LRISS Aquatic Invasives Project

LRISS Aquatic Invasives Project -Project number: COA-F17-F1198

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 completed the second year of an Aquatic Invasives Project. The study area includes the Bridge-Seton Watersheds. Aquatic invasive species have been detected in the LRISS region and they have the potential to take over shorelines of lakes and creeks. Invasives, like Yellow Flag Iris, can create monocultures along riparian areas that displace native plants and degrade fish and wildlife habitat.

The goals of this project included:

1. Targeted inventory of Anderson Lake that could potentially be the source of Yellow Flag Iris that has established in Seton Lake.
2. Targeted survey for Yellow Flag Iris on Tyaughton Creek.
3. Remove the Yellow Flag Iris and Knotweed sites from Seton and Tyaughton Lakes including the channels of Portage Creek flowing into Seton Lake.
4. Partner with local stakeholders and the Seton Lake First Nations (Tsal'alh) to educate and train them on how to identify aquatic invasives and remove them.
5. Participate in local community events to education the general public about the impacts of invasives and how they can stop their spread.

Benefits to fish and wildlife include the following measurable goals for this project: survey 60 km of shoreline, remove 20 square meters of Yellow Flag Iris, and remove 6 square meters of Knotweed.

The Ministry of Forests, Lands and Natural Resource Operations, Invasive Alien Plant Program's (IAPP) survey and treatment techniques were followed for the completion of this project. Treatment was mechanical in nature and primarily consisted of hand digging of infestations. An excavator was used on one site on Tyaughton Lake. Permits and permissions from private landowners, Ministry of Environment and the Squamish Lillooet Regional District were obtained for all removal work.

Fieldwork completed for the project met the fish & wildlife goals. The shoreline of Anderson Lake was surveyed along with Tyaughton Creek, which was over 60km. Only 9 new invasive sites were detected as a result. Monitoring was completed on 13 sites treated in 2015. Nineteen sites were treated and covered just over a hectare in size. The majority of these sites consisted of Yellow Flag Iris (*Iris pseudacorus*) but also included Japanese Knotweed (*Fallopia japonica*) and Himalayan Blackberry (*Rubus armeniacus*). The largest Yellow Flag Iris site is found on the west side of Seton Lake and was composed of 23 patches. Five LRISS crew members and 3 Tsal'alh community members removed these by hand digging.

A number of outreach methods were used to share information about this project: social media, news article, poster and attendance at 4 community events. The Bridge River Valley Community Association staff was also trained by LRISS to share information with tourists and locals about aquatic invasives and our project.

The goals were met and exceeded for this project. The LRISS crews removed 9,502 square meters (m^2) of Yellow Flag Iris, 451m^2 of Knotweed and 970m^2 of Himalayan Blackberry along the shores of Seton, Anderson and Tyaughton Lakes. Based on our monitoring of sites treated last year, the best way to remove Yellow Flag Iris is to dig out and remove all of the roots. Eradication of this species in our region is possible by this method. Knotweed and Blackberry treatment will need to continue because removal of these species will take years. Our partnerships with First Nations and private landowners will facilitate this ongoing need for treatment.

Recommendations for 2017 include monitoring all sites treated this year, continued surveys and removal of any remaining patches. On broader terms our recommendation is to implement the LRISS Aquatic Invasive Strategy, which prioritizes outreach, prevention and early detection for our program.

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Introduction and Background

The Lillooet Regional Invasive Species Society has recognized the need to address aquatic invasives in our program. The detection of Yellow Flag Iris (*Iris pseudacorus*) and Japanese Knotweed (*Fallopia japonica*) in our region in addition to the threats of Eurasian Watermilfoil (*Myriophyllum spicatum*) and Invasive Mussels (Zebra and Quagga) prompted LRISS to seek specific funding to launch our Aquatics program in 2015. Our focus included and continues to be three main activities: Prevention through community outreach, surveys to detect new infestations and removal of current sites. With so few Yellow Flag Iris sites, our goal is to completely eradicate this species from our region.

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 that could occur to Lake Okanagan have been estimated to cost $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.). Invasive Mussels have now been detected in Montana and Emergency meetings were held in December 2016 to discuss actions that BC must take to prevent the mussels from entering our province (PNWER December 9, 2016).

Goals and Objectives

The project goals include the following (taken directly from the agreement):

1. Targeted inventory of Anderson Lake that could potentially be the source of Yellow Flag Iris that has established in Seton Lake.
2. Targeted survey for Yellow Flag Iris on Tyaughton Creek.
3. Remove the Yellow Flag Iris and Knotweed sites from Seton and Tyaughton Lakes including the channels of Portage Creek flowing into Seton Lake.
4. Partner with local stakeholders and the Seton Lake First Nations to educate and train them on how to identify aquatic invasives and remove them.
5. Participate in local community events to education the general public about the impacts of invasives and how they can stop their spread.

Benefits to fish and wildlife included the following measurable goals for this project:

- Survey 60 km of shoreline.
- Remove 20 square meters (m^2) of Yellow Flag Iris.
- Remove 6 m^2 of Knotweed.

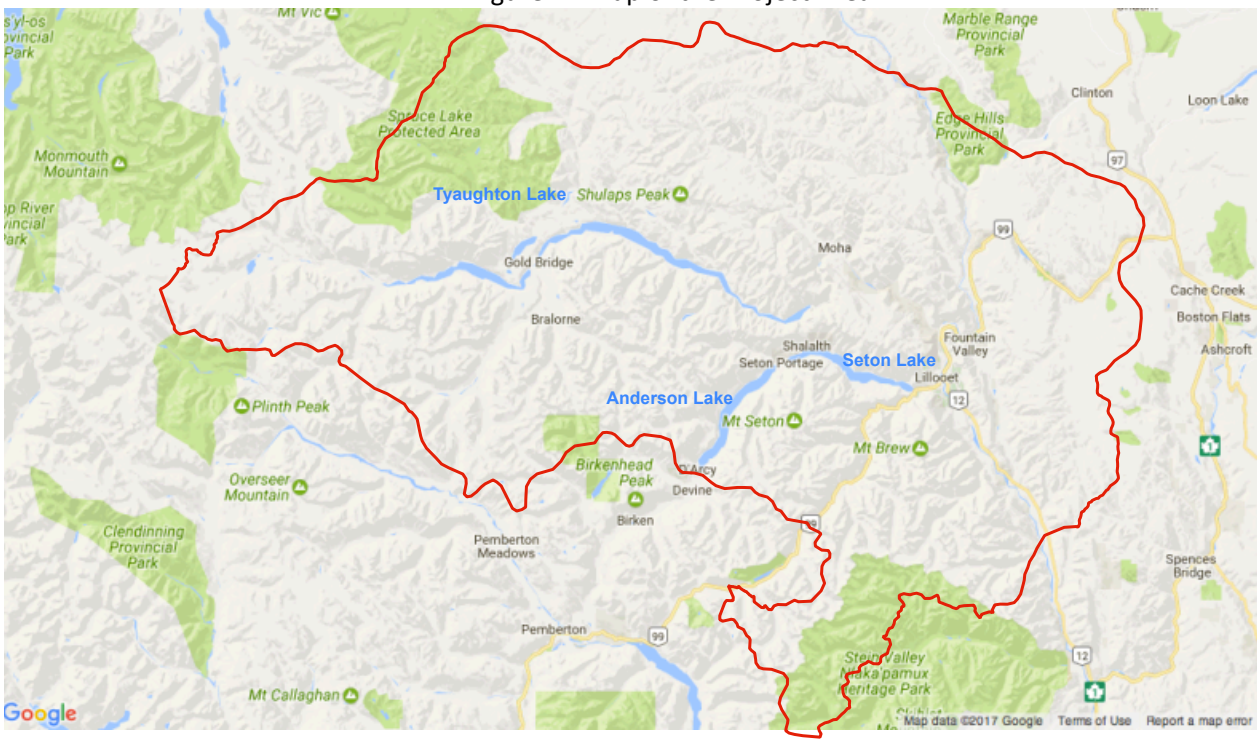
The removal and eradication of these invasives will allow for the regeneration of native riparian vegetation that will provide stream bank stability, cover, food and habitat for a host of species. Stream bank stability will prevent sedimentation of spawning areas for fish. Native plants and shrubs will provide breeding, cover and

food sources for birds and wildlife. If the invasive sites are left, they will continue to expand and suppress native vegetation. Yellow Flag Iris is poisonous to humans and wildlife. Knotweed roots caused increased sedimentation because the roots do not hold soil as well as native plants along riparian areas.

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. The project areas focused on the treatment of 2 known areas of Yellow Flag Iris: west end of Seton Lake and Tyaughton Lake. Anderson Lake and Tyaughton Creeks were our targets for inventory of shoreline aquatic plant species, primarily Knotweed and Yellow Flag Iris.

Figure 1. Map of the Project Area.



Methods

Our survey and data collection 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).

There were three types of IAPP surveys completed in this project: new sites, monitoring of sites (survey of an existing site) and treatment of a site (either new or existing). All IAPP sites are uniquely identifiable based on a geographical point on the land base. LRISS crews collect data using IPads and the GISPro Application (App). On a new site, you must place a "pin" to create this unique point and then other data is collected including how to get there, what species are present, the size of the infestation and surveyors names (please refer to the attached forms for all of the data). Once an invasive has been identified on sites, then other surveys and treatments can be added to the site. We completed surveys on the sites that were created and treated in 2015. The survey form is the same one that is used for new sites. The most important data to collect is the species present and the size of the infestation so that any changes that have occurred can be compared.

The treatment form is also attached. It is important to identify the species, area, percentage treated and the method of treatment. Many of the sites were treated 100 percent but in some cases, there were patches that could not be removed. On the largest site on the west side of Seton Lake there were a few sites on the north side of Portage Creek that were almost all underwater. The crews could not safely access them to remove the patches without either falling into the creek or risk the Yellow Flag Iris plant material dislodging, flowing into the lake potentially causing a new infestation.

The LRISS crews collected more detailed data on the patches within the IAPP sites for future monitoring purposes. A new IAPP site is distinguished only if there is 100 meters of invasive-free space between it and a neighbouring infestation. One site might contain numerous patches and they can separated, for example, by 90 meters. In order to find these patches efficiently during the field season and monitor the efficacy of the treatment, we mapped the patches within the IAPP sites. In the *Results and Outcomes* section below, there are 2 figures that show Seton and Tyaughton IAPP sites and their patches.

The field crews used boats for the project to increase efficiency and safety. Two different recreational motorboats were used for the survey work on Anderson and Seton Lakes. The shoreline of Anderson Lake was surveyed for new invasive sites and existing sites were surveyed on Seton Lake. Canoes, kayaks and a rowboat were used on Tyaughton and Seton Lakes for survey, removal and transportation of crews.

All treatment of sites was mechanical in nature. Three extra crew members from the Tsal'alh First Nation (Seton) were hired and trained to assist with this portion of the project. The majority of the Yellow Flag Iris sites were removed by hand digging with shovels and placing the plant material in bags. There were several patches, however, on Tyaughton Lake that were removed by an excavator. The local cabin owners granted LRISS access to their private land and all plant material was removed and hauled away by dump truck. Yellow Flag Iris material is very heavy because of the dense tubers and waterlogged organic material so it was necessary to use a dump truck to haul away the material removed by excavator. In order to do this work by excavator, LRISS was granted 2 permits: one by the Provincial Government that was a Section 9 Under the BC Water Act for "Changes in and around a stream" and a Development Permit from the Squamish Lillooet Regional District (SLRD, see attached). There was one large patch where we built a temporary silt fence to mitigate the movement of silt into the lake as a result of excavator work (see Figure 2 photo below).

Figure 2. Photo of the silt fence and excavator removing Yellow Flag Iris on Tyaughton Lake.

In addition to the permits, we worked very closely with the Tyaughton Rate Payers Association as well as the Tsal'alh First Nation. In mid-July, a notice was given to Sue Eckersley, the Tyaughton Rate Payers President, to circulate to the lake cabin owners about the invasive removal. This notification, numerous personal conversations between Sue and the cabin owners in addition to the SLRD permit was our commitment to ensure that the community knew about our project and intended work.

Results and Outcomes

The activities of this project followed specific work windows due to plant stage and reducing impacts to fish habitat. There was very limited risk of damage to fish habitat due to our removal activities but following the specific dates for work windows reduced any minor siltation effects to fish to almost zero. This list shows the activities by date. The activities are discussed in more detail later in this section.

- June 16: Treatment of Japanese Knotweed Seton Lake Public Beach
- July 7: Yellow Flag Iris seed pod removal on patches of largest site on west end of Seton Lake: 301281.
- August 3: Tyaughton Lake Yellow Flag Iris Treatment, Crews and Excavator
- August 4-5, 8-9: Seton Lake Invasive Removal – Crews removed Yellow Flag Iris and Himalayan Blackberry
- August 10: Seton Lake Shoreline Survey - monitoring of iris sites treated in 2015
- September 19-20: Anderson Lake Shoreline Survey approximately 48kms
- September 23: Tyaughton Creek Survey approximately 350 meters

New Sites

As a result of our fieldwork, we did find 9 new invasive sites. Eight of these sites were Yellow Flag Iris and one was Himalayan Blackberry. Seven of these sites were treated and this work is described in the treatment section. Table 1 gives a summary of these sites, area and location. Overall, there was 1,130 m^2 (0.113 hectare) of new invasives found. The largest sites included the Himalayan Blackberry found on the west side Seton Lake that had spread from private/Reserve land and a Yellow Flag Iris site on Tyaughton Creek (319048). This site has a large footprint but contains only 2 patches that will be treated in 2017. We also saw a plant on site 319048 that could be Purple Loosestrife (*Lythrum salicaria*). We were not able to get close enough to the plant to make a positive identification so we will return to the site next year. The crews will need waders and a boat. Site 318998 will also be treated in 2017 in collaboration with the Sea to Sky Invasive Species Council (SSISC).

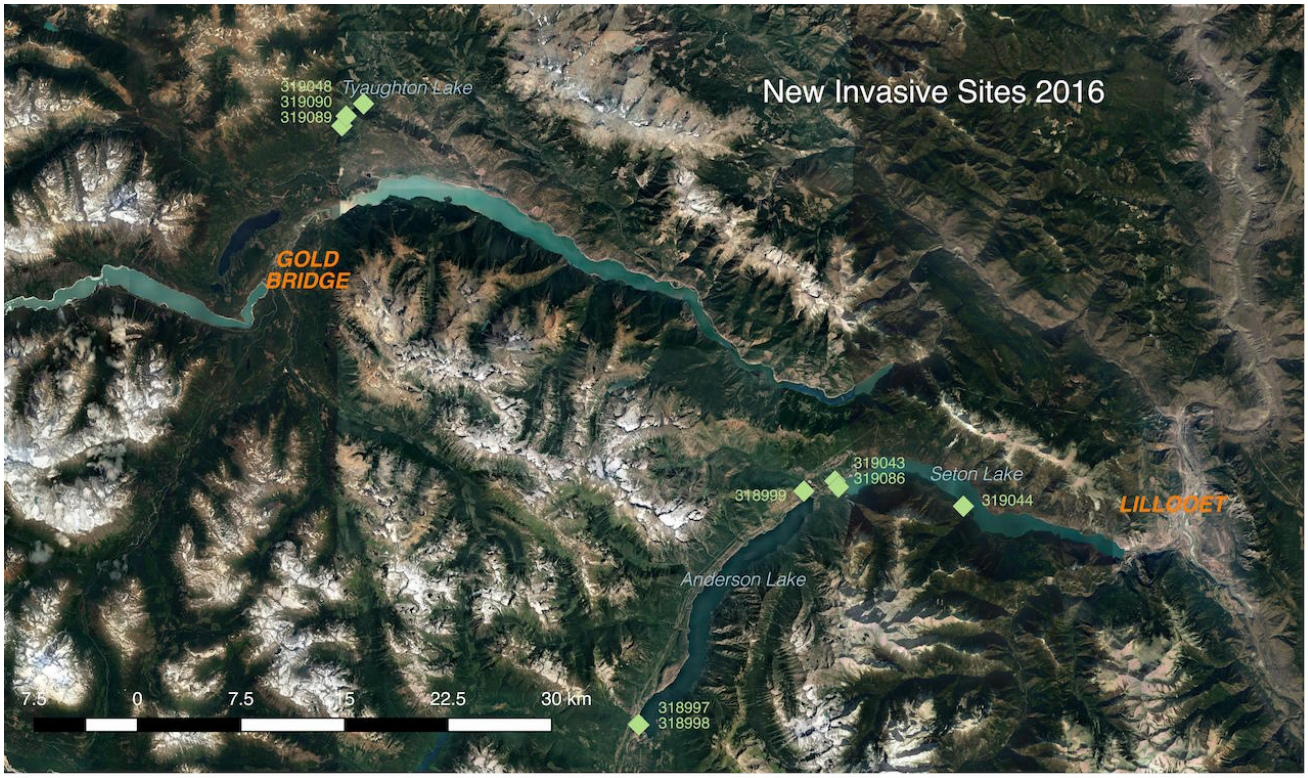
Table 1. Summary of New Sites found in 2016

IAPP Site #	Location	Invasive Species	Site Area (Hectares)	Notes
318997	Anderson Lake	Yellow Flag Iris	0.002	Treated
318998	Anderson Lake	Yellow Flag Iris	0.0001	Not treated – access through private land
318999	Anderson Lake	Yellow Flag Iris	0.0001	Treated
319043	Seton Lake	Himalayan Blackberry	0.07	Treated only on shoreline of Seton Lake. Private land owner continuing treatment.
319044	Seton Lake	Yellow Flag Iris	0.0001	Treated
319048	Tyaughton Creek	Yellow Flag Iris	0.04	Will be treated in 2017
319086	Seton Lake	Yellow Flag Iris	0.0005	Treated
319089	Tyaughton Lake	Yellow Flag Iris	0.0001	Treated
319090	Tyaughton Lake	Yellow Flag Iris	0.0001	Treated

The photo below is a map of the new site locations. The green diamonds indicate the new sites found. There are

two sites at the west end of Anderson Lake (only one symbol).

Figure 3. Map of New Invasive Sites found in 2016



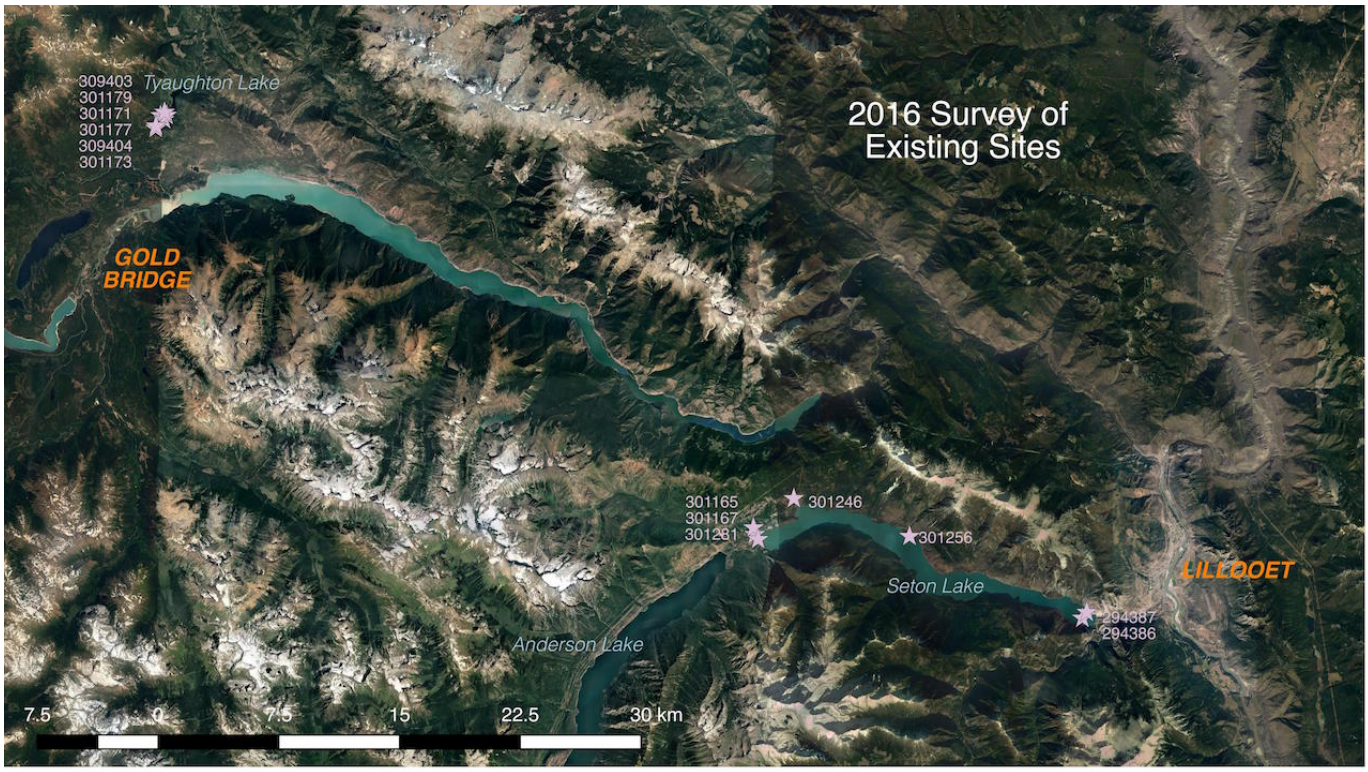
Sites Surveyed

In total 13 sites were surveyed and one site was surveyed twice. In total, there was 10,384 m^2 (1.0384 ha) of site area was surveyed. This included all of the sites found in last year's field season (2015). A site on Tyaughton Lake was treated in 2015 and no new invasives were found on this site (301177). This site is accessed by private land and the landowner has been removing the patch voluntarily. The largest site surveyed was on the west side of Seton Lake (301281), which is composed of 23 patches of Yellow Flag Iris. LRISS crews used our IPads and the GISPro App to map all of these patches for future monitoring purposes. The crews also mapped the 5 patches found in site 301171 on the west side of Tyaughton Lake. Please refer to the treatment section for more information. Figure 4 shows a map of these sites.

Table 2. Summary of Sites Surveyed

IAPP Site #	Location	Invasive Species	Site Area (Hectares)	Notes
294386	Seton Lake	Japanese Knotweed	0.045	This site was surveyed twice and treated.
294386	Seton Lake	Japanese Knotweed	0.045	Both times the site area was the same – no change to the infestation size.
294387	Seton Lake	Japanese Knotweed	0.0001	Treated
301165	Seton Lake	Yellow Flag Iris	0.001	Treatment slated for 2017
301167	Seton Lake	Yellow Flag Iris	0.0001	Treated
301171	Tyaughton Lake	Yellow Flag Iris	0.154	Largest site on the lake. 5 patches all treated: 2 by excavator, 3 by hand digging.
301173	Tyaughton Lake	Yellow Flag Iris	0.001	Treated
301177	Tyaughton Lake	Yellow Flag Iris	0	No plants found this year.
301179	Tyaughton Lake	Yellow Flag Iris	0.011	Treated
301246	Seton Lake	Yellow Flag Iris	0.006	Treated
301256	Seton Lake	Yellow Flag Iris	0.0001	Treated
301281	Seton Lake	Yellow Flag Iris	0.77	23 patches treated
309403	Tyaughton Lake	Yellow Flag Iris	0.005	Treated
309404	Tyaughton Lake	Yellow Flag Iris	0.0001	Treated

Figure 4: Map of Surveys of Existing Sites



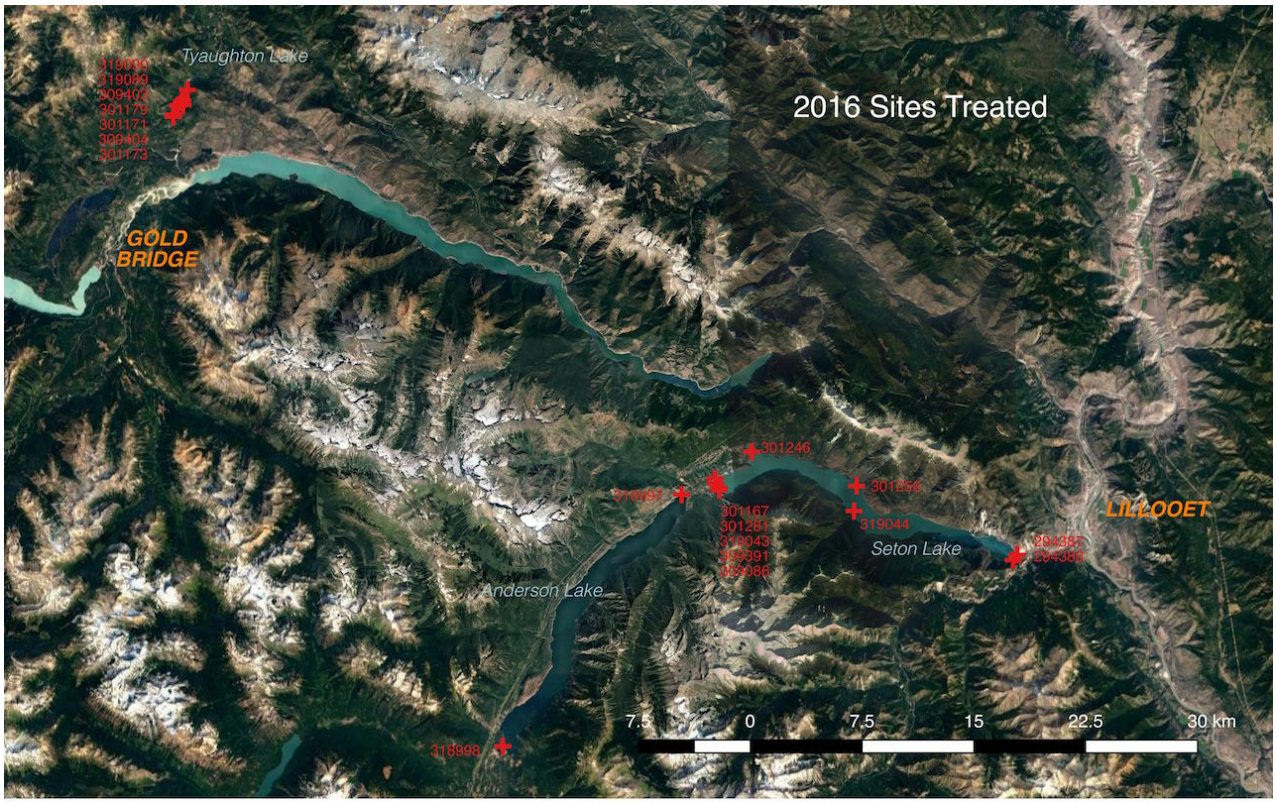
Sites Treated

In total, 19 sites were treated. This includes 10,923 m^2 of area (1.0923 ha). Table 3 and Figure 5 give an overview of the site locations and information. Over 7,000 kilograms (kg) of plant matter was taken to the Lillooet Landfill for disposal. The material from Tyaughton Lake alone was a dump truck load that weighed 6,360 kg. Yellow Flag Iris has a dense mat with tubers that are normally waterlogged and this added to the weight of the material. There were only 2 sites and one patch that were not completely removed as part of this project. These will be targeted for next year.

Table 3: Summary of Sites Treated

IAPP Site #	Location	Invasive Species	Site Area (Hectares)	Notes
294386	Seton Lake	Japanese Knotweed	0.045	On shore of public beach
294387	Seton Lake	Japanese Knotweed	0.0001	Next to cabin on IR – reduced stems.
301167	Seton Lake	Yellow Flag Iris	0.0001	
301171	Tyaughton Lake	Yellow Flag Iris	0.154	Site contains 5 patches. 2 treated with an excavator.
301173	Tyaughton Lake	Yellow Flag Iris	0.001	
301179	Tyaughton Lake	Yellow Flag Iris	0.011	
301246	Seton Lake	Yellow Flag Iris	0.006	Site the same size but only 3 patches found which were much smaller this year.
301256	Seton Lake	Yellow Flag Iris	0.0001	
301281	Seton Lake	Yellow Flag Iris	0.77	23 Patches dug out by hand. Only one could not be completed due to high water.
309391	Seton Lake	Himalayan Blackberry	0.027	
309403	Tyaughton Lake	Yellow Flag Iris	0.005	
309404	Tyaughton Lake	Yellow Flag Iris	0.0001	
318997	Anderson Lake	Yellow Flag Iris	0.002	
318999	Anderson Lake	Yellow Flag Iris	0.0001	
319043	Seton Lake	Himalayan Blackberry	0.07	
319044	Seton Lake	Yellow Flag Iris	0.0001	
319086	Seton Lake	Yellow Flag Iris	0.0005	
319089	Tyaughton Lake	Yellow Flag Iris	0.0001	
319090	Tyaughton Lake	Yellow Flag Iris	0.0001	

Figure 5: Map of Sites Treated.



The largest and most complicated site to treat was on Seton Lake north of Portage Creek in the small channels of wetlands where the creek entered Seton Lake (301281). Access was difficult and required canoes and a rowboat to transport crews and plant matter back to a boat launch. Crews had to wade in the shallow channels and dig out 23 patches of Yellow Flag Iris and cut out Himalayan Blackberry. Please refer to Figure 6 that shows all of the patches on this site. The 2 purple sites are Blackberry and the yellow symbol is the point location indicating the site in IAPP. The brown scallop circle indicates the only patch that we could not completely remove due to high water.

Tyaughton Lake had 7 sites that we treated this year. Site 301171 had 5 patches and an excavator removed 2 of them. In Figure 7, it shows the patches removed by excavator in red. We were able to access these patches through private land with the landowners' approval. As previously mentioned, we installed a temporary silt fence at the largest patch to reduce the addition of silt into the lake during the removal process. A dump truck was used to remove the material because it was too heavy to remove by pick-up truck.

Figure 6. Site 301281 patches on west side of Seton Lake.

Figure 7. Site 301171 patches on Tyaughton Lake.

Figure 8. Dump truck load of Yellow Flag Iris taken from Tyaughton Lake shoreline.

Outreach

LRISS participated in number of community events for outreach purposes including sharing information about aquatic invasives and this project. The following is a list of these community events & training:

- July 15: Haylmore Outreach-training BVRCA staff
- July 23: Apricot Festival Lillooet Farmer's Market
- July 31: Haylmore Event LRISS Display
- August 21: Bridge River Valley Summer Festival – LRISS Outreach
- August 26: LRISS outreach Lillooet Farmer's Market

In order to increase our capacity for outreach on this project and overall, we partnered with the Bridge River

Valley Community Association (BRVCA). The LRISS Executive Director and an Outreach technician conducted a training session with the BRVCA staff. The primary topics included invasive species identification, best management practices and the outreach programs that LRISS delivers. As part of the training we explained our fieldwork, priorities and the FWCP project. LRISS participated in several community events hosted by the BRVCA in Gold Bridge and kept the BRVCA staff apprised of our work on this project. The BRVCA has a venue at a historic mining site, called Haylmore, where they have tourist information and local craft sales. They staff this venue during the summer months and it is a source of information for locals and tourists. This training and partnership was a great way to build capacity for our outreach program, extend our reach and inform residences about the FWCP project.

During the summer months, we posted on our Social Media (primarily our Facebook page) about our success in removing the Yellow Flag Iris. The posts had a total reach of approximately 600.

LRISS submitted information about this project to a local publication in the Bridge River Valley called the Mountain Telegraph. As part of a valley-wide update, we included information about our success in removing invasives as a direct result of this project. This publication has a circulation of approximately 185.

Figure 9. LRISS Outreach staff at the Historic Haylmore Site, Gold Bridge, BC. Notice to Bridge River Valley residences about invasive removal on Tyaughton Lake.

Discussion

Overall, LRISS met the short and contributed to the long-term goals for this project. As a result of partnerships and other funders, there were many efficiencies with field work and outreach. As mentioned previously, we had partnerships with the BVRCA, Tyaughton Ratepayers and the Tsal'alh First Nations. Funding from the SLRD, BC Gaming and MoFLNRO allowed us to deliver outreach that included sharing information about this project. Three Tsal'alh First Nations members were hired for fieldwork as a direct result of our partnership with the Tsal'alh First Nation and LRISS Technician Brad Oleman.

In the field, LRISS crews removed more area of invasives than the goals outlined and met the goal for the kilometers of shoreline surveyed. There was 451 m^2 of Japanese Knotweed removed. This was only the above

ground vegetation, however. There was 9,502 m^2 of Yellow Flag Iris removed and 970 m^2 of Himalayan Blackberry. The removal of the Knotweed and Blackberry will be an ongoing project and will take many years to complete. The roots of these plants are very hard to dig out and there is risk of spread from small rhizomes. Partnerships with the T'it'q'et and Tsal'alh communities will facilitate this treatment. These infestations are right along the waters edge on Seton Lake and also near private land.

Shoreline surveys of Anderson Lake and Tyaughton Creek amounted to approximately 49 km. There was at least another 11km of shoreline on Tyaughton and Seton Lakes combined when the monitoring of sites were completed. LRISS met the goal of surveying 60 km of shoreline.

Of the new sites found during this project, there were 3 sites that we know will need treatment next year. We will receive assistance to treat the site on Anderson Lake from our neighbouring invasive group, the Sea to Sky Invasive Species Council. The private landowner will also treat the Blackberry site. One Yellow Flag Iris site on Tyaughton Creek will need to be hand dug out and the LRISS crews will be able to do this removal. It was not accessible at the time of the survey in September. We will require waders or a boat to get to the site.

During the monitoring surveys of treated sites (from 2015), LRISS crews noted that the patches of iris that were dug out had minimal re-sprouting and the infestation size was reduced. The patches that only had the top vegetation cut had completely regained vigor and were the same size. Our surveys confirmed that mechanical treatment of Yellow Flag Iris can be effective if the root mass is completely removed. Knotweed, however, is not significantly affected by top cutting and removing stems only because the rhizomatous roots re-sprout easily. Using mechanical means, it is possible to eradicate iris from our region. The number of sites is still relatively few and this project has removed the majority of them.

Future funding will be necessary to monitor sites treated and to continue outreach with the goal of preventing aquatic invasives. LRISS intends to apply for 2017 funding from FWCP as well as use other funds from SLRD and the BC Government for our Aquatic Invasive Program. In the recommendation section below, it outlines our 2017 needs primarily in the field to monitor treated sites, survey and treat (if needed). LRISS will continue to seek funding to implement our AIS Strategy. The plan outlines our entire program but our highest priorities include expanding our aquatic invasive species (AIS) outreach program and completing surveys in the field to detect any new outbreaks.

This project and our AIS Strategy contributes significantly to the long-term goals as outlined for this project. They include conservation of habitat and improving science and knowledge. The removal of invasives will improve fish and wildlife habitat by allowing native species to flourish and removing the monoculture of invasives. The collection of data including riparian shorelines contributes to the understanding of where invasives species can establish, vectors for spread and how to prevent invasives in the future.

Recommendations

There are two lists of recommendations. The first one contains recommendations specific to the 2017 field season. The second set of recommendations is more strategic in nature to increase awareness, build capacity and continue AIS field surveys.

2017 Field Season Specific Recommendations include:

1. Continued monitoring of the Yellow Flag Iris sites that were treated for any regrowth.
2. Survey of Seton, Anderson and Tyaughton Lakes for new sites in future years.
3. Removal of Yellow Flag Iris sites on the D'Arcy side of Anderson Lake by the Sea to Sky Invasive Species Council in partnership with the First Nation community.
4. Removal of the Yellow Flag Iris sites found along Tyaughton Creek flowing out of the lake.
5. Survey of Tyaughton Creek for any new invasives beyond 2016 survey.

6. Investigate possible Purple Loosestrife site on Tyaughton Creek.
7. Removal of Himalayan Blackberry sites on west end of Seton Lake.

Strategic recommendations:

- Continued partnership with Tsal'alh First Nation on invasive removal projects and community outreach. Train crews to collect data and remove invasives in their own community and adjacent lands.
- Outreach with Tourism Sector in Seton Portage and Shalalth including Tsal'alh hotel, Chamber of Commerce Caboose, campgrounds and local businesses.
- Continued partnership with the Bridge River Valley Community Association to deliver community outreach with the goal of prevention.
- Continued partnership with the Squamish Lillooet Regional District for outreach, funding and field operations.
- Continue partnership with the Sea to Sky Invasive Species Council to treat Yellow Flag Iris on the west end of Anderson Lake and build connections within the D'Arcy First Nations.
- Continue to implement the LRISS Aquatic Invasive Species Strategy & Action Plan.

Acknowledgements

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

- The Fish and Wildlife Compensation Program for financial support.
- Seton Lake – Tsal'alh First Nation wrote us a support letter for the application process.
- Sue Eckersley and the Tyaughton Lake Rate Payers for their support, volunteer time and excavator expertise for the Tyaughton Lake removal.
- Squamish Lillooet Regional District Area A and B in addition to BC Gaming provided financial support for event participation to share information about this project.
- Bridge River Valley Community Association provided a support letter for our grant application.
- Catherine MacCrae, Ministry of Forests, Lands and Natural Resource Operations, Invasive Plant Specialist, Range Branch wrote a support letter for our grant application.

References & Attachments:

1. Final Statement of Accounts: Attached separately.
2. Invasive Alien Plant Program Survey and Treatment forms attached.
3. Treatment, Survey and Inventory data collected and entered into the Ministry of Forests, Lands and Natural Resource Operations' Invasive Alien Plant Program database (separate Excel spreadsheet)
4. BC Government Notice of approval to do works in and around a stream and SLRD Development permit including signature of landowners for access to invasive sites through their property on Tyaughton Lake (separate pdf).

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.

Emergency Call to Action Meetings – Invasive Mussels Western Canada and BC Partners. December 9, 2016. Pacific Northwest Economic Region. Invasive Council of BC and Alberta Invasive Species Council. Meeting Summary notes. 5 pages.

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):

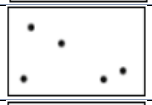
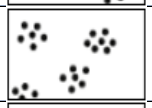
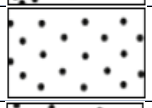
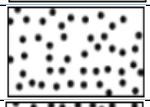
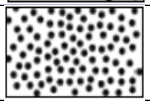
Invasive Plants * Species name or code	**Area** * Dimension or Ha	Distr. Code (see reverse for codes)	Density Code (see reverse for codes)	**Survey Type** * **C**ursory /**O**perational /**P**recise	Proposed Activity Man	Chem	Bio
				C ☐ O ☐ P ☐	☐	☐	☐
				C ☐ O ☐ P ☐	☐	☐	☐
				C ☐ O ☐ P ☐	☐	☐	☐

Site Image Details

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

Density Code

Code	Reference	Description
1	Low	≤ 1 plant/m^2
2	Medium	2-5 plants/m^2
3	High	6-10 plants/m^2
4	Dense	> 10 plants/m^2

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).

BRITISH COLUMBIA The Best Place on Earth — Ministry of Forests and Range

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								