
- Avenza Maps, an alternative application for georeferenced photo collection, was also loaded onto the tablet, with baseline maps imported.
- Hard copy printouts of base maps were available for field assessors to mark up polygons and other feature information. And,
- Waterproof field notebooks and hand counters were also available for field assessors to take additional notes and tally counts.

2.1.3 Foreshore Inventory and Mapping Field Surveys

The re-FIM field survey was conducted over a 4-day period on 21 to 24 September 2021. Slocan Lake was accessed via boat launches in Slocan and New Denver. As outlined in Schleppe et al. (2021), the field survey was conducted by navigating a boat along the shoreline of the lake, slowly and within a safe distance from shore to minimize wave action and avoid nearshore hazards. A four-person field crew, consisting of staff from Wood, Okanagan Nation Alliance and Sylix Natural Resources, was stationed on the deck of the boat and each crew member was responsible for ensuring specific data fields were collected. Data collection was accomplished via tablet using the ArcGIS Collector data dictionary (Section 2.1.2). Surveys began at a segment break closest to the boat launch or where surveys had ended the previous day and proceeded along the shoreline until all segments were inventoried. Within each segment, all lake characteristics (i.e., data fields) outlined by Schleppe et al. (2021) were inventoried following standard methods.

The Slocan Lake ArcGIS data dictionary contained the 2010 FIM dataset that was used to verify and update the data collection fields during the re-FIM. Those data fields that remained similar between the 2010 and 2021 surveys were left as documented by the original observers to avoid documenting changes that were solely due to observer differences and potential changes/interpretation of the definitions from the updated methodology. One crew member, Louise Porto, was present during both the initial 2007 and 2021 field surveys and provided consistency and background information on how original values were determined, when necessary. Potentially erroneous data in the 2010 FIM dataset was highlighted for further office review. Digital and hard copies of Schleppe et al. (2021) were available in the field and used as reference during inventory of all data entry fields. At least one photograph of each single-family residential lot, each shoreline modification as well as representative photographs of each segment were taken.

2.1.3.1 Fish Survey

Information on fish and other aquatic resources was compiled during the background literature review. Fish species observations were compiled using the provincial Fisheries Inventory Data Query tool (FIDQ 2021) and reports relevant to aquatic resources in Slocan Lake were obtained from provincial databases (e.g., FIDQ and Ecocat), the previous FIM survey (Galena Environmental Ltd. 2011) and web searches. Data gaps related to the presence/absence of SARA-listed sculpin and dace species in Slocan Lake were identified during the background review. Therefore, fish surveys were conducted over a two-day period on 24 and 25 September 2021 as part of the Slocan Lake re-FIM survey.

The conservation status of all fish species identified in the lake was reviewed against the federal (e.g., SARA and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC)) and provincial (e.g., CDC) listings (Government of Canada 2021, CDC 2021). The information was summarized and presented in Section 3.1.6.

2.1.3.2 Wildlife Survey

Wildlife surveys, outside of observational data collected during the standard FIM procedure, were not conducted as part of the re-FIM survey as detailed wildlife surveys were conducted during the 2010 FIM survey (Galena Environmental Ltd. 2011). Information on wildlife and other terrestrial resources in Slocan Lake was compiled during the background literature review. The conservation status of all wildlife species identified in the lake was reviewed against the federal (e.g., SARA and COSEWIC) and provincial (e.g., CDC) species listings (Government of Canada 2021, CDC 2021). The information was summarized and presented in Section 3.1.7.

2.1.3.3 Unpiloted Aerial Vehicle (UAV) Survey

Videography and still image photography via an Unpiloted Aerial Vehicle (UAV) (drone) survey was also conducted on 10 September 2021. The UAV survey collected video and still images with a focus on areas with development, extensive aquatic vegetation/wetlands and any areas suspected to have changed since the 2010 FIM. Shoreline areas around Slocan, Silverton, New Denver, Rosebery and Hills were surveyed by UAV. The UAV survey was conducted up to a maximum height of 122 m (operator's permitted use) to capture these foreshore features as well as any areas that were not visible from the boat (e.g., vegetation bands in steeper areas).

2.1.4 Post-Processing and QA/QC

Post-processing included extracting photos, converting data, modifying feature layers, shoreline mapping to match orthophoto representation of high-water mark, and another QA/QC of entire dataset. Shape files for each lake segment by section breaks were created. Aquatic vegetation GIS polygons were determined by reviewing maps, UAV imagery and field observations and were then delineated manually on maps,

digitized and added to map templates. After post-processing, data were imported into map templates for report map production. The UAV footage was reviewed during post-processing to help QA/QC field survey data and extract relevant still images for reporting that highlight specific features of interest.

During post-processing, two segments (Segments 26 and 27), located on the west shore of Valhalla Provincial Park, were divided into smaller sub-segments to better delineate the areas of privately held land parcels that occur along this shoreline; these had not been separated out in 2010. To accommodate these private land parcels, Segment 26 was divided into five sub-segments (Segments 26.1-26.5) and Segment 27 into three (Segment 27.1-27.3). Photos, satellite imagery and fieldnotes were used to populate the 2021 FIM dataset for the sub-segments. Counts and percentages of some variables such as littoral substrates, LWD, veteran trees, snags, and groynes, were difficult to distinguish this way and a best attempt was made to designate each to the new subsegment as accurately as possible and total counts allocated to the new subsegments equalled the previous total for the larger initial segment. For example, there were 105 LWD pieces enumerated in Segment 26 and after post-processing, Segments 26.1 through 26.5 (n=20, 0, 5, 5, and 75 LWD pieces, respectively) were allocated a combined total that matched what was observed in the field.

2.1.4.1 QA/QC of the 2010 FIM Dataset

QA/QC of the 2010 FIM dataset was initially conducted during field surveys (Section 2.1.3) and completed during post-processing prior to comparing 2010 and 2021 datasets. The following revisions were made to the 2010 FIM dataset based on field and desktop review:

- Disturbance was adjusted in Segments 4, 8, 14, 16 and 19 to match the values observed in 2021. These adjustments were made to remove observer bias when comparing the change in disturbance levels between the 2010 and 2021 surveys. Changes between surveys had not been observed in these segments and the 2021 values were a better reflection of the state of the foreshore.
- Small areas of historic railway and roadway were updated in the 2010 FIM dataset based on
 observations during the 2021 re-FIM survey. In Segments 3 and 4, areas that had been classified as
 historical roadway were reclassified as historic railway (100% of both segments). In Segment 13, the
 percent railway was increased from 15% to 55% to reflect true conditions observed in both 2010
 and 2021. And,
- Dock counts for the 2010 FIM dataset in Segments 1 (n=2), 11 (n=1), 26 (n=6) and 27 (n=5) were updated based on review of FIM and SMG orthophoto maps (Galena Environmental Ltd. 2011, Ecoscape 2014) to facilitate comparisons between years.

The 2010 FIM dataset was not updated to include updated counts of other variables that had previously been inventoried (e.g., retaining walls) or counts of new variables that were included in the 2021 re-FIM dataset (e.g., boat launches, sheds, etc.) as outlined by Schleppe et al. (2021) as a preliminary review of historic orthophotos suggested obtaining the data this way would be inaccurate. Although photographs were imbedded in the 2010 FIM report (Galena Environmental Ltd. 2011), they were not detailed enough to allow the 2010 inventory to be updated. The 2010 FIM dataset was also not updated to reflect land use classifications as per Schleppe et al. (2021).

2.1.5 Data Analyses and Management

The following shoreline characteristics were summarized by evaluating the proportions of each category within a segment and summing each category for Slocan Lake:

- Natural versus disturbed shoreline.
- Shore type segment class including the proportion of natural versus disturbed shoreline within each shore type.
- Land use segment class including the proportion of natural versus disturbed shoreline within each land use type.
- Foreshore, littoral and riparian (i.e., vegetation bands) characteristics.
- Aquatic vegetation.
- Shoreline modifications. And,
- Level of impact.

Note that the segment classification for shore type and land use, not the proportion within each segment, were evaluated against the proportion of the segment that was disturbed versus natural. Riparian characteristics were summarized qualitatively, where possible. Fish and wildlife observations/attributes were described based on background literature review and field observations.

All fish and wildlife-related datasets collected during the desktop review were exported digitally (e.g., shapefiles, file geodatabase, Excel) and provided to Living Lakes Canada as supporting documentation to this report.

2.1.6 Comparison of 2010 FIM and 2021 re-FIM Datasets

The 2010 and 2021 datasets were scrutinized on a segment-by-segment basis to determine which categories were comparable between years. Segment length data measured in 2021 was used for all comparisons to remove bias in the data from GIS mapping differences between years. Shoreline categories that typically remain static through time (e.g., land use, shore type, substrate type, littoral zone width, and some riparian characteristics) were not formally compared between years since no change was expected (Schleppe et al. 2021). Each dataset was reviewed to confirm that no change had been documented.

The following shoreline categories were compared between the 2010 and 2021 Slocan Lake datasets:

- Natural versus disturbed shoreline.
- Level of Impact.
- Shoreline modifications including docks, groynes, retaining walls, and marinas. And,
- Lineal shoreline modifications including retaining walls, railway, roadway, and substrate modification.

To facilitate this evaluation, segment breaks that were subdivided during the re-FIM (e.g., Segment 26 split into 26.1 - 26.5 and Segment 27 split into 27.1 - 27.3) were evaluated as if they had remained as the single segment they had been delineated as during the initial FIM. This was done because it was not possible to update the 2010 dataset using the new segment breaks because existing orthophotos, photographs and reporting for the 2010 FIM did not include enough detail within each of the new segments to do this effectively.

A rate of change analysis was conducted by comparing the percent natural shoreline for the entire lake in 2010 versus 2021 (Schleppe et al. 2021). Rate of change was also calculated for individual segments where a percentage of the segment in natural condition changed between 2010 and 2021. Orthophoto and still images available from the original FIM were reviewed against orthophoto, still images, and UAV to compare survey outputs, where possible.

2.2 Foreshore Habitat Sensitivity Index (FHSI)

A FHSI is a framework for assessing the relative aquatic and terrestrial habitat values along a lake's shoreline. The FHSI uses inventory information collected during the FIM survey, additional field surveys (e.g., fish and wildlife surveys), background literature reviews and/or data from other sources to develop a points-based index that assigns positive values to important and sensitive habitat features and negative values to modifications that have impaired habitat value. Non-FIM categories included in the FHSI can include fish, wildlife, herptile, waterfowl, ecosystem, rare or endangered species or ecosystems, and/or other criteria. The FHSI is then applied to each shoreline segment delineated during the FIM, resulting in a collection of habitat segment scores. A numerical range is used to define each Ecological Rank (e.g., Very Low, Low, Medium, High, and Very High), allowing each segment to be labelled accordingly. Methods outlined by Schleppe et al. (2021) were followed during development and calibration of the Slocan Lake FHSI, calculation of segment FHSI scoring and determination of FHSI Ecological Ranks. Additional details are also provided below.

2.2.1 FHSI Weighting and Calibration

Each FIM and non-FIM category were assigned an initial weighting following the standardized procedure outlined by Schleppe et al. (2020) whereby each category value is initially equal, except for shoreline modifications, then weights of categories were adjusted based on the expected influence of the criterion. At the same time, the influence of each criterion was determined by adjusting the Percent Within Category to reflect the influence of each criteria on foreshore habitat. The FHSI score was then calculated by summing the score of all index criteria for each segment. Note that Band 1 data was used for both Band 1 and Band 2 calculations when Riparian Band 1 extended the entire 50 m assessment zone and no Riparian Band 2 was observed. Subcategories of substrate types were weighted the same as their primary category (e.g., fine gravel and coarse gravel received the same weight as gravel).

Five FHSI versions were developed, each with different category and/or criteria weightings, and were scrutinized by the study team; the version that best reflected Slocan Lake's habitat values was selected. The FHSI segment scoring was then used to develop FHSI Ecological Ranks, a five-class ranking system, ranging from Very Low to Very High ecological value, by reviewing the minimum, maximum, median and distribution of FHSI scores for the lake and creating appropriate boundaries for each ranking. Several iterations of the FHSI Ecological Rank breaks were conducted to determine if the ranks were reflective of values along the shoreline. Iterations were reviewed, mapped (Section 2.2.3) and updated using procedures outlined by Schleppe et al. (2021).

The FHSI was calibrated by reviewing the influences of each of the different FIM and non-FIM FHSI categories and criteria and associated weightings to ensure that the index is appropriately scored. Three versions of the FHSI were selected to represent the most reflective of shoreline habitat value for review/calibration by the LLC Technical Committee, including the version selected by the study team. Feedback was received from one committee member and was used to finalize FHSI criteria, FHSI Ecological Rank breaks and segment rankings.



2.2.2 Zones of Sensitivity

Zones of Sensitivity (ZOS) are specific areas identified as important habitats for either species or general ecosystem function. ZOS are a way of displaying sensitive habitat areas that may or may not have been included in the FHSI rank calculation, as point, line or polygon features graphically on maps and using GIS mapping tools. ZOS often include wetlands, aquatic vegetation, creek mouths, native grasslands, wildlife habitat and corridors, gravel/cobble habitat, biologically productive areas and other unique unimpacted/natural areas because of their value to fish and wildlife (Schleppe et al. 2021, Caskenette et al. 2020, NRC 2002).

2.2.3 FHSI Mapping, Analysis and Reporting

Mapping is the best framework for viewing results of the FHSI. Mapping products initially developed during the FIM were updated to include the FHSI Ecological Rank of each segment using the prescriptive colour and mapping requirements as specified in Schleppe et al. (2021). ZOS were also added to the maps as polygons and a 20 m buffer was added to each polygon to account for unknowns in the mapping of the ZOS and protect the core ZOS from potential impacts from adjacent activities. The buffer size was kept relatively narrow due to inherent buffering already included in the ZOS polygons during digitization for tributary mouths and change in mapping scale for wetlands.

Standard analysis of FHSI Ecological Rank was completed. These included a summary of the total shoreline length and percentage of the total shoreline of each FHSI Ecological Rank with an additional summary of FHSI Ecological Rank by shore type and a plot of total length of natural and disturbed shoreline by rank (Schleppe et al. 2021).

Areas with unique, high value habitats were highlighted for designation as conservation zones. Potential conservation zones included areas with Very High or High FHSI Ecological Rank that also contain one or more ZOS.

2.2.4 Evaluation of 2021 Data Using the 2010 AHI

An attempt was made to evaluate the data collected in 2021 using the original AHI created for Slocan Lake in 2010. Although calculations could be completed to come up with new numerical AHI values for each segment there was not enough detail provided in Galena Environmental Ltd. (2011) to facilitate comparison of AHI values or ranks between years. Numerical AHI values for each segment and ecological rank breaks were not provided in the original FIM report. Therefore, this comparison could not be completed.

2.3 First Nations Traditional Ecological Knowledge (TEK)

FIMP recognizes the importance of including First Nation's Traditional Ecological Knowledge, which can be included as non-FIM criteria and/or as points, polygons or lines on FHSI mapping and GIS products (Schleppe et al. 2021). The Slocan Lake FIMP program was developed to include the direct involvement of Sylix Natural Resources (SNR) and Okanagan Nation Alliance (ONA) members during the FIM field survey as well as in the review of FHSI criteria and the FDG document. As a result, TEK was incorporated directly into the assessment and inventory of shoreline variables, habitats and disturbance/modification observations. In addition, SNR and ONA compiled background and generational Sylix knowledge with observations during the September 2021 field survey to include value considerations, areas of concern, and recommendations for the long-term protection of important habitats and cultural values. Mapping includes medium and high potential archaeological polygon areas and point locations of important cultural sites observed during the survey including pictographs and culturally modified trees. Appendix D contains SNR's cultural memo and this information was considered during development of the Slocan Lake FHSI and FDG.

ONA also conducted a desktop cultural review of the Slocan Lake watershed and information is provided in Section 3.3.1.

Ktunaxa Nation Council (KNC) did not respond to invitations to participate in the Slocan Lake FIMP during initial correspondence in 2021.

2.4 Foreshore Development Guide (FDG)

The FDG provides development planning guidelines, aimed at protecting sensitive fish and wildlife species and their habitats identified through the previous FIM and FHSI analyses. The template FDG provided by Schleppe et al. (2021) was populated with Slocan Lake specific information including the FHSI Ecological Rank of each shoreline segment and ZOS. This information was also provided on FDG mapping products which were a streamlined version of the FHSI maps revised to only include FHSI Ecological Rank and ZOS using predetermined colour coding (Schleppe et al. 2021). The Slocan Lake FDG is provided in Appendix G.

3.0 Results

3.1 FIM

Biophysical characteristics of Slocan Lake are summarized below. Segment maps are provided in Appendix A and segment summaries are provided in Appendix B.

3.1.1 Natural versus Disturbed Shoreline

The re-FIM was completed along the entire 88,566 m of the Slocan Lake shoreline. The shoreline was divided into 34 segments ranging in length from 239 to 22,970 m. The total length of disturbed shoreline was 9,174 m (10%) while the total length of shoreline that remained in natural condition was 79,392 m (90%); (Figure 2).



Figure 2: Total shoreline length (m) that is disturbed or natural for Slocan Lake.

3.1.2 Shore Type

The predominant shore type was rocky shore which was observed along 55,281 m (62%) of Slocan Lake (Figure 3). Other shore types observed included cliff/bluff (25,346 m; 29%), gravel (5,549 m; 6%), stream mouth (1,952 m; 2%) and sand (436 m; <1%). Wetland shore types were not observed. One segment classified as gravel shore type (Segment 15) was noted as being entirely imported fill. In areas with cliff/bluff and rocky shores, 98% and 91% of the shoreline remained in natural condition, respectively. Less of the shoreline remained in natural condition in areas with stream mouth and gravel shore types (57% and 56%, respectively) while the one segment classified as sand shore type (Segment 21) was completely disturbed with no natural shore remaining (Figure 3). The Slocan River outlet accounted for most of the stream mouth shore type observed (Segments 1 and 28) with the remaining area located at the Wilson Creek outlet (Segment 17).





Figure 3: Shore types and length of natural (green) versus disturbed (red) shoreline for Slocan Lake.

3.1.3 Land Use

The predominant land use along the Slocan Lake shoreline was natural area (48,428 m; 55%) followed by park (34,075 m; 36%) (Figure 4). Lesser amounts of single family residential (3,766 m; 4%), rural (2,618 m; 3%), industrial (779 m; <1%), urban park (572 m: <1%) and transportation (327 m; <1%) land uses were also observed (Figure 4).

Most of the shoreline in segments classified as natural area and park were in a natural state (3% and 7% disturbed, respectively) (Figure 4). Disturbance in natural areas was due to small areas of rural and single-family residential development or transportation corridors (e.g., Highway 6) in a portion of the segment. Disturbance in areas with park land uses was also due to small areas of rural and single-family residential as well as park infrastructure. More disturbance was observed in segments classified as rural (31% disturbed) where shoreline modification was associated with beach access, docks and substrate modification. Segments with transportation and industrial land uses had similar levels of disturbance (70% and 81%, respectively) mainly due to erosion protection, retaining walls and infilling adjacent to the shoreline. The highest levels of disturbance were associated with segments classified as single-family residential and urban park land uses (85% and 90%, respectively) due to numerous shoreline modifications including docks, groynes, retaining walls, boat launches, erosion protection and substrate modification.

Small areas of institutional and commercial land uses were observed in segments that had other overall land use classifications. The hospital adjacent to the shoreline in New Denver (Segment 12) was classified as institutional land use (429 m) while the municipal campground and marina were classified as commercial land use (286 m). The municipal campground in Silverton was also classified as commercial land use (88 m).



Figure 4: Land use types and length of natural (green) versus disturbed (red) shoreline for Slocan Lake.

3.1.4 Aquatic Vegetation

Aquatic vegetation was observed along 7,559 m (9%) of the Slocan Lake shoreline. All aquatic vegetation observed was submergent; emergent and floating aquatic vegetation were not observed. Submergent aquatic vegetation was observed in half of the shoreline segments. Aquatic vegetation was only observed in small portions of most segments where it was observed ($\leq 20\%$) except for segments near the south (Segments 1 and 28; 70% and 65%, respectively) and north (Segments 20 and 21; 100%) ends of the lake.

3.1.5 Shoreline Characteristics

Characteristics of foreshore, littoral, riparian, and wetland areas are described below.

3.1.5.1 Foreshore Areas

Large Woody Debris (LWD) was observed along the foreshore in 23 of the 34 Slocan Lake shoreline segments and the number of LWD pieces ranged from 1 to 75 per segment when observed (Appendix B). The highest abundance of foreshore LWD was observed along the west side of the lake in Segment 26.5 (n=75) adjacent to Valhalla Park. The next highest counts of LWD were approximately 20 pieces per count and observed in protected and/or undeveloped foreshore areas along northwest (Segment 24, 25 and 26.1) and southeast (Segments 6 and 8) areas of the lake. LWD clusters (n=4) were observed in the northern half of Segment 22 where LWD was recruited down steep slopes to the foreshore.

Boulder (34,795 m; 39%) and bedrock (30,290 m; 34%) were the predominant substrate types observed along the foreshore of Slocan Lake (Figure 5). Lesser amounts of cobble (9,301 m; 11%), coarse gravel (6,457 m; 7%), fine gravel (4,290 m; 5%), sand (2,210 m; 3%), gravel (923 m; 1%) and fines (299 m; <1%) were also observed.



Figure 5: Substrate types observed along the foreshore of Slocan Lake.

3.1.5.2 Littoral Areas

The littoral area was narrow (<10 m) along the majority (65,694 m; 74%) of the Slocan Lake shoreline. Medium (10 – 50 m) littoral areas were observed along 21,086 m (24%) of the shoreline while wide (>50 m) littoral areas were observed along the remaining 1,785 m (2%) of the shoreline. Littoral width ranged between 1 and 55 m. Wide littoral areas were located at the south (Segment 1) and north (Segments 20 and 21) ends of the lake. Littoral LWD was observed in 11 segments and the number of LWD pieces ranged between 1 and 95 in segments where it was present. The highest count of littoral LWD (n=95) was observed along the east side of the lake (Segment 8) which had very steeply sloped banks (>60%) facilitating LWD recruitment from densely forested areas upslope.

Littoral substrates were found in similar amounts as foreshore substrates in Slocan Lake. Boulder (30,714 m; 35%) and bedrock (27,700 m; 31%) were the predominant substrate types observed in littoral areas of Slocan Lake (Figure 6). Lesser amounts of cobble (14,197 m; 16%), gravel (10,175 m; 12%), sand (4,112 m; 5%), coarse gravel (1,430 m; 2%) and fines (237 m; <1%) were also observed.



Figure 6: Substrate types observed in littoral areas of Slocan Lake.



3.1.5.3 Riparian Areas (Vegetation Bands 1 and 2)

The nearshore riparian vegetation band (Vegetation Band 1) was 50 m or greater in all shoreline segments; secondary vegetation layers (i.e., Vegetation Band 2) within 50 m of the shoreline were not observed (Appendix B). The majority of riparian vegetation in Vegetation Band 1 was coniferous (87,019 m; 98%) with small areas of herbs/grasses (974 m; 1%) and landscape/lawn (572 m; <1%). The dominant stage of riparian vegetation was mature forest (64,208 m; 73%) followed by young forest (22,811 m; 26%), sparse vegetation (871 m; 1%) and grass/herb (675 m; 1%) (Figure 7). Riparian vegetation was continuous in just over half (n=20) of the shoreline segments and patchy in the remainder. Areas with continuous riparian vegetation had abundant (>50%) tree cover while areas with patchy vegetation had sparse (<10%) or medium (10-50%) tree cover.

Most shoreline segments did not have veteran trees (n=21) and those that did had <5 veterans except for areas adjacent to Valhalla Provincial Park (Segments 26.1 and 26.5) where more (>5 veterans) were observed. Snags were more common and observed in 25 segments; segments with the most snags (>25 trees; n=15 segments) were mainly natural areas or parks. Segments that had no veterans and no snags (n=4) were in areas where shorelines were heavily modified by an urban park (Segment 1), a historic log dump (Segments 14 and 15) and short segments with steep rocky slopes (Segment 4) or residential development (Segments 26.3, 26.4 and 27.2).

Overhanging vegetation was only observed in eight of the 34 segments and covered between 5 and 20% of the segment when present (Appendix B).



Figure 7: Vegetation stages observed in Vegetation Band 1 for Slocan Lake.

3.1.6 Fish Species Information

Fish observations made during the September 2021 field survey are provided in Appendix C. Fish values identified by Syilx Natural Resources during the FIM survey are provided in Appendix D. Galena Environmental Ltd. (2011) provides a summary of detailed fish and fish habitat observations for Slocan Lake as well as the results of fish habitat assessments conducted between 2007 and 2010. Fish species occurrence information provided by Galena Environmental Ltd. (2011) updated with information from FIDQ (2021), CDC (2021) and 2021 fish inventory survey (Appendix C) is provided in Table 1.



Common Name	Species Name	BC Provincial Conservation Status	Federal Species-At- Risk-Act (SARA) Status
Brook Trout	Salvelinus fontinalis	-	-
Bull Trout	Salvelinus confluentus	Blue	-
Burbot	Lota lota	Yellow	-
Dace (General)	Rhinichthys spp.	Yellow	-
Kokanee	Oncorhynchus nerka	Yellow	-
Lake Chub	Couesius plumbeus	Yellow	-
Largescale Sucker	Catostomus macrocheilus	Yellow	-
Longnose Dace	Rhinichthys cataractae	Yellow	-
Mountain Whitefish	Prosopium williamsoni	Yellow	-
Northern Pikeminnow	Ptychocheilus oregonensis	Yellow	-
Peamouth Chub	Mylocheilus caurinus	Yellow	-
Prickly Sculpin	Cottus asper	Yellow	-
Rainbow Trout	Oncorhynchus mykiss	Yellow	-
Redside Shiner	Richardsonius balteatus	Yellow	-
Sculpin	Cottus sp.	Yellow	-
Shorthead Sculpin	Cottus confusus	Blue	Special Concern
Torrent Sculpin	Cottus rhotheus	Yellow	-
Westslope Cutthroat Trout	Oncorhynchus clarkii lewisi	Blue	Special Concern
White Sturgeon*	Acipenser transmontanus	Red	Endangered

Table 1: Fish species known to occur or have occurred in Slocan Lake including current provincial conservation status and federal Species-At-Risk (SARA) Listing.

* A remnant population that is considered functionally extirpated has been documented in Slocan Lake (COSEWIC 2003).

Prior to the fish inventory survey in September 2021, Shorthead Sculpin had not been identified in Slocan Lake. Shorthead Sculpin, Columbia Sculpin (both provincially blue listed and Special Concern under SARA) and Umatilla Dace (provincially red listed and initially listed as Special Concern under SARA though this is under review) had been captured throughout the Slocan River from the confluence with the lower Kootenay River to approximately 13 km downstream of the Slocan Lake outlet for Umatilla Dace (AMEC 2014), 34.5 km for Columbia Sculpin (AMEC 2014) and 0.5 km for Shorthead Sculpin (CDC 2021; Peden and Clermont 1989). Sampling targeting at-risk sculpin and dace had not previously been conducted further upstream in the Slocan River or in Slocan Lake (AMEC 2014). In 2021, Shorthead Sculpin were observed in Slocan Lake near the outflow to the Slocan River (Segment 1) as well as in Springer Creek near the confluence with Slocan Lake (Segment 2; Appendix C).

Westslope Cutthroat Trout were stocked to Slocan Lake in 1911 when 50,000 fry were released (FIDQ 2021). Provincial databases and reports do not list other Westslope Cutthroat Trout observations within Slocan Lake, however, the species has been documented in tributaries to the lake including Enterprise, Shannon, Wilson and Silverton creeks (Galena Environmental Ltd. 2011 and references cited therein). Westslope Cutthroat Trout were stocked in headwater lakes of the Slocan Lake watershed which may be the source of resident populations observed in tributary streams. It remains unknown if native populations existed in the Slocan Lake watershed prior to hatchery-based stocking efforts.

A remnant population of White Sturgeon (Endangered under SARA) that is considered functionally extirpated was identified in Slocan Lake in the 1990's (COSEWIC 2003). The population is physically isolated from the Columbia River by dams and naturally from the Kootenay River at Bonnington Falls. Two White Sturgeon were captured in Slocan Lake during set-line sampling in 1995 (R.L. & L. 1996) and one of those individuals was recaptured during additional sampling conducted in 1996 (R.L. & L. 1997). In total, 102,642 hook-hours of effort were expended in Slocan Lake in 1995 and 1996. The two White Sturgeon captured were adults and one individual, examined in 1996, was a pre-spawning female that would likely have spawned in spring 1997. The limited availability of suitable spawning habitats and the absence of juveniles in the catch suggested the population was not reproducing successfully. One White Sturgeon was aged as being 37 years old at the time of capture. Based on the age (i.e., 1959 year-class), the sturgeon could not have accessed the Slocan River by migration upstream from the Columbia River due to development of the Brilliant Dam in 1944 and was therefore likely either from a remnant lake dwelling population or was entrained from the Kootenay Lake population through the series of dams on the lower Kootenay River and subsequently migrated up the Slocan River to reach Slocan Lake (R.L. & L. 1997).

Bull Trout, though not listed under SARA, are provincially blue-listed and the Slocan Lake population is considered "At-Risk". (Irvine and Baxter 2019). Slocan Lake Bull Trout historically had access to the Kootenay and Columbia river systems and it is likely that significant declines in abundance and diversity occurred following the loss of habitat connectivity because of hydroelectric development in the early 1900's (Irvine and Baxter 2019 and references cited therein). Slocan Lake Bull Trout have a typical adfluvial life history which means that they spawn and rear in tributaries to Slocan Lake then out-migrate to adult rearing habitat in the lake. Silverton Creek is the primary spawning creek for the population and in 2018 it accounted for 71% of escapement in the Slocan watershed, including Slocan River tributaries (Irvine and Baxter 2019). Wilson Creek and its tributary Dennis Creek are the other main spawning streams (21% of escapement in 2018) and spawning Bull Trout or redds have also been observed in Carpenter, Shannon, Wee Sandy, Wragge (Irvine and Baxter 2019, Baxter and Irvine 2017).

Adfluvial pacific salmon have been extirpated from the Slocan River watershed because the Grand Coulee Dam (constructed in 1942) in Washington blocks their passage into Canadian waters. Kokanee (*Oncorhynchus nerka*) are present in Slocan Lake and spawn in various tributaries including Bonanza, Wilson, Silverton and Carpenter creeks (Baxter and Irvine 2014, Amec Foster Wheeler 2015). In May 2021, the ONA released 10,000 Sockeye Salmon (*Oncorhynchus nerka*) fry into Slocan Lake in coordination with annual salmon ceremonies (Berry 2021). Efforts to restore Sockeye Salmon to the upper systems of the Columbia River watershed is a high priority for local First Nations (Appendix D).

3.1.7 Wildlife and Wildlife Habitat Observations

Galena Environmental Ltd. (2011) provides a summary of wildlife and wildlife habitat observations for Slocan Lake as well as the results of wildlife habitat assessments conducted between 2007 and 2010.

Wildlife observations recorded during the 2021 re-FIM are included in the segment summaries in Appendix B and summarized by segment below:

- Segment 2 one Northern Flicker (*Colaptes auratus*) and two stick nests.
- Segment 3 one Red-tailed Hawk (Buteo jamaicensis).
- Segment 5 Two Red-tailed Hawk and one each of Common Merganser (*Mergus merganser*) and Crow.
- Segment 6 one each of Bald Eagle (*Haliaeetus leucocephalus*) and Turkey Vulture (*Cathartes aura*).
- Segment 7 American Crow (Corvus brachyrhynchos).



- Segment 8 Two stick nests.
- Segment 12 American Crow.
- Segment 13 One each of Steller's Jay (*Cyanocitta stelleri*), Western Grebe (*Aechmophorus occidentalis*) and American Crow.
- Segment 16 Crows, Canada Goose (*Branta canadensis*) and one Bald Eagle.
- Segment 18 Common Merganser and American Robin (*Turdus migratorius*).
- Segment 19 Common Merganser.
- Segment 20 American Dipper (*Cinclus mexicanus*), Sandpiper (*Scolopacidae* sp.), Great Horned Owl (*Bubo virginianus*), Northern Flicker as well as North American River Otter (*Lontra canadensis*) and White-Tailed Deer (*Odocoileus virginianus*) tracks, American Beaver (*Castor canadensis*) dam in Bonanza Creek and potential Floater mussel (*Anodonta* sp.) beds.
- Segment 21 Common Loon (*Gavia immer*), Belted Kingfisher (*Megaceryle alcyon*), Steller's Jay, North American River Otter, American Crow, Pacific Treefrog (*Pseudacris regilla*), Western Toad (*Anaxyrus boreas*) and Floater mussel beds.
- Segment 22 one each of Bald Eagle and American Beaver as well as fresh woodpecker cavity.
- Segment 23 American Crow and Northern Flicker.
- Segment 24 Belted Kingfisher and fresh woodpecker cavity in a snag.
- Segment 26.5 Crow, Pileated Woodpecker (*Dryocopus pileatus*) cavity and one Bald Eagle stick nest.
- Segment 27.3 Western Grebe.
- Segment 28 Crow and Common Merganser.

Observations of at-risk wildlife species and their habitat in riparian and aquatic areas of Slocan Lake include:

- Western Grebe, provincially red-listed and Special Concern under SARA, observed in Segments 13 and 27 during the re-FIM survey (Appendix B).
- Western Toad, Special Concern under SARA, observed in Segment 21 during re-FIM survey (Appendix B).
- Banded Tigersnail (*Anguispira kochi*), provincially blue-listed, have been identified in Rosebery (Segment 17) approximately 120 m from the Slocan Lake and Wilson Creek shorelines. Fourteen live and 10 dead Banded Tigersnails were observed during a gastropod survey in 2008 (CDC 2021). And,
- Western Bumble Bee (*Bombus occidentalis*), provincially blue-listed, was observed in Hills at a property near the lakeshore (Segment 21) during a survey in 2010 (CDC 2021).

Galena Environmental Ltd. (2011) conducted a review of at-risk species in the Conservation Data Center (CDC) records within a wider geographic area that encompassed the entire Slocan Lake watershed. Records indicated there were nine mammal, eight bird, one amphibian and three reptile species provincially or federally listed as "at risk" within the region Galena Environmental Ltd. (2011). Recent assessments in wetlands north of Slocan Lake have also documented various at-risk species (e.g., SLSS 2021, Valhalla Foundation for Ecology 2021). Additional information on at-risk species in the Slocan Lake watershed beyond the lake foreshore and riparian habitats can be found in those resources.



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3.1.8 Shoreline Modifications

Groynes were the most prevalent shoreline modification observed in Slocan Lake (Figure 8). Groynes (n=118) were observed in 11 segments and the highest concentrations of groynes were observed near Rosebery (Segment 16; n=18; 26 groynes/km), Silverton (Segment 10; n=34; 19 groynes/km) and at boat-access properties on the west side of the lake (Segment 26.2; n=13; 30 groynes/km and Segment 27.2; n=1-; 22 groynes/km). The next most common shoreline modifications were pilings (n=110) followed by retaining walls (n=66), docks (n=57), mooring buoys (n=41), stairs (n=27), sheds (n=16) and pile-supported structures (n=15). Boat houses (n=9), dock groynes (n=9), swim floats (n=8), marine rail (n=7), gravel boat launches (n=5), concrete boat launches (n=4), fences (n=4), boat basins (n=2), boat lifts (n=1), marinas (n=1), and a pumphouse (n=1) were also observed (Figure 8). The highest concentrations of docks were observed near Hills (Segment 21 = 16 docks/km), boat-access properties on the west side of the lake (Segment 26.2 = 12 docks/km) and a small bay with private properties on the east side of the lake (Segment 7 = 11 docks/km). Figure 9 provides examples of some types of shoreline modifications observed in Slocan Lake.

The most prevalent lineal modification was historic railway locations, which occurred along 10,540 m (12%) of the shoreline, followed by erosion protection (10,330 m; 12%), roadway including both historic and active (5,190 m; 6%), substrate modification (4,561 m; 5%) and retaining walls (1,959 m; 2%) (Figure 10). A historic railway line that is now used as a bike/walking trail is present on the east side of the lake from New Denver to the north end of the lake. Erosion protection included retaining walls, groynes, and rip rap material along historic railway locations, roadways and abandoned industrial sites (log yards and a sawmill). A historic highway is located at the southeast side of the lake near Slocan (Segments 3 and 4) and active roadways included Highway 6, village roads and/or property access in various segments. Substrate modification was mainly caused by beach grooming and infilling along retaining walls; retaining walls were constructed of concrete, wood cribbing, cobble/boulder substrates and riprap (Appendix A).









Figure 9: Example of shoreline modifications observed on Slocan Lake including a boat basin with boat launch, dock and erosion protection in Segment 10 (left) and docks, groynes, mooring buoys and substrate modification at boat access residential properties in Segment 26.2 (right).



Figure 10: Total shoreline length that has been impacted by lineal modifications along the shoreline of Slocan Lake.

3.1.9 Level of Impact

In total, 56,332 m (64%) of the Slocan Lake shoreline was considered to have a low level of impact (<10% disturbance; Figure 11). Areas with no impact were observed along 17,537 m (20%) of the shoreline while high (>50% disturbance) and medium (10-50% disturbance) levels of impact were observed along the remaining 7,618 m (9%) and 7,079 m (8%), respectively (Figure 11). Examples of the different levels of impact assessed along the shoreline of Slocan Lake are illustrated in Figure 12.

The highest level of impact (≥90% disturbed) was observed in segments modified by historic log yard and sawmill operations (Segments 2 and 15), a beach park with retaining walls, docks and a boat launch (Segment 1) and modifications associated with single-family residential development including retaining walls, groynes, docks and riparian clearing (Segments 10 and 21). Shoreline segments with medium level of impact were mostly rural properties with a few shoreline modifications such as docks (e.g., Segment 7 and 26.4) or boat house on land (e.g., Segment 28). A low level of impact was observed in natural areas that had one or a few shoreline modifications such a dock or riparian clearing near beaches (e.g., Segments 8 and 9), or in Valhalla Provincial Park where minor modifications were observed at campsites and trailheads (e.g., Segments 26.1 and 26.5). No impacts were observed along steep natural areas along the northwestern shoreline (Segments 22 and 24) and in sections of Valhalla Provincial Park (Segments 25, 26.3, 27.1 and 27.3).



Figure 11: Level of Impact (None, Low, Medium or High) observed along the shoreline of Slocan Lake.



Figure 12: Examples of the different levels of impact assessed along the shoreline of Slocan Lake.

3.1.10 Comparison of 2010 FIM and 2021 re-FIM

Segments that were subdivided in 2021 (Segments 26 and 27) were assessed in the sections below as if they had not been subdivided (i.e., as two segments instead of eight) to facilitate comparison between the two surveys (see Section 2.1.6). As a result, there are slight differences in values presented below and those in Sections 3.1.1 to 3.1.9.

3.1.10.1 Natural versus Disturbed Shoreline

The shoreline of Slocan Lake was divided into 28 segments in 2010 and 34 segments in 2021. The total length of disturbed shoreline increased slightly by 80 m (0.1% of the total shoreline) between 2010 and 2021 from 8,490 m (9.6%) to 8,570 m (9.7%), respectively (Figure 13). Therefore, the total length of natural shoreline also slightly decreased between 2010 and 2021 from 80,076 m (90.4%) to 79,996 m (90.3%), respectively (Figure 13). This suggests the amount of disturbance along the Slocan Lake shoreline is increasing by approximately 7.3 m (0.01%) per year.



Figure 13: Comparison of the total shoreline length (m) classified as disturbed or natural for Slocan Lake, 2010 and 2021.

The level of disturbance increased between 2010 and 2021 at the following locations:

- Southeast side of the lake (Segment 6) a new permanent dock was observed along an undeveloped shoreline (Figure 14). However, no riparian impacts were observed. The disturbance level increased by 1%, the minimum amount possible (from 0% to 1%), resulting in approximately 58 m of modified shoreline. This suggests the amount of disturbance in Segment 6 increased by approximately 5 m (0.1% of the segment) per year. And,
- Northwest side of the lake at Wragge Beach Forest Recreation Site (Segment 24) a new gravel boat launch/lake access path was observed at the rustic camping area (Figure 14). The disturbance level increased by 1% (from 0% to 1%) resulting in approximately 22 m of modified shoreline. This suggests the amount of disturbance at Segment 24 increase by approximately 2 m (0.1% of the segment) per year.



Figure 14: Dock observed in Segment 6 (left) and gravel boat launch/lake access observed in Segment 24 (right) in 2021 that were not present in 2010.



Additional shoreline disturbance and modification was observed in other segments that did not result in an increase in the % disturbance because these segments had already been classified as 100% disturbed in 2010. For example, this occurred at the Village of Slocan beach (Segment 1) where a new retaining wall, landscaping and beach grooming were observed since the previous survey.

There were also areas of Slocan Lake where fewer shoreline modifications and/or disturbance were observed. This did not result in changes to the overall % disturbance of the segments because the shore remained heavily modified or increases in disturbance were observed elsewhere in the segment. Examples of this were observed at:

- Former Springer Creek Forest Products site in Slocan (Segment 2) All mill-related infrastructure has been removed from the property as well as from the lake itself. Retaining walls, cribbing and old access road remnants remain along the entire shoreline, therefore the segment remained 100% disturbed (Figure 15).
- A residence in Rosebery (Segment 16) A dock, mooring buoy, pole with solar panel and concrete ballast observed in a photo taken during the 2010 FIM were no longer present at the same residence during the 2021 re-FIM survey (Figure 16).



Figure 15: Photo of the former mill site in Segment 2 in 2010 (left) and the same property in 2021 (right).



Figure 16: Photo of a residence in Rosebery (Segment 16) in 2010 (left) and the same property in 2021 (right).


Note that it was not possible to evaluate whether additional shoreline modification has occurred between surveys at private properties along the west side of the lake adjacent to Valhalla Provincial Park (Segments 26.2, 26.4 and 27.2). These properties had been included within the much larger Segments 26 and 27 during the initial FIM and modifications were not georeferenced or photographed.

3.1.10.2 Aquatic Vegetation

Significant adjustments were made to the percentage of aquatic vegetation in some segments (e.g., from 100% in 2010 to 0% in 2021). However, these changes are mainly due to reclassification after review of the 2010 values against 2021 field observations, drone and satellite imagery. Most steep shorelines with no littoral area had been designated as having aquatic vegetation along 100% of the shoreline which is not possible; this was likely because map interpretation was used to identify aquatic vegetation during the previous survey. Therefore, comparisons of aquatic vegetation between years were not possible.

3.1.10.3 Land Use

Land use re-classification occurred in portions or the entirety of segments where no land use changes had occurred, but updated definitions provided by Schleppe et al. (2021) required reassignment. These changes were numerous and were required in most segments and are therefore not summarized here. Examples included most of the west side of the lake that was identified as natural area in 2010 were reclassified as park in 2021 and the Village of New Denver (Segment 12) that was classified as 100% single-family residential in 2010, however, land uses were observed to include institutional, commercial, park, transportation and single-family and these were unchanged since the previous FIM survey.

Land use was observed to be in the process of changing between surveys at the following location:

 Springer Creek Forest Products sawmill site in the Village of Slocan (Segment 2) – the sawmill closed in 2014 and was subsequently demolished. All infrastructure has been removed and the site has remained vacant (Figure 15). In 2020, the property was purchased by the Village of Slocan (Trembley 2020). Updated zoning is not available, therefore the segment was maintained as industrial land use (RDCK 2021).

Though not directly on the shores of Slocan Lake, recent conservation and restoration efforts have been undertaken within the Slocan Lake watershed since the initial FIM. The Snk'mip Marsh Sanctuary, a 35-acre wetland at the north end of Slocan Lake adjacent to Segment 20, was purchased in 2017 by the Valhalla Foundation for Ecology. Wetland restoration and expansion work has been undertaken and the property is being managed for conservation purposes (Valhalla Foundation for Ecology 2021). The Bonanza Biodiversity Corridor, located between the community of Hills near Slocan Lake (adjacent to Segments 20 and 21) and Summit Lake to the north, encompasses the entire drainage of Bonanza Creek. Part of the larger Kootenay Connect project, the Bonanza Biodiversity Corridor aims to provide a wildlife and ecological corridor between the Valhalla and Central Selkirk mountain ranges (Proctor and Mahr 2021). The corridor contains numerous riparian wetland complexes, high-quality fish habitat, wildlife corridors, habitat connectivity as well as unique and at-risk species (SLSS 2021). Protection and restoration of the corridor is ongoing and the project is supported by the SLSS, Kootenay Conservation Program (KCP), Canada Nature Fund and many regional and local organizations.

3.1.10.4 Level of Impact

The level of impact classification for each segment did not change between the 2010 and 2021 surveys.

3.1.10.5 Shoreline Modifications

Counts of shoreline modifications that were comparable between survey years included the number of boat launches, docks, groynes, marinas, and retaining walls (Figure 17). Differences between 2010 and 2021 counts are as follows (Figure 17):

- Groynes increased from 66 to 118.
- Retaining walls increased from 34 to 66.
- Docks increased from 43 to 57. And,
- The number of marinas remained the same.

The amount of the shoreline where substrate modification was observed increased by approximately 45% (1,356 m) between years while retaining walls increased by 35% (531 m) and roadways increased by 21% (932 m) (Figure 18). The amount of shoreline modified by historic railways remained unchanged (Figure 18).

The largest increase in docks were observed adjacent to Hills (Segment 21; increase from 2 to 7) and at boat-access private properties on the west shore of the lake across from New Denver (Segments 26.2 and 26.4; increase from 6 to 10). The largest increase in groynes was documented adjacent to the Village of Silverton (Segment 10; increase from 7 to 34) and in retaining walls was documented adjacent to the Village of New Denver (Segment 12; increase from 2 to 13). However, it is unclear if these represent true increases in shoreline modification or are due to differences between observers and/or updated methodology for inventorying these modifications. Recently constructed retaining walls were observed in Segment 1 and the proportion of the segment containing retaining walls increased from 5% to 15%, the largest change in the proportion of retaining walls observed in a segment between surveys (see Section 3.1.10.1). The largest increase in substrate modification was adjacent to the Village of Silverton (Segment 10; 25% to 60%) and in roadways was in the same area (Segment 10; 10% to 20%). However, as with other modifications mentioned above, the reason for these increases are unclear.

In some segments, fewer shoreline modifications were observed since the 2010 FIM:

- Springer Creek Forest Products sawmill site in the Village of Slocan (Segment 2) Infrastructure related to the former sawmill site has been removed (see Section 3.1.10.3).
- Rosebery (Segment 16) Fewer docks were observed in 2021 (n=5) compared with 2010 (n=11; e.g., Figure 16). And,
- West shoreline south of Wragge Beach Forest Recreation Site (Segment 24) Two docks removed leaving no docks remaining in this segment.

Though not an inventoried category, ONA has observed increased foreshore campsite use at the north end of the lake outside of Valhalla Park, specifically near the Shannon Creek mouth. No services to support campsites (septic, water, tent pads, etc.) are available and shrub clearing has been observed (David DeRosa, Natural Resources Program Lead, ONA, personal communication). In October 2020, the SLSS successfully had a Notation of Interest under the Land Act "application only area" established along the foreshore area adjacent to the Shannon Creek mouth (File No. 4405906). Under this notation, special events that involve music events must obtain a permit from Front Counter BC prior to the event.



Figure 17: Comparison of the total number of selected modifications observed along the foreshore of Slocan Lake, 2010 and 2021.







3.2 FHSI

The Slocan Lake FHSI included four categories:

- 1. Biophysical (FIM).
- 2. Fisheries (non-FIM).
- 3. Ecosystem (non-FIM).
- 4. Rare Occurrences (non-FIM). And,
- 5. Modifications (FIM).

Biophysical and modification criteria used data collected during the 2021 FIM survey, fisheries criteria used information compiled during the 2021 and 2010 fish surveys and background literature review, and ecosystem and rare occurrence criteria used background literature review. Other non-FIM categories outlined in Schleppe et al. (2021) (e.g., wildlife, herptile, waterfowl, and/or other criteria) were not included in the FHSI at this time as sufficient data did not exist to support the addition of these categories. Rationale for FIM criteria included in the Slocan Lake FHSI is provided in Table 2. The Slocan Lake FHSI is provided in Table 3.

Table 2:	Ecological Rationale for Criteria Included in the Foreshore Habitat Sensitivity Index for
	Slocan Lake.

Category	Criteria	zos	Rationale
	Shore Type	No	Shore type is related to many aspects of fish and wildlife habitat and inherent characteristics in each shore type (e.g., complexity, slope, substrate, etc.) can be an overarching determinant of habitat value. As a result, shore type received the highest weighting in the biophysical FIM category. Shore types with complexity that provide a variety of rearing, feeding and breeding habitats for both fish and wildlife (e.g., stream mouth, wetland, gravel beach and rocky shore) received higher value than less complex shore types (e.g., cliff/bluff and sand beach) (e.g., Kennedy and Mayer 2002; Rice et al. 2008).
	Foreshore Substrate	No	Substrates received a moderate weighting in the category because they provide important spawning and rearing habitat for fish. Cobble and gravel substrates received higher value than others because of their use as spawning and juvenile rearing habitat for salmonids, sculpins and Burbot in Slocan Lake (McPhail 2007).
	Percentage Natural	No	Percent natural was weighted high in the biophysical FIM category to capture the habitat value of intact ecosystems found in natural areas.
FIM	Aquatic Vegetation	Yes	Aquatic vegetation provides cover, food supply, primary production and filtration to aquatic ecosystems (Caskenette et al. 2020). The weighting applied to aquatic vegetation was higher than other criteria that provide cover (e.g., overhanging vegetation, LWD) due to its limited distribution in the lake and numerous benefits. Aquatic vegetation was also included as a ZOS in Slocan Lake (see Section 3.1.4).
	Overhanging Vegetation	No	Overhanging vegetation provides a source of nutrients to aquatic ecosystems, foraging areas for wildlife and can shade nearshore habitat (Caskenette et al. 2020). This criterion was weighted the same as LWD, lowest of the biophysical FIM data, because relative to other criteria, the influence is quite low due to large surface area of Slocan Lake.
	Large Woody Debris	No	LWD provides instream cover for fish of all age classes and is an especially important habitat for rearing juvenile salmonids. The weighting of this criterion was the same as overhanging vegetation because the influence is quite low given the large surface area of Slocan Lake and alternative cover habitat provided by depth.
	Band 1	No	Riparian Band 1 received a higher value than Riparian Band 2 because it inherently has more influence on foreshore habitat than riparian areas set back from the shoreline. Although Band 2 was not observed in any segments at this time, it was included in the FHSI to
	Band 2	No	facilitate future evaluation if the riparian community were to change to include two vegetation bands. Wider riparian areas received more value as did vegetation types that contribute to more to nutrient production than others (i.e., wetlands, broadleaf and shrubs) (Caskenette et al. 2020).



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Category	Criteria	ZOS	Rationale	
	Juvenile Rearing	No	A juvenile rearing criterion was included in the initial Slocan Lake AHI and suitability was ranked as either low, moderate or high (Galena Environmental Ltd. 2011). To evaluate the criterion within the FHSI, the juvenile fish rearing habitat suitability index developed by Galena Environmental Ltd. (2011) was applied to the current dataset. The index considered habitat values including shore type, substrate, presence of aquatic vegetation, overhanging vegetation, LWD, width of the littoral zone as well as the presence of migration corridors and spawning streams. Results were reviewed as a histogram to determine the most relevant ranking breaks. This criterion was weighted higher than other fisheries criteria because of the limited distribution of high-quality rearing habitat in the lake and the importance of rearing habitat for all fish species.	
Fisheries	Migration Corridor	Yes	Tributaries to Slocan Lake provide spawning, egg incubation and juvenile rearing habitat for salmonids including Westslope Cutthroat Trout (Special Concern under SARA) and Bull Trout (Blue-listed and of local conservation concern). Shorthead Sculpin (Special Concern under SARA) were also documented near confluence areas of tributaries at the south end of the lake. Tributary access is also important for the reintroduction of Sockeye Salmon, identified as a high priority for the Syilx (Appendix D). Migration corridors were identified at and surrounding tributary mouths and was identified by reviewing watercourses that flow into or out of Slocan Lake as delineated in the BC Freshwater Atlas. A migration corridor criterion was included in the initial Slocan Lake AHI (Galena Environmental Ltd. 2011).	
	Staging Area	No	The fish staging criterion identifies locations that fish are known to stage or hold prior to migration. Fish species where staging locations have been documented for Slocan Lake include Bull Trout and Kokanee (e.g., Baxter and Irvine 2017, Amec Foster Wheeler 2015) and these locations provide potential staging habitat for other salmonids including Westslope Cutthroat Trout and Rainbow Trout. Reference documents were used to identify staging locations as present or absent within a shoreline segment.	
Ecosystem	Wildlife Connectivity Corridor		Enhancing connectivity corridors is a priority to the Syilx and residential development along the foreshore limiting uninterrupted wildlife access was a concern (Appendix D). Proctor et al. (2015) and Proctor and Mahr (2021) identified high linkage potential habitat for access between Grizzly Bear core habitat areas that would also support migration of other wildlife species. As part of the Kootenay Connect project, the Bonanza Connectivity Corridor and the Slocan River Corridor were identified as focal, high value corridors to maintain landscape-level connectivity. Wildlife Connectivity Corridors were identified as being present where high value linkage potential habitat identified by Proctor et al. (2015) and Proctor and Mahr (2021) connected with the foreshore. Focal corridors were weighted higher than potential linkage habitat.	
Rare Occurrences	SARA-Listed Species		Location where species listed as Endangered, Threatened or Special Concern under SARA have been observed that were not already included in the categories above were identified under rare occurrences. Observations within the lake as well as the riparian area within 50 m of the HWM were included. Species included Shorthead Sculpin, Western Toad and Banded Tigersnail.	
15	Retaining Wall		Schleppe et al. (2021) provides detailed description of the impacts modifications can have	
tion:	Docks		on toreshore habitats. Similar weights were given to all modification criteria. Docks were weighted slightly higher because they are often associated with various other foreshore	
ifica	Groynes		modifications (e.g., riparian clearing, substrate modification) and provide habitat for non-	
μομ	Boat Launch		native fish species. Groynes were weighted slightly lower because groyne density was fairly low relative to docks and retaining walls. Columbia Lake FIM data was reviewed as a	
-	Marina		histogram to develop lake-specific value categories (Low, Moderate, High)	

Category	Criteria	Percentage of FHSI	Percent Within Category	Logic	Uses Weighted FIM Data	Value Categories
	Shore Type	23.8	35	Proportion of Segment * Percentage of FHSI * Value Category	Yes	Stream Mouth = Wetland (1) > Gravel Beach = Rocky Shore (0.8) > Sand Beach = Cliff /Bluff (0.5), Other (0.3)
	Foreshore Substrate	11.6	17	Proportion of Segment * Percentage of FHSI * Value Category	Yes	Cobble (1) > Gravel (1) > Boulder = Organic = Mud = Marl (0.8), Fines = Sands (0.5) > Bedrock (0.3)
	Percentage Natural	8.2	12	Proportion of Segment Natural * Percentage of the FHSI	No	
	Aquatic Vegetation	6.8	10	Proportion of Segment with Aquatic Vegetation * Percentage of the FHSI	No	
M	Overhanging Vegetation	4.1	6	Proportion of Segment with Overhanging Vegetation * Percentage of the FHSI	No	
ш	Large Woody Debris	4.1	6	Percentage of the FHSI * Value Category	No	>20 LWD/km (1) > 10-20 LWD/km (0.8) > 5-10 LWD/km (0.6) > 0 - 5 LWD/km (0.4) > 0
	Band 1	6.8	10	Vegetation Bandwidth Category * Vegetation Quality * Percentage of the FHSI	Yes	Vegetation Bandwidth Category 1 to 5 m (0.2) < 6 to 10 m (0.4) < 11 to 15 m (0.6) < 16 to 20 m (0.8) < 21 m (1)
	Band 2	2.7	4	Vegetation Bandwidth Category * Vegetation Quality * Percentage of the FHSI	Yes	Vegetation Quality Category Natural Wetland = Disturbed Wetland = Broadleaf = Shrubs (1) > Coniferous Forest = Mixed Forest (0.8) > Herbs/Grasses = Unvegetated (0.6) > Lawn = Landscaped = Row Crops (0.3) > Exposed Soil (0.05)
Cate	egory Subtotal	68.0	100			

Table 3: Foreshore Habitat Sensitivity Index for Slocan Lake.

Category	Criteria	Percentage of FHSI	Percent Within Category	Logic	Uses Weighted FIM Data	Value Categories
heries	Juvenile Rearing	6.0	50	Juvenile Rearing habitat quality is categorized as High, Moderate or Low. High = Percentage of the FHSI, Moderate (0.5*Percentage of the FHSI), Low (0.25*Percentage of the FHSI)	No	
Fis	Migration Corridor	3.0	25	Present (Percentage of the FHSI), Absent (0)	No	
	Staging Area	3.0	25	Present (Percentage of the FHSI), Absent (0)	No	
Category Subtotal		12.0	100			
Ecosystem	Wildlife Connectivity Corridor	5.0	100	Focal Corridor Present (Percentage of the FHSI), High-Value Potential Linkage Habitat (0.5*Percentage of the FHSI), Absent (0)	No	
Cate	egory Subtotal	5.0	100			
Rare Occurrences	SARA Listed Species	5.0	100	Present (Percentage of the FHSI), Absent (0)	No	
Cate	egory Subtotal	5.0	100			

Category	Criteria	Percentage of FHSI	Percent Within Category	Logic	Uses Weighted FIM Data	Value Categories
	Retaining Wall	2.0	20	Proportion of Segment with Retaining Walls * (Percentage of the FHSI)	No	
	Docks	2.5	25	Dock Density is categorized as High, Moderate, Low or None using segment data. High = Percentage of the FHSI, Moderate (0.75*Percentage of the FHSI), Low (0.5*Percentage of the FHSI), None (0*Percentage of FHSI)	No	>0-1 docks/km (Low); >1-5 docks/km (Moderate); >5 docks/km (High)
Modifications	Groynes	1.0	10	Groyne Density is categorized as High, Moderate, Low or None using segment data. High = Percentage of the FHSI, Moderate (0.75*Percentage of the FHSI), Low (0.5*Percentage of the FHSI), None (0*Percentage of FHSI)	No	>0-1 groynes/km (Low); >1-5 groynes/km (Moderate); >5 groynes/km (High)
	Boat Launch	2.0	20	Boat Launch Density is categorized as High, Moderate, Low or None using segment data. High = Percentage of the FHSI, Moderate (0.75*Percentage of the FHSI), Low (0.5*Percentage of the FHSI), None (0*Percentage of FHSI)	No	>0-1 boat launch/km (Low); >1-2 boat launches/km (Moderate); >2 boat launches/km (High)
	Marina	2.5	25	Present (Percentage of the FHSI), Absent (0)	No	
Categ	gory Subtotal	10.0	100			
	Total	100.0				

3.2.1 Summary of FHSI Values

A summary of the 2021 FHSI values for Slocan Lake is provided in Table 4. Maps of shoreline segments with FHSI Ecological Ranking are provided in Appendix E. Calculations for each criterion and category as well as Ecological Rank breaks are provided in Appendix F.

Most of the shoreline of Slocan Lake was ranked as High (62.0%) ecological value followed by Moderate (34.3%), Low (2.0%) and Very High (1.6%) (Table 4). Most shoreline areas with Very High and Moderate ecological value remained in natural condition (3.1% and 6.1% disturbed, respectively) while more disturbance was observed in shoreline areas with High and Low ecological value (12.1% and 34.2% disturbed, respectively) (Figure 19).

FHSI Ecological Rank	# of Segments	Shoreline Length (m)	% of Shoreline
Very High	2	1,445	1.6
High	16	54,936	62.0
Moderate	13	30,403	34.3
Low	3	1,782	2.0
Very Low	0	0	0.0
Total	34	88,566	100

 Table 4:
 Slocan Lake FHSI Ecological Rankings.



Figure 19: FHSI Ecological Rankings and length of natural (green) versus disturbed (red) shoreline for Slocan Lake.

All Very High ecological value segments had gravel or wetland shore types present while High ecological value segments had rocky shore, gravel or stream mouth shore types (Table 5). Moderate ecological value segments had a variety of shore types while Low value segments had cliff/bluff or rocky shore types (Table 5). Land uses observed in segments with Very High ecological value included natural areas and park while land uses were variable in segments with High and Moderate ecological value (Table 6). Natural area and single family residential land uses were observed in segments with Low ecological value (Table 6).



	Cliff/Bluff		Gravel		Rocky Shore		Sand		Stream Mouth	
FHSI Ecological Rank	Shoreline Length (m)	% of Shore Type Category	Shoreline Length (m)	% of Shore Type Category						
Very High	0	0	777	14	0	0	0	0	668	34
High	0	0	4,293	77	49,360	89	0	0	1,284	66
Moderate	23,996	95	480	9	5,490	10	436	100	0	0
Low	1350	5	0	0	432	1	0	0	0	0
Very Low	0	0	0	0	0	0	0	0	0	0

Table 5: Slocan Lake FHSI Ecological Rankings by shore type.

Table 6: Slocan Lake FHSI Ecological Rankings by land use.

	Indu	strial	Natura	al Area	Pa	rk	Ru	ral	Single	Family	Transpo	ortation
FHSI Ecological Rank	Shoreline Length (m)	% of Shore Type Category										
Very High	0	0	777	2	668	2	0	0	0	0	0	0
High	299	38	28,166	58	22,290	68	2,086	80	1,769	47	327	100
Moderate	480	62	18,136	37	9,689	30	532	20	1,566	42	0	0
Low	0	0	1350	3	0	0	0	0	432	11	0	0
Very Low	0	0	0	0	0	0	0	0	0	0	0	0

In general, Very High ecological value was identified at the shoreline adjacent to the Bonanza (Segment 20) and Wilson (Segment 17) creek outlets where the shoreline consists of stream confluences that are in natural condition with no/very little shoreline disturbance observed. These shoreline areas also provide important juvenile rearing, migration and staging habitat for fish, wildlife connectivity corridors and habitat for SARA-listed amphibians (Segment 20) and gastropods (Segment 17). High ecological value shorelines, though sometimes disturbed by residential, industrial and urban park development, provide important fish and wildlife migration corridors and often had intact riparian areas and other high value shoreline habitat features. Conversely, Low ecological value was identified where the shoreline is heavily disturbed by residential shoreline modifications or has steep cliff/bluff shorelines modified by historic transportation uses.

Overall, eight of the 26 segments that could be compared had different Ecological Rankings in 2021 than they had in 2010 (Galena Environmental Ltd. 2011). Four segments increased in value while four decreased. All rank changes were likely due to additional criteria and adjusted weighting included in the 2021 FHSI that captured more aspects of shoreline habitat sensitivity than the 2010 AHI was able to detect. For example, Segment 6 increased from Very Low to Moderate ecological ranking because additional factors including LWD cover habitat and wildlife migration corridors were included in the 2021 FHSI. Three of the four segments that declined in value dropped from Very High to High (Segments 9, 10 and 23) which still highlights the important habitat value in these segments.

3.2.2 Zones of Sensitivity

A preliminary list of ZOS identified during the FIM field assessment and during the background data review are described below.

- Aquatic Vegetation Aquatic vegetation contributes to the overall health of an ecosystem by
 providing an important source of nutrients, oxygenation and habitat for aquatic, terrestrial and
 avian species (Kennedy and Mayer 2002). Aquatic vegetation is an important component of
 wetlands, which provide habitat, flood control, water filtration and food resources (Mitsch and
 Gosselink 1993). Submergent aquatic vegetation on Slocan Lake was mapped during the 2021
 re-FIM and was observed along 9% of the foreshore. Note that wetlands were not included as a
 ZOS at this time because wetlands were not observed within the HWM of Slocan Lake. This also
 highlights the important role aquatic vegetation plays in the lake in the absence of wetlands. All
 areas of aquatic vegetation were identified as ZOS.
- Tributary Mouths Tributary mouth areas provide important habitat for fish rearing, migration and staging. Tributaries to Slocan Lake may provide spawning, egg incubation and juvenile rearing habitat for salmonids. Tributaries may also provide habitat for SARA-listed species like Shorthead Sculpin which were documented at the Springer Creek outlet and the Slocan River inlet. Tributary mouths can also provide cool water refuge during summer when there are periods of higher water temperatures (Rice et al. 2008). In addition to fisheries values, water quality parameters such as temperature, dissolved oxygen, turbidity and nutrients of tributary inflows play an important role in the overall water quality of lake ecosystems (Rice et al. 2008). Therefore, the confluence areas of all tributaries to and from Slocan Lake delineated in the BC Freshwater Atlas dataset were identified as tributary mouth ZOS. Tributary mouth polygons of either 250 m or 100 m radius semicircle polygons were identified as a ZOS in the initial Slocan Lake FIM and SMG (Galena Environmental Ltd., 2011, Ecoscape 2014). To be consistent with the initial FIM mapping, ZOS were identified by 250 m radius semicircle polygons at the confluence of tributaries and Slocan Lake where salmonid or at-risk sculpin species spawning has been documented (Bonanza, Shannon, Wilson, Carpenter, Silverton, Wee Sandy, Nemo and Springer creeks and the Slocan River (see Section 3.1.6)). All other tributary mouths were identified by a 100 m polygon.

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3.2.3 Potential Conservation Zones

The Bonanza Creek confluence (Segment 20) is a unique element of the Slocan Lake ecosystem and the FHSI analysis indicated it has Very High ecological value. Low elevation wetlands adjacent to the lake are limited to the north end near Bonanza Creek. Aquatic vegetation, also limited in the lake, is abundant at the north end. Intact riparian habitat with mature cottonwoods is present. Conservation and restoration of wetland (e.g., Snk'mip Marsh Sanctuary) and aquatic/riparian habitat north of the lake (e.g., Bonanza Biodiversity Corridor) have been undertaken. The Wilson Creek confluence (Segment 17; Very High ecological value) is an important fish and wildlife migration area with undisturbed riparian habitat. Conservation areas should be established along the foreshore adjacent to Segments 17 and 20, including aquatic and riparian areas, to protect these unique and intact habitats from future development.

The shoreline adjacent to the Wragge Beach Forest Recreation site (Segment 23) provides high value juvenile fish rearing habitat with gravel substrates, aquatic vegetation and a relatively wide littoral area compared to most areas of the lake. The islands are a unique habitat feature not observed elsewhere around the lake. Additional development of the campground facilities including some riparian clearing was observed between the 2010 and 2021 FIM surveys. High value habitat with similar characteristics is also present at the nearby Shannon Creek mouth (Segment 22). A Notification of Interest limits shoreline activities to conserve natural areas (see Section 3.1.10.5) though the scope is limited to music events. The unique habitat features along these shoreline areas should be protected.

The Slocan River outlet (sections of Segments 1 and 28) provides habitat for SARA-listed Shorthead Sculpin and is an important fish migration corridor connecting the lake with downstream aquatic habitat. Abundant gravel/cobble substrates also provide habitat for juvenile fish rearing and potential salmonid spawning habitat. Riparian habitat adjacent to the lake/river confluence also provides potential habitat for migrant and resident terrestrial and avian species. This area should be protected from further development.

Springer Creek (Segment 2) has been modified by previous industrial uses. Only the most downstream approximately 100 m of the creek is accessible to Slocan Lake fish as the creek then flows through a concrete, closed, square-bottom culvert that is a barrier to upstream migration (Baxter and Irvine 2015). Springer Creek provides habitat for a SARA-listed fish species (Shorthead Sculpin) and potential habitat for spawning salmonids including Kokanee and possibly Bull Trout. As this formerly industrial property has recently been sold, there is an opportunity to restore, reconnect and conserve fish habitat in Springer Creek and its confluence with Slocan Lake.

Most communities (e.g., Rosebery, New Denver and Silverton) around Slocan Lake are located on alluvial fans at the outlet of large drainages that connect the foreshore to upland habitats (e.g., Wilson Creek, Carpenter Creek and Silverton Creek). The creeks provide important spawning habitat for locally at-risk Bull Trout as well as other fish species. Riparian and upland areas provide important linkage habitat for Grizzly Bear as well as other wildlife species. Tributary outlets and riparian habitat should be protected from future development. In addition, restoration of streambank and riparian areas could improve fish habitat while providing flood protection and helping address climate change associated predictions.

3.3 **TEK**

The following information was compiled by ONA during a desktop cultural review of the Slocan Lake watershed

3.3.1 Desktop Cultural Review of Slocan Lake

Slocan Lake is part of the traditional territory of the Syilx, Sinixt, and Ktunaxa First Nations (First Peoples' Cultural Council 2018) (Sinixt Nation 2019). It is suspected that the name "Slocan" was derived from a First

Nations' word that translated to "hit on the head" and mirrors the harpooning and harvest of a oncebountiful salmon fishery (Ian Fraser and Associates no date (n.d.)). First Nations history at Slocan Lake is glimpsed through a lens of archeological evidence and ethnographic interpretation and presently, First Nations continue to bring important cultural practise, natural resource management, and Traditional Ecological Knowledge to the area.

Archeological evidence and ethnographic interpretation claim historic presence of Indigenous Peoples in the Slocan Valley from 3,000 years ago to the 18th century (Kowsz n.d). Slocan Lake region's traditional indigenous languages include: Nsyilxcən, Secwepemctsín, Ktunaxa (First Peoples' Cultural Council 2018), and Sn-səlxcin (Sinixt Nation 2019).

Settlers arriving in Slocan noted First Nations watercraft and encampments (Ian Fraser and Associates n.d.) that were described to be pithouses constructed in the style of the Sinixt Nation (First Nations n.d.). First Nations fishers and hunters are credited with guiding settlers to rich silver ore deposits. Many pictographs drawn in red, yellow, and black were seen on the cliffs above Slocan Lake (Ian Fraser and Associates n.d.), some of which are still visible today (Heritage BC n.d.). In 1896 the population of approximately 70 Sinixt people living at the outlet of Slocan Lake moved southward to escape the rapid expansion of Slocan City due to the silver rush (Sinixt Nation 2019). One statement from an early settler claimed that there was a conflict between the settlers and the Sinixt people when a settler accused a Sinixt man of theft (Ian Fraser and Associates n.d.). After the police confronted the man and shot off his gun into the air, the Sinixt left the lakefront. This is the last recorded historic interaction between the Sinixt and the Slocan Lake settlers. Pictographs can be found painted on the cliffs of the Western and Southeastern sides of Slocan Lake and archeological sites are along the Slocan River (Heritage BC n.d.).

The most prominent of these archeological sites are Vallican and Slocan Narrows, found South of the lake on the shores of the Slocan River (Kowsz n.d). On the North end of Slocan Lake is the Snk'mip Marsh Sanctuary (Y2Y 2020) which was likely near or the exact location of the Snk'mip Village site. Although the records are unclear, another site of potential significance could be Wilson Creek, located along the Northeast shore of Slocan Lake (Maa Press and Smum iem 2021).

South of Slocan Lake down the valley, the Sinixt hold one of the longest on-going indigenous occupations of Crown Land at the Vallican pithouse site (Firstnations n.d.). The Sinixt continue to hold a social and cultural presence and hold other events and public education (Sinixt Nation 2021). In May 2021, the Okanagan Nation Alliance led a release of 10,000 Sockeye Salmon fry into Slocan Lake held in relation to annual salmon ceremonies (Berry 2021). This ceremony held great cultural importance because of its' relation to one of the four Food Chiefs: Salmon. It also holds ecological significance with approximately 500,000 Sockeye Salmon returning across all release sites throughout the Okanagan and Columbia Valley (Crow 2021). In 2013, the Ktunaxa signed a treaty agreement with the BC Provincial government for land in the Slocan Valley, located South of Nakusp (Wolffenden 2013). This treaty was controversial, however. Wolffenden claims that the treaty had political motives by signing the land to the Ktunaxa and should have been rightfully claimed by the Sinixt People, deemed extinct by the Canadian Government in 1956 (Stefanovich 2021).

Additional information is also provided in the Syilx Natural Resources (2021) memo found in Appendix D.

3.4 FDG

The FDG for Columbia Lake is provided in Appendix G. The FDG is also provided under separate cover for distribution to landowners, regulators and other stakeholders.



4.0 Discussion

The foreshore of Slocan Lake remained in a relatively similar state between the 2021 re-FIM and the initial 2010 FIM. Overall, 90.3% of the Slocan Lake shoreline remains undisturbed. The total length of disturbed shoreline increased slightly between 2010 and 2021 (80 m; 0.1% of the total shoreline). Relative to other large lakes in the Kootenays where re-FIM surveys were conducted, most of the shoreline of Slocan Lake remains in natural condition and less area has been modified since the initial FIM. For example, a re-FIM survey of Windermere Lake conducted in 2020 observed that 43% of the shoreline remained in natural condition and approximately 1% (369 m) of the shoreline had been disturbed since the initial FIM survey of Moyie Lake in 2020 where 55% of the shoreline remained in natural condition and approximately 1.3% (471 m) of shoreline had been disturbed since the initial FIM in 2008 (Wood 2021a).

Conservation and protection of lands surrounding Slocan Lake has effectively maintained a high amount of intact foreshore habitat. For example, prior to the completion of the initial FIM, a 155-acre parcel of private land on the west side of the lake referred to as the Valhalla Mile was purchased for conservation purposes and transferred BC Parks (VWS 2021). The property, now part of Valhalla Provincial Park, included 1.7 km of natural, undeveloped shoreline that was observed to remain unchanged during the 2021 re-FIM survey. In addition to land protection (e.g., 39% of the shoreline is park), development along some areas of Slocan Lake is also limited by physical shoreline qualities. Cliff/bluff shore types (29% of the shoreline) and other steep-sloped rocky areas with limited access and building sites prevent large scale residential and/or recreational development in some areas such as large sections of the east shoreline between Slocan and Silverton. Though one new development (a permanent dock) was observed here during the 2021 re-FIM, impacts to shoreline sediments were minimal and no impacts to riparian vegetation were observed (e.g., Figure 14).

Shoreline modifications were observed to have increased between FIM surveys mainly in locations that were already developed. For example, the highest increase in the number of docks was at the north end of the lake near Hills and the highest increase in the number of groynes was adjacent to the Village of Silverton, though it remains unclear if this is a true increase in numbers or due to observer and/or methodology changes. Both areas already had a high level of impact during the 2010 FIM survey. These areas have existing OCPs, some of which include measures to regulate development activities in and adjacent to watercourses to protect aquatic and riparian habitats. For example, the RDCK Electoral Area 'H' – Slocan Lake North OCP includes a Watercourse Development Permit Area within 30 m of the high-water mark. However, the results of the initial FIM shoreline sensitivity evaluation are not included in existing OCPs. Going forward, results of the 2021 FIMP will be available for integration into existing OCPs as a means of informing landowners, stakeholders and regulators about the habitat values of a given shoreline area and the types of developments that may or may not be suitable at that location.

It is important to note that since the initial FIM some of the recommendations made by Galena Environmental Ltd. (2010) have been accomplished or are in progress. Examples include:

• Wildlife movement corridors that connect the upland areas to the lake foreshore should be identified and developments or encroachments into these areas minimized - The Bonanza Biodiversity Corridor located from the north end of Slocan Lake to Summit Lake aims to protect a vital wildlife corridor and restore numerous riparian wetland complexes between the two lakes.



- Bonanza Marsh: The single wetland around Slocan Lake is located along the north foreshore of the lake. Wetland ecosystems should be protected and restoration encouraged The Snk'mip Marsh Sanctuary was purchased in 2017 for conservation purposes and wetland restoration work is in progress.
- Native aquatic vegetation should be mapped in detail This was completed in littoral and foreshore areas during the 2021 re-FIM survey. At a larger scale, the Slocan Wetland Assessment and Monitoring Project (SWAMP), a multi-year initiative to establish a community-based monitoring program to assess the abundance, distribution, and ecological integrity/function of wetlands and riparian habitat throughout the Slocan watershed, mapped and inventoried wetlands throughout the watershed between 2013 and 2018 (SWAMP 2021).

Most of the projects above were initiated by stewardship and conservation groups as well as active community members that have prioritized the preservation and restoration of unique and sensitive habitats in the Slocan Lake watershed.

5.0 Recommendations

The following are recommendations to protect sensitive habitats around Slocan Lake and improve the FIMP if additional data becomes available in the future:

1. Conduct inventories of other non-FIM categories for inclusion in the FHSI.

Sufficient data was not available to support the inclusion of some non-FIM categories in the FSHI. Waterfowl, amphibian, herptile and other ecosystem categories were not included because although some point observations were available (e.g., one Western Toad near the north end of the lake) lake-wide inventories have not been conducted. Monitoring and inventory surveys should be conducted to identify other important species and habitats throughout Slocan Lake. The FHSI should be updated to include additional non-FIM categories if additional data becomes available.

2. Update existing ZOS to reflect any new information.

Additional sensitive habitat features can be added as polygons, points or lines to the FIMP dataset and maps. A field-based tributary assessment should be conducted to update the current dataset of tributary mouth ZOS.

3. Avoid placing mooring buoys and other shoreline modifications in ZOS.

Shoreline modifications, such as mooring buoys, can disturb aquatic vegetation and other littoral habitat features. For example, mooring buoy anchor/chain drag and scour have been observed to disturb benthic sediments and impact the growth of aquatic vegetation. Aquatic vegetation is an important source of nutrients, oxygenation and habitat though it was observed along less than 10% of the Slocan Lake shoreline during the re-FIM survey. It is recommended that shoreline modifications not be placed in sensitive habitat areas identified as ZOS.

4. Update existing OCPs with results of FIMP.

Existing OCPs, including community OCPs, do not currently include Ecological Rankings assigned to shoreline segments during the initial FIMP to guide development recommendations. FHSI Ecological Rankings as presented in the FDG will be available for integration into existing OCPs (e.g., the RDCK Electoral Area 'H' – Slocan Lake North OCP). Sensitive shoreline areas (red and orange shoreline segments) should receive conservation protections in existing OCPs. ZOS should also be incorporated into the bylaw and receive the same protections as red and orange shoreline segments.

5. Update existing OCPs to include a development permit area along the foreshore.

Include a development permit area with 30 m setback measured from the high-water mark in the New Denver, Silverton, and Slocan OCPs as they do not currently have this setback specified. The RDCK Electoral Area 'H' – Slocan Lake North OCP incorporates a development permit area within 30 m of the high-water mark.

6. Create OCPs for areas that currently do not have OCPs.

OCPs exist for all foreshore areas of Slocan Lake. There are no OCPs for remaining areas of RDCK Electoral Area 'H' including the entire Slocan River drainage outside of the Village of Slocan and rural areas immediately outside the village. The Slocan River, the only outlet for Slocan Lake, is an important migration corridor between Slocan Lake, the Kootenay River and Slocan River tributary habitats. An OCP that includes a development permit area with 30 m setback measured from the high-water mark is recommended.

7. Prioritize habitat restoration at historic industrial sites.

Property ownership transfers of historic industrial sites (e.g., log yards and sawmill sites in Slocan and Rosebery) provide a unique opportunity to restore important terrestrial, riparian and aquatic habitats. For example, opportunities to restore, reconnect and conserve habitat for fish including SARA-listed Shorthead Sculpin were identified for Springer Creek which is located on the former Springer Creek Forest Products mill site that has recently been sold. Habitat restoration should be included in future development plans wherever possible.

8. Protect important connectivity habitat.

Most communities around Slocan Lake are located on alluvial fans at the outlet of large tributary drainages that connect the foreshore to upland, low elevation valleys and/or wetland habitats. Tributary confluences provide important spawning and rearing habitat for SARA-listed Shorthead Sculpin, provincially at-risk Bull Trout, and other fish species such as Kokanee. Riparian and upland areas provide important linkage habitat for wildlife including Grizzly Bear and SARA-listed Western Toad. Therefore, it is important to protect these areas from development expansion. Stream and riparian restoration within these connectivity habitats encourages climate resilience while also improving fish habitat and flood protection.

9. Consider downstream impacts of hydrological changes in tributaries to Slocan Lake.

Communities around Slocan Lake are all situated near one of the major inflowing tributaries or the outflowing Slocan River. Upstream alterations to streamflow to control future flooding (e.g., dykes), anthropogenic water withdrawals, and wastewater disposal have the potential to alter water quantity, timing of flows and water quality of inflows to the lake. Hydrological impacts of channel alterations to tributaries of Slocan Lake, even those located in drainages well away from the foreshore, should be evaluated with consideration of downstream impacts.

10. Consider potential impacts of climate change during foreshore and lake planning.

The effects of climate change have the potential to alter riparian and aquatic habitats in various ways such as altering hydrological patterns, increasing wildfire intensity and increasing water temperatures. Lake planning, such as FIMP, can help mitigate climate-related impacts by identifying sensitive habitats, directing development applications in a manner that conserves high value habitat, communicating to the public the value of these habitats to provide resilience to climate impacts such as mitigating flood impacts and identifying opportunities for habitat restoration. Slocan Lake provides a unique opportunity to study the effects of climate change on pelagic, littoral, foreshore, tributary and riparian habitats as it is the largest undammed lake in Southeastern BC and not subjected to artificial water level fluctuations.

11. Complete future FIM surveys during peak summer.

The 2021 re-FIM survey was conducted in September to be consistent with the timing of the initial FIM survey. However, it is possible that some shoreline modifications such as mooring buoys and docks may have been removed for the season by mid-September. It is recommended that future FIM surveys be conducted during peak summer to ensure all shoreline modifications, including those removed seasonally, are inventoried.

The following are recommendations made by Syilx Natural Resources and ONA to respect Syilx values during future planning of the Slocan Lake system. The recommendations below are specific to Slocan Lake foreshore and riparian habitats. Additional details for some of the recommendations below are provided in Appendix D as are recommendations relevant to habitats outside of the current study area:

1. Prevent and control invasive species.

Protect native biodiversity by preventing introductions of invasive species and containing and mitigating already established ones.

2. Protect existing habitat.

Conserve habitat such as fish spawning areas, wetlands, and old growth forests.

3. Enhance connectivity and corridors.

Monitor population trends of various species such as grizzly bear, ungulates, migratory birds, bats, fish, reptiles, and other mammals. Preserve the continuity for wildlife migration and travel corridors.

4. Advance climate resilience through mitigation and adaptation.

Prepare for climate change by ongoing data collection that can be used to make predictions of potential future scenarios and manage for risks associated with development.

5. Monitor and manage campsites on the west side of Slocan Lake north of Wragge Beach.

ONA has observed increased foreshore campsite use at the north end of the lake outside of Valhalla Park, specifically near the Shannon Creek mouth. No services to support campsites (septic, water, tent pads, etc.) are available and shrub clearing has been observed. Currently, a Notation of Interest is established over Crown land adjacent to the Shannon Creek mouth requiring music events to obtain a permit through Front Counter BC. Recreational pressure is expected to increase and a strategy to manage the creation of campsites outside of designated areas is recommended.

- 6. Complete bird surveys on Slocan Lake.
- 7. Conduct water temperature and water level monitoring in the major Slocan Lake tributaries.
- 8. Provide public education about the Columbia River Treaty and Syilx peoples.
- 9. Ensure ecotourism is holistically regulated in accordance with Syilx informed values, guidelines and local community interests.

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Appendix A – Foreshore Inventory and Mapping (FIM) Segment Maps





Segment Number 20 Shore Type: Gravel Land Use: Natural Area Level of Impact: Low (< 10%)

Segment Number 22 Shore Type: Rocky Shore Land Use: Natural Area Level of Impact: None

Segment Number 19 Shore Type: Rocky Shore Land Use: Natural Area Level of Impact: Low (< 10%)



CLIENT:

LivingLakes

PROJECT:

Slocan Lake FIMP

TITLE:

Slocan Lake Foreshore Inventory Mapping

LEGEND:

- Shoreline Segment I Segment Break Modifications O Boat Launch - Concrete O Boat Launch - Gravel O Dock 🔵 Marina
- Mooring Buoy Aquatic Vegetation Submergent

Base Data

- +++ Railway
- Highway Road
- Watercourse
- 📈 Wetland Parcel Boundary

0 50 100 Meters



REFERENCE:

Scale:1:6,000

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NOTE:

CAUTION: DO NOT USE THIS MAP FOR NAVIGATIONAL PURPOSES This map may not reflect current conditions. Uncharted hazards may exist



wood. Wood PLC Suite 601E, 601 Front St. Nelson, BC V1L 4B6

1 of 14 VE52823 NAD 1983 UTM Zone 11N February, 2022 CL BB 02-01-017_slocan_lake_fim_maps.mxd



Segment Number 19 Shore Type: Rocky Shore Land Use: Natural Area Level of Impact: Low (< 10%)

Segment Number 23 Shore Type: Gravel Land Use: Natural Area Level of Impact: Low (< 10%)



CLIENT:

LivingLakes

PROJECT:

Slocan Lake FIMP

TITLE:

Slocan Lake Foreshore Inventory Mapping

LEGEND:

- Shoreline Segment I Segment Break Modifications O Boat Launch - Concrete O Boat Launch - Gravel O Dock
- 🗕 Marina
- Mooring Buoy Aquatic Vegetation
- Base Data

+++ Railway

- Highway
- Road
- Watercourse 📈 Wetland
- Parcel Boundary



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ANALYST:	QA:						

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Segment Number 19 Shore Type: Rocky Shore Land Use: Natural Area Level of Impact: Low (< 10%)

Segment Number 18 Shore Type: Rocky Shore

Land Use: Transportation Level of Impact: High (> 50%)

Segment Number 17 Shore Type: Stream Mouth Land Use: Park Level of Impact: Low (< 10%)



CLIENT:

LivingLakes

PROJECT:

Slocan Lake FIMP

TITLE:

Slocan Lake Foreshore Inventory Mapping

LEGEND:

- Shoreline Segment I Segment Break Modifications O Boat Launch - Concrete O Boat Launch - Gravel O Dock
- \varTheta Marina
- Mooring Buoy Aquatic Vegetation

Base Data +++ Railway

- Highway
- Road
- Watercourse 📈 Wetland
- Parcel Boundary

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Wood PLC Suite 601E, 601 Front St. Nelson, BC V1L 4B6

3 of 14 VE52823 NAD 1983 UTM Zone 11N February, 2022 CL BB 02-01-017_slocan_lake_fim_maps.mxd



Segment Number 19 Shore Type: Rocky Shore Land Use: Natural Area Level of Impact: Low (< 10%)

> Segment Number 18 Shore Type: Rocky Shore Land Use: Transportation Level of Impact: High (> 50%)

Segment Number 17 Shore Type: Stream Mouth Land Use: Park Level of Impact: Low (< 10%)

> Segment Number 16 Shore Type: Rocky Shore Land Use: Single Family Level of Impact: High (> 50%)

Segment Number 14 Shore Type: Gravel Land Use: Industrial Level of Impact: Medium (10-50%)

> Segment Number 15 Shore Type: Gravel Land Use: Industrial Level of Impact: High (> 50%)

Segment Number 25 Shore Type: Cliff / Bluff Land Use: Park Level of Impact: None





Wee Sandy Creek

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Segment Number 26.1 Shore Type: Rocky Shore Land Use: Park Level of Impact: Low (< 10%)



LivingLakes

Slocan Lake FIMP

Slocan Lake Foreshore Inventory Mapping



wood. Wood PLC Suite 601E, 601 Front St. Nelson, BC V1L 4B6 5 of 14

NAD 1983 UTM Zone 11N February, 2022 CL 02-01-017_slocan_lake_fim_maps.mxd



Segment Number 12 Shore Type: Rocky Shore Land Use: Park Level of Impact: High (> 50%)

Segment Number 11 Shore Type: Rocky Shore Land Use: Natural Area Level of Impact: Medium (10-50%)



CLIENT:

LivingLakes

PROJECT:

Slocan Lake FIMP

TITLE:

Slocan Lake Foreshore Inventory Mapping

LEGEND:

- Shoreline Segment I Segment Break Modifications O Boat Launch - Concrete
- O Boat Launch Gravel
- O Dock 🗕 Marina
- Mooring Buoy Aquatic Vegetation

Base Data

- Highway Road
- Watercourse 📈 Wetland
- Parcel Boundary

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Scale:1:6,000

REFERENCE: DataBC Data Distribution Service Open Government License (http://www.data.gov.bc.ca/)

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PROJECT:

Slocan Lake FIMP

TITLE:

Slocan Lake Foreshore Inventory Mapping

LEGEND:

- Shoreline Segment I Segment Break Modifications O Boat Launch - Concrete
- Boat Launch Gravel
- O Dock
- MarinaMooring Buoy
- Aquatic Vegetation
- Base Data

++++ Railway

- Highway
- ----Road
- Watercourse
 Wetland
- Parcel Boundary

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KEY MAP



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REFERENCE:

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 COORDINATE SYSTEM:
 DATE:

 NAD 1983 UTM Zone 11N
 February, 2022

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PROJECT:

Slocan Lake FIMP

TITLE:

Slocan Lake Foreshore Inventory Mapping

LEGEND:

- Shoreline Segment
- I Segment Break Modifications
- O Boat Launch Concrete
- O Boat Launch Gravel
- O Dock
- \varTheta Marina Mooring Buoy
- Aquatic Vegetation

Base Data +++ Railway

- Highway
- Road
- Watercourse
- 📈 Wetland Parcel Boundary



KEY MAP

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NAD 1983 UTM Zone 11N February, 2022 CL BB 02-01-017_slocan_lake_fim_maps.mxd



LivingLakes

PROJECT:

Slocan Lake FIMP

TITLE:

Slocan Lake Foreshore Inventory Mapping

LEGEND:

- Shoreline Segment I Segment Break
- Modifications
- O Boat Launch Concrete O Boat Launch - Gravel
- O Dock
- \varTheta Marina
- Mooring Buoy
- Aquatic Vegetation

Base Data

- +++ Railway — Highway
- Road
- Watercourse
- 📈 Wetland Parcel Boundary



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NOTE:

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LivingLakes

PROJECT:

Slocan Lake FIMP

TITLE:

Slocan Lake Foreshore Inventory Mapping

LEGEND:

- Shoreline Segment I Segment Break Modifications O Boat Launch - Concrete O Boat Launch - Gravel O Dock \varTheta Marina
- Mooring Buoy
- Aquatic Vegetation

Base Data

- Highway Road
- Watercourse 📈 Wetland
- Parcel Boundary

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REFERENCE:

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Scale:1:6,000

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wood. Wood PLC

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Suite 601E, 601 Front St. Nelson, BC V1L 4B6 10 of 14 VE52823 NAD 1983 UTM Zone 11N February, 2022

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LivingLakes

PROJECT:

Slocan Lake FIMP

TITLE:

Slocan Lake Foreshore Inventory Mapping

LEGEND:

- Shoreline Segment I Segment Break Modifications
- O Boat Launch Concrete
- O Boat Launch Gravel
- O Dock 🗕 Marina
- Mooring Buoy
- Aquatic Vegetation

Base Data

- +++ Railway
- Highway
- Road
- Watercourse 📈 Wetland
- Parcel Boundary



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LivingLakes

PROJECT:

Slocan Lake FIMP

TITLE:

Slocan Lake Foreshore Inventory Mapping

LEGEND:

- Shoreline Segment
- I Segment Break Modifications
- O Boat Launch Concrete
- Boat Launch Gravel
- O Dock 🔵 Marina
- Mooring Buoy
- Aquatic Vegetation

Base Data +++ Railway

- Highway
- Road
- Watercourse
- 📈 Wetland Parcel Boundary



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Suite 601E, 601 Front St. Nelson, BC V1L 4B6 12 of 14 VE52823 NAD 1983 UTM Zone 11N February, 2022 CL BB

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PROJECT:

Slocan Lake FIMP

TITLE:

Slocan Lake Foreshore Inventory Mapping

LEGEND:

- Shoreline Segment I Segment Break Modifications O Boat Launch - Concrete
- Boat Launch Gravel
- O Dock \varTheta Marina
- Mooring Buoy
- Aquatic Vegetation

Base Data +++ Railway

- Highway
- Road
- Watercourse 📈 Wetland
- Parcel Boundary





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Suite 601E, 601 Front St. Nelson, BC V1L 4B6 13 of 14 VE52823 NAD 1983 UTM Zone 11N February, 2022 CL

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LivingLakes

PROJECT:

Slocan Lake FIMP

TITLE:

Slocan Lake Foreshore Inventory Mapping

LEGEND:

- Shoreline Segment I Segment Break Modifications O Boat Launch - Concrete O Boat Launch - Gravel O Dock
- 🔵 Marina
- Mooring Buoy Aquatic Vegetation
- Submergent

Base Data

- +++ Railway — Highway
- Road
- Watercourse 📈 Wetland
- Parcel Boundary



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Appendix B – Segment Summaries



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
572	Stream Mouth	Roadway	Low (< 5%)	Urban Park	High (>50%)	No	90%	10%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	0%	30%	10%	60%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land Use (
0%	0%	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	90%	0%	

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	60%	0%	20%	20%	0%	0%	0%	0%	0%	Low (0 - 25%)	Smooth

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	10%	50%	40%	0%	0%	0%	0%	0%	0%	0%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Landscape / Lawn	Sparse	Sparse (< 10%)	Sparse (< 10%)	Patchy	50	0%	

Aquatic Vegetation:

Aquatic Vegetation:					Large Woody Debris (LW	/D):			_	Littoral Area:
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment		Littoral Zone
70%	70%	0%	0%		< 5 Pieces	1	0]	Wide (>50 m)

Shoreline Modifications:

Ret. Wal	ls %Ret.Wall	Docks	Docks/km	Dock Groyne	Swim Float	Boat House_Float	t Boat House_Land	Boat Cover	Groynes	Groynes/km	Boat Launch - Concret	e Boat Launch -	Gravel Marine R	ailMarina	s Fences St	airs N	Mooring Buoys	Boat Rack/Li	ift Boat Basin	Shed	Pumphouse	Geothermal	Pond_Pool	Pilings Pi	le Support Struct	Tram
2	25%	5	8.7	0	1	0	0	0	0	0	1	0	0	0	0	0	3	0	0	1	0	0	0	11	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	95%	Yes	100%	25%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
No	No	0	0	0	0	0	0		



Comment

Littoral Width	Littoral LWD (#)	Littoral Comment
55	2	



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Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
299	Gravel	Log Yard	Low (< 5%)	Industrial	High (>50%)	No	100%	0%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	0%	99%	0%	1%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land Us
0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	Land use ov

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	2%	0%	38%	40%	10%	0%	0%	10%	0%	Low (0 - 25%)	Smooth

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	60%	40%	0%	0%	0%	0%	0%	0%	0%	High (>75%)	Angular

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Herbs / Grasses	Sparse	Sparse (< 10%)	Sparse (< 10%)	Patchy	50	0%	Invasive weeds (napweed); thimbleberry (non invasive

Aquatic Vegetation:

Aquatic Vegetation:	Aquatic Vegetation:				Large Woody Debris (LW	/D):			Littoral Area:			
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone	Littoral Width	Littoral LWD (#)	Littoral Comment
0%	0%	0%	0%		6 - 25 Pieces	12	0		Medium (10 - 50 m)	10	0	

Shoreline Modifications:

Ret. Wal	ls %Ret.Wal	l Docks	Docks/km	Dock Groyne	Swim Float	Boat House_Flo	at Boat House_La	and Boat Cover	Groynes	Groynes/km	Boat Launch ·	- Concrete E	Boat Launch - G	iravel Marii	ne Rail M	/larinas	Fences	Stairs	Mooring Buo	ys Boat Rack/Lif	Boat Basi	n Shed	Pumphouse	Geothermal	Pond_Pool	Pilings	Pile Support Struct	Tram
4	75%	0	0	0	0	0	0	0	0	0	0		0		0	0	2	0	0	0	0	2	0	0	0	9	0	0
																											·	

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	0%	Yes	100%	100%	Creosote treated wood retaining wall material; cribbing, concrete and wood retaining wal

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
No	< 5 Trees	0	0	0	0	0	2		Northern Flicker



lse Comment wnership change



all materials; metal cables



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
600	Cliff / Bluff	Roadway	Very Steep (>60%)	Natural Area	Medium (10-50%)	No	40%	60%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
100%	0%	0%	0%	0%	0%	0%

Land Use:

Agriculture	Comm	ercial	Conse	rvation	Forestr	y Industrial	Institutional	Multi-Far	nily Natura	l Area	Park	Rural	Single I	Family	Transportation	Urban Park	Utility Corric	lor	Land Use C
0%	09	6	0	0%	0%	0%	0%	0%	100)%	0%	0%	09	%	0%	0%	0%		
Foreshore Substrates:																			
Marl I	Mud Or	ganic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobb	le Coa	rse B	oulder [Bedrock	Embeddedn	ess Sha	pe		
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%		20%	80%	Low (0 - 25%	%) Ang	ular		

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	0%	0%	0%	20%	0%	0%	60%	20%	Medium (25 - 75%)	Angular

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Young Forest	Sparse (< 10%)	Medium (10 - 50%)	Patchy	50	0%	

Aquatic Vegetation:

Aquatic Vegetation:					_	Large Woody Debris (LW	/D):		
Aquatic Vegetation	Aquatic Vegetation Submergent Emergent Floating Aq Veg Comment					LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment
0%	0%	0%	0%			6 - 25 Pieces	6	0	

Shoreline Modifications:

ł	Ret. Walls	%Ret.Wal	l Docks	Docks/km	Dock Groyne	Swim Float	Boat House_Floa	at Boat House_Land	Boat Cover	Groynes	Groynes/km	Boat Launch - Concrete	Boat Launch	- Gravel Marine Rail	Marinas	Fences Sta	rs Mooring	Buoys Boat Rac	:/Lift Boat	Basin She	d Pumphous	e Geothermal	Pond_Pool Pilings	Pile Support Struc	t Tram:
	1	20%	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0	0	0		0 0	0	0	0 1	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	100%	Yes	100%	100%	Old railway line and highway

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
No	5 - 25 Trees	0	0	0	0	0	0		Red tail hawk

Littoral Area:

Littoral Zone	Littoral Width	Littoral LWD (#)	Littoral Comment
Narrow (< 10 m)	1	0	

Comment



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
750	Cliff / Bluff	Roadway	Very Steep (>60%)	Natural Area	Low (< 10%)	No	9%	91%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
100%	0%	0%	0%	0%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	l
0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	Historic aba

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%	95%	Low (0 - 25%)	Angular

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	Low (0 - 25%)	Angular

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Mature Forest	Medium (10 - 50%)	Abundant (> 50%)	Continuous	50	0%	

Aquatic Vegetation:

Aquatic Vegetation:					_	Large Woody Debris (LW	/D):			_	Littoral Area:
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment		LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment		Littoral Zone
0%	0%	0%	0%]	None	0	0]	Narrow (< 10 m)

Shoreline Modifications:

Ret.	. Walls	%Ret.Wall	Docks	Docks/km	Dock Groyn	ne Swim Float	Boat House_F	loat Boat House_	Land Boat Cover	Groynes	Groynes/km	Boat Launch - Concrete	Boat Launch - G	Gravel Marine Rai	Marinas	Fences Stai	s Mooring Buoy	s Boat Rack/Lift	Boat Basin Sh	ed Pumphou	se Geotherma	Pond_Pool	l Pilings	Pile Support Struct	Tram
	0	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0	0	0	0 (0	0	0	0	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	100%	No	0%	0%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
No	No	0	0	0	0	0	0		

Land Use Comment andoned road along shoreline

	Littoral Width	Littoral LWD (#)	Littoral Comment
)	1	0	



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
1522	Rocky Shore	None	Steep (20-60%)	Natural Area	Low (< 10%)	No	1%	99%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	100%	0%	0%	0%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land Use
0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	

Foreshore Substrates:

												ound	r mes	Orguine	Innaa	IVIGIT
0%0%0%0%0%0%20%0%	0% 0% 0% 0% 0% 20% 0% 0% 50% 30% Low (0 -	Low (0 - 25%)	30% Low (0 - 25	30%	50%	0%	0%	20%	0%	0%	0%	0%	0%	0%	0%	0%

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	10%	20%	0%	0%	60%	0%	0%	10%	0%	Low (0 - 25%)	Angular

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Young Forest	Medium (10 - 50%)	Abundant (> 50%)	Continuous	50	5%	

Aquatic Vegetation:

Aquatic Vegetation:					Large Woody Debris (LW	/D):			Littoral Area:
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone
0%	0%	0%	0%		6 - 25 Pieces	12	0		Narrow (< 10 m

Shoreline Modifications:

Ret. Wall	s %Ret.Wall	Docks	Docks/km	Dock Groyne	Swim Float	Boat House_Float	Boat House_Land	Boat Cover	Groynes	Groynes/km	Boat Launch - Concrete	Boat Launch	- Gravel Marine Rai	Marina	Fences S	Stairs	Mooring Buoys	Boat Rack/Lift	Boat Basi	in Shed	Pumphous	e Geothermal	Pond_Po	ol Pilings	Pile Support Struc	t Tram
0	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	0%	No	0%	0%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
No	>25 Trees	0	0	0	0	0	0	Stress signs on vegetation	2 redtail hawk, crow, merganser

se Comment

	Littoral Width	Littoral LWD (#)	Littoral Comment
)	3	5	



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
5797	Cliff / Bluff	Roadway	Very Steep (>60%)	Natural Area	Low (< 10%)	No	1%	99%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
99%	0%	0%	0%	1%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land U
0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%	95%	Low (0 - 25%)	Angular

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%	95%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Young Forest	Medium (10 - 50%)	Abundant (> 50%)	Continuous	50	5%	

Aquatic Vegetation:

Aquatic Vegetation:					Large Woody Debris (LW	/D):			Littoral Area:
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone
0%	0%	0%	0%		6 - 25 Pieces	22	0		Narrow (< 10 m)

Shoreline Modifications:

[Ret. Walls	%Ret.Wall	Docks	Docks/kn	n Dock Groyne	Swim Float	Boat House_Float	Boat House_Land	Boat Cover	Groynes	Groynes/km	Boat Launch - Concrete	Boat Launch - Grave	el Marine Ra	ilMarinas	Fences	Stairs	Mooring Buoys	Boat Rack/Lift	Boat Basir	n Shed	Pumphous	Geothermal	Pond_Poo	l Pilings	Pile Support Stru	ict Tram
[0	0%	1	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	1%	No	0%	0%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
< 5 Trees	>25 Trees	0	0	0	0	0	0		Bald eagle, turkey vulture

Jse Comment

	Littoral Width	Littoral LWD (#)	Littoral Comment
)	1	0	



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
532	Rocky Shore	None	Low (< 5%)	Rural	Medium (10-50%)	No	40%	60%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	50%	50%	0%	0%	0%	0%

Land Use:

5 - 25 Trees

No

0

0

0

0

0

0

Agriculture	Comme	ercial C	onservat	ion Forest	try Industria	al Institutional	Multi-Famil	ly Natural.	Area Pa	rk Rura	I Single	Family	Transportatior	urban	Park L	Utility Corr	ridor	Land	Use Co	mment							
0%	0%		0%	0%	0%	0%	0%	0%	09	6 100%	6 0	%	0%	0%	6	0%											
Foreshore S	ubstrate	es:																									
Marl N	/lud Org	anic Fi	ines Sar	nd Gravel	Gravel Fine	Gravel Coarse	Cobble Co	bble Fine	Cobble (oarse B	Boulder	Bedrock	Embedded	ness	Shape	e											
0%	0% 0	% 1	.0% 0%	6 0%	10%	10%	15%	0%	0%		45%	10%	Low (0 - 25	5%)	Angula	ar											
Littoral Sub	strates:			•									•														
Marl N	1ud Org	anic I	ines Sa	nd Gravel	Gravel Fine	Gravel Coarse	Cobble Co	obble Fine	Cobble	Coarse E	Boulder	Bedrock	Embedded	ness	Shap	e											
0% (0% 0	%	0% 0	40%	0%	30%	20%	0%	0%	5	10%	0%	Low (0 - 2	5%)	Smoot	th											
Vegetation	Band 1:								_			_															
Class	5	St	age	Shrub	Cover	Tree Cover	Distributio	on Bandwi	idth (m)	Overha	nging Ve	egetatior	n Veg Ba	nd Comr	ment												
Conifer	ous	Matur	e Forest	Medium (10 - 50%) M	edium (10 - 50%) Patchy	5	i0		0%																
Aquatic Veg	getation	:					Li	arge Wood	ly Debris	(LWD):							Littora	Area:									
Aquatic Ve	getation	Subm	ergent E	mergent F	Floating Aq	Veg Comment		LWD	Range	Litt	oral LW	D (#) LV	VD Clusters	LWD Cor	mment	t	Litt	oral Zor	ne	Littoral V	Vidth	Littora	LWD (#) I	Littoral	Comme	nt
10%	6	1	0%	0%	0%			< 5 P	ieces		3		0			7	Mediu	ım (10 -	50 m)	16			0				
Shoreline Modif	ications:																										
Ret. Walls %Re	t.Wall Doc	ks Docks	/km Dock Gr	royne Swim Flo	oat Boat House	Float Boat House_La	nd Boat Cover G	Groynes Groyn	es/km Boat	Launch - C	Concrete Bo	at Launch -	Gravel Marine Rai	Marinas F	ences Sta	airs Mooring	Buoys Boat	Rack/Lift	Boat Basi	n Shed Pur	nphouse	Geothern	nal Pond	Pool P	ilings Pil/	Support S	truct Tram
0 (0% 6	11.	3 0	0	0	0	0	1 1	.9	0		0	0	0	0	0 1		0	0	2	0	0	(5	15	4	0
Lineal Modi	fications	:							_																		
% Rail		% Roa	ad	Substra	te Mod	% Substrate M	od % Erosi	ion Protect	. N	Iodificat	tion Corr	nment															
0%		0%		Ye	es	2%		2%																			
Flora and Fa	auna:																_										
Veteran Tre	ees S	nags	Beaver	Lodge Wil	dlife Den V	Vildlife Trail Mi	neral Lick S	hellfish St	ick Nest	Flo	ora Com	ments	F	auna Co	mmen	ts]										

Crows



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
10817	Cliff / Bluff	None	Very Steep (>60%)	Natural Area	Low (< 10%)	No	1%	99%

Shore Type:						
Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
99%	0%	0%	0%	1%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land Use Cor
0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	Old wha

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	50%	Low (0 - 25%)	Angular

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	50%	Low (0 - 25%)	Angular

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Mature Forest	Medium (10 - 50%)	Abundant (>50%)	Continuous	50	5%	

Aquatic Vegetation:						Large Woody Debris (LW	/D):			Littoral Area:			
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment		LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone	Littoral Width	Littoral LWD (#)	Littoral Comment
0%	0%	0%	0%	0%]	6 - 25 Pieces	17	0		Narrow (< 10 m)	1	95	

Shoreline Modifications:

Ret. Wal	Is %Ret	t.Wall [Docks	Docks/km	Dock Groyne	Swim Float	Boat House_Float	t Boat House_Lan	d Boat Cover	Groyne	s Groynes/km	Boat Launch - Concrete	Boat Launch - Grave	Marine Rail	Marinas	Fences	Stairs Mo	ooring Buoys	Boat Rack/Lift	Boat Basin	Shed	Pumphouse	Geothermal	Pond_Pool	l Pilings	Pile Support Struct	Tram
1	0.	.1%	1	0.1	1	0	0	0	0	0	0	0	0	1	0	0	2	4	0	0	1	1	0	0	0	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	0.1%	Yes	1%	0.1%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
< 5 Trees	>25 Trees	0	0	0	0	0	2		

mment	
arf	



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
3048	Rocky Shore	None	Low (< 5%)	Natural Area	Low (< 10%)	No	1%	99%

Shore Typ	e:																			
Cliff/Bluf	f Ro	ocky (Gravel	San	d Str	eam Mout	th Wetland	Other												
0%	5	0%	49%	0%	6	1%	0%	0%												
Land Use:																				
Agricultur	e Con	nmercial	Conser	vation	Forest	y Industr	rial Institutional	Multi-Fa	mily	Natural	Area	Park	Rural	Single	Family	Transportatio	n Urba	an Park	Utility Corrido	r Land Use C
0%		0%	0%	6	0%	0%	0%	0%		1009	6	0%	0%	0)%	0%	(0%	0%	
Foreshore	Subst	rates:																		
Marl	Mud	Organic	Fines S	Sand	Gravel	Gravel Fin	e Gravel Coarse	Cobble	Cobb	le Fine	Cobbl	e Coa	irse Bo	oulder	Bedrock	Embedded	ness	Shap	e	
0%	0%	0%	0%	5%	0%	20%	25%	45%	(0%	(0%		5%	0%	Medium (25	- 75%)	Angul	ar	
Littoral Su	bstrat	es:																		
Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fir	ne Gravel Coarse	e Cobble	Cob	ble Fine	Cobb	le Co	arse B	Boulder	Bedrock	k Embedde	dness	Shap	pe	
0%	0%	0%	0%	5%	0%	0%	0%	40%		0%		0%		10%	45%	Medium (25	i - 75%)	Angu	ılar	
Vegetation	n Band	11:																		
Cla	SS		Stage		Shrub C	over	Tree Cover	Distrib	ution	Bandwi	idth (n	n) Ov	verhan	iging Ve	egetatior	n Veg Band	l Comm	nent		
Conife	erous	Mat	ure Fore	st Me	edium (1	0 - 50%)	Abundant (> 50%) Contin	uous	5	0			0%						
Aquatic V	egetat	tion:							Larg	ge Wood	ly Deb	ris (L\	WD):						Li	ttoral Area:
Aquatic V	egeta	tion Sub	mergen	t Eme	ergent F	loating A	q Veg Comment			LWD	Range		Litte	oral LWI	D (#) LV	WD Clusters	LWD C	ommen	nt 🗌	Littoral Zor

Littoral Zone 0% 0% 10% 6 - 25 Pieces 14 Medium (10 - 50 10% 0 Shoreline Modifications:

_			-																								
	Ret. Walls	%Ret.Wall	Docks	Docks/km	Dock Groyne	Swim Float	Boat House_Float	Boat House_Land	Boat Cover	Groynes	Groynes/k	m Boat Launch - Concrete	Boat Launch - Grave	el Marine Rai	Marinas	Fences	Stairs Mo	oring Buoys	Boat Rack/Lift	Boat Basin	Shed	Pumphouse	Geothermal	Pond_Pool	Pilings	Pile Support Struct	Tram
	0	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	0.1%	Yes	2%	2%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
No	>25 Trees	0	0	0	0	0	0		

dor Land Use Comment

	Littoral Width	Littoral LWD (#)	Littoral Comment
m)	38	2	



G	e	n	e	ra	I	1
			_		-	

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
1769	Gravel	Roadway	Medium (5-20%)	Single Family	High (>50%)	No	100%	0%
Chana Tanan								

S	h	0	r	e	T	y	p	e	
	_								_

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	0%	85%	0%	15%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	
0%	5%	0%	0%	0%	0%	0%	0%	5%	0%	90%	0%	0%	0%	Silverton; s

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	0%	10%	50%	30%	0%	0%	10%	0%	Low (0 - 25%)	Smooth

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	60%	0%	0%	30%	0%	0%	10%	0%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Young Forest	Medium (10 - 50%)	Sparse (< 10%)	Patchy	50	0%	

Aquatic Vegetation:

Aquatic Vegetation:						Large Woody Debris (LWD):					Littoral Area:
	Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment		Littoral Zone
	10%	10%	0%	0%		< 5 Pieces	3	0			Medium (10 - 50

110 -11-

Ret. Walls %Ret.Wall Docks Docks/km Dock Groyne Swim Float Boat House_Float Boat House_Land Boat Cover Groynes Groynes/km Boat Launch - Concrete Boat Launch - Concrete Boat Launch - Concrete Boat Launch - Concrete Boat Launch - Gravel Marinas Fences Stairs Mooring Buoys Boat Rack/Lift Boat Basin Shed Pumphouse Geothermal Pond_Pool	lings Pile Support Struct Tram
10 10% 4 2.3 1 2 0 2 0 34 19.2 1 0 2 0 2 0 1 10 5 0 1 1 0 0 0	21 1 0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	20%	Yes	60%	50%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
No	< 5 Trees	0	0	0	0	0	0		Bat house at last property

Land Use Comment single family plus campground, marina and day park

	Littoral Width	Littoral LWD (#)	Litto	ral Comment	
m)	22	0]
					-



-		
Con	oral	
Gen	era	

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
3174	Rocky Shore	Roadway	Low (< 5%)	Natural Area	Medium (10-50%)	No	10%	90%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	99%	0%	0%	1%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land Us
0%	0%	0%	0%	0%	0%	0%	99%	0%	1%	0%	0%	0%	0%	

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	0%	15%	15%	25%	0%	0%	40%	5%	Low (0 - 25%)	Smooth

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	30%	0%	0%	25%	0%	0%	40%	5%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Young Forest	Medium (10 - 50%)	Abundant (>50%)	Continuous	50	10%	

Aquatic Vegetation:

Aquatic Vegetation:					Large Woody Debris (LW	/D):			Littoral Area:
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone
10%	10%	0%	0%		< 5 Pieces	5	0		Medium (10 - 50

Shoreline Modifications:

Ret. Wall	ls %Ret.W	all Dock	s Docks/km	n Dock Groyne	Swim Float	Boat House_Float	t Boat House_Land	Boat Cover	Groynes	Groynes/km	Boat Launch - Con	ncrete Boat Launch ·	Gravel Marine R	ailMarina	as Fences Sta	airs Mo	looring Buoys	Boat Rack/Lift	Boat Basin S	Shed	Pumphouse	Geothermal	Pond_Pool	Pilings	Pile Support Struct	Tram
3	2%	1	0.3	0	0	0	1	0	6	1.9	0	0	0	0	0	0	1	0	0	0	0	0	0	25	2	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	30%	Yes	2%	10%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
< 5 Trees	> 25 Trees	0	0	0	0	0	0		

se Comment

	Littoral Width	Littoral LWD (#)	Littoral Comment
m)	20	0	



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Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
2861	Rocky Shore	Small Marina (6-20 Slips)	Low (< 5%)	Park	High (>50%)	No	70%	30%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	50%	40%	0%	10%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	
0%	10%	0%	0%	0%	15%	0%	0%	30%	0%	20%	25%	0%	0%	New Denve

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	0%	20%	20%	30%	0%	0%	30%	0%	Low (0 - 25%)	Smooth

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	40%	30%	0%	0%	30%	0%	0%	0%	0%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Mature Forest	Medium (10 - 50%)	Medium (10 - 50%)	Patchy	50	5%	

Aquatic Vegetation:

Aquatic Vegetation:					Large Woody Debris (LW	/D):			Littoral Area:			
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone	Littoral Width	Littoral LWD (#)	Littoral Comment
0%	0%	0%	0%		< 5 Pieces	5	0		Medium (10 - 50 m)	33	1	

Shoreline Modifications:

Ret. Walls	%Ret.Wal	l Docks	Docks/km	Dock Groyne	Swim Float	Boat House_Float	t Boat House_Land	Boat Cover	Groynes	Groynes/km	Boat Launch - Concrete	Boat Launch	- Gravel Marine Rail	Marinas	Fences	Stairs	Mooring Buoys	Boat Rack/Lift	Boat Basin	Shed	Pumphouse	Geothermal	Pond_Pool	Pilings	Pile Support Struct	Tram
13	10%	4	1.4	2	1	0	2	0	24	8.4	2	0	1	1	0	1	1	0	1	2	0	0	0	3	1	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	10%	Yes	10%	30%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
< 5 Trees	5 - 25 Trees	0	0	0	0	0	0		Crow

Land Use Comment r; campground and marina are commercial



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
4546	Rocky Shore	Railway	Low (< 5%)	Natural Area	Low (< 10%)	No	1%	99%

Shore Type:

Cliff/Bl	uff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
10%		54%	35%	0%	1%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land
0%	0%	0%	0%	0%	0%	0%	99%	0%	1%	0%	0%	0%	0%	F

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	0%	20%	15%	35%	0%	0%	20%	10%	Low (0 - 25%)	Smooth

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	35%	0%	0%	35%	0%	0%	20%	10%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Mature Forest	Medium (10 - 50%)	Abundant (>50%)	Patchy	50	0%	

Aquatic Vegetation:

Aquatic Vegetation:						Large Woody Debris (LW	/D):			Littoral Area:			
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment		LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone	Littoral Width	Littoral LWD (#)	Littoral Comment
0%	0%	0%	0%			< 5 Pieces	5	0		Medium (10 - 50 m)	20	0	

Shoreline Modifications:

Ret. Walls Ret. Wall Docks Docks/km Dock Groyne Swim Float Boat House_Float Boat House_Land Boat Cover Groynes Groynes/km Boat Launch - Concrete Boat Launch - Concrete Boat Launch - Concrete Boat Launch - Concrete Boat Launch - Gravel Marinas Fences Stairs Mooring Buoys Boat Rack/Lift Boat Basin Shed Pumphouse Geothermal Pond_Pool Pile	lings Pile Support Struct Tram
	8
0 0% 1 0.2 0 1 0 0 0 1 0.2 0 1 0.2 0 0 1 0.2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
55%	10%	Yes	1%	1%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
No	> 25 Trees	0	0	0	0	0	0		Steller's jay, western grebe, crow

Use Comment Rail to Trail



General:

Segment Le	ngth (n	n) Sh	ore Type	e Shor	re Type Modi	ication	Slop)e	Land Us	e Leve	el of Impac	t Livest	tock Acc	cess Disturb	oed N	latural													
241			Gravel		None		Low (<	5%)	Industri	al Medi	um (10-50	%)	No	40%	6	60%													
Shore Type:																													
Cliff/Bluff	Rocky	y Gra	vel	Sand	Stream Mou	th Wet	and	Other																					
0%	100%	6 0	%	0%	0%	09	6	0%																					
Land Use:																													
Agriculture	Comm	ercial C	onserva	ition Fo	orestry Indus	trial Institu	utional I	Multi-Famil	ly Natura	l Area Par	k Rural S	ingle Fam	nily Tra	ansportation	n Urba	an Park Uti	ility Corri	idor	Lá	and Use	e Comm	ent							
0%	09	%	0%		0% 100	% 0	%	0%	09	6 0%	0%	0%		0%	(0%	0%												
Foreshore S	ubstrat	es:																											
Marl N	lud Org	ganic Fi	nes Sa	nd Gra	avel Gravel Fi	ne Gravel	Coarse	Cobble Co	bble Fine	Cobble Co	oarse Bou	der Bed	rock	Embeddedr	ness	Shape													
0% ()% (0% 1	0% 0	% 0	% 35%	33	3%	20%	0%	0%	2	6 09	%	Low (0 - 25	5%)	Smooth]												
Littoral Subs	trates:																_												
Marl M	ud Org	ganic F	ines Sa	and Gra	avel Gravel F	ine Gravel	Coarse	Cobble Co	bble Fine	Cobble C	oarse Bou	lder Bed	rock	Embedded	ness	Shape													
0% 0	% C	0%	0% 1	.0% 30	0% 0%	0	%	40%	0%	0%	20	% 0	%	Low (0 - 25	5%)	Smooth													
Vegetation I	Band 1:																												
Class		St	age	Shr	rub Cover	Tree C	over	Distributio	on Bandw	vidth (m)	Overhangi	ng Vegeta	ation	Veg Band	Comm	nent													
Conifer	ous	Young	Forest	Spar	rse (< 10%)	Medium (1	l0 - 50%)	Patchy		50		0%																	
Aquatic Veg	etation	:						La	arge Woo	dy Debris (LWD):							Littor	al Area:										
Aquatic Veg	etation	n Subm	ergent [Emerge	nt Floating	Aq Veg Con	nment		LWD	Range	Littora	LWD (#)	LWD	Clusters L	WD Co	omment		Lit	ttoral Zo	ne	Littora	l Width	Littor	al LWC) (#)	Littora	al Comr	nent	1
0%		0	%	0%	0%				N	one		0		0				Medi	um (10 -	- 50 m)	2	20		0]
Shoreline Modifi	ations:																												-
Ret. Walls %Ret	Wall Doo	cks Docks/	km Dock G	royne Swi	m Float Boat Hou	se_Float Boat	House_Land	d Boat Cover G	roynes Groy	nes/km Boat L	aunch - Concr	ete Boat Lau	nch - Grav	vel Marine Rail	Marinas	Fences Stairs	Mooring B	uoys Boa	at Rack/Lift	t Boat Bas	in Shed F	o	e Geothe	rmal Po	nd_Pool	Pilings F	vile Suppo	ort Struct	Tram
Lineal Modif	ication		0		0 0		0	U	0	0	0		0	0	0	0 0			0	0	0	0	0				2		
& Rail		% Roa	d	Sub	strate Mod	% Subs	trato Mo	d % Frosi	on Protec	t Modif	ication Co	nment	1																
0%		100%	<u> </u>	545	Yes	70 50 55	2%		0%	i inouri	arge barg	5	1																
Flora and Fau	ına:	2007				I						-																	
Veteran Tree	es S	nags	Beaver	Lodge	Wildlife Den	Wildlife Tr	ail Mine	eral Lick Sh	ellfish St	ick Nest	Flora Co	mments		Fauna (Comm	ents													
No		No	0	Ŭ	0	0		0	0	0							1												



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
239	Gravel	Log Yard	Low (< 5%)	Industrial	High (>50%)	No	100%	0%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	0%	0%	0%	0%	0%	100%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land Use Comment
0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	Log Yard

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	Low (0 - 25%)	Angular

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	Low (0 - 25%)	Angular

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Herbs / Grasses	Grass / Herb	Sparse (< 10%)	Sparse (< 10%)	Patchy	50	0%	

Aquatic Vegetation:

Aquatic Vegetation:					_	Large Woody Debris (LW	/D):			Li
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment		LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	
0%	0%	0%	0%]	None	0	0		Г

Shoreline Modifications:

Ret. Walls %Ret.	Wall D	ocks Doo	:ks/km [Dock Groyne	Swim Float	Boat House_Floa	t Boat House_Land	Boat Cover	Groynes	Groynes/km	Boat Launch - Concrete	Boat Launch - Gra	vel Marine Rail	Marinas	Fences	Stairs	Mooring Buoys	Boat Rack/Lift	Boat Basin	Shed	Pumphouse	Geothermal F	Pond_Pool	Pilings F	Pile Support Struct	Tram
1 100	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	0%	No	0%	100%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
No	No	0	0	0	0	0	0		

Littoral Area:

Entional Zone E	littoral width	Littoral LWD (#)	Littoral Comment
Narrow (< 10 m)	1	0	



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
683	Rocky Shore	Roadway	Low (< 5%)	Single Family	High (>50%)	No	80%	20%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	100%	0%	0%	0%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land U
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	20%	0%	0%	70%	0%	0%	10%	0%	Low (0 - 25%)	Smooth

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	10%	20%	0%	0%	70%	0%	0%	0%	0%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Young Forest	Medium (10 - 50%)	Sparse (< 10%)	Patchy	50	0%	

Aquatic Vegetation:

Aquatic Vegetation:					Large Woody Debris (LW	/D):			Littoral Area:			
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone	Littoral Width	Littoral LWD (#)	Littoral Comment
20%	20%	0%	0%		None	0	0		Medium (10 - 50 m)	25	0	

Shoreline Modifications:

Ret. Walls %Ret.Wall Docks Docks/km Dock Groyne Swin	bat Boat House_Float Boat House_La	d Boat Cover Groyn	es Groynes/km	Boat Launch - Concrete	Boat Launch - (Gravel Marine Rail	Marinas	Fences S	Stairs	Mooring Buoys	Boat Rack/Lif	t Boat Basir	h Shed	Pumphouse	Geothermal	Pond_Pool Pili	ngs Pile S	upport Struct	Íram
14 60% 5 7.3 0	0 0	0 18	26.3	0	2	1	0	1	5	2	0	0	1	0	0	0	5	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	1%	Yes	60%	85%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
No	< 5 Trees	0	0	0	0	0	0		Goose, crows, eagle

Jse Comment



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\mathbf{c}	0	5	0	10	-		
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-	_	•••	-				

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
668	Stream Mouth	None	Low (< 5%)	Park	Low (< 10%)	No	1%	99%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	0%	10%	0%	90%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land Use Comment
0%	0%	0%	0%	0%	0%	0%	20%	80%	0%	0%	0%	0%	0%	Wilson Creek fan and Roseberry Parklands

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	10%	0%	0%	20%	20%	40%	0%	0%	10%	0%	Low (0 - 25%)	Smooth

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	20%	20%	0%	0%	60%	0%	0%	0%	0%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Mature Forest	Medium (10 - 50%)	Sparse (< 10%)	Continuous	50	0%	

Aquatic Vegetation:

Aquatic Vegetation:					Large Woody Debris (LW	/D):			Littoral Area:
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone
0%	0%	0%	0%		None	0	0		Medium (10 - 50

Shoreline Modifications:

Ret. Wall	s %Ret.Wall	Docks	Docks/km	Dock Groyne	Swim Float	Boat House_	Float Boat House_Land	Boat Cove	r Groynes	Groynes/km	Boat Launch - Concrete	Boat Launch - (Gravel Marine Ra	il Marina	s Fences	Stairs	Mooring Buoys	Boat Rack/Lif	ft Boat Basi	n Shed	Pumphouse	Geothermal	Pond_Poo	l Pilings	Pile Support Stru	ct Tram
0	0%	2	3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	1%	Yes	2%	0%	

Flora and Fauna:

Veteran Tre	es Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
No	5 - 25 Trees	0	0	0	0	0	0		Crow, 2 pileated woodpeckers

	Littoral Width	Littoral LWD (#)	Littoral Comment
m)	15	0	



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
327	Rocky Shore	Railway	Medium (5-20%)	Transportation	High (>50%)	No	70%	30%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	100%	0%	0%	0%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	90%	0%	0%	Old Hig

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	20%	0%	0%	60%	0%	0%	20%	0%	Low (0 - 25%)	Angular

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	20%	0%	0%	60%	0%	0%	20%	0%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Young Forest	Medium (10 - 50%)	Medium (10 - 50%)	Patchy	50	0%	
Aquatic Vegetation	:			Larg	ge Woody Debris	(LWD):	

Aquatic Vegetation:

Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone
0%	0%	0%	0%		None	0	0		Medium (10 - 50

Shoreline Modifications:

Ret. Walls	%Ret.Wall	Docks	Docks/km	Dock Groyne	Swim Float	Boat House_Fl	loat Boat House_Land	Boat Cover	Groynes	Groynes/km	Boat Launch - Concrete	Boat Launch - (Gravel Marine Ra	Marina	s Fences	Stairs	Mooring Buoys	Boat Rack/Li	ft Boat Basir	n Shed	Pumphouse	Geothermal	Pond_Poo	l Pilings	Pile Support Struc	t Tram
2	20%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	4	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
100%	0%	Yes	5%	40%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
No	< 5 Trees	0	0	0	0	0	0		Mergansers, robins, bat box at end property

Land Use Comment hway sidecast, old barge landing

Littoral Area:

	Littoral Width	Littoral LWD (#)	Littoral Comment
m)	18	0	



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
7324	Rocky Shore	Railway	Medium (5-20%)	Natural Area	Low (< 10%)	No	9%	91%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	99%	0%	0%	1%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land Use Comment
0%	0%	0%	0%	0%	0%	0%	55%	0%	0%	0%	45%	0%	0%	Rail to Trail; highway comes close in areas

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	0%	1%	2%	10%	0%	0%	85%	2%	Low (0 - 25%)	Angular

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	0%	0%	0%	30%	0%	0%	70%	0%	Low (0 - 25%)	Angular

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Young Forest	Medium (10 - 50%)	Abundant (> 50%)	Continuous	50	0%	

Aquatic Vegetation:

Aquatic Vegetation:					 Large Woody Debris (LW	′D):			 Littoral A
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littora
20%	20%	0%	0%		< 5 Pieces	5	0		Narrow

Shoreline Modifications:

Ret. Wall Docks Docks/km Docks/km Dock Groyne Swim Float Boat House_Float Boat House_Land Boat Cover Groynes/km Boat Launch - Grovel Marine Rail	_				-																								
1 0.1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0		Ret. Wal	s %Ret.	Wall	Docks D	ocks/km	Dock Groyne	Swim Float	Boat House_Float	Boat House_Land	Boat Cover	Groynes	Groynes/kn	n Boat Launch - Concret	e Boat Launch	- Gravel Marine R	ailMarina	s Fences	Stairs	Mooring Buoys	Boat Rack/I	ift Boat Basir	n Shed	Pumphouse	Geothermal	Pond_Poc	ol Pilings	Pile Support Struct	Tram
		1	19	6	1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
100%	10%	Yes	1%	80%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
No	>25 Trees	0	0	0	0	0	0		Mergansers

Littoral Area:

Littoral Zone	Littoral Width	Littoral LWD (#)	Littoral Comment
Narrow (< 10 m)	1	4	



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
777	Gravel	Railway	Low (< 5%)	Natural Area	Low (< 10%)	No	5%	95%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	0%	50%	0%	50%	0%	0%

Land Use:

Agriculture	Comm	ercial	Conse	rvation	Forest	ry Industrial	Institutional	Multi-Fan	nily Natural	Area	Park	Rural	Single F	amily	Transportation	Urban Parl	Utility Co	ridor	Land	
0%	0%	6	C)%	0%	0%	0%	0%	709	6	0%	0%	0%	6	30%	0%	0%		Bonanza Cr	
Foreshore S	preshore Substrates:																			
Marl I	Mud Or	ganic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble (Cobble Fine	Cobb	le Coa	rse B	oulder B	edrock	Embeddedn	ess Sha	ipe			
0%	0% (0%	0%	0%	0%	90%	9%	0%	0%		0%		1%	0%	Low (0 - 259	6) Smo	oth			

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	40%	60%	0%	0%	0%	0%	0%	0%	0%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Mature Forest	Abundant (> 50%)	Abundant (> 50%)	Continuous	50	0%	Mature cottonwoods around creek mouth; Bonanza ma

Aquatic Vegetation:					Large Woody Debris (LW	/D):			Littoral Area:			
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone	Littoral Width	Littoral LWD (#)	Littoral Comment
100%	100%	0%	0%		None	0	0		Wide (>50 m)	51	0	
Shoreline Modifications:												

Ret.	Walls	%Ret.Wall	Docks	Docks/km	Dock Groyne	Swim Float	Boat House_Floa	t Boat House_Land	Boat Cover	Groynes	Groynes/k	m Boat Launch - Concre	te Boat Launch	- Gravel M	larine Rail	Marinas	Fences	Stairs	Mooring Buoys	Boat Rack/Lif	t Boat Basin	Shed	Pumphouse	Geothermal	Pond_Pool	Pilings P	le Support Struct	t Tram
	0	0%	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	1	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
50%	0%	Yes	1%	0%	Quad tracks at confluence of Bonanza Creek

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
No	5 DE Troop	0	0	0	0	1	0		Otter and deer tracks, beaver dam, Kokanee in Bonanza Creek, A
INO	5 - 25 frees	U	U	U	U	1	U		sandpiper, northern flicker, great-horned owl; potential mussel beds

Use Comment reek fan; Rail to Trail

arsh behind B1

American dipper, ls extend from Seg21



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
436	Sand	Roadway	Low (< 5%)	Single Family	High (> 50%)	No	100%	0%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	0%	0%	100%	0%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	Low (0 - 25%)	Smooth

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	30%	70%	0%	0%	0%	0%	0%	0%	0%	0%	Medium (25 - 75%	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Herbs / Grasses	Grass / Herb	Sparse (< 10%)	Sparse (< 10%)	Continuous	50	0%	

Aquatic Vegetation					Large Woody Debris (LW	/D):			Littoral Area:			
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone	Littoral Width	Littoral LWD (#)	Littoral Comment
100%	100%	0%	0%		None	0	0		Wide (> 50 m)	55	0	
Shoreline Modifications:												

Ret. Walls	%Ret.Wal	l Docks	Docks/km	Dock Groyn	e Swim Float	Boat House_Float	Boat House_Land	Boat Cover	Groynes	Groynes/	km Boat Launch - Concr	ete Boat Launch	- Gravel	Marine Rai	Marinas	Fences	Stairs	Mooring Buoys	Boat Rack/Lif	Boat Basin	Shed	Pumphouse	Geothermal	Pond_Pool	Pilings	Pile Support Struct	Tram
4	2%	7	16.0	0	2	0	0	0	0	0	0	2		0	0	0	0	2	0	0	0	0	0	0	0	1	0
Lineal Mo	difications																										

Linear woundat					
% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	1%	Yes	100%	2%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
< 5 Trees	No	0	0	0	0	1	0		Loon, kingfisher, steller's jay, otter, crows, tree frogs, western

d Use Comment



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
3516	Rocky Shore	None	Steep (20-60%)	Natural Area	None	No	0%	100%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	95%	0%	4%	1%	0%	0%

Land Use:

Agriculture	Com	nmercial	Conservat	tion Forest	ry Industria	Institutional	Multi-Fami	ly Natural /	Area Park	Rural Sir	gle Family	Transportatio	on Urbar	n Park Ut	ility Corri	dor	Land Use	Comme	ent						
0%		0%	0%	0%	0%	0%	0%	100%	6 0%	0%	0%	0%	0	%	0%										
Foreshore S	ubst	rates:																							
Marl N	/lud (Organic	Fines San	nd Gravel	Gravel Fine	Gravel Coarse	Cobble Co	bble Fine	Cobble Coa	rse Bould	er Bedroo	k Embedde	dness	Shape											
0%	0%	0%	3% 5%	6 0%	5%	0%	10%	0%	0%	62%	15%	Low (0 - 2	25%)	Angular											
Littoral Sub	strate	2 S :													_										
Marl N	/lud (Organic	Fines Sa	and Gravel	Gravel Fine	Gravel Coarse	Cobble Co	obble Fine	Cobble Co	arse Boul	der Bedro	ck Embedde	dness	Shape											
0%	0%	0%	0% 0	0% 20%	0%	0%	60%	0%	0%	20	6 0%	Low (0 -	25%)	Smooth	1										
Vegetation	Band	1:																							
Class	s		Stage	Shrub (Cover	Tree Cover	Distributio	on Bandwi	dth (m) O	verhangin	g Vegetatio	on Veg I	Band Con	nment											
Conifer	rous	Mat	ure Forest	Medium (10 - 50%) A	bundant (> 50%)	Continuo	us 5	0	0	%														
Aquatic Ve	getati	ion:					L	arge Wood	y Debris (L	VD) :						Littoral Area	a:								
Aquatic Ve	getat	ion Sub	mergent E	mergent F	loating Aq	Veg Comment		LWD F	Range	Littoral	.WD (#) l	WD Clusters	LWD Co	omment		Littoral 2	Zone	Littoral	Width	Littora	LWD (#) Litte	oral Co	mment	1
20%	6		20%	0%	0%			< 5 Pi	eces	5		4				Narrow (<	:10 m)	1	0		30				
Shoreline Modif	fication	is:																		_					
Ret. Walls %Re	t.Wall	Docks Doc	ks/km Dock Gr	royne Swim Flo	oat Boat House_	Float Boat House_La	nd Boat Cover (Groynes Groyn	es/km Boat La	unch - Concre	e Boat Launch	n - Gravel Marine Ra	ailMarinas	Fences Stair	s Mooring Bu	loys Boat Rack/I	.ift Boat Bas	in Shed P	umphouse	e Geotheri	nal Pond_	Pool Piling	s Pile Su	pport Stru	uct Tram
1	0%	0	0 0	0	0	0	0	1 0.	.3	0	0	0	0	0 0	0	0	0	0	0	0	0	0		0	0
Lineal Mod	ificat	ions:											_												
% Rail		% F	Road	Substra	ate Mod	% Substrate N	1od % Eros	ion Protect	t	Modifica	tion Comm	nent													
0%		0	0%	Y	es	0%		0%																	
Flora and F	auna:	:																							
Votoran Tr		Cases	Deever		dlife Den V	Vilalifa Trail Mi		hallfich Ct	iels Neet E	ara Cama	anta	E au													

Veteran Trees Snags Beaver Lodge Wildlife Den Wildlife Trail Mineral Lick Shellfish Stick Nest Flora Comments Fauna Comments >25 Trees Bald eagle, fresh woodpecker cavity, beaver < 5 Trees 0 0 0 0 0 0



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
2225	Gravel	Roadway	Medium (5-20%)	Natural Area	Low (< 10%)	No	1%	99%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	20%	79%	0%	1%	0%	0%

Land Use:

Agriculture	e Con	nmercial	Conse	rvation	Forest	y Industrial	Institutional	Multi-Fan	nily Natural	Area	Park F	Rural	Single	Family	Transportation	Urban I	Park	Utility Corridor	Lan
0%		0%	0	%	0%	0%	0%	0%	80%	6	20%	0%	0	%	0%	0%	5	0%	Forest Recre
Foreshore	Subst	trates:														-			
Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobb	le Coar	se B	oulder	Bedrock	Embeddedn	ess	Shap	e	
0%	0%	0%	0%	15%	0%	0%	35%	35%	0%		0%		10%	5%	Low (0 - 259	%) /	Angul	lar	
Littoral Sul	ostrate	es:																	
Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobb	le Coar	rse B	oulder	Bedroc	k Embeddedn	less	Shap	be	
0%	0%	0%	0%	20%	70%	0%	0%	10%	0%		0%		0%	0%	Low (0 - 25	%)	Smoo	oth	

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Mature Forest	Medium (10 - 50%)	Abundant (> 50%)	Continuous	50	0%	Riparian clearing to extend campground, gravel boat la

Aquatic Vegetation:

Aquatic Vegetation:	:				Large Woody Debris (LW	/D):			Littoral Area:			
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone	Littoral Width	Littoral LWD (#)	Littoral Comment
20%	20%	0%	0%		< 5 Pieces	5	0		Medium (10 - 50 m)	35	0	

Shoreline Modifications:

Ret	. Walls	%Ret.Wall	Docks	Docks/km D	ock Groyne	Swim Floa	t Boat House_Floa	at Boat House_	Land Boat Cover	Groynes	Groynes/km	Boat Launch - Concrete	Boat Launch - Gra	avel Marine Ra	il Marina:	Fences Sta	rs Mooring	Buoys Boat Rack/Li	ft Boat Basin Sh	ed Pumphou	se Geotherma	Pond_Pool	Pilings	Pile Support Struct	Tram
	0	0%	1	0.4	0	0	0	0	0	1	0.4	0	1	0	0	0 0	0	0	0 0	0 (0	0	0	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	2%	Yes	5%	0%	New boat access from campground

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
< 5 Trees	>25 Trees	0	0	0	0	0	0		Crow, northern flicker

nd Use Comment eation Site Wragge Beach

aunch



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
4332	Rocky Shore	None	Steep (20-60%)	Natural Area	None	No	0%	100%

Shore Type:

Supre The						
Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	99%	0%	0%	1%	0%	0%

Land Use:

Agricultur	e Cor	nmercial	Conse	rvation	Forest	ry Industrial	Institutional	Multi-Fa	mily Natural	Area	Park	Rural	Single	Family	Transportation	Urbar	n Park	Utility Corridor	Lar
0%		0%	0)%	0%	0%	0%	0%	100	%	0%	0%	0)%	0%	0	%	0%	
Foreshore	Subst	trates:																	
Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobb	le Coar	se B	oulder	Bedrock	Embeddedne	ess	Shap	e	
0%	0%	0%	0%	0%	0%	0%	5%	5%	0%		0%		60%	30%	Low (0 - 25%	6)	Angul	ar	
Littoral Sul	bstrat	es:																	
Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobb	le Coar	rse B	oulder	Bedroc	k Embeddedn	ess	Shap	e	
0%	0%	0%	0%	0%	5%	0%	0%	30%	0%		0%		60%	5%	Low (0 - 259	%)	Smoo	oth	

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Mature Forest	Medium (10 - 50%)	Abundant (>50%)	Continuous	50	0%	

Aquatic Vegetation:	uatic Vegetation:						/D):				Littoral Area:			
Aquatic Vegetation	Aquatic Vegetation Submergent Emergent Floating Aq Veg Comment						LWD Range Littoral LWD (#) LWD Clusters LWD Comment					Littoral Width	Littoral LWD (#)	Littoral Comment
0%	0%	0%	0%			6 - 25 Pieces	20	0			Narrow (< 10 m)	5	50	

Shoreline Modifications:

Ret. W	alls 🕺	6Ret.Wall	Docks	Docks/km	n Dock Groyne	Swim Float	t Boat House_Floa	t Boat House_Land	Boat Cover	Groynes	Groynes/km	Boat Launch - Concrete	Boat Launch	- Gravel Marine Ra	Marina	Fences Sta	irs Moo	oring Buoys	Boat Rack/Lift	Boat Basin	Shed	Pumphouse	Geothermal	Pond_Poo	l Pilings	Pile Support Struc	t Tram
0		0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0 ()	0	0	0	0	0	0	0	0	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	0%	Yes	0%	0%	No docks observed

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
< 5 Trees	>25 Trees	0	0	0	0	0	0		Kingfisher, snag with fresh woodpecker feeding cavities

and Use Comment



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
1257	Cliff / Bluff	None	Steep (20-60%)	Park	None	No	0%	100%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
100%	0%	0%	0%	0%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Lar
0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	0%	5%	5%	0%	0%	0%	10%	80%	Low (0 - 25%)	Angular

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	0%	30%	60%	Low (0 - 25%)	Angular

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Mature Forest	Medium (10 - 50%)	Abundant (> 50%)	Continuous	50	0%	

Aquatic Vegetation:

Aquatic Vegetation:					 Large Woody Debris (LW	/D):			Littoral Area:			
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone	Littoral Width	Littoral LWD (#)	Littoral Comment
0%	0%	0%	0%		6 - 25 Pieces	20	0		Narrow (< 10 m)	1	10	

Shoreline Modifications:

Ret. Walls %Ret.Wall Docks Docks/km Dock Groyne Swim Float Boat House_Float Boat House_Land Boat Cover Groynes Groynes/km Boat Launch - Concrete Boat Launch - Gravel Marines Fences Stairs Mooring Buoys Boat Rack/Lift Boat Basin Shed Pumphouse Geothermal Pond_Pool Pilings Pile Supr	Scovpes Growpes/km Boat Jaunch - Concrete Boat Jaunch - Gravel Marine Bail Marinas Fences Stairs Mooring Buoys Boat Back/Lift Boat Basin Shed Pumphouse Geothermal Pond, Pool Pile Support Struct	t Tram
		_
	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	0%	No	0%	0%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
< 5 Trees	>25 Trees	0	0	0	0	0	0	0	

nd Use Comment

General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
6197	Rocky Shore	None	Medium (5-20%)	Park	Low (< 10%)	No	1%	99%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
30%	59%	10%	0%	1%	0%	0%

Land Use:

Agriculture	e Cor	nmercial	Cons	ervatio	n Foresti	y Industria	I Institutional	Multi-Fa	mily N	latural A	Area	Park	Rural	Single	e Family	Transportation	Urban I	Park	Utility Corri	lor	Land
0%		0%		0%	0%	0%	0%	0%		0%		100%	0%	(0%	0%	0%	i	0%		
Foreshore Substrates:																					
Marl N	∕lud	Organic	Fines	Sand	Gravel 0	Gravel Fine	Gravel Coarse	Cobble	Cobble	Fine C	obble	e Coar	se Bo	ulder	Bedrock	Embeddedne	ess 🛛	Shape	<u>4</u>		
0%	0%	0%	0%	2%	0%	0%	6%	0%	0%	6	(0%	4	44%	48%	Low (0 - 25%	6) A	Angula	ar		
Littoral Sub	strat	es:																			

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	2%	0%	0%	6%	0%	0%	0%	44%	48%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Mature Forest	Medium (10 - 50%)	Abundant (> 50%)	Continuous	50	0%	

Aquatic Vegetation:

Aquatic Vegetation:					Large Woody Debris (LW	/D):			Littoral Area:
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone
5%	5%	0%	0%		6 - 25 Pieces	20	0		Narrow (< 10 m

Shoreline Modifications:

oynes Groynes/kmBoat Launch - ConcreteBoat Launch - Grave Marine RailMarinas Fences Stairs Mooring BuoysBoat Rack/L	oat Basin Shed PumphouseGeothermal Pond_Pool Pilings Pile Support Struct Tra
0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	0%	No	0%	0%	Old sunken barge south of Sharp Creek

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
5 - 25 Trees	>25 Trees	0	0	0	0	0	0		

Use Comment

	Littoral Width	Littoral LWD (#)	Littoral Comment
ו)	3	0	



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
432	Rocky Shore	None	Medium (5-20%)	Single Family	High (> 50%)	No	70%	30%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	60%	20%	20%	0%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land
0%	0%	0%	0%	0%	0%	0%	0%	0%	20%	80%	0%	0%	0%	

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	5%	5%	35%	0%	0%	30%	0%	0%	20%	5%	Low (0 - 25%)	Angular

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	5%	5%	35%	0%	0%	30%	0%	0%	20%	5%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Mature Forest	Medium (10 - 50%)	Abundant (> 50%)	Patchy	50	0%	Some riparian clearing in front of residences

Aquatic Vegetation:

Aquatic Vegetation:					Large Woody Debris (LW	/D):			Littoral Area:			
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone	Littoral Width	Littoral LWD (#)	Littoral Comment
0%	0%	0%	0%		None	0	0		Narrow (< 10 m)	5	0	

Shoreline Modifications:

Ret. Walls	%Ret.Wall	Docks	Docks/km	Dock Groyne	Swim Floa	tBoat House_Floa	Boat House_Land	Boat Cover	Groynes	Groynes/km	Boat Launch - Concrete	Boat Launch - Gra	avelMarine Rail	Marinas	Fences	Stairs	Mooring Buoys	Boat Rack/Lift	Boat Basir	Shed	umphouse	Geothermal	Pond_Pool	Pilings	Pile Support Struct	Tram
4	20%	5	11.6	3	0	0	0	0	13	30.1	0	0	1	0	0	6	5	0	0	1	0	0	0	0	4	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	0%	Yes	50%	30%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
No	No	0	0	0	0	0	0		

d Use Comment



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
2306	Rocky Shore	None	Medium (5-20%)	Park	None	No	0%	100%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
30%	59%	10%	0%	1%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Lan
0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	2%	0%	0%	6%	0%	0%	0%	44%	48%	Low (0 - 25%)	Angular

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	2%	0%	0%	6%	0%	0%	0%	44%	48%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Mature Forest	Medium (10 - 50%)	Abundant (> 50%)	Continuous	50	0%	

Aquatic Vegetation:

Aquatic Vegetation:					Large Woody Debris (LW	/D):			Littoral Area:
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zon
0%	0%	0%	0%		< 5 Pieces	5	0		Narrow (< 10

Shoreline Modifications:

Pool Pilings Pile Support Struct Tra	Pond_Pool	seGeotherma	Pumphouse	n Shed P	ftBoat Basir	sBoat Rack/Lif	ring Buoys	irs Mo	es Stair	Fence	Marinas	Aarine Rail	aunch - Grave	unch - ConcreteBoat	nes/km Boat l	nes Groyn	er Groyne	d Boat Cove	Boat House_Land	Boat House_Floa	Swim Float	ock Groyne	ocks/km	Docks [%Ret.Wall	Ret. Walls
0 0 0	0	0	0	0	0	0	0		0	0	0	0	0	0	0) (0	0	1	0	0	0	0	0	0%	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	0%	No	0%	0%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
No	No	0	0	0	0	0	0		

d Use Comment

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,,	1	0					J
	in the state of the second	- Carathanna I D	and Deal	D111	011-0	Courses	T



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
1374	Rocky Shore	None	Medium (5-20%)	Rural	Medium (10-50%)	No	20%	80%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	55%	35%	5%	5%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land
0%	0%	0%	0%	0%	0%	0%	0%	30%	70%	0%	0%	0%	0%	

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	2%	10%	35%	0%	0%	33%	0%	0%	20%	0%	Low (0 - 25%)	Angular

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	2%	10%	35%	0%	0%	33%	0%	0%	20%	0%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Young Forest	Medium (10 - 50%)	Medium (10 - 50%)	Patchy	50	0%	

Aquatic Vegetation:

Aquatic Vegetation:					Large Woody Debris (LW	/D):			Littoral Area:
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone
5%	5%	0%	0%		< 5 Pieces	5	0		Narrow (< 10 m

Shoreline Modifications:

R	et. Walls	%Ret.Wall	Docks	Docks/km	Dock Groyne	Swim Float	Boat House_Floa	a B oat House_Lan	Boat Cover	Groynes	Groynes/km	Boat Launch - Concrete	Boat Launch - Grave	Marine Rail	Marinas	Fences	Stairs	Mooring Buoys	Boat Rack/Lift	Boat Basin	Shed	Pumphouse	Geothermal	Pond_Pool	Pilings	Pile Support Struct	Tram
	0	0%	5	3.6	2	0	0	0	0	5	3.6		0	0	0	0	0	1	1	0	2	0	0	0	0	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	0%	Yes	5%	2%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
No	No	0	0	0	0	0	0		

d Use Comment

	Littoral Width	Littoral LWD (#)	Littoral Comment
)	5	0	



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
12660	Rocky Shore	None	Medium (5-20%)	Park	Low (< 10%)	No	1%	99%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
30%	59%	10%	0%	1%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land
0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	2%	0%	0%	6%	0%	0%	0%	44%	48%	Low (0 - 25%)	Angular

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	2%	0%	0%	6%	0%	0%	0%	44%	48%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Mature Forest	Medium (10 - 50%)	Abundant (>50%)	Continuous	50	0%	

Aquatic Vegetation:

Aquatic Vegetation:					Large Woody Debris (LW	/D):		
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment
10%	10%	0%	0%		> 25 Pieces	75	0	

Shoreline Modifications:

Ret. Walls	%Ret.Wa	II Docks	Docks/km	Dock Groyne	Swim Float	Boat House_Fl	loatBoat House_L	and Boat Cover	Groyne	s Groynes/km	Boat Launch - Concrete	Boat Launch	- GravelMarine Rai	Marinas	Fences	Stairs	Mooring Buoys	Boat Rack/Lift	Boat Basir	Shed P	umphouse	eGeothermal	Pond_Pool	Pilings	ile Support Strue	ct Tram
0	0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	1	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	0%	No	0%	0%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
5 - 25 Trees	>25 Trees	0	0	0	0	0	1		Crows, pileated woodpecker cavities; eagle nest

d Use Comment

Littoral Area:

Littoral Zone	Littoral Width	Littoral LWD (#)	Littoral Comment
Narrow (< 10 m)	1	52	



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
2947	Cliff / Bluff	None	Steep (20-60%)	Park	None	No	0%	100%

Shore Type:

5						
Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
99%	0%	0%	0%	1%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land
0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	40%	58%	Low (0 - 25%)	Angular

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	5%	10%	0%	0%	0%	0%	0%	40%	45%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Mature Forest	Sparse (< 10%)	Abundant (> 50%)	Continuous	50	20%	

Aquatic Vegetation:					Large Woody Debris (LW	/D):			Littoral Area:			
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone	Littoral Width	Littoral LWD (#)	Littoral Comment
8%	8%	0%	0%		None	0	0		Narrow (< 10 m)	1	0	

Shoreline Modifications:

0 0% 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Ret. Walls	%Ret.Wal	II Docks	Docks/km	Dock Groyne	Swim Floa	tBoat House_Floa	Boat House_Land	Boat Cover	Groynes	Groynes/km	Boat Launch - Concre	teBoat Launch - Gra	velMari	ne RailMarin	as Fence	es Stairs	Mooring Buoys	Boat Rack/Lif	ftBoat Basir	Shed P	umphouse	Geothermal	Pond_Pool	Pilings	Pile Support Struc	Tram
	0	0%	0	0	0	0	0	0	0	0	0	0	0		0 0	0	0	0	0	0	0	0	0	0	1	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	0%	No	0%	0%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
< 5 Trees	>25 Trees	0	0	0	0	0	0		

d Use Comment



General:

deneral.																									
Segment L	ength ((m)	Shore Ty	pe Sh	ore Type M	odificatio	n Sl	оре	Land Use	Lev	el of Impact	Livestoc	k Access D	isturbed	Natural										
44	6	I	Rocky Sh	ore	Nor	е	Mediun	n (5-20%)	Single Fam	ily Med	ium (10-50%	6) N	0	30%	70%										
Shore Type									_																
Cliff/Bluff	Rock	ky (Gravel	Sand	Stream	Mouth	Wetland	Other																	
5%	90%	6	5%	0%	09	6	0%	0%																	
Land Use:																					_				
Agriculture	Comn	nercial	Conserv	vation F	orestry In	dustrial Ir	nstitutional	Multi-Fami	ily Natural	Area Pai	rk Rural Si	ngle Family	Transpor	tation Ur	rban Park	Utility Corrido	or L	and Use	Comment		1				
0%	0)%	0%	6	0%	0%	0%	0%	0%	0%	6 <mark>0</mark> %	100%	0%		0%	0%					l				
Foreshore S	ubstra	tes:																							
Marl N	1ud Or	rganic	Fines S	and Gr	avel Grave	l Fine Gr	avel Coarse	Cobble Co	bble Fine	Cobble Co	oarse Bould	ler Bedrock	k Embe	ddedness	Shap	e									
0%	0%	0%	0%	5% 2	0% 0	%	0%	20%	0%	0%	50%	5%	Low	0 - 25%)	Angu	lar									
Littoral Sub	strates	s:																							
Marl M	/lud O	rganic	Fines	Sand G	ravel Grav	el Fine G	ravel Coars	e Cobble C	obble Fine	Cobble (Coarse Boul	der Bedroo	ck Embe	ddednes	s Sha	pe									
0%	0%	0%	0%	5%	20%	0%	0%	20%	0%	0%	50	% 5%	Low	(0 - 25%)	Smo	oth									
Vegetation	Band 1	:																							
Class	5		Stage	Sł	nrub Cover	Tr	ee Cover	Distributi	on Bandwi	dth (m)	Overhangin	g Vegetatio	n V	eg Band C	omment										
Conifer	ous	Mat	ure Fore	st Spa	arse (< 10%) Abun	dant (> 50%) Continuo	us 5	0	20)%		-											
Aquatic Ve	vetatio	on:				·			arge Wood	v Debris	(IWD):		•				ittoral Area:								
Aquatic Ve	getatio	on Sub	mergent	Emerg	ent Floatir	ng Aq Vea	2 Comment	ו ר	LWD	Range	Littoral	LWD (#)	WD Cluste	ers LWD) Commer	nt 🗌	Littoral Zo	one I	Littoral Wi	idth Litte	oral LWI	D (#)	Littoral	Comme	nt
0%	0		0%	0%	0%	0	2	1 F	No	ne)	0				Narrow (<:	10 m)	3		0				
Shoreline Modifi	cations:			1		I					I	I													
Ret. Walls %Re	t.Wall D	ocks Doo	ks/km Dock	k Groyne St	wim FloatBoat	House_Floa	Boat House_L	and Boat Cover	Groynes Groyn	es/kmBoat	Launch - Concre	teBoat Launch	ı - GravelMari	ne RailMari	nas Fences	Stairs Mooring Buo	ysBoat Rack/Lif	ftBoat Basiı	Shed Pumph	houseGeot	hermal Po	nd_Pool F	'ilings Pile	Support S	Struct Tram
4	10%	6 1	13.5	0	0	0	0	0	10 22	4	0	0		0 0	0	0 0	0	0	1 0)	0	0	0	0	0
Lineal Mod	ificatio	ons:		-							1.5														
% Rail		% F	Road	Su	ibstrate Mo	od %	Substrate N	vlod % Eros	ion Protect	Mo	odification (omment	_												
0%		0	1%		Yes		20%		20%																
Flora and Fa	una:															1									
Veteran Tre	es	Snags	Beave	er Lodge	Wildlife D	en Wildl	ife Trail Mi	neral Lick S	hellfish Sti	ck Nest	Flora Comm	ents	Fauna (Comment	S										
No		No		0	0		0	0	0	0															



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
3179	Cliff / Bluff	None	Steep (20-60%)	Park	None	No	0%	100%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
100%	0%	0%	0%	0%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land
0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	40%	58%	Low (0 - 25%)	Angular

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	5%	10%	0%	0%	0%	0%	0%	40%	45%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Mature Forest	Sparse (< 10%)	Abundant (> 50%)	Continuous	50	20%	

Aquatic Vegetation:

Aquatic Vegetation:					Large Woody Debris (LW	/D):			 Littoral Area:
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment	LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	Littoral Zone
0%	0%	0%	0%		< 5 Pieces	5	0		Narrow (< 10 m

Shoreline Modifications:

					about nouse_cane	bout cover	Groynes	Groynes/kii	poar raunch - concrete	boat Launch - Grave	warine kai	warinas	rences	Stairs	Mooring Buoys	воат каск/Lift	Boat Basin	Sheapt	umpnouse	Geothermai	Pond_PoolPIII	ngsprife	2 Support Struct Tran
0 0% 0)	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0		0 0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	0%	No	0%	0%	

Flora and Fauna:

Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
< 5 Trees	> 25 Trees	0	0	0	0	0	0		Western Grebe

Use Comment

	Littoral Width	Littoral LWD (#)	Littoral Comment
)	1	2	



General:

Segment Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural
712	Stream Mouth	Roadway	Medium (5-20%)	Rural	Medium (10-50%)	No	45%	55%

Shore Type:

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0%	40%	0%	0%	60%	0%	0%

Land Use:

Agriculture	Commercial	Conservation	Forestry	Industrial	Institutional	Multi-Family	Natural Area	Park	Rural	Single Family	Transportation	Urban Park	Utility Corridor	Land
0%	0%	0%	0%	0%	0%	0%	0%	0%	60%	0%	40%	0%	0%	

Foreshore Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	5%	0%	5%	5%	0%	0%	0%	55%	30%	Low (0 - 25%)	Angular

Littoral Substrates:

Marl	Mud	Organic	Fines	Sand	Gravel	Gravel Fine	Gravel Coarse	Cobble	Cobble Fine	Cobble Coarse	Boulder	Bedrock	Embeddedness	Shape
0%	0%	0%	0%	0%	5%	0%	0%	55%	0%	0%	40%	0%	Low (0 - 25%)	Smooth

Vegetation Band 1:

Class	Stage	Shrub Cover	Tree Cover	Distribution	Bandwidth (m)	Overhanging Vegetation	Veg Band Comment
Coniferous	Mature Forest	Sparse (< 10%)	Medium (10 - 50%)	Patchy	50	0%	

Aquatic Vegetation:					_	Large Woody Debris (LW	 Litto			
Aquatic Vegetation	Submergent	Emergent	Floating	Aq Veg Comment		LWD Range	Littoral LWD (#)	LWD Clusters	LWD Comment	L
65%	65%	0%	0%			< 5 Pieces	5	0		Med

Shoreline Modifications:

Ret. Walls %Ret.	t.Wall [Docks [Docks/km	Dock Groyne	Swim Float	Boat House_Float	Boat House_Land	Boat Cover	Groynes	Groynes/km	Boat Launch - Concret	e Boat Launch	- Gravel Marine	RailMarin	as Fences S	Stairs	Mooring Buoys	Boat Rack/Lift	Boat Basin	Shed	Pumphouse	Geothermal	Pond_Pool	Pilings	Pile Support Struct	Tram
1 19	1%	3	4.2	0	0	0	3	0	4	5.6	0	0	1	0	0	0	9	0	0	0	0	0	0	4	0	0

Lineal Modifications:

% Rail	% Road	Substrate Mod	% Substrate Mod	% Erosion Protect	Modification Comment
0%	20%	Yes	1%	5%	Mine shaft

Flora and Fauna:

[Veteran Trees	Snags	Beaver Lodge	Wildlife Den	Wildlife Trail	Mineral Lick	Shellfish	Stick Nest	Flora Comments	Fauna Comments
	No	5 - 25 Trees	0	0	0	0	0	0	0	Crows, common mergansers

Littoral Area:

Littoral Zone	Littoral Width	Littoral LWD (#)	Littoral Comment
Medium (10 - 50 m)	21	0	

Use Comment



Appendix C – 2021 Fish Sampling




Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited Suite 601E, 601 Front St. Nelson, BC Canada T: 250-354-1600

Memo

Re:	Slocan Lake Nearshore Fish Sampling – September 2021
Ref:	VE52823.2021C
Date:	11 February 2022
From:	Crystal Lawrence, Aquatic Biologist, Wood Environment & Infrastructure Solutions
То:	Georgia Peck, Program Coordinator, Living Lakes Canada Bruce Mac Donald, Program Director, Living Lakes Canada

Wood Environment & Infrastructure Solutions was retained by Living Lakes Canada to complete a Foreshore Integrated Management Planning (FIMP) project on Slocan Lake (Schleppe et al. 2021). During FIMP background literature reviews, data gaps related to the presence of at-risk fish species in nearshore habitats of Slocan Lake were identified. Three small-bodied shallow water fish species, Shorthead Sculpin (*Cottus confusus*), Columbia Sculpin (*Cottus hubbsi*) and Umatilla Dace (*Rhinichthys umatilla*), listed as Special Concern under the federal Species-at-Risk-Act (SARA) have been documented in the Slocan River, the outlet of Slocan Lake, however, these species have not been identified in Slocan Lake or its tributaries (Figure 1).

Nearshore habitats used by Shorthead Sculpin and Columbia Sculpin typically have medium to large cobble substrates, whereas Umatilla Dace habitat also includes silt, gravel and small cobbles as well as areas of flooded terrestrial and aquatic vegetation as dictated by season (AMEC 2014). Substrates used by juvenile sculpins are similar to adults, whereas young-of-year are found in cobble, gravel substrates with flooded vegetation (AMEC 2014). Younger life stages of Umatilla Dace may be present in higher abundances in foreshore areas during late summer and fall over gravel and cobble substrates (AMEC 2014 and references cited therein). Low gradient foreshore areas along Slocan Lake have habitat appropriate for these species.

To determine if SARA-listed fish species are present in nearshore and/or tributary habitats of Slocan Lake, fish sampling was conducted between 23 and 25 September 2021. A scientific fish collection permit (CB21-634564) was obtained from FrontCounterBC prior to sampling; a permit under SARA was not required.

Methods

Fish capture methods included minnow trapping and backpack electrofishing. Minnow traps baited with roe were set overnight at depths between 0.2 and 3 m in select areas within Slocan Lake and its tributaries (Table 1). Backpack electrofishing was conducted during the day in wadeable, nearshore areas of Slocan Lake (Table 1). Backpack electrofishing is not allowed in tributaries containing Bull Trout (*Salvelinus confluentus*) after September 15 in the Kootenay Region. Therefore, only the mouth of tributaries below the high-water mark of Slocan Lake were sampled using backpack electrofishing. Confluence areas were inspected for spawning fish (i.e., Bull Trout and Kokanee (*Oncorhynchus nerka*)) and redds prior to using backpack electrofishing.



Captured fish were placed in large buckets with fresh water and allowed to recover fully after capture. All fish were identified to the species level and measured for total length to the nearest millimeter. Fish were held in freshwater until fully recovered from handling then released near the location of capture.

Results

Fish sampling was conducted at 14 sites in Slocan Lake and its tributaries (Table 1; Figure 1). This consisted of 8 sites sampled by backpack electrofishing, 2 sites sampled by minnow trapping and 4 sites sampled by both methods. Details of site locations, effort, sampling methods and fish captured are provided in Tables A1 and A2 in the Appendix.

Shorthead Sculpin (n=3) were captured at two of the 14 sites that were both located at the south end of the lake. Shorthead Sculpin were captured in Slocan Lake near the outlet to the Slocan River (n=2; Photos A1 and A2) as well as at the confluence of Springer Creek and Slocan Lake (n=1). Columbia Sculpin and Umatilla Dace were not observed at this time.

Other fish species captured included Burbot (*Lota lota*; Photo A3), Longnose Dace (*Rhinichthys cataractae*), Northern Pikeminnow (*Ptychocheilus oregonensis*), Prickly Sculpin (*Cottus asper*), Rainbow Trout (*Oncorhynchus mykiss*), Redside Shiner (*Richardsonius balteatus*) and Torrent Sculpin (*Cottus rhotheus*; see Attachments for information).

Table 1:Slocan Lake nearshore and tributary fish species observations, 23 to 25 September2021.

		Number of Fish Observed											
FIMP Segment Number	Site Name	Burbot	Longnose Dace	Northern Pikeminnow	Prickly Sculpin	Rainbow Trout	Redside Shiner	Shorthead Sculpin	Torrent Sculpin				
1	Slocan Lake Outlet		1		1			2	4				
2	Springer Creek					1		1	1				
2	Slocan Lake at Springer Creek												
9	Slocan Lake East Shore South of Silverton												
12	New Denver Campground Beach	1	3		2		1						
17	Wilson Creek				3				1				
17	Slocan Lake at Wilson Creek				1								
20	Bonanza Creek												
20	Slocan Lake at Hills			4	1		1						
26	Wee Sandy Creek								2				
26	Slocan Lake at Wee Sandy Creek		3		2		1						
26	Slocan Lake at Sharp Creek		1		8				1				
26	Slocan Lake at Nemo Creek		1		9								
26	Nemo Creek		1		2								

Notes: Blank cells indicate no fish were captured.

Closing

This memo was prepared exclusively for Living Lakes Canada (LLC) by Wood Environment & Infrastructure Solutions, a division of Wood Canada Inc. The quality of information, conclusions and estimates contained herein are consistent with the level of effort involved in Wood services and based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions and qualifications set forth in this report. This report is intended to be used only by LLC, subject to the terms and conditions of its contract with Wood. Any use of, or reliance on, this report by any third party is at that party's sole risk.

Please contact the undersigned to discuss further or if you have any questions.

Sincerely,

Wood Environment & Infrastructure Solutions a Division of Wood Canada Limited

Prepared by:

Reviewed by:

Crystal Lawrence Aquatic Biologist Louise Porto Associate Fisheries Biologist

References

AMEC. 2014. Lower Columbia River Sculpin and Dace Life History Assessment (CLBMON-43). Year 5 Technical Report. Report Prepared for: BC Hydro, Burnaby, BC. Prepared by: AMEC Environment & Infrastructure Ltd. 117 pp + 8 App.

Schleppe, J., S. McPherson, L. Porto, and B. Mason. 2021. Foreshore Integrated Management Plan Methods. Prepared for Living Lakes Canada. Prepared by: Ecoscape Environmental Consultants Ltd., Lotic Environmental Ltd., Wood Environment and Infrastructure Solutions, and BC Community Mapping Network. 52 pp. + 4 app.



Appendix A – Figure, Photos and Tables



 Fish Sampling Site Populated Place Highway 	0 1 2 Kilometers Scale: 1:110,000	LivingLakes	PROJECT:	locan	Lake	e FIMP	
Watercourse Waterbody Parks & Protected Areas	References: DataBC Data Distribution Service Open Government License (http://www.data.gov.bc.ca/) Geografis/Geobase Open Government License - Canada (http://data.gc.ca/eng/about/datagcoca	Slocan Lake Fish Sampling Locations 2021	DATE: February 11, 2022 GIS FILE: 02-01-022_slocan_lake_ J08 No: VE52823 COORDINATE SYSTEM: NAD 1983 UTM Zone	ANALYST: BB fish_samplii	QA/QC: CL ng_locatior	Figure 1	wood.

52823



Photo A1: Facing north at the Slocan Lake outlet (Segment 1) sample site where Shorthead Sculpin (n=2) were observed, 25-Sep-21.



Photo A2: Shorthead Sculpin captured at the Slocan Lake outlet (Segment 1) sample site, 25-Sep-21.



Photo A3: Juvenile Burbot (135 mm total length) captured by backpack electrofishing near the New Denver campground (Segment 12), 24 September 2021.

Table A1: Slocan Lake Backpack Electrofishing (EF) Sampling Effort, 2021

Site	Method	Field Site ID	Segment Number	Date	Start time	End time	UTM Easting	UTM Northing	Water Temperature (°C)	Conductivity (μs)	EF seconds	Site length (m)	Site width (m)	EF Voltage	Substrate Type, Depth (m) and Velocity (m/s)	Fish Captures (length in brackets)
Slocan Lake Outlet	EF	12	1	25-Sep-21	11:00	11:20	465861	5512945	18.8	100	558	60	3	550	Small cobble/large gravel	Shorthead Sculpin (n=2; 27, 30 mm) Torrent Sculpin (n=4; 31, 34, 35, 106 mm) Longnose Dace (n=1; 33 mm) Prickly Sculpin (n=1; 30 mm)
Springer Creek	EF	13	2	25-Sep-21	11:45	12:00	466218	5513270	9.2	98	156	30	2	550	Cobble, <0.3 m, 0.4 m/s	Shorthead Sculpin (n=1, 33 mm) Rainbow Trout (n=1; 90 mm) Torrent Sculpin (n=1; 70 mm)
Slocan Lake at Springer Creek	EF	14	2	25-Sep-21	11:45	12:00	466218	5513270	18.8	100	196	20	4	550	Gravel	No Fish Caught
Slocan Lake East Shore South of Silverton	EF	11	9	24-Sep-21	14:30	14:45	473097	5531074	15.7	90	200	30	2	550	Angular cobble and bedrock shelf	No Fish Caught
New Denver Campground Beach	EF	7	12	24-Sep-21	9:35	10:00	473025	5536929	15.2	91	661	30	3	550	Cobble/boulder	Burbot (n=1; 135 mm) Redside Shiner (n=1; 51 mm) Longnose Dace (n=3; 35, 55, 60 mm) Prickly Sculpin (n=2; 25, 44 mm)
Wilson Creek	EF	5	17	24-Sep-21	10:40	10:25	470193	5542056	9.9	111	275	20	2	550	Cobble, <0.3 m, >0.5 m/s	Torrent Sculpin (n=1; 70 mm) Prickly Sculpin (n=3; 42, 55, 55 mm)
Slocan Lake at Wilson Creek	EF	6	17	24-Sep-21	10:40	10:25	470193	5542056	16	111	197	10	3	550	Small cobble, 0 m/s	Prickly Sculpin (n=1; 42 mm)
Wee Sandy Creek	EF	1	26	24-Sep-21	11:30	11:50	470118	5539303	-	-	37	5	3	550	Cobble, <0.3 m, 0.8 m/s	Torrent Sculpin (n=2; 34 and 75 mm)
Slocan Lake at Wee Sandy Creek	EF	2	26	24-Sep-21	11:30	11:50	470118	5539303	15.6	96	162	20	3	550	Boulder, <1.2 m, 0 m/s	Longnose Dace (n=3; 30, 36, 66 mm) Prickly Sculpin (n=2; 68, 68 mm)
Slocan Lake at Sharp Creek	EF	8	26	24-Sep-21	12:30	12:43	471005	5536911	16	90	221	30	5	550	Gravel/Cobble	Torrent Sculpin (n=1; 70 mm) Prickly Sculpin (n=8; 24, 38, 52, 58, 62, 68, 80, 85) Longnose Dace (n=1; 44 mm)
Slocan Lake at Nemo Creek	EF	9	26	24-Sep-21	13:30	13:45	470718	5530261	16	90	180	30	5	550	Cobble	Prickly Sculpin (n=9; 32, 34, 36, 60, 63, 65, 65, 70, 79) Longnose Dace (n=1; 35 mm)
Nemo Creek	EF	10	26	24-Sep-21	13:30	13:45	470718	5530261	-	-	180	15	5	550	Boulder/Cobble	Prickly Sculpin (n=2; 35, 90) Torrent Sculpin (n=1, 34 mm)

Page 9

Site	Method	Field Site ID	Segment Number	Set Date	Set time	Pull Date	Pull Time	Water Temperature (°C)	Conductivity (μs)	Set Depth (m)	UTM Easting	UTM Northing	Fish Captures (length in brackets)
Wilson Creek	MT	5	17	23-Sep-21	15:00	24-Sep-21	10:25	9.9	111	0.4	470193	5542056	-
Wilson Creek	MT	5	17	23-Sep-21	15:00	24-Sep-21	10:25	9.9	111	0.4	470193	5542056	-
Slocan Lake at Wilson Creek	MT	6	17	23-Sep-21	15:00	24-Sep-21	10:25	16	111	2	470193	5542056	-
Bonanza Creek	MT	3	20	23-Sep-21	13:35	24-Sep-21	8:40	-	-	0.5	466551	5548647	-
Bonanza Creek	MT	3	20	23-Sep-21	13:35	24-Sep-21	8:40	-	-	0.5	466551	5548647	-
Slocan Lake at Hills	MT	4	20	23-Sep-21	13:35	24-Sep-21	8:10	16	-	2	466551	5548647	Northern Pikeminnow (n=4)*
Slocan Lake at Hills	MT	4	20	23-Sep-21	13:35	24-Sep-21	8:10	16	-	3	466551	5548647	Redside Shiner (n=1)* Prickly Sculpin (n=1)*
Wee Sandy Creek	MT	1	26	23-Sep-21	9:50	24-Sep-21	11:20	-	-	0.5	470118	5539303	-
Slocan Lake at Wee Sandy Creek	MT	2	26	23-Sep-21	9:50	24-Sep-21	11:20	15.6	96	0.2	470118	5539303	-
Slocan Lake at Wee Sandy Creek	MT	2	26	23-Sep-21	9:50	24-Sep-21	11:20	15.6	96	0.3	470118	5539303	Redside Shiner (n=1; 45 mm)

Table A2: Slocan Lake Minnow Trapping (MT) Sampling Effort, 2021

Notes: * Fish length not recorded





Appendix D – Syilx Natural Resources TEK Memo



Syilx Natural Resources takł yckst (Slocan Lake)

Slocan Lake FIM Summary Report



Prepared for: Living Lakes Canada (LLC)

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Acknowledgement

The responsibility to the management of Natural Resources within unceded syilx territory have always remained with the syilx people's Protocols, Customs and Culture. Living Lakes Canada (LLC) and Syilx Natural Resource (SNR) have made a positive effort to respect syilx values regarding information gathered for future planning of the Slocan Lake system. Utilizing a process that aligns values based on the refinement of previously collected information and streamlining communication structures to reflect a reciprocal relationship to the land. Syilx Natural Resources paired generational syilx knowledge with western science to provide an assessment that is holistic in nature to achieve mutual objectives that acknowledges the siwlkw, temxwulaxw and the timixw as being that which gives us life.

Background

Previously conducted Foreshore Inventory Mapping (FIM) projects have been undertaken starting in 2007 by staff of the Department of Fisheries and Oceans (DFO) as an overview to the Slocan Lake foreshore. A more detailed FIM was concluded in 2008 and 2009 in collaboration with Galena Environmental Ltd.

Project Area

Over the span of three field days a modified FIM that included syilx values and perspectives were conducted. Slocan Lake is a large body of water that is approximately 6,928.87 (ha) in size and is not impacted by water-controlled dams such as the Arrow and Kootenay Lake systems. The average depth of the lake is 171 (m) and at its maximum depth 298 (m). There are excellent examples where the entire elevation span from lakeshore to alpine headwaters are intact. The western portion of the lake is sheltered by the Valhalla Provincial Park. Premiere Bull Trout spawning Habitat in Silverton Creek along with diverse valley bottom wetlands and riparian habitat complexes such as the east end of Summit lake south along Bonanza Creek to Bonanza Marsh is approximately 2,000 ha of rich riparian-wetland habitat with high specie density.

Town sites within area include:

New Denver founded in 1892 and Incorporated 1929

Previously known as Slocan City, New Denver is located at the mouth of Carpenter Creek on the east shore of Slocan Lake. A resident population od approximately 473.

Slocan Village Incorporated in 1901 then 1958

The former steamboat landing and ferry terminal is located at the mouth of Springer Creek, at the southern end of Slocan Lake. Having a resident population of approximately 272.

Silverton was first surveyed in 1894 incorporated 1930

Silverton was a former steamboat landing at the mouth of Silverton Creek on the east shore of Slocan Lake. A resident population of approximately 195.

Rosebery purchased by an English syndicate in 1897

Formerly named Wilson creek, Rosebery is located at the northern end of Slocan Lake at the mouth of Wilson creek and was one of the smaller West Kootenay interment camps housing Japanese Canadians. This was also a former steamboat and ferry terminal.

Slocan Lake FIM Maps









Valhalla Provincial Park





Value Considerations

- Monitoring population trends of various species such as Grizzly bear, ungulates, migratory birds, bats, fish, reptiles, and other mammals.
- Conserving Habitat such as fish spawning areas, wetlands, and old growth forests.
- Preserving the continuity for wildlife migration and travel corridors.
- Protecting native biodiversity by preventing introductions of invasive species and containing and mitigating already established ones.
- Preparing for climate changes by ongoing data collection for predictions of potential future scenarios by managing for risks associated with development.

Areas of concern:

Inventory of all resident and migratory wildlife and aquatic species important to the syilx. Grizzly Bear, wolverine, mountain goat, moose, caribou population size and distribution. Fish species present; Kokanee, Rainbow Trout (stocked), Dolly Varden, Northern Pike Minnow, Bull Trout, Mountain Whitefish. Fish Species Suspected; Cutthroat Trout, Burbot, White Sturgeon. Additionally, the ongoing efforts to restore Sockeye salmon to the upper systems of the Columbia is a high priority for the syilx.



The entire lake system contains many benches, lake access points, tributaries and vantage points that all serve as medium to high archeological potential areas. Evidenced by pictographs, known archeological sites and landmarks in syilx creation stories (captikwl).



The most northern section of the project area is surrounded by steep terrain areas with lots of benches and excellent landing sites making ideal camp sites for food gathering and land based cultural practices. Archeological site integrity is high (orange polygons).



The mid-section of the project area includes the small town site of New Denver, with many creeks that run into the Slocan Lake. Multiple medium to high potential areas are found here (orange polygons).



The most Southern section of the project area contains multiple pictograph and archeological sites. Numerous medium to high potential archeological area needing a further inspection identified by the orange polygons.

Prevent & Control Invasive species

Small infestations of highly invasive species such as giant hogweed, policeman's helmet, yellow flag iris and knot weed require a quick control response.

Boat traffic transporting invasive species such as Eurasian milfoil, and zebra and quagga mussels within the region must be strictly regulated. Implement a frequent monitoring program within the system to ensure movement of invasive species are identified and contained quickly.

Protect existing Habitat

Impacts to the abundance and distribution of bull trout due to the loss of spawning habitat and warming water temperatures are being witnessed at an alarming rate. Causes include invasive species, unregulated boat launches, pollution from waste and general garbage.

There was noted barriers and log jams impacting Kokanee populations and spawning habitats.

All animals and insects play a vital role in the health of any ecosystem. It would be beneficial to locate where bats are hibernating and the conditions they are in as the westward advancement of white-nose syndrome is being discovered. This is important because they play a crucial role in many water insects and reptile life cycles which in turn directly benefit the waters and the health of all things that live in and around the water. Wetland surveys throughout the Slocan Valley must be undertaken to assess their health and identify priority areas for conservation and restoration.

Sedimentation and erosion caused by logging roads and other access roads located near waterways impacts fish spawning and water quality. Recommendation is to set up monitoring and measuring stations near logging cut blocks, road building activities and be considered under any development in or near creeks, rivers and lakes surrounding the Slocan Lake system.

Enhance Connectivity & Corridors

SNR recommends amphibian surveys to assess the impact of highway mortality on western toads to inform mitigation measures such as reducing recreational pressure. There are many species at risk in these highly desired development areas. SNR recommends a population survey to discern the abundance and distribution of wildlife and locate travel routes and identify migration patterns. The Slocan Lake foreshore plays a vital role in the health of the larger ecosystem controlling resident and migratory species.

Advance Climate Resilience through Mitigation & Adaptation

Climate change implications for fire frequency and intensities, hydrologic changes and major ecosystem shifting are a direct by-product causing drier forest types. Numerous developments along the lake and mountain sides have impacted the health and function of the ecosystems in this area including but not limited to:

- Gravel pit activities above Bannock point may have impacted Archaeological sites
- Highway and road construction altering waterflows effecting water qualities.
- Home and cabin lots along Slocan Lake foreshore limiting wildlife uninterrupted access for wildlife.
- Population densities on the North and south end of the lake can impact inflow and outflow requirements.
- Third party transfers and Provincial Park management without proper engagement are restricting the ability for syilx to participate in cultural revitalization initiatives and the inclusion of syilx values regarding consent-based decision making.

Conclusion

Slocan Lake and surrounding area have extensive syilx values that are considered high in Food, Social, Ceremonial (FSC) and many Archaeological impacts that have not been included within the previously developed areas. Future planning stages of proposed developments must include proper assessments carried out by a sanctioned syilx representative to determine syilx values are being protected.

Collaborative culturally appropriate processes need to be conducted to determine the impacts to culturally sensitive materials and sites and so that implementing syilx knowledge can be supported with western science.

A continued effort is needed by industry, government and all proponents operating within unceded syilx territory to further develop long lasting and meaningful relationships & partnerships.

The following list captures recommendations and considerations for a higher quality of land use planning, current FIM review and long-term planning for the Slocan Lake area.

1. More comprehensive forest inventory to capture shifts in flora and forest structure over time. The existing Vegetation Resource Inventory(VRI) contains mainly tree species and heights for timber purposes that is not robust enough to account for information based decision making for long term planning (does not capture cumulative impacts, shifting ground cover, etc).

2. Access to current real imagery as orthophotos or higher resolution air photos are usually weeks, months or years old.

3. Bird surveys and bird count data that covers the area.

4. Wildlife movement data to provide more information on connectivity and wildlife corridors in the landscape. This information is invaluable in making long term land impacting decisions.

5. Consistent logging of water temperature and water levels in the major drainages of the Slocan Lake watershed. This will inform all decision making processes in the area (water licenses, fishing licenses, boating licenses and regulations)

6. Map of all existing Old Growth >180 years plus trees >60cm DBH.

7. Mapping of past and projected fire regimes to help inform syilx land management through fire enhancements (in collaboration with BCWF).

8. Education of the general public regarding the Columbia River Treaty and the syilx peoples.

9. Ecotourism: the Slocan Valley is an obvious magnet for increased pressure on Slocan Lake, along the Rail Trail, and in the high country. This must be holistically regulated in accordance with syllx informed values, guidelines and including local community interests.

Appendix



Water is life. Water is our relation. Water bonds us to our ancestry, our descendants and our land. July 31 2014 ONA AGA Spaxomin, BC

SIWIK" - WATER

siw#k^w is a part of us and a part of all life.

*siw*⁴*k*^w must be treated with reverence and respect. Our relationship with *siw*⁴*k*^w is not taken lightly; we are responsible to ensure that our relation can continue to maintain the health and resiliency of our *tmx*^w*ulax*^w and *timix*^w.

siw#k^w is the lifeblood of our tmx^wulax^w and our timix^w and we as Syilx People recognize siw#k^w as a sacred entity and relative that connects all life.

siw#k^w comes in many forms and all are needed for the health of tmx^wulax^w and for the timix^w.

siwtk^w is our most sacred medicine: *siwtk*^w nourishes, replenishes, cleanses, and heals. Any use of *siwtk*^w should be an act of reverence and a commitment to our responsibilities to all life: now and to come, as Syilx People.

siwfk^w comes from the sky and the highest places yet it never willfully rises above anything. It will always take the lowest path in its humility, yet of all the elements, it is the most powerful.

Our sacred *siw4k*^w water teaches us that we have great strength to transform even the tallest mountain while being gentle, soft, and flexible.

siw#*k*^w will always find a way around obstructions: under, over and through. It teaches us that anything is possible.

*siw*4k^w movements, pathways, resiliency and power teach us who we are and who we can be as people.



Sts-oomsts yeeh S-Ooknahkchinx OKANAGAN NATION DECLARATION

Yeeh koo S-Ooknahkehinx kgoolhentem yarpnah shehelheharli kihikidekminiet kgel yayari yeeh sentsoo-weeptet. Oothi yalah yarpnah koo isoot.

We, the Okanagan Nation make this declaration today as a sign for every generation to come. Therefore, we hereby declare that:

Mneemihitet yeeh koo xahtmaskchilwk, koo temskchiwhowh yatlah te temwhoolaluwh, yeeh toomhtemhtet.

We are the unconquered aboriginal peoples of this land, our mother;

Telh kgoolhentsooten swhitzetzxtet weeh toomhtemhtet, konpeceelshmenhtemh, kotzetdenhtimh ooth! kokgethikchiwhenhtomh

The creator has given us our mother, to enjoy, to manage and to protect;

Telhs meeas gehesapihs, yeeh koo xahtmaskehilwh koos queleewix eel toomhtemhtet.

We, the first inhabitants, have lived with our mother from time immemorial;

Yeeh koo S-Ooknahkehinx yeeh izohehenisooteniet koo xeehxeehstim koo kgel yayari phehwiksimentem an hehasian yeeh telh toomhiemhtet.

Our Okanagan Governments have allowed us to share equally in the resources of our mother;

Loot penhkinh ide xeehxeehxeexmentem yeeh stethliethliet yeeh kgel loomhtemhtet, yeeh ielh toomhtemh an hehastaniet, yeeh ixtdeeplahtentet ooihl yeeh noonenwheenahtentet.

We have never given up our rights to our mother, our mother's resources, our governments and our religion;

Loot penhkinh koo tdeks ntzespoolawhahx. Peentk kstxtdiplahntemh yech telh toomhtemh an hehasiantet koo kgel yayart, <u>telh yarpnah</u> oothl tdeswhoois.

We will survice and continue to govern our mother and her resources for the good of all for all time.

CHEES AND COUNCIL/195 OCONCOL INFORME AND A CONTROL OF A CONTROL O



Appendix E – Foreshore Habitat Sensitivity Index (FHSI) Maps





Segment Number 20 Shore Type: Gravel Land Use: Natural Area Level of Impact: Low (< 10%) FHSI Ecological Rank:Very High

> Segment Number 22 Shore Type: Rocky Shore Land Use: Natural Area Level of Impact: None FHSI Ecological Rank:High

Segment Number 19 Shore Type: Rocky Shore Land Use: Natural Area Level of Impact: Low (< 10%) FHSI Ecological Rank:High



CLIENT:

LivingLakes

PROJECT:

Slocan Lake FIMP

TITLE:

Slocan Lake Foreshore Habitat Sensitivity Index (FHSI) Mapping

LEGEND: I Segment Break Modifications O Boat Launch - Concrete Boat Launch - Gravel O Dock 🕒 Marina Mooring Buoy FHSI Ecological Rank Very High – High - Moderate Low and Very Low Zones of Sensitivity Submergent Fisheries - Tributary Mouth Zones of Sensitivity Buffer Base Data +++ Railway — Highway Road - Watercourse 🚧 Wetland Parcel Boundary

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Segment Number 22 Shore Type: Rocky Shore Land Use: Natural Area Level of Impact: None FHSI Ecological Rank:High

Segment Number 23 Shore Type: Gravel Land Use: Natural Area Level of Impact: Low (< 10%) FHSI Ecological Rank:High

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Segment Number 19 Shore Type: Rocky Shore Land Use: Natural Area Level of Impact: Low (< 10%) FHSI Ecological Rank:High



CLIENT:

LivingLakes

PROJECT:

Slocan Lake FIMP

TITLE:

Slocan Lake Foreshore Habitat Sensitivity Index (FHSI) Mapping

LEGEND:

I Segment Break Modifications O Boat Launch - Concrete O Boat Launch - Gravel O Dock 🕒 Marina Mooring Buoy FHSI Ecological Rank ---- Very High - High - Moderate Low and Very Low Zones of Sensitivity Submergent Fisheries - Tributary Mouth Zones of Sensitivity Buffer Base Data +++ Railway — Highway Road - Watercourse 🚧 Wetland

Parcel Boundary





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Segment Number 23 Shore Type: Gravel Land Use: Natural Area Level of Impact: Low (< 10%) FHSI Ecological Rank:High

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Segment Number 24 Shore Type: Rocky Shore Land Use: Natural Area Level of Impact: None FHSI Ecological Rank:High

Segment Number 19 Shore Type: Rocky Shore Land Use: Natural Area Level of Impact: Low (< 10%) FHSI Ecological Rank:High



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Slocan Lake FIMP

TITLE:

Slocan Lake Foreshore Habitat Sensitivity Index (FHSI) Mapping

LEGEND:

I Segment Break Modifications O Boat Launch - Concrete Boat Launch - Gravel O Dock 🕒 Marina Mooring Buoy FHSI Ecological Rank Very High – High - Moderate Low and Very Low Zones of Sensitivity Submergent Fisheries - Tributary Mouth Zones of Sensitivity Buffer Base Data +++ Railway — Highway Road - Watercourse

🚧 Wetland Parcel Boundary

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0 50 100

Meters Scale:1:6,000

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Segment Number 25 Shore Type: Cliff / Bluff Land Use: Park Level of Impact: None FHSI Ecological Rank:Moderate

Wee Sandy Creek

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Segment Number 26.1 Shore Type: Rocky Shore Land Use: Park Level of Impact: Low (< 10%) FHSI Ecological Rank:High





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Slocan Lake FIMP

TITLE:

Slocan Lake Foreshore Habitat Sensitivity Index (FHSI) Mapping

LEGEND:

I Segment Break Modifications O Boat Launch - Concrete Boat Launch - Gravel O Dock 🕒 Marina Mooring Buoy FHSI Ecological Rank Very High – High - Moderate Low and Very Low Zones of Sensitivity Submergent Eisheries - Tributary Mouth Zones of Sensitivity Buffer Base Data +++ Railway — Highway Road - Watercourse

Wetland Parcel Boundary

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Slocan Lake Foreshore Habitat Sensitivity Index (FHSI) Mapping

LEGEND: I Segment Break Modifications O Boat Launch - Concrete Boat Launch - Gravel O Dock 🕒 Marina Mooring Buoy FHSI Ecological Rank Very High - High - Moderate Low and Very Low Zones of Sensitivity Submergent Fisheries - Tributary Mouth Zones of Sensitivity Buffer Base Data +++ Railway Highway Road - Watercourse 🚧 Wetland Parcel Boundary KFY MA 0 50 100 Meters Scale:1:6,000 REFERENCE: DataBC Data Distribution Service Open Government License (http://www.data.gov.bc.ca/) Geogratis/Geobase Open Government License - Canada (http://data.gc.ca/eng/about-datagcca) NOTE: CAUTION: DO NOT USE THIS MAP FOR NAVIGATIONAL PURPOSES This map may not reflect current conditions. Uncharted hazards may exist wood. Wood PLC Suite 601E, 601 Front St. Nelson, BC V1L 4B6 8 of 14 VE52823 NAD 1983 UTM Zone 11N February, 2022 CL BB

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TITLE:

Slocan Lake Foreshore Habitat Sensitivity Index (FHSI) Mapping

LEGEND:

I Segment Break Modifications Boat Launch - Concrete Boat Launch - Gravel Dock Marina Mooring Buoy FHSI Ecological Rank Very High High High Moderate Low and Very Low Zones of Sensitivity Submergent Fisheries - Tributary Mouth Submergent Fisheries - Tributary Mouth Cones of Sensitivity Buffer Base Data +++ Railway Highway Road Watercourse Wetland Parcel Boundary

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Segment Number 8 Shore Type: Cliff / Bluff Land Use: Natural Area Level of Impact: Low (< 10%) FHSI Ecological Rank:Moderate

Segment Number 7 Shore Type: Rocky Shore Land Use: Rural Level of Impact: Medium (10-50%) FHSI Ecological Rank:Moderate



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TITLE:

Slocan Lake Foreshore Habitat Sensitivity Index (FHSI) Mapping

LEGEND:

- I Segment Break Modifications Boat Launch - ConcreteBoat Launch - Gravel O Dock 🕒 Marina Mooring Buoy FHSI Ecological Rank - High - Moderate Low and Very Low Zones of Sensitivity Submergent Fisheries - Tributary Mouth Zones of Sensitivity Buffer Base Data +++ Railway Highway Road Watercourse 🚧 Wetland
- Parcel Boundary

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Segment Number 27.1 Shore Type: Cliff / Bluff Land Use: Park Level of Impact: None FHSI Ecological Rank:Moderate

bing

Evans Creel

Segment Number 6 Shore Type: Cliff / Bluff Land Use: Natural Area Level of Impact: Low (< 10%) FHSI Ecological Rank:Moderate



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PROJECT:

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TITLE:

Slocan Lake Foreshore Habitat Sensitivity Index (FHSI) Mapping

LEGEND: I Segment Break

Modifications O Boat Launch - Concrete Boat Launch - Gravel O Dock 🕒 Marina Mooring Buoy FHSI Ecological Rank - Very High – High - Moderate Low and Very Low Zones of Sensitivity Submergent Fisheries - Tributary Mouth Zones of Sensitivity Buffer Base Data +++ Railway — Highway Road

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TITLE:

Slocan Lake Foreshore Habitat Sensitivity Index (FHSI) Mapping

LEGEND: I Segment Break Modifications O Boat Launch - Concrete Boat Launch - Gravel O Dock \varTheta Marina Mooring Buoy FHSI Ecological Rank — Very High - High - Moderate — Low and Very Low Zones of Sensitivity Submergent Fisheries - Tributary Mouth Zones of Sensitivity Buffer Base Data +++ Railway — Highway - Road Watercourse 🚧 Wetland Parcel Boundary 0 50 100 Meters XX Scale:1:6,000 REFERENCE: DataBC Data Distribution Service Open Government License (http://www.data.gov.bc.ca/) Geogratis/Geobase Open Government License - Canada (http://data.gc.ca/eng/about-datagcca) NOTE: CAUTION: DO NOT USE THIS MAP FOR NAVIGATIONAL PURPOSES This map may not reflect current conditions. Uncharted hazards may exist wood. Wood PLC Suite 601E, 601 Front St. Nelson, BC V1L 4B6 13 of 14 VE52823 NAD 1983 UTM Zone 11N February, 2022

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Segment Number 5 Shore Type: Rocky Shore Land Use: Natural Area Level of Impact: Low (< 10%) FHSI Ecological Rank:Moderate

> Segment Number 4 Shore Type: Cliff / Bluff Land Use: Natural Area Level of Impact: Low (< 10%) FHSI Ecological Rank:Low

> > Segment Number 3 Shore Type: Cliff / Bluff Land Use: Natural Area Level of Impact: Medium (10-50%) FHSI Ecological Rank:Low

Segment Number 28 Shore Type: Stream Mouth Land Use: Rural Level of Impact: Medium (10-50%) FHSI Ecological Rank:High

Segment Number 2 Shore Type: Gravel Land Use: Industrial Level of Impact: High (> 50%) FHSI Ecological Rank:High Segment Number 1 Shore Type: Stream Mouth Land Use: Park

Level of Impact: High (> 50%) FHSI Ecological Rank:High



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Slocan Lake Foreshore Habitat Sensitivity Index (FHSI) Mapping

LEGEND:

I Segment Break Modifications O Boat Launch - Concrete Boat Launch - Gravel O Dock 🕒 Marina Mooring Buoy FHSI Ecological Rank Very High – High - Moderate Low and Very Low Zones of Sensitivity Submergent Fisheries - Tributary Mouth Zones of Sensitivity Buffer Base Data +++ Railway Highway Road - Watercourse 🚧 Wetland

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Appendix F – Foreshore Habitat Sensitivity Index (FHSI) Calculations



Appendix T	able F1. Slo	ocan Lake FHS	SI values by c	riteria.														
				FIM						Fisheries		Ecosystem	Rare		Ν	Modificatio	ns	
Segment Number	Shore Type	Foreshore Substrate	Percent Natural	Aquatic Vegetation	Overhanging Vegetation	Large Woody Debris	Riparian Band 1	Riparian Band 2	Juvenile Rearing	Migration	Staging	Corridor	SARA Species	Ret Walls	Docks	Groynes	Boat Launches	Marinas
1	21.182	8.12	0.82	4.76	0.2856	2.46	2.04	0.81	6	3	3	5	5	-0.5	-2.5	0	-1.5	0
2	19.0876	11.252	0	0	0	4.1	4.08	1.62	6	3	3	5	5	-1.5	0	0	0	0
3	11.9	4.64	4.92	0	0	3.28	5.44	2.16	1.5	0	0	0	0	-0.4	0	0	0	0
4	11.9	3.77	7.462	0	0	0	5.44	2.16	1.5	0	0	0	0	0	0	0	0	0
5	19.04	8.004	8.118	0	0	3.28	5.44	2.16	1.5	0	0	0	0	0	0	0	0	0
6	12.019	3.77	8.118	0	0	1.64	5.44	2.16	1.5	3	0	2.5	0	0	-1.25	0	0	0
7	19.04	9.164	4.92	0.68	0.0408	2.46	5.44	2.16	3	0	0	2.5	0	0	-2.5	-0.75	0	0
8	12.019	6.38	8.118	0	0	3.28	5.44	2.16	1.5	0	3	2.5	0	-0.002	-1.25	0	0	0
9	19.0876	11.194	8.118	0.68	0.0408	2.46	5.44	2.16	3	0	0	0	0	0	0	0	0	0
10	19.754	11.368	0	0.68	0.0408	1.64	5.44	2.16	6	3	3	2.5	0	-0.2	-1.875	-1	-1	0
11	19.0876	10.266	7.38	0.68	0.0408	1.64	5.44	2.16	3	3	0	0	0	-0.04	-1.25	-0.75	0	0
12	19.516	10.904	2.46	0	0	1.64	5.44	2.16	6	3	3	2.5	0	-0.2	-1.875	-1	-1	-2.5
13	18.3736	10.324	8.118	0	0	1.64	5.44	2.16	3	3	0	0	0	0	-1.25	-0.5	0	0
14	19.04	10.9736	4.92	0	0	0	5.44	2.16	1.5	0	0	2.5	0	0	0	0	0	0
15	19.04	9.28	0	0	0	0	4.08	1.62	1.5	0	0	2.5	0	-2	0	0	0	0
16	19.04	11.368	1.64	1.36	0.0816	0	5.44	2.16	3	0	3	2.5	0	-1.2	-2.5	-1	-2	0
17	23.324	10.788	8.118	0	0	0	5.44	2.16	6	3	3	2.5	5	0	-1.875	0	0	0
18	19.04	11.136	2.46	0	0	0	5.44	2.16	3	0	3	2.5	0	-0.4	0	0	0	0
19	19.0876	9.4656	7.462	1.36	0.0816	1.64	5.44	2.16	1.5	0	0	0	0	-0.02	0	0	0	0
20	21.42	11.5768	7.79	6.8	0.408	0	5.44	2.16	6	3	3	5	5	0	0	0	0	0
21	11.9	5.8	0	6.8	0.408	0	4.08	1.62	3	0	3	5	5	-0.04	-2.5	0	-2	0
22	18.802	8.4796	8.2	1.36	0.0816	2.46	5.44	2.16	3	3	3	0	0	0	0	-0.5	0	0
23	19.0876	10.092	8.118	1.36	0.0816	1.64	5.44	2.16	6	3	3	2.5	0	0	-1.25	-0.5	-1	0
24	19.0876	7.772	8.2	0	0	3.28	5.44	2.16	3	3	0	2.5	0	0	0	0	0	0
25	11.9	4.872	8.2	0	0	4.1	5.44	2.16	1.5	0	0	2.5	0	0	0	0	0	0
26.1	16.9456	6.5656	8.118	0.34	0.0204	1.64	5.44	2.16	3	3	3	2.5	0	0	0	0	0	0
26.2	17.612	10.15	1.64	0	0	0	5.44	2.16	1.5	0	0	0	0	-0.4	-2.5	-1	0	0
26.3	16.9456	6.5656	8.2	0	0	1.64	5.44	2.16	1.5	3	0	0	0	0	0	0	0	0
26.4	18.921	10.44	5.74	0.34	0.0204	2.46	5.44	2.16	3	3	3	2.5	0	0	-1.875	-0.75	0	0
26.5	16.9456	6.5656	8.118	0.68	0.0408	3.28	5.44	2.16	1.5	3	0	2.5	0	0	0	0	0	0
27.1	12.019	5.8464	8.2	0.544	0.03264	0	5.44	2.16	1.5	3	3	2.5	0	0	0	0	0	0
27.2	18.683	9.744	4.92	0	0	0	5.44	2.16	1.5	0	0	0	0	-0.2	-2.5	-1	0	0
27.3	11.9	5.8464	8.2	0	0	1.64	5.44	2.16	1.5	0	0	0	0	0	0	0	0	0
28	21.896	7.598	4.51	4.42	0.2652	2.46	5.44	2.16	6	3	3	2.5	0	-0.02	-1.875	-1	0	0

Segment				Rare			
Number	FIM	Fish	Ecosystem	Occurances	Modifications	FHSI Value	FHSI Rank
1	40.5	12	5	5	-4.5	58	High
2	40.1	12	5	5	-1.5	61	High
3	32.3	1.5	0	0	-0.4	33	Low
4	30.7	1.5	0	0	0	32	Low
5	46.0	1.5	0	0	0	48	Moderate
6	33.1	4.5	2.5	0	-1.25	39	Moderate
7	43.9	3	2.5	0	-3.25	46	Moderate
8	37.4	4.5	2.5	0	-1.252	43	Moderate
9	49.2	3	0	0	0	52	High
10	41.1	12	2.5	0	-4.075	52	High
11	46.7	6	0	0	-2.04	51	High
12	42.1	12	2.5	0	-6.575	50	High
13	46.1	6	0	0	-1.75	50	High
14	42.5	1.5	2.5	0	0	47	Moderate
15	34.0	1.5	2.5	0	-2	36	Moderate
16	41.1	6	2.5	0	-6.7	43	Moderate
17	49.8	12	2.5	5	-1.875	67	Very High
18	40.2	6	2.5	0	-0.4	48	High
19	46.7	1.5	0	0	-0.02	48	High
20	55.6	12	5	5	0	78	Very High
21	30.6	6	5	5	-4.54	42	Moderate
22	47.0	9	0	0	-0.5	55	High
23	48.0	12	2.5	0	-2.75	60	High
24	45.9	6	2.5	0	0	54	High
25	36.7	1.5	2.5	0	0	41	Moderate
26.1	41.2	9	2.5	0	0	53	High
26.2	37.0	1.5	0	0	-3.9	35	Low
26.3	41.0	4.5	0	0	0	45	Moderate
26.4	45.5	9	2.5	0	-2.625	54	High
26.5	43.2	4.5	2.5	0	0	50	High
27.1	34.2	7.5	2.5	0	0	44	Moderate
27.2	40.9	1.5	0	0	-3.7	39	Moderate
27.3	35.2	1.5	0	0	0	37	Moderate
28	48.7	12	2.5	0	-2.895	60	High

Appendix Table F2. Slocan Lake FHSI values by category and rank.

Appendix Table F3. Slocan Lake FHSI Ecological Rank Categories.

FHSI	FHSI
Ecological	Value
Rank	Range
Very Low	≤22
Low	23-35
Moderate	36-48
High	49-61
Very High	≥62



Appendix G – Foreshore Development Guidelines (FDG)



Foreshore Development Guide

Slocan Lake

Prepared For: Living Lakes Canada

Suggested Citation

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- Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD) Branches include:
 - Water Stewardship
 - Habitat
 - Lands
- Okanagan Nation Alliance
- Ktunaxa Nation Council
- Regional District of East Kootenay
- Regional District of Central Kootenay
- Wood Environment & Infrastructure
- Foreshore Inventory and Mapping Technical Committee

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1. Introduction

In recent years, environmental impacts to lake shorelines (e.g., degraded habitat, recreational use conflicts, and water quality impacts) have prompted government agencies to initiate projects focused on increasing our understanding of lake shorelines to support evidencebased lake management strategies. For example, Living Lakes Canada has partnered with local, provincial and federal regulators to provide guidance on how to balance shoreline development with protection of important habitats. The guidelines presented in this document are founded on the concept that sustainable management is the shared responsibility of all stakeholders, including proponents, professionals and all levels of government.

This Foreshore Development Guide (FDG) provides development planning guidelines, aimed at protecting sensitive fish and wildlife species and their habitats identified through the previous FIM and FHSI analyses. The FDG is an initial tool used when planning for, prescribing, or reviewing riparian and shoreline alterations. Based on the environmental (species and habitat) values, the FDG identifies the levels of risk associated with shoreline alteration from various types of development activities. The risks identify the anticipated regulatory steps required to proceed with the project. The guidelines provide important information to support both the landowner in preparing foreshore work applications, and the government agencies during their review of the applications.

The FDG recommends areas to be conserved, where development may present very high or significant risk to high value species and their habitats that require shoreline areas to carry out their life-cycle. These sensitive habitats may be protected by various means, including local government inclusion in local planning processes such as Official Community Plans (OCP) and bylaws. Additionally, the FDG describes how restoration opportunities should be sought to improve habitat previously disturbed, and to potentially aid in obtaining regulatory support for new proposed projects.

The FDG methods were first developed for Windermere Lake by the East Kootenay Integrated Lake Management Partnership (EKILMP et al. 2009). These original methods used the BC Ministry of Environment (BC MoE) document - High Value Habitat Maps and Associated Protocol for Works along the Foreshore of Large Lakes within the Okanagan (BC MoE 2008), and input from the various EKILMP members including: Fisheries and Oceans Canada (DFO), BC MoE, Regional District of East Kootenay (RDEK) and Wildsight. Additional lake projects followed and expanded on the initial EKILMP FDG. Notable lake projects included: Moyie Lake (Schleppe 2009), Tie Lake (McPherson et al. 2012) and Kootenay Lake (Kootenay Lake Partnership 2019). With each iteration of these documents, the general process for developing a FDG were refined.

2. Important Contact Information

Proponents may use the contact information provided below when planning their proposed activities. Even with the use of this document, it is recommended that anyone who is planning work on Crown Land (such as the shoreline), first contact FrontCounterBC or retain the services of a Qualified Environmental Professional (QEP) who will contact FrontCounterBC on their behalf. Depending on the situation, FrontCounterBC will provide guidance on whether the proposed works are allowed or not allowed under the respective legislation. Similarly, works on private lands must also consider local government's requirements (e.g., permitting or notifications).

FrontCounterBC - FrontCounterBC should be contacted for any works planned on Crown Land, including work along the lake shoreline. Phone: 1-877-855-3222 Email: FrontCounterBC@gov.bc.ca

- Regional District Regional District of Central Kootenay should be contacted for any works planned on private land within the region's jurisdiction. Phone: 250-352-6665 (Nelson) Email: <u>info@rdck.bc.ca</u>
- **Local Municipality –** The following should be contacted for any works planned on private land within the village's jurisdiction.

Village of Slocan Phone: 250-355-2277 Email: info@villageofslocan.ca

Village of Silverton Phone: 250-358-2472 Email: <u>administration@silverton.ca</u>

Village of New Denver Phone: 250-358-2316 Email: office@newdenver.ca

First Nations – The following should be contacted for any works that require First Nation engagement.

Syilx Okanagan Nation Alliance Phone: 250-707-0095 Website: https://www.syilx.org/

Sinixt Nation Email: sinisxt@centurytel.net Website: https://sinixtnation.org/

Ktunaxa Nation Council Phone: 250-489-2464 Email: news@ktunaxa.org

Lake Partnership Group – Slocan Lake Stewardship Society Website: <u>https://slocanlakess.com/</u>

2.1. First Nations Traditional Ecological Knowledge (TEK)

The Slocan Lake FIMP program was developed to include the direct involvement of the Okanagan Nation Alliance (ONA) and Syilx Natural Resources during all aspects of the FIM field survey as well as in the review of FHSI criteria and the FIMP documents. Sylix Natural

Resources and ONA compiled background and generational Syilx knowledge with observations during the September 2021 field survey to produce a report that includes value considerations, areas of concern, and recommendations for the long-term protection of important habitats and cultural values. Mapping products included in the report include polygons of medium to high and high potential archaeological areas as well as point locations of important cultural sites observed during the survey including pictographs and culturally modified trees. This report is included within an appendix of the Slocan Lake FIMP. ONA also conducted a desktop cultural review of the Slocan Lake watershed and information obtained during the review is provided in the body of the Slocan Lake FIMP report.

3. FDG Process Overview

The FDG provides a step-wise process to help direct applicants through the initial planning stages for their proposed shoreline development, project or activity (Figure 1).

Step 1: Identify the fish and wildlife habitat values where the project is situated using the FDG map. The FDG map was prepared using the FHSI outputs, and depicts: a) values by segment, with different colours representing high to low values; and b) where Zones of Sensitivity (ZOS) may be present. ZOS are areas with exceptionally high value, which should if at all possible, be conserved according to local, provincial or federal plans or through private land agreements.

Step 2: Review the general recommendations for the applicable colour zone and ZOS to understand associated habitat sensitivity of the area, and risk anthropogenic disturbances pose.

Step 3: Use the Activity Risk Matrix (ARM) to identify the level of risk of the proposed project on the habitat. The risk is indicative of the acceptability of a project to regulators.

Step 4: Determine the necessary regulatory approvals/permits/authorizations (collectively 'approvals') that must be obtained. This final step is project dependent and depends on many factors and is subject to change based on government policy. Hence, only an overview is provided here, along with logistical considerations.

For areas of greater risk, a very high level of detail is needed in order to submit an application that can be considered for regulatory review. In these cases, it should not be expected that because information is submitted that approvals are forthcoming.





3.1. Interpret the FDG Map

The key results of the FIM and FHSI are presented in tables and maps in Wood (2022). When planning foreshore development, the FDG map is the primary reference tool because it synthesizes the pertinent fish and wildlife information into an easy to understand map (Appendix A). In the FDG map, the FHSI ecological rankings for each segment are depicted as one of five colours zones, ranging from very high to very low value (Table 1).

Value type	Rank/Sensitivity	Map Colour
	Very High	Red
Ecological Bank	High	Orange
Ecological Ralik	Moderate	Yellow
	Low & Very Low	Grey
	Fisheries	Blue

Table 1.	FHSI ecological	rank and ZOS colou	Ir scheme applied to the tot the the tot the termination of terminati	ne FDG map.

Zones of	Wildlife	Brown
Sensitivity	Herptiles	Mauve
	Waterfowl	Teal
	Ecosystem/Habitat Feature	Green
	Rare occurrences	Purple
	Vegetation	Olive

The FDG map also depicts each ZOS in a specific colour scheme. Each ZOS is presented as either a polygon, line, or point, and should include an outer buffer. This buffer accounts for unknowns of the ZOS full extent, and protects the core ZOS from potential impacts from adjacent activities (Figure 2). Details on each ZOS, including how each was defined, and how the buffers were determined are presented in Section 5.2.



Figure 2. Zone of Sensitivity with an appropriate buffer.

4. Step 1. Locate Project Relative to Shoreline Colour Zones and Zones of Sensitivity

Use the FDG map to identify the values present along or within their proposed development area. Together, the FHSI colour zone and the ZOS mapped features provide a science-based tool to guide development planning. The fish and wildlife value/risk and subsequent regulatory review process are highest in red zones and areas with ZOS. Since these areas have the highest natural value and are at greatest risk to shoreline alteration, they require the highest level of on-going protection. The values/risk in the grey zones are lowest. Since there is already likely significant impact from development in grey zones, future development is less likely to cause negative impacts. The specific recommendations for each colour zone and ZOS are provided in the next section.

5. Step 2 – Review Colour Zone, ZOS and Conservation Recommendations

For this step, review the recommendations for the respective colour zone and ZOS that aligns with the proposed development. The summary tables below provide detail on the values present, and identify how to potentially minimize impacts. Also, refer to the conservation recommendations to see how your project may align with an area that has been identified as a candidate for protection. Proposed development should adhere to these recommendations to reduce impacts on sensitive fish and wildlife values. Opportunities for restoration or redevelopment should be explored in any zone where work is proposed.

5.1. Shoreline Colour Zone Recommendations

Red Shoreline

Defined by: Very High FHSI ecological rank.

FHSI Red zones account for 3.1% of the total shoreline length of Slocan Lake. **summary:**

- Sensitivity Summary: Red shoreline areas have been identified as essential for the long term maintenance of fish and/or wildlife values through the FHSI Analysis. These areas are essential for fish and/or wildlife populations. These shoreline areas are stream confluences in natural condition with no/very little shoreline disturbance observed. These shoreline areas also provide important juvenile rearing, migration and staging habitat for fish, wildlife connectivity corridors and habitat for SARA-listed terrestrial species. Shoreline disturbance is increasing at a rate of approximately 0.01% of the Slocan Lake shoreline per year and it is important to identify and protect sensitive areas from development pressure.
- **Recommen**dations: Due to their high value (sensitive communities present), Red shoreline areas are recommended to have limited development to promote conservation use (Section 5.3). Low impact water access recreation and traditional First Nation uses are examples of acceptable activities in these areas, while permanent structures or alteration of habitats are not. Invasive aquatic plant removal is often acceptable, provided there is an approved aquatic plant removal program, including trained personnel, and appropriate permitting in place. Habitat restoration may be appropriate in these areas, where applicable.

Orange Shoreline

Defined by: High FHSI ecological rank.

FHSIOrange zones account for 62% of the total shoreline length of Slocansummary:Lake.

Sensitivity Summary: Orange shoreline segments have been identified as high value habitat areas for fish and/or wildlife. These areas are comprised of relatively natural undisturbed habitats that provide important fish and wildlife migration corridors and often have intact riparian areas and other high value shoreline habitat features. These areas are sensitive to development, continue to provide important habitat functions, but may be at risk from adjacent development pressures. Shoreline disturbance is

Orange Shoreline

increasing at a rate of approximately 0.01% of the Slocan Lake shoreline per year and it is important to identify and protect sensitive areas from development pressure.

Recommendations: Proponents should consider moving high risk activities to other areas if possible, or pursuing activities that have lower associated risks. The lake environment can benefit from having orange shoreline areas set aside to contribute to the overall lake conservation area. The conservation options identified in Section 5.3 would likely apply through most of the orange areas, benefitting the lake. Restoration opportunities potentially exist in these areas.

	Yellow Shoreline
Defined by:	Moderate FHSI ecological rank.
Lake summarv:	Yellow zones account for 34.3% of the total shoreline length of Slocan Lake.
,	
Sensitivity summary:	These areas have experienced a moderate amount of development disturbance and pressure or have shoreline characteristics that provide limited habitat for fish and wildlife. Foreshore modifications associated with residential development including docks, groynes, retaining walls, boat launches and mooring buoys are observed in some segments with Moderate FHSI ecological rank. Others have steep cliff/bluff shorelines with very narrow littoral zones. Although some of these areas have been impacted to some degree, they still are largely intact and their habitat values remain important. Shoreline disturbance is increasing at a rate of approximately 0.01% of the Slocan Lake shoreline per year and it is important to identify and protect sensitive areas from development pressure.
Recommen- dations:	Development along Yellow shoreline areas would likely result in less of an impact, than along Red or Orange areas. However, activities should incorporate protection of habitat features that remain, be well above the high water mark, and and/or be situated outside of the riparian area. Restoration may be an option in some areas that have experienced past developments. Development may proceed for low risk activities provided a Best Management Practice (BMP) or Regional Operating Statement (ROS) is available and followed (Appendix B). High risk activities without a BMP or ROS will require an environmental assessment from a QEP. Local Official Community Plans (e.g., RDCK Electoral Area 'H' – Slocan

Yellow Shoreline

Lake North OCP) also provide direction and bylaws for development adjacent to the foreshore.

	Grey Shoreline
Defined by:	Low and Very Low FHSI Ecological Rank.
Lake summary:	Grey zones account for 2.0% of the total shoreline length of Slocan Lake.
Sensitivity summary:	Grey shorelines have a lower ecological ranking. Shorelines have been heavily disturbed by residential development and historic transportation uses. However, they still may contain valuable habitats requiring some protection, such as aquatic or riparian vegetation. Their importance as corridors to neighboring high value areas should also be considered during development. Shoreline disturbance is increasing at a rate of approximately 0.01% of the Slocan Lake shoreline per year and it is important to identify and protect sensitive areas from development pressure.
Recommen- dations:	Human development has been concentrated in these areas and has resulted in disturbances to the natural fish and wildlife habitat. Important habitats do exist in degraded and developed areas, and at least minimal standards are required to protect fish and wildlife habitat in the grey zone areas. In keeping with the objective of concentrating development in areas that are already disturbed or of low value, new developments may be considered in these areas. Re-development will also be considered. Proposals should incorporate fish and wildlife habitat restoration or improvement features, where feasible and practicable. For example, a retaining wall redevelopment may be moved back from the HWM and/or incorporate re-vegetation or other fish and wildlife features in the design. Obtain advice from a QEP for habitat restoration techniques.

5.2. Zones of Sensitivity Recommendations

A total of two types of ZOS were identified through the FHSI analysis. The ZOS with their corresponding buffers are identified on the FDG map. For this step, use the map and identify if the proposed development aligns with any of the mapped ZOS (use outer edge of buffer). Then refer to the corresponding ZOS summary table(s) below for general information on the values present and recommendations to reduce impacts.

Fisheries – I ributary wouth

- Lake Tributary mouth ZOS are located at the confluence of Slocan Lake and inflow and outflow tributaries. Tributary mouth areas were mapped as polygons that capture the confluence of the two waterbodies and include both shallow areas used for migration and deeper areas used for staging. This was done by outlining a 50 m radius semicircle polygon at the confluence of each tributary identified in the BC Freshwater Atlas and Slocan Lake. A 20 m buffer was applied to the ZOS around its perimeter. Note that other tributary mouth locations, though not identified as ZOS at this time, may still provide important fish habitat and tributary mouths identified as ZOS can be updated if additional information becomes available.
- **Sensitivity summary:** Tributary mouths provide important habitat for fish rearing, migration and staging. Tributaries to Slocan Lake provide spawning, egg incubation and juvenile rearing habitat for salmonids and can also provide a cool water refuge during summer when there are periods of higher water temperatures. Tributaries may also provide habitat for SARA-listed species like Shorthead Sculpin which were documented at the Springer Creek outlet and Slocan River inlet. In addition to fisheries values, water quality parameters such as temperature, dissolved oxygen, turbidity and nutrients of tributary inflows play an important role in the overall water quality of lake ecosystems.
- **Recommendations:** These sensitive habitats are to be protected, with no permanent developments recommended both within and adjacent to the mapped polygon areas. A buffer of 20 m is recommended.

Vegetation – Aquatic Vegetation

Lake Submergent aquatic vegetation on Slocan Lake was mapped during the summary: 2021 re-FIM and was observed along 9% of the foreshore. Note that wetlands were not included as a ZOS at this time because wetlands were not observed within the high-water mark of Slocan Lake. This also highlights the important role aquatic vegetation plays in the lake in the absence of wetlands. Snk'mip Marsh, a wetland in the riparian area at the north end of the lake, is protected by a conservation covenant.

Sensitivity Aquatic vegetation contributes to the overall health of an ecosystem by providing an important source of nutrients, oxygenation and habitat for aquatic, terrestrial and avian species. Aquatic vegetation is an important component of wetlands, which provide habitat, flood control, water filtration and food resources.

Vegetation – Aquatic Vegetation

Recommendations: These sensitive habitats are to be protected, with no permanent developments recommended both within and adjacent to the mapped polygon areas. A buffer of 20 m is recommended.

5.3. Shoreline Conservation Recommendations

It is recommended that the following very high and high ecological value locations identified during the Slocan Lake FIMP be considered for designation as conservation zones:

- Bonanza Creek confluence.
- Shannon Creek confluence.
- Wragge Creek confluence.
- Wilson Creek confluence.
- Carpenter Creek confluence.
- Silverton Creek confluence.
- Springer Creek confluence.
- Slocan River outlet. And,
- Shoreline adjacent to Wragge Beach Forest Recreation area.

Protection of these areas could include: a) establishment of protected areas (potentially through any level of government); b) Section 16 Land Act Reserves; c) regional or municipal official community plans (OCPs) which designate these areas as development permit areas of limited development potential (e.g., not within an urban growth boundary as an example); or, d) through private land conservation agreements, such as tenure covenants or direct land sales to land conservancy organizations such as the Land Conservancy of Canada. Current OCPs such as the Village of Slocan OCP, Village of New Denver OCP and the Regional District of Central Kootenay Electoral Area 'H' – Slocan Lake North OCP can be updated to include the results of the 2021 Slocan Lake FIMP and FDG to identify shoreline areas with Very High (Red) and High (Orange) ecological ranks as well as ZOS as sensitive habitats, for example, by designating them as Development Permit Areas with 30 m setback measured from the high-water mark.

6. Step 3. Refer to the Activity Risk Matrix (ARM) to Determine Project Risk.

This step involves using the ARM to determine what the predicted level of risk is for your specific proposed activity, given the shoreline colour zone and ZOS present. It is a well understood concept that the potential for negative environmental impacts are deemed greatest in areas where values and risk are highest (Figure 3; DFO 2006). In the ARM, each colour zone and activity combination has been rated as having a risk of either: Very High (VH), High (H), Moderate (M), or Low (L) (Appendix B). These risk ratings reflect the potential impacts on fish and wildlife, with a Very High risk posing the greatest potential concern, and the Low Risk a lower level of concern. The ARM also identifies that if a ZOS is present, the risk also increases.



Figure 3. How the potential for negative effects relates to sensitivity and risk (DFO 2006).

6.1. Using the ARM

Clarifications for using the ARM are listed below:

- 1. If your activity is not listed, assume High Risk and contact FrontCounterBC for advice.
- 2. Where several activities with differing risk rating are proposed for a single Project, the cumulative risk may increase. Consequently, it is recommended to seek the advice of a QEP to determine if the higher of the two risk ratings effectively captures the cumulative risk, or if the highest risk rating should be used [e.g., Very High]).
- 3. The ARM distinguishes between several activities above and below the present natural boundary (NB). The NB is the legal term BC Crown Land Branch uses to define the Crown Land property boundary along the shoreline. High Water Hark (HWM) is a similar standard term used by DFO when considering impacts to fish values. The NB and HWM are often located in the same location, but this can vary. Only a registered BC Legal Land Surveyor may determine the NB.
- 4. In some instances, the project may not seem to have a high degree of risk. However, the ARM also accounts for other accompanying impacts likely to occur once the modification is in place. For instance, once a dock is in place, other likely associated impacts are: prop wash, maintenance, and boat traffic.

6.2. General Mitigation Hierarchy

The general principles of shoreline development are to design in such a way that there is "No Net Loss" in the quantity or quality of existing habitat. These principles are supported by the

federal and provincial policy^{1,2}). In general, these principles are achieved through application of the following mitigation options: (1) avoidance of environmental impacts and associated components; (2) minimization of unavoidable impacts on environmental values and associated components; (3) restore on site environmental values and associated components, and, (4) offset impacts to environmental values of components for residual impacts that cannot be minimized.

6.3. Very High and High Risk Activities

Most in-stream works in Red and Orange shoreline zone areas are considered Very High and High Risk activities. All activities in a ZOS are considered Very High Risk. Development in these areas has the potential to cause long-term or irreparable disturbance to the highly sensitive/unique values present. The Very High Risk activities in particular, are known to have significant challenges related to providing adequate mitigation to address the loss of fish and/or wildlife habitat values. For example, the dredging activity is considered Very High Risk in all colour zones, since it results in a major disturbance to the substrate, aquatic vegetation that may be present, and has the potential for direct impacts on aquatic life, and processes (wave climate and sediment transport). There may also be indirect impacts, such as on water quality, if for example the dredge is to support a marina.

If your activity is identified as being Very High or High Risk, determine if you can modify the activity or location to reduce the risk. This may involve moving the project to a colour zone with less sensitive habitat, or selecting a lower risk activity (Figure 4). If reducing the risk is not possible by re-designing or re-locating the project, there is a high likelihood that a detailed environmental assessment would be required to support the project application. In these areas, the high risks may trigger a request for a Harmful Alteration, Disruption or Destruction of Fish Habitat (HADD) authorization under the federal Fisheries Act. If residual effects cannot be mitigated, compensation may be required. Acceptable mitigation and compensation measures would likely be very costly to implement. It is highly advised that a QEP be retained to assist with the project planning in all high and very high risk areas. A QEP should be knowledgeable about both the permitting and application process for proposed activities and will be able to provide guidance on potential environmental risks and impacts. A QEP would likely conduct an environmental assessment within the project area, confirm risks, and make recommendations to reduce impacts to aid in the regulatory permitting process. Applications for these types of developments may not be supported by regulators and may not be approved, even if extensive and detailed information is provided as part of a permitting process.

As an example, the type of information that might be required to support an application for a proposed project located in a sensitive area could include, a detailed erosion control plan that might require a BC Legal Land Surveyor to determine the location of NB and property boundaries, a QEP to provide recommendations to mitigate construction works as part of an environmental assessment, or an engineer may be needed to provide a detailed design for submission of permits under regulatory processes.

Figure 4. Typical Environmental Regulatory Review Decision-Making Process

¹ DFO Projects Near Water website: <u>https://dfo-mpo.gc.ca/pnw-ppe/index-eng.html</u>

² BC Environmental Mitigation Policy website: <u>https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/laws-policies-</u> <u>standards-guidance/environmental-guidance-and-policy/environmental-mitigation-policy.</u>



¹ Very High or High Risk activities have the potential to raise significant concerns. These activities have great challenges related to providing adequate mitigation or compensation to address the loss of fish and/or wildlife habitat values, and could be costly to implement (may require compensation). ² Environmental Assessment

³BMP – Best Management Practice; ROS – Regional Operating Statement

6.4. Moderate and Low Risk Activities

With appropriate design and planning, Moderate and Low Risk activities could be incorporated along the foreshore with fewer impacts on fish and wildlife habitat values. Where available, these activities should follow applicable Best Management Practices (BMP), Standards and Codes of Practice (collectively BMP; see next section). Where BMPs are not available, or a deviation from the BMP is proposed, a QEP should be retained to complete the application. The application will be reviewed by the applicable agencies.

7. Step 4 – Determine Regulatory Requirements and Submit Applications

The final step when planning a foreshore development project is to determine the regulatory requirements necessary for the project to proceed and to submit those applications. Regulatory applications are to be made to the federal, provincial, or local governments for necessary permits, authorizations, notifications, and reviews etc. Essentially any shoreline development will require the preparation of at least one regulatory application. The regulatory application's acceptance will be required for the project to proceed legitimately. Commencing work without approval may be considered unlawful and result in infractions such as trespass. Work that has not been approved may also be subject to enforcement actions by the respective agencies, and may require additional effort to mitigate any undesired

environmental impacts that occurred. Alternatively, the project proponent could be required to remove all infrastructure and restore the area.

Typical regulatory requirements for each activity listed in the ARM are provided in Appendix C. As well, Provincial BMPs have been listed in Appendix D³. Although summarized here, the requirements at the time of planning the project will need to be confirmed, as regulatory changes might occur. Also, the DFO website should be reviewed for applicable Standards and Codes of Practice that may help guide planning and development ⁴. Contact FrontCounterBC to determine which provincial permits, approvals or authorizations you need, or retain a QEP for guidance.

This document does not provide a full summary of all potential requirements for a particular project. Proponents must ensure that they have adequately considered, consulted, and determined the necessary approvals required for a project to proceed prior to undertaking any works.

7.1. Other Considerations to Facilitate Project Approvals

This FDG addresses both existing and proposed works. Sometimes there are concerns with the installation of past structures, which may include, if the structures:

- Resulted in extensive impacts along the shoreline;
- Were installed without appropriate permits or approvals in place; and/or,
- Were not compliant with standard BMPs.

If any of the above concerns are present on the property where work is planned, then follow these steps, so that new applications, or applications for maintenance or expansion on existing projects, can be reviewed more effectively:

- 1. Determine if the existing works are on private land or Crown Land.
- 2. Determine if they are located in an Application Only Area/Reserve area established under the *Land Act*.
- 3. Determine if the works were authorized by the appropriate authority. If yes, skip to step 5.
- 4. Seek approval from the appropriate authority. Approval may or may not be granted depending on the situation. Previous projects installed without appropriate permits or approvals may be required to be removed as part of an application process.
- 5. Plan and update existing works to current Best Management Practices.
- 6. Include other mitigation practices, such as landscape restoration (planting native riparian vegetation), substrate improvement (removing or mitigating existing groynes), and other habitat improvements.

³ A current list of provincial BMP's are available at: <u>https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/laws-policies-standards-guidance/best-management-practices</u>

⁴ DFO Project Near Water website: <u>https://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html</u>

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Appendix A. Foreshore Guidance Document Map



CLIENT: LivingLakes PROJECT: Slocan Lake FIMP TITLE: Slocan Lake Foreshore Development Guidelines (FDG) Mapping LEGEND: I Segment Break FHSI Ecological Rank - Very High — High - Moderate Low and Very Low Zones of Sensitivity Vegetation – Aquatic Vegetation Fisheries – Tributary Mouth Zones of Sensitivity Buffer Base Data +++ Railway — Highway Road - Watercourse 🚧 Wetland Parcel Boundary 0 50 100 Meters NZ Scale:1:6,000 REFERENCE: DataBC Data Distribution Service Open Government License (http://www.data.gov.bc.ca/) Geogratis/Geobase Open Government License - Canada (http://data.gc.ca/eng/about-datagcca) NOTE: CAUTION: DO NOT USE THIS MAP FOR NAVIGATIONAL PURPOSES This map may not reflect current conditions. Uncharted hazards may exist wood. Wood PLC

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Zones of Sensitivity
Vegetation – Aquatic Vegetation
Fisheries – Tributary Mouth
Zones of Sensitivity Buffer
Base Data
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Parcel Boundary



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Fisheries – Tributary Mouth
Zones of Sensitivity Buffer
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Parcel Boundary

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Base Data
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Wetland Parcel Boundary



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Vetland Parcel Boundary



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Parcel Boundary

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Appendix B. Activity Risk Matrix (Risk ratings: NA = Not Allowed, VH = Very High, H = High, M = Moderate, and L = Low)

	Risk rating based on Ecological Ranking				Risk rating if
Activity ¹	Very High	High	Moderate	Low / Very low	Sensitivity Present ²
Aquatic Vegetation Removal					
Removing native aquatic vegetation - by hand, or mechanical cutting for swimming areas and private beach access	νн	VH	νн	VH	NA
Removing non-native/invasive aquatic vegetation - by hand or mechanical cutting for swimming areas and private beach access	νн	νн	н	М	NA
Dredging, Infilling and Beach Creation					
Dredging - new or expansion works, no current tenure	νн	νн	VH	νн	NA
Maintenance dredging - dredged in last 10 years, no increase in footprint below the NB ¹ , dredged material deposited on land, within existing tenure	νн	VH	νн	VH	NA
Lake infilling - e.g. extension of upland landscaping	VH	VH	VH	VH	NA
Beach creation below the lake NB	VH	VH	VH	VH	NA
Foreshore sediment disturbance and removal of lakebed substrate (e.g., beach grooming)	VH	νн	н	м	NA
Foreshore Erosion, Sediment or Wave Control Struc	ctures			1	
New groyne construction or increase in existing footprint	VH	VH	VH	VH	NA
Maintenance of existing groyne, no increase in existing footprint, within existing tenure	М	М	L	L	NA
Erosion control (e.g., concrete, rip rap, vegetation, etc.)	VH	VH	н	м	NA
Infill breakwaters or boat basins	VH	VH	н	н	NA
Wave control structures (e.g., log booms)	VH	VH	н	М	NA
Boat Launches					
Construction of new hard surface boat launch or repair/upgrade of existing hard surface boat launch without land tenure	νн	νн	νн	н	NA
Upgrade/repair of existing hard surface boat launch with land tenure and within existing footprint	νн	н	н	м	NA

	Risk rating based on Ecological Ranking				Risk rating if
Activity	Very High	High	Moderate	Low / Very low	Sensitivity Present ²
Upgrade/repair of existing hard surface boat launch with land tenure and increasing size of the existing allowable footprint	νн	νн	н	м	NA
Construction of new boat rail launch or repair/upgrade of existing boat rail launch without land tenure	νн	н	м	L	NA
Upgrade/repair of existing boat rail launch with land tenure and within existing footprint	н	н	м	м	NA
Buoys					
Placement of up to 2 helical screw anchor mooring buoys for non-commercial use.	VH	н	м	L	NA
Placement of up to 2 non-helical screw mooring buoys for non-commercial use.	νн	н	н	М	NA
Placement mooring buoys for commercial use	Moorage # dependent - see Marina Activity rankings			NA	

Docks, boathouses, pile supported structures, float home structures, and other - below NB

Docks - floating, pile supported or removable	νн	н	М	L	NA
Floating or lake access boat house, covered boat storage, or permanent non-moorage structures	VH	VH	VH	VH	NA
Land boat house - located on land with access directly to the water	νн	νн	νн	н	NA
Pumphouse	νн	νн	VH	н	NA
Boat lifts	νн	н	L	L	NA
Float homes and house boats - refers to long term storage area.	νн	νн	νн	VH	NA
Float home/ house boats - refers to short term mooring (in bays).	VH	н	М	L	NA
Submarine cables, including related land clearing and equipment access.	VH	VH	VH	н	NA
Submarine cables - no land clearing necessary.	L	L	L	L	NA
Overwater piled structure (e.g. building, deck, etc.)	νн	νн	νн	νн	NA
Elevated boardwalk over water	VH	н	н	н	NA
Marinas	•				
Private dock moorage = < 6	νн	Н	м	М	NA
Small Marina = 6 – 20 slips	νн	н	н	н	NA

	Risk rating based on Ecological Ranking				Risk rating if Zone of
Activity ¹	Very High	High	Moderate	Low / Very low	Sensitivity Present ²
Marina Large = >20 slips	VH	VH	νн	VH	NA
Water Withdrawal, Use or Discharge					
Waterline - directional drilling	м	М	м	М	NA
Waterline - open excavation	νн	νн	н	М	NA
Geothermal heating/cooling - commercial, industrial, strata or multi-family	VH	νн	νн	н	NA
Geothermal heating/cooling - single family residence	н	н	м	L	NA
Treated effluent discharge pipe	VH	VH	VH	VH	NA
Commercial water withdrawals (addressed through water licensing, with physical activities addressed elsewhere in this table)	-	-	-	-	-
Transition to Private Land from Crown Land		,	ł	,	Į.
Application to purchase or lease crown land (crown grant)	νн	н	м	L	NA
Land development, on private land - above NB					
Native vegetation modification/removal, including for: buildings (e.g., boathouses, covered boat storage, permanent non-moorage structures), beach creation, landscaping, and septic fields.	VH	νн	VH	н	NA
Non-native vegetation modification / removal, including for: buildings (see above), landscaping, beach creation, and septic fields.	VH	н	М	L	NA
Drilling and blasting	νн	νн	νн	н	NA

Legend:

¹NB refers to present natural boundary. NB is the legal term BC Crown Land Branch uses to define the property boundary. Often NB and High Water Hark (HWM) are similar. Only a registered BC Legal Land Surveyor may determine NB.

²For all activities, if species or Critical Habitat listed under the Species at Risk Act are present, refer to DFO Projects Near Water Website for next steps (<u>https://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html</u>).

³Refer to DFO Land Development Guidelines (<u>http://stewardshipcentrebc.ca/PDF_docs/StewardshipSeries/LandDevelopmentGuidelines.pdf</u>)

Appendix C. Legal Requirements and Policy

The following provides a brief summary of environment related legislation that may be applicable to a proponent's project. While this list is fairly inclusive, other pieces of legislation may be applicable, and proponents are to ensure that they have identified all legislation that may apply to their project. The Federal Project Near Water website may be updated to reflect the integration of permitting under the *Species at Risk Act* and *Fisheries Act*. It is the proponents 'responsibility to refer to the Projects Near Water website for any updates.

Federal Acts:

- The Department of Environment Act
- Fisheries Act
- Species at Risk Act (SARA)
- Migratory Birds Convention
 Act
- Canada Wildlife Act

Federal Regulations:

- Canada Environmental
 Protection Act Regulations
- Migratory Birds
 Regulations

Provincial Acts:

- Water Sustainability Act
- Fish Protection Act
- Wildlife Act
- Land Act
- Weed Control Act
- Environmental Management Act

Local Government:

- Development Permit Areas (DPAs)
- Subdivision Servicing Bylaw
- Official Community Plans

- Navigable Waters
 Protection Act
- Pesticides Act
- Canadian Environmental Assessment Act (CEAA)
- Indian Act
- Fisheries Act Regulations
- Wildlife Area Regulations

(Contaminated Sites Regulations)

- Local Government Act
- Heritage Conservation Act
- Health Act (e.g., Sewerage System Regulation)
- Floodplain Management Bylaw
- Building Bylaw
- Zoning Bylaws

The Legal Requirements table, provided below (Table C1) identifies the main fish and wildlife habitat regulatory requirements for typical foreshore activities. These requirements involve three regulatory processes:

1. Obtaining a BC Crown Land tenure - to request permission for use of provincial Crown land.

- 2. Obtaining a BC Water Sustainability Act Section 11 notification or approval for making changes in and about a stream.
- 3. Obtaining necessary DFO acceptance through a Project Review. DFO staff will review the project plans to identify the potential risks of the project to the conservation and protection of fish and fish habitat. During the review, it will be determined if the project will: a) impact an aquatic species at risk, result in the death of fish and the harmful alternation, disruption or destruction of fish habitat, or need authorization under the *Fisheries Act*.

Although potential regulatory requirements (e.g., permits) are listed, the requirements at the time of planning the project should be confirmed, as regulatory changes do occur. FrontCounterBC should be contacted to confirm these requirements.

The Legal Requirements table only provides direction related to protecting fish and wildlife habitat values, and as such, does not consider other development factors (such as erosion hazards, drinking water quality, or navigation considerations). Proposed works may be subject to requirements such as: local government zoning or permitting, BC *Water Sustainability Act* approvals or notifications (in addition to those noted above) and Water License applications, Heritage Conservation Act permits, Land Act permits, licenses or permissions for occupation of Crown Lands, or Navigable Waters Protection Act approvals. It remains the responsibility of the project proponent to verify this information and meet all regulatory requirements that may apply to their project.

Table C1. Summary of typical legal environmental requirements for select development activities.

Activity ¹	Crown Land Tenure	BC Water Sustainability Act-Section 11 ²	Federal Fisheries Act Review⁴	Other
Aquatic Vegetation Removal				-
Removing native aquatic vegetation - by hand, or mechanical cutting for swimming areas and private beach access	N	Y	See DFO website	-
Removing non-native/invasive aquatic vegetation - by hand or mechanical cutting for swimming areas and private beach access	N	Y	See DFO website	-
Dredging, Infilling and Beach Creation				<u>.</u>
Dredging - new or expansion works, no current tenure	Y	Y	Y	-
Maintenance dredging - dredged in last 10 years, no increase in footprint below the NB, dredged material deposited on land, within existing tenure.	N	Y	See DFO website, likely N	-
Lake infilling - e.g., extension of upland landscaping	Y	Y	Y	-
Beach creation below the lake NB	Y ³	Y	Y	-
Beach creation above the lake NB, assumes on the applicant's land	N	Y	See DFO website, likely N	See DFO Land Development Guidelines ⁵
Foreshore sediment disturbance and removal of lakebed substrate (e.g., beach grooming)	N	Y	See DFO website, likely Y	-
Foreshore Erosion, Sediment or Wave Control S	Structures			-
New groyne construction or increase in existing footprint	Y	Y	Y	-
Maintenance of existing groyne, no increase in existing footprint, within existing tenure	N	Y	N	-
Erosion control (e.g., concrete, rip rap, vegetation, etc.)	N	Y	See DFO website	-
Infill breakwaters or boat basins	Y	Y	See DFO website	-
Wave control structures (e.g., log booms)	Y	Y	See DFO website	-
Boat Launches	·			-
Construction of new hard surface boat launch or repair/upgrade of existing hard surface boat launch without land tenure	Y	Y	See DFO website	-
Upgrade/repair of existing hard surface boat launch, within land tenure, and within existing footprint	N	Y	N	-

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Activity ¹	Crown Land Tenure	BC Water Sustainability Act-Section 11 ²	Federal Fisheries Act Review⁴	Other
Upgrade/repair of existing hard surface boat launch, within land tenure, and increasing size of the existing allowable footprint	Y	Y	Y	-
Construction of new boat rail launch or repair/upgrade of existing boat rail launch without land tenure	Y	Y	See DFO website	-
Upgrade/repair of existing boat rail launch with land tenure and within existing footprint	N	Y	Ν	-
Buoys	1	Γ		
Placement of up to 2 helical screw anchor mooring buoys for non-commercial use.	Y ³	Y	Ν	Federal Navigable Waters Act
Placement of up to 2 non-helical screw mooring buoys for non-commercial use.	Y ³	Y	Ν	Federal Navigable Waters Act
Placement mooring buoys for commercial use	Y	Y	Ν	-
Docks, boathouses, pile supported structures, f	loat home str	uctures, and othe	er - below NB	
Docks - floating, pile supported or removable	Y ³	Y	See DFO website	-
Floating or lake access boat house, covered boat storage, or permanent non-moorage structures	Y	Y	Y	-
Land boat house - located on land with access directly to the water.	Y	Y	See DFO website	-
Pumphouse	Y	Y	Y	-
Boat lifts	Y ³	Y	See DFO website	-
Float homes and house boats - refers to long term storage area.	Y	Y	Y	-
Float home/ house boats - refers to short term mooring (in bays).	Y	Y	See DFO website	-
Submarine cables, including related land clearing and equipment access.	N	Y	See DFO website	-
Submarine cables - no land clearing necessary.	N	Y	Ν	-
Overwater piled structure (e.g. building, deck, etc.)	Y	Y	See DFO website	-
Elevated boardwalk over water	Y	Y	See DFO website	-
Marinas				
Private dock moorage = < 6	Y ³	Y	See DFO website, likely Y	-
Small Marina = 6 – 20 slips	Y	Y	Y	-
Marina Large = >20 slips	Y	Y	Y	-

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Activity ¹	Crown Land Tenure	BC Water Sustainability Act-Section 11 ²	Federal Fisheries Act Review ⁴	Other
Water Withdrawal, Use or Discharge				
Waterline - directional drilling	Ν	Y	See DFO website	May require a Water License
Waterline - open excavation	Ν	Y	See DFO website	May require a Water License
Geothermal heating/cooling - commercial, industrial, strata or multi-family	Y ³	Y	See DFO website	May require a Water License
Geothermal heating/cooling - single family residence	Y ³	Y	See DFO website	May require Water License
Treated effluent discharge pipe	Y ³	Y	Ν	Environment Canada
Commercial water withdrawals	Y ³	Y	See DFO website	Requires Water License
Transition to Private Land from Crown Land				-
Application to purchase or lease crown land (crown grant)	Y	Ν	Ν	-
Land development, on private land - above NB				
Native Vegetation modification / removal	N	Y ³	See DFO website	-
Non-native Vegetation modification / removal	Ν	Y ³	See DFO website	-
Drilling and blasting	Ν	Y	See DFO website	lf < 30 m NB, contact local government
Boathouses / covered boat storage / permanent non-moorage structures	N	Y ³	See DFO website	Refer to Local Government
Building and development permit application	N	Y ³	Y ³	Refer to Local Government
Landscaping with Native Vegetation	N	Ν	See DFO website	Refer to Local Government
Landscaping with Non-native Vegetation	N	Ν	See DFO website	Refer to Local Government
Septic application	Y ³	Ν	Ν	Refer to Health Authority

Legend:

¹NB refers to present natural boundary. NB is the legal term BC Crown Land Branch uses to define the property boundary. Often NB and High Water Hark (HWM) are similar. Only a registered BC Legal Land Surveyor may determine NB.

²BC Water Sustainability Act Approval or Notification.

³Although indicated as Yes, the requirement is structure/location dependent. Refer to FrontCounterBC.

⁴DFO Projects Near Water Website (https://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html). For all activities, if species or Critical Habitat listed under the Species at Risk Act are present, refer to this website.

⁵Refer to DFO Land Development Guidelines (<u>http://stewardshipCentrebc.ca/PDF_docs/StewardshipSeries/LandDevelopmentGuidelines.pdf</u>).

Appendix D. Best Management Practices

The BC Ministry of Environment (MOE 2019) defines best management practices (BMPs) as "guidelines that help development projects meet necessary legislation, regulations and policies. For example, legislation might dictate that projects cannot harm a stream, while best management practices provide practical methods to avoid harming a stream."

The table below provides a summary of potentially applicable environmental and archaeological BMPs. This list is not exhaustive, other applicable BMPs may be available for a given project, and updates occur regularly. Thus, it is recommended that the website accessed at the following link for а current updated list: be https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/lawspolicies-standards-guidance/best-management-practices.

FrontCounterBC or a QEP should be contacted for more information on recent Provincial BMP's that may be specifically applicable to the Project. For Federal documents, the *Projects Near Water* website by Fisheries and Oceans Canada should also be referred to (https://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html).

Table D1. Summary of BMPs and guidelines that may be applicable to development in the Kootenay Region (Source: Kootenay Lake Partnership 2019).

Provincial BMPs	Target - species habitat	Applicability	Web Link
Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia (2014)	Sensitive Species Terrestrial Aquatic Riparian	Works involving any form of land development.	https://www2.gov.bc.ca/gov/content/environment/ natural-resource-stewardship/laws-policies- standards-guidance/best-management- practices/develop-with-care
Guidelines for Amphibian and Reptile Conservation during Urban and Rural Land Development in British Columbia (2014)	Amphibians and Reptiles	Ecosystems comprised of aquatic habitats, rocky outcrops and forested areas.	https://www2.gov.bc.ca/assets/gov/environment/ natural-resource-stewardship/best-management- practices/herptilebmp_complete.pdf
Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia (2013)	Raptors	Terrestrial ecosystems comprised of mature coniferous and mixed woodlands.	http://www.env.gov.bc.ca/wld/documents/bmp/ra ptor_conservation_guidelines_2013.pdf
Best Management Practices Guidelines for Bats during Urban and Rural Land Development in British Columbia in BC (2016)	Bats	Terrestrial ecosystems, insect rich riparian zones, as well as wetlands, forest edges and open woodland.	http://a100.gov.bc.ca/pub/eirs/viewDocumentDet ail.do?fromStatic=true&repository=BDP&docume ntId=12460
Standards and Best Practices for In- stream Works (2004)	Aquatic	Works undertaken in-stream.	http://www.env.gov.bc.ca/wld/documents/bmp/is wstdsbpsmarch2004.pdf
General BMPs and Standard Project Considerations	Aquatic	Any projects undertaken in and around a stream.	http://www.env.gov.bc.ca/wld/in- streamworks/generalBMPs.htm
Bank Stabilization Specific BMPs	Terrestrial Aquatic	Bank stabilization works that could impact fish or wildlife habitat.	http://www.env.gov.bc.ca/wld/in- streamworks/bankstabilization.htm
Best Management Practices for Hazard Tree and Non-Hazard Tree Limbing, Topping or Removal (2009)	Terrestrial Aquatic	Works involving tree removal.	https://www2.gov.bc.ca/assets/gov/environment/ natural-resource-stewardship/best-management- practices/hazardtree_26may_09.pdf

Table D1. Summary of BMPs and guidelines that may be applicable to development in the Kootenay Region (Source: Kootenay Lake Partnership 2019).

Provincial BMPs	Target - species habitat	Applicability	Web Link
Standards and Best Practices for In- stream Works	Terrestrial Aquatic	Wharves, piers, docks, boathouses, and small moorings in and about a stream	http://www.env.gov.bc.ca/wld/in- streamworks/downloads/Docks.pdf
Best Management Practices for Boat Launch Construction & Maintenance on Lakes (2006)	Terrestrial Aquatic	Boat Launch Construction & Maintenance on Lakes (Okanagan specific)	http://www.env.gov.bc.ca/okanagan/documents/ BMPBoat_LaunchDraft.pdf
Best Management Practices for Small Boat Moorage on Lakes (2006)	Terrestrial Aquatic	Small Boat Moorage on Lakes (Okanagan specific)	http://www.env.gov.bc.ca/okanagan/documents/ BMPSmallBoatMoorage_WorkingDraft.pdf
Best Management Practices for Installation and Maintenance of Water Line Intakes (2006)	Aquatic	Installation and Maintenance of Water Line Intakes (Okanagan specific)	http://www.env.gov.bc.ca/okanagan/documents/ BMPIntakes WorkingDraft.pdf
Beaver Management Guidelines (2001)	Aquatic	Areas that support beaver communities.	http://www.env.gov.bc.ca/van- island/pa/pdf/Beaver-Guide.pdf
Tree replacement criteria (1996)	Terrestrial	Works involving tree removal and replacement.	http://www.env.gov.bc.ca/wld/documents/bmp/tre ereplcrit.pdf
Kootenay-Boundary Water Sustainability Regulation Terms and Conditions (2018)	Aquatic	Changes in and around a stream of the kind listed in Part 3 of the <i>Water</i> <i>Sustainability Regulation.</i>	https://www2.gov.bc.ca/assets/gov/environment/ natural-resource-stewardship/best-management- practices/iswstdsbpsmarch2004.pdf
Fish Habitat Rehabilitation Procedures (1997)	Aquatic	Works with an erosion and sediment risk near water.	https://www.for.gov.bc.ca/hfd/library/ffip/Slaney_ PA1997_A.pdf
Guidelines for Wetland Protection and Conservation in British Columbia: Land Development (2009)	Wetlands	Wetland protection near development sites.	https://www2.gov.bc.ca/assets/gov/environment/ natural-resource-stewardship/best-management- practices/wetland ways ch 10 development.pdf

Table D1. Summary of BMPs and guidelines that may be applicable to development in the Kootenay Region (Source: Kootenay Lake Partnership 2019).

Provincial BMPs	Target - species habitat	Applicability	Web Link
Land Development Guidelines for the Protection of Aquatic Habitat (1992)	Aquatic	Works undertaken in areas adjacent to riparian features.	http://www.dfo-mpo.gc.ca/Library/165353.pdf
Ktunaxa Nation Council BMPs	Target Area	Applicability	Web Link