



St. Mary Lake

Foreshore Integrated Management Plan – 2022



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EXECUTIVE SUMMARY

A Foreshore Integrated Management Plan (FIMP) for St. Mary Lake was completed by Masse Environmental Consultants Ltd in 2022. This project collected a detailed inventory of the foreshore of St. Mary Lake, and identified foreshore habitat values, habitat sensitivities, and impacts from existing foreshore developments. Another main objective of the 2022 FIMP was to update data collected from the original Foreshore Inventory and Mapping (FIM) conducted in 2010 and document the rate of change along the lake foreshore over a period of 12 years. The information presented in this report will provide guidance to governments and developers on future lake foreshore developments while sustaining healthy aquatic and riparian ecosystems.

St. Mary Lake is a 295 ha lake located in the Regional District of East Kootenay, approximately 16 km west of the City of Kimberley. The St. Mary River is a large 5th order stream with a length of ~116 km and is the main inlet and outlet of the lake. St. Mary Lake is located approximately halfway up the drainage, defining St. Mary River into lower and upper sections. St. Mary Lake is situated within the Dry Mild Interior Cedar-Hemlock (ICHdm) biogeoclimatic subzone, which occurs in low to mid-elevations in the Southern Purcell Mountains. Several marsh class wetlands (Wm) are present around the perimeter of the lake, including an important wetland complex and cottonwood floodplain ecosystem at the inlet of St. Mary Lake. St. Mary Lake is located in the center of Ktunaxa traditional territory, where The Ktunaxa Indigenous People have lived for thousands of years. The community of ʔàqam (formerly known as the St. Mary's Indian Band) is located along the St. Mary River near its confluence with the Kootenay River and is the closest First Nation community to the study area.

St. Mary Lake supports several fish species including Bull Trout, Burbot, Kokanee, Longnose Sucker, Mountain Whitefish, Rainbow Trout and Westslope Cutthroat Trout. The St. Mary River watershed is an important riverine system for the at-risk Westslope Cutthroat Trout and Bull Trout, and the remnant Burbot population which is the only component of the Upper Kootenay River Burbot population that has shown signs of recruitment in recent years. St. Mary Lake is important to these species and is utilized by Westslope Cutthroat Trout for overwintering and rearing. The lake also appears to define the Westslope Cutthroat Trout into upper and lower populations, with the upper population upstream of the lake less susceptible to genetic introgression with Rainbow Trout. Burbot have also been reported in the lake, however in low numbers.

Field surveys were conducted on August 16 and 17, 2022 to inventory and describe the land use, shoreline modifications and biophysical attributes along 10.5 km of lake foreshore, defined into 9 segments. More than half of the shoreline was in natural condition (70.4%, 7360 m), while the remainder was disturbed (29.6%, 3090 m). The predominant level of impact for lake shoreline was medium (6862 m; 68.7%), followed by high (2444 m; 23.4%) and none (1143 m; 10.9%). The leading shoreline modification was roads (totalling 21% of the foreshore), with the St. Mary Lake Road running along the entire length of Segment 6 and various access roads on private land. Other alterations included removal of riparian vegetation for logging and property development, cabins and residences, boat launches, docks, retaining

walls, groynes, pilings, swim float, gazebos and a fence. An area at the northwest end of the lake has been transformed into agricultural fields, resulting in the removal of important riparian vegetation and sensitive habitat.

Aquatic vegetation was present in all segments ranging from 20% to 90% cover. The most common aquatic vegetation type was emergent vegetation (45.1%), followed by submergent vegetation (29.6%) and floating vegetation (1.5%). The highest density of aquatic vegetation was associated with wetlands. The dominant substrate along the foreshore consisted of organics (34.1%) and cobble (25.5%) followed by boulder (14.7%), mud (10.8%) and sand (8.7%), while the substrate in the littoral zone was dominated by mud (55.7%) and organics (33.1%). Large woody debris within the foreshore was the most abundant (i.e., #LWD/distance of shoreline) in 3 of the segments. The greatest amount of large woody debris within the littoral zone was found at the lake outlet and in the vicinity of remnant pilings at the east end of the lake where large woody debris has accumulated. The widest littoral zones (ranging from 60 to 200 m) were associated with the floodplain at the west end of the lake and the lake outlet at the east end. Littoral zones ranging from 10 to 50 m made up the remainder.

Comparison between the 2010 and 2022 FIM surveys indicated that the total length of disturbed shoreline increased substantially by 560 m (or 5.4%) from 2530 m to 3090 m, representing an annual increase of 47 m (0.4%), although much of these changes likely occurred over a one- or two-year period. This high rate of change is the largest observed in re-FIMP surveys undertaken by Living Lakes Canada, and is a concern, especially in a system that supports at-risk species and sensitive ecosystems. Additionally, the relative impacts associated with these disturbances are generally more pronounced given the relatively small size of the lake.

Shoreline habitat sensitivities were determined using a ranking index (Foreshore Habitat Sensitivity Index, or FHSI) that incorporated criteria from biophysical data collected in the FIMP, fisheries values, terrestrial/ecosystem values, and shoreline modifications. The criteria and ratings used from the original study were adjusted to reflect current methods and adjusted weights were applied to the criteria based on the conditions observed. A large portion of the shoreline was ranked as Very High (44.1%) ecological value followed by Medium (20.4%), Low (15.4%), High (12.1%) and Very Low (8.0%). All segments were assigned the same FHSI rankings in 2022 as in the previous study, with the exception of one segment, which decreased in ecological ranking from Medium to Low. The lowering in rank was due mainly to the increase in disturbance along the shoreline recorded in 2022 associated with residential and rural development, including a road along the shoreline that was not recorded in 2010. Despite the recent impacts that were observed in some of the segments, these segments were assigned the same habitat index rankings based on the presence of high value biophysical habitat within these segments, which carried more weight in the FHSI calculation.

Five Zones of Sensitivity (ZOS), which are defined as specific areas that provide important habitats to either species or general ecosystem function, have been identified for St. Mary Lake. These areas consist of

Stream Mouths, Wetlands, Shrub Riparian, Cottonwood Riparian and Submerged Vegetation. The large wetland complex located at the west end of St. Mary Lake is also recommended as a Conservation Zone. This area is made up of diverse ecological communities including open water, marshes, low bench shrub habitat and mid bench cottonwood riparian.

After review of the RDEK Official Community Plan, we recommend that the Development Permit Area #3 - St. Mary Lake Shoreline be extended from 7.5 m to at least 30 m upland from the natural property boundary along all shorelines around St. Mary Lake regardless of the foreshore habitat sensitivity index designation as the riparian vegetation provides important habitat and nutrient input to the lake. This does not preclude development within these areas, however, landowners would be required to obtain a Development Permit prior to proceeding with any projects including any construction (such as addition or alteration of a building or other structure) or alteration of land (such removal of riparian or aquatic vegetation, site grading, deposition of fill, beach creation, or dredging) and would require an Environmental Impact Assessment report prepared by a QEP. In addition, DPA #3 will need to be updated to include the ZOS identified in this report (and conservation zones, if designated). This will help ensure that these areas are properly protected during development, which in turn will help preserve the important fish and wildlife habitat that St. Mary Lake provides.

The FDG is presented under a separate cover and presents recommendations and tools to aid in identification and planning so high value environments and ZOS are conserved during development (Appendix 5).

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Living Lakes Canada Mission Statement

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1 INTRODUCTION

Masse Environmental Consultants Ltd. (Masse) was retained by Living Lakes Canada to complete a repeat Foreshore Integrated Management Plan (re-FIMP) for St. Mary Lake in 2022. The FIMP methodology was developed to assess the impacts of foreshore developments on lakes across British Columbia, providing a standardized method (Schleppe et al 2020). The purpose of the FIMP is to identify lake foreshore habitat values, habitat sensitivities and impacts from foreshore developments. The FIMP process can also be repeated and used to determine the rate of change along a lake foreshore. This information provides guidance to land managers during foreshore development, while sustaining healthy aquatic and riparian ecosystems.

St. Mary Lake was previously surveyed in 2010 (Schleppe and Patterson 2011a). This survey updates the data collection to the current FIMP standardized methods, assesses the current status of the foreshore, and allows for changes since the 2010 survey to be estimated.

2 BACKGROUND

2.1 Setting

St. Mary Lake is a 295 ha lake located in the Regional District of East Kootenay (RDEK), approximately 16 km west of the City of Kimberley (Figure 1). The main inlet and outlet of the lake is the St. Mary River which flows in a southeasterly direction into the west end of the lake. The St. Mary River is a large 5th order stream with a length of ~116 km originating from the Purcell Mountains (at ~2400 m elevation) and flowing into the Kootenay River at Fort Steele (at ~800 m elevation). The lake is located at 976 m elevation, is ~45 km upstream of the mouth of the St. Mary River ~halfway up the drainage, and defines the river into lower and upper sections, attenuating flows downstream. Other small tributary streams that flow into St. Mary Lake include Alki Creek, Argyle Creek and 5 unnamed tributary streams. The west end of the lake is located within a broad floodplain consisting of a wetland complex. There is no hydrological gauging of St. Mary Lake. Key physical characteristics are provided in Table 1.

Table 1. St. Mary Lake physical characteristics (Habitat Wizard, 2022).

Parameter	Amount
Elevation	976 m
Surface Area	295 ha
Foreshore Perimeter	10.5 km
Drainage	~ 2699 km ²
Maximum Depth	21 m
Mean Depth	7.7 m
Average Width	1.3 km
Average Length	2.7 km

2.2 Biogeoclimatic Characteristics

St. Mary Lake is situated within the Dry Mild Interior Cedar-Hemlock (ICHdm) biogeoclimatic subzone, which occurs at low- to mid-elevations in the Southern Purcell Mountains east of Kootenay Lake. The climate of this subzone is broadly characterized by warm, dry summers, moist springs, and cool, dry winters (Mackillop and Ehman 2016). Historic fires and timber harvesting have resulted in a current landscape dominated by younger mixed conifer forests and old-growth forests are uncommon within this subzone.

2.3 Cultural Significance

St. Mary Lake is in the center of Ktunaxa traditional territory, where The Ktunaxa People have lived for thousands of years. The community of ʔáqam (formerly known as the St. Mary's Indian Band) is located along the St. Mary River near its confluence with the Kootenay River and is the closest First Nation community to the study area.

The FIMP framework recognizes the importance of Indigenous Peoples' Traditional Ecological Knowledge (TEK) and is designed to incorporate this knowledge when it is available (Schleppe et al 2020). Limited information was available on Indigenous Peoples' uses of the St. Mary River and St. Mary Lake during the background review. During the planning phase of this project, Living Lakes Canada reached out to the ʔáqam community which showed an interest in participating in the field component of this assessment. Unfortunately, due to scheduling conflicts and capacity constraints, a member of the community was not available to participate. No information has been received to date that could be included in the FIMP framework. Further consultation with the Ktunaxa Nation and the community of ʔáqam will be welcomed in the future to help define the cultural significance of this area.

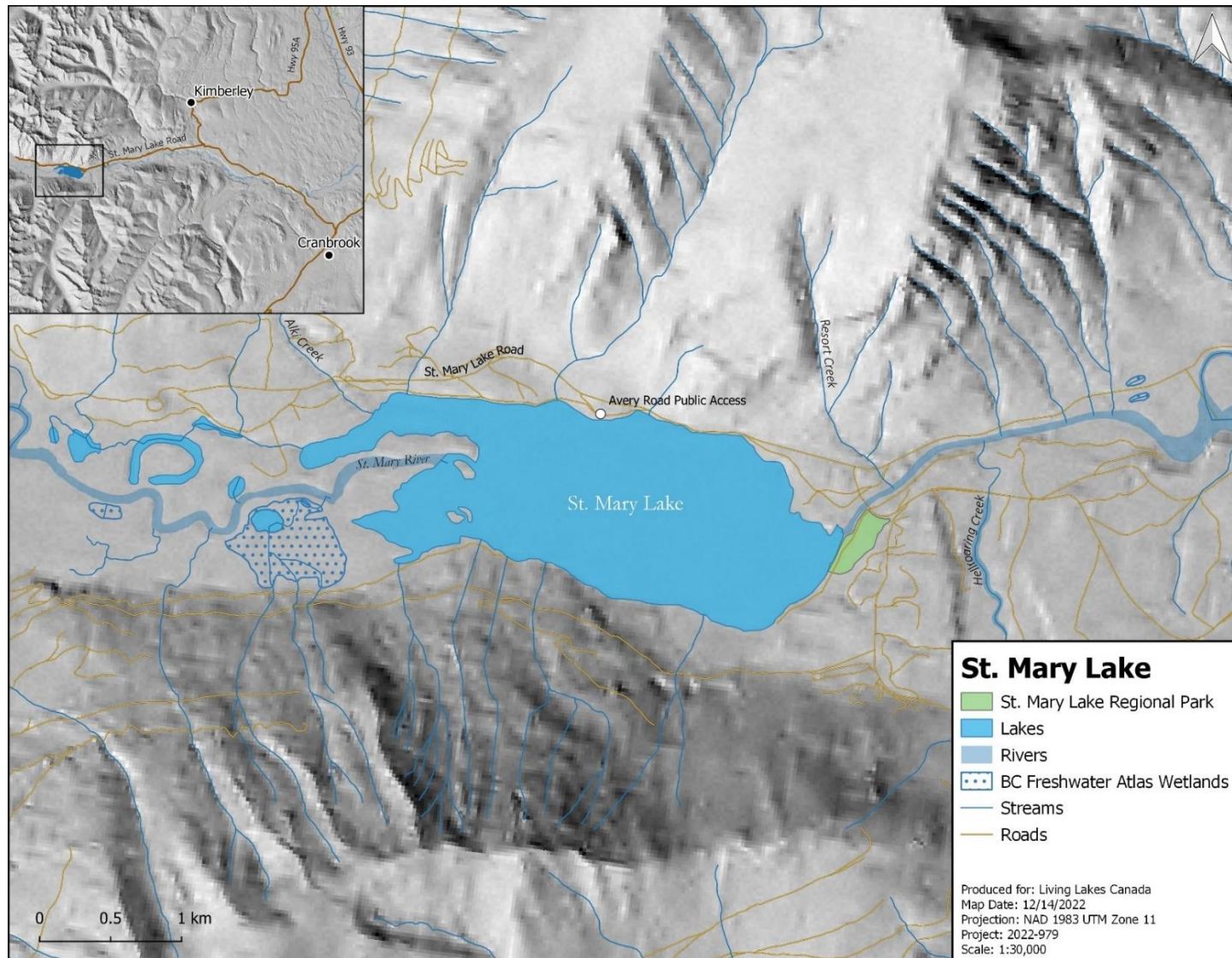


Figure 1. St. Mary Lake location map.

2.4 Recreational and Land Use

St. Mary Lake is a popular recreational destination with many anecdotes dating back to the early 1900s and was a popular camping area. Today most of the land around the lake is privately owned with many cottages along the foreshore used seasonally. The St. Mary Lake Regional Park and Avery Road Public Access provide day use opportunities for the public to access the lake. The St. Mary River watershed has a long history of forestry activities, and a sawmill was operated on the shores of St. Mary Lake where the St. Mary Lake Regional Park is now located. Remnant pilings are a testament to this presence.

St. Mary Lake is a popular destination for fishing, boating, canoeing, swimming and birdwatching. Other recreational opportunities in the area include hiking, cycling, and mountain biking. St. Mary Lake Regional Park located at the east end of the lake was created as a day use park and provides access to the lake. The land was previously owned by Tembec and was used by locals for recreation. Due to concerns by locals, sale of the property in 2017 included a rezoning condition that any subdivision of the property would require the creation of a six-hectare park that would be transferred to the RDEK (Coulter 2018). Since rezoning has not occurred, a Licence of Occupation Agreement was signed in 2018 with the owners of the land, Mt. Evans Land Company Ltd. The park is currently managed and operated by the RDEK from May 15 to September 15. Park amenities include washrooms, parking, steel fireplaces and a boat launch.

The Avery Road Public Access, located off Avery Road midway along the north side of St. Mary Lake, was created in 2012 to provide additional access to the lake for pedestrians and small watercrafts, in response to a lack of access by vehicle to the lake and presence of private land around most of the lake. Park amenities include parking, a lake access trail, a bench, and a designated boat launch for non-motorized watercrafts. A management plan for this area was developed in 2020 (RDEK 2020).

Whitewater rafting and kayaking are popular activities in the St. Mary River downstream of the lake, starting at the St. Mary Lake Regional Park to access the lake outlet. The first few kilometers are an easy two hour trip of slow moving Class 1 water, but beyond the town of Marysville the river narrows and becomes sections of Class 2 and Class 3 rapids (trailpeak.com 2022).

There are no restrictions for power boats on St. Mary Lake and the St. Mary River. The St. Mary River, including the lake, is classified as a federal waterway and rules and regulations surrounding boat use are the jurisdiction of Transport Canada. Some residents have voiced their concerns about unrestricted motorized boat use and speed limits and their impacts on wildlife and human safety (Cranbrook Daily 2019).

Year-round fishing opportunities are present at St. Mary Lake. Sport fish in the lake include Bull Trout (*Salvelinus confluentus*), Burbot (*Lota lota*), Mountain Whitefish (*Prosopium williamsoni*), Rainbow Trout (*Oncorhynchus mykiss*), and Westslope Cutthroat Trout (*O. clarkii lewisii*). The current Freshwater Fishing Regulations (2021-2023) have reduced the daily quota for Westslope Cutthroat Trout from 5 to 0. Currently, only catch and release fishing is allowed for both Burbot and Westslope Cutthroat Trout.

The Alki Creek Trail located on the north side of St. Mary Lake provided hiking opportunities into the alpine (15.9 km return trip), with views of Murphy, Bootleg and Pyramid Mountains. The access road to the trailhead was indefinitely closed to the public in 2020 by the current landowners (pers. comm. Miles 2022).

The majority of the properties along the St. Mary Lake shoreline are privately owned; and have zoning and land use designations under the RDEK (2014, 2017; Table 2). Foreshore developments along St. Mary Lake are regulated by Development Permit Area (DPA) #2 – Protection of Environmentally Sensitive Areas (ESA) and DPA #3 – St. Mary Lake Shoreline (RDEK 2017). DPA #2 applies to all areas designated as wetland and riparian ecosystem, habitat for species at risk, and old growth forest as shown in Schedule E2 of the Kimberly Rural Official Community Plan (OCP, RDEK 2017). DPA #3 applies to an area extending 30 m into the lake and 7.5 m upland from the natural boundary for shorelines that are designated as very high or high value habitat (red or orange shoreline zones) as shown in Schedule K of the OCP (RDEK 2017) and per the St. Mary Lake Shoreline Management Guidelines (Schleppe and Patterson 2011b).

Table 2. Zoning and land use designations for properties along the shoreline of St. Mary Lake.

PID	Segment(s)	Ownership	Zoning *	Land Use **
024-300-551	1,2	Crown Provincial	P-2	OSRT
011-836-539	1,8,9	Private	RR-2/P-2	LH/OSRT
017-047-081	2,3	Crown Provincial	RR-60	RR
011-836-628	3	Private	RR-60	RR
026-265-346	3	Private	RR-2	LH
026-281-252	3	Private	RR-60	RR
027-145-531	3	Private	RR-1	SH
027-145-549	3	Private	RR-1	SH
027-145-557	3	Private	RR-1	SH
027-145-565	3	Private	RR-1	SH
027-145-573	3	Private	RR-1	SH
027-145-581	3	Private	RR-1	SH
026-265-354	3,4	Private	RR-2	LH
026-265-362	4	Private	RR-2	LH
026-265-371	4	Private	RR-2	LH
026-265-389	4	Private	RR-2	LH
026-265-397	4,5	Private	RR-2	LH
026-265-401	5	Private	RR-2	LH
016-175-433	5,6	Private	RR-16/RES-1(A)	RR/REC
018-730-442	6	Crown Provincial	RR-60	RR
016-400-275	6,7,8	Private	RR-60/RR-8/RES-1(A)	RR/LH/REC

*P-2=Parks & Open Space, RES-1(A)= Residential (A), RR-1= Rural Residential, RR-2= Rural Residential (Small Holdings), RR-8=Rural Residential (Country), RR-16=Rural Residential (Extensive), RR-60=Rural Resource

**LH = Large Holdings, OSRT=Open Space, Recreation and Trails, REC= Residential Recreation, RR=Rural Resource, SH=Small Holdings

3 METHODS

The foreshore inventory and re-assessment of St. Mary Lake followed standard methodology presented in the Foreshore Integrated Management Planning Methods (FIMP; Schleppe et al 2020). The FIMP methodology includes three main components:

1. Foreshore Inventory and Mapping (FIM)
2. Foreshore Habitat Sensitivity Index (FHSI)
3. Foreshore Development Guide (FDG)

This report presents the results and findings of the first two components. The Foreshore Development Guide is provided in Appendix 5.

3.1 Foreshore Inventory and Mapping

3.1.1 Background Review and Pre-field Assessment

A background review was completed to gain a better understanding of the ecological and land use context of the St. Mary Lake area. Existing information was collected from the following resources:

- BC Conservation Data Centre (BC CDC)
- EcoCat
- iMap BC / Habitat Wizard
- Global Biodiversity Information Facility
- E-flora BC / E-fauna BC / E-Bird
- iNaturalist
- British Columbia Wildlife Survey Inventory data
- Regional District of East Kootenays (RDEK) informational brochures, Official Community Plans (OCP) and Zoning Plans and Mapping
- Ecoscape 2011 FIM report
- Google Earth imagery

The segment breaks assigned by the previous survey were retained as no substantial changes in land use or development has occurred since the 2010 survey.

3.1.2 Field Surveys

Field surveys were conducted on August 16 and 17, 2022, to inventory and describe the land use, shoreline modifications and biophysical attributes along the lake foreshore. The foreshore is defined as the area from the edge of the pelagic regions (or limnetic/open water areas) of the lake to an area up to 50 m past the high water mark (HWM) in the upland/riparian zone (Schleppe et al 2020). This includes the littoral, foreshore, and upland zones. The littoral zone consists of the area below the low water mark (LWM) to a point where light penetration to the bottom of the lake no longer occurs, the foreshore zone consists of the area between the approximate LWM and the HWM, and the upland zone consists of the terrestrial environment above the HWM (Schleppe et al. 2020). The survey team consisted of Sylvie Masse, MSc,

RPBio; Tyson Ehlers, BSF, RPBio; Renae Mackas, RPBio; and Beth Newbery, BSc, BIT. Weather conditions were ideal for the surveys with warm temperatures and clear skies. The entire foreshore was surveyed from a zodiac boat travelling at a slow speed 20-30 m from the shoreline.

A handheld GPS (Garmin 661) and iPad were used for georeferencing. Representative geo-referenced photos were taken for each segment with an iPhone 12. Special features were also photographed using an Olympus TG-6 camera. All data and field observations, such as wildlife and habitat features, were recorded on field sheets. The maximum depth of the littoral zone was measured by determining the depth of light penetration using a Secchi disk.

3.1.3 Unpiloted Aerial Vehicle (UAV) Survey

Aerial videography and photography were collected for each segment using a DFI Phantom 4 drone from August 16 to 18. The segments were identified in the field by the drone operator using digital maps and all segments around the lake were filmed. The georeferenced video was collected throughout the survey period at elevations not exceeding 122 m above ground. The operator adjusted the height and angle of the drone and camera to appropriately capture the width of the shoreline and any relevant features or disturbances that could not be assessed from the water by boat.

The wetland at the west end of the lake could not be accessed by boat; therefore, the drone was used to collect imagery and video of the extent of the wetland and an ~ 1 km section of the Upper St. Mary River. Video footage from Segment 3 was subsequently split into three parts to accommodate the extra footage.

3.1.4 Data Analysis

Field data were entered into an MS Excel spreadsheet. Mapping and GIS were completed using QGIS. The Freshwater Atlas (1:20,000) streamline was modified for stream mouths that did not match with field observations and ortho-imagery. Biophysical attributes of the foreshore are presented in tabular format and graphs were created to represent percentage of each category for the entire lake foreshore (see Section 4, results). Categories selected include:

- Percent of natural and disturbed shoreline;
- Percent of natural and disturbed shorelines for each shore type segment class¹;
- Percent of natural and disturbed shorelines for each land use segment class¹;
- Substrate type;
- Aquatic vegetation;
- Shoreline modification; and
- Level of impact.

¹ Note that the dominant segment classifications for shore type and land use (rather than the proportion of these categories for each segment) were used to evaluate the proportion of the segment that was natural or disturbed.

All results are presented on the Foreshore Inventory Maps in Appendix 1 and in the Segment Summaries in Appendix 2. JPEG photographs and geo-referenced videos of the foreshore are provided as attachments to this report.

3.1.5 Comparison of 2010 FIM and 2022 re-FIM Datasets

The 2010 and 2022 datasets were reviewed and differences between years were assessed for each segment. Comparisons focused mainly on biophysical attributes that have the potential to change over time rather than the more static categories (for example land use, shore type, substrate type, and littoral zone widths). However, since the FIM methodology developed by Schleppe and Mason (2009) was revised by the technical committee in 2020, some of these categories may have been reclassified due to updated definitions and interpretations in the current methods and are described in the results.

The following shoreline categories were selected for comparison between the 2010 and 2022 datasets:

- Natural vs. disturbed shoreline.
- Land use.
- Aquatic vegetation.
- Level of impact.
- Shoreline modifications.

The rate of change analysis was completed by comparing the proportion of natural shorelines to disturbed shoreline over the lake total shoreline and for each segment. An annual rate was then estimated. Changes were then summarized by segment by comparing orthoimagery, still photos and drone footage.

3.2 Foreshore Habitat Sensitivity Index

A Foreshore Habitat Sensitivity Index (FHSI) is an analytical framework used to determine the habitat value or environmental sensitivity of a shoreline segment. The output of the analysis assigns one of five potential “Ecological Ranks” to segments (e.g., Very High, High, Moderate, Low, and Very Low). The FHSI is calculated using a combination of criteria that are field derived and potentially also from desktop studies. Scores assigned to each criterion (Table 3) are tallied for a single habitat segment to determine the Ecological Rank. The rank represents the sensitivity of the shoreline to changes from land use or proposed shoreline activities. In general, ranks will be higher for segments that are natural or have sensitive habitat features than for segments that are disturbed.

The FHSI analysis was developed as follows. Foreshore habitat is comprised of littoral, foreshore, and terrestrial components, each of which have attributes that are measured in FIMP. Modifications and disturbances were incorporated into the index as negative values. Modifications may also alter biophysical attributes (i.e., riparian vegetation, substrates), which should be reflected by lower ratings for these attributes.

Table 3. Summary of criteria and ratings used to calculate the FHSI.

Criteria	% of FHSI	% Within Category	Logic	Uses Weighted FIM Data	Value Categories
FIM					
Shore type	18	22.5	Sum (% shore type _i * value _i) * Maximum Score	Y	Stream Mouth = Wetland (1) > Gravel Beach = Rocky Shore (.8) > Sand Beach = Cliff /Bluff (0.5), Other (0.3)
Substrate	15	18.8	Sum (% substrate * value _i) * Maximum Score	Y	Organic = Mud = Marl = Fines (1) > Cobble = Gravel (0.8) > Sands= Boulder (0.3) > Bedrock (0.2)
% Natural	12	15.0	% of segment * Maximum Score		% of segment
Aquatic vegetation	11	13.8	% * Maximum Score		% of segment
Overhanging vegetation	5	6.3	% of segment * Maximum Score		% of segment
Large woody debris /km	3	3.8	rating * Maximum Score		>15 LWD (1); 10-15 LWD (0.8); 5-10 LWD (0.6); 0-5 LWD (0.4) 0 LWD (0)
B1 vegetation width and type	11	13.8	Width rating x Class rating x Maximum Score	Y	Width: < 20 m (1) < 15 to 20 m (0.8) < 10 to 15 m (0.6) < 5 to 10 m (0.4) 0 to 5 m (0.2)
B2 vegetation width and type	5	6.3		Y	Class: 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)
Subtotal	80	100			
Fisheries					
Juvenile Rearing	6	60	Class rating x Maximum Score	Y	High (1), Moderate (0.4), Low (0.2)
Staging	2	20		Present (1), Absent (0)	
Migration	2	20		Present (1), Absent (0)	
Subtotal	10				
Wildlife					
Veteran Trees	1	10	rating * Maximum Score		> 25 (1), 5-25 (0.6), <5 (0.2), No (0)
Snags	1	10	rating * Maximum Score		> 25 (1), 5-25 (0.6), <5 (0.2), No (0)
Subtotal	2				
Ecosystem					
Floodplain Habitat	8	80	Class rating x Maximum Score		Class: Present = 1, Absent = 0
Subtotal	8				
Total	100				

Criteria	% of FHSI	% Within Category	Logic	Uses Weighted FIM Data	Value Categories
Modifications					
% Road modified	-5		% of segment * Maximum Score		% of segment
% Erosion protection (retaining walls)	-5		% of segment * Maximum Score		% of segment
Boat launches/km			-0.1 * # modifications/km		Presence
Swim floats/km					Presence
Docks/km					Presence
Groynes/km					Presence
"Other" modifications/km					Presence
Subtotal	-10				

The initial ratings and weightings were guided by the FIMP methods document (Schleppe et al. 2020) and the framework used by Ecoscape to generate the 2011 Aquatic Habitat Index for St. Mary Lake (AHI, referred to FHSI in updated methods). The criteria and ratings used for the 2011 AHI were adjusted to include additional criteria included in the current FIMP methods, and adjusted weights were applied to the criteria based on conditions observed. Several iterations were completed with different weightings and with or without specific attributes until the FHSI calculated for each segment was consistent with the professional opinion of the team’s biologists. The ratings and weighting used for each attribute are presented in Table 3. The rationale for the weighting of each criteria is provided in Table 4 and the rationale for including additional criteria is provided in Table 5.

The FHSI is heavily weighted towards attributes that are collected as part of the FIM for the following reasons:

- FIM attributes (shore type, substrate, disturbance and vegetation) can be consistently collected in the field.
- FIM attributes represent habitat potential and sensitivity to disturbance.
- FIM attributes do not require any additional species or site-specific information that may or may not be available.

Additional attributes can be added and/or relative weightings adjusted if the FHSI does not adequately represent foreshore sensitivity, or if new site-specific information becomes available. Additional values are summarized in Table 5.

Table 4. Rationale for values assigned to FHSI criteria.

Criteria	Value Categories	Rationale
FIM		
Shore type	Stream Mouth = Wetland (1) > Gravel Beach = Rocky Shore (.8) > Sand Beach = Cliff /Bluff (0.5), Other (0.3)	Values are based on habitat quality and sensitivity to disturbance. Streams and wetlands provide high value habitat for a wide variety of species and are extremely sensitive to disturbance. Gravel beach and rocky shores can provide spawning and rearing habitat and are easily modified by development.
Substrate	Organic = Mud = Marl = Fines (1) > Cobble = Gravel (0.8) > Sands= Boulder (0.3) > Bedrock (0.2)	Substrates provide habitat, cover, and potential spawning habitat. In general, the substrates within St. Mary Lake had value in terms of their contribution of biomass rather than spawning value. Greater value was placed on soft, organic substrates based on the foraging habitat value they provide for fish within the lake.
% Natural	% of segment	Natural shorelines tend to provide higher value habitat given the ecological function of intact ecosystems found in undisturbed areas.
Aquatic vegetation	% of segment	Aquatic vegetation contributes to aquatic productivity, provides high quality habitat, and is sensitive to disturbance.
Overhanging vegetation	% of segment	Overhanging vegetation provides shade and cover, and contributes leaf and insect drop.
Large woody debris /km	>15 LWD (1); 10-15 LWD (0.8); 5-10 LWD (0.6); 0-5 LWD (0.4) 0 LWD (0)	Woody debris can provide cover/rearing for fish and provides additional substrate for periphyton/benthic invertebrates.
B1/B2 vegetation width and type	Width: < 20 m (1) < 15 to 20 m (0.8) < 10 to 15 m (0.6) < 5 to 10 m (0.4) 0 to 5 m (0.2) Class: 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)	Riparian vegetation represents the interface of the aquatic and terrestrial environment and contributes to shoreline stability.
		Wetland, shrub and broadleaf vegetation generally provides the greatest habitat diversity and value for most species.

Table 5. The rationale for criteria that were added to develop the FHSI.

Criteria	Value Categories	Rationale
Fisheries		
Juvenile Rearing	High (1), Moderate (0.4), Low (0.2)	The juvenile rearing potential was based on professional judgement and considered known rearing habitat requirements for fish species in the lake (substrates, proximity to spawning streams, littoral area, cover present, etc.)
Staging	Present (1), Absent (0)	Fish will typically congregate, or stage, in areas to wait for appropriate conditions prior to migrating to new habitat. The presence of staging areas was based on professional judgement, and typically limited to the areas around the inlet and outlet of St. Mary River.
Migration	Present (1), Absent (0)	The presence of probable juvenile and adult fish migration route was based on professional judgement, and was limited to areas of the inlet and outlet of streams suitable for spawning (i.e., St. Mary River).
Wildlife		
Veteran Trees	> 25 (1), 5-25 (0.6), <5 (0.2), No (0)	Veteran trees are those that are significantly older than the dominant forest cover and provide increased structural diversity through unique habitat features for wildlife. They also provide recruitment for snags.
Snags	> 25 (1), 5-25 (0.6), <5 (0.2), No (0)	Snags are dead standing trees that can provide cavity nesting and denning habitat for birds and small mammals, as well as perching habitat for raptors.
Ecosystem		
Floodplain	Class: Present = 1, Absent = 0	Floodplains provide high quality habitat and are highly productive. A floodplain criteria was added as the riparian vegetation criteria did not adequately account for the ecological value of the riparian habitat in floodplain areas at the west end of the lake.

3.3 Ecological Ranks

After the FHSI values for each segment were calculated, segments were assigned a five-class ranking system with categories of Very Low, Low, Moderate, High and Very High (Table 6). The ranking system was developed by reviewing the range of FHSI values for the different segments of the lake (Appendix 4, Figure 9) and creating appropriate boundaries for each ranking. This process considered conditions observed during the 2022 survey, as well as the rankings previously assigned to the segments and changes that were observed in each segment between surveys. The ranking system was assigned such that segments that scored >70, were assigned a Very High ranking, with lower ranks assigned at increments of 10.

Table 6. Five class ranking system based on FHSI scores.

Rank	FHSI Score
Very High	>70
High	60 – 70
Medium	50 – 60
Low	40 – 50
Very Low	<40

4 RESULTS

4.1 General Survey Conditions

At the time of the survey, the lake level was ~ 1.3 m below the normal high water mark as determined in the field. The lake appears to fluctuate ~ 1.5 m between the high and low water marks. The depth of light penetration was 4.5 m as measured with a Secchi disk on August 17, 2022.

4.2 Foreshore Inventory and Mapping

4.2.1 Natural vs. Disturbed Shoreline

The foreshore of St. Mary Lake had a total length of 10450 m and was divided into 9 segments ranging in length from 418 m to 4609 m (Appendix 2). The total length of disturbed shoreline was 3090 m (29.6%), while the total length of natural shoreline was 7360 m (70.4%; Figure 2).

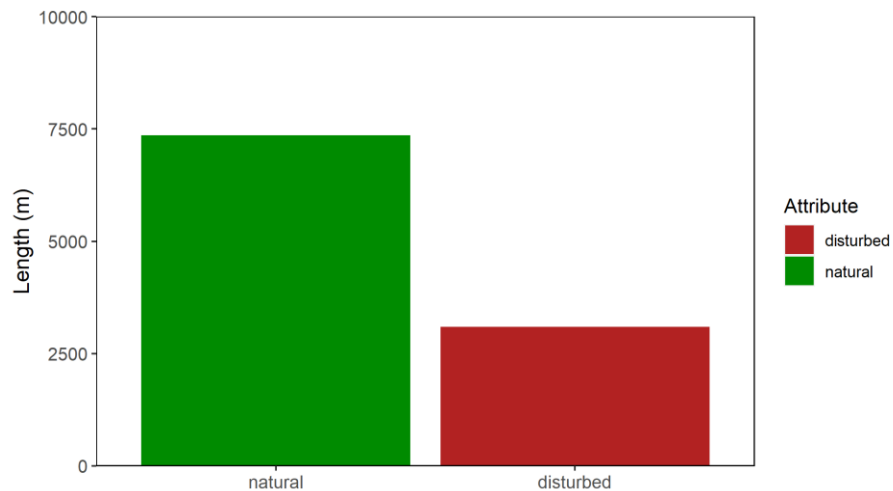


Figure 2. Amount of natural and disturbed shoreline on St. Mary Lake.

4.2.2 Shore Type

The predominant shore type was wetland with 5289 m of shoreline (50.6%) followed by gravel and rocky shore with 2607 m (24.9%) and 1974 m (18.9%) respectively (Table 7; Figure 3). The remainder consisted of stream mouth (580 m; 5.6%). Steeper shorelines were generally located along the north and south shores of the lake, as the lower gradient shorelines were located within the floodplain at the west end of the lake and the lake outlet at the east end. The greatest percentage of disturbed shoreline was found along gravel (24.9%) shorelines.

Table 7. Shore type along the St. Mary Lake foreshore and relative amounts.

Shore Type	Total (m)	Percent (%)	Natural (%)	Disturbed (%)
Gravel	2607	24.9	9.7	15.3
Rocky Shore	1974	18.9	12.5	6.4
Stream Mouth	580	5.6	3.3	2.2
Wetland	5289	50.6	44.9	5.7
Total	10450	100.0	70.4	29.6

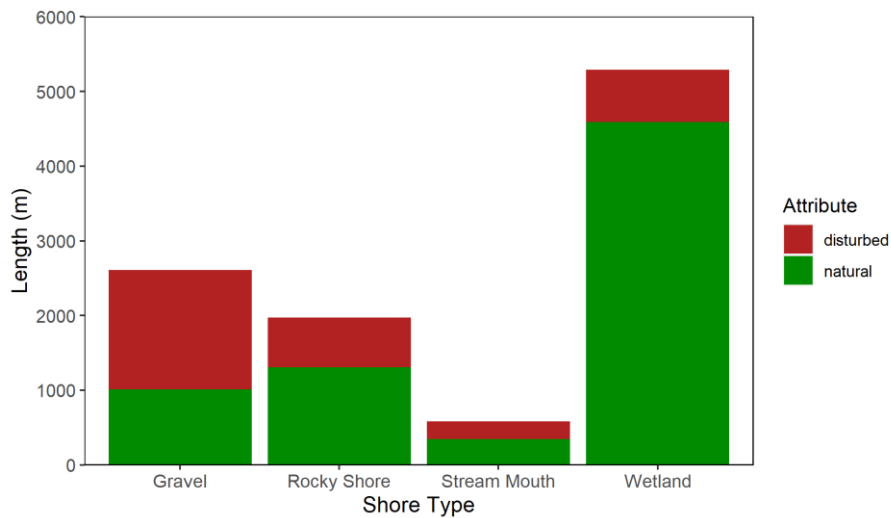


Figure 3. Shore types along the St. Mary Lake foreshore relative to the amount of natural and disturbed foreshore.

4.2.3 Land Use

The predominant land use along the foreshore of St. Mary Lake was natural area² (5753 m; 55.0%; Table 8; Figure 4), followed by single-family residential (2013 m; 19.3%) and rural (1273 m; 12.2%). St. Mary River Road runs along the north side of the lake over a distance of ~ 831 m (8.0%), and park use makes up 580 m (5.6%). The greatest percentage of disturbed shoreline was associated with the single-family residential, transportation and rural uses.

² Although FIM methods specify that natural area land use applies to areas of natural crown lands (and not privately-held properties), we felt that the biophysical characteristics associated with this category best matched those observed in the field for these sections.

Table 8. Land use along the St. Mary Lake foreshore and relative amounts.

Land Use	Total (m)	Percent (%)	Natural (%)	Disturbed (%)
Natural Area	5753	55.0	50.6	4.4
Park	580	5.5	3.3	2.2
Rural	1273	12.2	7.2	5.0
Single Family	2013	19.3	7.7	11.6
Transportation	831	8.0	1.6	6.4
Total	10450	100	70.4	29.6

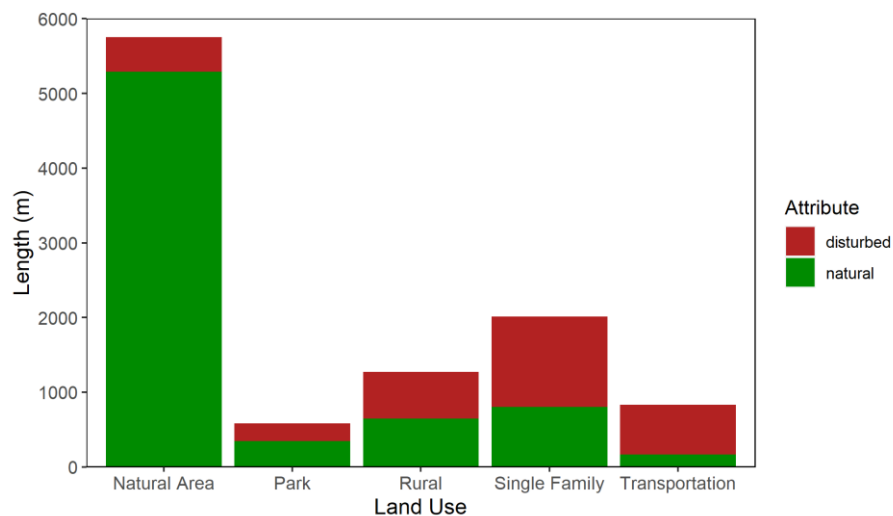


Figure 4. Land use along the St. Mary Lake foreshore relative to the amount of natural and disturbed foreshore.

4.2.4 Aquatic Vegetation and Wetlands

4.2.4.1 Aquatic Vegetation

Aquatic vegetation was present over 6298 m (60.3%) of the littoral zone of St. Mary Lake with variable cover and was present in all segments ranging from 20% to 90% cover. The predominant aquatic vegetation consisted of emergent vegetation (45.1%; Photo 1 to 3), followed by submergent vegetation (29.6%; Photo 4 and Photo 5) and floating vegetation (1.5%; Photo 6). The highest density of aquatic vegetation was associated with wetlands in Segments 1 and 3.

4.2.4.2 Wetland and Flood Ecosystems

Wetland and flood ecosystems occur over an extensive area within the St. Mary River floodplain at the west end of St. Mary Lake in Segment 3 (Photo 1), and in smaller patches along low-gradient sections of the shoreline in other segments. The following wetland and flood site associations were identified:

- The Wm01 Beaked sedge – Water sedge (*Carex utriculata* – *Carex aquatilis*) is the most common and widespread marsh wetland ecosystem in the province and forms an extensive part of the floodplain complex at the west end of the lake. Plant diversity was low and beaked sedge was the dominant species present (Photo 2).
- The Wm02 Swamp horsetail – Beaked sedge (*Equisetum fluviatile* – *Carex utriculata*) marsh wetland ecosystem occurs infrequently in the ICH and is typically found in protected bays of larger lakes, and along slow-moving streams. Wm02 sites were dominated by swamp horsetail and occur within the large floodplain complex and to a lesser extent in Segment 1 (Photo 3).
- The F104 Sitka willow – Red-osier dogwood – Horsetail (*Salix sitchensis* – *Cornus sericea*) low bench flood ecosystem is common at low elevations and occurs on sand bars in active floodplains of sluggish, low-gradient streams where vegetation is dominated by Sitka willow and mountain alder (Photo 4).
- The F106 Sandbar willow – Scouring rush (*Salix exigua* – *Equisetum hyemale*) low bench flood ecosystem typically occurs on sand bars along large river systems subject to prolonged spring flooding with strong currents. F106 sites occur along the St. Mary River at the lake inlet and are defined by abundant sandbar willow.
- The Fm02 Cottonwood – Spruce – Red-osier dogwood (*Populus trichocarpa* – *Picea engelmannii* x *glauca* / *Cornus sericea*) middle bench flood ecosystem supports mature black cottonwood stands with minor amounts of hybrid white spruce and a diverse and abundant shrub layer. Fm02 sites occur along the St. Mary River at the lake inlet in Segment 3 and in a smaller patch at the lake outlet in Segment 8.
- Swamp wetlands ecosystems (Ws) are likely to occur in the floodplain complex at the west end of the lake based on imagery but were not visited during field surveys.
- Several active channel flood sites (Fa) were also prominent along the St. Mary River at the lake inlet.



Photo 1. Aerial view of wetland complex (Segment 3).



Photo 2. Wm01 Beaked sedge – Water sedge marsh (Segment 3).



Photo 3. Wm02 Swamp horsetail – Beaked sedge marsh (Segment 1).



Photo 4. Littoral zone with patchy submergent vegetation and lined by FI04 Sitka willow – Red-osier dogwood – Horsetail flood ecosystem (Segment 3).



Photo 5. Littoral zone with submergent vegetation (Segment 9).



Photo 6. Narrow-leaved bur-reed (*Sparganium angustifolium*) floating vegetation (Segment 2).

4.2.5 Shoreline Characteristics

4.2.5.1 Foreshore Areas

The substrate within the foreshore areas consisted of a mixture of fines, gravel, cobble, and boulder (Table 9, Figure 5). Organic substrate was the dominant type with an overall percentage of 34.1% and was predominately associated with the wetlands (Segments 1 and 3), followed by cobble (25.5%), and boulder (14.7%). Mud (10.8%), sand (8.7%), gravel (5.9%), and fines (0.3%) were also present in lesser amounts. Larger substrates were generally found in Segments 2 and 6, where steeper slopes are present. Large woody debris within the foreshore was the most abundant (i.e., #LWD/distance of shoreline) in Segments 2, 7 and 9.

Table 9. Substrate type along St. Mary Lake foreshore.

Substrate Type	Percent (%)	Length of Shoreline (m)
Boulder	14.7	1537
Cobble	25.5	2662
Fines	0.3	29
Gravel	5.9	619
Mud	10.8	1126
Organic	34.1	3562
Sand	8.7	914
Total	100	10450

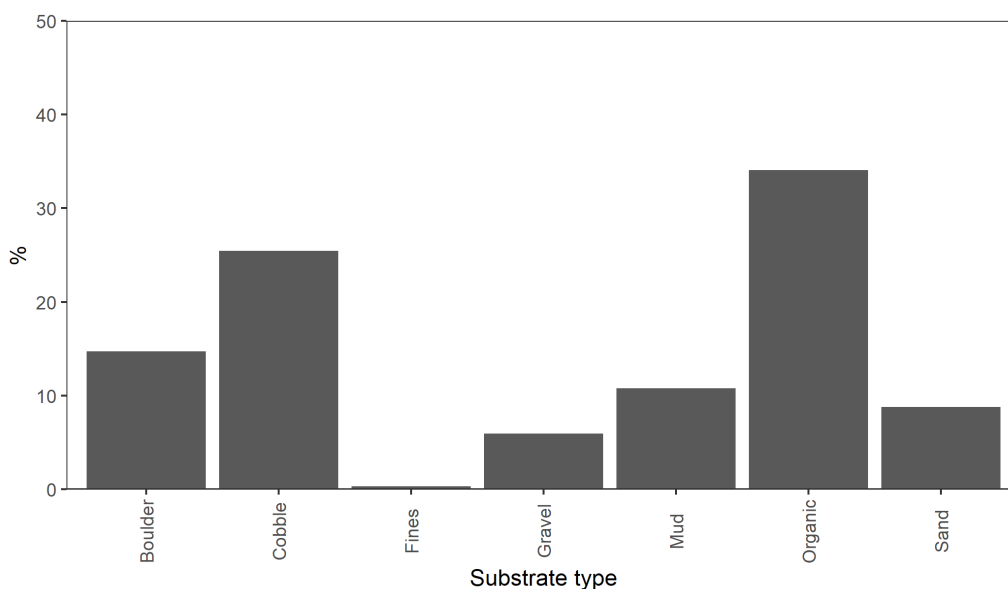


Figure 5. Substrate type along the St. Mary Lake foreshore.

4.2.5.2 Littoral Areas

Most of the segments (7 segments or 83.3% of the total shoreline) had wide littoral zones (>50 m) that ranged from 60 to over 200 m in width. The widest littoral zones were associated with the floodplain at the west end of the lake and the lake outlet at the east end. Littoral zones ranging from 10 to 50 m made up the remainder (16.7%, Segments 2 and 5). The substrate within the littoral zone was dominated by mud and organics (55.7% and 33.1%, respectively), with some fines (4.7%) in Segments 3 and 9, and cobble (3.5%) in Segments 6 to 8. Gravel and boulders were scarce totalling 1% and 0.5% respectively (Table 10). Segment 8 had the greatest amount of large woody debris within the littoral zone which corresponds to the lake outlet and presence of remnant pilings where large woody debris has accumulated.

Table 10. Substrate type along the St. Mary Lake littoral area.

Substrate Type	Percent (%)	Length of Shoreline (m)
Boulder	0.5	51
Cobble	3.6	371
Fines	4.7	491
Gravel	1.0	108
Mud	55.7	5824
Organic	33.1	3461
Sand	1.4	146
Total	100	10450

4.2.5.3 Riparian Vegetation

Upland forests surrounding the lake are dominated by Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*), and western larch (*Larix occidentalis*), with varying amounts of hybrid white spruce (*Picea engelmannii* x *glauca*), paper birch (*Betula occidentalis*), western redcedar (*Thuja plicata*), and western white pine (*Pinus monticola*). The shrub layer is diverse and well-developed. Very dry south-facing slopes above the north side of the lake have rocky talus and rocky outcrops with scattered mature Douglas-fir. Cooler aspects on the south side of the lake have more dense mixed forest with more spruce. Mature black cottonwood (*Populus trichocarpa*) stands occur along the immediate shoreline, with varying amounts of paper birch and mixed conifers.

Riparian vegetation (Vegetation Band 1) was a mixture of natural wetland (44.1%), mixed forest (30.5%), shrubs (17.4%), and broadleaf forest (8.0%). Overhanging vegetation was observed in all segments and was present along ~ 5124 m (49%) of the lake shoreline. The south side and the wetland at the west end of the lake (Segments 1 to 3) had the most overhanging vegetation.

The widths of Vegetation Band 1 ranged from 5 to 20 m and three of the nine segments had continuous distribution of riparian vegetation (Segments 1 to 3) while the rest had a patchy distribution. Tall shrub was the dominant stage across segments (61.6%) with mature forest (26.5%) as the subdominant stage. Young forest accounted for 12.0% of the segments.

Upland vegetation (Vegetation Band 2) was a mixture of mixed forest (46.1%), broadleaf (44.1%), and coniferous forest (9.8%), and the dominant stage in Vegetation Band 2 was mature forest (92.0%) with young forest as subdominant (8.0%).

Of the nine segments, three had veteran trees and eight had snags. Segments with fewer (<5) snags were associated with areas of sparse tree cover, young forest, the lake outlet, and areas with recent clearing (Segments 1, 4, 8 and 9).

4.2.6 Fish Species Information

St. Mary Lake is an important feature of the St. Mary River drainage, located approximately mid way up the drainage, it delineates the watershed into lower and upper sections and has implications for fish species distribution and migration. Fish species reported in St. Mary Lake include Bull Trout, Burbot, Kokanee, Longnose Sucker (*Catostomus catostomus*), Mountain Whitefish, Rainbow Trout, and Westslope Cutthroat Trout. Fish stocking in St. Mary Lake was conducted sporadically from 1918 to 1933, and on an almost yearly basis from 1938 to 1962, and in 1974 and 1989 (Habitat Wizard 2022) with Kokanee, Rainbow Trout, and Westslope Cutthroat Trout. Stocking of Rainbow Trout (1918) and Westslope Cutthroat Trout (1929-1988) was also undertaken sporadically in the St. Mary River from 1918 to 1988.

Burbot is the only freshwater representative of the cod family, Gadidae (McPhail and Paragamian 2000) and is commonly referred to as Ling or Lingcod. The Burbot in the St. Mary River watershed are important to the Upper Kootenay River Burbot population (Pers. comm. Lamson 2023). The Upper Kootenay River population has seen numbers collapse, except for the St. Mary River remnant Burbot population that shows some recruitment (Pers. comm. Lamson 2023). The collapse of the Upper Kootenay River Burbot population has been attributed to a variety of factors such as overharvesting, habitat alterations, hydrological changes, and reduced water quality including contaminants and water temperature increases (EKBSWG 2019; Cope 2016). Increasingly restrictive fishing regulations were put in place by the BC Ministry of Environment since 2006, including the closure of Burbot fishery on St. Mary Lake in 2006; however, the Kootenay River population appeared to continue to decline. This led to the formation of the East Kootenay Burbot Scientific Working Group (EKBSWG) in 2015. In conjunction with efforts to improve habitat for Burbot in the Kootenay River, recommended actions include implementing an aquaculture stocking strategy and monitoring plan (EKBSWG 2019).

Westslope Cutthroat Trout, which are indigenous to the Rocky Mountains, have experienced a reduction in population abundance and occupy a fraction of their historic range (Morris and Prince 2004). This has resulted in the species being designated as Blue-listed provincially and a species of Special Concern federally (Species at Risk Act (SARA) Schedule 1; Of Special Concern). The main threats identified for this population include habitat degradation, angling pressures, and introgressive hybridization with closely related species (Rainbow Trout and Yellowstone Cutthroat Trout (COSEWIC 2016)).

A radio telemetry study conducted in the St. Mary River watershed from 2001 to 2004 identified three life history strategies of Westslope Cutthroat Trout: lacustrine-adfluvial (move between lakes and streams or rivers), fluvial-adfluvial (move between mainstem rivers and tributary habitats) and resident (stay within one stream) forms (Morris and Prince 2004). The location of St. Mary Lake has implications on the distribution and life strategies utilized within the St. Mary River drainage. The radio telemetry study found that the Westslope Cutthroat Trout populations downstream and upstream of the lake did not readily mix. It was found that the downstream population had very little movement into St. Mary Lake, and either remained within a restricted section of the St. Mary River (resident) or migrated downstream into the Kootenay River to overwinter (fluvial-adfluvial). The population upstream of the lake either migrated into

St. Mary Lake to overwinter (lacustrine-adfluvial) or remained upstream (resident-fluvial and fluvial-adfluvial). Additionally, this demarcation between the populations upstream and downstream of the lake has other implications; the downstream population was found to be more vulnerable to genetic introgression with Rainbow Trout, a factor which has been identified as one the most significant threat to Westslope Cutthroat Trout (Morris and Prince 2004). The presence of St. Mary Lake may act as a deterrent to upstream migration and appears to provide some protection to the upstream population as samples collected upstream showed no evidence of hybridization.

Bull Trout, which is also considered a species at risk and has been Blue-listed provincially, were reported throughout the St. Mary River watershed.

Data for freshwater mussels in St. Mary Lake is limited. St. Mary Lake was identified as a site for future survey efforts during the 2007 surveys (Moore and Machial 2007). No mussels were identified during surveys undertaken in 2008 at Avery Road Public Access and at the mouth of the lake (Government of BC, 2015), though surveys at these two areas are not sufficient to conclusively determine the absence of mussels within the lake. Adult freshwater mussels have a limited ability to disperse and are sensitive to changes in the foreshore and littoral zones. No freshwater mussels were observed during our re-FIMP survey in 2022, though survey methods did not incorporate a thorough inventory for these species, and lack of observation does not necessarily imply that they are absent.

The importance of St. Mary Lake to local fish species is undeniable as it provides important overwintering habitat for the at risk Westslope Cutthroat Trout (Species at Risk Act (SARA) Schedule 1; Of Special Concern), it appears to provide some protection to the upstream Westslope Cutthroat Trout population against introgressive genetic hybridization with Rainbow Trout, and it provides relatively unaltered habitat to the St. Mary Burbot population which is a remnant population of the declining Upper Kootenay River Burbot population that shows signs of recruitment. The lake may also be used by other resident and migrating fish species accessing the spawning and rearing habitat in the St. Mary River and tributary streams. The wetlands, shorelines and associated riparian areas surrounding the lake provide important functions for the health of the aquatic community and fish species utilizing the lake. The abundance of emergent and submergent aquatic vegetation provide rearing habitat and food sources. Spawning habitat value is generally low within St. Mary Lake, especially for salmonids, due to the presence of fine substrate consisting predominantly of mud and organics along most of the littoral zone. Important staging areas along the lake are found in Segments 3, 7, 8, and 9 which encompass the inlet and outlet of the lake. Given that Segment 8 is small, it is likely that fish utilize Segments 7 and 9 as well when entering or leaving the lake. Substrate composition at the lake outlet (Segment 8) had more cobbles due to greater scouring associated with an increase in water velocity (Photo 7). Large woody debris at the lake inlet (Photo 8) provides valuable cover and the large wetland complex provides cover, feeding, breeding and rearing habitat for various life stages. These habitat features are supportive of both resident and migratory fish populations in St. Mary Lake.



Photo 7. Lake outlet (Segment 8).



Photo 8. Large woody debris in St. Mary River near the inlet of the lake (Segment 3).

4.2.7 Wildlife and Wildlife Habitat Observations

4.2.7.1 Mammals

The shoreline and riparian areas of St. Mary Lake provide suitable habitat for a variety of small and large mammals. Provincial records (WSI data) include observations of caribou (*Rangifer tarandus*), elk (*Cervus elaphus*), moose (*Alces alces*), mule deer (*Odocoileus hemionus*), cougar (*Puma concolor*), American badger (*Taxidea taxus jeffersonii*) and several species of bats in the vicinity of the lake (BC CDC 2022a). The majority of the St. Mary Lake and its shoreline are designated winter range for mountain goat (Ungulate Winter Range unit #U-4-002).

The following mammal signs were observed during the survey in 2022:

- Elk tracks were observed along the shoreline in Segment 1.
- White-tailed deer (*Odocoileus virginianus*) tracks were observed along the shoreline in Segment 3, and two were observed in the drone footage at the west end of Segment 9.
- A beaver (*Castor canadensis*) lodge was present near the inlet of St. Mary River into the west end of the lake (Segment 3, Photo 9), with several trails throughout the adjacent marsh (Photo 10).
- Common muskrat (*Ondatra zibethicus*) was observed swimming along the shore in Segment 3.



Photo 9. Beaver lodge in St. Mary Lake at west end next to wetland complex (Segment 3).



Photo 10. Beaver trail next to lodge (Segment 3).

4.2.7.2 Birds

The citizen science application eBird (2022) lists 99 species of birds observed at St. Mary Lake. Thirty-four species are included in provincial wildlife species inventory (WSI) datasets in the vicinity of the lake (BC CDC 2022a). Several species of waterfowl are known to use the lake; commonly observed species are Canada Goose (*Branta canadensis*), Mallard (*Anas platyrhynchos*), Common Merganser (*Mergus merganser*), Common Loon (*Gavia immer*), Green Winged Teal (*Anas carolinensis*), Red-necked and Horned Grebes (*Podiceps grisegena* and *P. auritus*), Tundra and Trumpeter Swans (*Cygnus columbianus* and *C. buccinator*), and Barrow's and Common Goldeneye (*Bucephala islandica* and *B. clangula*). Several other birds are reported in eBird and provincial records, including Dark-eyed Junco (*Junco hyemalis*), Pine Siskin (*Spinus pinus*), American Robin (*Turdus migratorius*), Snow Bunting (*Plectrophenax nivalis*), Chipping Sparrow (*Spizella passerine*) and Cedar Waxwing (*Bombycilla cedrorum*). Several nesting cavities were observed in trees along the lake shore, particularly along Segments 2 and 6. Cavity nesters commonly reported around the lake include Hairy Woodpecker (*Dryobates villosus*), Black-capped Chickadee (*Poecile atricapillus*), Red-breasted Nuthatch (*Sitta canadensis*), Violet-green Swallow (*Tachycineta thalassina*), Tree Swallow (*Tachycineta bicolor*), Pileated Woodpecker (*Dryocopus pileatus*) and Northern Flicker (*Colaptes auratus*).

Great Blue Heron (*Ardea Herodias*), Bald Eagle (*Haliaeetus leucocephalus*) and Osprey (*Pandion haliaetus*) are reported in eBird and provincial records around the lake, and several individuals of these species were observed during the 2022 survey. These species typically have large stick nests, which are afforded year-round protection under Section 34(b) of the *Wildlife Act*. No nests characteristic of these species were observed during the 2022 survey, however suitable nesting trees are present.

The following birds were observed during the survey in 2022:

- Several Osprey and Bald Eagles were observed flying overhead (Photo 11).
- Common Loon (*Gavia immer*) were heard calling on the lake.

- Belted Kingfisher (*Megaceryle alcyon*) were heard and seen flying along the shoreline near St. Mary Lake Regional Park (Segment 8).
- Great Blue Herons were observed roosting on large woody debris (Photo 12) and a dock at the west end of the lake, and flying overhead during surveys.
- Several Spotted Sandpiper (*Actitis macularius*) were seen foraging on the shoreline throughout the survey.
- A family of Goldeneye ducks were present on the lake during both days of the survey.



Photo 11. Bald Eagle flying overhead.



Photo 12. Great Blue Heron (Segment 3).

4.2.7.3 Reptiles and Amphibians

Potential amphibian and reptile habitat was abundant around the lakeshore, including high value amphibian habitat in wetland complexes for amphibians, and rocky areas with southern exposure suitable for basking reptiles (Photo 13). Columbia spotted frog (*Rana luteiventris*), western toad (*Anaxyrus boreas*), common gartersnake (*Thamnophis sirtalis*), northern rubber boa (*Charina bottae*) and western skink (*Plestiodon skiltonianus*) are reported within the vicinity of St. Mary Lake (BC CDC 2022a).

The following herptiles were observed during the survey in 2022:

- One Columbia spotted frog was observed on the shore at the marsh at the west end of the lake (Segment 3, Photo 14).
- Several garter snakes (*Thamnophis* sp.) were observed basking on the rocks on the north side of the lake just west of Avery Road Public Access (Segment 4).



Photo 13. South facing rocky shore with potential habitat for reptiles (Segment 6).



Photo 14. Columbia spotted frog (Segment 3).

4.2.8 Species and Ecosystems at Risk

Species and ecological communities at risk are tracked provincially (Red- and Blue-listed) by the BC Conservation Data Centre (CDC), and federally (designated as 'Special Concern', 'Threatened', 'Endangered', 'Extirpated' or 'Extinct') by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Legal protection for species and their habitats in Canada is enacted through the *Species at Risk Act* (SARA) based on research and recommendations from COSEWIC. The BC Species and Ecosystems Explorer (BC CDC 2021a) was queried to generate a list of potentially occurring at-risk taxa and ecological communities in the study area using the following criteria:

- BC Conservation Status: Red (Extirpated, Endangered, or Threatened) OR Blue (Special Concern)
- COSEWIC Status: Extinct OR Extirpated OR Endangered OR Threatened OR Special Concern
- Area of Interest: User Defined Polygon (5 km buffer around St. Mary Lake)

Results from the BC Species and Ecosystems Explorer query were filtered to remove unranked taxa redundancies where both populations and taxa are listed (e.g., western painted turtle) and multiple taxonomic level classifications (e.g., wolverine), and highly unlikely species to occur due to known habitat availability and distributions (e.g., white sturgeon), yielding 110 taxa with provincial and/or federal at-risk conservation rankings with potential occurrence in the vicinity of St. Mary Lake (BC CDC 2021a; Appendix 3). The list included 1 amphibian, 39 birds, 3 fish, 21 insects, 3 lichens and mosses, 14 mammals, 17 molluscs, 9 plants, and 3 reptiles.

The CDC iMap tool (BC CDC 2022b), the Global Biodiversity Information Facility (GBIF 2022), iNaturalist (2022) and eBird (2022) were further queried for publicly available wildlife species records within a 5 km buffer around St. Mary Lake. Species confirmed within this area are shown in Table 11.

Table 11. Species at risk with confirmed presence within 5 km of St. Mary Lake.

Class	Scientific Name	English Name	BC List ¹	COSEWIC ²	SARA ²	Comment
Amphibian	<i>Anaxyrus boreas</i>	Western Toad	Yellow	SC	SC	WSI data
Bird	<i>Aechmophorus occidentalis</i>	Western Grebe	Red	SC	SC	GBIF, eBird
Bird	<i>Ardea herodias herodias</i>	Great Blue Heron, <i>herodias</i> subspecies	Blue	SC	-	eBird, WSI data
Bird	<i>Chordeiles minor</i>	Common Nighthawk	Blue	SC	T	GBIF, eBird
Bird	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Yellow	SC	SC	eBird
Bird	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Yellow	SC	T	GBIF
Bird	<i>Cygnus columbianus</i>	Tundra Swan	Blue	-	-	WSI data
Bird	<i>Falco peregrinus anatum</i>	Peregrine Falcon, <i>anatum</i> subspecies	Red	NAR	SC	GBIF
Bird	<i>Nannopterum auritum</i>	Double-crested Cormorant	Blue	NAR	-	GBIF, eBird
Bird	<i>Podiceps auritus</i>	Horned Grebe	Yellow	SC	-	GBIF, eBird
Bird	<i>Sphyrapicus thyroideus</i>	Williamson's Sapsucker	Blue	E	E	GBIF
Fish	<i>Oncorhynchus clarkii lewisi</i>	Cutthroat Trout, <i>lewisi</i> subspecies	Blue	SC	SC	iNaturalist, iMapBC
Fish	<i>Salvelinus confluentus</i>	Bull Trout	Blue	NAR	-	iMapBC
Mammal	<i>Lasiurus cinereus</i>	Hoary Bat	Blue	-	-	WSI data
Mammal	<i>Myotis lucifugus</i>	Little Brown Myotis	Blue	E	E	WSI data
Mammal	<i>Taxidea taxus</i>	American Badger	Red	E	E	WSI data
Plant	<i>Pinus albicaulis</i>	whitebark pine	Blue	E	E	Present at higher elevations, north of St. Mary Lake (WSI data)
Reptile	<i>Plestiodon skiltonianus</i>	Western Skink	Blue	SC	SC	WSI data

¹Red: Species that is at risk of being lost (extirpated, endangered, or threatened) within British Columbia. Blue: Species considered to be of special concern within British Columbia. ²(E)Endangered: Facing imminent extirpation or extinction. (T)Threatened: Likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction. (SC)Special concern: May become a threatened or an endangered species because of a combination of biological characteristics and identified threats. (NAR)Not at Risk: A species that has been evaluated and found to be not at risk federally.

Incidental observations of Oregon spotted frog (*Rana pretiosa*) have been reported within St. Mary Lake, (BC CDC 2022b), however these were likely misidentified as this species is restricted in range to the Fraser Valley in the Lower Mainland (COSEWIC 2011).

Federally defined critical habitat polygons for the following species overlap the 5 km study area:

- Woodland caribou (Southern Mountain population): mapped polygon of final status critical habitat overlaps St. Mary Lake and the entire 5 km buffer around the lake. This includes low elevation range habitat on the west shore of the lake, and “matrix range” (i.e., areas within 30 km of core habitat that influence caribou activities) around the rest of the lake.

- Whitebark pine (*Pinus albicaulis*): mapped polygons of proposed critical habitat are present on the slopes to the north and south of St. Mary Lake. These polygons are based on the known range of the species with a 2 km buffer to allow for potential regeneration and recovery zone. The known range of this species is present at higher elevations than St. Mary Lake, though the 2 km regeneration and recovery zone extends down to the lake shore on the north side of the lake.
- American badger (jeffersonii subspecies; *Taxidea taxus jeffersonii*): a mapped polygon of proposed critical habitat overlaps land on the north and south side of St. Mary River, approximately 4 km downstream of St. Mary Lake.

Two at-risk ecological communities were identified along the shoreline of St. Mary Lake:

- The Fm02 Black cottonwood – Hybrid white spruce / Red-osier dogwood flood ecological community (Blue-listed) occurs in large patches within Segment 3, in narrow bands along the shoreline in Segments 4-9, and a small patch near the outlet in Segment 8.
- The Wm02 Swamp horsetail – Beaked sedge (*Equisetum fluviatile* – *Carex utriculata*) marsh ecological community (Blue-listed) occurs within Segment 3 and a small area was identified within Segment 1.

4.2.9 Shoreline Modifications

The predominant shoreline modification consisted of roads with the St. Mary Lake Road running along the entire length of Segment 6 (Photo 15) and various access roads on private land (Photo 16). In total, roads were present along ~ 2200 m (21%) of the entire lake shore. The proximity of roads to the shoreline varied along the lake with several sections with only a narrow riparian buffer retained. St. Mary Lake Regional Park at the east end of the lake provides access for recreational users to most of the foreshore in Segment 8, including a gravel boat launch area where vehicles can drive down to the lake (Photo 19). The Avery Road Public Access area also has an access trail down to the lake with a boat launch for non-motorized boats (Photo 18). Pilings (n=~35) were present in Segments 1, 3, and 8 of the lake (Photo 19), with an additional ~110 submerged pilings that had been cut off at the base near the boat launch in St. Mary Lake Regional Park (Photo 20), remnants of the historic forestry and sawmill operation at this location. Several of the private properties on the north side of the lake had docks (n=9) or swim floats (n=2). Other shoreline modifications included retaining walls (n=2, covering ~ 70 m of shoreline), groynes (n=2), fences (n=1) and gazebos (n=2; classified as “other”), and a large slash pile (n=1; classified as other) (Photo 21 to 24).

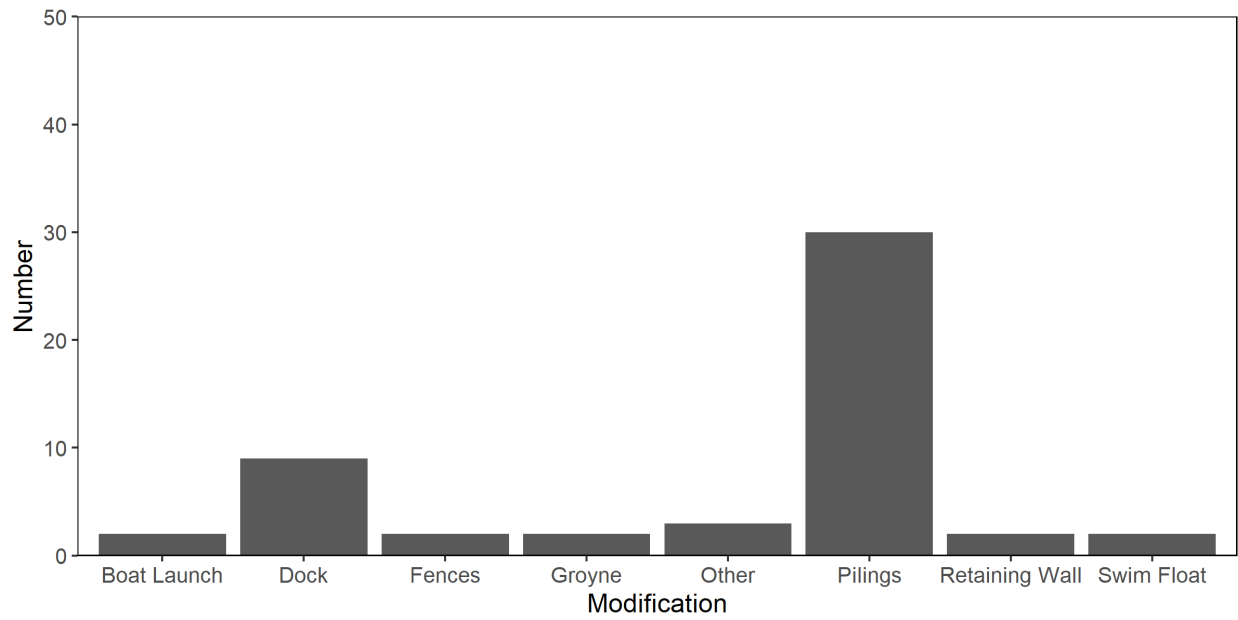


Figure 6. Foreshore modifications at St. Mary Lake.



Photo 15. St. Mary Lake Road (Segment 6).



Photo 16. Private roads behind narrow riparian buffer (Segment 9).



Photo 17. St. Mary Lake Regional Park including road, parking and boat launch (Segment 8).



Photo 18. Non-motorized boat launch at Avery Road Public Access (Segment 5).



Photo 19. Old pilings at east end of lake with large woody debris (Segment 8).



Photo 20. Cut-off pilings near the boat launch (Segment 8).



Photo 21. Single family development with dock (Segment 5).



Photo 22. Single family development with docks and retaining wall on the right (Segment 7).



Photo 23. Single family development with dock and gazebo (Segment 7).



Photo 24. Slash pile at the west end of Segment 9.

4.2.10 Level of Impact

Segments with a high level of impact (>50%) were associated with areas of residential developments and roads on the north side of the lake and southwest of the St. Mary Lake Regional Park (Segments 4, 5, 6 and 9), totalling 2444 m (23.4%) of shoreline (Table 12).

Segments 1, 3, 7, and 8 were assessed as having medium (10-50%) levels of impact, totalling 6862 m (65.7%) of shoreline. Developments along these segments included roads and riparian clearing (Segment 1), residential developments (Segment 7) and St. Mary Lake Regional Park (Segment 8). Developments along Segment 3 were associated with property development at the northwest end of the segment. Segment 2 (1143 m, 10.9% of shoreline) was assessed as having no impact.

Table 12. Summary of score rating for each segment.

Level of Impact	Shoreline Length (m)	Shoreline %	Segments
High (>50%)	2444	23.4	4, 5, 6, 9
Medium (10-50%)	6862	65.7	1, 3, 7, 8
Low (<10%)	0	0	None
None (0%)	1143	10.9	2

4.2.11 Comparison of 2010 FIM and 2022 re-FIM Data

When comparing the data collected in 2022 to the data from the original survey in 2010, we noted some variances that we expect are attributed to updates to survey methods or differences in interpretation of category descriptions, rather than actual changes in the shoreline conditions. For the purposes of this report, we have focused our comparisons mainly on variances that reflect actual biophysical changes since the 2010 survey. Discrepancies that were noted between the data are outlined below:

- Foreshore and littoral substrates: Several of the segments had inconsistencies in the foreshore substrate types observed in 2010 and 2022. Generally, 2010 survey recorded higher proportions of sand and marl recorded than in 2022, and lower proportion of gravel and boulders. Notably, no marl was observed in 2022. We consider it unlikely that foreshore substrates would have changed as much as reflected by the data in the relatively short period of time between surveys and expect that the differences are due to interpretation of the substrate category descriptions between years.
- Vegetation Band 1 and 2: The survey in 2010 only recorded riparian vegetation for Band 1 rather than Band 1 and 2. It appears that the data collected for Band 1 covers the entire riparian area, as it does not include shrubs or broadleaf classes, and only includes the mature forest stage.
- Overhanging vegetation: This was recorded in the 2010 data as present or absent, rather than a relative percentage of the shoreline within each segment.

4.2.11.1 Natural vs. Disturbed Shoreline

The total length of disturbed shoreline has increased from 2346 m to 3090 m since the 2010 survey, representing an increase of disturbed shoreline of 744 m (~7.1%) of the lake total shoreline over a 12-year period. However; when using an adjusted estimate of disturbance for Segment 3 (see discussion below), this percent difference is closer to 5.4% (~560 m) and increased from 2530 m to 3090 m (Figure 7). The greatest rates of change were observed in Segments 1 and 9, as well as in a portion of Segment 3. The overall rate of change of 5.4% corresponds with an estimated rate of change of 47 m (or 0.4% of the shoreline) per year, although much of these changes likely occurred over one- or two-year period. This high rate of change is a concern especially in a system that supports at-risk Westslope Cutthroat Trout, an important remnant Burbot population, the presence of sensitive ecosystems such as Cottonwood Forests and an important wetland complex. Additionally, the relative impacts associated with these disturbances are generally more pronounced given the relatively small size of the lake. A description of the changes observed in each segment is provided below.

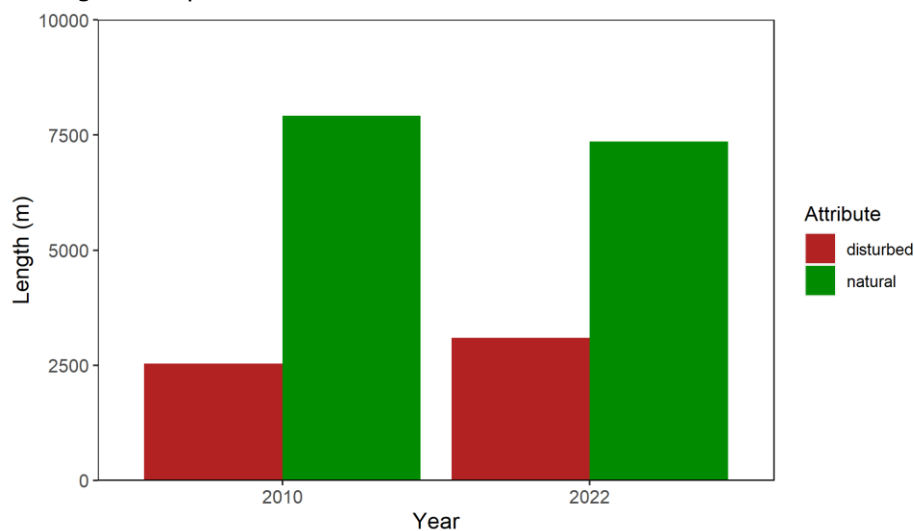


Figure 7. Comparison of the amount of natural and disturbed shoreline between 2010 and 2022 surveys.

Segments 6, 7, and 8 were estimated as having the same level of disturbance in 2022 as in the 2010 survey. Through review of video footage from 2010, it was noted that logs have been placed along several section of the road into St. Mary Regional Park in Segment 8, restricting vehicle access into the foreshore area. This did not result in a change to the assessed level of disturbance for Segment 8 but is considered an improvement. The following differences were observed for Segments 1, 2, 3, 4, 5 and 9:

- Segment 1: The 2010 survey classified all of Segment 1 as natural shoreline (Photo 25). In 2022, 80% of the shoreline was classified as natural, as the eastern and central portion of the privately-owned property along this section had been subject to recent logging activities (Photo 26), with vegetation clearing and new roads within the 50 m riparian boundary in these areas. This resulted in a reclassification of this segment from none to medium level of impact.



Photo 25. Photo showing undisturbed slopes above Segment 1 in 2010.



Photo 26. Roads and clearing associated with logging activities at east end of Segment 1.

- Segment 2: The 2010 survey classified 5% of Segment 2 as disturbed, with roads as the main modifier. Historical aerial imagery suggests that a road may have previously run along the shoreline of Segment 2, however this appeared to have been grown in, as it was not discernable in the field in 2022. Accordingly, this segment was classified as 100% natural in 2022. This resulted in a reclassification of this segment from low level of impact to none.
- Segment 3: The 2010 survey classified 1% of Segment 3 as disturbed, based on a road that runs along ~800 m of the shoreline at the northwest end of the segment near the wetland complex. Through review of historic aerial imagery, and assuming a road width of ~10 m, we suggest that the overall disturbance would have been more accurately assessed as ~5%. In 2022, Segment 3 was classified as 10% disturbed in consideration of property development on two private properties along the northern portion of this segment. This includes property development that has occurred since 2014 along ~250 m of shoreline on a private property located at the northwest end of the segment near the end of the wetland complex/small pond (Photo 27). Development activities here have included the conversion of intact mature forest and sensitive riparian vegetation habitat into agricultural fields, and the installation of a dock. No photos of this property are available from the

2010 survey, and this area was not accessible by boat during the 2022 survey, however based on review of historic aerial imagery and the 2022 drone footage, it appears that a mix of mature mixed forest, cottonwood riparian and shrub riparian habitat may have been removed. This area contained sensitive habitat that makes up an important part of the wetland complex and would have likely been utilized by a number of bird species and mammals. Additional clearing of riparian vegetation was also completed along a previously disturbed ~ 130 m section of shoreline along the north side of Segment 3, just south of St. Mary Lake Road (Photo 28). Based on review of aerial and drone footage, it appears that a mostly young mixed forest has been removed in this section. This resulted in a reclassification of this segment from low level of impact to medium.



Photo 27. Recent property development at the northwest end of Segment 3.



Photo 28. Recent riparian clearing associated with a previously disturbed area at the north end of Segment 3, just south of St. Mary Road.

- Segment 4: In 2010, Segment 4 was classified as 60% disturbed. The percentage of shoreline classified as disturbed increased from 60% to 70% (representing ~ 42 m of shoreline) in the 2022 survey. This difference is mainly attributed to increased residential/rural development, including one new single-family residence and associated driveway at the west end of the segment (Photo 29 and 30) and additional structures placed on existing properties. The developments have impacted the foreshore area principally through the removal of riparian vegetation.



Photo 29. Undeveloped shoreline filmed in 2010 at west of Segment 4.



Photo 30. New single-family residential house along same section of shoreline in 2022.

- Segment 5: The percentage of shoreline classified as disturbed increased from 60% to 70% (representing ~ 60 m of shoreline) in the 2022 survey. This difference is mainly attributed to an additional building on a residential property (Photo 31 and 32) and the boat launch at Avery Road Public Access (Photo 18). The developments have impacted the foreshore area principally through the removal of riparian vegetation.



Photo 31. Representative photo of a shoreline section along Segment 5 in 2010.



Photo 32. The same section of shoreline in 2022, with a new house on the left side of the photo.

- Segment 9: The percentage of shoreline classified as disturbed increased from 40% to 65% (representing ~ 148 m of shoreline) in the 2022 survey. This difference is attributed to vegetation clearing and residential development that has occurred along the private property since the previous survey (Photo 33 and 34). This resulted in a reclassification of this segment from medium to high level of impact.



Photo 33. Representative photo of a shoreline section along Segment 9 in 2010.



Photo 34. Vegetation clearing and residential development along the shoreline of Segment 9.

4.2.11.2 Land Use

With the exception of Segment 6, all segments had either a partial or total re-classification of land use categories assigned in the 2022 vs. the 2010 survey. Some of these re-classifications were a result of obvious changes to land use since the 2010 survey, whereas others are reflective of interpretation of land use categories and definitions in the current methods:

- Segment 1: The entire segment was classified as natural area in 2010. In 2022, this segment was classified as rural, due to property development and logging activities.
- Segment 2: In 2010, 95% of this segment was classified as natural area and 5% as recreation. In 2022, the entire length of this segment was classified as natural area, as no recreational features were observed. It is not evident in the data collected in 2010 what section of this segment was designated as recreation, though through correspondence with Living Lakes Canada we understand that a portion of the Segment may have been used for camping or shoreline use.
- Segment 3: The majority (94%) of this segment was classified as natural area in 2010. In 2022, 20% and 5% of the shoreline were classified as rural and single-family residential use respectively due to the development that has occurred at the northwest end of the lake. Accordingly, a lower proportion of the shoreline (75%) was considered as natural area in 2022.
- Segment 4: In 2010, 60% of the shoreline was classified as single-family residential and 40% as commercial. In 2022, the entire shoreline was classified as single-family residential, as no obvious signs of commercial businesses were noted in the field or found while searching for local businesses online.
- Segment 5: In 2010, 80% of the shoreline was classified as natural area and 20% as single-family residential. In 2022, 90% was classified as single-family residential and 10% as park (Avery Road Public Access). Comparison of photos and recorded disturbance levels from this segment in 2010 and 2022 suggest that much of this area was privately owned in 2010, and that the change in land

use classification is reflective of the updated category definitions in methods rather than conversion of land from natural areas to residential properties.

- Segment 7: The proportion of shoreline classified as single-family residential increased from 70% to 80% in 2022 with consideration to residential development that has occurred in this segment. Accordingly, the proportion of the shoreline classified as natural area decreased from 30% to 20%.
- Segment 8: The entire section of shoreline was classified as natural area in 2010, as the official regional park did not exist at that time, however the area was unofficially used for recreational purposes. In 2022, 40% of the shoreline was classified as natural area and 60% as park use, as the settings of St. Mary Lake Regional Park aligned with the park definition for land use described in current methods.
- Segment 9: In 2010, this segment was classified as 60% natural area and 40% as park. In 2022, it was classified as 80% rural and 20% single-family residential, in light of the development that has occurred on the property.

4.2.11.3 Aquatic Vegetation

The total length of shoreline with aquatic vegetation was comparable between years, with some form of aquatic vegetation recorded in 6085 m of shoreline in 2010, and 6298 m in 2022. Submergent vegetation was absent from Segments 1 and 6 in 2010 but was observed in all segments in 2022. Emergent vegetation was absent from Segments 1 and 7 in 2010 but pockets of emergent vegetation were observed in all segments except Segment 9 in 2022. No floating vegetation was recorded in 2010 (though review of the 2010 video footage suggests some was present within Segment 2), and small amounts were observed in Segments 2 and 3 in 2022. These differences do not appear to be related to shoreline development activities and are expected to be related to natural variation in growth between years and seasons (the 2010 survey was conducted approximately one month earlier than 2022 (mid-July vs. mid-August)).

4.2.11.4 Level of Impact

The level of impact classification for Segments 4, 5, 6, 7, and 8 did not change between the 2010 and 2022 surveys. The classification for segments on the southwest side of the lake (Segments 1, 2, 3 and 9) changed as described below:

- Segment 1: The 2010 survey classified the level of impact for this segment as “None”, whereas in 2022 the level of impact had increased to medium (10-50%) due to vegetation clearing and new roads along the shoreline.
- Segment 2: The 2010 survey classified the level of impact for Segment 2 as low (<10%), whereas in 2022 it was assessed as none. This is reflective of the influences from road along the shoreline that was recorded in 2010 but was overgrown and not observed in 2022.
- Segment 3: The 2010 survey classified the level of impact for Segment 3 as low (<10%) with an estimated 1% impact, however upon review of the road that was present along ~800 m of the shoreline at the northwest end of the segment near the wetland complex, we assessed that the level of impact should have been closer to 5%. The new land development activities observed at

the northwest end of Segment 3 in 2022, resulted in an increased level of impact to 10%, and reclassification of this segment to a medium (10-50%) level of impact.

- Segment 9: The 2010 survey classified the level of impact for segment 9 as medium (10-50%), whereas in 2022 it was classified as high (>50%) in consideration of the logging activities and residential development observed.

4.2.11.5 Shoreline Modifications

The count of shoreline modifications was generally comparable between the 2010 and 2022 surveys (Figure 7):

- The number of retaining walls counted in 2010 was 5, versus only 2 in 2022. Based on review of video footage from 2010 and drone footage from 2022, this difference is expected to be attributed to the following:
 - One retaining wall was counted in Segment 4 in 2010. We expect this may have been an error in data collection (no retaining wall is visible in the 2010 video footage of Segment 4) and may actually refer to a wall associated with the foundation of a large house at the west end of Segment 5. This wall is beyond 5 m from the high water level, so was not recorded as a retaining wall in 2022, per current methods.
 - Four retaining walls were counted in Segment 7 in 2010, versus only 2 in 2022. We expect that the two gazebos were recorded as retaining walls in 2010, whereas we recorded them as “other modifications” in 2022.
- Docks increased from 7 to 9 (1 additional dock each in Segments 3 and 5) and swim floats increased from 0 to 2 (1 each in Segments 5 and 7).
- Floating boat houses decreased from 1 to 0 (not present in Segment 4).
- Groynes decreased from 3 to 2 (only 2, associated with docks, were observed in Segment 7).
- Fences were not counted in 2010, but 1 was counted in 2022 (overlapping Segments 8 and 9).
- Pilings were not counted as their own category in 2010 but were recorded in notes. The 2010 survey noted ~40 pilings, whereas the 2022 survey counted ~30 pilings and ~110 cut off pilings near the boat launch at St. Mary Lake Regional Park. Additionally, most pilings were counted in error in Segment 9 rather than Segment 8 in 2010. We assume that the difference in counts between years is a result of different methods used rather than additional pilings being present (i.e., the ground count in 2010 was not as accurate for enumeration of pilings or determining which segment they were within as supplementing counts with aerial imagery in 2022).
- Three non-categorised (i.e., “other”) modifications were counted in the 2022 survey. These were 2 gazebos in Segment 7, and a slash pile present along the shoreline in Segment 9.

Although the reported values for the percent of shoreline modified by retaining walls was higher in 2022, no additional retaining walls were observed in the recent survey. The differences in reported values (~0.1 m in 2010 vs. ~76 m in 2022) are attributed to calculation errors in the 2010 report. An overall increase was also observed in 2022 for the percent of shoreline that was modified by roads, though it is not immediately

obvious from the 2010 data how this was previously calculated. Roadways were reported to impact ~76 m of shoreline in 2010, whereas this number was much higher (2205 m) in 2022. The percent of shoreline impacted by roadways in each segment appears to have been collected as a present/absent field in 2010 (i.e., data was either 0 or 1 value), so the actual distance was likely mistakenly converted to a number for the 2011 AHI, such that the value presented is lower than the conditions that were observed. Based on review of historical aerial imagery and video footage from 2010, the main differences in shoreline modifications associated with new roads are in Segments 1 and 9.

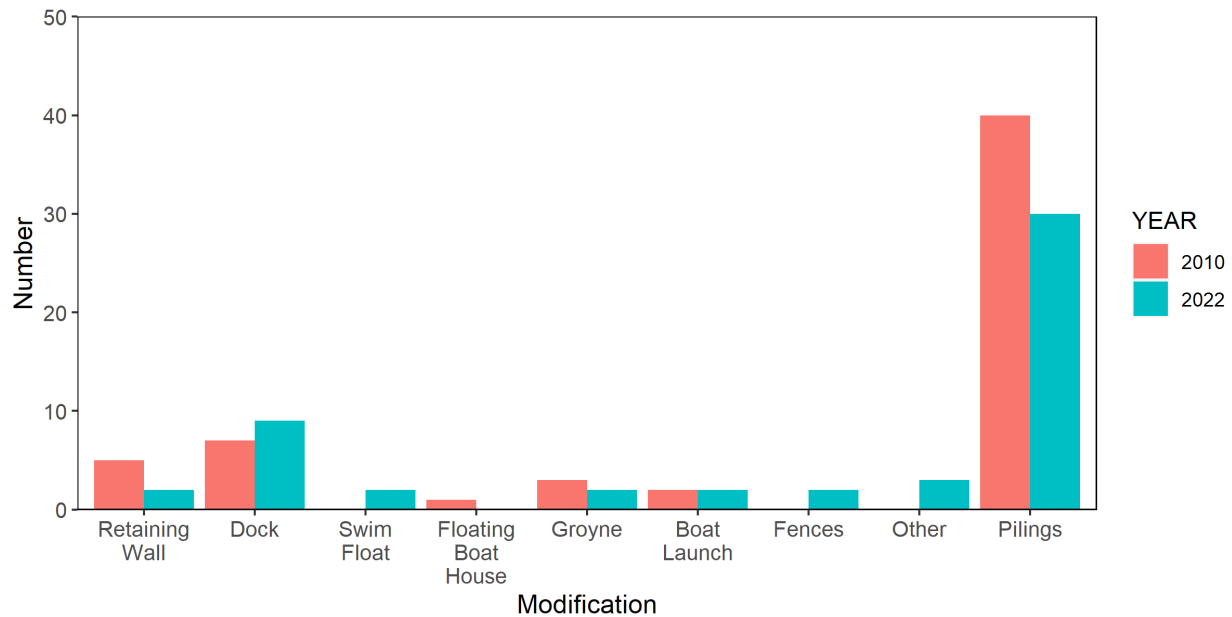


Figure 8. Comparison of the number of shoreline modifications counted on the foreshore of St. Mary Lake in 2010 and 2022.

4.3 Foreshore Habitat Sensitivity Index

4.3.1 Summary of FHSI Values

A summary of FHSI scoring is provided in Table 13, and in Figure 9. A detailed table of the FHSI data and calculations is provided in Appendix 5. Individual segments were assigned an ecological rank of Very Low, Low, Medium, High, and Very High, based on their FHSI score. A large portion of the shoreline had an ecological rank of Very High (44.1%), followed by Medium (20.4%), Low (15.4%), High (12.1%) and Very Low (8.0%).

A Very High ecological rank was assigned to Segment 3, which included the wetland/floodplain habitat at the west end of the lake. Even though this segment experienced an increase in disturbance along a portion of the foreshore, the high score for this segment was driven mainly by the relatively high percentage of undisturbed habitat, the presence of wetlands with abundant aquatic vegetation, important habitat for fish and wildlife, and presence of floodplain habitat.

Segments 1 and 8 were assigned a High ecological rank. The high score for both segments was mainly driven by the relatively high presence of undisturbed habitat. Segment 1 also scored high due to the presence of wetlands with abundant aquatic vegetation, and Segment 8 due to the relatively high fish habitat value associated with the lake outlet.

A Medium ecological ranking was assigned to Segments 2 and 7. The score for both segments was driven by the relatively high presence of undisturbed habitat. The score for Segment 2 was also driven by abundant overhanging vegetation, and relatively high counts of snags and veteran trees which provide high value wildlife habitat. The score for Segment 8 was also driven by B1 riparian vegetation type and width.

Segments 4 and 5, which were largely associated with residential areas on the north side of the lake, had a Low ecological ranking. The Low ranking was driven mainly by the presence of disturbed habitat associated with residential developments and shoreline modifications (including road disturbance).

Segment 6 was assigned a Very Low ecological ranking, driven mainly by the high level of shoreline disturbance associated with the St. Mary Lake Road, and the presence of relatively low-value boulder and cobble substrate.

Table 13. Summary of shoreline length, shoreline percentage and segments with the FHSI rankings.

Rating	Range	Shoreline Length (m)	Shoreline %	Segments
Very High	>70	4609	44.1	3
High	60-70	1260	12.1	1, 8
Medium	50-60	2136	20.4	2, 7
Low	40-50	1614	15.4	4, 5, 9
Very Low	<40	831	8.0	6

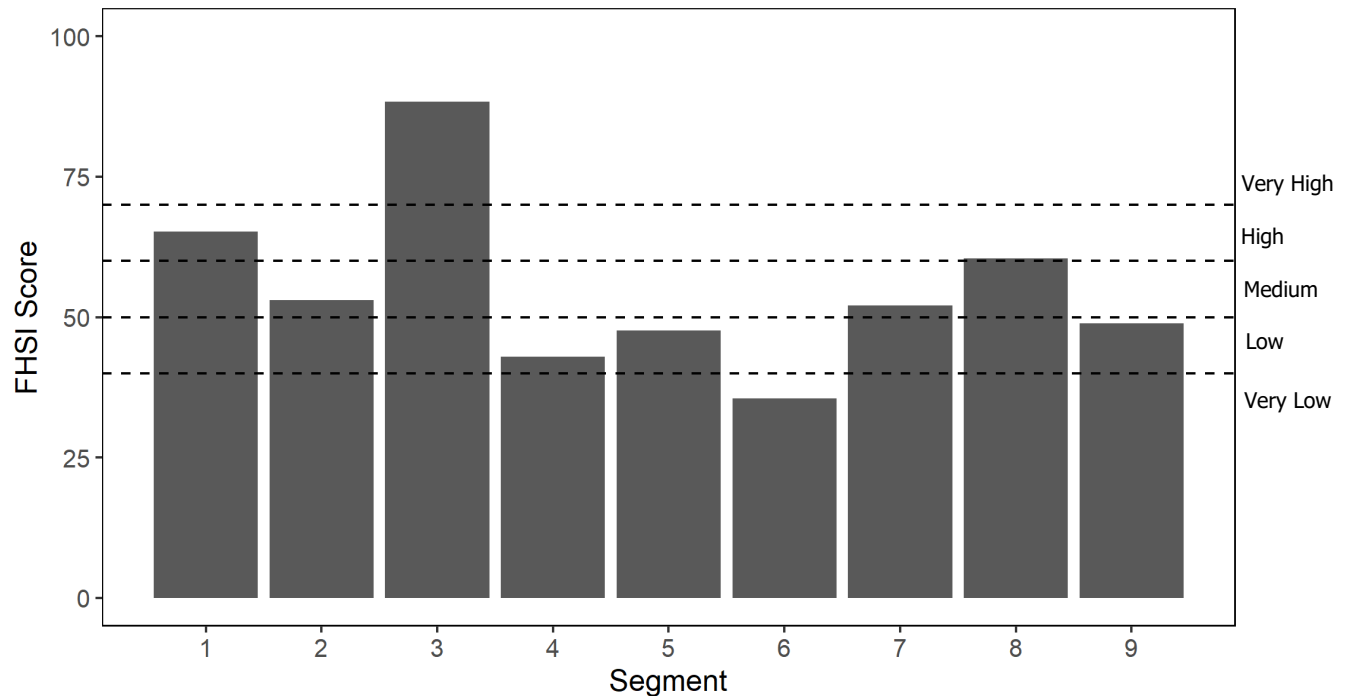


Figure 9. Plot of FHSI scores for each segment based on the criteria used in Table 3.

4.3.2 Zones of Sensitivity

Zones of Sensitivity (ZOS) are defined as specific areas that are identified as important habitats for either species or general ecosystem function (Schleppe et al 2020). Five ZOS were identified during the FIM surveys and background review and are described below:

- **Stream Mouths** - Stream mouths provide a source of nutrients to the lake and are key staging areas for both adult spawners and emergent fry/juveniles. The St. Mary River at both the inlet and outlet of the lake provide important staging and migratory habitat (Segments 3 and 8). The riparian zones around streams also provide high value wildlife habitat. A 200 m radius was used for polygons at the main inlet and outlet and a 100 m radius was used for small tributary streams that may provide some habitat and nutrient input into St. Mary Lake.
- **Wetlands** - Wetlands are areas of high productivity, provide key habitat for fish, birds and other wildlife, and protect the shoreline from wind/wave erosion. Wetland polygons are located at the north (Segment 4), west (Segment 3) and southeast end of the lake (Segment 1) within the shallow littoral areas. Smaller (< 0.1 ha) wetlands were also identified in Segments 2, 6, and 7.
- **Shrub Riparian** – Shrub riparian, including Sitka willow – Red-osier dogwood – Horsetail (FI04) stands and Sandbar willow (FI06) Site Association, located along the fringe of wetland and riverine systems, are important low bench site associations that provide habitat for many wildlife species. The shrub riparian ecosystem is located in Segment 3 and is mapped as a polygon.
- **Cottonwood Riparian** – Black cottonwood riparian ecosystems (Cottonwood – Spruce – Red-osier dogwood (Fm02) Site Association) provide important habitat for a wide range of plant and wildlife species. As the trees mature and decay, they offer important habitat for cavity nesters and

are often used by raptors for roosting, nesting and foraging. Black cottonwood riparian ecosystems have been ranked by the BC Conservation Data Centre amongst some of the rarest plant communities in the province. Reduced to fragments, the remaining stands are considered of special concern. The cottonwood riparian ecosystem is located in Segment 3 and is mapped as a polygon.

- **Submerged Vegetation** - Submerged vegetation contributes to lake primary productivity, provides habitat for fish, and is sensitive to disturbance. Submerged vegetation is present throughout the shallow littoral areas of the lake. The density of vegetation varies throughout these areas from dense to sparse. For the purposes of mapping the zone of sensitivity, the entire shallow littoral areas were mapped as polygons.

4.3.3 Potential Conservations Zones

The wetland complex at the west end of St. Mary Lake, located in Segment 3, should be considered for designation as a conservation zone, and could be in the form of a conservation covenant. The RDEK encourages registration of conservation covenants on the title of lands in order to permanently protect wetland or riparian ecosystems (RDEK 2017). This area could also be of interest to conservation groups such as Nature Trust of BC and Nature Conservancy of Canada in property acquisition. This would require a concerted and collaborative approach by the property owner, RDEK, conservation organization, Indigenous Peoples, and any interested stakeholders.

This area is made up of diverse ecological communities including open water, marshes, low bench shrub habitat and mid bench cottonwood riparian. This segment was given a high score for ecological value due to the relatively undisturbed habitat, presence of wetlands with abundant aquatic vegetation, important fish and wildlife habitat, and floodplain habitat. Protection of this habitat is even more important due to the presence of the at-risk Westslope Cutthroat Trout and regionally important remnant Burbot population that may utilize this habitat for feeding, rearing and overwintering. Since a large portion of this area is privately owned, landowner participation would be required.

4.3.4 Comparison of 2010 AHI and 2021 FHSI Results

Table 14 summarizes the amount of shoreline area designated as Very High, High, Medium, Low and Very Low habitat index rankings in 2010 (Ecoscape 2011) and in 2022. All segments were assigned the same habitat index ranking in 2022, with the exception of Segment 4, which decreased in ecological ranking from Medium to Low. The lowering in rank of Segment 4 was due mainly to the increase in disturbance along the shoreline recorded in 2022 associated with residential and rural development, including the road along the shoreline which was not recorded in 2010. Despite the recent impacts that were observed in Segments 1, 3 and 9, these segments were assigned the same habitat index rankings based on the presence of high value biophysical habitat within these segments, which carried more weight in the FHSI calculation. Overall, the relative values of these segments compared with others (i.e., what defines the FHSI rankings) is considered to remain unchanged despite the recent disturbances in these areas.

Table 14. Summary of shoreline length, shoreline percentage and segments with the 2010 AHI and 2022 FHSI rankings.

Rating	2010			2022		
	Shoreline Length (m)	Shoreline %	Segments	Shoreline Length (m)	Shoreline %	Segments
Very High	4609.5	44.1	3	4609.5	44.1	3
High	1259.8	12.1	1, 8	1259.8	12.1	1, 8
Medium	2554.7	24.4	2, 4, 7	2136.3	20.4	2, 7
Low	1195.2	11.4	5, 9	1613.6	15.4	4, 5, 9
Very Low	830.8	8.0	6	830.8	8.0	6

Direct comparison of the 2010 AHI and 2022 FHSI values is challenging, as the criteria and weighting applied to the analyses varied between years, and some of the variances in criteria considered is due to differences in interpretation of methods and errors in data/analyses from the 2010 data. To compare the AHI and FHSI values, we ran both sets of data using a modified version of the 2022 index that only included data that was consistently collected in both years³. In this comparison, the 9 shoreline segments scored the same relative to each other, with the main differences in scores driven by the percent of natural vs. disturbed shoreline present, as well as differences in the percent of shoreline with aquatic vegetation present.

5 DISCUSSION

The foreshore of St. Mary Lake has experienced substantial changes since the initial FIM in 2010. The total length of shoreline assessed as disturbed has increased by 7.1% (~744 m) since the 2010 survey. However, when using an adjusted estimate of disturbance for Segment 3 in 2010 (see Section 4.2.11.1), the difference between surveys is closer to 5.4% (~560 m). This represents the largest rate of change observed in re-FIMP surveys undertaken by Living Lakes Canada (Table 15). Although the total length of St. Mary Lake shoreline with new disturbance is on a similar level of magnitude to other lakes (e.g., Windermere and Moyie), the relative rate of change is more pronounced in St. Mary Lake given the relatively smaller size of the lake. Observed impacts were most prominent in Segments 1, 3 and 9 with vegetation clearing, new roads and residential developments. Recent developments observed at the northwest end of Segment 3 included conversion of mature forest and sensitive riparian habitat into agricultural fields, a new house and a dock. These areas likely provided high-value habitat for bird and wildlife species. It is difficult to determine from the drone and aerial imagery exactly where the high water mark occurs relative to the extent of clearing in these areas, however based on imagery during relatively high water conditions in 2016 (RDEK 2022), it appears that vegetation clearing remained outside of DPA#3 (i.e., beyond 7.5 m of the natural boundary). Based on correspondence with the RDEK planning, no development permits have been issued for DPA#3 since the 2011 report (MacLeod, K. pers. comm.).

³ Calculation excluded substrate type, overhanging vegetation, B1 and B2 vegetation.

Table 15. Comparison of rate of change from natural to disturbed shorelines from recent re-FIMP surveys.

Lake	Initial Survey	re-FIMP Survey	Lake perimeter (m)	Loss of Natural Shoreline			
				Total (m)	Total (%)	Per Year (m)	Per Year (%)
Slocan	2010	2021	88,566	80	0.1	7.3	0.01
Columbia	2009	2021	39,563	75	0.2	6.8	0.02
Windermere	2006	2020	37,400	369	1	26	0.07*
Moyie	2008	2020	37,638	471	1.2	38	0.1
Kootenay	2012	2021	406,811	4,525	1.1	488	0.12
St. Mary	2010	2022	10,450	560*	5.4*	62	0.59

*Note: St. Mary Lake values used an adjusted level of % disturbance for Segment 3 in 2010 to reflect a more accurate estimate of the road disturbance at that time (i.e., 5%).

Most of the disturbances along the foreshore of St. Mary Lake are related to single-family development and roads. Cottages are prevalent in segments 4, 5, 7 and 9, which most see seasonal use with some houses used year-round. Related appurtenances included docks, retaining walls and gazebos. Segment 6 had the highest disturbance with the St. Mary Lake Road running in close proximity to the foreshore along the entire segment. Segment 8 contains the St. Mary Lake Regional Park which sees abundant day use especially during the summer season and includes a public boat launch. Avery Road Public Access, located in Segment 4, provides additional day use access to the lake and a boat launch for non motorized watercrafts.

The shoreline and riparian areas of St. Mary Lake provide suitable habitat for a variety of wildlife, including several species at risk (see Section 4.2.8). High value wildlife habitat was identified within the floodplain at the west end of the lake (Segment 3), with abundant wildlife signs observed, including ungulate, beaver and waterfowl signs. The floodplain consists of a wetland complex which is made up of open water, marshes, low bench (Sitka willow – Red-osier dogwood – Horsetail (FI04) and Sandbar willow (FI06)) and mid bench (Cottonwood – Spruce – Red-osier dogwood (Fm02)) communities providing a diverse habitat for many wildlife species. Black cottonwood riparian ecosystems have been ranked by the BC Conservation Data Centre amongst the rarest plant communities in the province. These ecosystems are found in valley bottoms where human development is extensive, and the remaining stands are considered of special concern. These forests provide important wildlife habitat especially for birds and cavity nesters. Even though large stick nests were not observed during the 2022 survey, the presence of large cottonwood trees suitable for nesting and field observations of Bald Eagle, Blue Heron, and Osprey suggest that this area may provide breeding opportunities nearby.

The St. Mary River watershed is an important riverine system for the at-risk Westslope Cutthroat Trout and Bull Trout, and the Burbot remnant population which is the only portion of the Upper Kootenay River Burbot population that has shown signs of recruitment in recent years. St. Mary Lake, which is located approximately halfway up the drainage, is important to these species and has been reported to be utilized by Westslope Cutthroat Trout for overwintering and rearing. Burbot have also been reported in the lake,

however in low numbers. The lake also appears to define the Westslope Cutthroat Trout into upper and lower populations, with the population upstream of the lake less susceptible to genetic introgression with Rainbow Trout (Lamson 2019). The lake is also utilized by other resident and migratory species. Maintaining healthy riparian and shoreline habitats of St. Mary Lake is important in order to preserve the rearing, overwintering, and migratory habitats for these species.

Segment 3 has the highest ecological value as it contains sensitive habitats, such as an important and significant wetland complex, shrub and cottonwood riparian habitat and extensive littoral zones and is recommended to be designated as a conservation zone. The RDEK encourages registration of conservation covenants on the title of lands in order to permanently protect wetland or riparian ecosystems (RDEK 2017). Since a large portion of this area is privately owned, landowner participation would be required. This area could also be of interest to conservation groups such as Nature Trust of BC and Nature Conservancy of Canada in property acquisition. This would require a concerted and collaborative approach by the property owner, RDEK, conservation organization, Indigenous Peoples, and any interested stakeholders.

There are two Development Permit Areas that apply to St. Mary Lake: Development Permit Area (DPA) #2 – Protection of Environmentally Sensitive Areas (ESA) and Development Permit Area #3 – St. Mary Lake Shoreline (RDEK 2017) for shorelines that are designated as red or orange as per the St. Mary Lake Shoreline Management Guidelines (Schleppe and Patterson 2011b). The portions of DPA #2 that apply to the foreshore of St. Mary Lake, include protection of wetland and riparian ecosystems and habitat for species at risk. The objective of DPA #2 is the protection, preservation, restoration and enhancement of significant ecosystems, habitats, and features (RDEK 2017). The purpose of DPA #3 is for the protection of the natural environment, its ecosystems and biological diversity (RDEK 2017) and follows recommendations developed in the St. Mary Lake Shoreline Management Guidelines. The RDEK states that *"Activities within these areas must be undertaken in a manner that minimizes the disruption or alteration of its environmental integrity. The intent is not to preclude all development in these areas, but to provide notice that the areas include unique characteristics that warrant special review and consideration and to ensure appropriate mitigation measures are prescribed where appropriate"*. DPA #3, however, only addresses development within an area extending 30 m into the lake and 7.5 m upland from the natural boundary for shorelines that are designated as very high or high value habitat (red or orange shoreline zones). It is evident from this survey that shoreline developments, although they may be outside the bounds of DPA#3, are still impacting sensitive ecosystems and lowering the habitat value of riparian areas along the St. Mary Lake shoreline.

6 RECOMMENDATIONS

The following recommendations should be considered for the protection of sensitive habitats around St. Mary Lake:

1. Protection of zones of sensitivity (ZOS)

Zones of sensitivity include wetlands, stream mouths that provide staging and rearing habitat for fish bearing streams, shallow littoral zones at the east and west ends of the lake, and riparian shrub and cottonwood ecosystems within the floodplain at the west end of St. Mary Lake.

2. Designation of conservation area

Consider designation of conservation area for the wetland complex at the west end of St. Mary Lake (Segment 3). Landowner acceptance would be required for the portion of the wetland complex located within privately owned property. This area could also be of interest to conservation groups such as Nature Trust of BC and Nature Conservancy of Canada in property acquisition.

3. Conduct inventory of freshwater mussel bed locations in St. Mary Lake

No mussels were identified during surveys undertaken in 2008 at Avery Road Public Access and at the mouth of the lake (Government of BC, 2015), though surveys at these two areas are not sufficient to conclusively determine the absence of mussels within the lake. Adult freshwater mussels have a limited ability to disperse and are sensitive to changes in the foreshore and littoral zones. At the very least any development impacting littoral areas should include a mussel survey for permitting.

4. Enforcement OCP Policies and conduct a compliance audit of recent shoreline modifications

Recent development activities along the foreshore of St. Mary Lake were observed during the 2022 re-FIMP and included vegetation clearing, and residential developments especially in Segments 3 and 9. A compliance audit of these activities should be conducted to check if they were subject to Development Permit Area requirements and if applicable evaluate if permit conditions were met. As per the RDEK no DPA application has been submitted for the St. Mary Lake area since the last FIM report in 2011 (MacLeod, K., pers. comm.).

5. Management Plan for the St. Mary Lake Regional Park

The management plan should outline the vision and direction for the park area and include direction on the types and location of uses, activities and facility development. The park management plan should be developed through consultation with Indigenous Peoples, the public and other interest groups (RDEK 2017).

6. Post signage encouraging responsible boat use

Consider posting signage at St. Mary Regional Park and Avery Road Public Access encouraging boat users to avoid disturbance of substrate and aquatic vegetation within shallow littoral areas, and to exercise caution during the bird breeding season and avoid areas where nesting birds may be present (particularly around wetland areas).

7. Update Development Permit Areas in the OCP

Development Permit Area #2 currently applies to all areas designated as wetland and riparian ecosystem, habitat for species at risk, and old growth forest as shown in Schedule E2 of the Kimberly Rural OCP (RDEK 2017). Per correspondence with the RDEK, these polygons are based on publicly available spatial data (e.g., wetland layer in the Freshwater Atlas, and critical habitat for federally-listed species), and do not capture the full or current extent of these sensitive habitats around the lake. These areas should be updated to reflect current available data.

Development Permit Area #3 currently applies to an area extending 30 m into the lake and 7.5 m upland from the natural boundary for shorelines that are designated as very high or high value habitat (red or orange shoreline zones), which would only apply to Segments 1, 3, and 8. The justification for DPA #3 in the OCP is currently incorrect as it references ZOS that were not included in the previous FIM report or shoreline guidance document (e.g. “native fish spawning area, biologically productive areas, sensitive plant species and bird staging areas”). We suggest that DPA #3 be extended from 7.5 m to 30 m upland from the natural boundary for all shorelines around St. Mary Lake regardless of the foreshore ecological ranking designation as the riparian vegetation provides important habitat and nutrient input to the lake. This does not preclude development within these areas, however, landowners would be required to obtain a Development Permit prior to proceeding with any projects including any construction (such as addition or alteration of a building or other structure) or alteration of land (such removal of riparian or aquatic vegetation, site grading, deposition of fill, beach creation, or dredging), and would require an Environmental Impact Assessment report prepared by a QEP. In addition, DPA #3 will need to be updated to include the ZOS identified in this report (and conservation zones, if designated). This will help to ensure that these areas will be properly protected during development.

7 REFERENCES

All Trails. 2020. <https://www.alltrails.com/trail/canada/british-columbia/alki-creek-trail-to-third-bridge>

ᑭᐱᑭᐱᑭ Community.” n.d. Accessed December 21, 2022. <https://www.aqam.net/>.

[BC CDC] B.C. Conservation Data Centre. 2022a. BC Species and Ecosystems Explorer. B.C. Ministry of Environment, Victoria B.C. Available: <http://a100.gov.bc.ca/pub/eswp/> (accessed 2021-02-12). Search criteria: Animals OR Plants OR Lichens OR Macrofungi AND BC Conservation Status: Red (Extirpated, Endangered, or Threatened) OR Blue (Special Concern) AND COSEWIC Status: Extinct OR Extirpated OR Endangered OR Threatened OR Special Concern AND Area of Interest: User Defined Polygon (~ 5 km buffer around St. Mary Lake) (accessed 2022-12-06).

[BC CDC] B.C. Conservation Data Centre. 2022b. CDC iMap [web application]. Victoria, British Columbia, Canada. Available: <http://maps.gov.bc.ca/ess/sv/cdc/> (accessed 2022-12-06).

Cope, A. 2016. Abundance of Upper Columbia and Kootenay River Burbot Populations. Report prepared for Ministry of Forests, Lands, Natural Resource Operations. Cranbrook, B.C. 21 pp.

Corbett, P.J., Taylor, E.B. and Native Fish Research Group. 2001. Genetic Assessment of Westslope Cutthroat Trout (*Oncorhynchus clarki lewisi*) In the St Mary River of SE British Columbia: 2000

COSEWIC. 2011. COSEWIC assessment and status report on the Oregon Spotted Frog *Rana pretiosa* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 47 pp.

Coulter, B. 2018. New Park to be Established at St. Mary Lake. Kimberly Bulletin.

Cranbrook Daily Townsman. 2019. Kimberley Residents Concerned with Use of Motorized Boats on St. Mary Lake, River. <https://www.cranbrooktownsman.com/news/kimberley-residents-concerned-with-use-of-motorized-boats-on-st-mary-lake-river/>

eBird. 2021. eBird: An online database of bird distribution and abundance [web application]. eBird, Cornell Lab of Ornithology, Ithaca, New York. Available: <http://www.ebird.org>. (Accessed: January 29, 2021).

[EKBSWG] East Kootenay Burbot Scientific Working Group. 2019. Upper Kootenay River Burbot Conservation Strategy. Prepared by Westslope Fisheries Ltd., Cranbrook, B.C. 61 pp. Prepared for Fish and Wildlife Compensation Program (Project Number: UKE-F19-F-2734), the Ministry of Forests, Lands, Natural Resource Operations and Rural Development, and the Ktunaxa Nation Council.

- GBIF.org. 2022. Global Biodiversity Information Facility [GBIF] Occurrence Download <https://doi.org/10.15468/dl.x3axga>. (Accessed 2022-12-09)
- Habitat Wizard. 2022. B.C. Ministry of Environment, Victoria BC. <https://maps.gov.bc.ca/ess/hm/habwiz/>
- Hagen, J. and J.T.A. Baxter. 2009. 2008 Westslope Cutthroat Trout Population Abundance Monitoring of Classified Waters in the East Kootenay Region of BC. Report prepared by J. Hagen and Associates and Mountain Water Research. Report prepared for BC Ministry of Environment.
- iNaturalist. 2022. Area based query centered on St. Mary Lake. Available from <https://www.inaturalist.org>. (Accessed 2022-12-09)
- Lamson, H.M. 2019. Evaluation of Current Westslope Cutthroat Trout Hybridization Levels in the Upper Kootenay Drainage – Final Report. Report prepared for Fish and Wildlife Compensation Program. 27 pp.
- Lamson, H.M. 2023. Personal communication. Fisheries Biologist. Resource Management – Kootenay Cranbrook. Ministry of Forests.
- Lamson, H.M., Evans, V. and S. Whyte. 2014. Kootenay Region 2014 Small Lake Assessments. Report prepared by the Ministry of Forests, Lands and Natural Resource Operations, Fish and Wildlife Branch. 102 pp.
- MacKillop, D.J. and A.J. Ehman. 2016. A field guide to site classification and identification for southeast British Columbia: the south-central Columbia Mountains. Province of British Columbia, Victoria, BC. Land Management Handbook 70.
- MacLeod, K. 2023. Personal communication. RDEK Planning Coordinator.
- McPhail, J.D. and V. L. Paragamian. 2000. Burbot biology and life history Pages 11-23 in V.L. Paragamian and D.W. Willis, editors. Burbot: biology, ecology, and management. American Fisheries Society, Fisheries Management Section, Publication Number 1, Bethesda.
- Miles, J. 2022. Personal communication. Kimberly Trails Executive Director.
- Moore, A. and L. Machial. 2007. Freshwater mussel surveys (target species *Gonidea angulata*) in the Okanagan and Kootenay regions, summer 2007. BC Conservation Corps Invertebrates at Risk Crew.

- Morris, K.J. and A. Prince. 2004. St. Mary River Westslope Cutthroat Trout Radio Telemetry Study 2001-2004. Report prepared by Westslope Fisheries Ltd., Cranbrook, B.C. Report prepared for Columbia-Kootenay Fisheries Renewal Partnership, Cranbrook B.C. 39 pp. + 5 App.
- RDEK. 2014. Regional District of East Kootenay Electoral Area E Zoning & Floodplain Management Bylaw No. 2502, 2014, Schedule A1.
- RDEK. 2017. Regional District of East Kootenay - Kimberley Rural Official Community Plan Bylaw No. 2760, 2017.
- RDEK. 2020. Avery Road Public Access Management Plan. 13 pp. <https://pub-rdek.escribemeetings.com/filestream.ashx?DocumentId=2836>
- RDEK. 2022. St. Mary Lake Regional Park.
https://www.rdek.bc.ca/departments/environmentalservices/parksandrec/st_mary_lake_regional_park/
- RDEK. 2022. RDEK Public Web Viewer. Web Mapping Application, Public Cadastral Land Use Web Map.
- Rubidge, E. 2002. Genetic Analysis of Radio-tagged Westslope Cutthroat Trout from St. Mary's River and Elk River. Report prepared for Westslope Fisheries.
- Schleppe, J. and B. Mason. 2009. Standard Methods for Completion of Foreshore Inventory and Mapping Projects. Prepared by: Ecoscape Environmental Consultants Ltd. and the Community Mapping Network. 37 pp.
- Schleppe, J.S., McPherson, S., Porto, L., and B. Mason. 2020. 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. Report prepared for Living Lake Canada. 81 pp.
- Schleppe, J.¹, and S. McPherson². 2021. Windermere Lake Foreshore Integrated Management Planning. Prepared for Living Lakes Canada. Prepared by: Ecoscape Environmental Consultants Ltd.¹, and Lotic Environmental Ltd.²
- Schleppe, J.¹, and S. McPherson². 2022. Kootenay Lake Foreshore Integrated Management Planning. Prepared for Living Lakes Canada. Prepared by: Ecoscape Environmental Consultants Ltd.¹, and Lotic Environmental Ltd.²

Schleppe, J. and A. Patterson. 2011a. St. Mary Lake Foreshore Inventory and Mapping and Aquatic Habitat Index. Ecoscape Environmental Consultants Ltd. Project File: 10-682. Prepared for: East Kootenay Integrated Lake Management Partnership.

Schleppe, J. and A. Patterson. 2011b. St. Mary Lake Shoreline Management Guidelines. Ecoscape Environmental Consultants Ltd. Project File: 10-682. Prepared for: East Kootenay Integrated Lake Management Partnership.

Stephenson, S.M., M.D. Neufeld, S.C. Ireland, S. Young, R.S. Hardy and P. Rust. 2013. Survival and dispersal of sonic-tagged, hatchery-reared Burbot released into the Kootenay River. Transactions of the American Fisheries Society 142 (6): 1671-1679

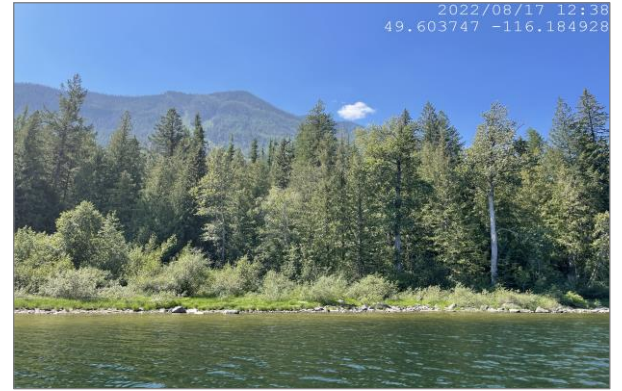
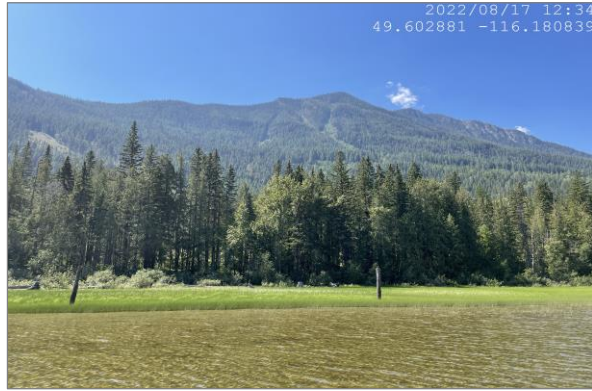
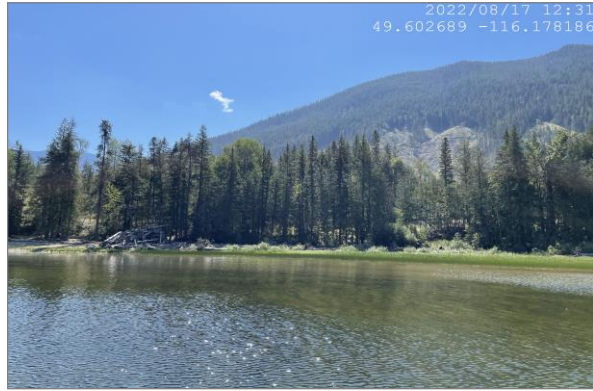
Wood Canada Ltd. 2021. Moyie Lake Foreshore Integrated Management Planning - 2021. Report Prepared for Living Lakes Canada, Nelson, BC. 43 pp. + 6 App.

Wood Canada Ltd. 2022a. Slocan Lake Foreshore Integrated Management Planning - 2021. Report Prepared for Living Lakes Canada, Nelson, BC. 46 pp. + 7 App.

Wood Canada Ltd. 2022b. Columbia Lake Foreshore Integrated Management Planning – 2021. Report Prepared for Living Lakes Canada, Nelson, BC. 48 pp. + 6 App

APPENDIX 1. ST. MARY LAKE FORESHORE INVENTORY MAPS

APPENDIX 2. ST. MARY LAKE SEGMENT SUMMARIES



General

Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural	Comment
679	Wetland	Road	Low <5%	Rural	Medium 10-50%	No	20	80	Vegetation clearing behind band of vegetation; 10 old pilings in littoral zone.

Shore Type (%)

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0	5	0	0	0	95	0

Fisheries

Juvenile Rearing	Staging	Migration
Moderate	Absent	Absent

Foreshore Substrate (%)

Marl	Mud	Organic	Fines	Sand	Gravel	Cobble	Boulder	Bedrock	Embeddedness	Shape
0	30	45	0	0	10	10	5	0	Low 0-25%	Smooth

Land Use (%)

Agriculture	Commercial	Conservation	Forestry	Industrial	Institution	Multi-family	Natural	Park	Rural	Single Family	Transportation	Urban Park	Utility
0	0	0	0	0	0	0	0	0	100	0	0	0	0

Vegetation Band 1

Class	Stage	Shrub	Tree	Distribution	Width	Overhang	Comment
Shrubs	Tall Shrubs	Abundant (>50%)	Sparse (<10%)	Continuous	5	45	None

Vegetation Band 2

Class	Stage	Shrub cover	Tree cover	Distribution	Width	Comment
Mixed Forest	Mature Forest	Medium (10-50%)	Medium (10-50%)	Patchy	45	Vegetation clearing behind band of vegetation.

Wildlife habitat

Veteran	Snags	Comment
No	<5	Marsh and large cottonwoods present. Elk trails and Osprey observed. Good amphibian habitat.

Aquatic Vegetation

Littoral Zone														
Aquatic Vegetation	Submergent Vegetation	Emergent Vegetation	Floating Vegetation	Width	LWD	Marl	Mud	Organic	Fines	Sand	Gravel	Cobble	Boulder	Bedrock
90	35	90	0	Wide >50m	8	0	65	30	0	0	0	0	5	0

Shoreline Modifications

Retaining Walls	% Retaining Walls	Docks	Swim Floats	Groynes	Boat Launches	Fences	Pilings	Other	% Road modified
0	0	0	0	0	0	0	10	0	0



General

Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural	Comment
4609	Wetland	Road	Low <5%	Natural Area	Medium 10-50%	No	10	90	Additional developments present in 2022. Clearing at northwest side of wetland/pond.

Shore Type (%)

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

Fisheries

Juvenile Rearing	Staging	Migration
High	Present	Present

Foreshore Substrate (%)

Marl	Mud	Organic	Fines	Sand	Gravel	Cobble	Boulder	Bedrock	Embeddedness	Shape
0	20	70	0	10	0	0	0	0	None 0%	Smooth

Land Use (%)

Agriculture	Commercial	Conservation	Forestry	Industrial	Institution	Multi-family	Natural	Park	Rural	Single Family	Transportation	Urban Park	Utility
0	0	0	0	0	0	0	75	0	5	20	0	0	0

Vegetation Band 1

Class	Stage	Shrub	Tree	Distribution	Width	Overhang	Comment
Natural Wetland	Tall Shrubs	Abundant (>50%)	Sparse (<10%)	Continuous	40	80	Band 1 width varies from 20 to 200 m.

Vegetation Band 2

Class	Stage	Shrub cover	Tree cover	Distribution	Width	Comment
Broadleaf	Mature Forest	Medium (10-50%)	Abundant (>50%)	Patchy	10	Dominated by floodplain cottonwoods. Mixed forest present on south side of segment.

Wildlife habitat

Veteran	Snags	Comment
No	5 to 25	Beaver lodge & trails, Osprey, Eagle, Great Blue Heron, muskrat tracks, Columbia spotted frog.

Aquatic Vegetation

Littoral Zone														
Aquatic Vegetation	Submergent Vegetation	Emergent Vegetation	Floating Vegetation	Width	LWD	Marl	Mud	Organic	Fines	Sand	Gravel	Cobble	Boulder	Bedrock
85	30	80	1	Wide >50m	44	0	20	70	10	0	0	0	0	0

Shoreline Modifications

Retaining Walls	% Retaining Walls	Docks	Swim Floats	Groynes	Boat Launches	Fences	Pilings	Other	% Road modified
0	0	1	0	0	0	0	5	0	10



General

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

Shore Type (%)

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0	0	95	0	0	5	0

Fisheries

Juvenile Rearing	Staging	Migration
Moderate	Absent	Absent

Foreshore Substrate (%)

Marl	Mud	Organic	Fines	Sand	Gravel	Cobble	Boulder	Bedrock	Embeddedness	Shape
0	0	0	0	0	5	85	10	0	Low 0-25%	Angular

Land Use (%)

Agriculture	Commercial	Conservation	Forestry	Industrial	Institution	Multi-family	Natural	Park	Rural	Single Family	Transportation	Urban Park	Utility
0	0	0	0	0	0	0	0	0	0	100	0	0	0

Vegetation Band 1

Class	Stage	Shrub	Tree	Distribution	Width	Overhang	Comment
Mixed Forest	Young Forest	Abundant (>50%)	Medium (10-50%)	Patchy	15	5	Foreshore development and vegetation clearing.

Vegetation Band 2

Class	Stage	Shrub cover	Tree cover	Distribution	Width	Comment
Coniferous	Mature Forest	Sparse (<10%)	Abundant (>50%)	Patchy	35	Some single family housing affecting B2 vegetation band.

Wildlife habitat

Veteran	Snags	Comment
<5	<5	Good wildlife habitat with large cottonwood trees. Great Blue Heron on dock.

Aquatic Vegetation

Littoral Zone														
Aquatic Vegetation	Submergent Vegetation	Emergent Vegetation	Floating Vegetation	Width	LWD	Marl	Mud	Organic	Fines	Sand	Gravel	Cobble	Boulder	Bedrock
30	25	5	0	Wide >50m	1	0	100	0	0	0	0	0	0	0

Shoreline Modifications

Retaining Walls	% Retaining Walls	Docks	Swim Floats	Groynes	Boat Launches	Fences	Pilings	Other	% Road modified
0	0	1	0	0	0	0	0	0	85



General

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

Shore Type (%)

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0	15	79	0	1	5	0

Fisheries

Juvenile Rearing	Staging	Migration
Low	Absent	Absent

Foreshore Substrate (%)

Marl	Mud	Organic	Fines	Sand	Gravel	Cobble	Boulder	Bedrock	Embeddedness	Shape
0	0	5	0	0	5	85	5	0	None 0%	Angular

Land Use (%)

Agriculture	Commercial	Conservation	Forestry	Industrial	Institution	Multi-family	Natural	Park	Rural	Single Family	Transportation	Urban Park	Utility
0	0	0	0	0	0	0	0	10	0	90	0	0	0

Vegetation Band 1

Class	Stage	Shrub	Tree	Distribution	Width	Overhang	Comment
Mixed Forest	Mature Forest	Medium (10-50%)	Medium (10-50%)	Patchy	15	8	None

Vegetation Band 2

Class	Stage	Shrub cover	Tree cover	Distribution	Width	Comment
Coniferous	Mature Forest	Sparse (<10%)	Medium (10-50%)	Patchy	35	Some single family housing affecting B2 vegetation band.

Wildlife habitat

Veteran	Snags	Comment
<5	5 to 25	Eagle and Great Blue Heron.

Aquatic Vegetation

Littoral Zone														
Aquatic Vegetation	Submergent Vegetation	Emergent Vegetation	Floating Vegetation	Width	LWD	Marl	Mud	Organic	Fines	Sand	Gravel	Cobble	Boulder	Bedrock
50	30	30	0	Medium 10-50m	3	0	94	5	0	0	0	1	0	0

Shoreline Modifications

Retaining Walls	% Retaining Walls	Docks	Swim Floats	Groynes	Boat Launches	Fences	Pilings	Other	% Road modified
0	0	1	1	0	1	0	0	0	30



General

Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural	Comment
993	Gravel	Other	Low <5%	Single Family	Medium 10-50%	No	50	50	Single family landuse, with some vegetation and beach clearing.

Shore Type (%)

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0	10	60	25	0	5	0

Fisheries

Juvenile Rearing	Staging	Migration
Moderate	Absent	Absent

Foreshore Substrate (%)

Marl	Mud	Organic	Fines	Sand	Gravel	Cobble	Boulder	Bedrock	Embeddedness	Shape
0	0	0	0	25	15	55	5	0	None 0%	Angular

Land Use (%)

Agriculture	Commercial	Conservation	Forestry	Industrial	Institution	Multi-family	Natural	Park	Rural	Single Family	Transportation	Urban Park	Utility
0	0	0	0	0	0	0	20	0	0	80	0	0	0

Vegetation Band 1

Class	Stage	Shrub	Tree	Distribution	Width	Overhang	Comment
Mixed Forest	Mature Forest	Medium (10-50%)	Medium (10-50%)	Patchy	20	7	Affected by single family development.

Vegetation Band 2

Class	Stage	Shrub cover	Tree cover	Distribution	Width	Comment
Mixed Forest	Mature Forest	Medium (10-50%)	Abundant (>50%)	Patchy	30	None

Wildlife habitat

Veteran	Snags	Comment
No	>25	None

Aquatic Vegetation

Littoral Zone														
Aquatic Vegetation	Submergent Vegetation	Emergent Vegetation	Floating Vegetation	Width	LWD	Marl	Mud	Organic	Fines	Sand	Gravel	Cobble	Boulder	Bedrock
40	40	5	0	Wide >50m	26	0	85	0	0	0	5	10	0	0

Shoreline Modifications

Retaining Walls	% Retaining Walls	Docks	Swim Floats	Groynes	Boat Launches	Fences	Pilings	Other	% Road modified
2	7	6	1	2	0	0	0	0	0



General

Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural	Comment
580	Stream Mouth	Road	Low <5%	Park	Medium 10-50%	No	40	60	St. Mary Lake Regional Park leased from private land owner on south side of lake outlet.

Shore Type (%)

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

Fisheries

Juvenile Rearing	Staging	Migration
High	Present	Present

Foreshore Substrate (%)

Marl	Mud	Organic	Fines	Sand	Gravel	Cobble	Boulder	Bedrock	Embeddedness	Shape
0	0	0	5	20	35	40	0	0	Low 0-25%	Angular

Land Use (%)

Agriculture	Commercial	Conservation	Forestry	Industrial	Institution	Multi-family	Natural	Park	Rural	Single Family	Transportation	Urban Park	Utility
0	0	0	0	0	0	0	40	60	0	0	0	0	0

Vegetation Band 1

Class	Stage	Shrub	Tree	Distribution	Width	Overhang	Comment
Mixed Forest	Mature Forest	Medium (10-50%)	Medium (10-50%)	Patchy	20	15	Tree cover 100% on north and 30% on south of outlet.

Vegetation Band 2

Class	Stage	Shrub cover	Tree cover	Distribution	Width	Comment
Mixed Forest	Mature Forest	Medium (10-50%)	Abundant (>50%)	Continuous	30	Predominantly cottonwood floodplain.

Wildlife habitat

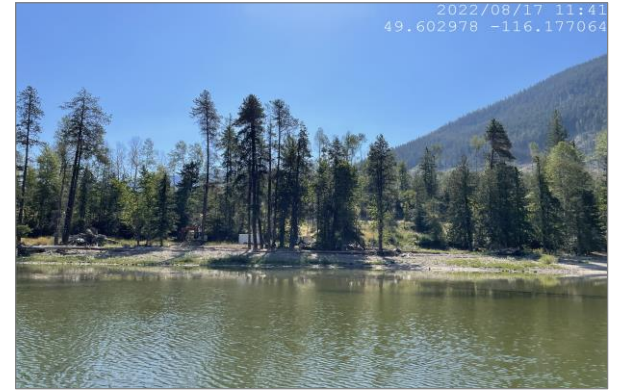
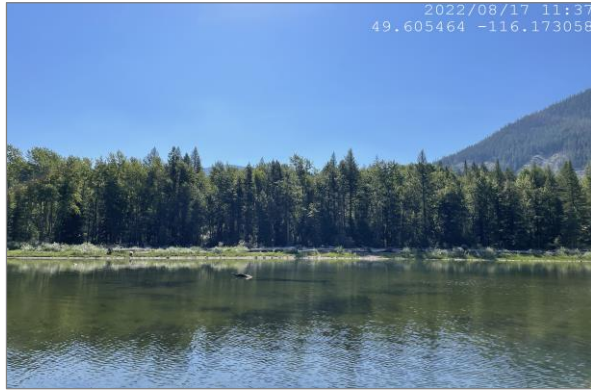
Veteran	Snags	Comment
No	<5	Abundant wildlife: Great Blue Heron, Loon, King Fisher, Bald Eagle.

Aquatic Vegetation

Aquatic Vegetation		Littoral Zone												
Submergent Vegetation	Emergent Vegetation	Floating Vegetation	Width	LWD	Marl	Mud	Organic	Fines	Sand	Gravel	Cobble	Boulder	Bedrock	
25	25	1	0	Wide >50m	151	0	50	0	0	20	10	20	0	0

Shoreline Modifications

Retaining Walls	% Retaining Walls	Docks	Swim Floats	Groynes	Boat Launches	Fences	Pilings	Other	% Road modified
0	0	0	0	0	1	1	15	0	60



General

Length (m)	Shore Type	Shore Type Modification	Slope	Land Use	Level of Impact	Livestock Access	Disturbed	Natural	Comment
593	Gravel	Road	Medium 5-20%	Rural	High >50%	No	65	35	Recent clearing and development on property.

Shore Type (%)

Cliff/Bluff	Rocky	Gravel	Sand	Stream Mouth	Wetland	Other
0	0	80	20	0	0	0

Fisheries

Juvenile Rearing	Staging	Migration
Moderate	Absent	Absent

Foreshore Substrate (%)

Marl	Mud	Organic	Fines	Sand	Gravel	Cobble	Boulder	Bedrock	Embeddedness	Shape
0	0	0	0	15	25	60	0	0	Low 0-25%	Angular

Land Use (%)

Agriculture	Commercial	Conservation	Forestry	Industrial	Institution	Multi-family	Natural	Park	Rural	Single Family	Transportation	Urban Park	Utility
0	0	0	0	0	0	0	0	0	80	20	0	0	0

Vegetation Band 1

Class	Stage	Shrub	Tree	Distribution	Width	Overhang	Comment
Mixed Forest	Mature Forest	Sparse (<10%)	Medium (10-50%)	Patchy	20	5	Impacted by residential development and recent land clearing.

Vegetation Band 2

Class	Stage	Shrub cover	Tree cover	Distribution	Width	Comment
Mixed Forest	Mature Forest	Medium (10-50%)	Medium (10-50%)	Patchy	30	Recent land clearing.

Wildlife habitat

Veteran	Snags	Comment
No	No	Spotted Sandpiper, Merganser, and Bald Eagle sighting.

Aquatic Vegetation

Aquatic Vegetation		Littoral Zone												
Submergent Vegetation	Emergent Vegetation	Floating Vegetation	Width	LWD	Marl	Mud	Organic	Fines	Sand	Gravel	Cobble	Boulder	Bedrock	
20	20	0	0	Wide >50m	63	0	90	0	5	5	0	0	0	

Shoreline Modifications

Retaining Walls	% Retaining Walls	Docks	Swim Floats	Groynes	Boat Launches	Fences	Pilings	Other	% Road modified
0	0	0	0	0	0	1	0	0	5

APPENDIX 3. SPECIES AT RISK

Appendix 3: Species at risk with potential occurrence around St. Mary Lake

Class	Scientific Name	English Name	BC List ¹	COSEWIC ²	SARA ²	Comment
Amphibian	<i>Anaxyrus boreas</i>	Western Toad	Yellow	Special Concern	Special Concern	Confirmed (WSI data)
Bird	<i>Accipiter gentilis atricapillus</i>	Northern Goshawk, <i>atricapillus</i> subspecies	Blue	Not at Risk		
Bird	<i>Aechmophorus occidentalis</i>	Western Grebe	Red	Special Concern	Special Concern	Confirmed (GBIF, eBird)
Bird	<i>Aeronautes saxatalis</i>	White-throated Swift	Blue			
Bird	<i>Ardea herodias herodias</i>	Great Blue Heron, <i>herodias</i> subspecies	Blue			Confirmed (eBird, WSI data)
Bird	<i>Asio flammeus</i>	Short-eared Owl	Blue	Threatened	Special Concern	
Bird	<i>Botaurus lentiginosus</i>	American Bittern	Blue			
Bird	<i>Buteo lagopus</i>	Rough-legged Hawk	Blue	Not at Risk		
Bird	<i>Buteo swainsoni</i>	Swainson's Hawk	Red			
Bird	<i>Butorides virescens</i>	Green Heron	Blue			
Bird	<i>Chondestes grammacus</i>	Lark Sparrow	Blue			
Bird	<i>Chordeiles minor</i>	Common Nighthawk	Blue	Special Concern	Threatened	Confirmed (GBIF, eBird)
Bird	<i>Coccythraustes vespertinus</i>	Evening Grosbeak	Yellow	Special Concern	Special Concern	Confirmed (eBird)
Bird	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Yellow	Special Concern	Threatened	Confirmed (GBIF)
Bird	<i>Cygnus columbianus</i>	Tundra Swan	Blue			Confirmed (WSI data)
Bird	<i>Cypseloides niger</i>	Black Swift	Blue	Endangered	Endangered	
Bird	<i>Dolichonyx oryzivorus</i>	Bobolink	Red	Special Concern	Threatened	
Bird	<i>Dryobates albolarvatus</i>	White-headed Woodpecker	Red	Endangered	Endangered	
Bird	<i>Euphagus carolinus</i>	Rusty Blackbird	Blue	Special Concern	Special Concern	
Bird	<i>Falco mexicanus</i>	Prairie Falcon	Red	Not at Risk		
Bird	<i>Falco peregrinus anatum</i>	Peregrine Falcon, <i>anatum</i> subspecies	Red	Not at Risk	Special Concern	Confirmed (GBIF)
Bird	<i>Hirundo rustica</i>	Barn Swallow	Yellow	Special Concern	Threatened	
Bird	<i>Hydroprogne caspia</i>	Caspian Tern	Blue	Not at Risk		
Bird	<i>Larus californicus</i>	California Gull	Red			
Bird	<i>Limnodromus griseus</i>	Short-billed Dowitcher	Blue			
Bird	<i>Melanerpes lewis</i>	Lewis's Woodpecker	Blue	Threatened	Threatened	
Bird	<i>Melanitta perspicillata</i>	Surf Scoter	Blue			
Bird	<i>Nannopterum auritum</i>	Double-crested Cormorant	Blue	Not at Risk		Confirmed (GBIF, eBird)
Bird	<i>Numenius americanus</i>	Long-billed Curlew	Yellow	Special Concern	Special Concern	
Bird	<i>Oreoscoptes montanus</i>	Sage Thrasher	Red	Endangered	Endangered	
Bird	<i>Pelecanus erythrorhynchos</i>	American White Pelican	Red	Not at Risk		
Bird	<i>Phalaropus lobatus</i>	Red-necked Phalarope	Blue	Special Concern	Special Concern	
Bird	<i>Pluvialis dominica</i>	American Golden-Plover	Blue			
Bird	<i>Podiceps auritus</i>	Horned Grebe	Yellow	Special Concern		Confirmed (GBIF, eBird)
Bird	<i>Podiceps nigricollis</i>	Eared Grebe	Blue			
Bird	<i>Progne subis</i>	Purple Martin	Blue			
Bird	<i>Psiloscops flammeolus</i>	Flammulated Owl	Blue	Special Concern	Special Concern	
Bird	<i>Recurvirostra americana</i>	American Avocet	Blue			
Bird	<i>Sphyrapicus thyroideus</i>	Williamson's Sapsucker	Blue	Endangered	Endangered	Confirmed (GBIF)
Bird	<i>Sterna forsteri</i>	Forster's Tern	Red	Date Deficient		
Fish	<i>Lota lota</i> pop. 1	Burbot (Lower Kootenay Population)	Red			
Fish	<i>Oncorhynchus clarkii lewisi</i>	Cutthroat Trout, <i>lewisi</i> subspecies	Blue	Special Concern	Special Concern	Confirmed (iNaturalist, iMapBC)
Fish	<i>Salvelinus confluentus</i>	Bull Trout	Blue	Special Concern		
Insect	<i>Argia vivida</i>	Vivid Dancer	Blue	Special Concern	Special Concern	
Insect	<i>Boloria alberta</i>	Albert's Fritillary	Blue			
Insect	<i>Cicindela hirticollis</i>	Hairy-necked Tiger Beetle	Blue			
Insect	<i>Colias meadii</i>	Mead's Sulphur	Blue			
Insect	<i>Copablepharon absidum</i>	Columbia Dune Moth	Red	Date Deficient		
Insect	<i>Cupido comyntas</i>	Eastern Tailed Blue	Blue			
Insect	<i>Danaus plexippus</i>	Monarch	Red	Endangered	Special Concern	
Insect	<i>Euphydryas gillettii</i>	Gillette's Checkerspot	Blue			

Appendix 3: Species at risk with potential occurrence around St. Mary Lake

Class	Scientific Name	English Name	BC List ¹	COSEWIC ²	SARA ²	Comment
Insect	<i>Euptoieta claudia</i>	Variiegated Fritillary	Blue			
Insect	<i>Hesperia nevada</i>	Nevada Skipper	Blue			
Insect	<i>Libellula pulchella</i>	Twelve-spotted Skimmer	Blue			
Insect	<i>Lycaena dione</i>	Dione Copper	Red			
Insect	<i>Lycaena hyllus</i>	Bronze Copper	Blue			
Insect	<i>Lycaena nivalis</i>	Lilac-bordered Copper	Blue			
Insect	<i>Oeneis jutta chermocki</i>	Jutta Arctic, <i>chermocki</i> subspecies	Blue			
Insect	<i>Ophiogomphus occidentis</i>	Sinuuous Snaketail	Blue			
Insect	<i>Papilio machaon dodii</i>	Old World Swallowtail, <i>dodii</i> subspecies	Red			
Insect	<i>Phanogomphus graslinellus</i>	Pronghorn Clubtail	Blue			
Insect	<i>Polites themistocles themistocles</i>	Tawny-edged Skipper, <i>themistocles</i> subspecies	Blue			
Insect	<i>Pyrgus communis</i>	Checkered Skipper	Blue			
Insect	<i>Speyeria aphrodite whitehousei</i>	Aphrodite Fritillary, <i>whitehousei</i> subspecies	Blue			
lichens/mosses	<i>Cladonia luteoalba</i>	lemon pixie	Blue			
lichens/mosses	<i>Entosthodon fascicularis</i>	banded cord-moss	Blue	Special Concern	Special Concern	
lichens/mosses	<i>Pterygoneurum kozlovii</i>	alkaline wing-nerved moss	Blue	Threatened	Threatened	
Mammal	<i>Corynorhinus townsendii</i>	Townsend's Big-eared Bat	Blue			
Mammal	<i>Gulo gulo luscus</i>	Wolverine, <i>luscus</i> subspecies	Blue	Special Concern	Special Concern	
Mammal	<i>Lasiurus cinereus</i>	Hoary Bat	Blue			Confirmed (WSI data)
Mammal	<i>Myodes gapperi galei</i>	Southern Red-backed Vole, <i>galei</i> subspecies	Blue			
Mammal	<i>Myotis lucifugus</i>	Little Brown Myotis	Blue	Endangered	Endangered	Confirmed (WSI data)
Mammal	<i>Myotis yumanensis</i>	Yuma Myotis	Blue			
Mammal	<i>Neotamias minimus selkirki</i>	Least Chipmunk, <i>selkirki</i> subspecies	Red			
Mammal	<i>Neotamias ruficaudus ruficaudus</i>	Red-tailed Chipmunk, <i>ruficaudus</i> subspecies	Red			
Mammal	<i>Oreamnos americanus</i>	Mountain Goat	Blue			
Mammal	<i>Ovis canadensis</i>	Bighorn Sheep	Blue			
Mammal	<i>Rangifer tarandus</i> pop. 1	Caribou (Southern Mountain Population)	Red	Endangered	Threatened	
Mammal	<i>Taxidea taxus</i>	American Badger	Red	Endangered	Endangered	Confirmed (WSI data)
Mammal	<i>Thomomys talpoides segregatus</i>	Northern Pocket Gopher, <i>segregatus</i> subspecies	Red			
Mammal	<i>Ursus arctos</i>	Grizzly Bear	Blue	Special Concern	Special Concern	
Mollusc	<i>Anguispira kochi</i>	Banded Tigersnail	Blue	Not at Risk		
Mollusc	<i>Cryptomastix mullani</i>	Coeur d'Alene Oregonian	Blue			
Mollusc	<i>Galba bulimoides</i>	Prairie Fossaria	Blue			
Mollusc	<i>Galba dalli</i>	Dusky Fossaria	Blue			
Mollusc	<i>Galba truncatula</i>	Attenuate Fossaria	Blue			
Mollusc	<i>Gastrocopta holzingeri</i>	Lambda Snaggletooth	Red			
Mollusc	<i>Gyraulus crista</i>	Star Gyro	Blue			
Mollusc	<i>Kootenaia burkei</i>	Pygmy Slug	Blue	Special Concern	Special Concern	
Mollusc	<i>Musculium partumeium</i>	Swamp Fingernailclam	Blue			
Mollusc	<i>Musculium transversum</i>	Long Fingernailclam	Blue			
Mollusc	<i>Physella columbiana</i>	Rotund Physa	Red			
Mollusc	<i>Sphaerium occidentale</i>	Herrington Fingernailclam	Blue			
Mollusc	<i>Sphaerium striatinum</i>	Striated Fingernailclam	Blue			
Mollusc	<i>Stagnicola traski</i>	Widelip Pondsnaail	Blue			
Mollusc	<i>Valvata humeralis</i>	Glossy Valvata	Red			
Mollusc	<i>Valvata tricarinata</i>	Threeridge Valvata	Red			
Mollusc	<i>Zacoleus idahoensis</i>	Sheathed Slug	Blue	Special Concern	Special Concern	
Plant	<i>Botrychium michiganense</i>	Michigan moonwort	Blue			
Plant	<i>Botrychium montanum</i>	mountain moonwort	Blue			
Plant	<i>Claytonia cordifolia</i>	heart-leaved springbeauty	Blue			
Plant	<i>Glycyrrhiza lepidota</i>	wild licorice	Blue			

Appendix 3: Species at risk with potential occurrence around St. Mary Lake

Class	Scientific Name	English Name	BC List ¹	COSEWIC ²	SARA ²	Comment
Plant	<i>Pinus albicaulis</i>	whitebark pine	Blue	Endangered	Endangered	Confirmed (higher elevations, N of St. Mary Lake (WSI))
Plant	<i>Pinus flexilis</i>	limber pine	Blue	Endangered		
Plant	<i>Pyrola aphylla</i>	leafless wintergreen	Blue			
Plant	<i>Ribes oxycanthoides</i> var. <i>cognatum</i>	northern gooseberry	Red			
Plant	<i>Senecio hydrophiloides</i>	sweet-marsh butterweed	Blue			
Reptile	<i>Charina bottae</i>	Northern Rubber Boa	Yellow	Special Concern	Special Concern	
Reptile	<i>Chrysemys picta</i> pop. 2	Painted Turtle - Intermountain - Rocky Mountain Population	Blue	Special Concern	Special Concern	
Reptile	<i>Plestiodon skiltonianus</i>	Western Skink	Blue	Special Concern	Special Concern	Confirmed (WSI data)

¹Red = Species that is at risk of being lost (extirpated, endangered or threatened) within British Columbia. Blue = Species considered to be of special concern within British Columbia. ²Endangered = Facing imminent extirpation or extinction. Threatened = Likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction. Special concern = May become a threatened or an endangered species because of a combination of biological characteristics and identified threats. Information sources: British Columbia Conservation Data Centre, BC Species and Ecosystem Explorer, and references therein.

APPENDIX 4. FORESHORE HABITAT SENSITIVITY INDEX DATA AND CALCULATIONS

2022 FHSI

Segment #	Year	FIM						Fisheries			Terrestrial/Ecosystem			Modifications								
		Percent Natural	Shore Type	Substrates	Aquatic Vegetation	Overhanging Vegetation	LWD	Riparian Bandwidth #1	Riparian Bandwidth #2	Juvenile Rearing	Migration	Staging	Floodplain	Vets	Snags	Road	Dock	Swim Float	Groyne	Boat Launch	Boat House	Other
1	2022	9.6	17.8	13.9	9.9	2.3	3.0	2.2	4.0	2.4	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2022	12.0	14.6	6.8	5.0	2.8	3.0	2.2	4.0	1.2	0.0	0.0	0.0	0.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	2022	10.8	18.0	14.0	9.4	4.0	1.2	11.0	2.0	6.0	2.0	2.0	8.0	0.0	0.6	-0.5	0.0	0.0	0.0	0.0	0.0	0.0
4	2022	3.6	14.6	11.3	3.3	0.3	2.4	5.3	4.0	2.4	0.0	0.0	0.0	0.2	0.2	-4.3	-0.2	0.0	0.0	0.0	0.0	0.0
5	2022	3.6	14.6	11.8	5.5	0.4	2.4	5.3	4.0	1.2	0.0	0.0	0.0	0.2	0.6	-1.5	-0.2	-0.2	0.0	-0.2	0.0	0.0
6	2022	2.4	14.6	6.8	2.2	0.1	3.0	4.4	4.0	2.4	0.0	0.0	0.0	0.0	0.6	-5.0	0.0	0.0	0.0	0.0	0.0	0.0
7	2022	6.0	13.2	9.8	4.4	0.4	3.0	7.0	4.0	2.4	0.0	2.0	0.0	0.0	1.0	0.0	-0.6	-0.1	-0.2	0.0	0.0	-0.2
8	2022	7.2	18.0	10.7	2.8	0.8	3.0	7.0	4.0	6.0	2.0	2.0	0.0	0.0	0.2	-3.0	0.0	0.0	0.0	-0.2	0.0	0.0
9	2022	4.2	13.3	10.9	2.2	0.3	3.0	7.0	4.0	2.4	0.0	2.0	0.0	0.0	0.0	-0.3	0.0	0.0	0.0	0.0	0.0	-0.2

Segment #	Year	FIM	Fisheries	Terrestrial/Ecosystem	Modifications	FHSI Score	FHSI Ranking
1	2022	62.6	2.4	0.2	0.0	65.2	High
2	2022	50.2	1.2	1.6	0.0	53.0	Medium
3	2022	70.3	10.0	8.6	-0.5	88.4	Very High
4	2022	44.7	2.4	0.4	-4.5	43.0	Low
5	2022	47.6	1.2	0.8	-2.0	47.6	Low
6	2022	37.5	2.4	0.6	-5.0	35.5	Very Low
7	2022	47.8	4.4	1.0	-1.1	52.1	Medium
8	2022	53.4	10.0	0.2	-3.2	60.4	High
9	2022	44.9	4.4	0.0	-0.4	48.9	Low
	Max possible	80	10	10	-10		
	Max observed	70.3	10.0	8.6	0.0		
	Min observed	37.5	1.2	0.0	-5.0		

COMPARISON OF 2010 and 2022 DATA USING MODIFIED 2022 FHSI INDEX THAT ONLY INCLUDES CONSISTENTLY COLLECTED DATA

Segment #	Year	FIM				Fisheries			Terrestrial/Wildlife			Modifications						Modified FHSI Score			
		Percent Natural	Shore Type	Aquatic Vegetation	LWD	Juvenile Rearing	Migration	Staging	Floodplain	Vets	Snags	Road	Dock	Swim Float	Groyne	Boat Launch	Boat House		Other		
1	2010	12.0	18.0	11.0	3.0	2.4	0.0	0.0	0.0	0.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.6
2	2010	11.4	14.4	1.1	3.0	1.2	0.0	0.0	0.0	0.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.7
3	2010	11.9	18.0	10.5	1.2	6.0	2.0	2.0	8.0	1.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.7
4	2010	4.8	14.6	3.3	2.4	2.4	0.0	0.0	0.0	0.6	0.6	-4.3	-0.2	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	24.0
5	2010	4.8	14.6	3.3	2.4	1.2	0.0	0.0	0.0	0.2	0.6	-1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.6
6	2010	2.4	14.4	3.3	3.0	2.4	0.0	0.0	0.0	0.2	0.6	-5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.3
7	2010	6.0	13.2	3.3	3.0	2.4	0.0	2.0	0.0	0.6	0.2	0.0	-0.6	0.0	-0.3	0.0	0.0	0.0	0.0	0.0	29.8
8	2010	7.2	18.0	0.6	3.0	6.0	2.0	2.0	0.0	0.2	0.6	-3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.6
9	2010	7.2	13.6	0.6	3.0	2.4	0.0	2.0	0.0	0.2	0.2	-0.3	0.0	0.0	0.0	-0.3	0.0	0.0	0.0	0.0	28.6
1	2022	7.8	17.82	9.9	3.0	2.4	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.1
2	2022	12.0	14.6	5.0	3.0	1.2	0.0	0.0	0.0	0.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.3
3	2022	10.8	18.0	9.4	1.2	6.0	2.0	2.0	8.0	0.0	0.6	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	57.4
4	2022	3.6	14.6	3.3	2.4	2.4	0.0	0.0	0.0	0.2	0.2	-4.3	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.2
5	2022	3.6	14.6	5.5	2.4	1.2	0.0	0.0	0.0	0.2	0.6	-1.5	-0.2	-0.2	0.0	-0.2	0.0	0.0	0.0	0.0	26.1
6	2022	2.4	14.6	2.2	3.0	2.4	0.0	0.0	0.0	0.0	0.6	-5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.2
7	2022	6.0	13.2	4.4	3.0	2.4	0.0	2.0	0.0	0.0	1.0	0.0	-0.6	-0.1	-0.2	0.0	0.0	0.0	-0.2	0.0	30.9
8	2022	7.2	18.0	2.8	3.0	6.0	2.0	2.0	0.0	0.0	0.2	-3.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	38.0
9	2022	4.2	13.3	2.2	3.0	2.4	0.0	2.0	0.0	0.0	0.0	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	26.7

APPENDIX 5. ST. MARY LAKE FORESHORE DEVELOPMENT GUIDE