LRISS Aquatic Invasives Project

Project number: 14.W.SON.04

Prepared for: Fish and Wildlife Compensation Program

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Prepared with financial support of the Fish and Wildlife Compensation Program on behalf of its program partners BC Hydro, the Province of BC, Fisheries and Oceans Canada, First Nations and public stakeholders.

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Executive Summary

The Lillooet Regional Invasive Species Society (LRISS) with the BC Hydro Fish and Wildlife Compensation Program grant has formally initiated an Aquatic Invasive Species (AIS) program. This project focused on creating an AIS Strategy and Action plan as well as a field program. LRISS crews surveyed and treated high priority shorelines. In the past, our program has focused primarily on terrestrial plants, but we found two invasive species in our region that are found in aquatic environments: Japanese Knotweed (*Fallopia japonica.)* and Yellow Flag Iris (*Iris pseudacorus*). These species as well as other AIS, like invasive mussels, have the ability to impact salmon spawning sites, riparian habitat as well as important BC Hydro infrastructure. It was essential that we treat the known sites and start a formal AIS program with goals and actions.

The goals of this project included:

1. Develop an Aquatics Action Plan.
2. Inventory lakes, riparian and wetland habitat for aquatic invasives.
3. Treat selected priority sites in order to gain a better understanding of time and costs for treatment (treatment options and plans will be identified in the Aquatics Action Plan).
4. Partner with stakeholders, local community associations and First Nations to educate their members about invasive identification and best management practices to prevent establishment and spread.
5. Participate in local events to raise awareness of this project and the threat of aquatic invasives in our area (there is an Education and Awareness component of the Action plan).

All of the goals were successfully met for this project. An Aquatics Invasive Species Strategy and Action Plan for our region have been developed and LRISS will start implementing it this year. LRISS participated in events and meetings to share information about this project. We had a display at the Bridge River Summer Festival in Gold Bridge as well as participated in the Tyaughton Lake Rate Payers AGM to educate people about AIS and this project. LRISS submitted an article to the Mountain Telegraph (distribution primarily the Bridge River Valley residents) and posted to social media details of the project. LRISS has also secured partnerships with the Seton Lake First Nations and the Tyaughton Lake Rate Payers to manage and treat AIS in their areas.

The field component focused on surveys and treatment. Using the Ministry of Forests, Lands and Natural Resource Operations' Invasive Alien Plant Program's survey procedures, LRISS crews surveyed 150 kilometers of shoreline primarily targeting Knotweed species and Yellow Flag Iris. Downton, Carpenter, Tyaughton and portions of Seton Lake shorelines were surveyed. Seven Yellow Flag Iris sites were treated and approximately 700 kilograms of plant matter was removed. It was clear during our treatment on west Seton Lake and Tyaughton Lake that we would not be able to remove all of the Yellow Flag Iris patches during this project. LRISS crews ensured that all patches were mapped (22) using our IPad GISPro Application for future treatment. IAPP surveys were completed for all of the sites that were treated. Survey information establishes whether a site has changed in size and if treatment is effective.

Introduction & Background

The Lillooet Regional Invasive Species Society has recognized the need to expand and formalize our program with regards to aquatic invasive species. Since 2012, when LRISS first started operating, the target species was primarily terrestrial. Our surveys detected Yellow Flag Iris (*Iris pseudacorus*) and Japanese Knotweed (*Fallopia japonica*) in our region. The Japanese knotweed was found on the public beach on Seton Lake and a patch of Yellow Flag Iris was found in the BC Hydro Canals along the water's edge (west of the upper spawning channels in the fenced area across from the junction of Highway 99 and road to the boat launch). The LRISS Board made the decision to actively seek funding for the prevention and management of aquatic invasive species and create an Aquatic Invasives Action Plan.

Aquatic invasive species, like Yellow Flag Iris and Knotweed, have the potential to degrade riparian habitat by decreasing bank stability and increasing sedimentation. Fish habitat is at risk as a result as well as water quality. Native plant diversity is replaced by a monoculture of invasive species that no longer provide shelter, food or habitat for a variety of species (many of which are listed in the Species Action Plan like Bats, Grizzly bears and Owls). Invasive alien species essentially desecrate important riparian and wetland habitat rendering it useless to these important native wildlife species.

Aquatic Invasives also have the potential to impact our region's hydro infrastructure and tourism industry. Eurasian Watermilfoil (*Myriophyllum spicatum*) has infested Okanagan Lake, Nicola Lake (Merritt) and Cultus Lake (near Chilliwack) interfering with recreational activities like boating and swimming. Dense growths of milfoil deplete water oxygen levels and alter the natural aquatic ecosystems. Invasive mussels, if introduced, would significantly impact recreational activities, freshwater ecosystems and hydro infrastructure. The mussels rapidly reproduce and clog water intake pipes. Damages to Lake Okanagan as been estimated at $42 million per year according to an Okanagan Water Board Study (Self, J., Larratt, H. 2013). A BC Ministry of Environment report estimates damages could cost BC $21 million annually (Robinson, D. et al. 2014.).

Goals and Objectives

Taken directly from the project application the project goals include:

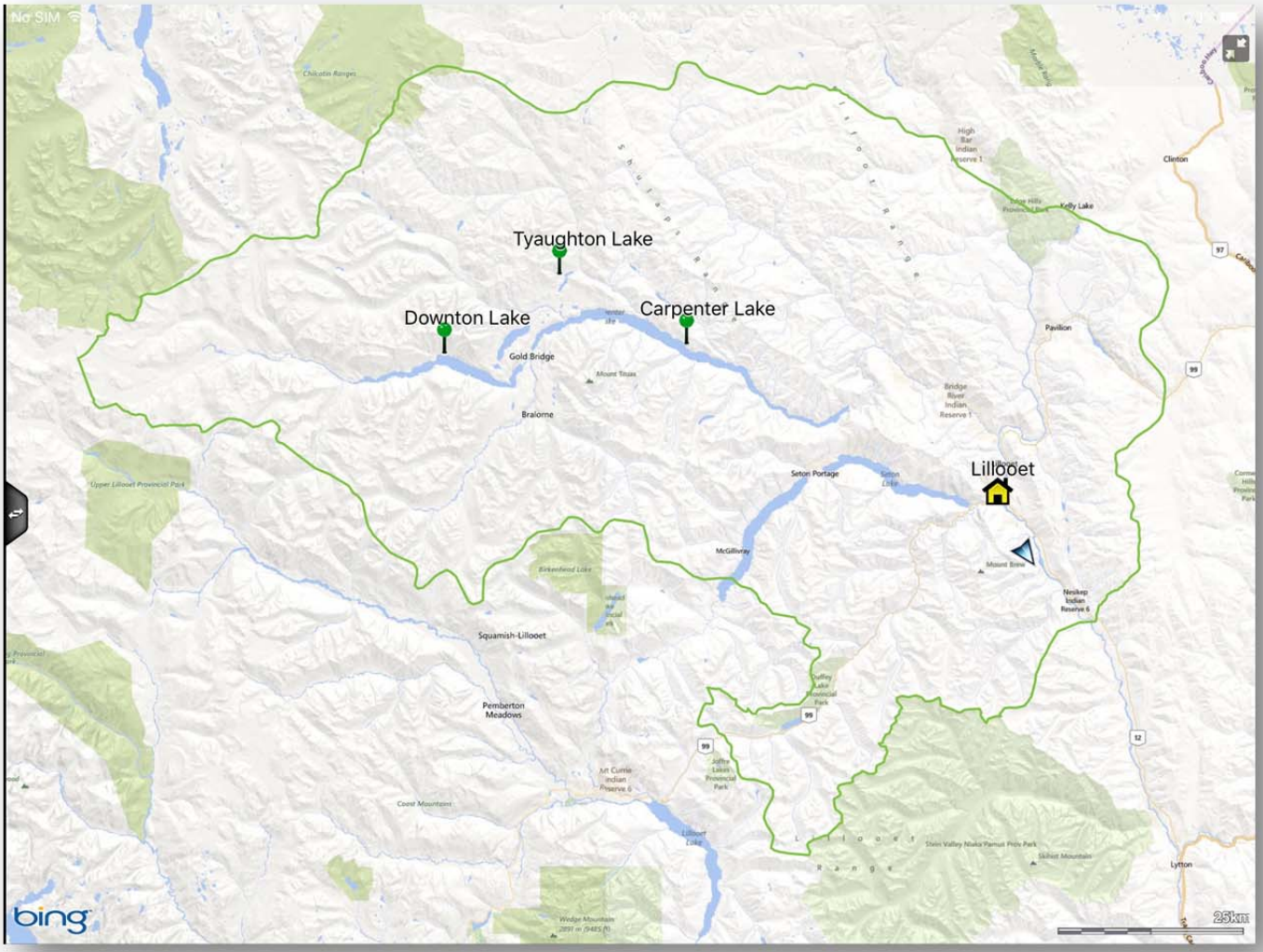
1. Develop an Aquatics Action Plan.
2. Inventory lakes, riparian and wetland habitat for aquatic invasives.
3. Treat selected priority sites in order to gain a better understanding of time and costs for treatment (treatment options and plans will be identified in the Aquatics Action Plan).
4. Partner with stakeholders, local community associations and First Nations to educate their members about invasive identification and best management practices to prevent establishment and spread.
5. Participate in local events to raise awareness of this project and the threat of aquatic invasives in our area (there is an Education and Awareness component of the Action plan).
6. Implement Aquatics Action Plan including updating the LRISS Strategic Plan to reflect new knowledge and goals with regards to aquatic invasives. *Please note that this goal was dropped due to time and funding constraints*.

Study Area

The study area includes the Bridge-Seton Watersheds. This is a significant portion of the LRISS operating area, which can be seen in the map below (Source: GIS Pro app; Bing map). The project areas focused on the treatment of 2 known areas of Yellow Flag Iris: west end of Seton Lake and Tyaughton Lake. Carpenter and Downton Lakes (reservoirs) were our targets for inventory of shoreline aquatic plant species, primarily

Knotweed and Yellow Flag Iris. Substrate monitors for invasive mussels were installed for the summer months in Seton Lake.

Map of the Project Area.



Methods

Our survey methods followed the Ministry of Forests, Lands and Natural Resource Operation's (MoFLNRO) Invasive Alien Plant Program (IAPP) protocols. This methodology ensures that any data collected and entered into this Provincial Database has the same methods and can be compared and analyzed consistently. The IAPP methodology can be found on their website in the IAPP Reference Guide (https://www.for.gov.bc.ca/hra/plants/RefGuide.htm).

The lakes were surveyed primarily for shoreline invasives and we used a boat to complete these surveys. A special river boat with a flat bottom was necessary for safety purposes because Carpenter and Downton Lakes are reservoirs that have old trees, logs and shallow rocks that can be found along the shallow shorelines. An

LRISS crew and a boat operator slowly travelled the entire shoreline of both lakes to look for any invasives. No further detailed surveys were necessary to complete because the target invasives were not found.

Data was collected as a result of the treatment of Yellow Flag Iris sites along Seton Lake and Tyaughton Lake. These sites were already created in IAPP so they have a number and a survey indicating the site location (GPS - Universal Transverse Mercator), size (hectares), invasive species and other information (please refer to survey forms attached). The provincial IAPP Database then allows for the addition of treatment information to this site. The IAPP treatment form requires the field technician to record site size, location, percentage of the site treated and important comments relevant to the type of treatment. IAPP requires that we collect information on the method of treatment. In all cases, LRISS mechanically treated the Yellow Flag Iris sites by either cutting off the seed pods and vegetation or digging out the entire tuber mass.

In order to monitor the efficacy of the mechanical treatment of these sites, they will need to be re-surveyed. Before the treatment of the sites, we did re-survey them as well, to record the most current site information prior to treatment. Other than location details, the most important information that we collected is the size of the infestation as well as its density and distribution. Density and Distribution also give the invasive managers key information about the changes to an infestation. As seen on the IAPP survey form, this information is collected at the time of the site creation. Distribution refers to the special distribution of plants on a site and density is the amount of plants per meter squared found (please refer to the IAPP Survey Form attached). These key pieces of data allow us to track the spread of a species on a site and the efficacy of treatment.

LRISS collected more detailed information on Tyaughton and Seton Lake about the location of the patches of Yellow Flag Iris found within the IAPP sites. A new IAPP site can only be established if there is a 100 meter gap between plants found. This can result in many small clumps or patches within a site that is 99 square meters. In order to track the Yellow Flag Iris patches more accurately for treatment and surveying, LRISS used a Geographical Information System (GIS) Application on our Ipads (called GPS Pro), to record the location of the patches. We also took photos and notes about these locations for future treatment.

Results and Outcomes

LRISS has successfully completed all of the goals and objectives as outlined by our project. As described below, we were able to complete fieldwork, engage community groups and create an Aquatics Strategy & Action Plan for our region. As stated above, the implementation of the plan will occur in the future as time and funds allow.

Table 1 below outlines the results of our project fieldwork.

Location	Type of Field Work	Metrics	Important Information
Carpenter Lake	Shoreline Survey	95 kms	No target invasives found.
Downton Lake	Shoreline Survey	50 kms	No target invasives found.
Tyaughton Lake	Shoreline Survey IAPP Survey IAPP Treatment IAPP New Site	• 2 kms of shoreline; 6 Patches mapped • 1 Survey 301171 • 3 Sites Treated 301171, 301179 & New Site; 0.02 hectares removed • 1 new IAPP Site	Patches were mapped using GISPro app – already part of an existing or new IAPP site. All sites treated were Yellow Flag Iris and hand dug out.

Seton Lake	Patches Mapped IAPP Survey IAPP Treatments	• 16 patches mapped • 5 Surveys: 301246, 301167, 301165, 301281(x2) • 4 Sites Treated: 301246, 301167, 301165, 301281; 0.0075 hectares removed	There were only 2 sites where treatment removed 100% of the iris. The other sites had a combination of treatment including digging, removal of vegetation and seed pods.

The fieldwork for this project was completed over the summer months in stages. Yellow Flag Iris seed pods were removed in early summer to prevent spread of Yellow Flag Iris in Seton and Tyaughton Lakes. Later, surveys and treatment were completed in August to correspond to the Federal Fisheries work window for the watersheds. Hand digging next to waterways does cause some sedimentation so we wanted to ensure that the work would cause little or no harm to fish species. Shoreline surveys for Downton & Carpenter reservoirs were completed late summer and no new sites were found. A detailed inventory of Yellow Flag Iris patches on Tyaughton Lake will allow us to incorporate the findings into the LRISS Aquatics Action Plan for future treatment.

Seton Lake First Nations and BC Hydro's summer student engaged in installing substrate monitors in Seton Lake to monitor for Aquatic Invasive Species. There were no invasives found. Specifically, there were no invasive mussels found on the substrates.

LRISS crews removed approximately 700 kilograms of Yellow Flag Iris tubers and plant matter from Seton Lake. This was completed by hand digging and transporting the thick organic mat of tubers by canoe to the shore and disposed of in the Lillooet Landfill (they were put in thick plastic bags).

Engagement with the residents of the Bridge River Valley and Seton was successful. The community events, AGM meeting and informal meetings allowed us to talk about this project, FWCP's funding and develop relationships that have lead to future partnerships. LRISS attended the Bridge River Summer Festival and the Tyaughton Rate Payers Association AGM (by telephone) and was able to share information about this project. Both Seton Lake First Nation and Tyaughton Rate Payers are concerned about aquatic invasives and want to help remove them from their area. This is an important achievement because LRISS seeks partnerships to expand our capacity to achieve goals in our region.

LRISS specifically spent a day engaging with Tyaughton Lake Property owners and volunteers removed Yellow Flag Iris patches by hand-digging. Our crews and a volunteer did a more detailed search of the west shore of Tyaughton Lake to map the patches of iris. Three sites were treated and including a new site. LRISS has secured a partnership with this group to treat the patches in the future and use the Association's President's excavator.

There were also other opportunities to raise awareness of this project through traditional media in addition to social media. We posted photographs on our Facebook page of the loads of Yellow Flag Iris that we removed from Seton Lake's shoreline. LRISS also wrote an article for a small publication in the Bridge River Valley called the *Mountain Telegraph*. In this article, we gave an update on the project.

LRISS learned about the staff time and needs for Yellow Flag Iris removal from this project. Removal of Yellow Flag Iris was very labour intensive and time consuming. Access to the Seton Lake – Portage Creek patches was by canoe and crews had to wade in water. LRISS crews were able to remove patches at the Hydro Picnic site on the north side of Seton Lake but the Portage Creek area was not fully completed. Hand-digging can be very effective but the thick masses of iris tubers were growing in dense organic sod. Crews purposefully started by digging out all patches closest to the lake to try and limit further spread. We found that digging out and

transporting the plant waste via canoe back to shore took a lot of time. We had to re-adjust our approach because we knew that we didn't allot enough time (or labour) to dig out all of the patches. In consultation with the Sea to Sky Invasive Species Society, we chose to flag all of the remaining patches and cut off the leaves from the tubers. It was recognized that the cutting would not eradicate the patch but would stress the plant. As stated previously, LRISS crews mapped all of the patches for future treatment and monitoring.

An Aquatic Invasives Strategy and Action Plan was developed for the Lillooet Region as part of this project. It will allow us to understand the current invasives that are now in our region and prioritize sites for treatment. It will also identify those species that are not in our region and the role of outreach and education to prevent these invasives from entering our area. LRISS is currently developing an outreach and education plant that and the majority of the activities related to aquatics will be in this plan. This plan is attached.

Acknowledgements

Special thanks to the following organizations for the support of our project:

- The Fish and Wildlife Compensation Program for financial support.
- Seton Lake - Tsalath First Nation wrote us a support letter for the application process. They also installed a substrate monitor for Zebra and Quagga Mussels.
- Squamish Lillooet Regional District Area A and B provided financial support from the SLRD allowed us to purchase materials and construct substrate monitors for invasive Zebra and Quagga Mussels.
- Bridge River Valley Community Association provided a support letter for our grant application.
- Matthias Herborg, Ministry of Environment's, Aquatic Invasive Species Specialist wrote a support letter for our grant application.

References & Attachments:

1. Final Statement of Accounts: Attached separately.
2. LRISS Aquatic Invasive Species Strategy and Action Plan: Attached separately.
3. Invasive Alien Plant Program Survey and Treatment forms attached.

Self, J., Larratt, H. 2013. Limiting the Spread of Aquatic Invasive Species into the Okanagan. Prepared for the Okanagan Basin Water Board and the Glenmore-Ellison Improvement District., (available online http://www.obwb.ca/fileadmin/docs/2013_obwb_ais_report.pdf);

Robinson, D. et al. 2014. Preliminary Damage Estimates for Selected Invasive Fauna in B.C. Prepared for Ecosystems Branch, B.C. Ministry of Environment.

Range Branch. Ministry of Forests and Range. 2010. Invasive Alien Plant Program Reference Guide.

Ministry of Forests, Lands and Natural Resource Operations Invasive Alien Plant Program Data Collection Forms

Survey Form

IAPP Site & Invasive Plant Survey Record

Entered into IAPP (YYYY-MM-DD):	*By:*	*Assigned Site IDs recorded on this form:* ☐

Site Created Date (YYYY-MM-DD): *	**Invasive Plant Survey Date** (YYYY-MM-DD): * (only if different from Site Created Date)	**Site ID:** (assigned at IAPP data entry)

Site Details

Jurisdiction: * (see reverse for choices/codes)	District Lot Nr:	Range Unit:	Site Paper File ID:
UTM Zone: *	**UTM Easting:** * (no initial zero)	**UTM Northing:** * (7 digits)	Site Soil Texture: coarse ☐ fine ☐ organic ☐
Slope:	Aspect:	Elevation (m):	
Site Location (and directions how to get there):			Site Comments (anything else important /useful):

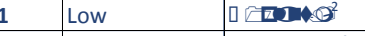
Invasive Plant Survey Details

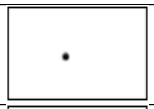
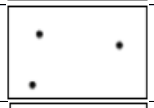
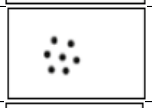
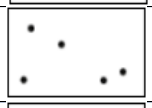
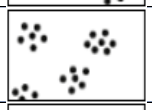
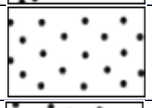
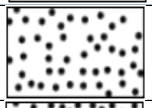
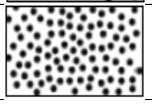
Survey Agency: *	Employer:	Surveyor(s):

Invasive Plants * Species name or code	**Area** * Dimension or Ha	Distr. Code (see reverse for codes)	Density Code (see reverse for codes)	**Survey Type** * **C**ursory /**O**perational /**P**recise	Proposed Activity Man	Chem	Bio
				C ☐ O ☐ P ☐	☐	☐	☐
				C ☐ O ☐ P ☐	☐	☐	☐
				C ☐ O ☐ P ☐	☐	☐	☐

Site Image Details

Date taken (YYYY-MM-DD):	**Reference No.** *	**Perspective:** * (see reverse for codes)	Image Comments:

Density Code		
Code	Reference	Description
1	Low	
2	Medium	2-5 plants/m^2
3	High	
4	Dense	

Distribution Code		
Code	Reference	Description
1		Rare individual, a single occurrence
2		Few sporadically occurring individuals
3		Single patch or clump of a species
4		Several sporadically occurring individuals
5		A few patches or clumps of a species
6		Several well-spaced patches or clumps of a species
7		Continuous uniform occurrence of well-spaced individuals
8		Continuous occurrence of a species with a few gaps in the distribution
9		Continuous dense occurrence of a species

Treatment Form (includes both Mechanical and Chemical – LRISS only did mechanical for this project).

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INVASIVE PLANT CHEMICAL & MECHANICAL TREATMENT RECORD

DATA ENTERED INTO IAPP | ENTERED BY | PCP #s 2,4-D 14725; Banvel 18837; Escort 23005; Milestone 28137 Restore 28137/28271; Vanquish 26980; Grazon 26649 Roundup 13644; Tordon 22K 9005; Transline 24084 | OTHER HERBICIDE | REGISTRATION #

TREATMENT DATE YY/MM/DD | AGENCY | EMPLOYER | CERTIFIED APPLICATORS | CERT. NUMBER | SUPERVISOR SIGNATURE | OTHER APPLICATORS | CERT. NUMBER

RANGE UNIT | PASTURE | PAPER FILE ID | PMP NUMBER

ACTIVITY	New Site	Site ID OR Paper File ID	UTM Zone	Easting	Northing	Invasive Plant Not Found	Time of Application	Species 1	%	Distribution Code	Species 2	%	Distribution Code	Species 3	%	Distribution Code	Area Treated (ha)	Temperature (°C)	Windspeed (Km/h)	Wind Direction	Treatment Method	Name of Herbicide	Application Rate (L Herbicide/ha)	Amount of Mix Used (L)	Sprayer Delivery Rate (L Mix/ha)
☐ CHEMICAL ☐ MECHANICAL ☐ SURVEY ONLY	☐					☐																			
JURISDICTION	LOCATION OR ROAD NAME/Km																COMMENTS								
☐ CHEMICAL ☐ MECHANICAL ☐ SURVEY ONLY	☐					☐																			
JURISDICTION	LOCATION OR ROAD NAME/Km																COMMENTS								