

Governance & Regional Services Committee Amended Agenda

April 2, 2020

2:00 pm

Members: All Directors (Director Gay as Chair)

Voting Rules: Unless otherwise indicated on this agenda, all Directors have one vote and a simple majority is required for a motion to pass.

	Pages
1. Call to Order	
2. Addition of Late Items	
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9. Bylaws

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10. Late Agenda Items

11. Reports from Directors

12. Adjourn to Closed



MINUTES OF THE GOVERNANCE & REGIONAL SERVICES COMMITTEE MEETING

March 5, 2020
Regional District Office, Cranbrook, BC

PRESENT:	Chair R. Gay	Electoral Area C
	Director M. Sosnowski	Electoral Area A
	Director S. Doehle	Electoral Area B
	Director J. Walter	Electoral Area E
	Director S. Clovechok	Electoral Area F
	Director G. Wilkie	Electoral Area G
	Director L. Pratt	City of Cranbrook
	Director W. Graham	City of Cranbrook
	Director A. Qualizza	City of Fernie
	Director D. McCormick	City of Kimberley
	Director D. McKerracher	District of Elkford
	Director A. Miller	District of Invermere
	Director D. Wilks	District of Sparwood
	Director K. Sterzer	Village of Canal Flats
	Director C. Reinhardt	Village of Radium Hot Springs
STAFF:	S. Tomlin	Chief Administrative Officer
	S. Moskal	Corporate Officer
	C. Thom	Executive Assistant (Recording Secretary)

Call to Order

Chair Rob Gay called the meeting to order at 11:30 am.

Adoption of the Agenda

MOVED by Director McKerracher
SECONDED by Director Miller

THAT the agenda for the Governance & Regional Services Committee meeting be adopted.

CARRIED

Adoption of the Minutes

February 13, 2020 Meeting

MOVED by Director Pratt
SECONDED by Director Sosnowski

THAT the Minutes of the Governance & Regional Services Committee meeting held on February 13, 2020 be adopted as circulated.

CARRIED

Invited Presentations & Delegations

Director Stan Doehle arrived to the meeting at 11:31 am.

UBCM 2020 Poverty Reduction Planning and Action Program

Kerri Wall, Interior Health, Ron Popoff, City of Cranbrook, and Donna Fields, United Way East Kootenay, provided information on a proposed application for UBCM Poverty Reduction Planning funds and asked the Board to partner with the City of Cranbrook on the application. It was explained that the project will increase community awareness and engagement on reducing poverty in Cranbrook and the Regional District of East Kootenay.

New Business**UBCM 2020 Poverty Reduction Planning & Action Program**

49068

MOVED by Director Pratt

SECONDED by Director Qualizza

THAT the RDEK partner with the City of Cranbrook to apply for UBCM Poverty Reduction Planning funds with the City of Cranbrook as the primary applicant that will receive and manage the grant funds.

CARRIED

CBT CIP Reallocation Request - Friends of Lake Koocanusa Society 2020

49069

MOVED by Director Doehle

SECONDED by Director Walter

THAT the request from the Friends of Lake Koocanusa Society to reallocate a portion of their 2019/2020 Columbia Basin Trust Community Initiatives Program grant to conduct an archaeological assessment at Waldo Cove be approved.

CARRIED

Elk Valley Tax Sharing Meeting with Minister

49070

MOVED by Director Wilks

SECONDED by Director Qualizza

THAT Director Sosnowski be reimbursed for expenses to attend the meeting with Minister Robinson regarding the Elk Valley Tax Sharing agreement held on February 27, 2020 in Victoria with expenses paid from the Elk Valley Tax Sharing funds.

CARRIED

2020 Invited Presentations

49071

MOVED by Director Wilks

SECONDED by Director Clovechok

THAT invitations to present to the Regional District of East Kootenay be sent to other organizations as outlined in the February 27, 2020 report from the Chief Administrative Officer as amended.

CARRIED

Kootenay Forest Sector Collaborative – Appointments

49072

MOVED by Director Reinhardt

SECONDED by Director McKerracher

THAT Director Gerry Wilkie be appointed to the Kootenay Forest Sector Collaborative.

CARRIED

49073

MOVED by Director McKerracher

SECONDED by Director Miller

THAT Director Susan Clovechok be appointed as alternate to the Kootenay Forest Sector Collaborative.

CARRIED

Draft 2020 - 2024 Financial Plan

The Committee reviewed changes to the Five-Year Financial Plan as presented by the Chief Financial Officer.

General Administration

MOVED by Director Clovechok

SECONDED by Director Sosnowski

THAT the transfer to reserves for the RDEK Cranbrook office building in General Administration be reduced from \$200,000 to \$100,000.

OPPOSED: Director Doehle, Director Gay, Director Graham, Director McCormick, Director McKerracher, Director Miller, Director Pratt, Director Reinhardt, Director Sterzer, Director Walter, Director Wilkie, and Director Wilks

DEFEATED

Cheque Register - February 2020

49074

MOVED by Director Graham

SECONDED by Director Reinhardt

THAT the cheque register for the RDEK General Account for February 2020 in the amount of \$968,112.66 be approved as paid.

CARRIED

Bylaws**Bylaw No. 2984 (2020-2024 Five Year Financial Plan) - Introduction**

MOVED by Director Walter

SECONDED by Director Wilks

THAT Bylaw No. 2984 cited as "Regional District of East Kootenay – 2020 – 2024 Five Year Financial Plan Bylaw No. 2984, 2020" be introduced.

CARRIED

Note: On March 6, 2020, the Board adopted a resolution to introduce Bylaw No. 2984 as amended due to changes made at Committee meetings (Resolution 49075).

Adjournment

The meeting adjourned at 12:32 pm.

Chair Rob C. Gay

Shannon Moskal, Corporate Officer

Subject Environmental Services

Month April 2020

SOLID WASTE

All RDEK Solid Waste Facilities are operating regular hours, and RDEK staff continue to go to rural sites to ensure they are tidy and safe for the public.

In order to prevent person to person contact the Re-Use Centers at facilities throughout the region have been closed as of March 16th. In an additional effort to limit person to person exposure, all bottle collection by volunteer groups have also been suspended until further notice at our sites as of March 23rd.

Diabetes Canada has reached out to indicate they are closing their clothing and textile bins and will not be accepting any more donations at this time.

Wood grinding at the Columbia Valley Landfill and Central Subregion Landfill have been completed as of March 18th. Wood grindings were hauled to Skookumchuck Pulp Mill.

PARKS AND RECREATION

EMMA

Public access to the Eddie Mountain Memorial Arena has been suspended as of March 16th as part of recommendations from Provincial and Federal Health Authorities. Arena staff remain on site to complete annual maintenance while maintaining social distancing.

Recreation Facilities

All recreation facilities remain closed as part of regular opening dates. The RDEK will follow all Federal and Provincial recommendations in order to promote social distancing.

Communications Department created signs to indicate closure of Playgrounds at RDEK facilities as the sites are still accessible to the public even when seasonally closed.

INVASIVE PLANT

The Environmental Services Secretary and Weed Control Officer are preparing enforcement correspondence (letters and warnings) to send out to residents with invasive plants on their property as identified during 2019 inspections.

STAFF

All staff except Operation Maintenance Workers and Arena Staff are working from home at this time. Staffing levels and requirements are being monitored daily.

Subject Development Services – Building Report
Month April 2020

Building

Total monthly inquiries (phone/email/counter): 1,011

	February 2020			Year to Date		
Jurisdiction	Permits Issued	Dwellings Created	Construction Value	Total Permits Issued	Total Dwellings Created	Construction Value
Area A	1	1	\$185,000	2	2	\$1,015,000
Area B	1	0	\$1,000	3	1	\$325,000
Area C	3	0	\$265,000	8	4	\$1,002,200
Area E	2	0	\$99,000	4	0	\$127,000
Area F	6	2	\$2,430,000	15	6	\$2,941,000
Area G	5	1	\$1,278,000	6	1	\$1,278,999
Totals	18	4	\$4,258,000	38	14	\$9,689,199

Canal Flats	2	1	\$94,000	2	1	\$94,000
Cranbrook	14	3	\$2,449,000	26	8	\$22,456,000
Elkford	4	1	\$433,000	8	4	\$919,000
Fernie	3	0	\$58,000	8	1	\$213,000
Invermere	0	0	\$0	2	0	\$10,850
Kimberley	6	1	\$736,500	17	13	\$1,878,303
Radium	2	4	\$674,872	3	4	\$697,872
Sparwood	1	0	\$49,999	2	0	\$59,999
Totals	32	10	\$4,495,371	68	31	\$26,329,024

Bylaw Compliance

Active compliance files: 37

Columbia Valley Dog Control

	Area F	Area G	Radium	Total
Complaints	2	4	0	6
Notification/Warning Issued	0	1	0	1
Captured	1	0	0	1
Pound Nights	0	0	0	0
Licenses Sold	0	0	0	0

Subject Engineering Board Report

Month April 2020

MOYIE WATER SYSTEM

Water consumption is slightly high for this time of year. It is possible that customers are running water to prevent plumbing from freezing or there are leaks within the distribution system.

Elko WATER SYSTEM

Water consumption remains low and normal for this time of year.

RUSHMERE WATER SYSTEM

Water distribution check valves have been received and will be installed to prevent water from flowing back into the distribution tanks.

WINDERMERE WATER SYSTEM

The Water Quality Advisory remains in place as turbidity is between 0.5 and 1.0 NTU. The Windermere Watermain Upgrades are anticipated to begin early April. Marwest Industries and MPE continue to look at implications of the pandemic and could delay the work if provincial or federal orders prevent the work from proceeding. A newsletter is being drafted to inform the public about the project.

EDGEWATER WATER AND SEWER SYSTEMS

Macaulay Creek is flowing normal for this time of year. Operators disassembled and cleaned the faulty flow control valves at the UV Treatment Plant. The administration portion of the Lake Baptiste Dam Upgrade is complete with all as-built drawings received and final grant claim submitted which brings the Project to completion.

EAST SIDE LAKE WINDERMERE WATER SYSTEM

All new water pumps are installed and commissioned with some pump programming to occur at the Low Lift Pump Station. The SCADA remote monitoring upgrades continue. The Timber Ridge and Swansea watermain looping construction began in late March. Similar to the Windermere Project, construction will move cautiously given the potential challenges with the pandemic. A teleconference Utility Advisory Commission meeting is scheduled for April 20 to discuss the financial plan and operations and maintenance.

SPURVALLEY WATER SYSTEM

A teleconference Utility Advisory Commission meeting is scheduled for **March 27** to discuss the financial plan, user fees and operations and maintenance.

FAIRMONT FLOOD AND LANDSLIDE SERVICE

Further to last month's announcement of receiving the UBCM Structural Mitigation grant of \$750,000 for Cold Spring Creek upgrades, procurement for engineer services will begin this spring with construction tentatively scheduled for 2021.

SNOW PACK AND WATER SUPPLY OUTLOOK

The snow weather stations in the East Kootenay show that the snow-water equivalent is slightly above normal for late March. Floe Lake is at 110%, Morrissey Ridge is at 90% and Moyie Mountain is at 120% of normal.

AREA A FLOOD CONTROL – HILL ROAD DIKE

The revised Hill Road Flood Protection project was submitted to the Department of Fisheries and Oceans for approval and we are awaiting their feedback on approval to proceed. The construction tender documents were released March 24 with construction planned for summer/fall 2020. If any changes are required from the DFO, they will be reflected in a Tender Addendum.

STAFF

Most of the Cranbrook Engineering Staff continue to work from home to follow the physical distancing measures. Utility Operators in the Cranbrook area and Columbia Valley continue to complete the required daily to weekly utility inspections as they are essential water and wastewater services.

Subject Protective Services Monthly Report

Month April 2020

Fire Services

All face-to-face fire service training is suspended due to COVID19. Online training modules are delivered remotely, where possible. Fire services are receiving guidance from the BC Fire Chiefs Association to protect personnel and Kelowna Fire Dispatch has modified dispatch procedures to reduce exposure. Personal protective equipment inventories are being carefully managed and additional supplies are being sourced.

Columbia Valley Fire

All Columbia Valley RDEK departments are heavily involved with interior and exterior training for at least another two months. In addition, volunteers will be taking extra weekends to attend wild fire training, team leader training, and electrical awareness and procedure training from BC Hydro. Training in many disciplines have been the focus this winter.

We've had a reasonable turnout of new recruits for this year. However, more members are still needed, as it is very common to gain a new member or two just to lose one around the same time.

Windermere and Fairmont Fire Department will be focusing this year on aerial truck training and operations. This year we will be purchasing a used aerial truck (ladder truck) to accommodate our three and four-story resorts, condos and larger homes. This unit will be stationed at the Windermere Fire Hall. This also renders this unit to be centrally located within the Columbia Valley.

Elk Valley South Country Fire

Jaffray Fire Department Society recently held their 14th annual curling bonspiel. The bonspiel was very successful, raising over \$11,000! These funds are earmarked for a side-by-side utility vehicle equipped with wildland firefighting equipment.

The training program has been very busy in the Elk Valley and South Country. In addition to regular weekly training sessions, several members have taken specialized training. Jaffray Fire Department was the host to a hazmat operations training course which saw 22 firefighters from 6 different fire departments participating. 3 fire officers recently travelled to Trail to become certified as Provincial Structural Protection Task Force Leaders and 2 fire officers from Baynes Lake recently attended Fire Service Instructor certification training in Christina Lake.

Recruitment is still a challenge with no new members to report.

2020 Responses to date	Fire Service Areas								Totals
	Baynes Lake	Edgewater	Elko	Fairmont	Hosmer	Jaffray	Panorama	Windermere	
Fire				6			1	3	10
MVA		1	1	1	10	5	1	2	21
First Responder	1	2	1	7	3	7	2	14	37
Ice Rescue									0
Still Water Rescue									0
Swift Water Rescue									0
Embankment Rescue									0
Other	1	1		7	2	4	4	7	26
Totals	2	4	2	21	15	16	8	26	94
Average Attendance for Training	6	7	7	9	6	6	10	9	
Average Attendance for Incidents	4	5	6	5	4	5	5	5	
Volunteer Roster	10	16	15	16	11	16	22	18	

East Kootenay Emergency Management Program

COVID 19 Pandemic

The East Kootenay Regional Emergency Operations Center (REOC) has been activated virtually since March 16, 2020. All municipalities and First Nations in the region are participating in twice weekly coordination calls, along with partner agencies such as Interior Health, School Districts, and first responders.

Protective Services staff have been dedicating a majority of their time supporting this planning and response effort. The key functions of the REOC are; supporting Interior Health, business continuity, information management to residents and stakeholders and REOC support.

Emergency Management Training

All emergency management training has been postponed for the time being and will be re-scheduled for a later date.

Regional Functional Emergency Exercise

Exercise Sunbeam has been postponed. The planning for the exercise is near complete and we will be ready to proceed once we are able to resume larger gatherings.

Freshet Flooding Preparedness

Current snowpack in the East Kootenay is 114% of normal and is considered moderately high for this time of year. While snowpack is one risk factor for freshet flooding, spring weather is also a critical factor in whether flooding occurs or not. Heavy rainfall during the snowmelt period has been a key driver in spring flooding in BC, and can cause flooding irrespective of snowpack levels. Staff are in the process of staging sand and sandbags strategically across the region and working on seasonal preparedness messaging for residents.

FireSmart Communities

RDEK staff are in the process of awarding a contract for a FireSmart Coordinator for the 2020 year. The coordinator will provide overall coordination of the FireSmart activities, deliver and advance the FireSmart Canada Community Recognition Program (FCCRP) and provide outreach/education to residents on the seven FireSmart disciplines.

UBCM Grants

RDEK staff have received notification of a successful grant application this month:

- Indigenous Cultural Safety and Cultural Humility Training - \$25,000.00



March 2, 2020

Shannon Moskal, Corporate Officer
Regional District of East Kootenay
19 – 24th Avenue South, Cranbrook, British Columbia, V1C 3H8

RE: 2019 Columbia Valley Local Conservation Fund (CVLCF) - Final Reports

Dear Ms. Moskal:

The Kootenay Conservation Program (KCP) has received seven (7) final reports from the 2019 CVLCF grantees and one (1) from a 2018 CVLCF grantee. Please note that one final report has not been received (Farmland Advantage). The following is a summary of our review:

1. CLSS Water Quality, Quantity, Education and Communications Work (Columbia Lake Stewardship Society) - **under budget reduce final payment by \$1,050.00**
2. Strategic Invasive Plant Control of Leafy Spurge (East Kootenay Invasive Species Council)
3. Kootenay Community Bat Project – Bat Conservation in the Columbia Valley (Rocky Mountain Trench Natural Resources Society)
4. Reintroducing Endangered Northern Leopard Frogs (Calgary Zoo)
5. Wrapping up the Columbia Wetlands Waterbird Survey (Wildsight Golden)
6. Marion Creek Benchlands Forest Restoration Project (Nature Conservancy of Canada)
7. Lake Windermere Community-Based Watershed Monitoring Project (Lake Windermere Ambassadors)
8. Securement of Columbia River Wetlands – Edgewater Conservation Property (The Nature Trust of BC) – 2018 Securement Project

These reports are acceptable and we recommend final payment be made. Please contact me directly if you require any additional details. Thanking you in advance for your consideration and attention.

Sincerely,

Juliet Craig, Program Manager

COLUMBIA VALLEY LOCAL CONSERVATION FUND (CVLCF)

FINAL REPORT

2019

General Instructions

- Final reports must be submitted **by 4:00 pm MT January 31, 2020** to the Kootenay Conservation Program. Email final report to info@kootenayconservation.ca.
- All areas of the final report must be answered.

Section A – GENERAL INFORMATION

1. Project Title (as indicated in application): CLSS Water Quality, Quantity, Education and Communication Work

2. Proponent

- | | |
|---------------------------------|---|
| a) Legal Name: | Columbia Lake Stewardship Society |
| b) Organization Registration #: | S-0062764 |
| c) Mailing Address: | 4483 Pine Bay, Fairmont, Hot Springs, V0B 1L2 |
| d) Contact: | Nancy Wilson |
| e) Telephone #: | 403-993-3131f) |
| g) Email: | columbialakess@shaw.ca |

3. Partner (if applicable)

- | | |
|---------------------------------|--|
| a) Legal Name: | |
| b) Organization Registration #: | |
| c) Mailing Address: | |
| d) Contact: | |
| e) Telephone #: | |
| g) Email: | |

Section B – PROJECT INFORMATION

1. Project Location: Columbia Lake Watershed
(ie: RDEK area, watershed, direction from major centre, etc)

2. Total Project Value 55,704

3. CVLCF Contribution: \$13,000

4. Non-CVLCF Contribution: 42,704

5. Single or multiple year project: This is a multi year project but the budget is only for 2019

Section C – PROJECT SUMMARY

1. Please provide a single paragraph describing your project, its objective (goals) and the results. As this summary will be used in CVLCF communications, clearly state the issues addressed and avoid overly technical descriptions. Maximum 2000 characters (~290 words).

The 2019 projects continued the 3 related but overlapping objectives: water quality monitoring, water quantity monitoring and community engagement and education. We also broadened our understanding of water quality and quantity by commencing the study of small streams.

Water Quality:

- Overall lake water quality is acceptable for the current uses of the lake. However, the 2019 results differ from those of the prior five years and suggest that the growth of phytoplankton, activity on the lake or uses of the surrounding lands are having a noticeable influence on the indicator parameters used by CLSS to monitor the lake's condition.
- Results from monitoring 4 small streams indicate that their water quality varies considerably.

Water Quantity:

- Work in 2019 focussed on local inflow and groundwater contributions.
- The net outflow in October was measured as less than 2 cubic metres per second. Such a low flow has 2 implications;
 - There is not an unlimited supply of water to meet future demands
 - The upper limit for groundwater flow from the Kootenay river is not likely to exceed 2 cubic metres per second in winter.

Community Engagement and Education Activities:

- The second annual Lake tour was run in 2019
- Development and delivery of a watershed education program including classroom and field trip
- Educating the public about invasive species detection and responsible boating at Community AGM's and at public events
- Engaging community members in shoreline clean ups and bird counts
- Developing, delivering and displaying signage and brochures at four lakeside areas.

2. OPTIONAL: If your project lends itself to sparking interest through a compelling sound bite (for potential use in CVLCF communications), please tell us what that would be. Maximum 1050 characters (~150 words).

The Columbia Lake Stewardship Society has made major strides in understanding the water balance and water quality of Columbia Lake. In 2019, we learned that

- 2019 monitoring results suggest that the growth of phytoplankton, activity on the lake or uses of the surrounding lands are having noticeable influence on the indicator parameters used by CLSS to monitor the lake's condition.
- The water quality of Columbia Lake is generally acceptable for current uses of the lake and ranges for water quality parameters have been established so we can observe any changes.
- There is not an unlimited supply of water to meet future demands

This information and continued science-based investigations will help local residents and leaders to make informed decisions about the health and viability of their lake.

3. Biodiversity Targets (please list, maximum 90 words):

- Endangered and threatened species such as painted turtles, belted kingfishers
- Residential and Commercial development
- Climate Change
- Invasive and other problematic species
- Human intrusions and disturbance

4. IUCN Threats to Target (please list, maximum 90 words):

- The communities surrounding the lake may impact the health of the lake and its shoreline
- Climate change may alter lake levels and aquatic community composition
- Invasive and problematic species may be brought into Columbia Lake by recreational vehicles
- Human activity occurs both on the lake surface and in its watershed. Residential development and an active railway line also impact the lake

Section D – PROJECT DELIVERABLES AND RESULTS

- 1. Identify the deliverables outlined in your application in the table below (50 words/field) and list the results of each. Please include copies of any relevant communications products (brochures, posters, videos, websites, photos of signage, etc.) resulting from this project. Add an attachment if you need more room.**

Deliverables	Results
-Number of water quality and water quantity monitoring events (target = biweekly water quality stream measuring) 3X per summer lake water quality measuring, -continuous in-situ water level measuring supplemented by quarterly manual measurements, -3 events measuring stream -profiles and volumes on the Kootenay at 4 sites – total 12 events.	-7 water quality monitoring events and 3 sets of water samples submitted for chemical analysis between May and September 2019, which met our target our ~biweekly water quality measuring. -The 12 sites that were sampled in 2018 were revisited in July 2019 and samples were collected. -The location of most streams was identified and 4 streams were sampled for water quality - Water quantity – 4 of the water stations installed during 2014 and 15 remained in operation and were continuously measured. 1 additional station was added. -A small number of flow measurements were made to substantiate the rating curves established in 2019 -It was determined that stream profiles and possible inflow from the Kootenay would not provide useful data so they were not done.
Maintenance and expansion of surface water quality and quantity / level databases that will provide data to enable trends to be documented.	Both databases were updated with 2019 results. Having the trends from previous years enabled CLSS to identify measurements that were outside previous ranges. These measurements will be further investigated in 2020.
-Diversity and number of volunteers involved in water monitoring (target = three from each Community) -Sustained involvement of core volunteers	-Two volunteers stepped forward and implemented the small streams project -Twelve core volunteers participated in another summer of sampling. -All the lakeside communities were represented in our volunteer contingent. There were 3 or more volunteers from each community.
Increase in community awareness about the monitoring program as measured by conversations between Columbia Lake Stewardship Society members and members of the community.	-CLSS conducted a half day lake tour to help participants understand more about the physical, biological and historical aspects of the lake. Local residents and experts presented. -CLSS moved its AGM to June which increased attendance. It also attended community AGMs and village council meetings -CLSS continued to use media (Facebook, local newspapers, mailing lists, our webpage) to provide information to interested members and the general public

Increased membership in the Columbia Lake Stewardship Society as a result of this program (target=10 new members).	Communication with our membership via eblasts, Canal Flats newsletter submissions, educational articles distributed at lake access points and posts to our website have increased awareness and interest in the CLSS.
Increased awareness among residents and visitors of the impacts of their activities on our watershed as measured through number and quality of interactions at community events, number of brochures picked up, and testimonials from the individuals we interact with.	The number of personal interactions, Inquiries on the website and attendance at the AGM all increased in 2019. The questions were generally more specific and detailed, suggesting that residents and visitors are becoming better informed on matters impacting the lake.

Section E – PROJECT EFFECTIVENESS

1. Please evaluate the effectiveness of the project using objective standards, quantifiable criteria and/or quality control measures identified in your application/proposal. Maximum 2000 characters (~290 words).

Water Quality

Using the baselines established with data collected from 2013-18, we were able to identify unusual data in 2019. We also identified a trend of increasing chloride from north to south along the lake. Additionally, we reconfirmed that, for the most part, the water quality meets the water quality objectives (WQO's) established for Lake Windermere.

Water Quantity

Water quantity monitoring helped us examine the water balance and levels of the lake. Lake levels impact the local economy and preserve the habitat necessary for wildlife and aquatic species to survive. Hydrometric data collected to date has shown that the annual rise and fall of Columbia Lake is attributable to waters entering the lake from Dutch Creek during spring runoff.

2019 work focussed on local inflow and outflow, which helped establish a minimum fall flow.

Community Education and Engagement

The 2nd annual Lake tour engaged and educated community members both as participants and as experts sharing their knowledge. CLSS described the health of the lake and those measures that will aid in protecting the lake's water quality at the AGM's of lakeside communities. We provided educational signage and brochures at the four lakeside areas. Also, in-class sessions and on-the lake sessions were conducted with an elementary school from a local community. We also moved our AGM to June and coupled it with demonstrations of the various activities that CLSS undertakes each year.

Volunteers

The work of CLSS is largely done by volunteers. One of the major objectives of CLSS is to educate and engage volunteers. Twenty-five volunteers helped: monitor water quality and quantity on the lake, locate and monitor streams, with the Lake tour, with the lakeside spring clean up, present at AGM's to the local communities and provided advice at boat launch sites on measures to protect the lake health.

What are the top 3 lessons learned from the project that would be important to communicate to others doing similar work throughout the RDEK? Maximum 1050 characters (~150 words).

- Volunteers are very important to conducting a successful program.
- Following scientific procedures and reliable methods is critical to collecting useable data
- Engaging and including lakeside communities, as well as networking with other organizations is key.

Section F – FURTHER COMMENTS

1. Please provide any further comments including recommendations for future conservation efforts. If your project produced a narrative or scientific report or additional project products (e.g. maps, photos), attach them as an Appendix (maximum 90 words).

CLSS continues to expand its sphere of engagement by participating with other organizations that are concerned with the health of the Columbia Valley watershed whenever possible. These engagements ranged from one-on one communication through to workshops and conferences. Through them, CLSS is becoming increasingly aware that the health of the Columbia valley rests in how well the various groups work together, sharing data, ideas and knowledge. CLSS is committed to be an active participant in promoting and maintaining strong relationships amongst the groups and thereby promoting the health of the Columbia Valley watershed. While it is important to engage with organizations, it is equally as important to engage with individuals and volunteers, which CLSS is also committed to doing. Reports on water quality, water quantity and groundwater will be sent to you shortly. If you have any questions or require clarification, contact Nancy Wilson.

Section G – FINANCIAL REPORT

1. Please submit a financial report for the project outlining revenue and expenditures with a comparison to the budget submitted with your CVLCF application. **Use the Final Budget Reporting form provided.** Details on any discrepancies from the budgeted amounts or items are required (maximum 90 words).

Columbia Valley Local Conservation Fund (CVLCF) Final Reporting Budget

Project:

Project Title:

Please include both cash and in-kind amounts, and itemize all projected revenues and expenditures, confirmed and pending (including in-kind contributions). Please ensure revenues and expenses balance.

Be sure to identify the specific component(s) of the project allocated to the Columbia Valley Local Conservation Fund. Record them in the "CVLCF Funding" column.

Please remove all green text upon completion of this Budget Form.

FUNDERS	APPLICATION	FINAL REPORTING		Additional Comments
		Estimated Cash Amount	In-kind Amount	
CVLCF		\$14,050.00	\$13,000.00	
Columbia Basin Trust		\$5,000.00	\$5,000.00	
Columbia Valley Community Foundation		\$2,100.00	\$2,100.00	
Lake Windermere Ambassadors		\$1,000.00	\$1,000.00	
Columbia Wetlands Stewardship Partners		\$500.00	\$500.00	
Living Lakes Canada		\$500.00	\$500.00	
Bill Thompson		\$250.00	\$250.00	
Project Mgmt Volunteers		\$18,000.00	\$18,000.00	
Community Volunteers		\$6,750.00	\$6,750.00	
Boat and Gas Donation		\$1,000.00	\$1,000.00	
Donations (Community Associations, Businesses, Individuals etc.)		\$1,000.00	\$600.00	
Summer Works Program		\$4,940.00	\$6,504.00	
Office supplies, telephone, internet		\$27,690.00	\$28,500.00	
TOTAL REVENUE		\$55,590.00	\$27,204.00	\$28,500.00

EXPENSES:	Expense Items	APPLICATION		FINAL REPORTING		
		Cash	In-kind	Total Budget	CVLCF Funding	Actual cash spent
Water Quality						
Laboratory Analysis (incl small streams)		\$2,200.00		\$2,200.00	\$2,200.00	\$ 1,366.00
Shipping		\$1,000.00		\$1,000.00	\$1,000.00	\$ -
Misc Supplies		\$200.00		\$200.00	\$200.00	\$ 67.00
Water testing Equipment						\$ 2,799.00
Boat and Gas			\$1,000.00	\$1,000.00		\$ 1,000.00
Community Volunteers			\$2,750.00	\$2,750.00		\$ 2,750.00
Project Management Volunteer			\$4,500.00	\$4,500.00		\$ 4,500.00
Water Quality (incl small streams)						
Rain Gauge			\$250.00	\$250.00		\$ 250.00
Data Loggers		\$900.00		\$900.00	\$900.00	\$ 893.00
Stabilizer Pin		\$350.00		\$350.00	\$350.00	\$ 350.00
Highway Flagging		\$3,000.00		\$3,000.00	\$3,000.00	\$ 3,000.00
Community Volunteers			\$9,000.00	\$9,000.00		\$ 9,000.00
Education and Outreach						
Wetlands Educational Signage		\$2,300.00		\$2,300.00	\$2,300.00	\$ 4,300.00
Organization and Execution of Lake Tour		\$400.00		\$400.00	\$400.00	\$ 766.00
Printing of Educational Materials		\$500.00		\$500.00	\$500.00	\$ 316.00
Project Management Volunteer			\$4,500.00	\$4,500.00		\$ 4,500.00
Community Volunteers			\$1,000.00	\$1,000.00		\$ 1,000.00
Labor Related to all Projects						
Summer Student		\$7,200.00		\$7,200.00	\$2,260.00	\$ 8,675.00
Misc Employee Expenses		\$300.00		\$300.00	\$300.00	\$ 234.00
Coordinator		\$4,800.00		\$4,800.00	\$4,800.00	\$ 3,800.00
Travel Expenses (gas, mileage)		\$140.00		\$140.00	\$140.00	\$ 121.00
Program Development						
Conference attendance and Travel		\$1,000.00		\$1,000.00	\$1,000.00	\$ 1,055.00
Professional Advice and Development			\$2,000.00	\$2,000.00		\$ 2,000.00
Administrative Costs						
Office, telephone, internet, printing etc		\$2,000.00		\$2,000.00		\$ 1,527.00
Insurance and memberships		\$800.00		\$800.00		\$ 935.00
Total Amounts		\$27,690.00	\$28,500.00	\$55,590.00	\$14,050.00	\$27,204.00
Total Expenses						\$55,704.00

COLUMBIA VALLEY LOCAL CONSERVATION FUND (CVLCF) FINAL REPORT 2019

General Instructions

- Final reports must be submitted **by 4:00 pm MT January 31, 2020** to the Kootenay Conservation Program. Email final report to info@kootenayconservation.ca.
- All areas of the final report must be answered.

Section A – GENERAL INFORMATION

1. Project Title (as indicated in application): Strategic Invasive Plant Control of Leafy Spurge (SIPCOLS)

2. Proponent

- a) Legal Name: East Kootenay Invasive Species Council
- b) Organization Registration #: S-53803
- c) Mailing Address: 1902 Theatre Rd. Cranbrook, BC Postal Code: V1C 7G1
- d) Contact: Kendal Benesh, Program Manager
- e) Telephone #: 250-919-7826 f) Fax #: N/A
- g) Email: kendal@ekisc.com

3. Partner (*if applicable*)

- a) Legal Name:
- b) Organization Registration #:
- c) Mailing Address: Postal Code:
- d) Contact:
- e) Telephone #: f) Fax #:
- g) Email:

Section B – PROJECT INFORMATION

1. Project Location: RDEK Electoral Areas F and G
(ie: RDEK area, watershed, direction from major centre, etc)

2. Total Project Value: 19204

3. CVLCF Contribution: 6500

4. Non-CVLCF Contribution: 12704

5. Single or multiple year project: This is year 4 of a 5 year project.

Section C – PROJECT SUMMARY

1. Please provide a single paragraph describing your project, its objective (goals) and the results. As this summary will be used in CVLCF communications, clearly state the issues addressed and avoid overly technical descriptions. Maximum 2000 characters (~290 words).

The objective of this project is to control and prevent the spread of leafy spurge (LS) infestations in RDEK Electoral Areas F and G, including inventory and mapping of existing and new LS sites, and treatment of LS sites within 1km of private property. During the 2019 field season, EKISC coordinated the inventory and treatment of 99 LS sites across high value grasslands and conservation areas in the upper Columbia Valley in collaboration with various stakeholders (RDEK, MFLNRORD, Village of Radium, Canada Wildlife Service). Chemical treatments were delivered in early October using 1,693 L of herbicide mix, covering an area of 8.45 ha. Approximately 10% of treatment sites were monitored to assess treatment completion and herbicide efficacy and all inventory and treatment data were entered into the Provincial Invasive Alien Plant Program database prior to December 1, 2019.

An assessment of 2019 treatment locations indicate that herbicide treatments are continuing to be successful for management of LS by reducing the spread and size of existing infestations, and ultimately supporting healthy ecosystem function in the upper Columbia Valley. Specifically, in 2019, 100% of project site locations in the Columbia Wetlands Wildlife Management Area (CWWMA) were treated – the first time this large of an area has been covered in one year. Site monitoring resulted in a 100% site completion score and a 95% treatment efficacy score. At a site-specific level, we are also seeing successes in long term treatments, i.e., areas where over time the use of herbicide and area treated is decreasing. By managing existing LS infestations, we also are actively preventing the spread and introduction of this species into neighbouring areas. Finally, we are continuing to engage new stakeholders in this project, building support for LS management in the upper Columbia Valley.

2. OPTIONAL: If your project lends itself to sparking interest through a compelling sound bite (for potential use in CVLCF communications), please tell us what that would be. Maximum 1050 characters (~150 words).

Got roots? Leafy Spurge does. This invasive species shoots out an extensive root system as far as 9 metres – about as long as a school bus! If you aren't aware, invasives pose significant threats to food security, human health, and economic development. In the Upper Columbia Valley, Leafy Spurge has infested high value grasslands and conservation areas, and because of its impressive ability to spread far and wide, it's very difficult to manage. EKISC, with support from the CVLCF and local land managers, has inventoried, treated, and monitored these areas for the past nine years in order to reduce direct pressures on biodiversity in the area. This has allowed EKISC to not only make better informed decisions regarding Leafy Spurge management planning for the Columbia Valley, but has also generated successes in raising awareness about Leafy Spurge for land managers and user groups, and has actively operated to reduce the spread of existing populations and prevent introduction of new infestations.

3. Biodiversity Targets (please list, maximum 90 words):

This project works to reduce direct pressures on biodiversity and is related to Aichi Biodiversity Target 9: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

This project takes place in upland grassland and open forest ecosystems of the RDEK and includes globally significant components of the Columbia Valley Wetlands.

4. IUCN Threats to Target (please list, maximum 90 words):

Invasive species are recognized as one of the main drivers of biodiversity loss at the global level by the IUCN. In addition to negative environmental impacts, invasive species pose a threat to food security, human health and economic development. This project directly aims to mitigate the negative environmental, social and economic impacts of Leafy Spurge in the Columbia Valley.

Section D – PROJECT DELIVERABLES AND RESULTS

1. Identify the deliverables outlined in your application in the table below (50 words/field) and list the results of each. Please include copies of any relevant communications products (brochures, posters, videos, websites, photos of signage, etc.) resulting from this project. Add an attachment if you need more room.

Deliverables	Results
Site Selection: (a) Generate a list of leafy spurge sites in RDEK Electoral Areas F and G using the Provincial IAPP database, and (b) Identify private properties with leafy spurge and prioritize treatments at sites that are within a 1km buffer.	(a) We generated a list of existing leafy spurge sites in the project area using the Provincial IAPP database. (b) Sites were reviewed and a SIPCOLS site eligibility list was produced based on location (within 1km of private property), treatment records, and available funding.
Coordination: (a) Develop and (b) Present a work plan to Provincial Ministries, the Regional District, local community groups, and other relevant agencies and organizations.	(a) We developed an annual SIPCOLS work plan based on site selection, and available funding from CVLCF and other stakeholders (e.g., Canadian Wildlife Service, Provincial Ministries). (b) We presented this work plan to stakeholders (Canadian Wildlife Service, Ministry of MFLNRORD, Ministry of Transport and Infrastructure).
Treatments: (a) Administer treatment contract to a qualified, experienced herbicide applicator. (b) Complete treatments at sites identified in work plan.	(a) Our SIPCOLS treatment contract was administered to Rob Chemelli at RMC Enterprises. He is a licensed herbicide applicator with significant experience with leafy spurge management. (b) Treatment plans were communicated in Spring 2019. Herbicide treatments were completed by October 15, 2019.
Monitoring & Data Entry: (a) Monitor at least 10% of all treatments to ensure efficacy and site completion is reached, and (b) Enter all inventory and treatment data into the Provincial IAPP database.	(a) At least 10% of contractor treatments were monitored to ensure site completion and treatment efficacy. (b) All inventory and treatment data collected to date were entered into the IAPP database prior to December 1, 2019.
Reporting: (a) Analyze and summarize treatment records, and (b) complete Final Report outlining the goals, objectives, and measures of success.	(a/b) Analysis and reporting on the SIPCOLS project, including an overview of project goals, objectives and measures of success, are complete and will be submitted along with this report (prior to the January 31st, 2020 deadline).
Communications: (a) Press release to local papers highlighting the project and funding support (b) Present final results to all Partners and other relevant Government agencies and organizations and (c) Press release to local papers showcasing project and results.	(a) A project spotlight was included in the EKISC September Newsletter, highlighting the project support of CVLCF and the KCP. (b) Final results are being presented to partners and relevant organizations during seasonal meetings and 2020 work planning sessions. (c) A final press release was completed in January 2020 and run on EKISC social media.

Section E – PROJECT EFFECTIVENESS

1. Please evaluate the effectiveness of the project using objective standards, quantifiable criteria and/or quality control measures identified in your application/proposal. Maximum 2000 characters (~290 words).

To assist with tracking accomplishments and results, EKISC tracks the following measures of success related to this project: (1) Short term success of invasive plant treatments through seasonal monitoring of project sites. Treatments are monitored for efficacy, completion, and response. In 2019, 100% of project site locations in the CWWMA were treated (note: this was the first time this large of an area has been covered in one year). Monitoring resulted in a 100% site completion score and a 95% treatment efficacy score. Treatment efficacy score was not 100% due to the limitation of herbicide selection (currently in BC we do not have access to herbicides that will translocate the entire root length, therefore 95% treatment efficacy is expected). (2) Long term success of invasive plant treatments through annual site monitoring. Treatment and inventory records are collected annually and entered into Provincial IAPP database (includes infestation size, density, herbicide use, etc.). Some long-term treatment sites are resulting in reduced size and density of LS infestations. For example, treatments at Site 324112 within the CWWMA has had a steady decrease in the total treatment area over the last 3 years. Note: not all SIPCOLS project sites have annual funding. Amount of herbicide also depends on application rate. (3) Prevention of new LS introductions. We aim to reduce the spread of LS into new areas within the Columbia Valley through early detection and rapid response and treating known infested areas. Though difficult to quantify, because of successful treatments we anticipate a lower frequency of new LS introductions into project areas. (4) Stakeholder engagement and participation. Success can be measured in the number of stakeholders participating in the SIPCOLS Project. This year, we were able to engage with the Shuswap Indian Band and hope to work with the Lands Department in 2020 on treatments adjacent to reserve lands.

2. What are the top 3 lessons learned from the project that would be important to communicate to others doing similar work throughout the RDEK? Maximum 1050 characters (~150 words).

(1) Due to the nature of invasives, it can be difficult to quantify successes in management actions. LS spreads quickly and can be introduced to new areas easily – so while we work to reduce distribution and density of existing populations, we see the introduction and spread of new infestations. Therefore, our main lesson learned is to ensure that invasive plant management programs set realistic and achievable objectives and goals; ones that can be effectively communicated to stakeholders and project partners. (2) With an increase in inventory and survey efforts, we often see an increase in LS presence and distribution. This again makes it difficult to quantify successes but should be anticipated to help future project planning. (3) Invasives do not know boundaries. This is increasingly important when thinking about management for LS, and why coordinating treatments across stakeholders and landscapes is crucial. For anyone considering invasive plant management, we recommend contacting and engaging with adjacent managers.

Section F – FURTHER COMMENTS

1. Please provide any further comments including recommendations for future conservation efforts. If your project produced a narrative or scientific report or additional project products (e.g. maps, photos), attach them as an Appendix (maximum 90 words).

Please see the following documents:

- SIPCOLS Supplementary Information 2019 for treatment summaries, maps, and future recommendations
- Appendix 1 for 2016 - 2019 chemical treatment records
- Appendix 2 for EKISC SIPCOLS News

Section G – FINANCIAL REPORT

1. Please submit a financial report for the project outlining revenue and expenditures with a comparison to the budget submitted with your CVLCF application. **Use the Final Budget Reporting form provided.** Details on any discrepancies from the budgeted amounts or items are required (maximum 90 words).

There are no major changes from the original proposed budget. Note the RDEK's Neighbourhood Invasive Plant Program does not provide funding to the SIPCOLS Project. The Village of Radium contributed funding to treatment of LS in 2019. This is acknowledged in the budget template.

Columbia Valley Local Conservation Fund (CVLCF) Final Reporting Budget

Proponent: East Kootenay Invasive Species Council

Project Title: Strategic Invasive Plant Control of Leafy Spurge (SIPCOLS)

Please include both cash and in-kind amounts, and itemize all projected revenues and expenditures, confirmed and pending (including in-kind contributions). Please ensure revenues and expenses balance.

Be sure to identify the specific component(s) of the project allocated to the Columbia Valley Local Conservation Fund. Record them in the "CVLCF Funding" column.

Please remove all green text upon completion of this Budget Form.

REVENUES:					
Funders	APPLICATION		FINAL REPORTING		Additional Comments
	Estimated Cash Amount	In-kind Amount	Actual Funds Received	Actual In-kind	
CVLFC	\$6,500.00		\$6,500.00	\$1,120.00	Planning, monitoring, herbicide, administration, mapping, reporting. EKISC contracts to various provincial ministries and entities regarding invasive plant management. Other leafy Multi-year fee-for-service contract to treat LS at Ritchie's point New NIPP clients with leafy spurge sites will be subsidized for treatment. No new clients managing LS. This funding is not awarded to EKISC.
EKISC		\$2,000.00			
MFLNRO/MOTI/BC Hydro	\$5,000.00		\$4,400.00		
Environment Canada	\$2,000.00		\$3,000.00		
RDEK -Neighbourhood Invasive Plant Program (NIPP)	\$1,000.00		\$0.00		
FWCFP/NCC	\$4,000.00		\$3,520.00		
Village of Radium			\$664.00		
Total Amounts	\$18,500.00	\$2,000.00	\$18,084.00	\$1,120.00	
TOTAL REVENUE	\$20,500.00		\$19,204.00		

[illegible]

Strategic Invasive Plant Control of Leafy Spurge

Annual Report 2019
Supplementary Information



Prepared for:
Kootenay Conservation Program
915 Vernon St., Nelson, BC
V1L 4G7

Prepared by:
East Kootenay Invasive Species Council
1902 Theatre Rd., Cranbrook, BC
V1C 7G1

Date: January 15, 2020



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Introduction

The East Kootenay Invasive Species Council (EKISC) is a regional non-profit organization that strives to mitigate the negative environmental, social, and economic impacts of invasive species within the East Kootenay Region. Part of this work includes coordinating the inventory and treatment of invasive species on different land jurisdictions and fostering increased support for invasive species management. As such, EKISC works with various land managers and granting agencies to provide noxious and invasive weed control activities in areas across the Regional District of East Kootenay (RDEK). In 2019, EKISC partnered with the Columbia Valley Local Conservation Fund (CVLCF), a program supported by the RDEK and administered by the Kootenay Conservation Program (KCP) to deliver year 4 of 5 of the Strategic Invasive Plant Control of Leafy Spurge (SIPCOLS) Project.

The overall objective of this project is to control and prevent the spread of leafy spurge (LS) infestations in RDEK Electoral Areas F and G, including inventory and mapping of existing and new LS sites, and treatment of LS sites within 1km of private property. During the 2019 field season, EKISC coordinated the inventory and treatment of LS sites across high value grasslands and conservation areas in the upper Columbia Valley in collaboration with various stakeholders. Chemical treatments were delivered in early October, and treatment sites were monitored to assess treatment completion and herbicide efficacy. Inventory treatment data were entered into the Provincial Invasive Alien Plant Program (IAPP) database.

Project deliverables and results can be found in the completed *CVLCF Final Report template for 2019*. This Supplementary Information document contains supporting material, such as inventory and treatment records and project maps, that help EKISC evaluate the effectiveness of this Project in terms of short- and long-term successes, and stakeholder participation.

Objectives

Specific objectives for 2019 delivery of the SIPCOLS Project include:

1. Inventory and map all known and newly identified LS sites in the project area.
2. Create a comprehensive, multi-stakeholder invasive plant management plan for LS in the Columbia Valley, focusing on areas that are of high habitat value and pose the greatest threat to adjacent land managers (i.e., Wildlife Management Areas, conservation lands, agricultural lands).
3. Treat identified high-priority LS infestations within 1km of private land in the project area. Infestations that are on crown land within 1km of the Columbia Wetlands Wildlife Management Area (CWWMA) were also treated protect the high ecological value surrounding the wetlands.
4. Communicate importance of LS control to stakeholders and community members within the Columbia Valley.

Management Area

Invasive plant treatments occurred within the East Kootenay Region, which has been divided by EKISC into five primary Invasive Plant Management Areas (IPMAs), as shown in Figure 1. The intent of delineating these units is to provide a more localized approach to prioritizing invasive plant species. Invasive plant treatments taking place under the SIPCOLS Project occurred within IPMAs 4 and 5. Several known infestations of LS occur outside of these IPMAs but are treated with other land manager funding.

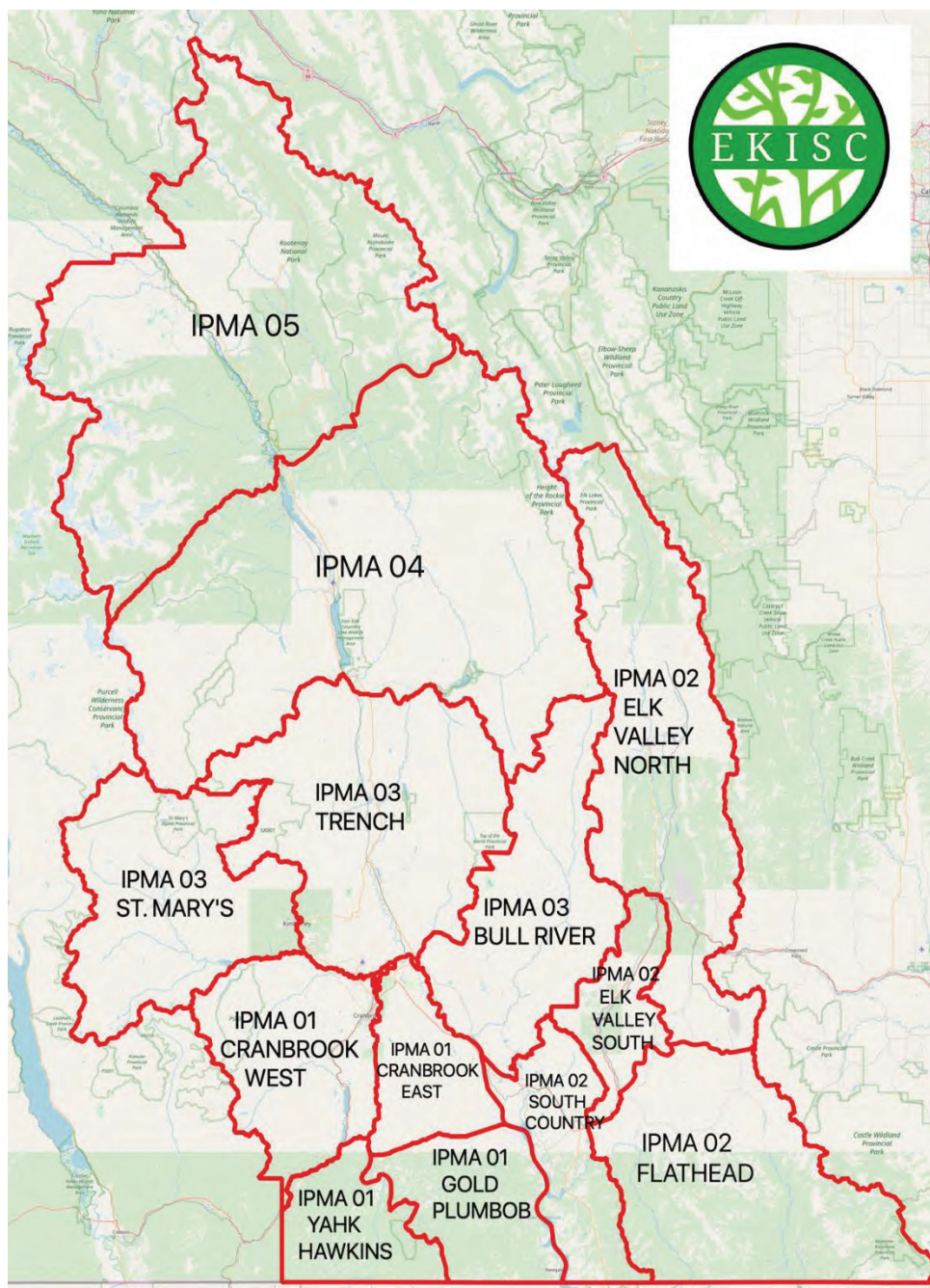


Figure 1 Invasive Plant Management Areas (IPMAs) within the Regional District of East Kootenay. Note that IPMA's 1 through 3 are further divided into sub-IPMAs. The SIPCOLS Project manages LS infestations within IPMAs 4 and 5, within the Columbia Valley.



Treatment Summary & Project Results

2019 Treatments

EKISC combines available information from the Provincial Invasive Alien Plant Program (IAPP) database, previous treatments completed, project and site objectives, existing funding, and adjacent land manager plant management plans to allocate treatment dollars for the SIPCOLS Project. Treatments for LS are typically completed at the same time as nearby treatments to increase efficiency and better utilize a landscape level approach.

In 2019, EKISC coordinated the inventory and treatment of 99 LS sites across high value grasslands and conservation areas in the upper Columbia Valley in collaboration with various stakeholders (e.g., RDEK, MFLNRORD, Village of Radium, Canada Wildlife Service). Chemical treatments were delivered in early October using 1,693 L of herbicide mix, covering an area of 8.45 ha. Table 1 summarizes treatment information, as well as funding levels and stakeholder engagement for the SIPCOLS Project from 2016 to 2019.

A complete extract of all 2019 chemical treatment locations (as well as treatments completed in the years 2016, 2017 and 2018) can be found in Appendix 1: 2016-2019 Leafy Spurge Treatment Data.

Table 1 Summary of annual SIPCOLS treatments, project funding, and stakeholder participation.

Year	Total Funding Allocated to LS ¹	SIPCOLS Funding Provided ²	# LS Sites Treated ³	Amount of herbicide mix used (L) ⁴	Area covered (ha) ⁵	No weed found sites ⁶	Stakeholders Engaged ⁷
2016	\$8,713.54	\$6,838.63	81	1842.35	9.19	20	5; MFLNRORD, MOTI, BC Hydro, CVLFC, EKISC
2017	\$7,596.86	\$6,500.00	96	896.11	4.41	56	6; MFLNRORD, MOTI, BC Hydro, CVLFC, EKISC, CWS
2018	\$12,565.00	\$6,500.00	115	1837.68	9.01	16	7; MFLNRORD, MOTI, BC Hydro, CVLFC, EKISC, CWS, RDEK, Village of Radium
2019	\$19,204.00	\$6,500.00	99	1693.06	8.45	15	8; MFLNRORD, MOTI, BC Hydro, CVLFC, EKISC, CWS, NCC, Village of Radium

¹Total funding allocated is the total amount of funding provided by all EKISC project partners to treat LS.

²SIPCOLS funding is funding provided directly through the CVLFC.



³Number of LS sites treated is highly dependent on funding, and can also be affected by seasonal work planning, spatial distribution of sites, and other factors. Sites also vary in size and density. Funding is typically the limiting factor in number of sites treated (i.e., not all LS sites are treated every year).

⁴Amount of herbicide mix used varies based on number of sites visited, size and density of site, type of herbicide used and application rate. Less herbicide used does not necessarily mean less LS sites or density. Amount of herbicide used can also vary greatly at an individual site from year to year due to plant response to treatment.

⁵Area covered is the total treatment area for all LS sites. Area covered is based on the amount of herbicide mix used and the herbicide delivery rate. Area covered can also vary greatly at an individual site from year to year due to plant response to treatment. Note: previous reporting included only the area treated with CVLCF funds.

⁶No weed found sites. This is the number of sites visited that had no LS plants observed. LS sites are visited for up to five years after No Weed Found. LS plants may not be visible at a site one year but be visible the subsequent year.

⁷Stakeholders engaged is the number of funders that contributed funding to LS treatments in a given year.

Measures of Success

Due to the nature of invasive species, it can be incredibly difficult to quantify successes in management actions. Invasive plants can spread quickly and be introduced to new areas easily – so while we are working hard to reduce the distribution and density of existing LS populations, we are also seeing the introduction and spread of new infestations in the Columbia Valley. Throughout this project, EKISC has observed that LS responds aggressively and unpredictably to herbicide treatments. For example, a site that has herbicide applied in one year may experience a boom in growth during subsequent years – the infestation may either increase in density, or more often in size, sending out new shoots up to ten metres away from the main infestation. This can increase the size of the site or “area covered” and increase the amount of herbicide used.

LS is also very easily spread to new sites, making it difficult to use the total number of LS sites in the Columbia Valley as an indicator of project success. In addition, the longer this project runs, the more likely we are to see more LS sites, as our cumulative plant inventory time increases. Finally, due to limited funding, EKISC is not able to treat all LS sites every year which can also complicate evaluating treatment and project success.

To assist with tracking accomplishments and results, EKISC tracks the following measures of success related to this project:

1. Short term success of invasive plant treatments through seasonal monitoring of project sites. Treatments for this project are monitored for treatment efficacy, completion, and response.
 - a. In 2019, 100% of site locations in the CWWMA were treated – the first time this large of an area has been covered in one year. Monitoring of LS treatments sites resulted in a 100% site completion score and a 95% treatment efficacy score. Treatment efficacy score was not 100% due to the limitation of herbicide selection (currently in BC we do not have access to herbicides that will translocate the entire root length, therefore 95% treatment efficacy is expected).
2. Long term success of invasive plant treatments through annual site monitoring. Treatment and inventory records are collected annually and entered into the Provincial IAPP database. Data submitted includes the infestation size, density, and herbicide use.
 - a. Some long-term treatment sites are resulting in reduced size and density of LS infestations. For example, Site 324112 within the CWWMA has the following treatment record data associated with it:



- 2017: 21L of herbicide sprayed over 0.08 ha
- 2018: 11.5L of herbicide sprayed over 0.03 ha
- 2019: 9.5L of herbicide sprayed over 0.04 ha

Table 2 showcases additional sites where we are observing trends of decreased herbicide use and infestation size. Many of these areas are in high value wildlife habitat.

- As mentioned, although the infestation size is decreasing in areas, new sites are establishing, and some existing patches of LS seem to be spreading. This is likely due to the long root system of LS, and effort from treated plants to spread out and survive once treatment is initiated. Though we have observed the unpredictability of LS response to herbicide, we expect that subsequent treatments at these sites will decrease plant density and extent.
- Prevention of new LS introductions. We aim to reduce the spread of LS into new areas within the Columbia Valley through early detection and rapid response and treating known infested areas.
 - Though difficult to quantify, because of successful treatments we anticipate a lower frequency of new LS introductions into project areas. The more we are able to contain existing infestations, the lower rate of spread into new areas.
 - Stakeholder engagement and participation. Success can be measured in the number of stakeholders participating in the SIPCOLS Project.
 - Through raising awareness of the negative impacts LS has on ecosystem integrity in the Columbia Valley, SIPCOLS has motivated additional stakeholders and land managers to participate in coordinated LS management. Table 1 highlights that over time, we have both increased the number of stakeholders contributing funding to the treatment of LS, but also increased the overall leveraged funding for this project.
 - For example, in 2019 CVLCF, MOTI, MFLNRORD, BC Hydro, FWCP/NCC, CWS, EKISC and the Village of Radium all engaged in treatments for LS and other priority invasive plants in high value wildlife areas of the Columbia Valley (compared to solely the CVLCF in 2013). This collaborative effort for invasive species management provides a substantial advantage in managing LS infestations in the Columbia Valley.

Table 2 Examples of sites that have received treatment funding since 2016 and are experiencing a trend in decreased infestation size and herbicide use. Note that the area treated and amount of herbicide used often fluctuates between years, highlighting that LS can sometimes respond to herbicide treatment with increased growth the subsequent year.

Site ID	Treatment Date	Area Treated	Amount of Undiluted Herbicide Used ¹
45787	2019	0.0200	0.0900
	2018	0.0600	0.2700
	2017	0.0100	0.0450
	2016	0.1750	0.7875
230786	2019	0.0300	0.1350
	2018	0.0600	0.2700
	2017	0.0400	0.1800
	2016	0.0900	0.4050



263397	2019	0.0200	0.0900
	2018	0.0200	0.0900
	2017	0.0150	0.0675
	2016	0.0600	0.2700
230783	2019	0.0400	0.1800
	2018	0.0800	0.3600
	2017	0.0050	0.0225
	2016	0.0750	0.3375
263397	2019	0.0200	0.0900
	2018	0.0200	0.0900
	2017	0.0150	0.0675
	2016	0.0600	0.2700
300660	2019	0.0050	0.0225
	2018	0.0300	0.1350
	2017	0.0100	0.0450
	2016	0.0500	0.2250

¹Amount of herbicide mix used varies based on number of sites visited, size and density of site, type of herbicide used and application rate. Less herbicide used does not necessarily mean less density or fewer plants. Amount of herbicide used can also vary greatly at an individual site from year to year due to plant response to treatment.

Figures 2 through 5 illustrate LS treatment locations throughout the RDEK from 2019 back to year 2016, highlighting how contained LS has remained to the Upper Columbia Valley. EKISC's current strategy with LS is to decrease infestation levels and prevent new introductions of the invasive plant leafy spurge (LS) in the Fairmont to Radium Hot Springs area.

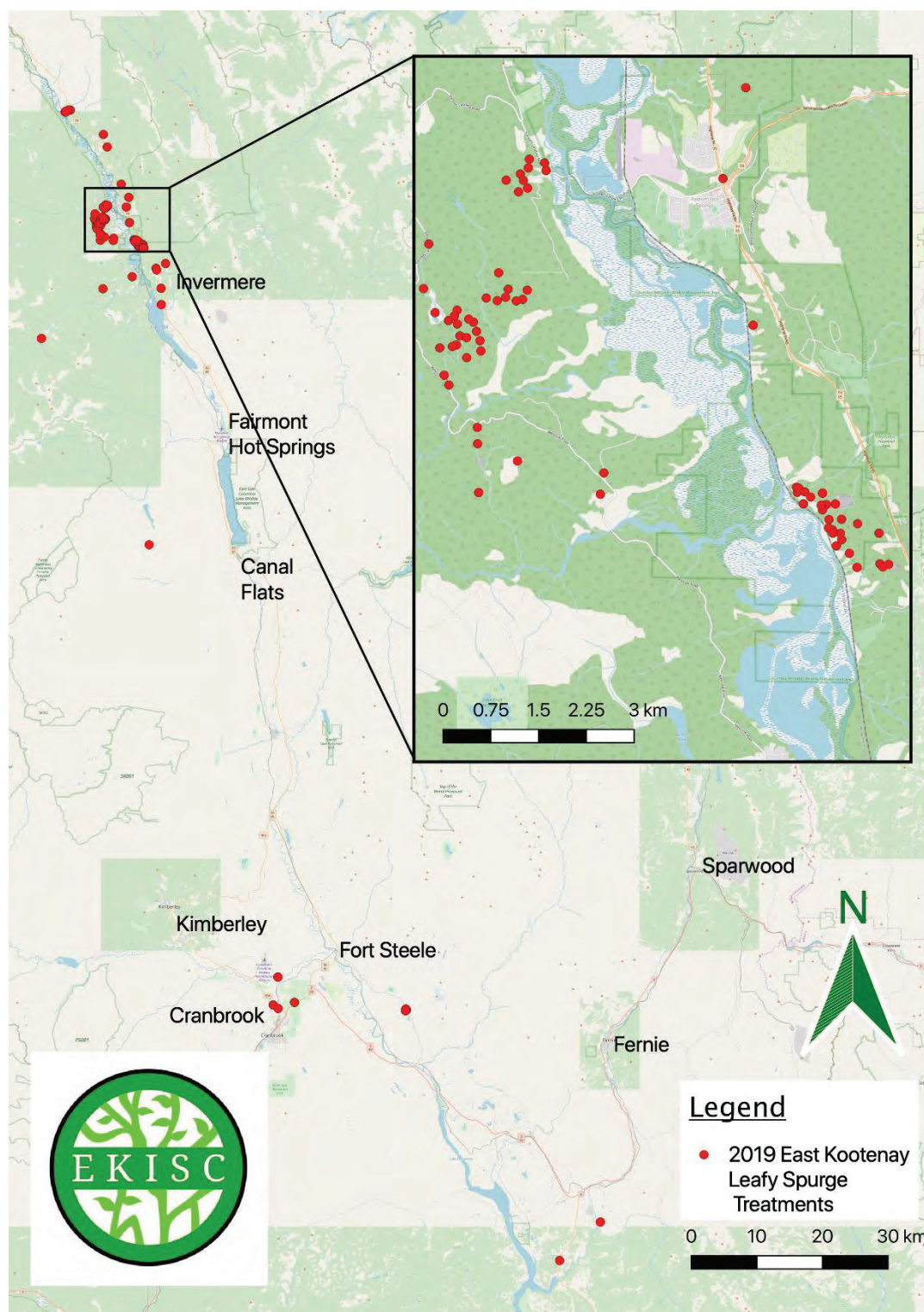


Figure 2 Locations of 2019 LS treatment sites. Treatments outside of Electoral Areas F and G are not treated with CVLCF funds.

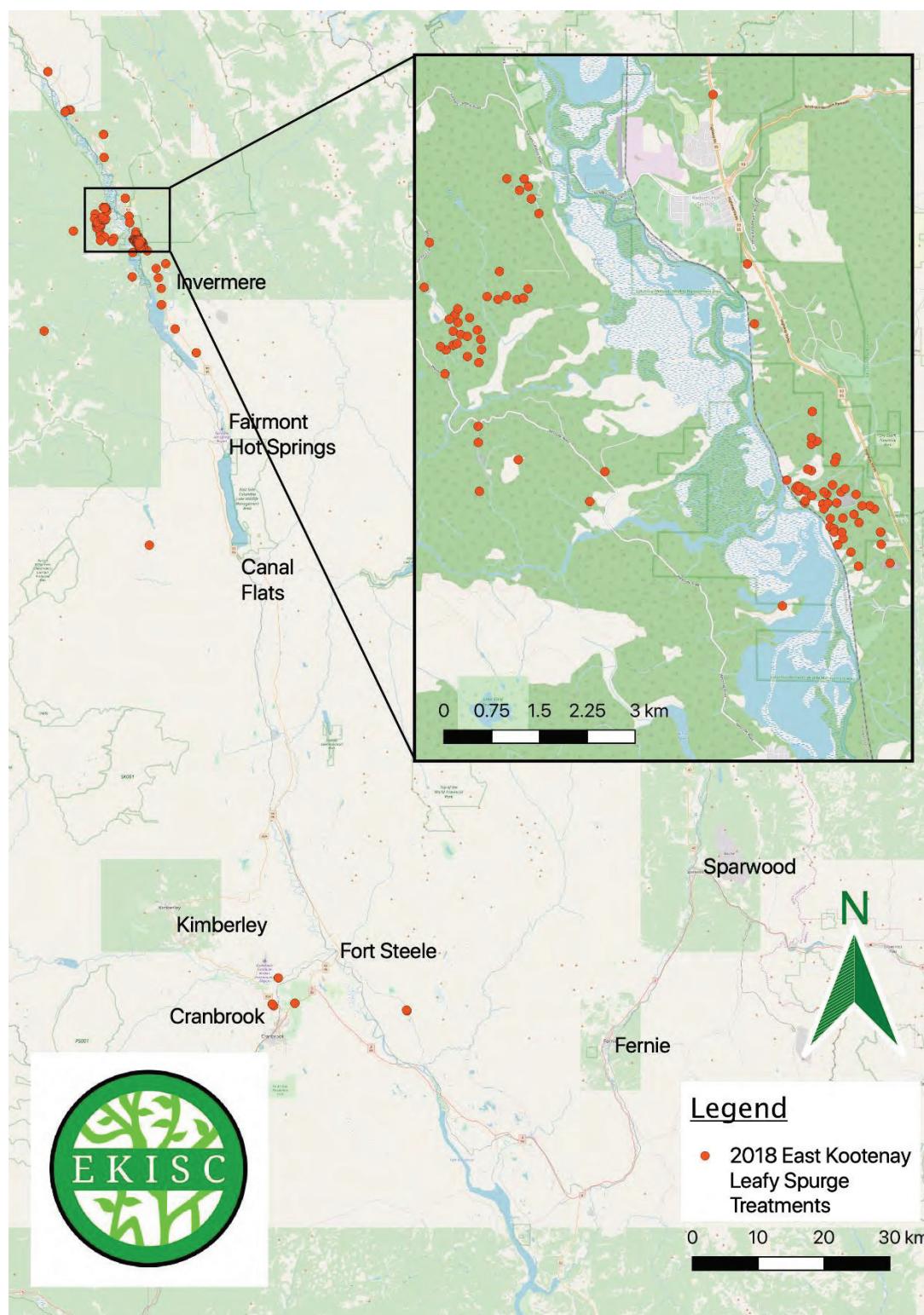


Figure 3 Locations of 2018 LS treatment sites. Treatments outside of Electoral Areas F and G are not treated with CVLCF funds.

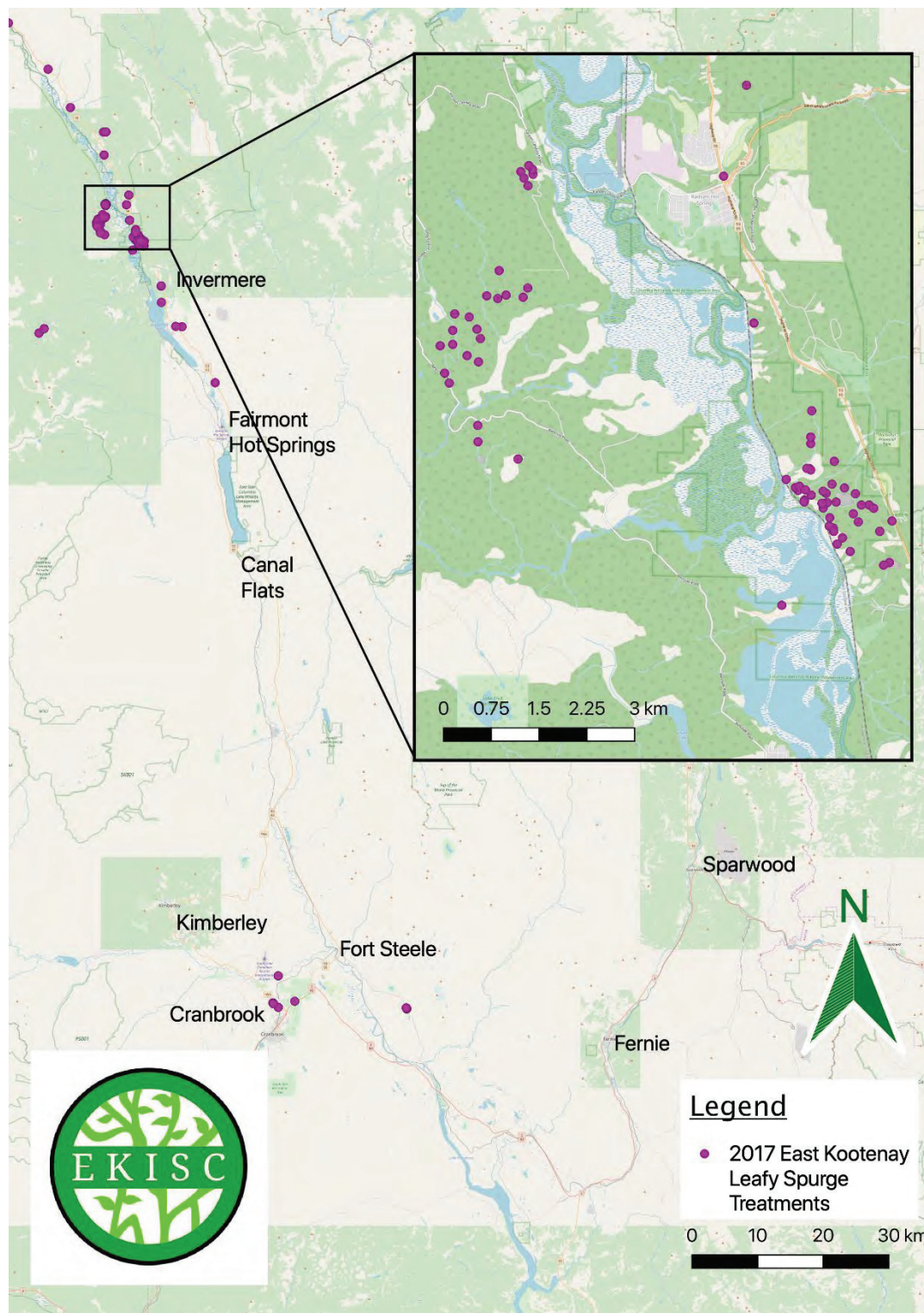


Figure 4 Locations of 2017 LS treatment sites. Treatments outside of Electoral Areas F and G are not treated with CVLCF funds.

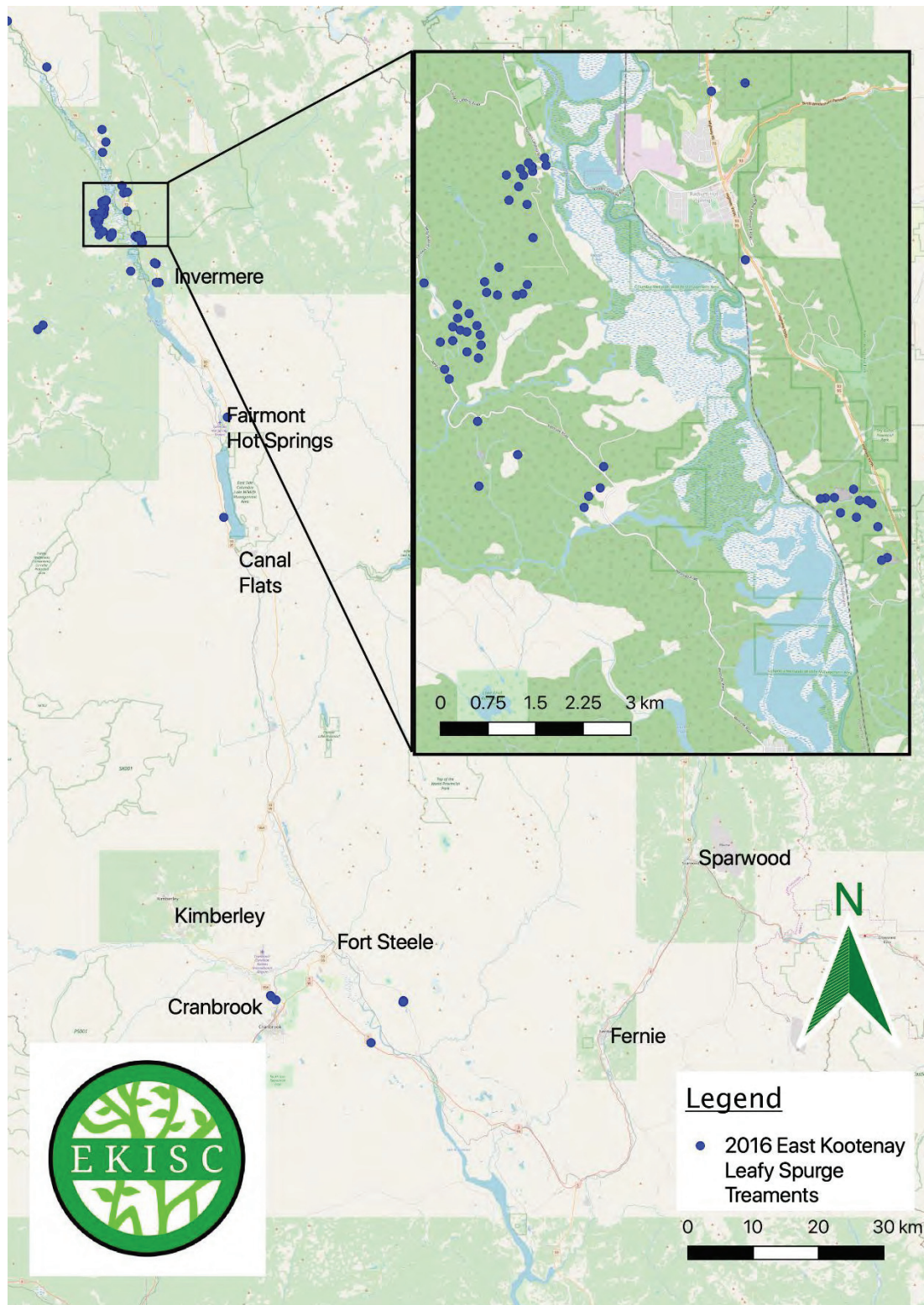


Figure 5 Locations of 2017 LS treatment sites. Treatments outside of Electoral Areas F and G are not treated with CVLCF funds.



Future Recommendations

The SIPCOLS Project is a crucial component in management of LS in the Columbia Valley, utilizing stakeholder collaboration to decrease existing infestations and reduce the risk of spread into high value lands. Although we believe this project is not only containing and reducing the spread of existing LS populations and allowing contractors and EKISC staff to quickly identify and respond to new LS sites, we know that in most years there are areas that we do not have funding to visit or treat. There may be uncertainty around if eradication of LS is possible at some project locations (due to funding restrictions and longevity of the seed bank), but we do know that funds provided by CVLCF are going a long ways in preventing the spread of LS, and ensuring that negative impacts to wildlife (reduced biodiversity and forage quality and availability) and the agricultural community in particular (toxicity risk to livestock, reduced forage quality and availability) are negated as much as possible.

Recommended objectives for 2020 are:

1. Inventory and map all known and newly identified LS sites in the project area.
2. Create a comprehensive, multi-stakeholder invasive plant management plan for LS in the Columbia Valley, focusing on areas that are of high habitat value and pose the greatest threat to adjacent land managers (i.e., Wildlife Management Areas, conservation lands, Shuswap reserve lands, agricultural lands).
3. Treat identified high-priority LS infestations within 1km of private land within the project area. Additional treatments areas, funding permitting, will include:
 - a. Infestations that are adjacent to Shuswap Indian Band reserve lands to assist with on-reserve treatments.
 - b. Infestations that are on crown land near the CWWMA to prevent the further spread of LS away from the main areas of infestation.
4. Complete biocontrol agent inventory at previous release sites and identify two candidate sites for potential release (or re-release) of LS biocontrol agent.
5. Continue to communicate importance of LS control to stakeholders and community members within the Columbia Valley.

Additional details can be found in the 2020 SIPCOLS Project Proposal, submitted to the CVLCF in November 2019.

2019 LS Treatments

Site ID	Site Created Date	Mapsheet	UTM Zone	UTM Easting	UTM Northing	Decimal Latitude	Decimal Longitude	Invasive Plant	Treatment Date	Herbicide	Method	Area Treated	Amount of Mix Used	Application Rate	Delivery Rate	Amount of Undiluted Herbicide Used
15883	1900-01-02	082G053	11	609460	5489194	49.54545	-115.48685	Leafy spurge (EUPH ESU)	2019-06-11	Tordon 22K	Back Pack	0.0327	11.00000	4.50	336	0.1473
15883	1900-01-02	082G053	11	609460	5489194	49.54545	-115.48685	Leafy spurge (EUPH ESU)	2019-09-20	Tordon 22K	Boomless Nozzle	0.9000	180.00000	2.25	200	2.0250
15883	1900-01-02	082G053	11	609460	5489194	49.54545	-115.48685	Leafy spurge (EUPH ESU)	2019-09-20	Tordon 22K	Boomless Nozzle	0.9000	180.00000	2.25	200	2.0250
45428	2018-10-12	082K070	11	562126	5606400	50.60618	-116.12204	Leafy spurge (EUPH ESU)	2019-10-02	Tordon 22K	Boomless Nozzle	0.0750	15.00000	4.50	200	0.3375
45445	2018-10-10	082K060	11	567333	5603270	50.57746	-116.04903	Leafy spurge (EUPH ESU)	2019-09-27	Aspect	Hand Gun	0.0400	8.00000	4.50	200	0.1800
45463	2018-10-11	082K060	11	561494	5605700	50.59995	-116.13108	Leafy spurge (EUPH ESU)	2019-10-02	Aspect	Boomless Nozzle	0.0200	4.00000	4.50	200	0.0900
45473	2018-10-11	082K070	11	561862	5605770	50.60054	-116.12587	Leafy spurge (EUPH ESU)	2019-10-02	Aspect	Hand Gun	0.1250	25.00000	4.50	200	0.5625
45506	2018-09-20	082K060	11	568184	5602350	50.56909	-116.03718	Leafy spurge (EUPH ESU)	2019-09-19	Tordon 22K	Boomless Nozzle	0.0400	8.00000	4.50	200	0.1800
45511	2018-10-11	082K060	11	561878	5605610	50.59910	-116.12567	Leafy spurge (EUPH ESU)	2019-10-02	Aspect	Boomless Nozzle	0.0400	8.00000	4.50	200	0.1800
45585	2018-10-10	082K060	11	567826	5602290	50.56859	-116.04224	Leafy spurge (EUPH ESU)	2019-09-20	Aspect	Hand Gun	0.0150	3.00000	4.50	200	0.0675
45732	2018-10-12	082K070	11	562581	5608170	50.62205	-116.11531	Leafy spurge (EUPH ESU)	2019-10-03	Tordon 22K	Hand Gun	0.0100	2.00000	4.50	200	0.0450
45787	2018-10-10	082K060	11	567473	5603279	50.57752	-116.04705	Leafy spurge (EUPH ESU)	2019-09-27	Aspect	Hand Gun	0.0200	4.00000	4.50	200	0.0900
45788	2018-10-09	082K060	11	567272	5603184	50.57669	-116.04990	Leafy spurge (EUPH ESU)	2019-09-27	Aspect	Boomless Nozzle	0.0750	15.00000	4.50	200	0.3375
45789	2018-10-09	082K060	11	567251	5603257	50.57735	-116.05019	Leafy spurge (EUPH ESU)	2019-09-20	Aspect	Hand Gun	0.0100	2.00000	4.50	200	0.0450
45789	2018-10-09	082K060	11	567251	5603257	50.57735	-116.05019	Leafy spurge (EUPH ESU)	2019-09-27	Aspect	Hand Gun	0.0900	18.00000	4.50	200	0.4050
45792	2018-10-09	082K060	11	566872	5603455	50.57917	-116.05550	Leafy spurge (EUPH ESU)	2019-10-01	Aspect	Boomless Nozzle	0.0500	10.00000	4.50	200	0.2250
45795	2018-10-09	082K060	11	567081	5603385	50.57852	-116.05257	Leafy spurge (EUPH ESU)	2019-10-01	Aspect	Hand Gun	0.1250	25.00000	4.50	200	0.5625
45796	2018-10-09	082K060	11	566857	5603533	50.57988	-116.05570	Leafy spurge (EUPH ESU)	2019-10-01	Aspect	Boomless Nozzle	0.1000	20.00000	4.50	200	0.4500
45849	1995-08-09	082K070	11	562867	5608448	50.62452	-116.11122	Leafy spurge (EUPH ESU)	2019-10-03	Tordon 22K	Hand Gun	0.0600	12.00000	4.50	200	0.2700
45904	2018-10-10	082K060	11	561870	5603390	50.57914	-116.12615	Leafy spurge (EUPH ESU)	2019-10-22	Tordon 22K	Boomless Nozzle	0.0200	4.00000	4.50	200	0.0900
116333	1998-07-28	082J041	11	571000	5594000			Leafy spurge (EUPH ESU)	2019-08-07	Milestone	Back Pack	0.0020	0.20000	1.00	400	0.0002
128201	2018-10-09	082K060	11	566971	5603275	50.57754	-116.05414	Leafy spurge (EUPH ESU)	2019-10-01	Aspect	Boomless Nozzle	0.1250	25.00000	4.50	200	0.5625
128201	2018-10-09	082K060	11	566971	5603275	50.57754	-116.05414	Leafy spurge (EUPH ESU)	2019-10-01	Aspect	Boomless Nozzle	0.1500	30.00000	4.50	200	0.6750
210402	2005-12-15	082K060	11	570150	5599356	50.54193	-116.00999	Leafy spurge (EUPH ESU)	2019-06-24	Clearview	Boomless Nozzle	0.1225	24.50000	0.14	200	0.0172
210426	2018-10-12	082K070	11	562595	5606571	50.60767	-116.11538	Leafy spurge (EUPH ESU)	2019-10-03	Tordon 22K	Boomless Nozzle	0.1750	35.00000	4.50	200	0.7875
210427	2018-10-11	082K070	11	561498	5606244	50.60484	-116.13094	Leafy spurge (EUPH ESU)	2019-10-02	Aspect	Boomless Nozzle	0.0050	1.00000	4.50	200	0.0225
210430	2018-10-11	082K070	11	561807	5605916	50.60186	-116.12662	Leafy spurge (EUPH ESU)	2019-10-02	Tordon 22K	Boomless Nozzle	0.2850	57.00000	4.50	200	1.2825
210434	2018-10-09	082K060	11	566895	5603519	50.57975	-116.05517	Leafy spurge (EUPH ESU)	2019-10-01	Aspect	Boomless Nozzle	0.1250	25.00000	4.50	200	0.5625
210448	2018-07-16	082K060	11	561837	5604410	50.58832	-116.12645	Leafy spurge (EUPH ESU)	2019-06-28	Aspect	Boomless Nozzle	0.0300	6.00000	4.50	200	0.1350
210956	2018-05-30	082J033	11	570936	5596402	50.51528	-115.99946	Leafy spurge (EUPH ESU)	2019-06-26	Tordon 22K	Boomless Nozzle	0.1050	21.00000	4.50	200	0.4725
225971	2007-06-30	082G025	11	613542	5451765	49.20412	-115.16667	Leafy spurge (EUPH ESU)	2019-05-29	Tordon 22K	Back Pack	0.0400	0.20000	4.50	5	0.1800
230770	2007-01-11	082K070	11	565984	5609784	50.63619	-116.06692	Leafy spurge (EUPH ESU)	2019-10-22	Tordon 22K	Hand Gun	0.0800	16.00000	4.50	200	0.3600
230778	2007-01-12	082K070	11	561757	5606059	50.60315	-116.12731	Leafy spurge (EUPH ESU)	2019-10-02	Aspect	Hand Gun	0.0150	3.00000	4.50	200	0.0675
230781	2018-10-11	082K070	11	561455	5606152	50.60402	-116.13156	Leafy spurge (EUPH ESU)	2019-10-02	Aspect	Boomless Nozzle	0.2250	45.00000	4.50	200	1.0125
230782	2018-10-11	082K070	11	561503	5606028	50.60290	-116.13090	Leafy spurge (EUPH ESU)	2019-10-02	Aspect	Boomless Nozzle	0.0050	1.00000	4.50	200	0.0225
230783	2018-10-12	082K070	11	561954	5606056	50.60656	-116.12446	Leafy spurge (EUPH ESU)	2019-10-02	Tordon 22K	Boomless Nozzle	0.0400	8.00000	4.50	200	0.1800
230784	2007-01-12	082K070	11	562589	5604885	50.62488	-116.11514	Leafy spurge (EUPH ESU)	2019-10-03	Tordon 22K	Boomless Nozzle	0.1750	35.00000	4.50	200	0.7875
230785	2007-01-12	082K070	11	562464	5608390	50.62404	-116.11692	Leafy spurge (EUPH ESU)	2019-10-03	Tordon 22K	Hand Gun	0.2100	42.00000	4.50	200	0.9450
230786	2018-10-12	082K070	11	562514	5608290	50.62313	-116.11623	Leafy spurge (EUPH ESU)	2019-10-03	Tordon 22K	Hand Gun	0.0300	6.00000	4.50	200	0.1350
230788	2018-10-12	082K070	11	562524	5606425	50.60636	-116.11641	Leafy spurge (EUPH ESU)	2019-10-03	Tordon 22K	Boomless Nozzle	0.0150	3.00000	4.50	200	0.0675
230789	2007-01-12	082K070	11	561154	5606201	50.60449	-116.13580	Leafy spurge (EUPH ESU)	2019-10-02	Aspect	Hand Gun	0.0050	1.00000	4.50	200	0.0225
230791	2018-10-12	082K070	11	562243	5608290	50.62316	-116.12007	Leafy spurge (EUPH ESU)	2019-10-03	Tordon 22K	Boomless Nozzle	0.0050	1.00000	4.50	200	0.0225
230792	2018-10-12	082K070	11	562425	5606400	50.60615	-116.11781	Leafy spurge (EUPH ESU)	2019-10-02	Tordon 22K	Hand Gun	0.0050	1.00000	4.50	200	0.0225
230793	2018-10-12	082K070	11	562143	5606837	50.61011	-116.12172	Leafy spurge (EUPH ESU)	2019-10-03	Tordon 22K	Hand Gun	0.0350	7.00000	4.50	200	0.1575
230795	2007-01-12	082K060	11	570251	5599121	50.53981	-116.00861	Leafy spurge (EUPH ESU)	2019-06-25	Tordon 22K	Boomless Nozzle	0.4500	90.00000	4.50	200	2.0250
230809	2018-10-10	082K060	11	562474	5603992	50.58359	-116.11754	Leafy spurge (EUPH ESU)	2019-10-22	Tordon 22K	Boomless Nozzle	0.1000	20.00000	4.50	200	0.4500
231495	2007-01-23	082G053	11	609388	5489317	49.54657	-115.48781	Leafy spurge (EUPH ESU)	2019-06-11	Tordon 22K	Back Pack	0.0149	5.00000	4.50	336	0.0670
231495	2007-01-23	082G053	11	609388	5489317	49.54657	-115.48781	Leafy spurge (EUPH ESU)	2019-09-20	Tordon 22K	Boomless Nozzle	0.0500	10.00000	2.25	200	0.1125
231495	2007-01-23	082G053	11	609388	5489317	49.54657	-115.48781	Leafy spurge (EUPH ESU)	2019-09-20	Tordon 22K	Boomless Nozzle	0.0500	10.00000	2.25	200	0.1125
232353	2006-10-27	082G053	11	609336	5489089	49.54453	-115.48859	Leafy spurge (EUPH ESU)	2019-09-20	Tordon 22K	Boomless Nozzle	0.0500	10.00000	2.25	200	0.1125
232353	2006-10-27	082G053	11	609336	5489089	49.54453	-115.48859	Leafy spurge (EUPH ESU)	2019-09-20	Tordon 22K	Boomless Nozzle	0.0500	10.00000	2.25	200	0.1125
243672	2018-10-10	082K060	11	563832	5603721	50.58191	-116.09839	Leafy spurge (EUPH ESU)	2019-06-28	Aspect	Boomless Nozzle	0.0200	4.00000	4.50	200	0.0900
243615	2018-06-15	082K070	11	564843	5611712	50.65365	-116.08271	Leafy spurge (EUPH ESU)	2019-06-17	Tordon 22K	Boomless Nozzle	0.1400	28.00000	4.50	200	0.6300
243628	2018-06-18	082K080	11	562720	5617174	50.70300	-116.11182	Leafy spurge (EUPH ESU)	2019-08-29	Tordon 22K	Hand Gun	0.0050	1.00000	4.50	200	0.0225
243947	2018-10-09	082K060	11	567269	5603447	50.57906	-116.04990	Leafy spurge (EUPH ESU)	2019-09-27	Aspect	Hand Gun	0.0250	5.00000	4.50	200	0.1125
243947	2018-10-09	082K060	11	567269	5603447	50.57906	-116.04990	Leafy spurge (EUPH ESU)	2019-09-27	Aspect	Boomless Nozzle	0.0600	12.00000	4.50	200	0.2700
243980	2018-09-20	082K060	11	568164	5602831	50.57341	-116.03737	Leafy spurge (EUPH ESU)	2019-09-20	Aspect	Boomless Nozzle	0.0150	3.00000	4.50	200	0.0675
243984	2018-10-09	082K060	11	566990	5603463	50.57923	-116.05384	Leafy spurge (EUPH ESU)	2019-10-01	Aspect	Boomless Nozzle	0.0750	15.00000	4.50	200	0.3375
244681	2018-09-20	082K060	11	568320	5602344	50.56902	-116.03526	Leafy spurge (EUPH ESU)	2019-09-19	Tordon 22K	Boomless Nozzle	0.0200	4.00000	4.50	200	0.0900
244784	2018-09-20	082K060	11	568230	5602301	50.56864	-116.03654	Leafy spurge (EUPH ESU)	2019-09-19	Tordon 22K	Boomless Nozzle	0.2250	45.00000	4.50	200	1.0125
251413	2018-10-11	082K060	11	561657	5605501	50.59815	-116.12881	Leafy spurge (EUPH ESU)	2019-10-02	Aspect	Hand Gun	0.0050	1.00000	4.50	200	0.0225
251451	2018-07-16	082K060	11	561844	5604155	50.58602	-116.12639	Leafy spurge (EUPH ESU)	2019-10-22	Tordon 22K	Boomless Nozzle	0.0050	1.00000	4.50	200	0.0225
251457</																

Site ID	Site Created Date	Mapsheet	UTM Zone	UTM Easting	UTM Northing	Decimal Latitude	Decimal Longitude	Invasive Plant	Treatment Date	Herbicide	Method	Area Treated	Amount of Mix Used	Application Rate	Delivery Rate	Amount of Unfilled	Herbicide Used
291647	2018-05-28	082K060	11	570151	5599342	50.54181	-116.00997	Leaky spurge (EUPH ESU)	2018-05-28	Tordon 22K	Boomless Nozzle	0.3063	61.25000	4.50	200	1.3781	
115901	2018-05-28	082K060	11	570500	5597950	50.52925	-116.00531	Leaky spurge (EUPH ESU)	2018-05-28	Tordon 22K	Boomless Nozzle	0.7150	143.00000	4.50	200	3.2175	
295848	2019-08-31	082G052	11	589328	5495980	49.55223	-115.76499	Leaky spurge (EUPH ESU)	2018-05-29	Grazon	Back Pack	0.0044	2.00000	4.67	450	0.0208	
278176	2018-05-28	082K060	11	568799	5601955	50.56546	-116.02857	Leaky spurge (EUPH ESU)	2018-05-29	Milestone	Boomless Nozzle	0.0450	9.00000	0.50	200	0.0225	
210955	2018-05-30	082J033	11	570936	5596402	50.51528	-116.05846	Leaky spurge (EUPH ESU)	2018-05-30	Tordon 22K	Hand Gun	0.1500	30.00000	4.50	200	0.0750	
251459	2018-05-31	082K070	11	566023	5607001	50.61116	-116.06786	Leaky spurge (EUPH ESU)	2018-05-31	Tordon 22K	Hand Gun	0.0750	15.00000	4.50	200	0.3735	
291660	2018-05-31	082J041	11	573083	5590452	50.46151	-115.97034	Leaky spurge (EUPH ESU)	2018-05-31	Milestone	Boomless Nozzle	0.0700	14.00000	0.50	200	0.0350	
270302	2010-06-21	082G052	11	589967	5493903	49.59011	-115.75519	Leaky spurge (EUPH ESU)	2018-06-01	Tordon 22K	Back Pack	0.0001	0.05000	4.50	450	0.0005	
231024	2018-06-02	082J041	11	576268	5586972	50.42981	-115.92619	Leaky spurge (EUPH ESU)	2018-06-02	Milestone	Boomless Nozzle	0.1150	23.00000	0.50	200	0.0575	
15883	1900-01-02	082G053	11	609460	5489194	49.54545	-115.48685	Leaky spurge (EUPH ESU)	2018-06-08	Tordon 22K	Back Pack	0.0167	7.50000	4.50	450	0.0750	
324127	2019-10-04	082G052	11	592532	5490021	49.55571	-115.72060	Leaky spurge (EUPH ESU)	2018-06-12	Tordon 22K	Back Pack	0.0060	2.70000	4.50	450	0.0270	
251510	2018-06-15	082K070	11	565454	5609646	50.63500	-116.07444	Leaky spurge (EUPH ESU)	2018-06-15	Tordon 22K	Hand Gun	0.2063	41.25000	4.50	200	0.9281	
206793	2018-06-18	082K070	11	562257	5615629	50.68915	-116.11863	Leaky spurge (EUPH ESU)	2018-06-18	Tordon 22K	Hand Gun	0.0250	5.00000	4.50	200	0.1125	
309531	2019-08-29	082K080	11	562136	5619005	50.71952	-116.11978	Leaky spurge (EUPH ESU)	2018-06-18	Tordon 22K	Hand Gun	0.0050	1.00000	4.50	200	0.0225	
116333	1998-07-28	082J041	11	571000	5594000			Leaky spurge (EUPH ESU)	2018-06-27	Clearview	Hand Gun	0.0200	4.00000	0.20	200	0.0040	
274889	2018-07-11	082K090	11	553861	5621848	50.80256	-116.23565	Leaky spurge (EUPH ESU)	2018-07-11	Tordon 22K	Hand Gun	0.0050	1.00000	4.50	200	0.0225	
316711	2019-06-13	082K049	11	553886	5589916	50.45879	-116.24267	Leaky spurge (EUPH ESU)	2018-07-12	Tordon 22K	Back Pack	0.0092	4.12500	4.50	450	0.0413	
210448	2018-07-16	082K060	11	561837	5604410	50.58832	-116.12545	Leaky spurge (EUPH ESU)	2018-07-16	Clearview	Boomless Nozzle	0.0100	2.00000	4.50	200	0.0020	
291653	2018-07-16	082K090	11	547691	5635222	50.86671	-116.32228	Leaky spurge (EUPH ESU)	2018-07-16	Tordon 22K	Boomless Nozzle	0.0050	7.00000	4.50	200	0.1575	
251451	2018-07-16	082K060	11	561844	5604155	50.58602	-116.12639	Leaky spurge (EUPH ESU)	2018-07-16	Clearview	Boomless Nozzle	0.0050	1.00000	0.20	200	0.0010	
323986	2019-08-09	082K090	11	557217	5622554	50.75194	-116.18890	Leaky spurge (EUPH ESU)	2018-07-24	Aspect	Boomless Nozzle	0.1400	28.00000	4.50	200	0.6300	
339200	2018-07-24	082K090	11	556982	5622568	50.75209	-116.19223	Leaky spurge (EUPH ESU)	2018-07-24	Aspect	Back Pack	0.0400	8.00000	4.50	200	0.1800	
339197	2018-07-24	082K090	11	556498	5622341	50.75010	-116.19913	Leaky spurge (EUPH ESU)	2018-07-24	Aspect	Boomless Nozzle	0.0600	12.00000	4.50	200	0.2700	
339134	2018-07-24	082K090	11	556452	5622273	50.74949	-116.19979	Leaky spurge (EUPH ESU)	2018-07-24	Aspect	Hand Gun	0.1350	27.00000	4.50	200	0.6075	
291054	2018-07-30	082G052	11	589097	5489840	49.55460	-115.76812	Leaky spurge (EUPH ESU)	2018-07-30	Aspect	Boomless Nozzle	0.9767	210.00000	4.67	215	4.5614	
300452	2019-03-19	082K060	11	566641	5598074	50.53082	-116.05973	Leaky spurge (EUPH ESU)	2018-07-30	Tordon 22K	Back Pack	0.0100	2.00000	4.50	200	0.0450	
324112	2018-09-13	082K060	11	566641	5601652	50.56299	-116.05909	Leaky spurge (EUPH ESU)	2018-09-19	Grazon	Back Pack	0.0256	11.50000	4.67	450	0.1193	
244681	2018-09-20	082K060	11	568320	5602344	50.56902	-116.03526	Leaky spurge (EUPH ESU)	2018-09-20	Tordon 22K	Boomless Nozzle	0.2000	40.00000	4.50	200	0.9000	
243982	2018-09-20	082K060	11	568177	5602637	50.57167	-116.03723	Leaky spurge (EUPH ESU)	2018-09-20	Tordon 22K	Boomless Nozzle	0.0188	3.75000	4.50	200	0.0844	
300660	2018-09-20	082K060	11	568164	5602229	50.57340	-116.03737	Leaky spurge (EUPH ESU)	2018-09-20	Tordon 22K	Hand Gun	0.0300	6.00000	4.50	200	0.1350	
243980	2018-09-20	082K060	11	568164	5602831	50.57341	-116.03737	Leaky spurge (EUPH ESU)	2018-09-20	Tordon 22K	Hand Gun	0.0250	5.00000	4.50	200	0.1125	
231495	2007-01-23	082G053	11	609388	5498317	49.54657	-115.48781	Leaky spurge (EUPH ESU)	2018-09-24	Grazon	Back Pack	0.0393	13.75000	4.67	350	0.1835	
284855	2018-09-28	082K060	11	567456	5603990	50.58392	-116.04716	Leaky spurge (EUPH ESU)	2018-09-28	Aspect	Hand Gun	0.0250	5.00000	4.50	200	0.1125	
284856	2018-09-28	082K060	11	567071	5604703	50.59037	-116.05247	Leaky spurge (EUPH ESU)	2018-09-28	Aspect	Boomless Nozzle	0.0900	18.00000	4.50	200	0.4050	
128203	2018-09-28	082K060	11	567068	5603777	50.58205	-116.05268	Leaky spurge (EUPH ESU)	2018-09-28	Aspect	Hand Gun	0.1500	30.00000	4.50	200	0.6750	
243985	2018-09-28	082K060	11	567007	5603801	50.58227	-116.05354	Leaky spurge (EUPH ESU)	2018-09-28	Aspect	Hand Gun	0.0700	14.00000	4.50	200	0.3150	
284858	2018-09-28	082K060	11	567435	5603918	50.58327	-116.04747	Leaky spurge (EUPH ESU)	2018-09-28	Aspect	Hand Gun	0.0500	10.00000	4.50	200	0.2250	
309525	2018-09-28	082K060	11	567063	5604191	50.58577	-116.05267	Leaky spurge (EUPH ESU)	2018-09-28	Aspect	Hand Gun	0.1000	20.00000	4.50	200	0.4500	
284857	2018-09-28	082K060	11	567151	5604240	50.58620	-116.05142	Leaky spurge (EUPH ESU)	2018-09-28	Aspect	Boomless Nozzle	0.0400	8.00000	4.50	200	0.1800	
309534	2018-09-28	082K060	11	567062	5604293	50.58669	-116.05267	Leaky spurge (EUPH ESU)	2018-09-28	Aspect	Hand Gun	0.1500	30.00000	4.50	200	0.6750	
210450	2018-09-30	082K060	11	567867	5604728	50.59158	-116.18248	Leaky spurge (EUPH ESU)	2018-09-30	Aspect	Hand Gun	0.0250	5.00000	4.50	200	0.1125	
339152	2018-09-30	082K070	11	561041	5607276	50.61417	-116.13722	Leaky spurge (EUPH ESU)	2018-09-30	Aspect	Boomless Nozzle	0.0100	2.00000	4.50	200	0.0450	
290813	2018-10-01	082K070	11	566147	5606965	50.60273	-116.06528	Leaky spurge (EUPH ESU)	2018-10-01	Aspect	Boomless Nozzle	0.0500	10.00000	4.50	200	0.2250	
45798	2018-10-09	082K060	11	567314	5603415	50.57876	-116.04927	Leaky spurge (EUPH ESU)	2018-10-09	Aspect	Hand Gun	0.0050	1.00000	4.50	200	0.0225	
284862	2018-10-09	082K060	11	567375	5603034	50.57533	-116.04848	Leaky spurge (EUPH ESU)	2018-10-09	Aspect	Hand Gun	0.1150	23.00000	4.50	200	0.5175	
263635	2018-10-09	082K060	11	567370	5602902	50.57414	-116.04857	Leaky spurge (EUPH ESU)	2018-10-09	Aspect	Hand Gun	0.0700	14.00000	4.50	200	0.3150	
262958	2018-10-09	082K060	11	567433	5602873	50.57388	-116.04769	Leaky spurge (EUPH ESU)	2018-10-09	Aspect	Hand Gun	0.0150	3.00000	4.50	200	0.0675	
278014	2018-10-09	082K060	11	567441	5602820	50.57340	-116.04758	Leaky spurge (EUPH ESU)	2018-10-09	Aspect	Hand Gun	0.0750	15.00000	4.50	200	0.3375	
243955	2018-10-09	082K060	11	567537	5603449	50.57904	-116.04611	Leaky spurge (EUPH ESU)	2018-10-09	Aspect	Boomless Nozzle	0.1450	29.00000	4.50	200	0.6525	
45476	2018-10-09	082K060	11	567404	5603559	50.58005	-116.04797	Leaky spurge (EUPH ESU)	2018-10-09	Aspect	Boomless Nozzle	0.0600	12.00000	4.50	200	0.2700	
262954	2018-10-09	082K060	11	567496	5602623	50.57162	-116.04684	Leaky spurge (EUPH ESU)	2018-10-09	Aspect	Hand Gun	0.0200	4.00000	4.50	200	0.0900	
263709	2009-09-11	082K060	11	567579	5602721	50.57249	-116.04565	Leaky spurge (EUPH ESU)	2018-10-09	Aspect	Hand Gun	0.2350	47.00000	4.50	200	1.0575	
284860	2018-10-09	082K060	11	566685	5603624	50.58072	-116.05811	Leaky spurge (EUPH ESU)	2018-10-09	Aspect	Boomless Nozzle	0.0200	4.00000	4.50	200	0.0900	
45793	2018-10-09	082K060	11	566831	5603499	50.57957	-116.05608	Leaky spurge (EUPH ESU)	2018-10-09	Aspect	Boomless Nozzle	0.0250	5.00000	4.50	200	0.1125	
45796	2018-10-09	082K060	11	566857	5603533	50.57989	-116.05570	Leaky spurge (EUPH ESU)	2018-10-09	Aspect	Boomless Nozzle	0.2100	42.00000	4.50	200	0.9450	
45792	2018-10-09	082K060	11	566872	5603465	50.57917	-116.05560	Leaky spurge (EUPH ESU)	2018-10-09	Aspect	Boomless Nozzle	0.0700	14.00000	4.50	200	0.3150	
210434	2018-10-09	082K060	11	566895	5603519	50.57975	-116.05517	Leaky spurge (EUPH ESU)	2018-10-09	Aspect	Boomless Nozzle	0.0800	16.00000	4.50	200	0.3600	
243984	2018-10-09	082K060	11	566990	5603463	50.57923	-116.05384	Leaky spurge (EUPH ESU)	2018-10-09	Aspect	Boomless Nozzle	0.1700	34.00000	4.50	200	0.7650	
128201	2018-10-09	082K060	11	566971	5603275	50.57754	-116.05414	Leaky spurge (EUPH ESU)	2018-10-09	Aspect	Boomless Nozzle	0.0950	19.00000	4.50	200	0.4275	
45794	2018-10-09	082K060	11	566979	5603308	50.57784	-116.05402	Leaky spurge (EUPH ESU)	2018-10-09	Aspect	Boomless Nozzle	0.1850	37.00000	4.50	200	0.8325	
45795	2018-10-09	082K060	11	567081	5603385	50.57852	-116.05257	Leaky spurge (EUPH ESU)	2018-10-09								

2017 LS Treatments

Site ID	Site Created Date	Mapsheet	UTM Zone	UTM Easting	UTM Northing	Decimal Latitude	Decimal Longitude	Invasive Plant	Treatment Date	Herbicide	Method	Area Treated	Amount of Mix Used	Application Rate	Delivery Rate	Amount of Undiluted Herbicide Used
15883	1900-01-02	082G053	11	609460	5489194	49.54545	-115.48685	Leaty spurge (EUPH ESU)	2017-07-05	Grazon	Back Pack	0.0080	2.00000	3.70	250	0.0296
45428	2018-10-12	082K010	11	562126	5606400	50.60618	-116.12204	Leaty spurge (EUPH ESU)	2017-10-26	Aspect	Hand Gun	0.0050	1.00000	4.50	200	0.0225
45445	2018-10-10	082K060	11	567333	5603270	50.57746	-116.04903	Leaty spurge (EUPH ESU)	2017-10-14	Aspect	Hand Gun	0.0600	12.00000	4.50	200	0.2700
45473	2018-10-11	082K070	11	561862	5605770	50.60054	-116.12587	Leaty spurge (EUPH ESU)	2017-10-25	Aspect	Hand Gun	0.0250	5.00000	4.50	200	0.1125
45476	2018-10-09	082K060	11	567404	5603559	50.58005	-116.04797	Leaty spurge (EUPH ESU)	2017-10-19	Aspect	Boomless Nozzle	0.0150	3.00000	4.50	200	0.0675
45732	2018-10-12	082K070	11	562581	5608170	50.62205	-116.11531	Leaty spurge (EUPH ESU)	2017-10-27	Aspect	Hand Gun	0.0250	5.00000	4.50	200	0.1125
45768	1994-11-15	082K070	11	562656	5608350	50.62366	-116.11422	Leaty spurge (EUPH ESU)	2017-10-27	Aspect	Hand Gun	0.0150	3.00000	4.50	200	0.0675
45769	1994-11-15	082K070	11	562648	5608427	50.62435	-116.11432	Leaty spurge (EUPH ESU)	2017-10-27	Aspect	Boomless Nozzle	0.0500	10.00000	4.50	200	0.2250
45780	2018-10-11	082K070	11	561428	5605893	50.60170	-116.13198	Leaty spurge (EUPH ESU)	2017-10-25	Aspect	Boomless Nozzle	0.0100	2.00000	4.50	200	0.0450
45787	2018-10-10	082K060	11	567473	5603279	50.57752	-116.04705	Leaty spurge (EUPH ESU)	2017-10-24	Aspect	Back Pack	0.0100	2.00000	4.50	200	0.0450
45788	2018-10-09	082K060	11	567272	5603184	50.57669	-116.04990	Leaty spurge (EUPH ESU)	2017-10-14	Aspect	Hand Gun	0.0500	10.00000	4.50	200	0.2250
45789	2018-10-09	082K060	11	567251	5603257	50.57735	-116.05019	Leaty spurge (EUPH ESU)	2017-10-14	Aspect	Hand Gun	0.0450	9.00000	4.50	200	0.2025
45792	2018-10-09	082K060	11	566872	5603455	50.57917	-116.05550	Leaty spurge (EUPH ESU)	2017-10-24	Aspect	Boomless Nozzle	0.0650	13.00000	4.50	200	0.2925
45793	2018-10-09	082K060	11	566831	5603498	50.57957	-116.05608	Leaty spurge (EUPH ESU)	2017-10-24	Aspect	Boomless Nozzle	0.0400	8.00000	4.50	200	0.1800
45794	2018-10-09	082K060	11	566979	5603308	50.57784	-116.05402	Leaty spurge (EUPH ESU)	2017-10-24	Aspect	Boomless Nozzle	0.0100	2.00000	4.50	200	0.0450
45795	2018-10-09	082K060	11	567081	5603385	50.57852	-116.05257	Leaty spurge (EUPH ESU)	2017-10-24	Aspect	Hand Gun	0.0400	8.00000	4.50	200	0.1800
45798	2018-10-09	082K060	11	567314	5603415	50.57876	-116.04927	Leaty spurge (EUPH ESU)	2017-10-19	Aspect	Hand Gun	0.0200	4.00000	4.50	200	0.0900
45857	2018-10-10	082K060	11	567991	5603240	50.57711	-116.03974	Leaty spurge (EUPH ESU)	2017-10-19	Aspect	Boomless Nozzle	0.0250	5.00000	4.50	200	0.1125
116333	1998-07-28	082J041	11	571000	5594000			Leaty spurge (EUPH ESU)	2017-07-25	Grazon	Boomless Nozzle	0.2500	50.00000	4.50	200	1.1250
128201	2018-10-09	082K060	11	566971	5603275	50.57754	-116.05414	Leaty spurge (EUPH ESU)	2017-10-24	Aspect	Boomless Nozzle	0.0500	10.00000	4.50	200	0.2250
128202	2004-10-26	082K060	11	567048	5603798	50.58224	-116.05296	Leaty spurge (EUPH ESU)	2017-10-24	Aspect	Hand Gun	0.0200	4.00000	4.50	200	0.0900
128203	2018-09-28	082K060	11	567068	5603777	50.58205	-116.05268	Leaty spurge (EUPH ESU)	2017-10-24	Aspect	Hand Gun	0.0250	5.00000	4.50	200	0.1125
206793	2018-06-18	082K070	11	562257	5615629	50.68915	-116.11863	Leaty spurge (EUPH ESU)	2017-07-29	Tordon 22K	Back Pack	0.0350	7.00000	4.50	200	0.1575
210426	2018-10-12	082K070	11	562595	5606571	50.60767	-116.11538	Leaty spurge (EUPH ESU)	2017-10-26	Aspect	Boomless Nozzle	0.0400	8.00000	4.50	200	0.1800
210430	2018-10-11	082K070	11	561807	5605916	50.60186	-116.12662	Leaty spurge (EUPH ESU)	2017-10-26	Aspect	Boomless Nozzle	0.0250	5.00000	4.50	200	0.1125
210432	2005-12-15	082K060	11	568353	5602995	50.57487	-116.03467	Leaty spurge (EUPH ESU)	2017-10-24	Aspect	Boomless Nozzle	0.0025	0.50000	4.50	200	0.0113
210434	2018-10-09	082K060	11	566895	5603519	50.57975	-116.05517	Leaty spurge (EUPH ESU)	2017-10-24	Aspect	Boomless Nozzle	0.0500	10.00000	4.50	200	0.2250
210448	2018-07-16	082K060	11	561837	5604410	50.58832	-116.12645	Leaty spurge (EUPH ESU)	2017-08-17	Tordon 22K	Back Pack	0.0060	1.20000	4.50	200	0.0270
210956	2018-05-30	082J033	11	570936	5596402	50.51528	-115.99946	Leaty spurge (EUPH ESU)	2017-08-04	Tordon 22K	Boomless Nozzle	0.1550	31.00000	4.50	200	0.6975
210964	2005-12-27	082J023	11	574103	5590446	50.46133	-115.95598	Leaty spurge (EUPH ESU)	2017-06-29	Tordon 22K	Boomless Nozzle	0.0463	9.25000	4.50	200	0.2081
230770	2007-01-11	082K070	11	565984	5609784	50.63619	-116.06692	Leaty spurge (EUPH ESU)	2017-07-12	Aspect	Back Pack	0.0150	3.00000	4.50	200	0.0675
230773	2018-10-11	082K060	11	561837	5605405	50.59726	-116.12628	Leaty spurge (EUPH ESU)	2017-10-25	Aspect	Boomless Nozzle	0.0050	1.00000	4.50	200	0.0225
230781	2018-10-11	082K070	11	561455	5606152	50.60402	-116.13156	Leaty spurge (EUPH ESU)	2017-10-25	Aspect	Boomless Nozzle	0.0500	10.00000	4.50	200	0.2250
230783	2018-10-12	082K070	11	561954	5606440	50.60656	-116.12446	Leaty spurge (EUPH ESU)	2017-10-26	Aspect	Boomless Nozzle	0.0050	1.00000	4.50	200	0.0225
230784	2007-01-12	082K070	11	562589	5608485	50.62488	-116.11514	Leaty spurge (EUPH ESU)	2017-10-27	Aspect	Boomless Nozzle	0.1000	20.00000	4.50	200	0.4500
230785	2007-01-12	082K070	11	562464	5608390	50.62404	-116.11692	Leaty spurge (EUPH ESU)	2017-10-27	Aspect	Hand Gun	0.0500	10.00000	4.50	200	0.2250
230786	2018-10-12	082K070	11	562514	5608290	50.62313	-116.11623	Leaty spurge (EUPH ESU)	2017-10-27	Aspect	Boomless Nozzle	0.0400	8.00000	4.50	200	0.1800
230788	2018-10-12	082K070	11	562524	5606425	50.60636	-116.11641	Leaty spurge (EUPH ESU)	2017-10-26	Aspect	Hand Gun	0.0050	1.00000	4.50	200	0.0225
230793	2018-10-12	082K070	11	562143	5606837	50.61011	-116.12172	Leaty spurge (EUPH ESU)	2017-10-26	Aspect	Boomless Nozzle	0.0050	1.00000	4.50	200	0.0225
230809	2018-10-10	082K060	11	562474	5603892	50.58359	-116.11754	Leaty spurge (EUPH ESU)	2017-10-26	Aspect	Boomless Nozzle	0.0050	1.00000	4.50	200	0.0225
230884	2007-01-14	082J041	11	573167	5590492	50.46186	-115.96915	Leaty spurge (EUPH ESU)	2017-06-29	Tordon 22K	Boomless Nozzle	0.0513	10.25000	4.50	200	0.2306
230887	2018-06-04	082J031	11	579131	5582231	50.38680	-115.88688	Leaty spurge (EUPH ESU)	2017-08-05	Tordon 22K	Boomless Nozzle	0.3950	79.00000	4.50	200	1.7775
231495	2007-01-23	082G053	11	609388	5489317	49.54657	-115.48781	Leaty spurge (EUPH ESU)	2017-07-05	Grazon	Back Pack	0.0040	1.00000	3.70	250	0.0148
239718	2007-06-12	082G005	11	642660	5430435	49.01031	-115.04911	Leaty spurge (EUPH ESU)	2017-09-10	Clearview	Boomless Nozzle	0.0233	5.00000	0.20	215	0.0047
243947	2018-10-09	082K060	11	567269	5603447	50.57906	-116.04990	Leaty spurge (EUPH ESU)	2017-10-19	Aspect	Boomless Nozzle	0.0300	6.00000	4.50	200	0.1350
243963	2018-10-10	082K060	11	567869	5603239	50.57712	-116.04146	Leaty spurge (EUPH ESU)	2017-10-19	Aspect	Hand Gun	0.0300	6.00000	4.50	200	0.1350
243980	2018-09-20	082K060	11	568164	5602831	50.57341	-116.03737	Leaty spurge (EUPH ESU)	2017-10-19	Aspect	Boomless Nozzle	0.0050	1.00000	4.50	200	0.0225
243983	2018-10-10	082K060	11	567745	5603100	50.57588	-116.04324	Leaty spurge (EUPH ESU)	2017-10-14	Aspect	Hand Gun	0.0200	4.00000	4.50	200	0.0900
243984	2018-10-09	082K060	11	566990	5603463	50.57923	-116.05384	Leaty spurge (EUPH ESU)	2017-10-24	Aspect	Boomless Nozzle	0.0250	5.00000	4.50	200	0.1125
243985	2018-09-28	082K060	11	567007	5603801	50.58227	-116.05354	Leaty spurge (EUPH ESU)	2017-10-24	Aspect	Hand Gun	0.0225	4.50000	4.50	200	0.1013
244681	2018-09-20	082K060	11	568320	5602344	50.56902	-116.03526	Leaty spurge (EUPH ESU)	2017-10-13	Tordon 22K	Boomless Nozzle	0.0550	11.00000	4.50	200	0.2475
244784	2018-09-20	082K060	11	568230	5602301	50.56864	-116.03654	Leaty spurge (EUPH ESU)	2017-10-13	Tordon 22K	Boomless Nozzle	0.2000	40.00000	4.50	200	0.9000
251413	2018-10-11	082K060	11	561657	5605501	50.59815	-116.12881	Leaty spurge (EUPH ESU)	2017-10-25	Aspect	Hand Gun	0.0050	1.00000	4.50	200	0.0225
251451	2018-07-16	082K060	11	561844	5604155	50.58602	-116.12639	Leaty spurge (EUPH ESU)	2017-08-17	Lontrel 360	Boomless Nozzle	0.0020	0.40000	0.70	200	0.0014
251457	2008-07-31	082K057	11	565644	5608357	50.62339	-116.07198	Leaty spurge (EUPH ESU)	2017-08-01	Tordon 22K	Boomless Nozzle	0.1500	30.00000	4.50	200	0.6750
251506	2018-10-11	082K060	11	561234	5605650	50.59953	-116.13476	Leaty spurge (EUPH ESU)	2017-10-25	Aspect	Boomless Nozzle	0.0500	10.00000	4.50	200	0.2250
262713	2009-07-04	082G052	11	590057	5489064	49.54748	-115.75503	Leaty spurge (EUPH ESU)	2017-09-08	Milestone	Boomless Nozzle	0.0000	0.01000	0.29	250	0.0000
262954	2018-10-09	082K060	11	567496	5602623	50.57162	-116.04684	Leaty spurge (EUPH ESU)	2017-10-14	Aspect	Hand Gun	0.0500	10.00000	4.50	200	0.2250
262958	2018-10-09	082K060	11	567433	5602873	50.57388	-116.04769	Leaty spurge (EUPH ESU)	2017-10-14	Aspect	Hand Gun	0.0300	6.00000	4.50	200	0.1350
263397	2018-10-11	082K070	11	561683	5606105	50.60357	-116.12834	Leaty spurge (EUPH ESU)	2017-10-26	Aspect	Hand Gun	0.0150	3.00000	4.50	200	0.0675
263463	2018-10-10	082K060	11	567773	5603415	50.57871	-116.04279	Leaty spurge (EUPH ESU)	2017-10-19	Aspect	Boomless Nozzle	0.0100	2.00000	4.50	200	0.0450
263618	2009-10-24	082K038	11	539800	5579160	50.36317	-116.44043	Leaty spurge (EUPH ESU)	2017-07-20	Tordon 22K	Hand Gun	0.0750	15.00000	4.50	200	0.3375
263635	2															

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Site ID	Site Created Date	Mapsheet	UTM Zone	UTM Easting	UTM Northing	Decimal Latitude	Decimal Longitude	Invasive Plant	Treatment Date	Herbicide	Method	Area Treated	Amount of Mix Used	Application Rate	Delivery Rate	Amount of Undiluted	
																Herbicide Used	Water Used
15883	1990-01-02	082G053	11	609460	5489194	49.54545	-115.48685	Leafy spurge (EUPH ESU)	2016-07-04	Grazon	Boomless Nozzle	0.4750	95.00000	3.00	200		1.4250
45428	2019-10-12	082K070	11	562126	5606400	50.60618	-116.12204	Leafy spurge (EUPH ESU)	2016-08-12	Grazon	Boomless Nozzle	0.0500	10.00000	4.50	200		0.2250
45445	2019-10-10	082K060	11	567333	5603270	50.57746	-116.09033	Leafy spurge (EUPH ESU)	2016-08-16	Grazon	Hand Gun	0.1500	30.00000	4.50	200		0.6750
45473	2019-10-11	082K070	11	561862	5605770	50.60054	-116.12587	Leafy spurge (EUPH ESU)	2016-08-12	Grazon	Hand Gun	0.0500	10.00000	4.50	200		0.2250
45511	2019-10-11	082K060	11	561878	5605610	50.59910	-116.12567	Leafy spurge (EUPH ESU)	2016-08-12	Grazon	Hand Gun	0.2250	45.00000	4.50	200		1.0125
45733	1994-11-15	082K070	11	562676	5607308	50.61429	-116.11411	Leafy spurge (EUPH ESU)	2016-08-13	Grazon	Boomless Nozzle	0.0200	4.00000	4.50	200		0.0900
45768	1994-11-15	082K070	11	562656	5608350	50.62366	-116.11422	Leafy spurge (EUPH ESU)	2016-08-13	Grazon	Hand Gun	0.0750	15.00000	4.50	200		0.3375
45769	1994-11-15	082K070	11	562648	5608427	50.62435	-116.11432	Leafy spurge (EUPH ESU)	2016-08-13	Grazon	Boomless Nozzle	0.0750	15.00000	4.50	200		0.3375
45780	2019-10-11	082K070	11	561428	5605893	50.60170	-116.13198	Leafy spurge (EUPH ESU)	2016-08-11	Grazon	Boomless Nozzle	0.0200	4.00000	4.50	200		0.0900
45787	2019-10-10	082K060	11	567473	5603279	50.57752	-116.04705	Leafy spurge (EUPH ESU)	2016-08-15	Grazon	Hand Gun	0.1750	35.00000	4.50	200		0.7875
45789	2019-10-09	082K060	11	567251	5603257	50.57735	-116.05019	Leafy spurge (EUPH ESU)	2016-08-16	Grazon	Hand Gun	0.2750	55.00000	4.50	200		1.2375
45849	1995-08-09	082K070	11	562867	5608448	50.62452	-116.11122	Leafy spurge (EUPH ESU)	2016-08-13	Grazon	Hand Gun	0.0500	10.00000	4.50	200		0.2250
45857	2019-10-10	082K060	11	567991	5603240	50.57711	-116.03974	Leafy spurge (EUPH ESU)	2016-08-15	Grazon	Boomless Nozzle	0.0200	4.00000	4.50	200		0.0900
45904	2019-10-10	082K060	11	561870	5603390	50.57914	-116.12615	Leafy spurge (EUPH ESU)	2016-08-10	Grazon	Boomless Nozzle	0.0500	10.00000	4.50	200		0.2250
115274	1993-08-06	082K060	11	570400	5599200	50.54050	-116.00649	Leafy spurge (EUPH ESU)	2016-05-31	Tordon 22K	Boomless Nozzle	0.1000	20.00000	4.50	200		0.4500
206793	2019-06-18	082K070	11	562257	5615629	50.68915	-116.11863	Leafy spurge (EUPH ESU)	2016-06-06	Tordon 22K	Back Pack	0.0100	2.00000	4.50	200		0.0450
210404	2005-12-15	082K060	11	570889	5596443	50.51565	-116.00011	Leafy spurge (EUPH ESU)	2016-05-31	Tordon 22K	Boomless Nozzle	1.0500	210.00000	4.50	200		4.7250
210426	2019-10-12	082K070	11	562595	5606571	50.60767	-116.11538	Leafy spurge (EUPH ESU)	2016-08-12	Grazon	Boomless Nozzle	0.2000	40.00000	4.50	200		0.9000
210427	2019-10-11	082K070	11	561498	5606244	50.60484	-116.13094	Leafy spurge (EUPH ESU)	2016-08-11	Grazon	Boomless Nozzle	0.5000	100.00000	4.50	200		2.2500
210430	2019-10-11	082K070	11	561807	5605916	50.60186	-116.12662	Leafy spurge (EUPH ESU)	2016-08-12	Grazon	Boomless Nozzle	0.8750	175.00000	4.50	200		3.9375
210448	2019-07-16	082K060	11	561837	5604410	50.58832	-116.12645	Leafy spurge (EUPH ESU)	2016-07-18	Tordon 22K	Back Pack	0.0400	8.00000	4.50	200		0.1800
230770	2007-01-11	082K070	11	565984	5609784	50.63619	-116.06692	Leafy spurge (EUPH ESU)	2016-06-28	Tordon 22K	Hand Gun	0.0400	8.00000	4.50	200		0.1800
230773	2019-10-11	082K060	11	561837	5605405	50.59726	-116.12628	Leafy spurge (EUPH ESU)	2016-08-12	Grazon	Hand Gun	0.0050	1.00000	4.50	200		0.0225
230782	2019-10-11	082K070	11	561503	5606028	50.60290	-116.13090	Leafy spurge (EUPH ESU)	2016-08-11	Grazon	Boomless Nozzle	0.0150	3.00000	4.50	200		0.0675
230783	2019-10-12	082K070	11	561954	5606440	50.60656	-116.12446	Leafy spurge (EUPH ESU)	2016-08-12	Grazon	Boomless Nozzle	0.0750	15.00000	4.50	200		0.3375
230784	2007-01-12	082K070	11	562589	5608485	50.62488	-116.11514	Leafy spurge (EUPH ESU)	2016-08-13	Grazon	Boomless Nozzle	0.1750	35.00000	4.50	200		0.7875
230785	2007-01-12	082K070	11	562464	5606390	50.62404	-116.11692	Leafy spurge (EUPH ESU)	2016-08-13	Grazon	Hand Gun	0.0500	10.00000	4.50	200		0.2250
230786	2019-10-12	082K070	11	562514	5606290	50.62313	-116.11623	Leafy spurge (EUPH ESU)	2016-08-13	Grazon	Hand Gun	0.0900	18.00000	4.50	200		0.4050
230787	2007-01-12	082K070	11	562577	5607832	50.61901	-116.11542	Leafy spurge (EUPH ESU)	2016-08-13	Grazon	Boomless Nozzle	0.0050	1.00000	4.50	200		0.0225
230788	2019-10-12	082K070	11	562524	5606425	50.60636	-116.11641	Leafy spurge (EUPH ESU)	2016-08-12	Grazon	Boomless Nozzle	0.0100	2.00000	4.50	200		0.0450
230790	2007-01-12	082K070	11	562289	5607894	50.61960	-116.11948	Leafy spurge (EUPH ESU)	2016-08-13	Grazon	Boomless Nozzle	0.0050	1.00000	4.50	200		0.0225
230791	2019-10-12	082K070	11	562243	5608290	50.62316	-116.12007	Leafy spurge (EUPH ESU)	2016-08-13	Grazon	Boomless Nozzle	0.0200	4.00000	4.50	200		0.0900
230792	2019-10-12	082K070	11	562425	5606400	50.60615	-116.11781	Leafy spurge (EUPH ESU)	2016-08-12	Grazon	Boomless Nozzle	0.0500	10.00000	4.50	200		0.2250
230793	2019-10-12	082K070	11	562143	5606837	50.61011	-116.12172	Leafy spurge (EUPH ESU)	2016-08-12	Grazon	Boomless Nozzle	0.0250	5.00000	4.50	200		0.1125
230809	2019-10-10	082K060	11	562474	5603892	50.58359	-116.11754	Leafy spurge (EUPH ESU)	2016-08-10	Grazon	Boomless Nozzle	0.2350	47.00000	4.50	200		1.0575
231495	2007-01-23	082G053	11	609388	5489317	49.54657	-115.48781	Leafy spurge (EUPH ESU)	2016-07-04	Grazon	Boomless Nozzle	0.0750	15.00000	3.00	200		0.2250
232353	2006-10-27	082G053	11	609336	5489089	49.54453	-115.48859	Leafy spurge (EUPH ESU)	2016-07-04	Grazon	Boomless Nozzle	0.0500	10.00000	3.00	200		0.1500
243666	2019-10-10	082K060	11	563602	5603251	50.57771	-116.10172	Leafy spurge (EUPH ESU)	2016-08-10	Grazon	Hand Gun	0.0100	2.00000	4.50	200		0.0450
243667	2007-06-12	082K060	11	563532	5603074	50.57612	-116.10274	Leafy spurge (EUPH ESU)	2016-08-11	Grazon	Hand Gun	0.8000	160.00000	4.50	200		3.6000
243672	2019-10-10	082K060	11	563832	5603721	50.58191	-116.09839	Leafy spurge (EUPH ESU)	2016-08-10	Tordon 22K	Back Pack	0.0050	1.00000	4.50	200		0.0225
243828	2019-06-18	082K080	11	562720	5611714	50.70300	-116.11182	Leafy spurge (EUPH ESU)	2016-07-20	Tordon 22K	Boomless Nozzle	0.0200	4.00000	4.50	200		0.0900
243963	2019-10-10	082K060	11	567869	5603239	50.57712	-116.04146	Leafy spurge (EUPH ESU)	2016-08-15	Grazon	Boomless Nozzle	0.0240	4.80000	4.50	200		0.1080
244681	2019-09-20	082K060	11	568320	5602344	50.56902	-116.03526	Leafy spurge (EUPH ESU)	2016-08-15	Grazon	Boomless Nozzle	0.0375	7.50000	4.50	200		0.1688
244784	2019-09-20	082K060	11	568230	5602301	50.56864	-116.03654	Leafy spurge (EUPH ESU)	2016-08-15	Grazon	Boomless Nozzle	0.1000	20.00000	4.50	200		0.4500
251413	2019-10-11	082K060	11	561657	5605501	50.59815	-116.12881	Leafy spurge (EUPH ESU)	2016-08-11	Grazon	Hand Gun	0.0250	5.00000	4.50	200		0.1125
251421	2019-07-06	082J021	11	581041	5561592	50.20096	-115.86445	Leafy spurge (EUPH ESU)	2016-05-30	Barnel II	Hand Gun	0.0113	2.25000	3.00	200		0.0338
251436	2008-07-18	082K070	11	565181	5610738	50.64485	-116.07811	Leafy spurge (EUPH ESU)	2016-06-28	Tordon 22K	Boomless Nozzle	0.1800	36.00000	4.50	200		0.8100
251459	2019-05-31	082K070	11	566023	5607001	50.61116	-116.06686	Leafy spurge (EUPH ESU)	2016-07-14	Lontrel	Boomless Nozzle	0.2000	20.00000	0.70	200		0.0700
251506	2019-10-11	082K060	11	561234	5609550	50.59953	-116.13476	Leafy spurge (EUPH ESU)	2016-08-11	Grazon	Boomless Nozzle	0.3500	70.00000	4.50	200		1.5750
251515	2019-06-15	082K070	11	565454	5609646	50.63500	-116.07444	Leafy spurge (EUPH ESU)	2016-06-28	Tordon 22K	Back Pack	0.0900	18.00000	4.50	200		0.4050
262713	2009-07-04	082G052	11	590057	5489064	49.54748	-115.75503	Leafy spurge (EUPH ESU)	2016-06-28	Clearview	Hand Gun	0.0116	2.50000	0.20	215		0.0023
263397	2019-10-11	082K070	11	561683	5606105	50.60057	-116.12834	Leafy spurge (EUPH ESU)	2016-08-12	Grazon	Hand Gun	0.0600	12.00000	4.50	200		0.2700
263463	2019-10-10	082K060	11	567773	5603415	50.57871	-116.04279	Leafy spurge (EUPH ESU)	2016-08-15	Grazon	Boomless Nozzle						

Appendix 2: EKISC SIPCOLS News



EKISC is partnering for its 9th year with the Columbia Valley Local Conservation Fund (CVLCF) on its Strategic Invasive Plant Control of Leafy Spurge, or SIPCOLS Project.

The SIPCOLS Project has allowed EKISC to work with partners across the Columbia Valley (including the Canadian Wildlife Service and the Ministry of Forests, Lands, Natural Resource Operations and Rural Development) to reduce the infestation size and prevent further spread of [leafy spurge](#). Leafy spurge, originally introduced to the Columbia Valley in the 1960's, poses a threat to grasslands, pastures, and native ecosystems due to its ability to aggressively out-compete desirable plant species. Leafy spurge can also be toxic to livestock and wildlife if ingested at high-enough quantities, and is historically a very difficult species to manage. Due to its incredible ability to quickly spread into neighbouring areas once established, it is important to locate and treat new infestations as soon as possible, and make sure containment lines are in place.

Funding from the [CVLCF](#) has supported both the treatment of existing leafy spurge populations, and the inventory and mapping of new infestations. This allows EKISC to make better informed decisions regarding leafy spurge management planning for the Columbia Valley. The SIPCOLS Project has not only been successful in raising awareness about leafy spurge for land managers and user groups, but has also actively worked to reduce leafy spurge populations in the region. This success would not have been possible without the generous support of CVLCF! We are also grateful for the ongoing support of the Kootenay Conservation Program in administering the CVLCF.

Figure 1 Screenshot of EKISC September Newsletter, highlighting support from CVLCF.



EKISC has now completed its 9th year of administering the **Strategic Invasive Plant Control of Leafy Spurge**, or SIPCOLS, Project. The SIPCOLS Project has allowed EKISC to work with partners across the Columbia Valley to reduce the infestation size and prevent further spread of Leafy Spurge, a vigorous invader that was first introduced into the Columbia Valley in the 1960's. Leafy spurge is a great threat to grasslands, pastures, and native ecosystems as it not only aggressively outcompetes desirable plant species, but can also be toxic to livestock and wildlife if ingested at high-enough quantities.

Though the SIPCOLS project is largely made possible by support from the Columbia Valley Local Conservation Fund (CVLCF), EKISC also partners with other organizations to apply a coordinated approach to Leafy Spurge management in the Columbia Valley. This includes the Village of Radium, BC Parks, Ministry of Transportation, Ministry of Forests, Lands, Natural Resource Operations and Rural Development, FortisBC and the Fish and Wildlife Compensation Program. The goal each year is to not only treat existing Leafy Spurge populations, but also inventory and map new infestations. In 2019, a total of 99 Leafy Spurge sites were treated under this project, covering nearly 10 hectares of treatment area; over half of these were directly funded by CVLCF. Although each year we do add new Leafy Spurge sites to our records (due to a combination of the plant being easily introduced to new areas and our capacity to inventory additional locations), this project is helping us to achieve our long term objectives of working with land managers to collaboratively limit the current extent of Leafy Spurge populations, decrease the size of existing infestations, prevent new infestations from establishing, and increase stakeholder engagement.

The [Columbia Valley Local Conservation Fund](#) is a partnership between the Kootenay Conservation Program and Regional District of East Kootenay that provides funding for projects that benefit conservation in the area from Spillimacheen to Canal Flats.

PHOTO: Jeff Van Tine; Rocky Mountain Front Weed Roundtable's Biological Control Program

Figure 2 Screenshot of EKISC January Newsletter, highlighting support from CVLCF.

COLUMBIA VALLEY LOCAL CONSERVATION FUND (CVLCF) FINAL REPORT 2019

General Instructions

- Final reports must be submitted **by 4:00 pm MT January 31, 2020** to the Kootenay Conservation Program.
Email final report to info@kootenayconservation.ca.
- All areas of the final report must be answered.

Section A – GENERAL INFORMATION

1. Project Title (as indicated in application): KCBP - Bat Conservation in the Upper Columbia River valley

2. Proponent

- a) Legal Name: Rocky Mountain Trench Natural Resources Society
- b) Organization Registration #: S-0034838
- c) Mailing Address: PO Box 151 Kimberley Postal Code: V1A 2Y6
- d) Contact: Marc Trudeau
- e) Telephone #:
- f) Fax #:
- g) Email: marctrudeau36@gmail.com

3. Partner (*if applicable*)

- a) Legal Name: Kootenay Community Bat Project (not a non-profit society)
- b) Organization Registration #:
- c) Mailing Address: 359 Oughtred St. Kimberley, BC Postal Code: V1A 1J3
- d) Contact: Leigh Anne Isaac
- e) Telephone #: 250-427-3215
- f) Fax #:
- g) Email: kootenay@bcbats.ca

Section B – PROJECT INFORMATION

- 1. Project Location: residents of Areas F & G; spanning from the Village of Canal Flats to
(ie: RDEK area, watershed, Spillimacheen
direction from major centre, etc)
- 2. Total Project Value: \$17768
- 3. CVLCF Contribution: \$10000
- 4. Non-CVLCF Contribution: \$7768.00
- 5. Single or multiple year project: This is a multi-year project.

Section C – PROJECT SUMMARY

1. Please provide a single paragraph describing your project, its objective (goals) and the results. As this summary will be used in CVLCF communications, clearly state the issues addressed and avoid overly technical descriptions. Maximum 2000 characters (~290 words).

KCBP had a very successful year collaborating with key land stewards/managers, supporting landowners, and delivering events to promote bat counts. We developed 2 strong partnerships with the Lake Windermere Rod & Gun Club and the Nature Trust of BC to co-host 'Bat Fest'. We conducted 16 site visits with landowners. To date (since 2013), the majority of roosts are either Little brown myotis or Big brown bat. Maternity roosts are most frequently observed and these occur in occupied houses. KCBP emphasis was placed on establishing baseline population data for sentinel colonies and building Columbia Valley resident capacity. In total, 4 bat count workshops, starting with Wings Over the Rockies, were conducted. As a result, baseline population monitoring was established at 2 sentinel colonies in the region. Other KCBP initiatives that will inform and ultimately benefit bat conservation work in the region included: 1. KCBP database: An integrated database combining all program information into one portal was completed and was tested/tweaked. The main benefit is streamlined information that supports program coordination and maintains data accuracy. 2. Memorandum of Understanding: A draft MoU with the Wildlife Conservation Society of Canada has been reviewed and is awaiting finalization. The main benefit is the sharing of information to make more informed bat conservation decisions. 3. North American Society of Bat Research: KCBP summarized and presented key results at this national conference. The main benefit is the application of information learned in the CVLCF region (see attached). 4. North America Bat Monitoring: KCBP continued collaboration with BC Parks to establish a long-term bat acoustic monitoring site in the region. Species confirmed to date include Little brown myotis, Big brown bat, Silver-haired bat, Townsend's long-eared bat, Long-legged bat, Hoary bat, Long-eared myotis and California myotis.

2. OPTIONAL: If your project lends itself to sparking interest through a compelling sound bite (for potential use in CVLCF communications), please tell us what that would be. Maximum 1050 characters (~150 words).

Bats need your help. The fungal disease, White Nose Syndrome, has killed millions of bats and has been detected 150km from the BC border. We need to learn what are the types, numbers and locations of bats in our region in order to conserve them. If you know of a bat colony - please report it. If you would like to monitor your bats-please count them. If you would like to humanely exclude bats from your buildings- please follow the recommended timelines. If you would like to augment habitat for bats on your property- please use and place the best bat house designs. Funded principally by the Columbia Basin Trust and the Columbia Valley Local Conservation Fund, the Kootenay Community Bat Project (KCBP) can help!! KCBP provides site visits to residents with bats in buildings. Leigh Anne Isaac, KCBP Biologist, can visit your property to identify the bat species, show you how you can count your bats, provide protocols for safe exclusions, suggest effective bat houses designs/placements. Visit bcbats.ca or call 1-855-9BC-BATS for more info.

3. Biodiversity Targets (please list, maximum 90 words):

Target 1: People are aware of the values of biodiversity. KCBP focuses heavily on public outreach/education, which feeds into informed landowner decisions. Target 5: The rate of loss of all natural habitats is at least halved and degradation/fragmentation is significantly reduced. KCBP advises landowners on the value of natural habitats for bat forage and shelter. Target 12: The extinction of known threatened species has been prevented and their conservation status has been improved and sustained. KCBP's overall goal is to prevent the loss of bat species and their habitats.

4. IUCN Threats to Target (please list, maximum 90 words):

RESIDENTIAL/COMMERCIAL DEVELOPMENT: Development activity often results in land conversion and habitat fragmentation, which can impact roosting and foraging habitat. Through discussions of natural habitats and bat box design/placement, we highlight the importance of maintaining and creating bat habitats. CLIMATE CHANGE: Bats have specific microclimate requirements in summer to raise pups and in winter to hibernate; therefore, bats may be good indicators of climate change. By identifying bat colonies and determining diversity and relative abundance, we establish baseline data required for long term monitoring.

Section D – PROJECT DELIVERABLES AND RESULTS

1. Identify the deliverables outlined in your application in the table below (50 words/field) and list the results of each. Please include copies of any relevant communications products (brochures, posters, videos, websites, photos of signage, etc.) resulting from this project. Add an attachment if you need more room.

Deliverables	Results
Advertise the KCBP Columbia valley project through social media, website, newspapers and bulletin boards.	Complete. To date, 3 press releases have been issued and 16 posts generated on Facebook.
Deliver presentation at Wings Over the Rockies	Complete. We continue to partner with an engaged landowner in Invermere. This is an invaluable event we use as an opportunity to train people on bat counts. Due to overwhelming demand, we have been asked to consider offering 3 events in 2020.
Participate in community association meetings	Complete. We presented at Fairmont Hot Springs annual Community Association in May 2019 (30 attendees).
Deliver Bat Festival with Lake Windermere Rod & Gun Club & Nature Trust of BC	Complete. We delivered 'Bat Fest' in July 2019 to ~12 local residents. We constructed bat houses, discussed overheating concerns, discussed White Nose Syndrome and trained people on how to do a bat count.
Participate in small-scale neighbourhood 'bat chats'	Not complete. We decided to focus our efforts on bat count workshops and establishing sentinel sites throughout the CVLCF region for counting in 2019.
Visit high priority bat roost sites on private land to identify bat species, assess roost site, and discuss conservation methods, health issues	Complete. 16 site visits to new landowners and follow-up visits to 6 landowners with sentinel roosts and/or are active project participants.
Identify and monitor occupied and non-occupied bat houses to determine temperature, aspect, height, design, and other factors	Not complete due to limited funding. We are hopeful our proposal for 2020 will be successful to undertake some of this work.
Promote the Annual Bat Count to encourage local residents (citizen scientists) to monitor known roost sites. Write press release.	Complete. Press release written and distributed. We successfully conducted 4 bat count workshops to directly engage interested people in bat counts.
Submit guano (bat feces) for species confirmation.	Complete. 27 DNA priority samples were submitted.
Provide confirmed species data to Selkirk College	Pending. As soon as database has been finalized (by March 31 2020), data will be shared through.
Submit Annual Bat Count data to provincial wildlife inventory database	As above.
Update the Bat House Guidelines with information from summer bat house monitoring	Partially complete. We are participating in the US-Canada Bat House BMP and providing general project information vs. focal bat house monitoring.
Advertise and coordinate the "Building Homes for Bats" program.	Not complete. Awaiting on Bat House BMP guidance (expected 2020).
Write interim and final CVLCF reports	Complete.

Section E – PROJECT EFFECTIVENESS

1. Please evaluate the effectiveness of the project using objective standards, quantifiable criteria and/or quality control measures identified in your application/proposal. Maximum 2000 characters (~290 words).

KCBP had numerous successes during the 2019 year. We issued three press releases and generated 16 posts on Facebook where we are generating a substantial following. We are linked with the Fairmont Community Association to promote our events and messaging; we currently connect with most landowners through this active community group. We communicated with at least 40 different residents (via phone/email) and conducted 16 site visits to advise on safe exclusions and how to augment/provide bat habitat. In total, we identified 15 total roosts, which include the following: 2 maternity roosts, 3 day roosts and 1 night roost. One-on-one discussions and relevant material were shared with landowners to ensure roosts were conserved. We submitted 27 samples for genetic testing and are awaiting results; samples are from recently identified roosts, sentinel roosts, as well as bats in bat boxes following exclusion. In addition to site visits with new landowners, we continue to connect with 6 landowners throughout the region who are interested in bat conservation, are willing to contribute to our program each of whom play pivotal roles (largest colony in a multi-chamber bat box, focal monitoring of dead pups, monitoring bats after exclusions and observing for heat stress events). We completed 6 workshops/presentations engaging with 116 participants throughout the region. As a result of these workshops, counting occurred at 9 sites throughout the region. At one of these sites, counts were completed at 18 different structures. We are awaiting genetic results but we anticipate these will be Little brown myotis colonies. We have strengthened the ambassador program in the region by 15%- 1 new ambassador in Fairmont Hot Springs and an experienced bat ambassador that recently relocated to Invermere. This development is critical to our program success as bat ambassadors coordinate bat counts, train new people on the counting protocol and support landowners in counting.

2. What are the top 3 lessons learned from the project that would be important to communicate to others doing similar work throughout the RDEK? Maximum 1050 characters (~150 words).

1. Role of outreach: Conservation programs, such as KCBP, connect directly with local citizens through site visits and education events. It is through these connections where we have learned critical information about bat ecology in the upper Columbia valley. Creating and maintaining these relationships create a solid foundation from which we can draw upon for follow-up research and monitoring projects.
2. New ways to connect: The creation of interactive on-line resources may provide ways for residents to engage with our program in ways other than what KCBP traditionally has used. This could include on-line live chat sessions, short guidance videos, etc.
3. In order to inform landowner guidance, we need to continually be looking for opportunities to learn more about bat ecology. More specifically, we need to have a better understanding of roost selection and roost use in building roosting bats (e.g. how often and where bats roost throughout the summer).

Section F – FURTHER COMMENTS

1. Please provide any further comments including recommendations for future conservation efforts. If your project produced a narrative or scientific report or additional project products (e.g. maps, photos), attach them as an Appendix (maximum 90 words).

Information gathered from outreach and site visits with landowners within the CVLCF region were amalgamated with data from the larger Columbia region to inform KCBP's poster given to the North American Society for Bat Research in Kalamazoo, MI in October, 2019. Please see the attached.

Section G – FINANCIAL REPORT

1. Please submit a financial report for the project outlining revenue and expenditures with a comparison to the budget submitted with your CVLCF application. **Use the Final Budget Reporting form provided.** Details on any discrepancies from the budgeted amounts or items are required (maximum 90 words).

Please see the attached financial report.



Columbia Valley Local Conservation Fund (CVLCF) Final Reporting Budget

Proponent: Kootenay Community Bat Project (not a non-profit society)

Project Title: KCBP - Bat Conservation in the Upper Columbia River valley

REVENUES:		APPLICATION		FINAL REPORTING		Additional Comments
		Estimated Cash Amount	In-kind Amount	Actual Funds Received	Actual In-kind	
Fundors						
CVLCF		\$12,268.00		\$10,000.00		
Habitat Conservation Trust Fund*		\$480.00		\$500.00		project organization & delivery
Habitat Stewardship Program*		\$1,000.00		\$500.00		project organization & delivery
CBT*		\$1,000.00		\$1,000.00		project biologist bat count workshop
Lk Windermere Rod & Gun Club		\$735.00		\$0.00		no budget was provided to participate in the event
Wings Over the Rockies		\$135.00		\$0.00		no stipend for mileage was offered by WOTR this year
Columbia Basin Environmental Educators Workshop		\$400.00				bat ambassadors in schools
Kootenay Community Bat Project			\$500.00		\$500.00	display booth (\$500)
Citizen Scientists			\$600.00		\$1,050.00	70 hours of volunteer counter time @ \$15/hr
VAST Resource Solutions			\$200.00		\$0.00	no mist netting gear needed for Bat Fest
Ministry of Environment			\$450.00		\$450.00	website & toll free line (\$200); booklet printing (\$250)
Total Amounts		\$16,018.00	\$1,750.00	\$14,000.00	\$2,000.00	
TOTAL REVENUE		\$17,768.00		\$14,000.00		

EXPENSES:		APPLICATION			FINAL REPORTING		
		Cash	In-kind	Total Budget	CVLCF Funding	Actual in-kind	Actual total budget
Expense Items							
Project Biologists (coordination, promotions, landowner visits, bat house in	Details (if applicable)	\$7,098.00		\$7,098.00	\$5,718.00	\$4,880.00	\$4,450.00
Project Assistants (outreach & assistance)	160 hours days @ \$42/hour	\$1,425.00		\$1,425.00	\$825.00	\$1,164.55	\$2,440.00
Bat Ambassadors (community groups)	57 hours @ \$25/hr	\$900.00		\$900.00	\$900.00	\$500.00	\$900.00
Bat Ambassadors (school groups)	4 events @ \$225/event (incl mileage)	\$400.00		\$400.00			
Mileage	4 presentations @ \$100/presentation	\$2,430.00		\$2,430.00	\$2,160.00	\$1,247.40	\$2,160.00
Field work Supplies	4,500 km at \$0.54/km	\$400.00		\$400.00	\$200.00		\$200.00
website & conference call phone line	bat detector, ladder, envelopes		\$200.00	\$200.00		\$200.00	
citizen science monitoring	donated by BC MofE for bc bats.ca and toll free line		\$600.00	\$600.00		\$1,050.00	
mist netting gear for bat festival	10 landowners (4 hours per landowner @ \$15/hr)		\$200.00	\$200.00			
field work supplies for landowner visits	nets, decontamination supplies, poles, rebar, etc.						
display Booth & props	(e.g. envelopes, batteries, etc)	\$100.00		\$100.00			
DNA analysis	display posters, tables, props	\$250.00		\$250.00			
Booklet printing	sampling to confirm species ID	\$500.00		\$500.00		\$786.00	
Postage	booklets at booths/presentations	\$50.00		\$50.00			
Accommodation	mailing guano sampling, resources	\$600.00		\$600.00	\$600.00	\$364.83	\$600.00
LOA	model when staying over in northern part of area is required (4 nights)	\$250.00		\$250.00	\$250.00		\$250.00
Administration Fee	living over allowance when staying over in northern part of area is required (5 days)	\$1,615.00		\$1,615.00	\$1,615.00	\$1,000.00	\$1,000.00
	10% to Rocky Mountain Trench Society						
Total Amounts		\$16,018.00	\$1,750.00	\$17,768.00	\$12,268.00	\$9,942.78	\$12,000.00
TOTAL EXPENSES			\$17,768.00			\$12,000.00	\$10,000.00

Kootenay Community Bat Project: A Community-based Program Supporting Regional Bat Conservation in British Columbia, Canada

Leigh Anne Isaac*, Juliet Craig**, Mike Sarell*** and Elodie Kuhnt****

BACKGROUND & OBJECTIVES

- Building-roosting bats can come into conflict with humans where they co-occur.
- Kootenay Community Bat Project (KCBP) is a community-based program focused on bat conservation in buildings since 2004.

Three local KCBP objectives include:

- 1) Engage with landowners to understand bat occurrence and promote the conservation and enhancement of roost sites on their property;
- 2) Establish baseline population data prior to the arrival of White-Nose Syndrome (WNS); and,
- 3) Increase education and awareness around bat & bat-friendly buildings.

PROJECT AREA

- The project area includes the Kootenay portion of south-eastern British Columbia, Canada (Fig. 1).
- WNS has not been detected in this region but has been detected 320 km to the southeast.

METHODS

- Identified **roost sites** are investigated for:
 - Guano/urine, sound, visual ID
 - Obvious access points (Fig. 2)
- Roost & bat characteristics are recorded:
 - Location in building;
 - Height, width, aspect; and,
 - Species, sex, age class, and # of bats (Figure 2). A faecal (left) and E. Kuhnt (right) conducting site survey.
- Guano is collected for DNA analysis to confirm species ID.

- **Annual BC Bat Count** is a citizen-science program where, ideally, 4 counts/roost are completed- before (n=2) and after (n=2) pups fly.
- Total bats seen emerging from sunset-1.5 min are counted for 1 hr or until too dark to see (Fig. 3).
- Cloud cover, wind speed, temperature & survey start/end times are recorded.

- Trained **Bat Ambassadors** provide bat count workshops, deliver outreach/education events and work to promote bat-friendly communities (Fig. 4).

Figure 4. KCBP Bat Ambassadors.

RESULTS - Roost sites

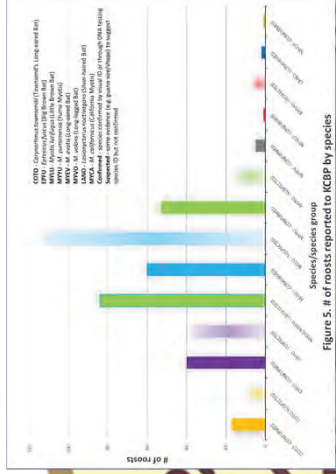


Figure 5. # of roosts reported to KCBP by species

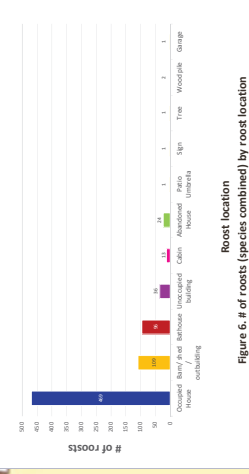


Figure 6. # of roosts (species combined) by roost location

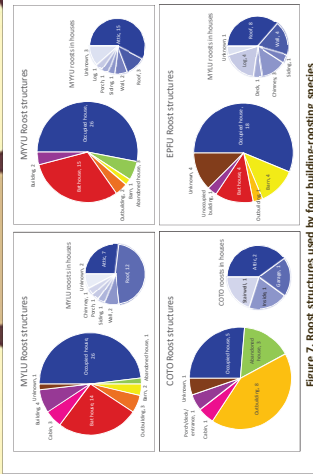


Figure 7. Roost structures used by four building structures

RESULTS - Annual BC Bat Count

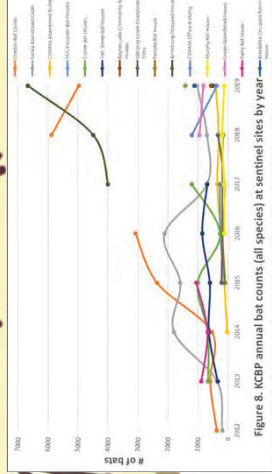


Figure 8. KCBP annual bat counts (all species) at sentinel sites by year

RESULTS -Bat Ambassadors

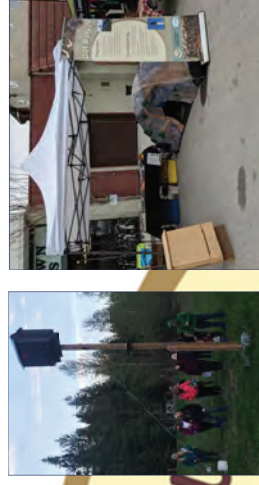


Figure 9. Bat count workshop

DISCUSSION

- **Roost sites:** 8 bat species were recorded during site visits; however the majority of roost sites (80%; suspected + confirmed) support *Myotis* sp. (Fig. 5).
- Of 789 roost sites, 59% occur in human-occupied houses (Fig. 6).
- MYU, EPFU and EPFU were observed most often in occupied houses, particularly in attics and roof where COTO were observed most often in occupied buildings (Fig. 7).
- **Annual BC Bat Count:** 28 sites (all *Myotis* sp.) were monitored in 2019; this is a 36% increase in sites in 7 years (Table 1).
- Populations at some sentinel sites (e.g. Fort Steele Bat Houses) appear stable, however the population at other sites, particularly large ones (e.g. Creston Bat Condo), appear to be increasing (Fig. 8).
- Overall, it is too early to understand population trends given inter-annual variability, particularly at sites where populations are large (e.g. Armstrong Occupied House).
- **Bat Ambassadors** successfully lead 8 bat count workshops in 2019 (Fig. 9) which engaged 80 volunteers and counted 29 sites totalling 19,070 bats.
- ‘Green building’ conferences were targeted in 2019 to increase awareness about the ecology of building-roosting bats and to incorporate bat-friendly features into building design (Fig 10).
- Current work is focusing on developing 2 ‘bat-friendly’ communities in the Kootenay region by 2020 (Fig 11).

LESSONS LEARNED

- Face-to-face site visits convey information and create personal connections in an effort to promote bat-friendly exclusions.
- Where possible, collect guano to confirm species ID.
- Constant and frequent communication with bat count volunteers is important to ensure consistent, long-term data collection.
- Build regional capacity to increase reach and sustainability.

SPONSORS



COLUMBIA VALLEY LOCAL CONSERVATION FUND (CVLCF) FINAL REPORT 2019

General Instructions

- Final reports must be submitted **by 4:00 pm MT January 31, 2020** to the Kootenay Conservation Program.
Email final report to info@kootenayconservation.ca.
- All areas of the final report must be answered.

Section A – GENERAL INFORMATION

1. Project Title (as indicated in application): Reintroducing Endangered Northern Leopard Frogs

2. Proponent

- a) Legal Name: Calgary Zoo
- b) Organization Registration #: 118824192 (Registered non-profit)
- c) Mailing Address: 1300 Zoo Rd. NE, Calgary, AB Postal Code: T2E 7V6
- d) Contact: Lea Randall
- e) Telephone #: 403-827-3487 f) Fax #:
- g) Email: lear@calgaryzoo.com

3. Partner (if applicable)

- a) Legal Name: Columbia Wetlands Stewardship Partners
- b) Organization Registration #: S-0053013
- c) Mailing Address: Box 2284 Invermere, BC Postal Code: V0A 1E0
- d) Contact: Dr. Suzanne Bayley
- e) Telephone #: 250-346-3181 f) Fax #:
- g) Email: sbayley@ualberta.ca

Section B – PROJECT INFORMATION

- 1. Project Location: RDEK Area G; reintroduction site is approximately 2 km southwest of Brisco,
(ie: RDEK area, watershed, BC
direction from major centre, etc)
- 2. Total Project Value: \$170,695
- 3. CVLCF Contribution: \$19,000
- 4. Non-CVLCF Contribution: \$151,695
- 5. Single or multiple year project: Multi-year

Section C – PROJECT SUMMARY

1. Please provide a single paragraph describing your project, its objective (goals) and the results. As this summary will be used in CVLCF communications, clearly state the issues addressed and avoid overly technical descriptions. Maximum 2000 characters (~290 words).

Once widespread and numerous, northern leopard frogs (*Lithobates pipiens*) began to disappear from many wetlands in western North America, including in southeastern British Columbia, in the 1970s and 80s. In British Columbia, only a single endangered population remains, located in the Creston Valley. This population is vulnerable to extinction due to continued habitat loss, disease, climate change, and the recent movement of invasive species such as bullfrogs into the area. Northern leopard frogs are important to the environment because they provide a crucial link between the aquatic and terrestrial ecosystems and are important for proper nutrient cycling. Reintroducing northern leopard frogs to the Columbia marshes will increase biodiversity and improve ecosystem function. The objective of this project is to use conservation translocations to recover northern leopard frogs and prevent local extinction within the province. Translocations first began in 2013 and will continue until 2023. We hope to reach our target of releasing 8,000 tadpoles per year over the next four years by using wild-to-wild, captive-bred, and head-started tadpoles to reestablish leopard frogs in the Columbia marshes. We used Automated Recording Units (n=13) to detect any male breeding calls and conducted Visual Encounter Surveys to determine if frogs had successfully overwintered and reached metamorphosis. No calling was detected but there were at least two confirmed observations of frogs that had successfully overwintered at the reintroduction site. A total of 4,181 individuals were released this year. Although this was short of our 8,000 target, it was more than twice as many as the previous two years. We observed 221 young of year frogs and managed to capture 160. In September, we began detecting some frogs with chytridiomycosis, but prevalence was about half the previous year.

2. OPTIONAL: If your project lends itself to sparking interest through a compelling sound bite (for potential use in CVLCF communications), please tell us what that would be. Maximum 1050 characters (~150 words).

We are happy to provide a sound bite for any communications. We could talk about how many releases we had this year, about finding 2 overwintering adults this year, or the challenges we have faced with declining numbers in the wild and the threat of bullfrogs and chytrid fungus. We could talk about the kinds of monitoring we do or the collaborations between organizations working on leopard frog conservation in BC. We could discuss the captive breeding and head-starting at the zoo and the wild-to-wild translocations from Creston. We have some great photos and video that could be used for communications.

3. Biodiversity Targets (please list, maximum 90 words):

Aichi Biodiversity Target 12: By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

Canada Target 2: By 2020, species that are secure remain secure, and populations of species at risk listed under federal law exhibit trends that are consistent with recovery strategies and management plans.

4. IUCN Threats to Target (please list, maximum 90 words):

a) Residential & commercial development, b) Agriculture, c) Energy production and mining, d) Transportation & service corridors, e) Human intrusions & disturbance, f) Natural system modifications, g) Invasive species & diseases, h) Pollution, i) Climate change effects on water availability and river flow

Section D – PROJECT DELIVERABLES AND RESULTS

1. Identify the deliverables outlined in your application in the table below (50 words/field) and list the results of each. Please include copies of any relevant communications products (brochures, posters, videos, websites, photos of signage, etc.) resulting from this project. Add an attachment if you need more room.

Deliverables	Results
January-February: Waterproof ibuttons will be placed in 3 locations on the surface of the ice of the release pond to determine the date of ice melt. This information will help to determine in future years when to deploy automatic recording units as northern leopard frogs may begin calling before ice has completely melted on the breeding pond.	Ibuttons were not able to be deployed last winter, but a water level logger and a water temperature logger were placed in the release pond from May to October. These provide information regarding changes in water temperature and depth of the release pond throughout the season (see final report).
April: We will deploy 12 automated recording units (ARUs) at the release site and nearby wetlands during the breeding season. The units will be programmed to record each night from 11 pm-1 am with additional recording times mid-afternoon as males may preferentially call during the heat of the day when nighttime temperatures are cool.	Automated recording units (n = 13) were deployed at the release pond and other wetlands in the vicinity from early May to late July. These units were programmed to record ten minutes per hour between 13:00 and 17:00 and continuously from 22:00 to 01:00 in an effort to detect any male calling that may be occurring.
May: We will work with BC gov. biologists to conduct breeding surveys at the CVWMA. Portions of egg masses will be transported to the Calgary Zoo and Vancouver Aquarium (VA) for their conservation breeding programs. Once threshold numbers of egg masses have been reached at the CVWMA we will transport and release tadpoles at the reintroduction site.	Calgary Zoo biologists helped conduct surveys in April and May. Seven egg masses were detected. Portions of two egg masses were translocated directly from the CVWMA to Brisco in May, and a total of 2317 tadpoles were released. Portions of other egg masses were transported to the Calgary Zoo for the captive breeding facility and head-starting.
June-August: We will collect ARUs and analyze calling data to identify potential breeding activity and colonization. Captive-bred tadpoles from Vancouver Aquarium will be released at the reintroduction site. Calgary Zoo biologists will head-start, transport, and release any surplus tadpoles not required for their captive breeding program.	Spectrograms were visually scanned for leopard frog calls in Aug, but no calling was detected. Eggs brought to the Calgary Zoo and head-started until release were transported to Brisco on 4 occasions, accounting for 596 tadpoles and 13 YOY. A total of 1201 captive-bred tadpoles, 8 juveniles, and 46 YOY from the Vancouver Aquarium were released.
Aug-Sept: Weekly VES will be conducted at and in the vicinity of the release site. Frogs will be captured and morphometrics and general health recorded. Swabs will be collected for disease or genetic testing, as required. A photo of the spot pattern will be taken, which allows data to be obtained on growth of frogs that are recaptured.	VES occurred on 14 occasions from July 29 to October 6, resulting in 221 observations and 160 captures; of these captures, there were 130 individuals, with 25 YOY captured twice and 4 captured on three occasions, as identified from photographed spot patterns. Two juveniles were also observed.
October-December: Regression analysis will be used to compare the morphometrics of Brisco frogs to those of similar ages at other locations (UKF, CVWMA). If sufficient numbers of frogs are recaptured, it may be possible to estimate population size to assess the efficacy of recovery efforts. A report will be provided, accompanied by a database.	A regression analysis showed that body condition at Brisco in 2019 was lower than in 2018, but higher than 2016. Body condition in 2019 was influenced by capture location and recapture status. Using recapture data, the estimated population of YOY at Brisco was between 207 and 493 individuals, using a 95% confidence interval.

Section E – PROJECT EFFECTIVENESS

1. Please evaluate the effectiveness of the project using objective standards, quantifiable criteria and/or quality control measures identified in your application/proposal. Maximum 2000 characters (~290 words).

The first objective of the project was to continue reintroductions in Brisco for the next 4 years with the goal of releasing 8,000 tadpoles per year at the release site. We were able reintroduce 4181 individuals in 2019, more than double the number released in the previous two years. This was the first year since 2016 that we were able to find enough egg masses at the CVWMA to do wild-to-wild translocations. However, this number still fell short of the targeted 8,000 due to poor reproduction in the wild and captive populations. It is anticipated that beginning in 2020 the frogs in the Calgary Zoo breeding facility will be old enough to produce fertilized egg masses, increasing the number of tadpoles available for release.

The second objective included monitoring of the reintroduced frogs at the release site to look for evidence of breeding in the wild, overwinter survival, metamorphosis and growth rates of YOY frogs, survivorship of recaptured individuals, colonization of additional areas, and long-term persistence of the reintroduced population. Monitoring for these factors was accomplished in 2019 through use of songmeters, visual encounter surveys and associated capture, and data analysis.

Of the indicators of success identified in the application/proposal, we have observed evidence of three of seven (survival to metamorphosis, overwinter survival, and male calling). Some of the indicators, such as persistence of the population for >10 years, cannot yet be assessed given the current age of the project.

2. What are the top 3 lessons learned from the project that would be important to communicate to others doing similar work throughout the RDEK? Maximum 1050 characters (~150 words).

1. Reintroductions are hard and require a coordinated and on-going effort by many partner organizations.
2. We have faced challenges in securing enough individuals for reintroduction due to poor reproduction in the wild and poor breeding in captivity. This may be due to the limited genetic diversity inherent in an endangered population which could cause reduced fertility (we are working with collaborators to examine this).
3. The goal for reintroduction of amphibians should be to establish a metapopulation to ensure long-term population stability but this is challenging when release numbers are limited. If possible, I would begin reintroduction efforts before the wild populations have declined to this level.

Section F – FURTHER COMMENTS

1. Please provide any further comments including recommendations for future conservation efforts. If your project produced a narrative or scientific report or additional project products (e.g. maps, photos), attach them as an Appendix (maximum 90 words).

In future, we are investigating the possibility of reintroducing eggs/tadpoles to other wetlands in the vicinity of the release site in an effort to create a metapopulation in the area. This type of population structure can increase the success and survival of reintroduced populations.

For more details regarding the 2019 season, please see the attached report.

Section G – FINANCIAL REPORT

1. Please submit a financial report for the project outlining revenue and expenditures with a comparison to the budget submitted with your CVLCF application. **Use the Final Budget Reporting form provided.** Details on any discrepancies from the budgeted amounts or items are required (maximum 90 words).

Equipment and supply costs were more than anticipated but this was offset by reduced cost of accommodations (we were able to secure free accommodations for part of our field season) and vehicle rentals and gas were less than anticipated. We were able to reduce our costs by getting collaborators to provide in-kind disease and genetic testing to achieve our objectives while remaining within budget.

Columbia Valley Local Conservation Fund (CVLCF) Final Reporting Budget					
Proponent: Lea Randall/ Calgary Zoo					
Project Title: Reintroducing the endangered northern leopard frog (<i>Lithobates pipiens</i>) to the Columbia Marshes					
REVENUES:					
Funders	APPLICATION		FINAL REPORTING		Additional Comments
	Estimated Cash Amount	In-kind Amount	Actual Funds Received	Actual In-kind	
CVLCF	\$24,000.00		\$19,000.00		
Columbia Basin Trust	\$15,000.00		\$15,000.00		
Calgary Zoo	\$100,000.00		\$100,000.00		
Calgary Zoo	\$30,075.00		\$30,995.00		
CWVMA		\$1,700.00		1700	
Dr . Purnima Govindarajulu and Dr. Lindsay Anderson		\$2,000.00		2000	
Penny Ohanjanian		\$2,000.00		2000	
Total Amounts	\$169,075.00	\$5,700.00	\$164,995.00	\$5,700.00	
TOTAL REVENUE	\$174,775.00		\$170,695.00		

EXPENSES:									
	Details (if applicable)	APPLICATION			FINAL REPORTING				
		Cash	In-kind	Total Budget	CVLCF Funding	Actual cash spent	Actual In-kind	Actual total budget	CVLCF Funding
Expense Items									
Principal Biologist	25 days x \$300/day	\$6,700.00	\$800.00	\$7,500.00	\$0.00	\$6,700.00	\$800.00	\$7,500.00	\$0.00
Field technicians	125 days x \$240/day	\$29,100.00	\$900.00	\$30,000.00	\$10,000.00	\$30,000.00	\$900.00	\$30,900.00	\$10,000.00
analysis (recovery team members)	6.7 days x \$600/day		\$4,000.00	\$4,000.00	\$0.00		\$4,000.00	\$4,000.00	\$0.00
Experimental design, data entry and analysis (Principal biologist)	8 days at \$300/day	\$2,400.00		\$2,400.00	\$0.00	\$2,400.00		\$2,400.00	\$0.00
Vehicle rental		\$10,700.00		\$10,700.00	\$5,000.00	\$7,055.00		\$7,055.00	\$5,000.00
Food		\$2,325.00		\$2,325.00	\$1,000.00	\$1,500.00		\$1,500.00	\$1,000.00
Accommodations		\$4,300.00		\$4,300.00	\$1,000.00	\$1,500.00		\$1,500.00	\$1,000.00
Gas		\$3,550.00		\$3,550.00	\$1,000.00	\$2,156.00		\$2,156.00	\$1,000.00
Equipment (waders, ARU, batteries, etc.)		\$5,000.00		\$5,000.00	\$5,000.00	\$8,684.00		\$8,684.00	\$1,000.00
Disease and genetic testing		\$5,000.00		\$5,000.00	\$1,000.00		\$5,000.00	\$5,000.00	\$0.00
Captive breeding costs		\$100,000.00		\$100,000.00		\$100,000.00		\$100,000.00	\$0.00
				\$0.00				\$0.00	
				\$0.00				\$0.00	
Total Amounts		\$169,075.00	\$5,700.00	\$174,775.00	\$24,000.00	\$159,995.00	\$10,700.00	\$170,695.00	\$19,000.00
TOTAL EXPENSES		\$174,775.00					\$170,695.00		

Reintroduction and monitoring of northern leopard frogs (*Lithobates pipiens*) in the Columbia marshes, 2019



Lea Randall, Rebecca Stanton

for

Columbia Basin Trust

Kootenay Conservation Program

Northern Leopard Frog Recovery Team

Ministry of Forests, Lands, and Natural Resource Operations

Executive Summary

Northern leopard frog (*Lithobates pipiens*) monitoring activities at the Brisco reintroduction site proceeded as in other years, with deployment of automated recording units (songmeters, n=13) and opportunistic visual encounter surveys (VES) during the breeding season, VES in the summer and fall, and release of tadpoles, metamorphs, and juvenile frogs via wild-to-wild translocation, head-starting, and captive breeding.

No calling was detected on any of the songmeters in 2019. Data collected from a water level logger showed that flooding of the river into the release pond occurred in early June, with water depth increasing significantly over a few days.

The egg mass threshold (5 egg masses) at the source population in the Creston Valley Wildlife Management Area was met this year, allowing for direct wild-to-wild translocation of 2317 tadpoles from 2 egg masses to the Brisco release site. An additional 1797 tadpoles, 59 metamorphs, and 8 juveniles were reintroduced through a combination of head-starting and captive breeding, for a total of 4181 individuals. Although this was short of our 8,000 target, it was more than twice as many as the previous two years. Mortality during translocation was low (0.1%).

Overwinter survival at the reintroduction site was confirmed this year through three observations of either juveniles or adult frogs. We were only able to obtain photos of two of the three, but it is possible that the unphotographed individual was one that was later photographed as it was in the same location. This frog was identified as a YOY that had been captured in 2018.

Visual encounter surveys occurred weekly from July 29 to October 6, over which time 221 young-of-year (YOY) observations were made. Of these, 160 were captured, accounting for 130 individuals as identified through spot patterns. There were 25 YOY captured twice and four captured on three occasions; the use of recapture data allowed for population size calculation, resulting in a population estimate of 293 YOY with a 95% confidence interval of 207 to 427 individuals. Mean weight was 10.5 g (± 3.0 SD) and mean SVL 46.5 mm (± 4.5 SD); body condition was significantly lower in 2019 than in 2018, but higher than in 2016.

Signs of chytridiomycosis (hereafter “chytrid”) were first observed on September 11 and continued until the final survey on October 6. A total of 17 individuals were identified as showing signs of chytrid, of which 15 were swabbed. We also swabbed 3 Columbia spotted frogs (*Rana luteiventris*) with no outward signs of chytrid. Laboratory analysis confirmed the presence of chytrid in all of the swabbed leopard frogs and 2 of the Columbia spotted frogs. Chytrid was about half as common as it was in 2018.

This was the first year since 2016 that we were able to locate enough egg masses in the CVWMA to do wild to wild translocations, allowing us to almost double the number of tadpoles released in the previous two years combined. Despite this effort we failed to meet our target releasing 8,000 tadpoles. There is hope that the number of released tadpoles may increase in the future, pending successful captive breeding at the Calgary Zoo in 2020.

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Introduction

Although the northern leopard frog (*Lithobates pipiens*) is one of the most widely distributed amphibian species in North America, western populations have experienced significant declines in recent decades (reviewed in Rorabaugh, 2005). The genetically distinct Rocky Mountain Population in British Columbia is ranked as *Endangered* federally (Government of Canada 2019) and *Critically Imperiled* (S1) provincially (BC Conservation Data Centre, 2019), with only a single extant population remaining at the Creston Valley Wildlife Management Area (CVWMA). This population has become the source for reintroductions in the province as well as the establishment of captive assurance and breeding populations at the Vancouver Aquarium and Calgary Zoo.

One of the reintroduction sites is located near the community of Brisco in the Columbia marshes, a region where leopard frogs were historically present. For this reason, the region was identified as a high priority location for re-establishment of leopard frog populations in the Federal Recovery Strategy (ECCC, 2017), and recent evidence demonstrates the contemporary presence of suitable habitat and environmental conditions at the site (Ohanjanian & Carli, 2010).

The purpose of this document is to report on the 7th year of release and monitoring of the Brisco reintroduction site. Success at this site is continuously evaluated using the following indicators of success (Randall et al., 2016):

- Indicator 1: Reintroduced tadpoles complete metamorphosis
- Indicator 2: Frogs overwinter successfully
- Indicator 3: Male calling observed during the breeding season
- Indicator 4: Evidence of successful breeding in the wild as indicated by wild-bred eggs, tadpoles, or frogs
- Indicator 5: Evidence of colonization and successful breeding at additional sites
- Indicator 6: Some or all life-stages are detected at least 3-years post-release
- Indicator 7: Persistence of reintroduced or colonized populations for >10 years without supplementation

Metamorphosis of tadpoles was observed in 6 out of 7 years, while a breeding call was recorded on an automated recording unit (songmeter) in 2017 with evidence of overwinter survival seen in the same year. Activities in 2019 included deployment of songmeters and opportunistic visual encounter surveys (VES) during the breeding season, VES in the summer and fall, and release of tadpoles via wild-to-wild translocation, head-starting, and captive breeding.

Methods

Remote Sensing

Songmeters (n = 13; Wildlife Acoustics) were deployed at the release pond and other wetlands in the vicinity during the first week of May (Figure 1). No songmeters were placed on the river island just south of the release pond (“Larry’s island”) or the wetland north of the release pond as these locations were completely dry in May. Units were programmed to record ten minutes per

hour between 13:00 and 17:00, ten minutes from 21:00 to 21:10, and then continuously from 22:00 to 01:00. Although the highest intensity of calling is widely considered to occur at night, northern leopard frogs have been shown to call extensively during the day when temperatures are cold (Sommers et al., 2017). Songmeters were retrieved in late July, and the spectrograms were visually scanned for the presence of leopard frog “snore” calls.

Water depth and temperature were measured in the release pond from May 8 to October 6 through use of a water level data logger (model U20, Onset Computer Corporation) and water temperature data logger (model UTBI-001, Onset Computer Corporation), respectively. The water level logger, which also records temperature, was placed near the second most southern songmeter in the release pond (11U, 550813 E, 5628497 N; see Figure 1 for songmeter locations), while the temperature logger was placed near the most southern in the release pond (11U, 550942 E, 5628306N).



Figure 1: Locations of songmeters deployed at Brisco in 2019.

Egg Mass Surveys, Translocations, and Release

The 2019 threshold for number of egg masses detected at the CVWMA before direct translocations were permitted was set at five by the recovery team. Researchers from the Calgary Zoo joined others at the CVWMA to conduct egg mass surveys and nocturnal calling surveys over 8 days between April 26 and May 18 (additional surveys were conducted at the CVWMA without Zoo researchers). These surveys were to locate eggs and cage them to protect them from predator and for translocation to the wild and captive assurance and breeding programs.

Head-started tadpoles and young-of-year (YOY) from the Calgary Zoo and captive-bred tadpoles, YOY, and juveniles from the Vancouver Aquarium were able to be released at the reintroduction site in 2019. All translocations and releases were conducted using serial water changes and following the translocation guidelines outlined in Kendell and Prescott (2007) and BC Hygiene Protocols (BC Ministry of Environment, 2008)

Visual Encounter Surveys

In an effort to detect post-metamorphic, juvenile, or adult frogs, VES occurred on a weekly basis from July 29 to October 6 and consisted of personnel visually searching for individuals during the warmest part of the day (typically between 11:00-16:00) in appropriate habitat and recording number and location of animals captured or observed. Two additional VES were conducted opportunistically on June 24 and July 16 while personnel were on site for tadpole releases. Additionally, if juveniles or adults were observed outside of survey periods, there was an attempt to get a photograph for identification. Environmental variables (air temperature, cloud cover, wind chill, and water temperature and pH) and survey start and end times were recorded for all VES.

A capture attempt was made on all individuals observed and a waypoint was taken as close to the first observed location as possible. We attempted to take a photo of the juvenile/adults observed in the spring prior to capture. Individuals were captured using a net and transferred to an unused zip-top sandwich bag; this was facilitated by the observer placing their hand inside the bag while the bag is inside out and then picking up the frog with the bagged hand. In cases where frogs needed to be handled outside of the bag (*e.g.* when swabbing for chytridiomycosis, hereafter “chytrid”), individual-specific powder-free nitrile gloves were worn. Once captured, individuals were weighed using a Pesola scale, and snout to vent length (SVL) and shank length measured and recorded. Overall health was noted by visual inspection (checking for vigour, sloughing skin, righting ability, presence of all limbs/digits, and other general health criteria). If chytrid was suspected, a skin swab was collected for analysis. Photos were taken of the dorsal spot pattern of all individuals in order to identify recaptures. Individuals were then released in the vicinity of where they were captured within 5 minutes from the capture time. Net heads were disinfected with Virkon between individuals to avoid spreading chytrid.

Statistical analysis

Body condition of YOY

A linear regression analysis was conducted using the *lm* function in R (version 3.6.1; R Core Team 2019) to investigate differences in YOY body condition between years at the release site and between the release site and the source population at the CVWMA in 2019. A body condition index was established using the residuals from a regression of weight against SVL. Linear regression was also used to look at drivers of body condition at the release site and included effects of date, direction from release location, and recapture status, with model selection completed using Akaike Information Criterion (AIC; Burnham & Anderson, 2002).

Population Estimation

A population estimate for YOY at the reintroduction site was calculated using capture-mark-recapture data and the *FSA* and *FSAdata* packages in R. Populations estimates were derived using the Schnabel estimation method with a Chapman modification (Chapman, 1954), following the equation,

$$\hat{N} = \frac{\sum_{i=1}^k C_i M_i}{(\sum_{i=1}^k R_i) + 1}$$

where $\hat{N}$ is the estimated population size, k is the number of samples, C_i is the number of individuals captured in sample i , M_i is the total number of individuals captured and marked prior to sample i , and R_i is the number of marked individuals in sample i . The Chapman modification (the addition of “+ 1” in the denominator) is used when the proportion of the total population caught in each sample is less than 10%. The Schnabel method follows the same assumptions as the Petersen population estimation method, being that

- the population is closed and N is constant,
- all individuals have the same chance of being captured in subsequent sampling periods,
- marking (or, in this case, capturing and photographing) an individual does not affect future capture probability,
- each sample is random, and
- all marks are recorded correctly (or, in this case, all photographs are identified correctly).

The objective of obtaining a population estimate is that this data can be used along with the number of released tadpoles to estimate survival from the tadpole to metamorph stage at the reintroduction site. For this reason, any recapture events of individuals released as metamorphs are not included in the analysis.

Results

Remote Sensing

No leopard frog calling was detected on any of the songmeters in 2019. Two of the songmeters (at 11U, 550712 E, 5629703 N and 551351 E, 5627637 N) only recorded until May 21; it is uncertain why these stopped recording, as the memory cards were not full and batteries retained

power at time of retrieval. This should not have affected our results as the leopard frog breeding period is generally wrapping up by this time in British Columbia.

Water level data shows a significant increase in water depth over a few days in early June, with levels rising from 0.15 m on June 3 to 0.80 m on June 6 (Figure 2). This change in depth is likely due to the influx of water from the river flooding into the release pond. There is also an observable drop in temperature (22.9°C on June 4 to 14.7°C on June 7) directly following the significant rise in water level, which would be expected given the comparatively colder temperature of the river water. Water temperature required about a week to recover, returning to temperatures above 20°C on June 14.

Water temperature was relatively variable throughout May, June, and July, becoming more stable in late July and early to mid-August. A steady decline in temperature began in late August and continued throughout most of September, before rapidly declining between September 25 and 28 and staying below 9°C thereafter. Temperature readings were nearly identical between the two loggers, which had been placed approximately 230 m apart.

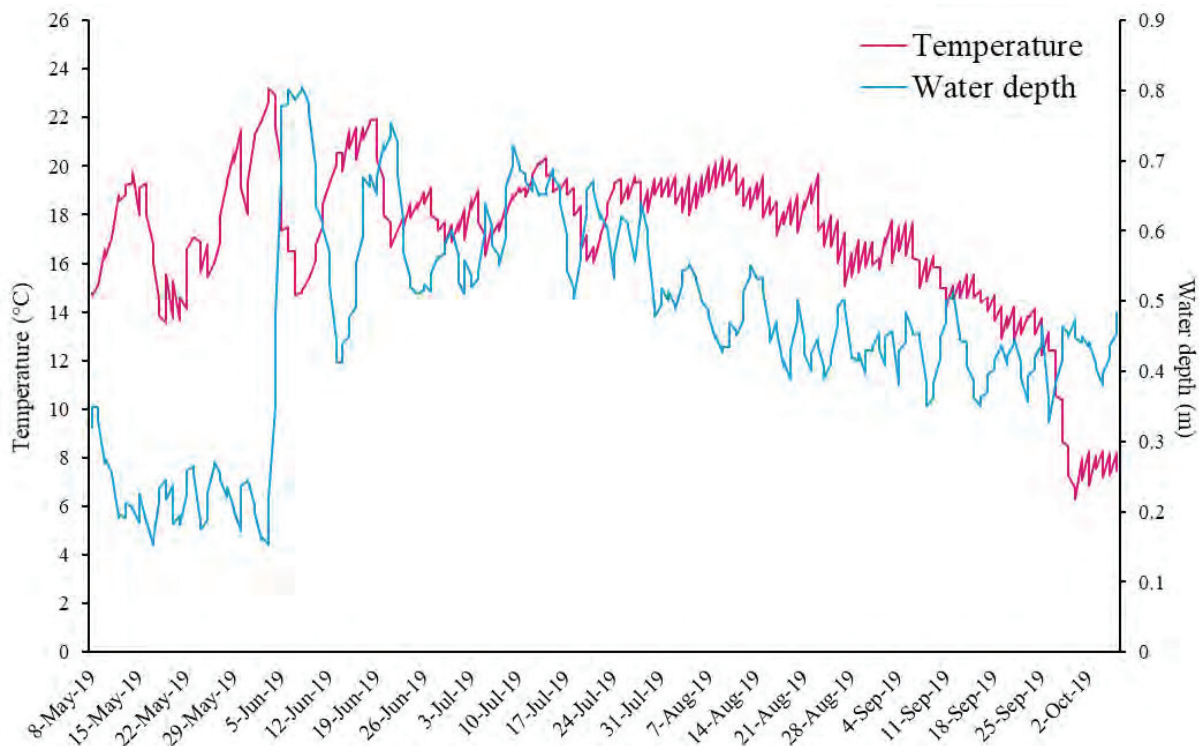


Figure 2: Temperature (°C) and water depth (m) as measured at the Brisco release pond from May 8 to October 6, 2019.

Translocations and Release

Seven egg masses were detected, surpassing the threshold and allowing for direct wild-to-wild translocations for the first time since 2016. Portions of two egg masses were translocated directly from CVWMA to Brisco on May 19; they were temporarily suspended in mesh cages and provided with romaine lettuce for sustenance prior to being released once tadpoles were free-swimming (soft-release). On three occasions between May 24 and 30, 303 tadpoles were released from one egg mass and 2014 from the other. Additionally, portions of 4 egg masses were brought to the zoo for integration into the captive breeding program and for head-starting of tadpoles prior to release.

Individuals brought to the Calgary Zoo as eggs and head-started until release were transported to the reintroduction site on 4 occasions – May 30, June 6, July 16, and September 7. This accounted for a total of 596 tadpoles and 13 YOY from four egg masses. Gosner stage of tadpoles at release varied from 26 to 41 and all appeared healthy and vigorous. A total of 1200 captive-bred tadpoles from the Vancouver Aquarium were released on June 24, with an additional 1 tadpole, 8 juveniles (over-wintered as tadpoles), and 46 YOY released on August 29.

Mortality during translocation was low, with a loss of only 4 individuals (all tadpoles) out of 4181 (0.1%).

Visual Encounter Surveys

Survey and body condition

Surveys occurred on 14 occasions for a total of 77:49 survey hours. Surveys were halted after October 6th when weather conditions became unfavorable for frogs. The surveys with the highest catch per unit effort occurred on August 29 and September 17, with a calculated 8.6 and 8.0 YOY captured or observed per hour, respectively. The former survey occurred along the release pond and a small portion of the riverbank south of the release pond, while the latter occurred along the channel at the north end of the release pond as well as the small pond to the north of the release pond. It is worth noting that the total number of observations is limited by the time required to capture and process frogs during the allotted survey time.

In total, 221 YOY observations were made over the season, of which 160 were captured (note: these totals and all calculations hereafter do not include the 59 individuals released as YOY from the Calgary Zoo and Vancouver Aquarium, but it does include 3 recapture occasions of these individuals). The highest density of YOY observations and captures was along the channel at the north end of the release pond, followed by the riverbank south of the release pond (Figure 3).

Mean and range for weight and SVL in 2019 can be found in Table 1. Note that the three smallest values for both measurements were recaptures of individuals released as YOY from the Vancouver Aquarium. Excluding these three individuals, the minimum weight and SVL were 6 g and 37.8 mm, respectively. Frogs released as metamorphs were smaller (mean weight = 3.2 g; mean SVL = 31.0 mm; n = 46) on their release date than those captured on the same date having

been released as tadpoles (mean weight = 8.9 g; mean SVL = 45.1 mm; n = 9). The first observation of potential nuptial pads on a male occurred on August 12 on a 17.5 g frog.

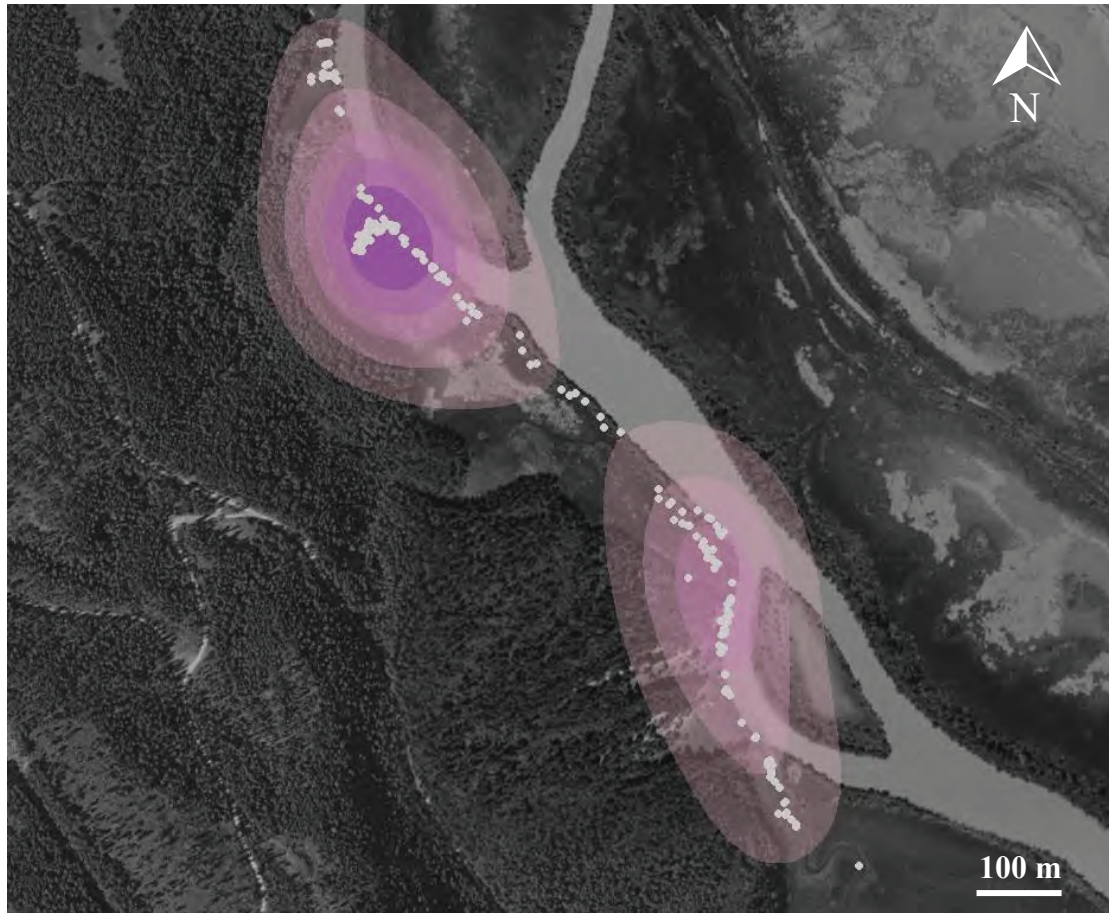


Figure 3: Density plot showing spatial distribution of YOY at the release site, with white points representing individual observation or capture locations.

Table 1: Minimum, average, and maximum weight and SVL observed for YOY in 2019 (n = 160). To allow comparisons with previous years, data from recaptures were included in calculations.

	Min	Mean $\pm$ SD	Max
Weight (g)	3.5	10.5 $\pm$ 3.0	23.0
SVL (mm)	33.0	46.5 $\pm$ 4.5	58.2

Body condition index in 2019 at Brisco was significantly lower than 2018 ($p < 0.001$), but higher than 2016 ($p = 0.04$; Figure 4a). Additionally, body condition of YOY was significantly lower in Brisco as compared to the CVWMA in 2019 ($p < 0.001$; Figure 4b). The best-fit model for drivers of body condition at Brisco in 2019 included direction from the release location ($\beta = 0.41$, $p = 0.04$) and recapture status ($\beta = 0.70$, $p = 0.004$); individuals captured south of the release location and individuals that were recaptures had a higher body condition. There was no relationship between body condition and capture date.

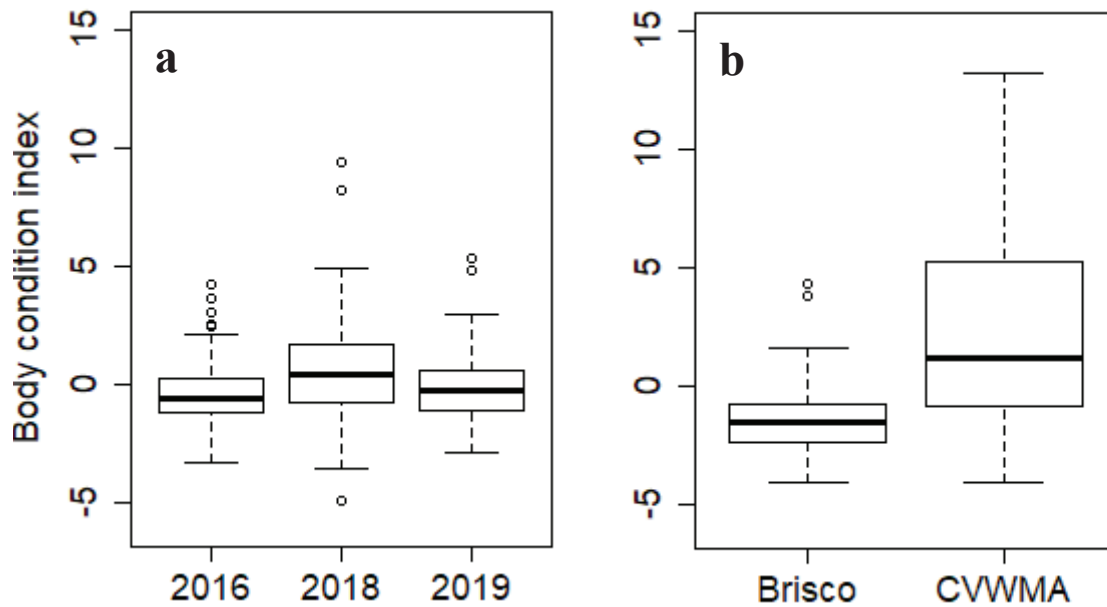


Figure 4: Body condition index by year at Brisco (a) and by site for 2019 (b).

Movements and recaptures

Of the 160 captures that occurred, there were 130 individuals, with 25 captured twice (including 3 YOY from the Vancouver Aquarium, whose release date serves as a proxy for first capture), and 4 captured on three occasions. The maximum distances that YOY were observed from the point of tadpole release was 707 m north (downstream) and 804 m south (upstream). Of the 160 captures, 88 occurred north of the release location and 72 south, indicating a relatively even distribution in the directionality of seasonal movement through and from the release pond. Several areas that were surveyed yielded no observations of leopard frogs (Figure 5).

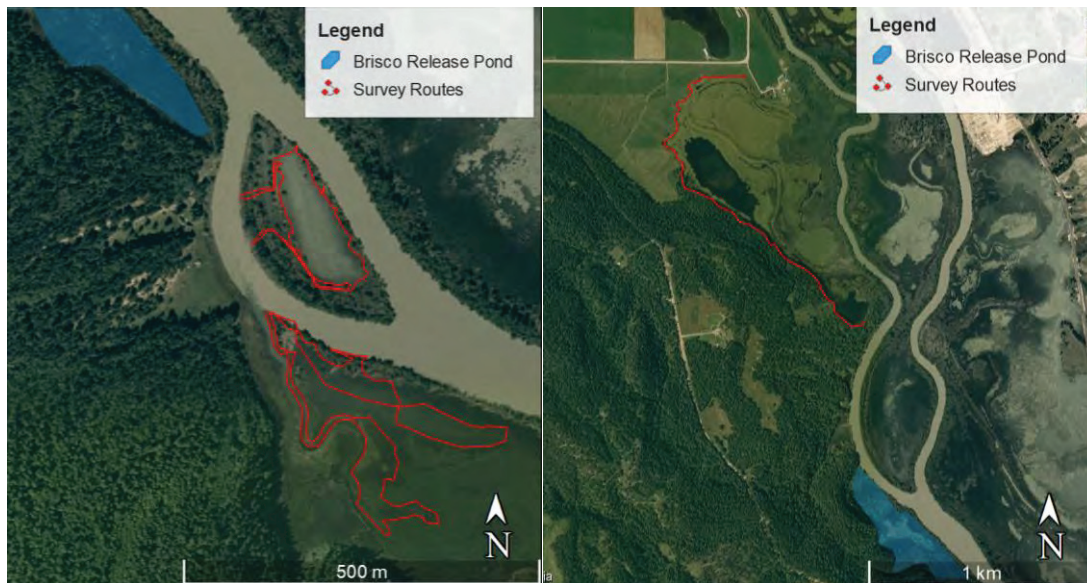


Figure 5: Survey routes along which no leopard frogs were detected.

Movement patterns were more thoroughly examined for the four individuals with three capture occasions (Figure 6). On their final capture, all four individuals were found south of the release location. Interestingly, two of the four individuals were originally captured north of the release location, before turning and heading south at a later date. The furthest cumulative known distance travelled was by BC19-23RS, which was first found 338 m north of the release location, before turning and travelling 221 and 757 m south before the second and third capture events, respectively, ending near the channel south of the release pond.

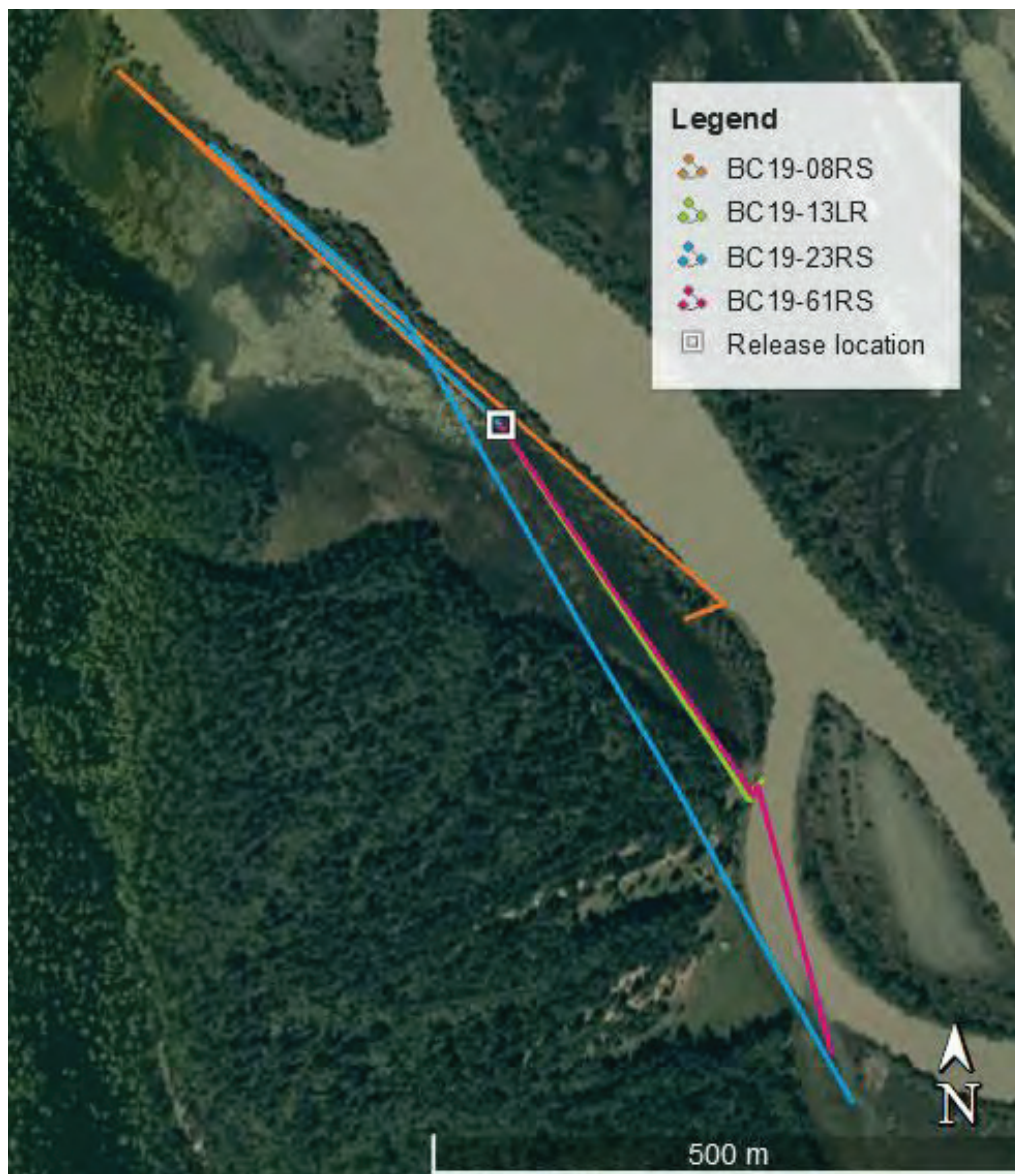


Figure 6: Movement patterns of four YOY that were captured on three occasions. Note that lines do not suggest movement pathways, but simply show connection between capture locations.

Of the 29 YOY with recapture data, 4 lost weight between the first and second capture (0.50-1.75 g decrease), 6 exhibited no change in weight, and 19 gained weight (0.25-11.50 g increase). One of the four that lost weight (1.0 g decrease) was later identified as having chytrid, and

another gained weight (6.75 g) between its second and third capture. Of those that gained weight, there was an average increase of 0.16 g per day. Summary data related to weight change and movement between recapture events can be found in Table 2.

Table 2: Movement and weight change data for YOY between the first and second recapture events.

	Min	Mean	Max	n
Days between recapture events	8	15	36	29
Distance (m)	3	180	695	29
Distance/day	0.4	13.0	60.6	29
Weight gain (g)	0.25	2.43	11.50	19*
Weight gain/day	0.01	0.16	0.50	19*

*weight gain data is only shown for individuals that had a positive weight change between recapture events

A large leopard frog, either a juvenile or adult, was observed on June 6 but eluded capture and photo. Another large leopard frog was photographed on July 29 at the release pond, but eluded capture and was not observed again (Figure 7a). Using the Brisco Photo Archive, we were able to confirm that this individual was a YOY in 2018 that had been previously captured. It is possible that the frog observed on June 6 and on July 29 were the same individual given that they were observed in the same location. Additionally, local landowner and president of the Columbia Wetlands Stewardship Partners, Suzanne Bayley, observed and photographed a leopard frog at the wetland just north of the release pond on September 6, which she estimated to be approximately 75 mm in length (Figure 7b). Assuming accuracy of the estimate, this would indicate successful overwintering of a second juvenile or adult.



Figure 7. Juvenile leopard frog observed on July 29, providing evidence of overwinter survival at the release site (a) and juvenile or adult observed on September 6 (b).

Physical abnormalities and disease

On August 12, a metamorph was captured and observed that had an underdeveloped rear leg and only one eye (Figure 8). This was the only individual observed throughout the season with physical abnormalities.



Figure 8: Metamorph observed at the release pond with a limb deformity and only one eye.

Signs of chytrid were observed in 17 frogs, first on September 11 and continuing until the final survey on October 7; these individuals made up 26.6% (17/64) of the captures over this period, and 10.6% (17/160) of all captures. Skin swabs were collected from 15 of the 17 individuals. Laboratory analysis confirmed that all of these swabs were positive for chytrid. Additionally, three Columbia spotted frogs (*Rana luteiventris*) showing no symptoms of chytrid were opportunistically sampled; two of these tested positive for chytrid, demonstrating their potential role as a reservoir for the disease.

The prevalence of chytrid in leopard frogs in 2019 was lower than the 35.2% (31/88) reported over the same time period for 2018 (September 11 to October 17) and the 19.3% (31/161) over the entire 2018 season. This may be a result of warmer water and air temperatures in 2019, given the negative relationship between temperature and rates of chytrid infection (Fernandez-Beaskoetxea et al., 2015).

Population Estimation

The capture history of 127 individuals was included in the population estimate calculation, as the three recaptures of individuals released as metamorphs from the Vancouver Aquarium were omitted. The calculated YOY population estimate for the site using the Schnabel method was 293, with a 95% confidence interval of 207 to 427 individuals.

It is important to acknowledge that these estimates should be viewed with caution, as likely some assumptions of the modelling approach were violated, in addition to the fact that the sampling

location itself was not constant (e.g. we did not begin surveying at the wetland just north of the release pond until September 11). Estimates would likely be more accurate if a pre-defined survey route was set and followed for each sampling occasion, but this would also result in a smaller total search area due to logistical and time restrictions. Additionally, even with a set route the amount of area covered between surveys would likely vary depending on number of individuals encountered.

Discussion

Overall, in 2019 we were able to release more tadpoles than in the previous two years combined due to the ability to directly translocate eggs from Creston to the reintroduction site. There were also adequate numbers of captures and recaptures to allow for estimation of population size and survival at the reintroduction site. Looking strictly at known variables, there were 4114 tadpoles released in 2019 and 127 individuals identified and captured as YOY; this would result in a minimum survivorship from tadpole to metamorphosis of 3.1%. Considering that, 1) there were another 62 YOY observations that were not able to be identified due to lack of capture, and 2) that it is unlikely that we observed every surviving YOY, the survival estimate can be assumed to be higher than the calculated minimum. This idea is further supported using population estimates derived from the Schnabel method (95% CI of 207 to 427 individuals), which would result in survivorship ranging between 5.0 to 10.4%. Both these values and the estimate based solely on known variables are within a reasonable range of expected survivorship, as reported for similar species at this life stage; larval survival rates for *Rana aurora* and *Rana temporaria* have been estimated at 0.03 ± 0.01 and 0.06 ± 0.05 , respectively (Biek et al., 2002).

While there was no overt evidence that release of small metamorphs in late summer was detrimental, as was seen in 2018 (Ohanjanian, 2019), data may still suggest an advantage for earlier release during the tadpole stage. If the date of release for frogs introduced as metamorphs or juveniles is used as their first capture occasion (since they were identifiable at this point, as compared to individuals released in the tadpole stage), 4.5% of them experienced a recapture at a later date (3 of 67). In comparison, of the 157 captures that occurred of individuals released as tadpoles, 16.6% of them were recaptured (26 of 157). While these calculations cannot be directly compared without accounting for factors such as release date, considering that later released individuals would have fewer opportunities to be recaptured, the large discrepancy of the two recapture rates may provide an argument for prioritizing release during the tadpole stage. It should also be noted that the three recaptures that did occur of frogs released as metamorphs were the three smallest YOY captured throughout the 2019 season. Additionally, when comparing the weight of metamorphs on their release date to YOY captured on the same day that had been released as tadpoles, the latter group of individuals had a mean weight more than twice that of the individuals released as metamorphs. This is an important distinction, given the positive relationship between YOY size and survival (Altwegg & Reyer, 2003).

Another point of concern is the lower body condition at the release site when compared to the source population at the CVWMA. Considering that more than half of the tadpoles released at Brisco in 2019 were direct wild-to-wild translocations from the CVWMA, this may indicate a deficiency in habitat quality or a density issue rather than an effect of captive breeding. Body

condition was also significantly lower at Brisco as compared to Creston in 2016 ($p < 0.001$), another year where the majority of releases were wild-to-wild. Density seems unlikely to be a major problem, however, as the number of tadpoles released would only represent approximately 2 egg masses in a 9 ha pond; mean density of leopard frog egg masses in Wisconsin was 277/ha (Hine et al., 1981) and 58/ha in Quebec (Gilbert et al., 1994). If there is a density concern at the release pond, given that the two years with high releases had YOY with lower body condition (2016 and 2019), it may be possible to release into multiple wetlands in the vicinity of the release pond going forward but local landowners would need to be supportive and agreements would need to be in place.

It is also possible that frogs at Brisco are smaller than those at Creston due to cooler temperatures in this region (amphibians have temperature dependent development) and because the release pond was inundated with cooler water from the river in June this could have delayed development resulting in smaller size. However, water temperatures only took about a week to recover. The habitat quality hypothesis is made more interesting by the result that individuals who travelled south of the release pond had a higher body condition than those who travelled north, potentially indicating more adequate resources in one direction.

While there were at least two juvenile/adult frogs observed this year, providing evidence of overwinter survival, it is nearly impossible to determine whether other individuals from previous years are failing to survive over the winter or are simply dispersing to other locations outside of the primary study area. Perhaps the first step in determining where any surviving juveniles and/or adults may be going would be to locate the overwintering area(s) for YOY frogs. This would provide a good starting point for spring VES in the following season, and potentially provide better information regarding the optimal locations for songmeters. This could be facilitated through use of radio-tagging YOY in late fall to track them to the overwintering area(s).

Although the reintroduction site has met the first three indicators of success (Randall et al. 2016) over the last few years, and this year experienced some successes with a larger number of releases than in each of the previous two years, as well as evidence of overwinter survival, there are still barriers to accomplishing Indicators 4 through 7 (see introduction). There continues to be inadequate numbers of individuals available for release each year; Semlitsch (2002) recommends 10,000-50,000 eggs released over several years. Assuming an embryo survival rate of 0.92 (Biek et al., 2002), this would be equivalent to 9,200-46,000 tadpoles. While >8000 tadpoles were able to be released in 2016, there have only been 6364 individuals released over the last three years combined, falling far short of the recommendation. There is hope that the Calgary Zoo captive breeding facility may begin producing tadpoles in 2020, which could greatly bolster the number of individuals released. Additionally, soft releases, in which tadpoles will first be released into a protective enclosure in the wetland to allow them to orient to the site, are planned for 2020 with the expectation that this may increase survival rate (Mendelson III & Altig, 2016).

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Appendix A: Summary of activities at Bummers Flats reintroduction site, 2019

Reintroduction of northern leopard frogs at Bummers Flats on the Upper Kootenay Floodplain occurred from 2003 to 2005 and again from 2011 to 2015. During this latter set of reintroductions, over 35,000 tadpoles were able to be released; consequently, breeding was detected at the site annually from 2014 to 2017, and the population was considered to be self-sustaining. Unfortunately, the pumps responsible for maintaining water levels in the release pond (north Bummers calling ditch) have not been operational for the last couple of years and there has been little to no water in the breeding pond. Activities in 2019 included deployment of automatic recording units (songmeters) during the breeding season, with potential for targeted visual encounter surveys (VES) in late summer and fall depending on the results of the songmeter analysis.

In May, songmeters ($n = 11$; Wildlife Acoustics) were deployed on private land and Cherry Creek Nature Trust land on the west side of the river, and in the north pond and at south Bummers on the east side of the river (Figure A-1). No songmeters were placed at the historic calling ditch as it was completely dry in May. Units were programmed to record ten minutes per hour between 13:00 and 17:00, ten minutes from 21:00 to 21:10, and then continuously from 22:00 to 01:00. Songmeters were retrieved in late July, and the spectrograms were visually scanned for the presence of leopard frog “snore” calls.

One songmeter on the west side (second from the north) was knocked down by wildlife sometime in the evening of May 22. It was replaced on May 30, but unfortunately, no data was collected between those dates.

No leopard frog calling was detected on any of the songmeters in 2019, and therefore no targeted VES occurred. No breeding or YOY have been detected at the site or adjacent habitat for the last two years. It is unclear whether this is simply part of the natural fluctuations seen in amphibian populations (Pechmann et al., 1991), or something more significant regarding habitat suitability.



Figure A-1: Locations of songmeters at Bummers Flats in 2019.

COLUMBIA VALLEY LOCAL CONSERVATION FUND (CVLCF) FINAL REPORT 2019

General Instructions

- Final reports must be submitted **by 4:00 pm MT January 31, 2020** to the Kootenay Conservation Program. Email final report to info@kootenayconservation.ca.
- All areas of the final report must be answered.

Section A – GENERAL INFORMATION

1. Project Title (as indicated in application): Wrapping up the Columbia Wetlands Waterbird Survey

2. Proponent

- a) Legal Name: Wildsight Golden
- b) Organization Registration #: S-35156
- c) Mailing Address: PO Box 25, Golden, BC Postal Code: V0A1H0
- d) Contact: Rachel Darvill
- e) Telephone #: 250-344-5530 f) Fax #:
- g) Email: racheldarvill@gmail.com

3. Partner (*if applicable*)

- a) Legal Name:
- b) Organization Registration #:
- c) Mailing Address: Postal Code:
- d) Contact:
- e) Telephone #: f) Fax #:
- g) Email:

Section B – PROJECT INFORMATION

1. Project Location: RDEK areas F & G. Columbia Wetlands.
(ie: RDEK area, watershed, direction from major centre, etc)

2. Total Project Value: 113,595.00

3. CVLCF Contribution: 8,000

4. Non-CVLCF Contribution: 105,595

5. Single or multiple year project: Multi year. the CVLCF supported this project in 2017 and 2019.

Section C – PROJECT SUMMARY

1. Please provide a single paragraph describing your project, its objective (goals) and the results. As this summary will be used in CVLCF communications, clearly state the issues addressed and avoid overly technical descriptions. Maximum 2000 characters (~290 words).

The CWWS is a five-year (2015-2019) coordinated bird count that incorporated the efforts of more than 230 volunteer citizen-scientists. Volunteers collected baseline data on bird populations and bird diversity in the wetlands during migratory periods. By providing a citizen-science role, local residents became engaged with wildlife and local landscapes. It is expected that this project will contribute significantly to the future management of the Columbia Wetlands ecosystem; bird species that utilize this habitat, with 30 at-risk bird species. Single day bird counts determined that American coot, American wigeon, and mallard are the most common bird species in the wetlands during spring and fall bird migration. Aerial surveys documented that the Columbia Wetlands provides significant habitat to swans, and an osprey inventory determined that there are at least 60 osprey nests in the valley; 43 nests were active in 2019. Three areas in the wetlands were determined to be important resting and feeding areas during migration as evidenced by the consistent high bird concentrations present at those locations. With the reported trend of decreasing global bird populations, this paper amongst other recommendations, suggests protecting these high valued habitat areas by designating them as refuges. A major outcome of this project is to use the data to nominate the Columbia Wetlands as a candidate area to be incorporated within the 'Important Bird and Biodiversity Area' (IBA) program. A decision on the IBA outcome is currently pending.

2. OPTIONAL: If your project lends itself to sparking interest through a compelling sound bite (for potential use in CVLCF communications), please tell us what that would be. Maximum 1050 characters (~150 words).

3. Biodiversity Targets (please list, maximum 90 words):

Biodiversity targets were to reduce increasing threats for migrant waterbirds birds that utilize Columbia Wetlands habitat, including the following at-risk bird species: Western Grebe, Horned Grebe, Eared Grebe, Tundra Swan, California Gull.

4. IUCN Threats to Target (please list, maximum 90 words):

- Residential and commercial development
- Invasive and/or other problematic species
- Transportation and service corridors
- Human intrusions and disturbance (recreational activities).
- Climate change

Section D – PROJECT DELIVERABLES AND RESULTS

1. Identify the deliverables outlined in your application in the table below (50 words/field) and list the results of each. Please include copies of any relevant communications products (brochures, posters, videos, websites, photos of signage, etc.) resulting from this project. Add an attachment if you need more room.

Deliverables	Results
Volunteer coordination and recruitment	Site locations assigned, maps of survey stations sent, waivers signed, data forms sent out and obtained completed forms, data entry into eBird. 40 posters up in spring, + 40 in fall. PRs - 5 newspaper articles, releases in KCP and CMI newsletters; social media - ongoing posts; Website content updated regularly.
-Developing collaborations and partnerships with stakeholder groups. --attend community events fir volunteer recruitment and education	We continue to have ongoing communications with 4 staff at CWS, 2 staff at Bird Studies Canada 1 staff at Canadian Intermountain Joint Venture, and several staff at MFLNRO. Critical partnerships for bouncing conservation ideas and questions. All partner groups have received the data summaries as well as the 2015-2019 CWWS Final Report.
-Outreach/education -presentations on CWWS outcomes -Deliver bird training modules (field and classroom) for volunteers.	-334 people in total were reached through presentations, event booths or training opportunities (as of Dec 17 2019) -6 presentations -7 training sessions (in-class and field) -5 bird walks for public -2 farmers markets with CWWS display
Install 5-10 nesting boxes on private land. Wild Voices for Kids Field Trips (4).	Installed 10 nesting boxes on private land. May 7th Linda Poon's class, 21 students, May 6th Laurie MC Douglass's class, 24 students May 13 Heather Adama class, 20 students. July 16 - Go Wild Kids Camp - 8 children 4 students in total
Aerial swan survey CWWS bird surveys (3 days during spring/3 in fall)	669 swans counted during aerial swan survey on April 8, 2019. 92 people participated in spring 2019 waterbird surveys to count 25,577 birds. 90 volunteers participated on three fall survey dates and in total, 41,095 birds were recorded on 305 checklists during fall.
Data collection and entry into eBird and provincial gov't data warehouse (WSI) Copletion of CWWS 2015-2019 Final Report	All data has been transcribed into the eBird database and it also available through the provincial data warehouse (WSI). The final report is complete and is available at the link found in Section F below.

Section E – PROJECT EFFECTIVENESS

1. Please evaluate the effectiveness of the project using objective standards, quantifiable criteria and/or quality control measures identified in your application/proposal. Maximum 2000 characters (~290 words).

The 2019 CWWS was successful given the high number of returning volunteers and their increased knowledge of nature coming from participation. Volunteers told us on numerous occasions how much this project means to them and how much it has grown their knowledge and appreciation for birds and the Columbia Wetlands. Success was also seen by the large amount of baseline inventory data collected on waterbirds during both spring and fall migration surveys. Success has also evaluated by counting the number of: newspaper articles, posters distributed, community presentations, brochures distributed, collaborations formed and feedback forms obtained after all CWWS training sessions (see Section D). Another potential measure of success will be if Columbia Wetlands are designated with Important Bird and Biodiversity Area (IBA) status. After collecting 5 years of data, we have made an application to Bird Studies Canada and requested that the wetlands be designated with IBA. We have collected bird data that shows the ecosystem supports 1% of national or global population of a waterbird species, therefore, we suspect that IBA will be granted.

For further quantifiable criteria, please refer to Section D above.

2. What are the top 3 lessons learned from the project that would be important to communicate to others doing similar work throughout the RDEK? Maximum 1050 characters (~150 words).

1. Work to assign refuge or Migratory Bird Sanctuary designation to the two areas located within the WMA determined to consistently contain the highest bird concentrations during migration. These two locations are found at the south end of Lake Windermere and the wetland complex located between Brisco and Spillimacheen.

2. Community members of the Upper Columbia really appreciate having the opportunity to be involved with a citizen-science project that collects useful baseline data. They find it enjoyable and worthwhile and are eager and willing to participate in this project.

3. There are a number of threats that could be effecting the habitat value for birds and other wildlife species.

Section F – FURTHER COMMENTS

1. Please provide any further comments including recommendations for future conservation efforts. If your project produced a narrative or scientific report or additional project products (e.g. maps, photos), attach them as an Appendix (maximum 90 words).

Detailed finding of the 2015-2019 Columbia Wetlands Waterbird Survey can be found here:
https://wildsight.ca/wp-content/uploads/2016/01/CWWS-2015_2019-Final-Report_Jan-2-2020.pdf?fbclid=IwAR1vPdMCTRdaazA6gKndBa_0EobVnCbboI_zzK1SXFShvE0Do6zLPQ2YzM

Section G – FINANCIAL REPORT

1. Please submit a financial report for the project outlining revenue and expenditures with a comparison to the budget submitted with your CVLCF application. **Use the Final Budget Reporting form provided.** Details on any discrepancies from the budgeted amounts or items are required (maximum 90 words).

More time than was originally anticipated was needed on the final year of the CWWS. Data management and review took a significant amount of time. We also added an Osprey survey to the CWWS program to see if they could help achieve IBA status. Therefore, more funds were sought and used for program biologist and assistant wages.

Columbia Valley Local Conservation Fund (CVLCF) Final Reporting Budget					
Proponent: Wildsight Golden					
Project Title: Wrapping up the Columbia Wetlands Waterbird Suary (2019)					
REVENUES:					
Funders	APPLICATION		FINAL REPORTING		Additional Comments
	Estimated Cash Amount	In-kind Amount	Actual Funds Received	Actual In-kind	
CVLCF	\$8,000.00	\$0.00	\$8,000.00	0	
Columbia Basin Trust	\$36,000.00	\$0.00	\$36,000.00	0	
Gaming Grant (Province of BC)	\$5,000.00	\$0.00	\$1,915.00	0	
Wild Voices for Kids	\$1,000.00	\$0.00	\$1,000.00	0	
Wildsight Golden	\$0.00	\$4,400.00	\$0.00	4400	
Wildsight Regional	\$0.00	\$2,000.00	\$0.00	2000	
Canadian Wildlife Service	\$0.00	\$3,000.00	\$0.00	3000	
Min Forests, Lands, Natural Resource & Rural Development	\$0.00	\$750.00	\$0.00	750	
Columbia Wetlands Stewardship Partners	\$2,000.00	\$0.00	\$2,000.00	0	
Ducks Unlimited Canada	\$0.00	\$2,000.00	\$0.00	2000	
Windermere Rod and Gun Club	\$0.00	\$350.00	\$0.00	350	
CWWS Volunteer surveyors	\$0.00	\$30,600.00	\$0.00	30600	
Volunteer mileage	\$0.00	\$2,080.00	\$0.00	2080	
The McLean Foundation	\$13,860.00	\$0.00	\$13,500.00	0	
Wings Over the Rockies	\$0.00	\$0.00	\$3,000.00	0	
Columbia Shuswap Regional District	\$0.00	\$0.00	\$3,000.00	0	
Total Amounts	\$65,860.00	\$45,180.00	\$68,415.00	\$45,180.00	More funds were required that originally anticipated to increase assistant hours. More funds were required that originally anticipated to increase assistant hours.
TOTAL REVENUE	\$111,040.00		\$113,595.00		

EXPENSES:									
Expense Items	APPLICATION		FINAL REPORTING		CVLCF Funding	FINAL REPORTING		CVLCF Funding	Additional Comments
	Estimated Cash Amount	In-kind Amount	Actual Cash Spent	Actual In-kind		Actual Cash Spent	Actual In-kind		
Program Biologist (R. Darvill)	85hrs/month @ \$40/hr for 10 months	\$0.00	\$34,000.00	\$0.00	\$34,000.00	\$36,000.00	\$0.00	\$36,000.00	
Program Assistant	80hrs/month @ \$25/hr for 8.5 months	\$0.00	\$17,000.00	\$0.00	\$17,000.00	\$18,900.00	\$0.00	\$18,900.00	
Professional Fees, honoraria:									
Canadian Wildlife Service	Staff support (Dr. Mark Drever) for expert advice	\$0.00	\$3,000.00	\$0.00	\$0.00	\$3,000.00	\$0.00	\$3,000.00	
Min Forests, Lands & Natural Resources	Professional services of Ariana McKay (prov. Habitat Biologist)	\$0.00	\$750.00	\$0.00	\$0.00	\$750.00	\$0.00	\$750.00	
Wildsight Regional	Insurance, communications assistance, web	\$0.00	\$2,000.00	\$0.00	\$0.00	\$2,000.00	\$0.00	\$2,000.00	
Wildsight Golden Branch	Pays for half of office costs: in-kind volunteers and	\$0.00	\$4,400.00	\$0.00	\$0.00	\$4,400.00	\$0.00	\$4,400.00	
Ducks Unlimited Canada	Logistical Staff Support from conservation biologist	\$0.00	\$2,000.00	\$0.00	\$0.00	\$2,000.00	\$0.00	\$2,000.00	
Volunteers (CWWS participants)	CWWS surveys - 85 people (18hrs/person @ \$350.00)	\$0.00	\$30,600.00	\$0.00	\$0.00	\$30,600.00	\$0.00	\$30,600.00	
Windermere Rod and Gun Club	Materials and time required to build waterfowl	\$0.00	\$350.00	\$0.00	\$0.00	\$350.00	\$0.00	\$350.00	
Wild Voices for Kids (CBEEN) - Bird Fieldtrip	\$200/trip x 5 trips/year	\$1,000.00	\$0.00	\$1,000.00	\$0.00	\$1,000.00	\$0.00	\$1,000.00	
Aerial Swan Survey	Aerial Survey (late March) - Alpine Helicopters	\$4,300.00	\$0.00	\$4,300.00	\$800.00	\$1,120.00	\$0.00	\$1,120.00	
Nest box supplies (for additional mounting materials not provided by WR&GC)	10 - 4x4x8" wooden posts (\$150), 24 gauge galvanized sheet metal for making 10 predator guards (\$270), mounting hardware (\$100), posters, newspaper ads, Wings Over the Rockies ad in Festival Calendar	\$600.00	\$0.00	\$600.00	\$400.00	\$750.00	\$0.00	\$750.00	
Advertising/promotional materials	100 sites for 6 surveys = 600 sheets	\$250.00	\$0.00	\$250.00	\$50.00	\$205.00	\$0.00	\$205.00	
Printing CWWS dataforms	For consultants - 3000kms @ \$0.54	\$200.00	\$0.00	\$200.00	\$50.00	\$200.00	\$0.00	\$200.00	
Mileage (CWWS surveys, presentations)	Volunteers contributing mileage (100kms x 40 people x \$5.52/km)	\$1,620.00	\$0.00	\$1,620.00	\$500.00	\$3,500.00	\$0.00	\$3,500.00	
CWWS Volunteers (for CWWS surveys)	Volunteers contributing mileage (100kms x 40 people x \$5.52/km)	\$0.00	\$2,080.00	\$0.00	\$0.00	\$2,080.00	\$0.00	\$2,080.00	
Postage	Mailing volunteers bird guides, scopes, data sheets	\$100.00	\$0.00	\$100.00	\$0.00	\$40.00	\$0.00	\$40.00	
Printing as required	newsletters, information for volunteers/events	\$200.00	\$0.00	\$200.00	\$0.00	\$0.00	\$0.00	\$0.00	
Administration/overhead	10% of cash funding	\$6,590.00	\$0.00	\$6,590.00	\$800.00	\$6,700.00	\$0.00	\$6,700.00	
TOTAL EXPENSES	\$111,040.00		\$113,595.00			\$68,415.00	\$45,180.00	\$113,595.00	

2020

Columbia Wetlands Waterbird Survey



Rachel Darvill, BSc., MSc., RPBio
Goldeneye Ecological Services
Prepared for Wildsight Golden
1/2/2020

Executive Summary

The Columbia Wetlands Waterbird Survey (CWWS) is a five-year (2015-2019) coordinated bird count that incorporated the efforts of more than 230 volunteer citizen-scientists. Volunteers collected baseline data on bird populations and bird diversity in the wetlands during migratory periods. The utilization of local active citizen-science volunteers proved to be an important strategy in the design of the study. By providing a citizen-science role, local residents became engaged with wildlife and local landscapes, which can help direct personal decisions leading to sustainable outcomes for the wetlands.

It is expected that this project will contribute significantly to the future management of the Columbia Wetlands ecosystem, as the CWWS documented 163 bird species that utilize this habitat, with 30 at-risk bird species. Single day bird counts determined that American coot, American wigeon, and mallard are the most common bird species in the wetlands during spring and fall bird migration. Aerial surveys documented that the Columbia Wetlands provides significant habitat to swans, and an osprey inventory determined that there are at least 60 osprey nests in the valley; 43 nests (71.7% of the total count) were observed to have some level of osprey activity in 2019. Three areas in the wetlands were determined to be important resting and feeding areas during migration as evidenced by the consistent high bird concentrations present at those locations. With the reported trend of decreasing global bird populations, this paper amongst other recommendations, suggests protecting these high valued habitat areas by designating them as refuges.

In addition to the important data collection and citizen-science engagement, this community-based project provided multiple opportunities to engage the local human population and visitors, all in the interests of enhancing and maintaining this unique ecosystem with its significant biodiversity values. A major outcome of this project is to use the data to nominate the Columbia Wetlands as a candidate area to be incorporated within the 'Important Bird and Biodiversity Area' (IBA) program. A decision on the IBA outcome is pending.

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1.0 Introduction

1.1 Background

The Columbia Wetlands is identified as an essential habitat component of the Pacific Flyway, which in North America, is the westernmost primary migratory bird corridor of which there are four (Wilson, 2010). This ecosystem plays an important role as migration stopover habitat for birds (Kaiser, McKelvey & Smith, 1977), providing a refuge where birds can fuel up and rest during the necessary long migratory flights requiring substantial amounts of energy. The Columbia Wetlands ecosystem has long been thought to provide important habitat to birds, but prior to the data collection of the Columbia Wetlands Waterbird Survey (CWWS), a project of Wildsight Golden, very little data had been recorded documenting composite bird populations and specific bird species distribution in the wetlands during bird migration.

A new study published in September 2019 estimates that 2.9 billion birds of various species have disappeared in Canada and the United States since 1970 – a population decrease of 29 per cent (Rosenberg et al., 2019). According to BirdLife International (2018), about one in eight bird species is threatened with global extinction due to factors such as: expansion of agriculture, logging operations, invasive species, hunting, and climate change. Climate change is expected to have broad and negative impacts across Bird Conservation Region 10 which includes the Northern Rockies (where the Columbia Wetlands are located) and particularly in alpine and wetland habitats where fluctuating water levels occur due to severe weather events (Environment Canada, 2013). The Columbia Wetlands and its habitat value to birds and other wildlife species continue to be under stress from a number of these identified threats; particularly relating to direct habitat losses, invasive species, transportation and utilities infrastructure, recreational pressure, climate change and other cumulative effects (Mahr, 2017).

Anthropogenic pressures are substantial in the Columbia Valley and agriculture is of concern. Land clearing removes trees needed by cavity-nesting waterfowl. Livestock grazing adds nutrients to water, promotes invasive species introduction, removes wetland vegetation, and results in trampling of riparian and emergent vegetation (Harrison et al., 2010), required by waterbirds for nest building material and food (Environment Canada, 2013). In one paper, Kaiser, McKelvey & Smith (1977) reported that a slough in Brisco had deteriorated to eutrophic status as a result of agricultural and domestic effluent. Surrounding land use pressures from increasing rural, urban and industrial developments result in cumulative pressures on birds.

Levels of non-motorized recreational use are increasing in specific locations (e.g. Althalmer to Radium, Fairmont), which are problematic for sensitive bird species. Several studies (e.g. (Korschgen & Dahlgren, 1992; Hockin et al., 1992; Korschgen, George & Green, 1985; Liddle & Scorgie, 1980; York, 1994) have reported a wide range of potentially detrimental behavioural patterns for waterbirds in response to recreationists, such as reduced foraging and resting periods; increased flushing, flight times and energy expenditure by birds reducing overall energy intake; increased nest abandonment and egg loss; discouragement of late-nesting pairs from breeding; disruption of pair bonds and parent-offspring bonds; reduced use of feeding, resting and breeding sites; repeat disturbances eventually cause ducks to nest elsewhere or not at all (Korschgen & Dahlgren, 1992). Birds are sensitive to human disturbance wherever they are present during critical phases of nesting and relocation during migration; both critical times influencing survival and procreation of bird species.

1.2 The value of IBA designation

With the documented decline and increasing threats to bird populations, protecting remaining habitats identified as being important or significant to birds is of paramount importance at this time.

“In order to conserve nature effectively, it is necessary to identify those places most important for biodiversity and therefore conservation action. Important Bird and Biodiversity Areas—IBAs—constitute the largest and most comprehensive global network of sites that are significant for the global persistence of biodiversity” (Birdlife International, 2018).

Identifying and conserving IBAs is a critical measure to safeguard migratory flyways, directing the importance and awareness to the value of nature. Although non-regulatory, conveying IBA status to a valuable and fragile ecosystem is desired at a community level as it implies the necessity for conservation planning and stewardship. The IBA program is increasingly being viewed as a framework for not only bird conservation, but for overall biodiversity preservation (Couturier, 2012). The IBA framework is now being adopted as a global standard for identifying and designating the world’s biodiversity hotspots, known as ‘Key Biodiversity Areas’ (KBAs). The IBA status, when assigned, additionally brings innovative economic opportunities to the identified sites, including increased tourism related to birding. Tourism related to IBA designation generates awareness and engagement in bird conservation activities.

Wildsight (an environmental non-governmental organization from southeastern British Columbia) made an application to nominate the Columbia Wetlands into the IBA program in 2014. While the Columbia wetlands was widely recognized as providing important habitat for birds (BC FLNRORD, n.d.; Environment Canada, 2014; Harrison et al., 2010; Kaiser, McKelvey & Smith, 1977), the application was not supported due to insufficient data. In adjudicating that application, Bird Studies Canada (BSC) and BC Nature (IBA program coordinators in Canada and BC respectively) stated that in the absence of recent supporting data to show that thresholds for IBA criteria had been met or exceeded, the application could not be approved. Subsequent to the 2014 application, several agencies including BSC, BC Nature, Canadian Wildlife Service, Canadian Intermountain Joint Venture, and Ducks Unlimited Canada, have encouraged Wildsight to collect the data necessary to resubmit the nomination of the Columbia Wetlands for IBA status. Bird Studies Canada stated that at least five years of consecutive data collection was needed before they would be able to make a decision regarding possible IBA designation.

The Columbia Wetlands Waterbird Survey (CWWS) protocol was conceived and managed by the author of this paper, a consulting biologist to Wildsight Golden. The project was initiated in 2015 with the intention of collecting five years of consecutive bird data. The major goals of this project were:

1. Design of a study incorporating a citizen-science opportunity for Columbia Valley residents,
2. Promote increased appreciation and recognition for birds and the Columbia Wetlands by providing diverse educational opportunities, and;
3. Collect baseline data on bird populations to support IBA designation for the Columbia Wetlands.

2.0 Study Area

The Columbia Wetlands (UTM: 0534506; 5650169) are located in southeastern British Columbia, in the Rocky Mountain Trench located between the Rocky Mountains and the Purcell Mountain Range. The CWWS study area extends from Canal Flats to Donald (Figure 1). Survey stations cover approximately 39% of the study area; the entire Columbia Wetlands complex. The Columbia Wetlands are part of the traditional territory of the Ktunaxa Nation, Secwepemc First Nation, Shuswap First Nations Band and Metis Nation Columbia River. Approximately half of the wetlands lie within the Regional District of East Kootenay (RDEK) Areas F and G, the other half are located within the Columbia Shuswap Regional District (CSRD) Area A. A number of communities are located adjacent to the wetlands, including

Fairmont, Invermere, Radium, Brisco, Spillimacheen, Parson, Nicholson and Golden.

Subsequent to an earlier nomination made by Wildsight, the Columbia Wetlands were identified as a Ramsar site under the Ramsar Convention in 2005. Ramsar status recognizes this ecosystem as a wetland with international significance. The Ramsar Convention’s mission recommends and encourages “the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world” (Ramsar, 2014).

Conservation parcels exist within the Columbia Wetlands along the Upper Columbia River floodplain, owned by The Nature Trust (TNT) of BC and The Nature Conservancy of Canada. A further 21.2% is private land which includes the First Nation Reserve Lands (BC Hydro, 2014). The TNT properties are leased to, and managed by Environment and Climate Change Canada’s Canadian Wildlife Service. Approximately 60.1% of the Columbia Wetlands has been designated as a Wildlife Management Area (WMA) (BC Hydro, 2014), with the provincial government (Ministry of Forests, Lands, Natural Resource Operations and Rural Development) as the land managers. By definition, a WMA is an area of land designated under section 4(2) of the *Wildlife Act* for the benefit of regionally to internationally significant fish and wildlife species or their habitats. While the WMA status is an important conservation designation, according to the IUCN Protected Areas Categories — the WMA designation (i.e. Managed Resource Protected Area) offers the lowest form of protection for a conservation area (IUCN, 2017).

The use of land-based motorized recreational vehicles is prohibited in the Columbia Wetlands; there may be no person in the wetlands with any conveyance that has ten horsepower or more (Phase II Ventures, 2019). The wetlands receive additional levels of protection through a three-part set of boating regulations that were enacted by Transport Canada Marine Safety and Security. The first two regulations amending vessel operation in the Columbia Wetlands came into effect in 2016, and are described as:

- 1) *A prohibition on the operation of power-driven vessels and vessels driven by electrical propulsion in the wetlands of the Columbia River.*
- 2) *A prohibition on towing persons on water skis, surfboards, or other similar equipment in the main channel of the*

Columbia River, at any time.[An exception has been made for trappers holding a provincial licence who require access to the wetlands year round and to the main channel during the seasonal closure. These persons operate small boats with small motors and their industry association is intensively aware of wildlife issues in the area. An exception has also been made for persons engaged in subsistence hunting and trapping (Department of Transport, 2009)].

In 2016, the final piece of the three-part Transport Canada boating regulations came into effect.

This regulation prohibits vessel operation on the main channel of the Columbia River, and its tributaries within the floodplain, to a motor with an engine power of 15 kilowatts or less (Department of Transport, 2016).

The wetlands provide important habitat for a number of migratory and resident birds (many of which are imperilled), as well as for several other wildlife species, including several considered to be at-risk, e.g. painted turtle (*Chrysemys picta*), American badger (*Taxidea taxus*), and several bat species (*Myotis spp.*). The Columbia Wetlands is located in the southern interior mountains planning area under the auspices of the Canadian Intermountain Joint Venture (CIJV) operating under the North American Waterfowl Management Plant, a bird habitat-based joint venture stretching across Canada, the United States and Mexico. The goal of the CIJV is to incorporate scientific principles and partnerships to implement habitat based conservation projects that will sustain healthy populations of migratory birds (Harrison et al. 2010). The CWWS has over time compiled a substantial database on a number of the CIJVs priority birds, including American wigeon (*Mareca Americana*), green-winged teal (*Anas crecca*), hooded merganser (*Lophodytes cucullatus*), lesser scaup (*Aythya affinis*), mallard (*Anas platyrhynchos*) and trumpeter swan (*Cygnus buccinators*).

3.0 Methods

3.1 Survey stations

The CWWS is a coordinated bird count utilizing citizen-scientists (number of volunteer participants varied from season to season) to simultaneously survey 115 survey stations in the Columbia Wetlands on specific survey dates during spring and fall migration. Surveys were scheduled to occur during peak waterfowl migration periods (spring and fall), to ensure maximal bird count in the chosen survey area. Due to the inaccessible nature of many potential survey stations within the Columbia Wetlands, the chosen survey stations were selected based on a number of factors including: accessibility, potential habitat suitability for waterbirds, local knowledge of bird clustering, private land owner permission, and known eBird data.

The CWWS survey stations encompassed a diversity of habitat types of variable sizes within the Columbia Wetlands including marshes, shallow water wetlands, adjacent agricultural fields, the Columbia River main stem and side channels. Typically, CWWS survey areas were viewed from a single viewing location, although some stations required travelling a short distance (50 meters to 2 kilometers) by car or on foot. Many survey stations were located alongside Highway 95 or Westside Road, whereas other stations required use of forestry roads (e.g. Radium Mill Pond) or walking on foot (e.g. Moberly Marsh, Fairmont Meadows). Survey stations were located at varying distances to one another. In most scenarios, volunteers lived within a relatively short distance to the stations they monitored, helping facilitate consistent monitoring to count waterbirds (Badzinski et al., 2005). Survey station descriptions including directions had been prepared and forwarded to volunteers ahead of survey dates. Spatial digital polygons for each survey station were generated on Google Earth Pro (Version 7.3.0.3832) and pdf maps were emailed to enrolled volunteers. These spatial maps were included in packages prepared for volunteers prior to the surveys, to ensure a clear understanding of areas to be covered during waterbird surveys.

3.2. Volunteer training and recruitment

In pursuit of fostering a conservation ethic in people of all ages and variable birding ability, specific efforts were made to encourage individuals of all ages and birding expertise to participate. Volunteer bird surveyors were recruited utilizing poster distribution, press releases in local newspapers, public presentations, social media, email newsletters, partnering organizations websites, word of mouth, radio interviews, magazine articles, birding fieldtrips, and Wings Over the Rockies festival guide. All CWWS volunteers were strongly encouraged to attend pre-survey workshops (training modules); a study program to enable participants to attain competence in the identification of the waterbird species most likely to be encountered during waterbird surveys.

The pre-survey workshop outlined the CWWS project goals and objectives, the CWWS survey protocol, the field datasheet that was to be used to record data, the process of online data entry using eBird, and the various techniques for counting flocks. The focus of each of these workshops was to teach identification techniques for target waterbird species. The Program Biologist of the CWWS developed this study guide to aid volunteers in the identification process, entitled ‘Columbia Wetlands Waterbird Survey: Waterbird Identification Guide.’ The guides were printed and distributed to each of the volunteer bird surveyors. Participants were encouraged to become familiar with, at a minimum, at-least all the birds in the supplied guide. Waterbirds have been defined by the Ramsar Convention as “species of bird that are ecologically dependent on wetlands” (Wetlands International, 2017). Experienced birders were assigned to monitor birds at survey stations where birds were expected to be present in highest abundance, whereas the more novice birders were appointed to survey stations with fewer birds expected, or they were partnered with birders designated by the CWWS project as experienced.

3.3 Survey protocol

During year one of the CWWS (2015), the optimal timing for surveys was chosen (i.e. peak abundance of migrant waterbird species present in the Columbia Wetlands), based upon local knowledge of the area by experienced resident birders. Following research and discussion, the following survey dates were chosen: April 24, April 29, May 4, and September 29, October 5, October 15, October 25. In the remaining years of survey effort (2016-2019) these chosen survey dates remained consistent; three bird counts occurred in the spring (April 3, 10, 16) and three counts during the fall (September 29, October 5, October 15). The bird surveys occurred on those specific dates regardless of weather conditions on the appointed date. Surveys took place from 0800-1100 hrs on each of the three spring survey dates, and from 1000-1300 hrs during the fall surveys to accommodate for recurrent early morning fog, a consistent condition often encountered in the fall. If a surveyor had multiple stations to cover, they needed to ensure that they were at their last survey station by either 1100 hrs in the spring or 1300 hrs in the fall, and counted and identified all birds at their final count.

The survey time varied at each survey station dictated by a number of factors, including: the familiarity with optical equipment, size of survey station, level of individual birding skill, and the time required to identify, count, and record the varying numbers of waterbirds present. All volunteers were instructed to remain at a survey station for the amount of time needed to count and identify all birds present. Each survey station was scanned for a minimum of five minutes, even if birds were not present. To avoid double counting of birds flying from one survey station to an adjacent station, the CWWS coordinated volunteers to attend specific survey stations simultaneously. Based on size of survey stations, expected flock sizes, station proximity and surveyor experience, some surveyors monitored several individual survey stations within a single three-hour survey period — predetermined prior to survey dates. Once at a survey station, all

surveyors were required to use either a pair of binoculars and/or spotting scope with tripod enabling the identification of waterbirds to a distance of at least 500 meters or to the edge of the wetland (whichever was closer). To ensure uniformity of this protocol, the CWWS acquired 13 sets of high optical gear (spotting scope/tripod), lent to those surveyors requiring the need of this equipment.

At each individual station, surveyors recorded total counts for each bird species present. While waterbird species were the focus of the CWWS, all bird species were identified at each station to the best of each observer's ability using both visual and aural detection techniques. Some of the stations required surveying birds at long distances; an expected impediment to positively identify birds to a species level. For unknown species, it was recommended that volunteers make best efforts to get as close as possible to assigning specific bird species names. As an example, if a volunteer believed that they were identifying either a horned or eared grebe but were unable to determine with certainty what specific species was being observed (due to marked similarity in non-breeding plumage) — those birds would be counted and recorded as 'horned/eared grebe'.

Birds that were flying overhead were not counted, unless those birds were observed to be directly related to use of wetland habitat (hunting, resting, feeding, or drinking). Not counting birds flying overhead also avoided double counting as those individual birds or flocks could potentially land at another individual's survey station and subsequently be counted twice. In addition to bird data, surveyors also recorded weather conditions, visibility, human activity, and other notable points of interest to the observer.

3.4 Data management

Subsequent to data being transcribed on hard copy data forms, all volunteers were encouraged to enter the data that they had collected in the field into the eBird Canada database maintained by the Cornell Lab of Ornithology. If they did not, hard copy forms were entered into eBird by CWWS project staff. Once submitted into the eBird database, all CWWS data was reviewed by CWWS staff and/or by an eBird reviewer. To maintain data integrity, any data uncertainties (e.g. entries of rare birds or high counts) were followed up on by CWWS staff and/or eBird reviewers, with the volunteer(s) who recorded the observation. All 2015-2019 CWWS data arising from spring and fall ground-based surveys were additionally transcribed into a standard template as defined by the British Columbia Provincial Government and subsequently submitted to the provincial data warehouse for species and ecosystems; British Columbia Species Inventory Information System (SPI). These 2015-2019 SPI datasets are available online through the provincial SPI data warehouse.

3.5 Aerial surveys

Tundra swan (*Cygnus columbianus*) and trumpeter swan species have historically been observed to migrate through the Columbia Wetlands ahead of the peak waterfowl migration window. Following the recording of previous swan counts from aerial surveys conducted in 1977, the trumpeter swan species was thought to hold potential to trigger IBA status for the Columbia Wetlands. In follow-up of this outcome, CWWS aerial surveys occurred from 2016-2019 in attempts to count the number of swans during their peak period of migration through the wetlands. The timing of the aerial swan surveys was scheduled to occur during periods of highest concentrations of swans reported by local observers and CWWS staff.

- On March 23, 2016, a fixed-wing aircraft was utilized for the swan survey. The flight began in Invermere at 0912 hrs and ended in Invermere at 1312 hrs; the survey began at the north end of Columbia Lake and extended north to Donald.
- On March 26, 2017, a helicopter was utilized as there were no fixed-winged aircraft available in the region at that time. The survey began in Golden at 1425 hrs and ended at the north end of Columbia Lake at 1525 hrs.
- The April 9, 2018 survey lasted from 1046 hrs until 1141 hrs, which was undertaken in a fixed wing aircraft. This flight departed from Invermere and headed south with the swan count beginning at the south end of Columbia Lake terminating in Golden. A ground-based count was undertaken from the south end of Columbia Lake to count any swans present there, as the aerial survey did not cover the south end of that lake.
- The April 8, 2019 survey went from 1036 hrs until 1141 hrs, and departed from Invermere, following the same flight plan as the previous year (north end of Columbia Lake to Golden). As in the previous year, a ground-based observation team was assigned to the south end of Columbia Lake to count any swans present, as the aerial survey again did not cover the south end of that lake.

It was not possible to differentiate Tundra Swans from Trumpeter Swans from their air due to the similarities between species and due to the far viewing distance to the birds. In all four years of aerial survey effort, an observation team of three-four people was utilized in addition to the pilot. Two surveyors counted all swans off their respective side of the aircraft and the number of swans seen at each location was recorded, along with the GPS coordinates. All data was entered into an excel database and locations were recorded onto a Google Earth Pro .kmz file.

3.6 Osprey surveys

Osprey (*Pandion haliaetus*) inventories were undertaken to count the number of osprey nests in the valley, in addition to determining the occupancy and use of those nests. To locate nests, a poster was designed and distributed throughout the Columbia Valley to solicit the input of local residents to identify location of known nests (Appendix 1). A press release announcing this effort was distributed to local newspapers and disseminated through social media. The Columbia Wetland and adjacent land base were surveyed by vehicle and visually scanned by observers identifying all of the nests that could be spotted in Canal Flats, Fairmont, Windermere, Invermere, Radium, Brisco, Spillimacheen, Horse Creek, Golden, as well as along Highway 95 South, and the off roads connected to this major transportation route.

The first of three rounds of nest observations were undertaken between May 6 and May 23, 2019; with the majority of nest observations occurring on May 6 and 7, 2019. The second group of nest observations were undertaken between July 25 and August 4, with the majority of observations being recorded between July 26 and 27. This second round of observations was determined to be the best windows to count early-hatched young preparing to fledge (leave the nest). Observations continued for a time frame of at least five minutes at each nest, as this is the amount of time between rest periods that chicks are thought to move about, with detection of movement being the most useful parameter to determine nest occupancy (Moore & Arndt, 2016). The final visit took place between August 6 and 26, with the majority of observations recorded on August 15 and 16, 2019. Most of the observations were recorded by the CWWS program biologist, although volunteers completed surveys at some specific nesting locations.

4.0 Results and Outcomes

As noted earlier, it is important to emphasise that while the waterbird species (waterfowl in particular) were the focal species of this project, volunteer surveyors were encouraged to record all of the birds that they could identify both aurally and visually at each survey station. Some volunteers had a more proficient birding expertise and thus, were able to more accurately count and identify a greater number of species including song birds or passerines. In total, 163 different bird species (not including additional taxa such as gull species) were identified during the five year CWWS project. A complete species list is documented in Appendix 2.

There were 115 survey stations used in total over the duration of the CWWS; of which the name and locations for all survey stations can be found in Appendix 3. During the initial year of this project in 2015, there were approximately 60 survey stations utilized. In 2016, there were 84 stations in spring, and 86 in the fall. In 2017, there were 97 stations during spring surveys, and 103 survey stations used in the fall. In spring 2018 there were 105 stations, and 106 used during fall surveys. During 2019, 102 survey stations were used in the spring, and 103 during fall of

2019. Due to unforeseen circumstances (e.g. volunteer illness, private property limitations), not all survey stations had bird surveys completed on each of the survey dates, or during each survey season.

A report entitled ‘Columbia Wetlands Waterbird Survey 2015-2017 Progress Report,’ was completed in December 2017, and reported in detail the results of the 2015-2017 waterbird surveys. To avoid repetition of that preliminary paper and its described results, this subsequent report will list only specific results of the 2018-2019 years of survey effort. In formulation of general conclusions and recommendations however, this paper will encompass information relating to all five years of collected data.

4.1 Columbia Wetlands Waterbird Survey 2018

4.1.1 Spring surveys in 2018

A total of 79 surveyors participated in waterbird surveys in the spring of 2018, with 310 surveys/checklists completed over the three survey dates (See Table 1). There were 48,266 individual birds counted during the three dates. The highest single day count occurred on April 16 when 19,925 individual birds were recorded on 104 checklists and 99 different species recorded (Table 1). The highest count for an individual species was for mallard at 4,817 individuals on April 10 (Appendix 4). The second highest species count was also for 4,023 mallard on April 16. (Appendix 4). The third highest count for an individual species also occurred on April 3, again for mallard with 3,438 individuals on April 3. A large number of birds were not identified to species level, for instance, 3,141 individual birds were recorded as unknown duck species on April 16.

The highest overall abundance of birds was recorded at ‘Brisco Rd North’, the large, shallow open-water wetland patches located between Brisco and Spillimacheen (0546084; 5633382). This area contains several large open water bodies as seen in Figures 2 and 3. On April 16th, 3,140 individual birds were sighted in a concentrated area; an estimate of 1,896 of these birds were recorded as unknown dabbling duck species seen in large rafts located 1.8-2.7 kilometers away from the observation point. There were also 704 mallard, 150 American coot (*Fulica americana*), 140 American wigeon, 125 northern pintail (*Anas acuta*), as well as 12 additional species seen at ‘Brisco Rd North’ on this date. The second highest account also occurred at Brisco Rd North on April 10 with 1,604 individual birds and 23 species. Appendix 4 provides data on the number of each individual species identified during each spring CWWS survey date.

4.1.2 Fall surveys in 2018

During the 2018 fall waterbird surveys, 105 volunteers participated on three survey dates. This was the highest amount of volunteer participation that the five-year CWWS project received (Table 1). In total 57,057 birds were recorded on 307 checklists over the three survey dates. This was the highest count over a three-day survey period during the five study years. The CWWS also had the highest single day count of the five year study period on October 15 with 20,575 individual birds recorded at 102 survey stations (see Table 1). The highest count for an individual species during the five-year project also occurred on October 10 with 6,495 American coots (Table 2) (Appendix 5). The second most abundant bird was American wigeon with 6,113 individual birds on October 15. The third highest count for an individual species was American coot with 4,892 individuals on September 29.

Similar to the 2018 spring counts, the survey station with the highest concentration of migratory birds was again at 'Brisco Rd North,' where 3,488 individuals were recorded on October 15; 1,292 were identified as American wigeon; 1,008 as dabbling duck species; 410 American coot; with 13 other species and two taxa (teal species, gull species). This was the fourth highest overall count recorded from a single survey station over the duration of the project (Table 3). The second highest concentration of birds during the fall 2018 surveys was also on October 15 with 2,728 birds at 'Golden-Mulligan's Slough'. The third highest was also on October 15 at the 'South End Lake Windermere' with 2,302 individual birds (17 species). Large concentrations of American coot and American wigeon frequently viewed from the 'South End Lake Windermere' during fall counts can be seen in Figures 4 and 5.

Table 1. Number of species, individual birds, volunteers and checklists submitted during each survey date (2015-2019).

Date	No. of Species	No. of Birds	No. of Checklists	No. of Volunteers
2015-04-24	70	5,870	62	32
2015-04-29	77	4,974	62	29
2015-05-04	82	4,047	57	35
Totals	104	14,891	181	41
2015-09-29	43	6,618	52	20
2015-10-05	63	14,086	55	27
2015-10-15	55	11,159	55	29
2015-10-25	53	6,479	60	35
Totals	83	38,342	222	63 (includes class of 20 kids)
2016-04-03	65	9,260	83	56
2016-04-10	71	9,971	86	58
2016-04-16	70	6,713	79	54
Totals	90	25,944	248	77
2016-09-29	63	13,968	78	49
2016-10-05	60	16,597	85	52
2016-10-15	63	20,822	85	57
Totals	79	51,387	248	76
2017-04-03	66	8,417	100	61
2017-04-10	69	7,871	94	63
2017-04-16	74	10,273	96	60
Totals	91	26,561	290	82
2017-09-29	81	16,884	95	51
2017-10-05	87	16,431	95	50
2017-10-15	77	17,507	95	63
Totals	94	50,822	287	85
2018-04-03	67	11,845	104	60
2018-04-10	83	16,496	102	64
2018-04-16	99	19,925	104	63
Totals	88	48,266	310	79
2018-09-29	93	16,492	105	73
2018-10-05	87	19,990	100	55
2018-10-15	82	20,575	102	65
Totals	89	57,057	307	105
2019-04-03	78	8,285	101	63
2019-04-10	96	8,626	101	67
2019-04-16	93	8,666	99	69
Totals	94	25,577	301	92
2019-09-29	76	11,892	101	57
2019-10-05	94	15,750	102	66
2019-10-15	86	13,453	102	61
Totals	90	41,095	305	97

Table 2. The ten highest species counts during the 2015-2019 CWWS.

Date	Species	No. of individuals
2018-10-05	American coot	6,495
2018-10-15	American wigeon	6,113
2017-09-29	American coot	5,070
2018-09-29	American wigeon	4,842
2018-04-10	mallard	4,817
2016-10-05	American wigeon	4,785
2018-10-15	American coot	4,385
2017-10-15	American wigeon	4,369
2018-04-16	mallard	4,023
2016-09-29	mallard	3,989



Figure 2. Brisco Rd North survey area as seen from the air during an aerial survey on October 10, 2017.



Figure 3. Brisco Rd North showing part of large bird concentration present as viewed from focal point at survey station on October 5, 2017.

Table 3. Survey stations with highest bird abundance during the 2015-2019 study period.

No.	Survey Station (n=115)	Total # of Individuals	Total # of species	Date
1	Columbia NWA (Wilmer Unit) - Richies Point	4,601	18	Oct 15/2016
2	South End Lake Windermere	4,587	17	Sept 29/2017
3	Columbia NWA (Wilmer Unit) - Richies Point	3,593	6	Oct 5/2015
4	Brisco Rd North	3,488	18	Oct 15/2018
5	Brisco Rd North	3,140	21	Apr 16/2018
6	South End Lake Windermere	2,955	9	Oct 15/2017
7	Golden-Mulligans Slough	2,728	7	Oct 15/2018
8	South End Lake Windermere	2,582	23	Oct 5/2016
9	South End Lake Windermere	2,505	20	Oct 5/2017
10	Columbia NWA (Wilmer Unit) - Richies Point	2,372	13	Sept 29/2017
11	South End Lake Windermere	2,302	17	Oct 15/2018
12	Columbia NWA (Wilmer Unit) - Richies Point	2,299	14	Oct 5/2017
13	Brisco Rd North	2,183	18	Oct 15/2019
14	Friends of Columbia Wetland (Richies Point)	2,178	16	Oct 5/2019
15	Fairmont--meadows	2,144	13	Sept 29/2016
16	South End Lake Windermere	2,120	15	Oct 5/2018
17	Friends of Columbia Wetland (Richies Point)	2,097	17	Oct 15/2019
18	Friends of Columbia Wetland (Richies Point)	2,070	15	Sept 29/2019
19	Columbia NWA (Wilmer Unit) - Richies Point	1,983	11	Sept 29/2015
20	Brisco Rd North	1,982	4	Oct 15/2016
21	Brisco Rd North	1,978	20	Oct 5/2018
22	Columbia NWA (Wilmer Unit) - Richies Point	1,972	26	Apr 16/2018
23	South End Lake Windermere	1,924	16	Oct 5/2019
24	Golden-Mulligans Slough	1,888	7	Oct 15/2016
25	Columbia NWA (Wilmer Unit) - Richies Point	1,888	14	Sept 29/2016
26	Brisco Rd North	1,839	9	Sept 29/2017
27	South End Lake Windermere	1,827	9	Sept 29/2019
28	Lake Windermere--Rushmere Road	1,817	19	Apr 16/2017
29	South End Lake Windermere	1,811	21	Oct 15/2016
30	Columbia NWA (Wilmer Unit) - Richies Point	1,793	13	Sept 29/2018



Figure 4. Large concentration of American coot and American wigeon as seen from the South end of Lake Windermere on October 10, 2018.



Figure 5. Large concentration comprised primarily of American coot and American wigeon as seen from the South end of Lake Windermere on October 10, 2018.

4.1.3 Aerial swan survey in 2018

During the aerial survey, a large concentration of trumpeter/tundra swans was seen in the wetlands complex between Brisco and Spillimacheen, estimated at 180 individuals. There was also a large concentration of swans located at the Columbia National Wildlife Area - Wilmer Unit; that flock size was estimated to be 140 individuals. The total count for trumpeter/tundra swans on April 9, 2018 was 915 individuals; specific flock sizes and their respective locations can be found in Appendix 6.

4.1.4. Outreach and communication activities in 2018

In 2018, the CWWS developed, printed and distributed a four-page newsletter that described the CWWS project assisting in increasing awareness relating to volunteer opportunities, bird species at risk, and bird conservation issues and efforts. Previous to fall and spring surveys, posters were designed and distributed throughout the Columbia Valley to promote opportunities to participate in surveys and free training sessions. Additional communication strategies were utilized relating to the promotion of volunteer opportunities and survey results, including: eBlast materials, website content on the Wildsight website, information in Wildsight newsletters (WildTimes), information article in the Wings Over the Rockies festival guide, information in Kootenay Conservation Program and Columbia Mountains Institute e-newsletters, and press releases for local newspapers. A total of seven articles were published in The Golden Star and The Columbia Valley Pioneer relating to the CWWS activities (Appendices 7 and 8). There were 161 elementary school-aged children assembled for birding watching field trips, who along with 13 supervising adults participated in these field trips for instruction in wetlands ecology and bird identification. Two additional educational bird walks were also offered and provided to the public.

In addition to field trips, this project was promoted throughout its five-year lifecycle with public presentations, event booths and ongoing training opportunities. Training modules to teach volunteers about bird identification, along with major goals of the CWWS, were presented annually on two separate occasions prior to each survey period — each of which included both field training and classroom training sessions. A CWWS educational booth was erected at Golden's Farmers Markets on four occasions, as well as at the Wings Over the Rockies gala event in Invermere, and at the premises of Tourism Golden on Highway 1. Presentations on the CWWS were delivered to the Columbia Wetlands Stewardship Partners Annual General Meeting, Wildsight's Columbia River Field School, Akisqnuk Chief and Council meetings, and students of a sustainable tourism program offered through the College of the Rockies, Golden campus. All of these presentations focused on the goals of the CWWS project, results accumulated to date and the importance of citizen-science involvement and bird identification methodology.

4.2 Columbia Wetlands Waterbird Survey 2019

4.2.1 Spring surveys in 2019

The CWWS coordinated a total of 92 people to participate in spring 2019 waterbird surveys to count 25,577 birds (Table 1). There were 301 surveys/checklists completed over the three survey dates. All of the survey dates were similar in terms of total number of birds counted, with 8,285 recorded on April 3; 8,626 birds on April 10; and 8,666 birds on April 16 (Table 1). On all three dates, the most abundant species was mallard; April 3 with 2,015 individuals; April 10 with 1,939; and April 16 with 1,614 individuals (Appendix 4). The survey station/checklist that had the highest bird count in spring 2019 occurred on April 10 at 'Brisco Rd North' where 953 individual birds were sighted; 349 of these were American wigeon with 299 mallard, 172 duck species, 11 other species as well as trumpeter/tundra Swan, and gull species. The second highest bird count occurred at 'Lake Windermere--Lakeshore Resort Campground' with 861 individuals on April 16.

4.2.2 Fall surveys in 2019

During the 2019 fall waterbird surveys, 90 volunteers participated on three survey dates and in total, 41,095 birds were recorded on 305 checklists. The highest single day count in 2019 occurred on October 10 with 15,750 birds, recorded at 102 survey stations (see Table 1). The highest count for an individual species occurred on October 10 with 3,577 American coot (Table 2) (Appendix 5). The second highest species count was for American wigeon with 3,405 individual birds on October 10. The third highest count for a species was for American wigeon with 3,160 individuals on October 15. Appendix 5 provides further data on the number of each individual species counted on each of the fall CWWS survey dates.

The survey station with the highest bird concentration was recorded on October 15 at 'Brisco Rd North' with 2,183 birds (Table 3); 978 were American wigeon with 522 mallard, 12 other species with two additional taxa (e.g. duck species). The second highest bird concentration during fall 2019 was at 'Friends of Columbia Wetland (Richies Point)' (also known as Columbia National Wildlife Area – Wilmer Unit) with 2,178 individuals on October 5; 1,016 American wigeon and 816 American coot with 12 other species and two additional taxa. The third largest concentration of birds was also seen at 'Friends of Columbia Wetland (Richies Point)' (again, also known as Columbia National Wildlife Area – Wilmer Unit), on September 29 with 2,070 birds: 1,035 were American wigeon and 620 were recorded as American coot; 11 additional species were present with 2 other taxa.

4.2.3 Aerial swan survey in 2019

The largest concentration of swans was observed in the Harrogate area with 84 trumpeter/tundra swans. The total count for trumpeter/tundra swans during the 2019 aerial survey was 669 individuals; specific flock sizes and their respective locations can be found in Appendix 9. A summary table for all of the aerial swan surveys completed during the duration of the CWWS project is seen in Table 4.

Table 4. Total counts for trumpeter/tundra swans during 2016-2019 aerial swan surveys.

Date	No. of swans
March 23, 2016	756
March 26, 2017	621
April 9, 2018	915
April 8, 2019	669

4.2.4 Osprey inventory in 2019

There were a total of 60 osprey nests identified and located in the Columbia Valley in 2019. A complete list of locations and observations are listed in Appendix 10. Of the 60 nests, 43 nests (71.7% of located nests) were observed to have some level of osprey activity in 2019; from nest building alone, to fledgling stage. Of the active nests located, 31 of those nests produced chicks that are assumed to have survived to fledgling stage. Eight of the 60 nests were located in trees; one was on a cell phone tower; whereas 51 of the nests were located on top of hydroelectric poles, most of which were located along Highway 95 South.

Of note, there was a single report of a vehicle collision with an osprey fledgling near a nest in Parson (UTM: 520568, 5661842). There was also a recorded incident with two deceased chicks found at a single pole nest located in the Town of Golden (UTM: 502028, 5682396). The Golden Fire Department with the available resident ladder truck cooperated on this second account to remove the dead chicks from the nest. During the chick removal by the fire department, an adult osprey was observed flying towards the nest with a fish in its bill. The chick carcasses were subsequently delivered to the 'Little Mittens Animal Rescue Association,' and the resident permitting officer transferred the bodies to Cranbrook for a necropsy (Allanah Knapp, personal communication, August 2019). Results of the necropsy were not available at time of this report.



Figure 6. Pair of adult osprey seen copulating at a nest located on top of a hydro pole near Harrogate.

4.2.5 Outreach and communication in 2019

Multiple venues of CWWS educational activities and outreach events took place in 2019 including:

- CWWS presentations (including outcomes and results) delivered at the:
 - Wildsight Golden Annual General Meeting
 - Field trip tour for the Technical Committee of the Columbia Valley Local Conservation Fund
 - British Columbia Field Ornithologists Annual General Meeting
 - Wildsight's Columbia River Field School
 - Columbia Mountains Institute Researchers Forum
 - Columbia Wetlands Stewardship Partners Annual General Meeting
- Seven in-class and field training sessions for volunteers of the project were provided to those whom wanted to advance their bird identification skills.
- Five guided bird walks offered to the public.
- CWWS educational booths at two separate Golden Famer's Markets during the summer.
- Landowner outreach visits with subsequent installation of ten nesting boxes (designed for cavity nesting waterfowl) were erected on private property in the Columbia Valley; the properties were either within or directly adjacent to the Columbia Wetlands. Nest boxes were provided by the Windermere Rod and Gun Club, mounted on cedar posts and erected in locations where habitat was limited, according to Best Practices for installation [e.g. pole/post mount (not tree), predator guard in place, nesting cavity six feet off the ground] (Bailey & Bonter, 2017; Ducks Unlimited Canada, n.d.).



Figure 7. Nest box installed at Dorothy Lake in Invermere for cavity nesting waterfowl.

4.3 Bird species at risk in the Columbia Wetlands

There are 30 at-risk bird species that utilize habitat of the Columbia Wetlands. At-risk birds recorded during the 2015-2019 waterbird surveys are as follows: tundra swan, surf scoter (*Melanitta perspicillata*), double-crested cormorant (*Phalacrocorax auritus*), American white pelican (*Pelecanus erythrorhynchos*), American bittern (*Botaurus lentiginosus*), eared grebe (*Podiceps nigricollis*), horned grebe (*Podiceps auritus*), western grebe (*Aechmophorus occidentalis*), great blue heron (*Ardea herodias herodias*), rough-legged hawk (*Buteo lagopus*), long-billed curlew (*Numenius americanus*), California gull (*Larus californicus*), peregrine falcon (*Falco peregrines*), and bank swallow (*Riparia riparia*). At various times through the course of the study each of these species was detected over the study years as illustrated in Table 5.

Additional at-risk bird species known to occur in the Columbia Wetlands through eBird records, but that were not detected during the CWWS (likely due to the timing window of surveys) include: common nighthawk (*Chordeiles minor*), Lewis's woodpecker (*Melanerpes lewis*), short-eared owl (*Asio flammeus*), barn swallow (*Hirundo rustica*), bobolink (*Dolichonyx oryzivorus*), rusty blackbird (*Euphagus carolinus*), evening grosbeak (*Coccothraustes vespertinus*), olive-

sided flycatcher (*Contopus cooperi*), caspian tern (*Hydroprogne caspia*), Swainson's hawk (*Buteo swainsoni*), broad-winged hawk (*Buteo platypterus*), black swift (*Cypseloides niger*), white-throated swift (*Aeronautes saxatalis*), American avocet (*Recurvirostra Americana*), and red-necked phalarope (*Phalaropus lobatus*). Table 6 documents these at-risk bird species along with their corresponding designations for at-risk status under provincial, federal (under Species at Risk Act (SARA), Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and under the International Union for Conservation of Nature (IUCN).

Table 5. Species at risk and their number of detections during the 2015-2019 CWWS.

Year	GBHE		HOCR		EAGR		WEGR		HOCR/EAGR		BKSW		AWPE		TUSW		LBCU		CAGU		AMBI		SUSC		RLHA		DCCO		PEFA	
	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
2015	22	20	6	7	2	0	4	8	1	0	3	0	2	0	3	4	0	1	0	5	1	0	0	1	0	0	0	0	0	0
2016	20	28	4	4	0	3	0	7	0	3	0	0	0	0	7	1	0	0	1	4	1	0	0	1	1	0	0	0	0	0
2017	16	26	0	5	0	1	0	8	0	6	0	0	0	0	7	2	0	1	2	3	0	0	0	0	0	5	0	0	0	1
2018	18	28	1	9	0	5	0	9	0	11	0	0	0	0	11	1	0	0	4	3	0	0	0	0	0	0	0	0	0	0
2019	9	14	2	8	0	1	0	17	1	6	0	0	0	1	15	3	0	0	3	4	0	0	0	0	1	0	2	0	0	0

Note: GBHE = great blue heron; HOCR = horned grebe; EAGR = eared grebe; BKSW = bank swallow; AWPE = American white pelican; TUSW = Tundra swan; LBCU = long-billed curlew; CAGU = California gull; AMBI = American bittern; SUSC = surf scoter; RLHA = rough-legged hawk; DCCO = double-crested cormorant; PEFA = peregrine falcon.

Table 6. Bird species-at-risk in the Columbia Wetlands.

English name	Scientific name	Provincial	BC List	SARA Status	COSEWIC status	IUCN Red List Category	IUCN population trend	CWWS recorded
Western Grebe	<i>Aechmophorus occidentalis</i>	S1B,S2N (2015)	Red	1-Special Concern (2017)	Special Concern (2014)	Least Concern	decreasing	yes
Horned Grebe	<i>Podiceps auritus</i>	S4B (2015)	Yellow	1-Special Concern	Special Concern(2009)	Vulnerable	decreasing	yes
Eared Grebe	<i>Podiceps nigricollis</i>	S3B (2015)	Blue	n/a	n/a	Least Concern	unknown	yes
Tundra Swan	<i>Cygnus columbianus</i>	S3N (2015)	Blue	n/a	n/a	Least Concern	unknown	yes
Great Blue Heron	<i>Ardea herodias herodias</i>	S3? (2017)	Blue	n/a	n/a	Least Concern	increasing	yes
American Bittern	<i>Botaurus lentiginosus</i>	S3B (2015)	Blue	n/a	n/a	n/a	n/a	yes
Rough-legged Hawk	<i>Buteo lagopus</i>	S3N (2015)	Blue	n/a	Not-at-Risk (1995)	Least Concern	stable	yes
Barn Swallow	<i>Hirundo rustica</i>	S3S4B (2015)	Blue	1-Threatened (2017)	Threatened (2011)	Least Concern	decreasing	yes
Bank Swallow	<i>Riparia riparia</i>	S4B (2015)	Yellow	1-Threatened (2017)	Threatened(2013)	Least Concern	decreasing	yes
Long-billed Curlew	<i>Numenius americanus</i>	S3B (2015)	Blue	1-Special Concern (2005)	Special Concern (2011)	Least Concern	decreasing	yes
Surf Scoter	<i>Melanitta perspicillata</i>	S3B,S4N (2015)	Blue	n/a	n/a	Least Concern	decreasing	yes
American White Pelican	<i>Pelecanus erythrorhynchos</i>	S1B (2015)	Red	Not-at-risk (1987)	n/a	Least Concern	increasing	yes
California Gull	<i>Larus californicus</i>	S2S3B (2015)	Blue	n/a	n/a	Least Concern	decreasing	yes
Peregrine Falcon	<i>Falco peregrinus anatum</i>	S2? (2011)	Red	1-Special Concern (2012)	Not-at-Risk (2017)	Least Concern	increasing	yes
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	S3S4 (2015)	Blue	n/a	Not-at-Risk (1978)	Least Concern	increasing	no
Bobolink	<i>Dolichonyx oryzivorus</i>	S3B (2015)	Blue	1-Threatened (2017)	Threatened (2010)	Least Concern	decreasing	no
Common Nighthawk	<i>Chordeiles minor</i>	S4B (2015)	Yellow	1-Threatened (2010)	Special Concern (2018)	Least Concern	decreasing	no
Caspian Tern	<i>Hydroprogne caspia</i>	S3B (2015)	Blue	n/a	Not-at-Risk (1999)	Least Concern	increasing	no
Rusty Blackbird	<i>Euphagus carolinus</i>	S3S4B (2015)	Blue	1-Special Concern (2009)	Special Concern (2017)	Vulnerable	decreasing	no
Swinson's Hawk	<i>Buteo swainsoni</i>	S2B (2015)	Red	n/a	n/a	Least Concern	stable	no
Lewis's Woodpecker	<i>Melanerpes lewis</i>	S2S3B (2015)	Blue	1-Threatened (2012)	Threatened (2010)	Least Concern	decreasing	no
Black Swift	<i>Gypseloides niger</i>	S2S3B (2015)	Blue	1-Endangered (2019)	Endangered (2015)	Least Concern	decreasing	no
White-throated Swift	<i>Aeronautes saxatalis</i>	S3S4B (2015)	Blue	n/a	n/a	Least Concern	decreasing	no
American Avocet	<i>Recurvirostra americana</i>	S2S3B (2015)	Blue	n/a	n/a	Least Concern	stable	no
Red-necked Phalarope	<i>Phalaropus lobatus</i>	S3S4B (2015)	Blue	n/a	Special Concern (2014)	Least Concern	decreasing	no
Broad-winged Hawk	<i>Buteo platypterus</i>	S3?B (2015)	Blue	n/a	n/a	Least Concern	increasing	no
Short-eared Owl	<i>Asio flammeus</i>	S3B,S2N (2015)	Blue	1-Special Concern (2012)	Special Concern (2008)	Least Concern	decreasing	no
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	S5 (2015)	Yellow	1-Special Concern (2019)	Special Concern (2016)	Vulnerable	decreasing	no
Olive-sided Flycatcher	<i>Contopus cooperi</i>	S3S4B (2015)	Blue	1- Threatened (2010)	Special Concern (2018)	Near Threatened	decreasing	no
Prairie Falcon	<i>Falco mexicanus</i>	S1 (2018)	Red	n/a	Not-at-Risk (1996)	Least Concern	increasing	no

Note - those species detected during the 2015-2019 Columbia Wetlands Waterbird Survey (CWWS) are indicated in the last column; other at-risk species are known of occurring in the Columbia Wetlands through eBird records.

4.4 General observations between 2015-2019 survey years

Greater-white fronted geese were only observed during fall 2017 and fall 2019 (Appendices 4 and 5). An observation of cackling geese (5 individuals) was reported on only one survey date; September 29, 2017. Double-crested cormorant were not seen during spring surveys, but single individuals were detected during fall 2019 at two locations, both on October 5. American white pelican were observed on three survey dates: May 4, 2015 when 16 individuals were seen at two locations; a single pelican was seen on September 29, 2019 and October 5, 2019. The single American white pelican was recorded on two dates in 2019 (likely the same individual), as it was injured, later captured and euthanized at the Invermere Veterinary Clinic. Black-necked stilt (*Himantopus mexicanus*) were seen during the spring only, on four survey dates: April 29, 2015; May 4, 2019; April 16, 2018; April 16, 2019. Red-breasted merganser (*Mergus serrator*) were seen on seven survey dates, a rare visitor to the Columbia Wetlands. Cinnamon teal (*Spatula cyanoptera*) was infrequently encountered, as was barrow's goldeneye (*Bucephala islandica*). Gadwall (*Mareca strepera*) were rarely detected during spring surveys, but more frequently encountered during fall survey dates. Surf scoter and white-winged scoter (*Melanitta deglandi*) were seen four times each respectively over the five-year study period; both of these species are considered to be rare visitors to the Columbia Wetlands. Eurasian Wigeon (*Mareca penelope*), a non-native species, was detected on six survey dates during 2015-2019 waterbird surveys. There was one long-tailed duck (*Clangula hyemalis*) observed over the duration of the project, this rare encounter was from Moberly Marsh in Burges James Gadsden Provincial Park on April 29, 2015. Long-billed dowitcher (*Limnodromus scolopaceus*) were not seen during spring surveys, but were frequently encountered during fall surveys. All other shorebird species were also infrequently detected (Appendices 4 and 5).

There were relatively small numbers of the following species detected during the duration of the CWWS: ruddy duck (*Oxyura jamaicensis*), greater scaup (*Aythya marila*), lesser scaup, blue-winged teal (*Spatula discors*), canvasback (*Aythya valisineria*), and redhead (*Aythya americana*). Whereas there were relatively large numbers of the following species encountered during waterbird surveys in all years of survey effort: American coot, Canada goose (*Branta canadensis*), American wigeon, mallard, northern pintail, and green-winged teal.

The following diving ducks species were also observed to be relatively common during all waterbird survey years: ring-necked duck (*Aythya collaris*), common goldeneye (*Bucephala clangula*), hooded merganser, common merganser (*Mergus merganser*), and bufflehead (*Bucephala albeola*). Trumpeter and/or Tundra swans were seen during each survey date, but Trumpeter swan were likely the more prevalent of the two species, as described previously. The highest swan count during the ground-based surveys was with 872 individual swans on April 3, 2018; 197 were trumpeter swan, 52 were identified as Tundra swan, and 623 could not be

identified to species level (trumpeter/tundra swan), generally because they were too far away and the two species are very similar in appearance (Appendix 4).

Five species of grebe were detected in the Columbia Wetlands: eared grebe, horned grebe, pied-billed grebe (*Podilymbus podiceps*), red-necked grebe (*Podiceps grisegena*) and western grebe (Figures 8 and 9); three of which are at-risk species. The grebe species detected most frequently were the pied-billed grebe and red-necked grebe. The highest count for a grebe was for the western grebe with 295 individuals seen at 13 different survey stations on October 5, 2019; 224 of those 295 were seen on the open water of Lake Windermere as observed from the Baltac Beach survey station. Peak migration for grebe species tends to occur slightly after the CWWS survey dates in both spring and fall; grebe species counts are anticipated to be higher if survey dates were adjusted to be slightly later during both the spring and fall.

The highest overall three-day seasonal count was during the fall of 2017 with 50,822 individuals. The highest single-day count was on October 15, 2018 with 20,575 birds; the second highest single day count was on April 16, 2018 with 19,925 individuals. The fall surveys usually produced higher counts than the spring surveys. With the exception of the first surveys in 2015 (given the lower amount of survey effort), the average fall count was 16,697 individuals and the average spring count was 10,529 birds. American wigeon, mallard and American coot were the species detected in highest abundance for bird species present in the Columbia Wetlands ecosystem during spring and fall bird migration periods (Table 2).

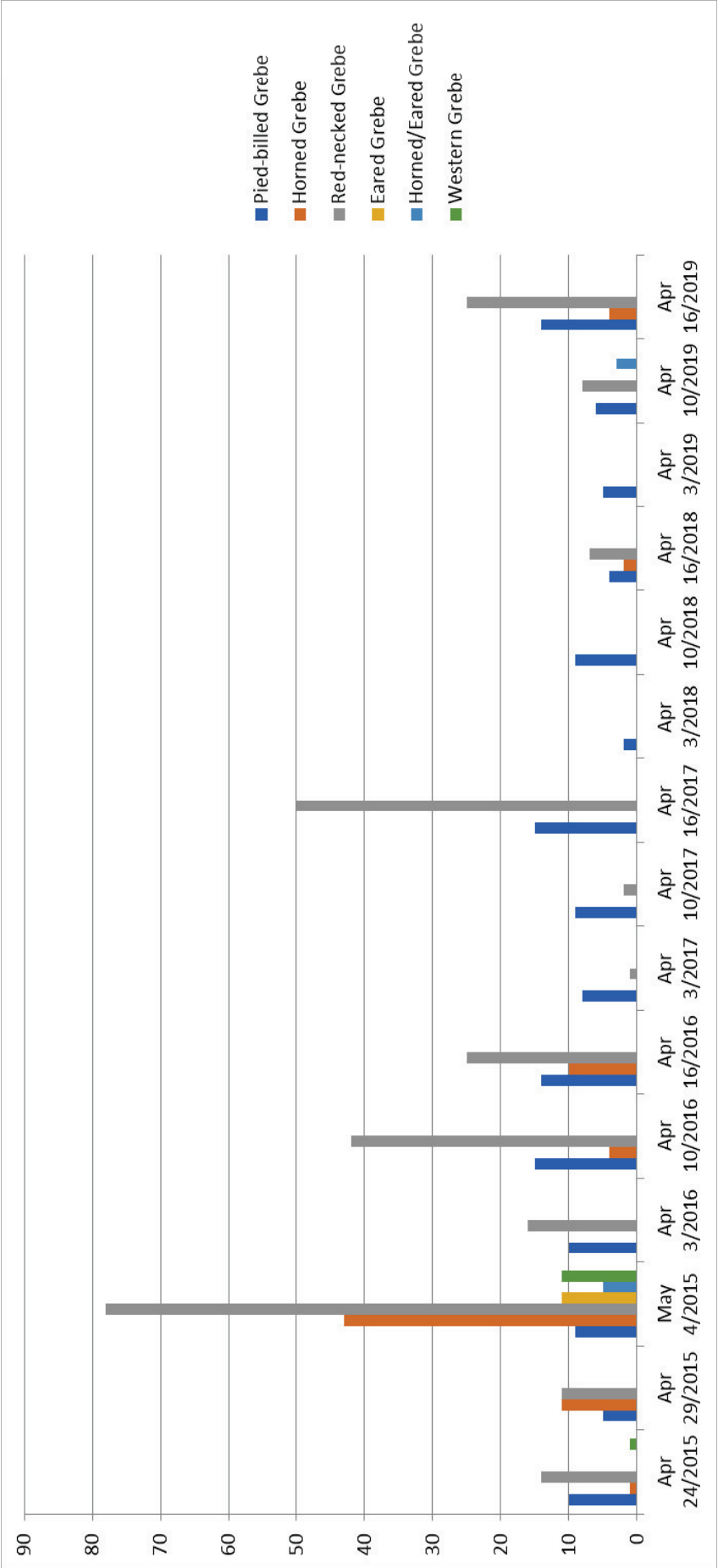


Figure 8. Grebe species distribution in the Columbia Wetlands across 2015-2019 survey dates during spring bird migration.

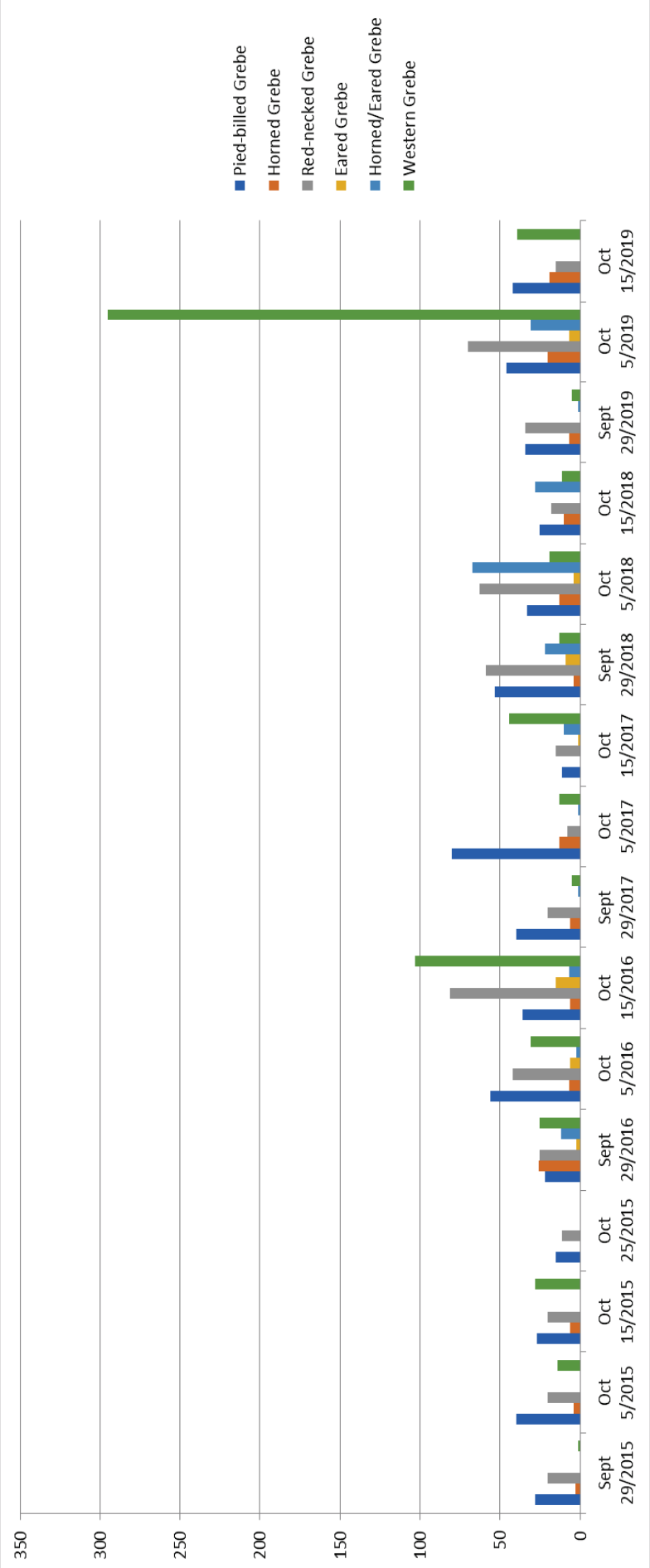


Figure 9. Grebe species distribution in the Columbia Wetlands across 2015-2019 survey dates during fall bird migration.

5.0 Discussion

5.1 Waterbird populations of note in the Columbia Wetlands

Throughout the years of CWWS survey effort, bird counts were considerably higher during the fall with an average of 16,697 individuals, compared to an average of 10,529 birds during spring counts. This is understandable as the fall counts include the surviving young of the year's hatch. An additional consideration relating to spring migration is that spring migrants tend to pass through quickly on their way to the breeding grounds; whereas during the fall, migrants tend to linger, rest and forage for food which is needed to accumulate energy reserves before heading south for winter (Entech Environmental Consultants, 1978).

As noted earlier, the highest single day count was on October 15, 2018 with 20,575 birds. However, the waterbird surveys were only able to cover approximately 39% of the contiguous Columbia Wetlands ecosystem and it can be safely assumed that more birds were present in the entire ecosystem on this date; a statement that would also apply to all the other waterbird survey dates. The CWWS also conducted an aerial survey on October 8, 2017 that documented an estimated 7,156 birds at 216 inaccessible locations of the Columbia Wetlands, which were areas not covered by regular ground-based survey stations (Darvill, 2017). Previously it was reported that many more birds and possibly several hundred thousand birds travel through the Columbia Wetlands during the entire migration period (Entech Environmental Consultants, 1978). After a series of 15 aerial surveys completed by the Canadian Wildlife Service in 1976-1977, Kaiser, McKelvey & Smith (1977) reported that, "[the Columbia Wetlands] is probably the most important migration corridor in British Columbia and competes with the coast in its ability to hold and feed large numbers of birds at critical moments during their annual migrations."

The Columbia Wetlands hold important populations of mallard, American wigeon and American coot; the most abundant species' recorded during all study years. The aerial surveys conducted by Kaiser, McKelvey & Smith (1977) stated that mallards were the most common duck in the Columbia Valley during all seasons, and that "extremely large numbers of wigeon are seen during migration," especially on large water bodies such as Lake Windermere. The CWWS data however records that higher numbers of American coot and wigeon were present when compared to mallard, but there were also large numbers of unidentified duck species that could have considerably added to any of the species counts had birds been identified to species level.

Also of note, the American coot population may have decreased in the Columbia Wetlands in recent years. Kaiser, McKelvey & Smith (1977) reported large flocks of American coot at the Columbia National Wildlife Area - Wilmer Unit (also known as Friends of Columbia Wetland (Richies Point in the CWWS), and at large open water bodies between Brisco and Golden, but that the largest concentrations were found at the south end of Lake Windermere. On October 5,

1977 there were 20,902 American coot recorded in the contiguous study area (Kaiser, McKelvey & Smith, 1977). In comparison, the highest count for coot during the CWWS project, was also on October 5, 2018, but with only 6,495 American coots (1,860 of which were reported from South End Lake Windermere). Again, a significant point to note is that the CWWS only covered about 39% of the ecosystem, whereas the 1977 aerial surveys covered the entire ecosystem. Notwithstanding, the numbers of coots are significantly lower in this five-year survey when compared to data in the 1977 report.

Kaiser, McKelvey & Smith (1977) reported that the Columbia Wetlands provided habitat for important concentrations of swans; 1,200 swans were observed during aerial surveys on March 28, 1977. While the CWWS did not have swan counts as high as this, survey effort during 2016-2019 was limited to one aerial survey per year. The 2016-2019 aerial swan data that was collected supports the conclusion that the Columbia Wetlands are of important habitat value to swans. Kaiser, McKelvey & Smith (1977) also reported high numbers of redhead, and that “in the spring of 1977, there was a spectacular influx of blue-winged and cinnamon teal.” The CWWS did not identify high numbers of these three species.

Merilees (1976) reported that there were 46 osprey nests detected along the Columbia Wetlands in 1976, whereas the CWWS detected 60 nests in 2019 and it is likely that they were additional tree nests that went undetected in less accessible areas (e.g. wetlands between Radium and Brisco). The increase in osprey nests over the past 44 years likely owes in part to the effort that BC Hydro has employed erecting numerous nesting poles along Highway 95 South, especially between Golden and Spillimacheen. Beebe (1974) reported that “ospreys were extremely abundant along the Columbia River, where the highest density in British Columbia has been reported.” It is unknown if the Columbia Valley still has the highest nesting density of osprey in BC.

5.2 Areas with highest bird abundance during migration

Data from this project supports the premise that waterbirds during bird migration are not distributed equally throughout the Columbia Wetlands. The CWWS results indicate that specific areas are more important than others in terms of habitat value provided to waterbirds during periods of bird migration. Lake Windermere and Columbia Lake appear to provide the most important habitat to grebe species during migration, especially for horned grebe, red-necked grebe and western grebe (Darvill, 2019). Previous research documented that most of the American coots and diving ducks of the Columbia Wetlands are found on Lake Windermere and Columbia Lake; whereas most of the dabbling ducks and geese are found evenly distributed amongst the Columbia River marshes (Entech Environmental Consultants, 1978). This is somewhat in contradiction to the results of the CWWS project in that the highest concentration of coots were detected at the south end of Lake Windermere, but specific survey stations

(‘Columbia National Wildlife Area - Wilmer Unit’ also known as ‘Friends of Columbia Wetland (Richies Point),’ ‘South End Lake Windermere,’ and ‘Brisco Rd North’ repeatedly had the highest overall waterbird counts. All three of these wetland habitat areas are similarly identified as large patches of shallow open water. These three areas consistently had high concentrations of birds during migration, they are distant enough from the shoreline for birds to feed undisturbed (Evans & Day, 2002) from humans and predators with ample supplies of food (submerged aquatic vegetation and invertebrates). Recognizing these areas as a safe haven for migratory birds, these three areas are of particular interest for conservation purposes.

The Wilmer Unit of the Columbia National Wildlife Area (NWA) is already protected under federal legislation. The Canadian Wildlife Service manages this area and maintains it “as wetland habitat for the primary benefit of migrating waterfowl with secondary benefits for other wetland-dependent wildlife, fish, and plant species, especially those species considered rare, threatened, or endangered” (Environment and Climate Change Canada, 2017). Human activities including recreational boating and hunting are not permitted in the NWA. The south end of Lake Windermere is also protected (to some degree) in that the far southern end of Lake Windermere is within the boundaries of the Columbia Wetlands Wildlife Management Area (WMA). The ‘Brisco Rd North’ survey station is also largely blanketed with the WMA designation, although there are individual private land parcels within this wetland complex.

While the WMA status is important for conservation in these areas, the WMA management plan does allow for recreational activities as well as hunting. As mentioned previously, several studies (e.g. Korschgen & Dahlgren, 1992; Hockin et al., 1992; Korschgen, George & Green, 1985; Liddle & Scorgie, 1980; York, 1994) have reported a wide range of potentially detrimental behavioural patterns for waterbirds in response to recreationists, whether intentional or not, including:

- multiple flushing and extended flight times resulting in increased energy expenditure by birds
- reduction of energy intake activities, including lost foraging opportunities and fewer resting periods
- lowered productivity during nesting
- increased incidences of nest abandonment and egg loss
- discouragement of breeding in late-nesting pairs as recreational traffic increases in spring
- disruption of pair bonding and parent-offspring bonds
- reduced use of feeding, resting and breeding sites

Repetitive disturbances eventually cause ducks and other nesting species to nest elsewhere or not at all (Korschgen & Dahlgren, 1992).

Hunting also affects bird distribution, abundance and behaviour (Casas, Mougeor, Vinuela & Bretagnolle, 2009; Fox & Madsen, 1997; Sokos, Birtsas, Connelly & Papaspyropoulos, 2013). Behavioural responses of birds to hunting activities include increased flight times and less time spent foraging, feeding and resting, which increases the amount of energy required for bird survival (Casas, Mougeor, Vinuela & Bretagnolle, 2009). Madsen (1998) showed that waterfowl hunting caused waterfowl species to be displaced, which resulted in a waterfowl community that was species-poor.

Published research documents have shown that hunting-free refuges can help mitigate the behavioural disturbances caused to birds through hunting activities (Casas, Mougeor, Vinuela & Bretagnolle, 2009) benefiting numerous bird species including species at risk as well as additional species experiencing population declines. Freedom of disturbance to birds is an important measure of establishing effective waterfowl management in designated nature conservation areas (Fox & Madsen, 1997). Establishing refuges, Migratory Bird Sanctuaries, or reserves of some kind that are protected from human use and resulting impacts is likely an important conservation tool to help mitigate and reduce recognized stressors within the two identified geographical components of the WMA that are documented to have high concentrations of birds during migration. Creating human-free refuges can create a nucleus of migratory bird activity, in a region or ecosystem (i.e. Columbia Wetlands) that also provides opportunities for hunters (Giroux & Bédard 1988). “Refuge creation is an efficient management tool to improve the conservation value and biodiversity of wetlands of importance to waterfowl (Madsen, 1998). Buffer zones between refuge and hunting areas can also be a useful management tool for preventing displacement of birds caused by hunting disturbance outside of refuges (Holm, Laursen & Clausen, 2011).

The three most important areas documenting consistent abundant numbers of high bird populations during migration should be considered as potential refuges or Migratory Bird Sanctuaries. Given social values and subsistence harvesting needs, it is recognized that any adaptive management strategy to protect migratory bird populations in the Columbia Wetlands that encompasses the concept of establishing a bird sanctuary or reserve, would need to be carefully weighed and measured with varying levels of government, multi-stakeholder group input, and multidisciplinary experts (Sokos, Birtsas, Connelly & Papaspyropoulos, 2013).

5.3 How the Columbia Wetlands may satisfy IBA criteria

Bird Studies Canada has been working in partnership with BirdLife International to identify and document those sites that are vital to the conservation of the world’s birds (Moore & Couturier, 2011). There are a number of criteria for identifying IBAs within Canada. Based on the data

collected within the five year CWWS study and through additional research, the Columbia Wetlands meet the following criteria, and as such qualify for designation as an IBA:

1. Trumpeter swan – The regional threshold for this species is 340 individuals. While the aerial swan survey completed during the 2016-2019 study years was unable to differentiate between trumpeter and tundra swans, the majority of swans seen during surveys are assumed to be trumpeter swans given that they are the most common swan species seen in the Columbia Wetlands during CWWS ground-based surveys and according to eBird records. Total single-day counts during aerial surveys were as follows: 2016 = 756 swans; 2017 = 621 swans; 2018 = 915 swans; and 2019 = 669 swans (Table 4).
2. Horned grebe – This species is listed as ‘Vulnerable’ by the International Union for the Conservation of Nature (IUCN) and is classified as a globally threatened bird. The threshold for an IUCN Red List species categorized as ‘Vulnerable,’ is 10 pairs or 30 individuals (Moore & Couturier, 2011). As of September 24 2019, there were 265 species occurrences for horned grebe in the Columbia Wetlands as listed in the eBird database, several of which exceed the threshold of 30 individuals (Appendix 11). This species was not often detected during the CWWS because this species tends to migrate through the wetlands subsequent to the spring and fall waterbird survey dates.
3. Pied-billed grebe – The threshold for this species is 1000-1200 individuals. While the CWWS did not detect large numbers of pied-billed grebes during migration, the Columbia Wetlands Marsh Bird Monitoring Project (CWMBMP) did detect relatively high numbers of this species in the Columbia Wetlands during the breeding season, over the four years of survey effort (Darvill & Westphal, 2020). The four-year (2016-2019) CWMBMP operated in collaboration with Canadian Wildlife Service, and led to the following population estimates produced through scientifically robust methods of data extrapolation. In 2016 it was estimated there were 1,187 (95% confidence interval (CI) = 838-1,682) pied-billed grebe in the Columbia Wetlands; 792 (95% CI = 577-1,086) in 2017; 1,006 (95% CI = 689-1,468) in 2018; and 887 (95% CI = 633-1,243) in 2019 (Darvill & Westphal, 2020).
4. “Significant numbers of birds congregating during migration” – The CWWS was able to survey approximately only 39% of the Columbia Wetlands ecosystem with the overall congregation assumed to be far greater than CWWS reported counts. Even with this limitation, some single day counts in this narrowed field either exceeded or approached the threshold of 20,000 birds. [20,822 birds were counted on October 15, 2016; 17,507 birds were counted on October 15, 2017; 19,925 birds were counted on April 16, 2018; and 20,575 birds were counted on October 15, 2018 (Table 1)].

5. Lewis's Woodpecker – The threshold for this species is 10-12 individuals. There is a colony of four nesting pairs in the Fairmont area, as well as 1-3 more Lewis's Woodpecker pairs nesting at the southwest end of Columbia Lake near Canal Flats.
6. The Columbia Wetlands holds exceptional species diversity, with at least 237 bird species recently documented (Leighton, 2006); 30 of which are at-risk bird species present during the breeding season, and/or during periods of migration (Table 5).

5.4 How this project is important for conservation in the Columbia Valley

The primary goal of the CWWS was to collect bird data during spring and fall migration, to support nomination of the Columbia Wetlands being incorporated into the IBA program. Several additional benefits have come as a result of the CWWS project. The CWWS has throughout the five year study engaged a large portion of Columbia Valley residents in discussion relating to the value of wetlands habitat and conservation efforts — through the use of public education opportunities offered in the RDEK Electoral Areas F and G, CSRD Area A, the District of Invermere, Village of Radium Hot Springs, Village of Canal Flats, Brisco, and the Town of Golden.

The project involved efforts of 230 citizen scientist volunteers and a class of Grade 8 students; all participating in waterbird surveys during at least some portion of the 2015-2019 project. This involvement resulted in each individual's potential growth regarding insight into biological systems, species identification, and environmental awareness and stewardship, which could lead to a career path geared towards conservation efforts (Cartwright, Cvetkovic, Graham, Tozer & Chow-Fraser, 2013). By providing this active citizen-science opportunity, volunteers were directly engaged with wildlife and local landscapes encouraging the development of sustainable personal decisions relating to general and specific conservation actions referable to the wetlands.

The CWWS data has provided valuable data assisting other agencies in their planning activities, including:

- Revisions to the Columbia Wetlands Wildlife Management Area Management Plan, helping to further strengthen the habitat conservation values of that plan as they relate to birds.
- Partnerships and information provided to local communities, regional and national groups, and with several additional organizations that have a considerable effect on waterbird and wetland conservation, e.g. CWWS data informed the Columbia Wetlands Conservation Action Framework (Mahr, 2019), as well as 2019-2020 revisions to the Steamboat-Jubilee Mountain Official Community Plan in the RDEK.

- Assisting in the maintenance of international Ramsar responsibilities by addressing one of the three pillars under the Convention's mission; "working towards wise use of all wetlands". To achieve this, the Convention recommends contracting parties to develop programs covering wetlands inventory, monitoring, research, training, education and public awareness (Ramsar, 2014).
- Assistance in maintaining and fulfilling WMA responsibilities by monitoring avian populations.
- While not the intent of this project, the CWWS data should prove useful in assisting with the assessment of priority bird populations within the Canadian Intermountain Joint Venture.

6.0 Conclusion and Recommendations

Throughout the five-year CWWS study, a significant amount of data on waterbirds has been collected. There is now documentation to show which specific species are found in the highest concentrations during periods of bird migration in the Columbia Wetlands. There are also data sets relating to swan migration through this habitat, and observed numbers of occupied osprey nests in the Columbia Valley. Critical areas of high migratory bird abundance were identified within the wetlands associated with specific areas of high habitat value. One cannot endeavour to achieve responsible habitat-based actions or recommendations without knowledge of what potential habitat areas are most worthy of conservation. This paper identifies these areas of critical value and the specific habitat threats impacting upon them, for which the following management recommendations and strategies are outlined:

- Designate the Columbia Wetlands as an 'Important Bird and Biodiversity Area', and sequentially as a 'Key Biodiversity Area'.
- It is strongly recommended that the British Columbia provincial government [land managers of the Columbia Wetlands Wildlife Management Area (CWWMA)] work with the federal government (Environment and Climate Change Canada's Canadian Wildlife Service) and interested stakeholders to conduct necessary measures to assign refuge or Migratory Bird Sanctuary designation to the two areas located within the WMA determined to consistently contain the highest bird concentrations during migration. These two locations are located at the south end of Lake Windermere and the wetland complex located between Brisco and Spillimacheen, known as 'Brisco Rd North' in this study. (The third area with high bird concentration is already protected as part of the Columbia National Wildlife Area). This will provide a safe haven and refuge for migrating birds within the WMA, but will not limit

human use and activities from the remaining vast portions of the Columbia Wetlands complex.

- It is recommended that all private land parcels located within the 'Brisco Rd North' survey area be identified and slated for purchase as conservation properties to expand and conserve bird habitat within the Pacific Flyway of the unique Columbia Wetlands ecosystem.

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9.0 Appendices

Appendix 1. Poster seeking information on osprey nest locations.

Wanted! Osprey Nest Locations

We are looking for reports of osprey nest locations that are found anywhere in the Columbia Valley, except those on hydro poles along Highway 95 South, or on the roads that intersect the Columbia Wetlands, such as Parson Crossing or Brisco Rd.

 wildsight Golden

Please email program biologist racheldarvill@gmail.com to report your sightings, or call 250-344-5530.

Information on osprey nest abundance and occupancy will be used as part of the application to nominate the Columbia Wetlands as an Important Bird and Biodiversity Area (IBA).

Appendix 2. Bird species list for birds encountered during the 2015-2019 CWSWS.

Species Name	Scientific Name	Species Name	Scientific Name
Cackling Goose	<i>Branta hutchinsii</i>	Ring-billed Gull	<i>Larus delawarensis</i>
Snow Goose	<i>Anser caerulescens</i>	*California Gull	<i>Larus californicus</i>
Snow/Ross's Goose	n/a	Herring Gull	<i>Larus argentatus</i>
Greater White-fronted Goose	<i>Anser albifrons</i>	gull sp.	n/a
Canada Goose	<i>Branta canadensis</i>	Great Horned Owl	<i>Bubo virginianus</i>
goose sp.	n/a	Great Gray Owl	<i>Strix nebulosa</i>
Trumpeter Swan	<i>Cygnus buccinator</i>	Northern Pygmy Owl	<i>Glaucidium gnoma</i>
*Tundra Swan	<i>Cygnus columbianus</i>	Barred Owl	<i>Strix varia</i>
Trumpeter/Tundra Swan	n/a	Belted Kingfisher	<i>Megasceryle alcyon</i>
Wood Duck	<i>Aix sponsa</i>	Red-naped Sapsucker	<i>Sphyrapicus nuchalis</i>
Blue-winged Teal	<i>Spatula discors</i>	Downy Woodpecker	<i>Dryobates pubescens</i>
Cinnamon Teal	<i>Spatula cyanoptera</i>	Hairy Woodpecker	<i>Dryobates villosus</i>
Blue-winged/Cinnamon Teal	n/a	Downy/Hairy Woodpecker	n/a
Northern Shoveler	<i>Spatula clypeata</i>	Northern Flicker	<i>Colaptes auratus</i>
Gadwall	<i>Mareca strepera</i>	Pileated Woodpecker	<i>Dryocopus pileatus</i>
Eurasian Wigeon	<i>Mareca penelope</i>	woodpecker sp.	n/a
American Wigeon	<i>Mareca americana</i>	American Kestrel	<i>Falco sparverius</i>
Mallard	<i>Anas platyrhynchos</i>	Merlin	<i>Falco columbarius</i>
Northern Pintail	<i>Anas acuta</i>	*Peregrine Falcon	<i>Falco peregrinus</i>
Green-winged Teal	<i>Anas crecca</i>	falcon sp.	n/a
teal sp.	n/a	diurnal raptor sp.	n/a
dabbling duck sp.	n/a	Say's Phoebe	<i>Sayornis saya</i>
Canvasback	<i>Aythya valisineria</i>	Northern Shrike	<i>Lanius borealis</i>
Redhead	<i>Aythya americana</i>	flycatcher sp.	n/a
Ring-necked Duck	<i>Aythya collaris</i>	Canada Jay	<i>Perisoreus canadensis</i>
Greater Scaup	<i>Aythya marila</i>	Steller's Jay	<i>Cyanocitta stelleri</i>
Lesser Scaup	<i>Aythya affinis</i>	Clark's Nutcracker	<i>Nucifraga columbiana</i>
Greater/Lesser Scaup	n/a	Blue Jay	<i>Cyanocitta cristata</i>
*Surf Scoter	<i>Melanitta perspicillata</i>	Black-billed Magpie	<i>Pica hudsonia</i>
White-winged Scoter	<i>Melanitta deglandi</i>	American Crow	<i>Corvus brachyrhynchos</i>
Long-tailed Duck	<i>Clangula hyemalis</i>	Common Raven	<i>Corvus corax</i>
Bufflehead	<i>Bucephala albeola</i>	crow/raven sp.	n/a
Common Goldeneye	<i>Bucephala clangula</i>	Northern Rough-winged	
Barrow's Goldeneye	<i>Bucephala islandica</i>	Swallow	<i>Stelgidopteryx serripennis</i>
Common/Barrow's Goldeneye	n/a	Tree Swallow	<i>Tachycineta bicolor</i>
Hooded Merganser	<i>Lophodytes cucullatus</i>	Violet-green Swallow	<i>Tachycineta thalassina</i>
Common Merganser	<i>Mergus merganser</i>	Tree/Violet-green Swallow	n/a
Red-breasted Merganser	<i>Mergus serrator</i>	*Bank Swallow	<i>Riparia riparia</i>
Common/Red-breasted		Cliff Swallow	<i>Petrochelidon pyrrhonota</i>
Merganser	n/a	swallow sp.	n/a
merganser sp.	n/a	Black-capped Chickadee	<i>Poecile atricapillus</i>
Ruddy Duck	<i>Oxyura jamaicensis</i>	Mountain Chickadee	<i>Poecile gambeli</i>
duck sp.	n/a	chickadee sp.	n/a
waterfowl sp.	n/a	Red-breasted Nuthatch	<i>Sitta canadensis</i>
Ruffed Grouse	<i>Bonasa umbellus</i>	nuthatch sp.	n/a
Dusky Grouse	<i>Dendragapus obscurus</i>	Brown Creeper	<i>Certhia americana</i>
Spruce Grouse	<i>Falcipennis canadensis</i>	Pacific Wren	<i>Troglodytes pacificus</i>

grouse sp.	n/a	Marsh Wren	<i>Cistothorus palustris</i>
Wild Turkey	<i>Meleagris gallopavo</i>	wren sp.	n/a
Common Loon	<i>Gavia immer</i>	American Dipper	<i>Cinclus mexicanus</i>
*Double-crested Cormorant	<i>Phalacrocorax auritus</i>	Golden-crowned Kinglet	<i>Regulus satrapa</i>
*American White Pelican	<i>Pelecanus erythrorhynchos</i>	Ruby-crowned Kinglet	<i>Regulus calendula</i>
*American Bittern	<i>Botaurus lentiginosus</i>	kinglet sp.	n/a
Pied-billed Grebe	<i>Podilymbus podiceps</i>	Western Bluebird	<i>Sialia mexicana</i>
*Horned Grebe	<i>Podiceps auritus</i>	Mountain Bluebird	<i>Sialia currucoides</i>
Red-necked Grebe	<i>Podiceps grisegena</i>	bluebird sp.	n/a
*Eared Grebe	<i>Podiceps nigricollis</i>	Townsend's Solitaire	<i>Myadestes townsendi</i>
*Horned/Eared Grebe	n/a	Varied Thrush	<i>Ixoreus naevius</i>
*Western Grebe	<i>Aechmophorus occidentalis</i>	American Robin	<i>Turdus migratorius</i>
grebe sp.	n/a	Gray Catbird	<i>Dumetella carolinensis</i>
Eurasian Collared Dove	<i>Streptopelia decaocto</i>	American Pipit	<i>Anthus rubescens</i>
Mourning Dove	<i>Zenaida macroura</i>	Lapland Longspur	<i>Calcarius lapponicus</i>
Rock Pigeon	<i>Columba livia</i>	Cedar Waxwing	<i>Bombycilla cedrorum</i>
Sora	<i>Porzana carolina</i>	Bohemian Waxwing	<i>Bombycilla garrulus</i>
*Great Blue Heron	<i>Ardea herodias</i>	House Finch	<i>Haemorrhous mexicanus</i>
Turkey Vulture	<i>Cathartes aura</i>	Purple Finch	<i>Haemorrhous purpureus</i>
Osprey	<i>Pandion haliaetus</i>	Northern Waterthrush	<i>Parkesia noveboracensis</i>
Golden Eagle	<i>Aquila chrysaetos</i>	Orange-crowned Warbler	<i>Oreothlypis celata</i>
Northern Harrier	<i>Circus hudsonius</i>	Yellow-rumped Warbler	<i>Setophaga coronata</i>
Cooper's Hawk	<i>Accipiter cooperii</i>	Townsend's Warbler	<i>Setophaga townsendi</i>
Sharp-shinned Hawk	<i>Accipiter striatus</i>	Wilson's Warbler	<i>Cardellina pusilla</i>
Sharp-shinned/Cooper's Hawk	n/a	warbler sp. (Parulidae sp.)	n/a
Northern Goshawk	<i>Accipiter gentilis</i>	American Goldfinch	<i>Spinus tristis</i>
Accipiter sp.	n/a	Chipping Sparrow	<i>Spizella passerina</i>
Bald Eagle	<i>Haliaeetus leucocephalus</i>	European Starling	<i>Sturnus vulgaris</i>
Golden/Bald Eagle	n/a	Snow Bunting	<i>Plectrophenax nivalis</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Fox Sparrow	<i>Passerella iliaca</i>
*Rough-legged Hawk	<i>Buteo lagopus</i>	American Tree Sparrow	<i>Spizelloides arborea</i>
buteo sp.	n/a	Dark-eyed Junco	<i>Junco hyemalis</i>
hawk sp.	n/a	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>
Virginia Rail	<i>Rallus limicola</i>	White-throated Sparrow	<i>Zonotrichia albicollis</i>
American Coot	<i>Fulica americana</i>	Vesper Sparrow	<i>Pooecetes gramineus</i>
Sandhill Crane	<i>Antigone canadensis</i>	Savannah Sparrow	<i>Passerculus sandwichensis</i>
Black-necked Stilt	<i>Himantopus mexicanus</i>	Song Sparrow	<i>Melospiza melodia</i>
Killdeer	<i>Charadrius vociferus</i>	Lincoln's Sparrow	<i>Melospiza lincolni</i>
Semipalmated Sandpiper	<i>Calidris pusilla</i>	Swamp Sparrow	<i>Melospiza georgiana</i>
*Long-billed Curlew	<i>Numenius americanus</i>	Spotted Towhee	<i>Pipilo maculatus</i>
peep sp.	n/a	sparrow sp.	n/a
Baird's Sandpiper	<i>Calidris bairdii</i>	Common Yellowthroat	<i>Geothlypis trichas</i>
Wilson's Snipe	<i>Gallinago delicata</i>	Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>
Solitary Sandpiper	<i>Tringa solitaria</i>	Western Meadowlark	<i>Sturnella neglecta</i>
Spotted Sandpiper	<i>Actitis macularius</i>	Red-winged Blackbird	<i>Agelaius phoeniceus</i>
Semipalmated Plover	<i>Charadrius semipalmatus</i>	Brown-headed Cowbird	<i>Molothrus ater</i>
Pectoral Sandpiper	<i>Calidris melanotos</i>	Brewer's Blackbird	<i>Euphagus cyanocephalus</i>
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>	blackbird sp.	n/a
Wilson's Phalarope	<i>Phalaropus tricolor</i>	Pine Grosbeak	<i>Pinicola enucleator</i>
Greater Yellowlegs	<i>Tringa melanoleuca</i>	Cassin's Finch	<i>Haemorrhous cassinii</i>
Lesser Yellowlegs	<i>Tringa flavipes</i>	Gray-crowned Rosy-Finch	<i>Leucosticte tephrocotis</i>
Greater/Lesser Yellowlegs	n/a	finch sp.	n/a
Tringa sp.	n/a	Common Redpoll	<i>Acanthis flammea</i>
Scolopacidae sp.	n/a	Red Crossbill	<i>Loxia curvirostra</i>

large shorebird sp.	<i>n/a</i>	White-winged Crossbill	<i>Loxia leucoptera</i>
shorebird sp.	<i>n/a</i>	Pine Siskin	<i>Spinus pinus</i>
Bonaparte's Gull	<i>Chroicocephalus philadelphia</i>	Western Tanager	<i>Piranga ludoviciana</i>
		passerine sp.	<i>n/a</i>

**Those species listed with an asterisk are listed as species-at-risk.*

Appendix 3. CWS survey station names and their geographical coordinates.

Site Name	Easting	Northing
Donald--Wiseman Rd	489320	5702860
Blaeberry/Columbia River Confluence	493980	5696781
Moberly Marsh/Gadsden Prov. Park	496580	5695183
Weir home - Hwy 1 - 1.5 km N of Golden	500833	5686526
Golden -- Anderson Rd	500748	5685695
Golden--West Edelweiss Slough	501185	5685410
Golden--Edelweiss Slough	501574	5685406
Golden--Kicking Horse Drive walking route	500744	5684251
Golden--lower Kicking Horse River	500804	5683908
Golden -- Airport Area	501031	5683082
Golden -- Sewage Lagoons	501733	5682101
Golden--Reflection Lake	503730	5681520
Golden--Railway Pond	504423	5680523
Golden--Southwest of Railway Yard	505096	5679537
Golden--Habart's Subdivision	505266	5678671
Nicholson--Bottom of Sander Road	503838	5677652
Nicholson Bridge	506078	5676895
Columbia River--Horse Creek Confluence	506977	5673100
Golden--9 mile Slough	508664	5671814
Section between 9 mile & Dickson Downs	509634	5670884
Columbia Wetlands Hwy 95 Views 10-17 km S of Golden	510957	5669474
19 km south of Golden-Birchlands Slough	513006	5668064
Golden--Mulligans Slough	507643	5670294
Columbia Wetlands -- McMurdo seasonal lake	515652	5666148
Beaver Lake	517898	5664224
Carbonate Landing	518243	5662998
Parson North--Braisher's Slough	521587	5660644
Parson -- Madden Road lookout	520046	5662748
Parson--Thomas Rd South 4150 area	522268	5658396
Parson--Marshwood	523717	5657110
Parson	525092	5657693
Parson - Wells Landing	526708	5654597
Parson--Beards Creek Rd	528238	5655457
Parson -- 5.6 km south	529683	5654443
Parson -- 6.0 km south	530007	5654175
Parson South--Great Blue Heron Rookery	529824	5654363

Castledale North	530929	5653677
Castledale	532621	5652946
McKeemans Slough	533662	5652149
Nabel/Gacek Creek Slough	535505	5651192
Columbia Wetlands--1.5 km south of Nabel Rd	536053	5650624
Columbia Wetlands--2 km south of Nabel Rd	536895	5649835
Columbia Wetlands--2.8km south of Nabel Rd	537334	5649165
Salsbury Rd off Hwy 95	537674	5648630
Harrogate	538755	5647403
Harrogate Corner Slough	539028	5647270
Harrogate - Ben Hynes Loop Rd	538945	5647759
Harrogate - Ben Hynes Loop Rd Quarry	539535	5646471
Harrogate--old barns	540420	5646138
Harrogate--CSRD Boundary	541587	5644461
Spillimacheen --5 km North	542310	5643514
Spillimacheen --2 km North	543588	5641273
Spillimacheen Crossing--Westside Road	544347	5639427
Spillimacheen--0.7 km South	544857	5639073
Spillimacheen--Stewart's Slough	543344	5637923
Spillimacheen--Galena Creek Ranch Slough	546125	5637575
Spillimacheen Rest Area	547660	5635241
Whiskey Point--Feldman's Ranch	544652	5635773
Brisco Rd North	546084	5633382
Brisco Rd--Feldman's Ranch	546773	5633038
Brisco west--Warner's Slough	547512	5632483
Brisco Rd - Patty's Greenhouse Slough	547706	5632129
3.6 km north of Brisco Store	549249	5633473
2.5 km north of Brisco Store	550351	5632619
0.7 km north of Brisco Store	550358	5631909
Brisco west--Trecher's Slough	549884	5630634
Brisco Road	550230	5631108
Rockaboo Ranch	548818	5631234
Brisco South - 2971 Hwy 95	552128	5629529
Brisco South--Snider Rd	552677	5627688
Luxor Station Rd	555689	5623633
NCC Luxor Linkage conservation property	556643	5621919
Edgewater Elementary School	560928	5616250
Radium--Red Rock Lookout	562502	5609260
Radium Hot Springs--Saw Mill Pond	564095	5608185
Radium South--Lookout Points	566420	5606368

Dry Gulch - Old Coach Trail	567823	5602198
1km North of Wilmer NWA - pullout	565456	5601790
Friends of Columbia Wetland (Richies Point)	565911	5600974
Wilmer National Wildlife Area (end of Smith Rd)	566728	5599495
Wilmer Pontoon Road	567240	5598807
Athalmer Sloughs	568927	5597788
Athalmer bridge - Pete's Marina	569526	5596332
James Chabot Provincial Park	569330	5596005
Invermere--Dorothy Lake	569101	5594510
Invermere--Kin Beach/Lake Windermere	569095	5594379
Invermere--Lakeview Meadows/Lake Windermere	570298	5594260
Invermere--Baltac Beach/Lake Windermere	570748	5593653
Off Baltac Road--Lake Windermere	571272	5593421
Private Beach Area Baltac Road	571045	5593558
Windermere Cemetery Hill	571394	5590993
Invermere--Cardiff Ave Beach/Lake Windermere	571529	5590359
Invermere--Windermere Creek/Lake Windermere	571533	5590015
Invermere--Grizzly Ridge Heights	569121	5592081
Lake Windermere--End of Coy Rd	570100	5590763
Lake Windermere--Ruault Road	572625	5587673
Lake Windermere--Lakeshore Resort Campground	575004	5586649
Lake Windermere--Rushmere Road	574620	5585343
Southeast End of Lake Windermere	576287	5585082
South End Lake Windermere	576054	5583970
700m north of Mud Lake - Fairmont	578997	5578850
Columbia Wetlands Viewpoint Trail	577610	5580679
Mud Lake--Fairmont	579159	5578413
Fairmont Meadows to Lakeshore Resort canoe route	580246	5577665
Fairmont--meadows	580258	5577755
Columere Park	580366	5571414
Columbia Lake - north end marsh	581716	5573360
Columbia Lake -- Rockbeach	581432	5571629
Columere Park Boat Launch	580493	5571409
Columbia Lake--Lot 48	581643	5569871
Columbia Lake -Shoreline near Columbia Ridge	580589	5566703
Columbia Lake-Armstrong Bay	582049	5567396
Lewis's Woodpecker Site	581834	5558978
Tilley Memorial Park--Canal Flats	584276	5559075
Columbia Lake--South end	582499	5557440

Appendix 4. Species counts during each survey date of the spring 2015-2019 CWWS

Species Name	Apr 24/2015	Apr 29/2015	May 4/2015	Apr 3/2016	Apr 10/2016	Apr 16/2016	Apr 3/2017	Apr 10/2017	Apr 16/2017	Apr 3/2018	Apr 10/2018	Apr 16/2018	Apr 3/2019	Apr 10/2019	Apr 16/2019
Sample Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size
Snow Goose	-	-	-	-	3	1	14	1	17	2	10	2	53	6	-
Snow/Ross's Goose	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Canada Goose	380	40	425	40	421	33	798	64	838	67	640	59	1,245	79	956
goose sp.	1	1	5	1	-	-	-	2	1	-	-	-	-	-	-
Trumpeter Swan	23	6	5	3	15	4	32	10	29	9	14	4	72	12	69
*Tundra Swan	2	1	-	-	7	2	39	6	14	2	-	-	14	5	8
Trumpeter/Tundra Sw	7	2	1	1	6	4	37	6	9	5	13	4	316	22	94
Wood Duck	32	8	34	8	44	7	47	13	58	13	47	8	7	4	63
Blue-winged Teal	2	1	-	-	1	1	7	1	-	-	-	-	-	-	-
Cinnamon Teal	17	7	46	10	30	11	-	-	5	2	-	-	-	-	-
Blue-winged/Cinnam	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Shoveler	94	9	382	13	79	7	19	4	17	4	74	9	8	4	43
Gadwall	8	3	38	5	-	-	-	-	2	1	-	-	-	-	-
Eurasian Wigeon	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-
American Wigeon	817	16	308	16	280	23	1,954	29	1,994	31	900	22	1,333	38	1,226
Mallard	727	48	495	48	514	49	1,991	71	1,394	70	1,225	64	1,863	65	1,225
Northern Pintail	170	12	89	9	142	2	113	9	247	15	205	14	75	9	122
Green-winged Teal	322	14	399	14	70	9	97	6	492	14	486	13	66	9	197
teal sp.	-	-	-	-	31	3	-	-	2	1	-	-	-	-	-
dabbling duck sp.	594	2	90	1	-	-	4	2	430	5	102	6	186	6	156
Canvasback	2	1	-	-	-	-	2	2	4	1	4	1	-	-	-
Redhead	39	4	12	3	28	3	24	4	14	3	8	1	4	1	17
Ring-necked Duck	412	18	294	18	137	18	185	14	307	22	297	22	98	9	321
Greater Scaup	-	-	2	1	2	1	-	-	-	-	-	-	-	-	-
Lesser Scaup	8	4	29	3	14	2	10	4	174	4	184	6	66	5	8
Greater/Lesser Scaup	-	-	-	-	131	2	11	1	-	-	-	-	3	1	91
Long-tailed Duck	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-
Bufflehead	130	26	119	21	302	27	71	21	168	28	175	29	58	17	125
Common Goldeneye	96	17	43	14	71	13	370	28	238	34	103	18	297	25	230
Barrow's Goldeneye	-	-	2	1	-	-	10	4	2	1	6	2	32	4	18
Common/Barrow's G	-	-	-	-	-	-	1	1	10	3	18	4	8	1	5
Hooded Merganser	88	18	94	22	108	21	115	32	114	21	66	14	55	13	137
Common Merganser	89	12	21	5	84	12	467	27	300	29	238	14	456	25	255
Red-breasted Mergan	2	1	-	-	3	2	-	-	-	-	-	-	-	-	-
Common/Red-breast	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
merganser sp.	-	-	2	1	7	1	-	-	1	1	4	1	-	-	-
Ruddy Duck	1	1	14	2	16	3	-	-	-	-	-	-	-	-	-
duck sp.	515	3	31	2	70	3	325	8	32	5	206	4	268	11	304
waterfowl sp.	3	2	639	10	354	8	688	7	313	15	159	18	296	7	383

Appendix 4 (con't). Species counts during each survey date of the spring 2015-2019 CWWs.

Species Name	Apr 24/2015		Apr 29/2015		May 4/2015		Apr 3/2016		Apr 10/2016		Apr 16/2016		Apr 3/2017		Apr 10/2017		Apr 16/2017		Apr 3/2018		Apr 10/2018		Apr 16/2018		Apr 3/2019		Apr 10/2019		Apr 16/2019	
	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size
Ruffed Grouse	-	-	2	2	1	1	-	-	5	4	3	2	3	2	3	3	4	3	1	1	3	2	1	1	-	-	1	1	4	4
Dusky Grouse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
grouse sp.	-	-	-	-	-	-	-	-	-	-	1	1	-	-	1	1	1	1	-	-	-	-	1	1	-	-	-	-	-	-
Wild Turkey	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1
Common Loon	20	12	16	8	15	10	17	8	18	12	14	11	10	5	9	7	24	14	1	1	1	1	22	15	-	-	10	8	39	22
*American White Pelican	-	-	-	-	16	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*American Bittern	1	1	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pied-billed Grebe	10	7	5	4	9	4	10	8	15	9	14	9	8	4	9	7	15	9	2	2	9	5	4	4	5	2	6	5	14	9
*Horned Grebe	1	1	11	1	43	4	-	-	4	3	10	2	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	4	2
Red-necked Grebe	14	6	11	5	78	8	16	7	42	13	25	10	1	1	2	1	50	11	-	-	-	-	7	3	-	-	8	7	25	11
*Eared Grebe	-	-	-	-	11	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Horned/Eared Grebe	-	-	-	-	5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	-	-
*Western Grebe	1	1	-	-	11	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
grebe sp.	-	-	1	1	-	-	2	1	-	-	1	1	-	-	-	-	1	1	-	-	2	1	1	1	-	-	3	2	-	-
Eurasian Collared Dove	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mourning Dove	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-	3	2
Rock Pigeon	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-
Sora	-	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-
*Great Blue Heron	41	11	22	6	44	17	38	9	48	12	81	9	15	4	40	9	36	9	27	1	56	8	52	13	34	4	38	5	31	5
Turkey Vulture	12	3	1	1	1	1	-	-	1	1	-	-	1	1	6	4	1	1	2	1	4	2	1	1	1	1	--	-	4	3
Osprey	18	10	22	13	22	15	1	1	11	7	10	9	4	2	29	17	28	18	2	2	12	10	21	12	1	1	13	12	24	16
Golden Eagle	-	-	2	1	1	1	2	2	-	-	-	-	-	-	1	1	-	-	1	1	2	2	-	-	-	-	-	-	-	-
Northern Harrier	1	1	5	4	1	1	-	-	7	6	5	5	2	2	5	5	6	5	2	2	1	1	6	5	3	3	4	4	6	5
Cooper's Hawk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Sharp-shinned Hawk	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sharp-shinned/Cooper's Hawk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
Northern Goshawk	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
Bald Eagle	22	13	45	22	33	19	35	19	34	19	34	18	63	31	77	39	63	27	46	25	64	30	76	45	91	40	66	38	66	37
Golden/Bald Eagle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	1	1	-	-	2	2	--	-	1	1
Red-tailed Hawk	2	2	2	2	4	4	6	3	2	2	1	1	6	6	10	8	9	6	5	4	8	5	8	8	2	2	5	4	2	2
*Rough-legged Hawk	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
buteo sp.	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-
hawk sp.	-	-	-	-	1	1	2	2	-	-	1	1	4	4	3	2	2	2	2	2	1	1	6	6	2	2	4	4	3	3
Virginia Rail	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
American Coot	775	11	166	9	246	8	869	9	1593	12	539	9	273	3	360	9	2,226	19	-	-	730	10	2,344	21	562	4	460	3	993	8
Sandhill Crane	3	1	2	2	5	2	4	3	4	3	4	3	5	3	6	4	6	4	4	2	6	4	8	5	6	3	1	1	14	10

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Species Name	Apr 24/2015		Apr 29/2015		May 4/2015		Apr 3/2016		Apr 10/2016		Apr 16/2016		Apr 3/2017		Apr 10/2017		Apr 16/2017		Apr 3/2018		Apr 10/2018		Apr 16/2018		Apr 3/2019		Apr 10/2019		Apr 16/2019	
	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size
Black-necked Stilt	-	-	1	1	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	3	-	-	-	-	4	1
Killdeer	3	1	6	3	18	12	12	5	9	6	17	10	7	4	11	8	12	8	15	5	41	15	40	12	16	9	13	8	5	4
Semipalmated Sandpiper	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
peep sp.	-	-	450	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Baird's Sandpiper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	1	-	-	-	-	-
Wilson's Snipe	3	3	2	2	2	2	-	2	1	-	-	-	-	-	-	-	2	1	-	-	-	-	6	1	-	-	1	1	1	1
Solitary Sandpiper	-	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spotted Sandpiper	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Semipalmated Plover	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Greater Yellowlegs	4	1	5	1	1	1	-	-	4	2	2	2	-	-	2	1	-	-	-	-	-	-	4	1	-	-	-	-	-	-
Lesser Yellowlegs	-	-	-	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2	-	-	6	1	-	-
Tringa sp.	-	-	-	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
shorebird sp.	1	1	-	-	5	2	-	-	1	1	-	-	1	1	-	-	-	-	6	1	3	2	-	-	-	-	-	-	-	-
Bonaparte's Gull	--	80	2	15	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring-billed Gull	1	1	8	1	28	3	17	2	9	3	-	-	35	2	18	2	10	3	-	-	1	1	46	3	-	-	13	2	2	1
*California Gull	-	-	-	-	-	-	1	1	-	-	-	-	1	1	6	1	-	-	40	1	22	2	22	3	-	-	118	2	1	1
Herring Gull	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
gull sp.	-	-	14	1	25	3	36	3	9	1	13	2	2	2	53	6	40	5	6	1	26	8	131	15	12	4	312	8	27	4
Great Horned Owl	-	-	-	-	-	-	1	1	2	2	1	1	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Great Gray Owl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Barred Owl	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Belted Kingfisher	4	4	6	5	14	8	6	5	3	3	11	9	1	1	3	3	5	5	1	1	4	4	9	8	13	10	14	12	5	5
Red-naped Sapsucker	-	-	2	2	6	4	-	-	2	1	3	1	-	-	2	2	6	3	-	-	-	-	-	-	3	3	2	1	7	4
Downy Woodpecker	-	-	2	1	-	-	-	-	7	5	-	-	1	1	1	1	4	3	1	1	4	3	1	1	6	4	1	1	5	4
Hairy Woodpecker	-	-	-	-	1	1	-	-	-	-	-	3	1	-	-	-	-	-	-	-	-	-	-	-	3	2	2	2	5	5
Downy/Hairy Woodp	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	2	1	-	-
Northern Flicker	5	4	5	4	9	7	37	21	42	21	30	22	46	27	63	29	60	28	20	17	51	34	59	33	61	39	50	31	49	28
Pileated Woodpecker	1	1	4	2	1	1	11	8	6	4	5	3	12	7	8	4	7	4	3	3	2	2	3	3	4	4	9	7	5	4
woodpecker sp.	--	-	2	1	4	4	4	4	7	6	10	8	1	1	-	-	2	2	1	1	1	1	2	2	4	4	6	6	7	6
American Kestrel	3	1	6	3	5	3	1	1	-	-	-	-	-	-	-	-	-	-	1	1	-	-	3	3	-	-	-	-	1	1
Merlin	2	1	-	-	1	1	1	1	4	3	1	1	2	2	3	1	-	-	-	-	2	2	4	4	2	2	1	1	2	2
diurnal raptor sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
Say's Phoebe	-	-	-	-	-	-	1	1	2	2	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Shrike	-	-	-	-	-	-	-	-	1	1	-	-	1	1	1	1	-	-	1	1	-	-	1	1	-	-	-	-	-	-
flycatcher sp.	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix 4 (con't). Species counts during each survey date of the spring 2015-2019 CWWS.

Species Name	Apr 24/2015		Apr 29/2015		May 4/2015		Apr 3/2016		Apr 10/2016		Apr 16/2016		Apr 3/2017		Apr 10/2017		Apr 16/2017		Apr 3/2018		Apr 10/2018		Apr 16/2018		Apr 3/2019		Apr 10/2019		Apr 16/2019	
	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size		
Canada Jay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	
Steller's Jay	1	1	-	-	-	-	3	2	2	1	2	1	-	-	-	-	2	1	3	2	-	-	-	-	3	1	-	-	-	
Clark's Nutcracker	3	1	2	1	-	-	1	1	3	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1	1	3	3	4	
Blue Jay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
Black-billed Magpie	12	5	15	8	16	7	19	9	19	11	23	9	43	14	29	12	26	15	37	16	33	17	27	17	39	22	45	25	29	
American Crow	25	8	44	13	62	15	51	13	116	23	113	23	113	33	170	29	137	32	107	20	117	29	115	28	155	38	143	31	144	
Common Raven	78	7	16	7	12	6	35	15	31	13	30	10	57	19	39	16	54	20	53	22	21	13	38	18	52	18	48	20	41	
crow/raven sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	1	37	
Northern Rough-wing	10	1	9	3	68	8	1	1	17	3	2	1	-	-	-	-	21	2	-	-	1	1	20	1	-	-	2	1	1	
Tree Swallow	20	1	10	3	34	6	114	9	173	16	117	13	60	6	104	10	126	14	-	-	96	9	171	12	181	15	114	13	174	
Violet-green Swallow	2	1	-	-	-	-	1	1	24	5	19	4	160	1	35	4	10	4	-	-	2	1	-	-	34	2	24	2	85	
Tree/Violet-green Sw	-	-	-	-	-	-	-	-	-	-	-	-	6	1	7	1	4	1	-	-	15	2	8	1	18	2	2	1	50	
*Bank Swallow	10	1	12	2	5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Cliff Swallow	-	-	7	1	10	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
swallow sp.	37	2	42	3	9	3	11	2	43	3	12	3	35	2	146	5	40	6	6	1	20	6	184	9	33	7	24	3	95	
Black-capped Chicka	-	-	1	1	--	-	15	10	17	6	25	8	36	14	27	7	25	10	35	12	31	13	19	12	55	19	35	12	32	
Mountain Chickadee	-	-	-	-	-	-	3	1	9	2	11	6	11	6	9	5	14	7	13	6	5	3	2	2	13	5	7	3	13	
chickadee sp.	2	2	2	1	4	2	19	8	16	6	12	5	18	5	11	5	20	8	16	5	21	7	8	3	22	5	2	1	9	
Red-breasted Nuthatch	-	-	-	-	2	2	19	10	21	10	17	11	40	20	35	19	38	19	7	5	12	9	5	4	18	16	19	10	16	
nuthatch sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	-	-	-	
Brown Creeper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	
Pacific Wren	1	1	-	-	1	1	2	1	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	
Marsh Wren	5	3	8	4	11	3	1	1	4	3	5	4	-	-	6	4	9	5	-	-	-	-	1	1	12	7	11	6	8	
American Dipper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	
Golden-crowned Kin	-	-	-	-	-	-	-	-	-	-	2	1	1	1	-	-	-	-	-	-	4	1	-	-	-	-	2	1	-	
Ruby-crowned Kinglet	12	7	19	7	16	9	1	1	6	5	5	4	3	3	7	2	26	11	-	-	1	1	1	1	-	-	1	1	6	
kinglet sp.	-	-	-	-	-	-	-	-	-	-	-	-	5	1	3	1	-	-	-	-	-	-	-	-	-	-	-	1	1	
Western Bluebird	-	-	-	-	-	-	-	-	-	-	-	-	7	1	-	-	-	-	-	-	-	-	-	-	-	-	4	2	-	
Mountain Bluebird	1	1	-	-	1	1	-	-	4	3	6	4	21	7	8	4	9	4	-	-	9	2	28	4	11	3	5	4	3	
bluebird sp.	-	-	-	-	4	1	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	1	1	2	1	-	-	4	
Townsend's Solitaire	-	-	-	-	-	-	-	-	-	-	1	1	3	2	-	-	-	-	3	2	1	1	1	1	2	2	1	1	-	
Varied Thrush	2	1	-	-	-	-	-	-	-	-	-	-	-	-	4	4	2	1	6	5	8	7	6	2	2	1	1	-	-	
American Robin	1	1	6	5	10	4	55	20	61	21	54	24	93	30	79	32	79	24	43	15	140	40	209	42	80	41	67	35	85	

Columbia Wetlands Waterbird Survey 2015-2019

Appendix 4 (con't). Species counts during each survey date of the spring 2015-2019 CWWWS.

Species Name	Apr 24/2015		Apr 29/2015		May 4/2015		Apr 3/2016		Apr 10/2016		Apr 16/2016		Apr 3/2017		Apr 10/2017		Apr 16/2017		Apr 3/2018		Apr 10/2018		Apr 16/2018		Apr 3/2019		Apr 10/2019		Apr 16/2019	
	Sample Count	Species Size	Sample Count	Species Size	Sample Count	Species Size	Sample Count	Species Size	Sample Count	Species Size	Sample Count	Species Size	Sample Count	Species Size	Sample Count	Species Size	Sample Count	Species Size	Sample Count	Species Size	Sample Count	Species Size	Sample Count	Species Size	Sample Count	Species Size	Sample Count	Species Size	Sample Count	Species Size
American Pipit	-	-	4	1	-	-	-	-	-	-	-	-	-	-	-	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Cedar Waxwing	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	1	-	-	-	-	-	-
House Finch	2	1	--	-	-	-	-	-	3	2	2	2	1	2	1	-	-	6	3	2	1	1	1	2	1	2	1	3	2	-
Purple Finch	-	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	-	-	-	-
Northern Waterthrush	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Orange-crowned Warbler	-	-	2	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow-rumped Warbler	1	1	4	2	11	5	-	-	-	-	-	-	2	2	5	3	-	-	-	-	-	1	1	-	-	-	-	-	-	-
Townsend's Warbler	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Chipping Sparrow	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
European Starling	-	-	3	1	-	-	27	2	15	3	4	2	76	2	2	1	19	1	24	3	446	8	234	5	277	7	82	5	22	4
Fox Sparrow	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
American Tree Sparrow	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	2	-	-	-	-	-	2	1	-	-	1	1	-	-	-
Dark-eyed Junco	3	2	4	2	-	-	23	12	28	13	23	10	31	15	29	11	28	14	77	18	67	24	108	24	55	21	44	17	34	19
White-crowned Sparrow	-	-	39	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-
Vesper Sparrow	-	-	-	-	3	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Savannah Sparrow	-	-	16	1	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	6	2	2
Song Sparrow	17	13	19	13	24	11	56	25	68	23	38	17	78	33	93	31	104	30	44	22	61	28	62	22	72	38	107	45	52	27
Lincoln's Sparrow	-	-	4	1	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Spotted Towhee	-	-	1	1	1	1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-
sparrow sp.	-	-	-	-	1	1	-	-	6	1	4	1	2	1	-	2	1	-	-	-	3	2	3	1	-	-	10	2	6	2
Yellow-headed Blackbird	7	3	4	2	29	6	-	-	-	-	-	-	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Western Meadowlark	1	1	5	4	7	4	7	5	11	8	7	6	4	4	10	8	10	10	3	2	4	3	5	4	5	4	4	4	6	6
Red-winged Blackbird	62	15	136	23	177	17	89	22	142	25	97	18	122	30	193	35	172	38	136	30	151	37	152	45	172	44	186	48	173	38
Brown-headed Cowbird	20	1	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	1
Brewer's Blackbird	-	-	4	1	20	2	-	-	-	26	2	-	-	-	2	1	5	2	-	-	-	-	-	-	-	-	1	1	-	-
blackbird sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pine Grosbeak	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	5	2	-
Gray-crowned Rosy-finch sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
Common Redpoll	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	1	-	-	6	2	-	-	-	-	-	-
Red Crossbill	-	-	-	-	-	-	-	-	-	-	-	-	5	1	-	-	2	1	-	-	-	-	-	-	-	-	2	1	-	-
White-winged Crossbill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	4	8	4	2	2
Pine Siskin	-	-	5	1	2	1	-	-	18	3	1	1	25	5	9	3	15	3	-	-	-	-	-	-	215	29	103	21	139	24
Western Tanager	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
passerine sp.	-	-	-	-	-	-	1	1	-	-	-	-	4	2	6	3	5	1	-	-	24	5	115	4	1	1	46	6	12	4

Columbia Wetlands Waterbird Survey 2015-2019

Appendix 5 (con't). Species counts during each survey date of the fall 2015-2019 CWWS.

Species Name	Sept 29/2015	Oct 5/2015	Oct 15/2015	Oct 25/2015	Sept 29/2016	Oct 5/2016	Oct 15/2016	Sept 29/2017	Oct 5/2017	Oct 15/2017	Sept 29/2018	Oct 5/2018	Oct 15/2018	Sept 29/2019	Oct 5/2019	Oct 15/2019
Species Name	Sample Count	Sample Count	Sample Count	Sample Count	Sample Count	Sample Count	Sample Count	Sample Count	Sample Count	Sample Count	Sample Count	Sample Count	Sample Count	Sample Count	Sample Count	Sample Count
Ruffed Grouse	-	1	-	-	-	2	1	-	2	-	1	-	2	-	-	-
Spruce Grouse	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
grouse sp.	-	-	1	-	-	-	-	-	-	-	-	-	-	1	1	-
Wild Turkey	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Common Loon	-	12	6	3	2	7	4	18	7	14	9	2	2	13	7	11
*Double-crested Cormorant	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
*American White Pelican	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Pied-billed Grebe	28	8	40	16	27	11	15	7	22	13	56	16	36	11	40	14
*Horned Grebe	3	2	4	3	6	3	-	26	1	7	2	6	2	6	3	13
Red-necked Grebe	20	7	20	9	20	7	11	3	25	10	42	13	81	5	20	10
*Eared Grebe	-	-	-	-	-	-	-	2	2	6	2	15	1	-	-	-
*Horned/Eared Grebe	-	-	-	-	-	-	-	12	3	2	1	7	2	1	1	10
*Western Grebe	1	14	5	28	5	-	-	25	1	31	3	103	6	5	2	13
grebe sp.	1	2	1	-	-	16	3	9	3	18	3	6	3	52	14	16
Mourning Dove	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Rock Pigeon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Great Blue Heron	19	5	34	11	38	13	10	5	62	21	47	21	42	13	43	16
Turkey Vulture	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Osprey	-	1	1	-	-	-	-	2	2	-	-	-	5	3	8	6
Golden Eagle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Harrier	-	1	1	4	3	1	1	5	4	8	7	5	5	16	13	10
Cooper's Hawk	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
Sharp-shinned Hawk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sharp-shinned/Cooper's Hawk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Goshawk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Accipiter sp.	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Bald Eagle	14	8	12	9	22	14	25	15	29	19	31	19	26	18	24	18
Golden/Bald Eagle	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red-tailed Hawk	-	-	-	-	1	1	5	4	2	4	4	3	3	1	1	1
*Rough-legged Hawk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
butco sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
hawk sp.	-	2	2	3	3	2	2	1	1	5	3	3	3	3	3	3
Virginia Rail	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
American Coot	1,586	4	3,386	8	891	9	227	4	703	7	2,558	10	2,164	13	5,070	10
Sandhill Crane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Killdeer	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Semipalmated Sandpiper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*Long-billed Curlew	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
peep sp.	4	1	24	1	10	2	5	1	77	4	-	-	46	2	1	1
Wilson's Snipe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spotted Sandpiper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Columbia Wetlands Waterbird Survey 2015-2019

Appendix 5 (con't). Species counts during each survey date of the fall 2015-2019 CWWS.

Species Name	Sept 29/2015	Oct 5/2015	Oct 15/2015	Oct 25/2015	Sept 29/2016	Oct 5/2016	Oct 15/2016	Sept 29/2017	Oct 5/2017	Oct 15/2017	Sept 29/2018	Oct 5/2018	Oct 15/2018	Sept 29/2019	Oct 5/2019	Oct 15/2019
Species Name	Count	Sample Size	Count	Sample Size	Count	Sample Size	Count	Sample Size	Count	Sample Size	Count	Sample Size	Count	Sample Size	Count	Sample Size
Semipalmated Plover	-	-	-	-	-	-	-	-	-	5	1	-	-	-	-	-
Pectoral Sandpiper	-	-	-	-	-	-	-	-	1	1	11	-	-	-	2	1
Long-billed Dowitcher	-	-	13	1	10	2	-	52	3	58	2	109	3	45	5	241
Wilson's Phalarope	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Greater Yellowlegs	-	-	-	-	6	1	-	-	-	-	-	-	-	-	-	-
Greater/Lesser Yellowlegs	-	-	-	-	-	-	-	-	-	9	1	-	-	-	-	-
Scolopacidae sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
large shorebird sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
shorebird sp.	-	-	-	-	96	3	2	80	4	34	1	4	1	9	2	3
Bonaparte's Gull	-	-	2	1	-	-	1	7	1	-	-	-	1	1	13	1
Ring-billed Gull	30	3	50	5	151	2	58	3	86	5	129	12	181	8	29	6
* California Gull	-	15	2	8	1	13	3	10	2	41	2	35	4	20	2	7
Herring Gull	-	2	1	-	2	1	5	2	17	2	18	1	2	1	-	8
gull sp.	51	4	109	10	390	11	43	10	124	11	512	16	223	15	44	11
Great Gray Owl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pygmy Owl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Belted Kingfisher	3	3	4	4	6	5	8	7	6	12	10	12	10	8	7	12
Red-naped Sapsucker	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Downy Woodpecker	-	1	1	-	-	-	-	2	2	2	2	1	1	-	-	3
Hairy Woodpecker	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Downy/Hairy Woodpecker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Northern Flicker	-	7	7	4	4	11	6	7	6	19	18	17	12	8	7	24
Pileated Woodpecker	1	1	2	2	2	2	1	9	8	-	-	2	2	2	2	1
woodpecker sp.	1	1	2	1	1	1	1	1	1	-	-	1	1	1	-	3
American Kestrel	1	1	-	-	1	1	-	1	1	-	-	1	1	1	-	1
Merlin	-	-	-	-	-	4	3	-	-	2	2	2	2	2	2	2
* Peregrine Falcon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
falcon sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Shrike	-	-	1	1	-	1	1	2	1	1	-	-	1	1	1	1
Canada Jay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Steller's Jay	-	3	2	1	1	1	-	-	-	1	1	1	1	1	1	1
Clark's Nutcracker	-	2	2	3	2	5	3	-	-	-	33	8	15	4	14	7
Blue Jay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black-billed Magpie	6	2	9	7	6	5	14	10	17	12	17	13	8	19	14	24
American Crow	32	9	47	6	41	7	5	92	11	18	8	26	5	117	16	79
Common Raven	2	1	19	7	34	9	45	15	32	10	30	14	15	11	26	12
crow/raven sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Columbia Wetlands Waterbird Survey 2015-2019

Appendix 5 (con't). Species counts during each survey date of the fall 2015-2019 CWWS.

Species Name	Sept 29/2015	Oct 5/2015	Oct 15/2015	Oct 25/2015	Sept 29/2016	Oct 5/2016	Oct 15/2016	Sept 29/2017	Oct 5/2017	Oct 15/2017	Sept 29/2018	Oct 5/2018	Oct 15/2018	Sept 29/2019	Oct 5/2019	Oct 15/2019																	
	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size	Species Count	Sample Size																	
Black-capped Chickadee	10	2	6	1	4	3	15	4	19	6	17	5	20	5	22	6	24	9	24	6	41	11	24	10	46	14	17	5	30	11	42	12	
Mountain Chickadee	-	-	7	1	3	2	5	2	7	2	22	5	3	1	1	1	1	1	1	1	-	11	5	11	4	19	4	2	1	14	5	3	1
chickadee sp.	-	-	3	3	5	1	8	3	-	-	10	4	-	14	7	8	4	1	1	43	5	4	2	10	3	8	1	-	-	8	5		
Red-breasted Nuthatch	-	-	2	2	-	-	-	-	19	8	25	12	5	11	8	20	13	-	-	27	15	10	6	21	11	5	3	15	7	19	9	-	
nuthatch sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	1	1	
Brown Creeper	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	1	1	
Marsh Wren	5	1	6	3	5	2	-	-	2	1	6	2	2	5	4	6	3	2	1	7	5	8	5	2	1	1	1	1	1	8	4	1	1
wren sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	
American Dipper	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	1	1	
Golden-crowned Kinglet	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	4	1	1	1	1	1	-	-	-	-	-	-	
Ruby-crowned Kinglet	-	-	1	1	--	-	-	-	-	-	5	2	-	1	1	3	2	-	-	6	1	2	1	-	-	-	-	-	6	3	-	-	
kinglet sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	1	-	-	-	-	-	-	-	
Mountain Bluebird	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	2	1	-	-	
Townsend's Solitaire	2	1	7	6	9	6	13	7	17	7	14	6	6	5	15	8	24	11	5	4	25	12	26	10	32	15	10	6	20	14	21	11	
American Robin	-	-	11	4	9	3	4	2	9	3	10	5	1	1	17	6	15	5	-	-	48	5	100	12	12	7	6	2	15	5	5	1	-
Gray Catbird	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	
American Pipit	-	-	1	1	-	-	-	-	-	-	15	1	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	1	1	-	-	
Lapland Longspur	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	1	-	-	-	-	-	-	-	-	-	-	-	-	
Cedar Waxwing	-	-	20	1	-	-	-	-	-	-	-	-	-	-	-	4	1	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	
Bohemian Waxwing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	1	-	-	-	-	-	-	
House Finch	-	-	-	-	1	1	4	2	-	-	-	-	-	-	-	2	1	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
Orange-crowned Warbler	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	1	1	-	-	-	-	
Yellow-rumped Warbler	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	3	2	2	2	11	3	9	2	-	-	-	13	2	13	4	2	2	
Wilson's Warbler	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	
warbler sp. (Parulidae)	-	-	-	-	1	1	-	-	4	1	-	-	-	-	-	1	1	-	-	3	1	-	-	-	2	1	-	-	-	-	-	-	
American Goldfinch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	3	1	-	
Chipping Sparrow	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	1	1	3	1	-	-	-	-	-	-	-	-	-	
European Starling	-	-	195	2	200	1	100	1	-	-	-	-	5	1	15	1	28	2	-	-	-	-	-	-	-	-	-	209	3	15	2	-	-
Snow Bunting	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
American Tree Sparrow	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	5	2	-	-	-	2	1	6	2
Dark-eyed Junco	4	2	3	2	4	2	1	1	33	8	4	4	12	3	3	2	7	4	2	1	43	10	56	8	15	5	13	8	8	3	27	5	-
White-crowned Sparrow	-	-	-	-	-	-	-	-	2	1	1	1	2	1	-	8	5	2	1	6	2	-	-	2	1	-	-	-	6	2	2	1	-
White-throated Sparrow	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	1	1	-	-	1	1	-	-	4	1	1	1	
Savannah Sparrow	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	
Song Sparrow	4	4	12	6	3	3	3	3	3	3	1	13	5	1	1	6	4	20	8	3	2	13	6	5	3	7	4	7	2	7	3	7	4
Lincoln's Sparrow	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
Swamp Sparrow	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	
Spotted Towhee	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
sparrow sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	3	-	-	9	2	4	2	-	-	6	3	-	-	10	3	-

Columbia Wetlands Waterbird Survey 2015-2019

Appendix 5 (con't). Species counts during each survey date of the fall 2015-2019 CWWS.

Species Name	Sept 29/2015	Oct 5/2015	Oct 15/2015	Oct 25/2015	Sept 29/2016	Oct 5/2016	Oct 15/2016	Sept 29/2017	Oct 5/2017	Oct 15/2017	Sept 29/2018	Oct 5/2018	Oct 15/2018	Sept 29/2019	Oct 5/2019	Oct 15/2019
Common Yellowthroat	-	-	-	-	-	-	-	-	5	1	-	-	-	-	2	-
Western Meadowlark	-	-	-	1	1	4	-	-	-	-	-	-	-	-	1	-
Red-winged Blackbird	58	32	3	1	1	211	2	3	45	3	1	80	3	28	2	8
Brown-headed Cowbird	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
Brewer's Blackbird	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Blackbird sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pine Grosbeak	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-
Cassin's Finch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gray-crowned Rosy-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Common Redpoll	-	-	-	121	4	-	-	-	-	-	-	-	-	-	-	-
Red Crossbill	-	-	1	6	1	-	-	-	-	-	-	-	-	-	-	-
Pine Siskin	-	-	-	-	-	15	7	2	2	4	1	9	3	-	25	3
passerine sp.	10	2	9	1	-	-	-	1	1	1	1	1	1	26	7	26
																3

Appendix 6. Data from aerial swan survey completed on April 9, 2018.

General loation	Location		No. of swans
	Easting	Northing	
South end Columbia Lake	583453	5558322	2
North end Columbia Lake	581070	5571935	25
Wetlands between Columbia Lk and Lk Windermere	579071	5579392	12
Wetlands between Columbia Lk and Lk Windermere	n/a	n/a	2
Wetlands between Columbia Lk and Lk Windermere	578780	5579902	7
Wetlands between Columbia Lk and Lk Windermere	578649	5580186	6
Wetlands between Columbia Lk and Lk Windermere	578581	5580429	7
Wetlands between Columbia Lk and Lk Windermere	578240	5581002	6
Wetlands between Columbia Lk and Lk Windermere	578026	5581417	4
Wetlands between Columbia Lk and Lk Windermere	578399	5580777	2
Wetlands between Columbia Lk and Lk Windermere	577203	5583230	1
Wetlands between Columbia Lk and Lk Windermere	576860	5583683	2
Wetlands between Columbia Lk and Lk Windermere	577722	5582176	2
South End Lake Windermere	575507	5585147	21
Lk Windermere W of Rushmere Rd	575142	5585547	16
Lk Windermere west of Lakeshore Resort Campground	574749	5586093	50
Lk Windermere west of Lakeshore Resort Campground	574638	5586095	2
Lk Windermere west of Lakeshore Resort Campground	574697	5586150	2
Lk Windermere west of Lakeshore Resort Campground	574325	5586462	2
Lk Windermere just south of Ruault Rd	573749	5587087	6
Lk Windermere east of Grizzly Ridge Heights	570415	5592126	2
Lk Windermere just south of Ruault Rd	574006	5586941	1
Between Lk Windermere, Athalmer slough	569092	5596544	2
Slough east of Wilmer Pontoon Rd Marsh	567706	5598986	140
Lk Windermere west of Baltac Rd	570259	5592828	14
Wetlands slightly ne of Ritchies Pt	566899	5601640	2
Wetlands slightly ne of Ritchies Pt	566849	5601780	2
Radium across from Lookout Pts	564875	5606160	1
In Columbia River just south of Radium saw mill pond	563916	5607819	2
Slough East of Red Rock Lookout	563524	5609672	9
Just south of Radium saw mill pond	564375	5606923	2
Between Edgewater and Radium	562272	5613166	2
Between Edgewater and Radium	562414	5612924	2
Between Edgewater and Luxor	559034	5617871	45
In Columbia River just south of Luxor	557470	5619698	42
Just west of Luxor Linkage	556119	5622024	3
Just north of Luxor Station	554385	5624706	5
Just north of Luxor Station	554471	5624565	3
Just south of 2971 Hwy 95	550930	5628943	5
Between Brisco Rd and Warner's Slough	549122	5632095	9
West of Snider Rd site	552284	5627363	2

West of Feldmann's Ranch	547767	5633595	1
Between Spilli Rest Area, Brisco Rd North sites	546829	5634490	11
Feldman's area, Brisco	547919	5633419	180
In Columbia River west of Spilli Rest area	545875	5635342	17
west of Spilli Rest area	546039	5635363	2
East of Stewart's Slough, Spilli	544234	5638429	78
1.5 km north of Spilli	543168	5640716	11
In Columbia River just south of Stewart's Slough, Spilli	544706	5637652	4
5 km north of Spilli	541157	5643672	70
4 km north of Spilli	541927	5642359	3
Columbia River Harrogate area	539998	5645407	3
2 km south of Nabel Rd	535558	5649857	2
West of Nabel/Gacek Creek Slough area	533949	5650963	2
West of McKeeman's Slough area	533357	5651383	4
West of Nabel/Gacek Creek Slough area	534871	5650439	17
Castledale North Area	529556	5653688	1
Between Parson Beard's Creek North, Wells Landing	527439	5655082	2
5 km south of Parson	568253	5654442	11
1.5 km north of Parson crossing	523512	5658281	6
East of the Smith's place in Parson	523061	5658648	2
SW of Braisher's Slough, Parson	521521	5659992	4
NW of Braisher's Slough, Parson	520188	5661304	3
SW of Timber Inn & Restaurant, Parson	524053	5657842	2
W of Golden, Railway Pond site	504026	5679803	2
Edelweiss area	501592	5685393	5
Total			915

Appendix 7. Newspaper article in local community newspaper, November 29, 2018.

Submitted
www.theglobeandmail.com

Golden Star
Thursday, November 29, 2018 Page A13

Highest counts recorded in waterbird survey

The long-billed dowitcher was one of the birds counted in a waterbird count in October. The highest single day count of birds in the Columbia Wetlands Waterbird Survey took place in October.



Submitted
www.theglobeandmail.com

The results of the fifth annual Columbia Wetlands Waterbird Survey (CWWS) were in. With the highest bird counts since the project's inception in 2015, and with the highest number of volunteers participating, this was Wildlife Canada's most successful annual waterbird count. Taking place during bird migration, 303 citizen-scientists observed birds from 105 survey stations located between Kane, Tula and Donald. With each survey period lasting three hours, more than 56,000 birds were counted in three survey dates. The CWWS ground-based survey area is only able to count about 40 per cent of the Columbia Wetlands, therefore many more birds were likely to be present in the entire wetland ecosystem. The previous CWWS record was made during the fall of 2016 with a count of 51,747 birds.

The overarching goal of the CWWS network is to involve community members in a science initiative and the resulting baseline data to monitor the Columbia Wetlands into the Imperial Bird and Biodiversity Area (IBA) program. "After five years of conservation data collection, we will create a report and subsequent IBA application, which will highlight specific bird species counts that may be high enough to enable the wetlands to be designated as an IBA," stated CWWS Program Biologist Rachael Darvill.

"After our first success this past spring in having the highest spring bird counts to date, it's fantastic to have that followed

by the project's highest overall counts to date," stated Darvill. "I am extremely amazed and grateful for the large number of people that are dedicated to counting and identifying birds in the Columbia Wetlands through this project. We are learning so much about bird use and distribution in the Columbia Wetlands through volunteer citizen-science efforts."

Darvill is currently working with Environment and Climate Change Canada's Canadian Wildlife Service, as well as with a master's student from Simon Fraser University. Together, they are working to extrapolate some of the bird data that has been collected so that population estimates for some species can be formed in order to provide estimates for the entire ecosystem, not just the CWWS survey area. If the IBA status is achieved, the wetlands will become part of

the globally-based IBA network that will show the world that the Columbia Wetlands important ecosystem and value as areas to be recognized internationally in terms of the habitat, ecological birds.

Some of the more interesting results in the recent fall include the highest single day count on October 5 with 19,929 birds (61 birds in the highest single day count) and an individual species was 6,493. Other highlights on October 5: Additional high counts included 6,080 American wigeons counted on October 15, 2,836 mallards on October 5, and 241 long-billed dowitchers on October 5. Some counts for provincially-listed at-risk birds were also submitted, including 82 hooded mergansers on October 15, 42 great blue herons on September 29, 19 western grebes on October 5, and eight surf scoters on September 29.

The CWWS continues to be an excellent avenue for people to become more familiar with the Columbia Wetlands and the scientific bird diversity values found within, and to become more knowledgeable about local bird species. Are you keen to join the fun and participate in the waterbird surveys? In our next year will be your last chance before we nominate the Columbia Wetlands as an IBA at the end of 2019, using data collected through this project.

There will be free bird identification training sessions and a limited amount of optical equipment for volunteers in need. E-mail CWWS program biologist at rachael@wls.ca or call to register or for more details about 2019 survey dates.

Nov 21/19

www.coww.ca

Low counts this fall on Waterbird Survey

Submitted

This year's Widgeon Golden is well up the Columbia Wetlands Waterbird Survey (CWWS) project. Initiated in 2015, the CWWS is a five-year, coordinated bird count where the major goal has been to mobilize and coordinate citizen-scientists to collect baseline data on birds. Volunteers collect data that will be used to nominate the Columbia Wetlands into the "Important Bird and Biodiversity Area" (IBA) program, a global initiative with over 600 sites across Canada. The IBA sites are considered to be the world's most critical bird and biodiversity hotspots.

"By all accounts, I think that this five-year project was a smashing success, a large part owing to the dedicated 230 volunteers that have collected a huge amount of data - over 360,000 birds counted," states Conservation Biologist Rachel Davis. "The CWWS data is already being used in a number of ways to help improve management and conservation of Columbia Wetlands."

This fall the CWWS had a total count of 41,043 individual birds observed over the three dates at 102 survey stations, with 98 volunteers. With the exception of 2015, which had fewer survey stations and fewer volunteers, this was the lowest fall count that the CWWS has recorded. The fall count in 2018 was 57,000 birds, and the fall 2017 count was 50,918 individuals. Reasons for the decline in total number of birds seen in 2019 are unknown. The highest count for an individual bird species was on October 5, with 5,577 American Coots sighted at 16 survey stations. The second highest single species count was on October 5 with 3,405 American Wigeons.

Some of the more rare sightings included 10 Greater White-fronted Green Scaup, one all ducks, and an American White Pelican that was badly injured and (sadly) ended up being euthanized at a Veterinary Clinic. Two species of owl were seen: Great Grey Owl and North-

Pygmy Owl, and nine at-risk bird species were recorded: Western Grebe, Boreal Grebe, Horned Grebe, Double-crested Cormorant, Immature, California Gull, American White Pelican, Great Blue Heron, and Rough-legged Hawk. Also of note, we had our highest count for the 2018-19 season: Western Grebe with 215 individuals reported at 3 survey stations on October 5.

"The CWWS would not be possible without the dedication of the incredible volunteers in our region, and because of the CWWS data I think that we have a very realistic opportunity of obtaining IBA status for the Columbia Wetlands," states Davis. "With a recent report stating that 9.9 billion birds have disappeared from North America since 1970, and with 1 million species currently at-risk of extinction on Earth, I think that it's a critical time and opportunity for Wildlife to find and conserve the world's most significant bird and biodiversity hotspots," says Davis.

The Columbia Wetlands Waterbird Survey found lower counts this year with nine species at risk.

More details on the fall 2019 results of the CWWS, as well as the online 2015-2019 project will be forthcoming in a report available by January 2020. Check out the Columbia Wetlands Waterbird Survey webpage for details and contact information.

Appendix 9. Data from aerial swan survey completed on April 8, 2019.

General location	GPS Coordinates		No. of swans
	Easting	Northing	
South end Columbia Lake	583474	5558359	30
Fairmont Meadows area	579957	5577802	9
Just north of Fairmont Meadows	579898	5578070	10
Mud Lake area	579495	5578877	6
Wetlands south of Lake Windermere	579323	5579030	4
Between Columbia Wetlands Viewpoint trail and Mud Lake	578786	5579709	3
Wetlands south of Lake Windermere	578651	5579891	2
In wetlands south of Lk Windermere	577750	5582123	3
Wetlands south of Lake Windermere	577320	5583089	2
South end Lake Windermere	576251	5584507	13
South end Lake Windermere	575713	5585149	4
Lake Windermere between Lakeshore Resort and Rushmere Rd	575046	5585845	2
South central Lake Windermere	574818	5586059	48
Across from Rault Rd in lake	573269	5587885	2
Northwest of Ruault Rd on Lk Windermere	572721	5588452	1
Windermere	570921	5590977	4
Wilmer area	567569	5599400	2
Wilmer area	567420	5599875	2
North of Richies Pt	566781	5601869	9
North of Richies Pt	566499	5602694	3
Radium area	564365	5607334	1
Radium area	564043	5608321	4
Radium area	563729	5609259	15
Radium area	563402	5610119	7
North of Red Rock Lookout	563095	5610781	3
South of Edgewater	561411	5614617	2
Edgewater	560879	5615553	2
Between Edgewater and Luxor	557555	5619703	2
Luxor area	556586	5621212	23
west of Luxor Station Rd	555312	5623276	2
Brisco	550878	5629478	2
Brisco	550509	5630324	2
East of Rockaboo Ranch, Brisco	549573	5631579	2
North of Brisco at Feldmans	548885	5632866	44
Southwest of Spillimacheen dump	547876	5634256	15
Southwest of Spillimacheen rest area	546689	5635765	6
Just south of Spillimacheen	545399	5637216	2
Just south of Spillimacheen	544617	5638253	2

Just north of Spillimacheen	543442	5640078	1
Just north of Spillimacheen	542954	5641082	4
Just north of Spillimacheen	542376	5641297	11
Between Harrogate and Spillimacheen	541721	5641878	18
Between Harrogate and Spillimacheen	541018	5642954	24
Between Harrogate and Spillimacheen	540711	5643344	7
Harrogate	539708	5644201	84
West of CSRD boundary	539728	5644282	9
West of Harrogate--old barns site	539196	5645112	10
Harrogate	538829	5645575	2
West of Ben Hynes Loop Rd quarry	538498	5646156	3
Harrogate	537247	5647425	6
Harrogate	536799	5647813	4
Northwest of Harrogate	536325	5648335	39
Northwest of Harrogate	535777	5649030	28
Between Nabel and Salsbury Rd	535251	5649552	2
West of McKeeman's Slough	533140	5651362	3
West of McKeeman's Slough	532713	5651739	2
Castledale North area	530790	5652806	3
West of Parson -- 5.6 km south site	528712	5654281	2
West of Beards Cr. Rd.	528429	5654537	2
Beards Creek Rd area	527998	5654755	2
Between Wells Landing and Beards Cr. Rd.	527798	5655004	2
Parson	522694	5658981	2
Between Carbonate Landing and Parson	520497	5661008	2
Between Carbonate Landing and Parson	520208	5661304	7
Carbonate Landing area	518460	5662839	1
Carbonate Landing area	518099	5663218	15
Carbonate Landing area	517983	5663222	2
Slightly NW of Beaver Lake	516855	5664274	41
West of Beaver Lk	515798	5665105	2
About 18 km south of Golden	511121	5668604	2
About 18 km south of Golden	510569	5669067	4
E of Mulligan's Slough	509030	5670728	2
9 Mile Slough	508320	5671537	2
S of Horse Creek Confluence	507268	5672277	2
Nicholson	505707	5677437	7
Habart area	504783	5678574	2
Slightly west of Habart	504501	5678802	13
Total # of Swans	669		

Appendix 10. Osprey inventory data from the Columbia Valley osprey survey in 2019.

Nest	Nest location	Northing	Easting	Observation date	Time	Observations at nest	Nest type
1*	Old Mill in Donald	487568	5704145	August 8, 2019	1130	adults seen from a distance	pole
1*	Old Mill in Donald	487568	5704145	August 22, 2019	1210	1 adult, 2 chicks	pole
2*	Bottom of Hartley Road, top of cell tower	498238	5692706	June 3, 2019	n/a	nest building	cell tower
2	Bottom of Hartley Road, top of cell tower	498238	5692706	August 14, 2019	1326	not active	cell tower
3*	13th Street S and 7th Ave in Town of Golden	502028	5682396	May 6, 2019	0919	1 adult, prob on eggs	pole
3	13th Street S and 7th Ave in Town of Golden	502028	5682396	July 21, 2019	1630	2 dead chicks found in nest	pole
3	13th Street S and 7th Ave in Town of Golden	502028	5682396	August 16, 2019	1900	not active	pole
4*	Hwy 95 S, at CP Railway Pond across from Day Road	504896	5679931	May 6, 2019	0912	2 adults on nest, prob on eggs	pole
4*	Hwy 95 S, at CP Railway Pond across from Day Road	504896	5679931	July 31, 2019	1028	2 adults, no chicks seen	pole
4	Hwy 95 S, at CP Railway Pond across from Day Road	504896	5679931	August 19, 2019	1010	not active	pole
5	Hwy 95 S, Champagne Road off Hwy 95S	505039	5679727	August 19, 2019	n/a	not active	pole
6*	Hwy 95 S, near Lou's Feed Store	506900	5676032	May 6, 2019	0908	1 adult, prob on eggs	pole
6*	Hwy 95 S, near Lou's Feed Store	506900	5676032	July 30, 2019	n/a	2 chicks in nest	pole
6*	Hwy 95 S, near Lou's Feed Store	506900	5676032	August 25, 2019	n/a	1 chick	pole
7	Hwy 95 S at Horse Creek North end, Austin Rd	507395	5673513	May 6, 2019	0905	not active	pole
7	Hwy 95 S at Horse Creek North end, Austin Rd	507395	5673513	July 26, 2019	0940	not active	pole
7	Hwy 95 S at Horse Creek North end, Austin Rd	507395	5673513	August 15, 2019	n/a	not active	pole
8*	Horse Creek rock quarry site, beside creek	507213	5673280	June 11, 2019	n/a	occupied	pole
8	Horse Creek rock quarry site, beside creek	507213	5673280	July 31, 2019	1015	not active	pole
8	Horse Creek rock quarry site, beside creek	507213	5673280	August 15, 2019	n/a	not active	pole

9	Hwy 95 S at Horse Creek South end	508317	5672306	May 6, 2019	0903	not active	pole
9	Hwy 95 S at Horse Creek South end	508317	5672306	July 26, 2019	0937	not active	pole
9*	Hwy 95 S at Horse Creek South end	508317	5672306	August 15, 2019	1008	1 chick, 1 adult	pole
10	Hwy 95 S, South of Nine Mile Slough	509511	5671022	May 6, 2019	0858	not active	pole
10	Hwy 95 S, South of Nine Mile Slough	509511	5671022	July 26, 2019	0930	not active	pole
10	Hwy 95 S, South of Nine Mile Slough	509511	5671022	August 15, 2019	n/a	not active	pole
11*	Hwy 95 S, near VGSW colony about 16kms S of Golden	510210	5670318	May 6, 2019	0857	2 adults on nest	pole
11	Hwy 95 S, near VGSW colony about 16kms S of Golden	510210	5670318	July 26, 2019	n/a	not active	pole
11	Hwy 95 S, near VGSW colony about 16kms S of Golden	510210	5670318	August 15, 2019	n/a	not active	pole
12*	Dickson Downs Rd at private property	510846	5669517	May 7, 2019	0956	1 adult, prob on eggs	pole
12	Dickson Downs Rd at private property	510846	5669517	July 29, 2019	n/a	not active	pole
12	Dickson Downs Rd at private property	510846	5669517	August 15, 2019	n/a	not active	pole
13*	~400m W of Hwy 95 S in wetlands near Birchlands Creek	512793	5668243	May 14 2019	n/a	1 adult beside nest	tree
13*	~400m W of Hwy 95 S in wetlands near Birchlands Creek	512793	5668243	July 26, 2019	0946	1 adult, 1 chick	tree
13*	~400m W of Hwy 95 S in wetlands near Birchlands Creek	512793	5668243	August 15, 2019	1027	1 chick	tree
14	Canadian Timberframes	513969	5667201	August 15, 2019	1030	not active	pole
15	West side of Hwy 95 S, McMurdo Slough	515333	5666384	May 7, 2019	1002	CAGO on nest	pole
15	West side of Hwy 95 S, McMurdo Slough	515333	5666384	July 26, 2019	0923	not active	pole
15	West side of Hwy 95 S, McMurdo Slough	515333	5666384	August 15, 2019	0951	not active	pole
16	East side of Hwy 95 S, McMurdo Slough	515360	5666382	n/a	n/a	n/a	pole
16*	East side of Hwy 95 S, McMurdo Slough	515360	5666382	August 6, 2019	n/a	1 adult, 2 chicks	pole
16*	East side of Hwy 95 S, McMurdo Slough	515360	5666382	August 15, 2019	0951	2 adults, 3 chicks	pole
17	Columbia Valley B&B	515760	5665939	August 15, 2019	1000	not active	pole

18*	Hwy 95 S, 1km south of Mons Road	517394	5664998	May 7, 2019	1007	1 adult on nest, didn't appear to be on eggs	pole
18	Hwy 95 S, 1km south of Mons Road	517394	5664998	July 26, 2019	0954	not active	pole
18	Hwy 95 S, 1km south of Mons Road	517394	5664998	August 15, 2019	0945	not active	pole
19*	Hwy 95 S, ~28kms south of Golden	520568	5661842	May 7, 2019	1016	1 adult, prob on eggs	pole
19*	Hwy 95 S, ~28kms south of Golden	520568	5661842	July 26, 2019	1019	1 adults, 2 chicks	pole
19*	Hwy 95 S, ~28kms south of Golden	520568	5661842	August 15, 2019	1119	1 adult, 1 chick	pole
20*	Hwy 95 S, just north of Parson Store	522450	5659924	May 7, 2019	1020	1 adult, prob on eggs	pole
20*	Hwy 95 S, just north of Parson Store	522450	5659924	July 26, 2019	1023	2 chicks	pole
20*	Hwy 95 S, just north of Parson Store	522450	5659924	August 15, 2019	1129	1 fledgling	pole
21*	Hwy 95 S, Timber Inn, Parson	524531	5658477	May 7, 2019	1023	1 adult, prob on eggs	pole
21*	Hwy 95 S, Timber Inn, Parson	524531	5658477	July 26, 2019	1034	1 chick	pole
21*	Hwy 95 S, Timber Inn, Parson	524531	5658477	August 15, 2019	1137	No OSPR seen	pole
22	Hwy 95 S, south of Timber Inn, beside Wilfred's	524988	5658171	n/a	n/a	n/a	pole
22*	Hwy 95 S, south of Timber Inn, beside Wilfred's	524988	5658171	July 27, 2019	n/a	1 adult, no chicks seen	pole
22*	Hwy 95 S, south of Timber Inn, beside Wilfred's	524988	5658171	August 16, 2019	1651	2 adults	pole
23*	Hwy 95 S, South of Parson School	526207	5657242	May 7, 2019	1027	1 adult on nest, prob on eggs	pole
23*	Hwy 95 S, South of Parson School	526207	5657242	July 26, 2019	1047	2 chicks	pole
23*	Hwy 95 S, South of Parson School	526207	5657242	August 15, 2019	1144	No OSPR seen.	pole
24*	Hwy 95 S near Hildeguard's, ~250m above Hwy in field	527816	5655758	May 6, 2019	n/a	1 OSPR on nest	pole
24*	Hwy 95 S near Hildeguard's, ~250m above Hwy in field	527816	5655758	July 26, 2019	1051	1 adult, 2 chicks	pole
24*	Hwy 95 S near Hildeguard's, ~250m above Hwy in field	527816	5655758	August 15, 2019	1158	1 chick seen	pole
25	Hwy 95 S	530941	5653663	May 7, 2019	1033	unoccupied	pole
25	Hwy 95 S	530941	5653663	July 26, 2019	1059	not active	pole

25	Hwy 95 S	530941	5653663	August 15, 2019	1205	not active	pole
26*	Hwy 95 S, Quinn Creek Campground	531948	5653113	May 7, 2019	n/a	1 OSPR on nest	pole
26	Hwy 95 S, Quinn Creek Campground	531948	5653113	July 26, 2019	1101	not active	pole
26	Hwy 95 S, Quinn Creek Campground	531948	5653113	August 15, 2019	1207	not active	pole
27*	Hwy 95 S	534149	5651579	May 7, 2019	n/a	2 OSPR on nest	pole
27*	Hwy 95 S	534149	5651579	July 26, 2019	1106	1 adult, 1 chick	pole
27*	Hwy 95 S	534149	5651579	August 15, 2019	1211	no osprey seen	pole
28*	Hwy 95 S	536073	5650604	May 7, 2019	n/a	1 OSPR on nest	pole
28*	Hwy 95 S	536073	5650604	July 26, 2019	1109	1 adult, 2 chicks	pole
28*	Hwy 95 S	536073	5650604	August 15, 2019	1225	1 fledgling in and out of nest	pole
29*	Hwy 95 S, Ben Hynes Loop Rd	537904	5648337	May 7, 2019	n/a	1 OSPR on nest	pole
29*	Hwy 95 S, Ben Hynes Loop Rd	537904	5648337	July 26, 2019	1116	2 adults, 1 chick	pole
29*	Hwy 95 S, Ben Hynes Loop Rd	537904	5648337	August 15, 2019	1232	1 chick in nest testing wings. 1 adult nearby	pole
30*	Near Westside Rd/Hwy 95 intersection in Spilli, east ~400m	544800	5639788	June 12 2019	n/a	occupied	pole
30*	Near Westside Rd/Hwy 95 intersection in Spilli, east ~400m	544800	5639788	July 29, 2019	n/a	1 Adult, probable chicks	pole
30*	Near Westside Rd/Hwy 95 intersection in Spilli, east ~400m	544800	5639788	August 15, 2019	1248	1 adult, 1 chick	pole
31	Spill xing east end	544566	5639534	May 7, 2019	n/a	CAGO on nest	pole
31	Spill xing east end	544566	5639534	July 26, 2019	n/a	not active	pole
31	Spill xing east end	544566	5639534	August 15, 2019	1252	not active	pole
32*	Brisco Pole Treatment Facility	550969	5630693	May 7, 2019	n/a	1 adult OSPR	pole
32*	Brisco Pole Treatment Facility	550969	5630693	July 26, 2019	1257	2 chicks	pole
32*	Brisco Pole Treatment Facility	550969	5630693	August 15, 2019	1228	2 chicks	pole
33*	Trescher's Field near barn	549912	5630945	May 7, 2019	n/a	1 OSPR	pole

33*	Trescher's Field near barn	549912	5630945	July 26, 2019	1303	1 adult, 2 chicks	pole
33*	Trescher's Field near barn	549912	5630945	August 15, 2019	1438	1 adult, 1 chick	pole
34*	Trescher's Field west, on hydro line	549749	5630689	June 12 2019	n/a	2 adults beside partially built nest	pole
34	Trescher's Field west, on hydro line	549749	5630689	July 26, 2019	1310	not active	pole
34	Trescher's Field west, on hydro line	549749	5630689	August 15, 2019	1441	not active	pole
35*	Radium xing	563761	5608098	May 7, 2019	n/a	2 OSPR	pole
35	Radium xing	563761	5608098	July 26, 2019	n/a	not active	pole
35	Radium xing	563761	5608098	August 15, 2019	1524	not active	pole
36	New nest pole - Athlmer	569469	5596354	August 16, 2019	1031	not active	pole
37	James Chabot Provincial Park	569268	5596096	May 7, 2019	n/a	not active	pole
37	James Chabot Provincial Park	569268	5596096	July 26, 2019	n/a	not active	pole
37	James Chabot Provincial Park	569268	5596096	August 16, 2019	1028	not active	pole
38	West of Rona in Invermere, in field across from houses	568847	5596040	n/a	n/a	n/a	pole
38*	West of Rona in Invermere, in field across from houses	568847	5596040	July 27, 2019	1524	2 adults nearby, 2 chicks	pole
38*	West of Rona in Invermere, in field across from houses	568847	5596040	August 16	1020	no osprey seen	pole
39*	Lake Windermere near Taoya's house	568771	5595570	June 12, 2019	n/a	occupied	tree/pole?
39*	Lake Windermere near Taoya's house	568771	5595570	August 2, 2019	n/a	adults at nest, probable chicks	tree/pole?
39*	Lake Windermere near Taoya's house	568771	5595570	n/a	n/a	n/a	tree/pole?
40	Downtown Invermere, behind arena	569141	5595225	August 16, 2019	1015	Not active	pole
41*	Dorothy Lake	569084	5594499	May 7, 2019	n/a	2 OSPR	pole
41*	Dorothy Lake	569084	5594499	July 26, 2019	1512	1 adult, 2 chicks	pole
41*	Dorothy Lake	569084	5594499	August 16, 2019	1009	No osprey	pole
42*	RDEK offices - Windermere Loop Rd	572650	5593879	May 23, 2019	n/a	1 adult	pole

42*	RDEK offices - Windermere Loop Rd	572650	5593879	July 27, 2019	1542	2 chicks	pole
42*	RDEK offices - Windermere Loop Rd	572650	5593879	August 16, 2019	1039	no osprey	pole
43*	North of Windermere Nursery	572182	5591459	May 7, 2019	n/a	1 OSPR on nest hunkered dwn	pole
43*	North of Windermere Nursery	572182	5591459	July 27, 2019	1455	1 adult, 2 chicks	pole
43*	North of Windermere Nursery	572182	5591459	August 16, 2019	1046	1 adult, 1 chick	pole
44*	Behind Windermere Nursery (Gail's nest)	572223	5590766	May 13, 2019	n/a	occupied	pole
44*	Behind Windermere Nursery (Gail's nest)	572223	5590766	July 22, 2019	n/a	2 chicks in nest	pole
44*	Behind Windermere Nursery (Gail's nest)	572223	5590766	August 16, 2019	1200	2 chicks in nest	pole
45*	Akisquuk Offices - across the street	573056	5590459	May 11, 2019	n/a	2 adult OSPR	pole
45*	Akisquuk Offices - across the street	573056	5590459	July 27, 2019	1426	1 adult, 1 chick possibly more	pole
45*	Akisquuk Offices - across the street	573056	5590459	August 16, 2019	1300	1 adult, 1 chick	pole
46*	Windermere Creek mouth	571559	5589936	May 11, 2019	n/a	1 adult OSPR on nest	pole
46*	Windermere Creek mouth	571559	5589936	July 27, 2019	1542	2 adults, 3 chicks	pole
46*	Windermere Creek mouth	571559	5589936	August 16, 2019	1130	2 adults, at least 2 chicks flying in and out of nest.	pole
47	Akisquuk Lakeshore Resort	575280	5587220	n/a	n/a	n/a	
47*	Akisquuk Lakeshore Resort	575280	5587220	July 27, 2019	1417	2 adults, 1 chick possibly more	tree
47*	Akisquuk Lakeshore Resort	575280	5587220	August 16, 2019	1309	2 adults, 1 chick	tree
48	Old tree nest, west side of Hwy	576455	5586835	n/a	n/a	n/a	
48	Old tree nest, west side of Hwy	576455	5586835	July 27, 2019	1355	not active	tree
48	Old tree nest, west side of Hwy	576455	5586835	August 16, 2019	1314	not active	tree
49	~400m N of #3 Rd, on Hwy 95	576820	5586340	May 11, 2019	n/a	not active	tree
49	~400m N of #3 Rd, on Hwy 95	576820	5586340	July 27, 2019	n/a	not active	tree
49	~400m N of #3 Rd, on Hwy 95	576820	5586340	August 16, 2019	1402	not active	tree

50*	#3 Rd at SE Windermere parking area, east side of Hwy 95	577147	5585838	June 12, 2019	n/a	occupied by 2 adults	tree
50*	#3 Rd at SE Windermere parking area, east side of Hwy 95	577107	5585888	July 27, 2019	1345	2 adults, 1 chick possibly more	tree
50*	#3 Rd at SE Windermere parking area, east side of Hwy 95	577107	5585888	August 16, 2019	1321	1 adult, 1 chick	tree
51*	North of Funtasia, west side of Hwy 95	578167	5583967	May 11, 2019	n/a	1 adult OSPR at nest	tree
51	North of Funtasia, west side of Hwy 95	578167	5583967	July 27, 2019	n/a	not active	tree
51	North of Funtasia, west side of Hwy 95	578167	5583967	August 16, 2019	1328	1 adult perched above nest on snag	tree
52	Funtasia mini golf course	581331	5577284	n/a	n/a	n/a	pole
52*	Funtasia mini golf course	581331	5577284	July 27, 2019	1233	1 adult, 2 chicks	pole
52*	Funtasia mini golf course	581331	5577284	August 16, 2019	1336	2 chicks	pole
53	Fairmont Airport	580255	5574882	n/a	n/a	n/a	pole
53	Fairmont Airport	580255	5574882	July 27, 2019	n/a	appears inactive	pole
53	Fairmont Airport	580255	5574882	August 16, 2019	1340	appears inactive	pole
54	Columere marina - Columbia Lake	580325	5571480	May 11, 2019	n/a	no OSPR at nest	pole
54*	Columere marina - Columbia Lake	580325	5571480	July 25, 2019	n/a	2 chicks	pole
54*	Columere marina - Columbia Lake	580325	5571480	August 6, 2019	n/a	2 fledglings	pole
55	Lot 48 Nest 2	581933	5570426	n/a	n/a	n/a	tree
55	Lot 48 Nest 2	581933	5570426	July 31 2019	n/a	not active	tree
55	Lot 48 Nest 2	581933	5570426	August 18, 2019	n/a	not active	tree
56*	Lot 48 Nest 1	582017	5570120	Early May 2019	n/a	occupied	tree
56*	Lot 48 Nest 1	582017	5570120	July 31 2019	n/a	2 adults, probable chicks	tree
56*	Lot 48 Nest 1	582017	5570120	August 18, 2019	n/a	active	tree
57	Pole 53-02 Hydro Line above west side of Columbia Lk	580828	5565189	n/a	n/a	n/a	pole
57	Pole 53-02 Hydro Line above west side of Columbia Lk	580828	5565189	August 4, 2019	n/a	not active	pole

57	Pole 53-02 Hydro Line above west side of Columbia Lk	580828	5565189	August 26, 2019	n/a	not active	pole
58	Pole 54-04 Hydro Line above west side of Columbia Lk	580912	5559630	n/a	n/a	n/a	pole
58	Pole 54-04 Hydro Line above west side of Columbia Lk	580912	5559630	August 4, 2019	n/a	not active	pole
58	Pole 54-04 Hydro Line above west side of Columbia Lk	580912	5559630	August 26, 2019	n/a	not active	pole
59	Pole 53-04 Hydro Line above west side of Columbia Lk	580941	5557777	n/a	n/a	n/a	pole
59*	Pole 53-04 Hydro Line above west side of Columbia Lk	580941	5557777	August 4, 2019	n/a	2 adults at nest	pole
59*	Pole 53-04 Hydro Line above west side of Columbia Lk	580941	5557777	August 26, 2019	n/a	osprey nearby	pole
60*	Canal Flats	585723	5555701	July 31, 2019	n/a	1 adult, 1 chick	pole

*indicates osprey occupancy at nest.

Appendix 11. Horned grebe records in the Columbia Wetlands, taken from eBird online database as of September 24, 2019

Location in eBird	Date	No.
Golden--Reflection Lake	1996-05-07	18
Moberly Marsh/Gadsden Provincial Park	1996-05-10	6
Moberly Marsh Spring Survey Route	1996-05-12	1
Moberly Marsh/Gadsden Provincial Park	1997-10-18	3
Moberly Marsh/Gadsden Provincial Park	1997-10-23	2
Moberly Marsh Spring Survey Route	1999-04-28	4
Moberly Marsh Spring Survey Route	1999-05-14	1
Nicholson	2002-05-11	80
Moberly Marsh/Gadsden Provincial Park	2003-05-09	1
Invermere Area (between Invermere and Radium)	2003-05-10	X
Invermere area (close to Richie's Point)	2004-04-24	X
Invermere Area (between Invermere and Radium)	2005-05-03	X
Radium Hot Springs	2005-05-08	2
Radium Hot Springs--Saw Mill Pond	2006-05-07	2
Radium Hot Springs--Saw Mill Pond	2009-05-01	X
Wilmer National Wildlife Area	2010-05-07	3
Canal Flats - Columbia Lake	2011-05-03	40
Reflection Lake	2011-05-05	1
Golden--Reflection Lake	2011-06-21	X
Friends of Columbia Wetland--Richie's Point	2012-05-06	20
Invermere--Kin Beach/Lake Windermere	2012-05-07	30
Lake Windermere--Westside Rd	2012-05-08	20
Golden--Reflection Lake	2012-07-04	2
Columbia Wetlands Hwy 95 Views 10-17 km S of Golden	2012-09-12	1
Golden--Railway Pond	2012-09-12	1
Columbia Wetlands Hwy 95 Views 10-17 km S of Golden	2012-09-19	2
Invermere (south of Kin Beach)	2012-10-08	2
Moberly Marsh Fall Survey Route	2012-11-05	1
Moberly Marsh Spring Survey Route	2013-04-24	1
Moberly Marsh Spring Survey Route	2013-05-01	8
Moberly Marsh Spring Survey Route	2013-05-04	2
Columbia Lake--Lot 48	2013-05-06	4
Invermere--Dorothy Lake	2013-05-08	2
Invermere--Kin Beach/Lake Windermere	2013-05-08	1
Invermere--Grizzly Ridge Heights	2013-05-10	1
James Chabot Provincial Park	2013-05-10	10
Columbia Wetlands Hwy 95 Views 10-17 km S of Golden	2013-09-17	4
Columbia Wetlands--McMurdo seasonal lake	2013-09-17	8
Golden--Railway Pond	2013-09-17	5
Golden--Railway Pond	2013-10-03	1
Castledale	2014-04-22	1

Columbia Wetlands Hwy 95 Views 10-17 km S of Golden	2014-04-22	2
Timber Ridge Rd @ Ridge Place (Invermere)	2014-04-29	2
private residence Hilltop Road	2014-04-30	32
Castledale	2014-05-01	6
private residence Hilltop Road	2014-05-02	11
private residence Hilltop Road	2014-05-03	11
private residence Hilltop Road	2014-05-03	24
Golden--Railway Pond	2014-05-04	16
Golden--Reflection Lake	2014-05-04	18
private residence Hilltop Road	2014-05-04	5
Columbia Wetlands Hwy 95 Views 10-17 km S of Golden	2014-05-05	10
Golden--Railway Pond	2014-05-05	9
Golden--Reflection Lake	2014-05-05	4
Invermere--Kin Beach/Lake Windermere	2014-05-05	6
Invermere--Sewage Lagoons	2014-05-05	2
Invermere--Windermere Creek/Lake Windermere	2014-05-05	15
Windermere Lake	2014-05-05	120
Invermere Athalmer Wilmer Circuit (east of James Chabot Provincial Park)	2014-05-06	2
Invermere--Windermere Creek/Lake Windermere	2014-05-06	1
Radium Hot Springs--Saw Mill Pond	2014-05-06	3
Baltac Road, Windermere	2014-05-07	2
Columbia Lake Road Overlook	2014-05-07	30
Invermere--Windermere Creek/Lake Windermere	2014-05-07	5
Moberly Marsh Spring Survey Route	2014-05-07	2
Windermere Creek Mouth, Windermere	2014-05-07	1
Moberly Marsh/Gadsden Provincial Park	2014-05-08	1
private residence Hilltop Road	2014-05-08	4
Columbia Lake - North end	2014-05-09	1
Columbia Lake--Lot 48	2014-05-09	1
Golden--Reflection Lake	2014-05-09	2
Invermere (Between Lillian Lake and Eileen Lake)	2014-05-10	1
private residence Hilltop Road	2014-05-10	16
Moberly Marsh Spring Survey Route	2014-05-11	1
Radium Hot Springs--Saw Mill Pond	2014-05-11	4
private residence Hilltop Road	2014-05-12	9
Invermere--Windermere Creek/Lake Windermere	2014-05-13	2
private residence Hilltop Road	2014-05-22	6
private residence Hilltop Road	2014-05-22	2
private residence Hilltop Road	2014-05-23	2
private residence Hilltop Road	2014-05-25	6
private residence Hilltop Road	2014-05-26	4
Moberly Marsh Spring Survey Route	2014-05-30	1
private residence Hilltop Road	2014-05-31	2
private residence Hilltop Road	2014-06-03	1
private residence Hilltop Road	2014-06-04	1

private residence Hilltop Road	2014-06-06	3
private residence Hilltop Road	2014-06-19	2
Columbia Wetlands--McMurdo seasonal lake	2014-09-04	4
Columbia Wetlands Hwy 95 Views 10-17 km S of Golden	2014-10-03	2
private residence Hilltop Road	2014-10-28	4
private residence Hilltop Road	2014-10-29	2
private residence Hilltop Road	2014-10-30	1
private residence Hilltop Road	2014-11-01	4
private residence Hilltop Road	2014-11-05	3
private residence Hilltop Road	2014-11-08	2
Windermere (Cardiff ave beach area)	2014-11-11	1
Invermere--Baltac Beach/Lake Windermere	2015-04-24	1
Golden--Reflection Lake	2015-04-29	11
Baltac Road, Windermere	2015-05-01	1
Baltac Road, Windermere	2015-05-04	36
Columbia Lake--Lot 48	2015-05-04	4
Invermere--Cardiff Ave Beach/Lake Windermere	2015-05-04	1
Richies Point	2015-05-04	2
Invermere--Windermere Creek/Lake Windermere	2015-05-06	1
Invermere--Baltac Beach/Lake Windermere	2015-05-09	4
private residence Hilltop Road	2015-05-10	1
Golden--Reflection Lake	2015-05-12	1
private residence Hilltop Road	2015-05-13	2
private residence Hilltop Road	2015-05-14	3
private residence Hilltop Road	2015-05-14	2
private residence Hilltop Road	2015-05-14	2
private residence Hilltop Road	2015-05-15	1
private residence Hilltop Road	2015-05-15	2
private residence Hilltop Road	2015-05-16	2
private residence Hilltop Road	2015-05-21	2
private residence Hilltop Road	2015-07-25	3
Blaeberry--north delta (Private Prop)	2015-07-26	1
Golden--Railway Pond	2015-08-22	1
Columbia Wetlands Hwy 95 Views 10-17 km S of Golden	2015-09-08	3
Golden--Reflection Lake	2015-09-08	3
Beaver Lake	2015-09-24	2
Brisco Road	2015-09-29	1
Brisco west--Trecher's Slough	2015-09-29	2
Beaver Lake	2015-10-05	2
Columbia Wetland Viewpoint Trail	2015-10-05	1
Golden--Mulligans Slough	2015-10-05	1
Columbia Wetlands Hwy 95 Views 10-17 km S of Golden	2015-10-06	2
private residence Hilltop Road	2015-10-11	2
Invermere--Kin Beach/Lake Windermere	2015-10-12	1
private residence Hilltop Road	2015-10-12	8
private residence Hilltop Road	2015-10-12	1

private residence Hilltop Road	2015-10-13	6
Beaver Lake	2015-10-15	1
Wilmer National Wildlife Area (end of Smith Rd)	2015-10-15	1
Windermere Cemetery Hill	2015-10-15	4
Columbia Wetlands Hwy 95 Views 10-17 km S of Golden	2015-10-22	1
private residence Hilltop Road	2015-10-26	12
private residence Hilltop Road	2015-11-10	2
private residence Hilltop Road	2016-04-08	3
private residence Hilltop Road	2016-04-09	8
Castledale North	2016-04-10	1
Columbia Lake--Lot 48	2016-04-10	1
Invermere--Baltac Beach/Lake Windermere	2016-04-10	2
private residence Hilltop Road	2016-04-11	9
private residence Hilltop Road	2016-04-15	2
Castledale	2016-04-16	1
Invermere--Baltac Beach/Lake Windermere	2016-04-16	9
private residence Hilltop Road	2016-04-17	8
private residence Hilltop Road	2016-04-17	10
private residence Hilltop Road	2016-04-18	57
private residence Hilltop Road	2016-04-18	29
private residence Hilltop Road	2016-04-26	6
private residence Hilltop Road	2016-04-27	40
private residence Hilltop Road	2016-04-27	30
Columbia Lake--Lot 48	2016-05-01	58
private residence Hilltop Road	2016-05-01	28
Invermere--Kin Beach/Lake Windermere	2016-05-10	6
BC - Roadside Pond, Westside Rd (southwest Lk Windermere)	2016-05-12	4
Columbia Lake--Lot 48	2016-05-12	6
Golden--Reflection Lake	2016-05-13	2
Golden--Reflection Lake	2016-05-13	2
private residence Hilltop Road	2016-05-15	2
Columbia Wetlands Hwy 95 Views 10-17 km S of Golden	2016-05-23	1
private residence Hilltop Road	2016-05-31	2
private residence Hilltop Road	2016-06-06	4
Columbia Wetlands--McMurdo seasonal lake	2016-08-08	6
Golden--Reflection Lake	2016-08-08	1
private residence Hilltop Road	2016-09-16	22
private residence Hilltop Road	2016-09-18	15
private residence Hilltop Road	2016-09-24	21
private residence Hilltop Road	2016-09-25	10
private residence Hilltop Road	2016-09-26	6
private residence Hilltop Road	2016-09-27	2
Golden--Mulligans Slough	2016-09-29	26
Spillimacheen--Galena Creek Ranch Slough	2016-09-29	100
CWWS - Southeast End Lake Windermere	2016-10-05	1
Golden--Mulligans Slough	2016-10-05	6

private residence Hilltop Road	2016-10-12	1
private residence Hilltop Road	2016-10-13	8
Golden--9-mile slough	2016-10-15	4
Invermere--Kin Beach/Lake Windermere	2016-10-15	2
private residence Hilltop Road	2016-10-16	6
Moberly Marsh/Gadsden Provincial Park	2016-10-26	2
Invermere--Cardiff Ave Beach/Lake Windermere	2016-11-21	1
private residence Hilltop Road	2017-04-17	1
private residence Hilltop Road	2017-04-23	16
Golden--Reflection Lake	2017-04-25	1
private residence Hilltop Road	2017-05-04	19
Moberly Marsh/Gadsden Provincial Park	2017-05-05	2
private residence Hilltop Road	2017-05-07	8
Invermere--Windermere Creek/Lake Windermere	2017-05-08	1
Moberly Marsh/Gadsden Provincial Park	2017-05-18	1
Golden--Reflection Lake	2017-05-24	1
CA-British Columbia-Golden-Reflection Lake Road - 51.285x-116.946	2017-06-19	2
Golden--Reflection Lake	2017-06-19	2
Columbia Wetlands Hwy 95 Views 10-17 km S of Golden	2017-09-11	1
Golden--Reflection Lake	2017-09-11	2
Golden--Reflection Lake	2017-09-11	2
Lake Windermere - boat survey	2017-09-21	1
CWWS - Southeast end of Lake Windermere	2017-09-29	1
CWWS-Columbia Lake -Shoreline near Columbia Ridge	2017-09-29	4
Lakeshore Resort Campground	2017-09-29	1
CWWS-Columbia Lake -Shoreline near Columbia Ridge	2017-10-01	12
CWWS-Columbia Lake -Shoreline near Columbia Ridge	2017-10-05	11
James Chabot Provincial Park	2017-10-05	1
Parson south--Great Blue Heron Rookery	2017-10-05	1
Beaver Lake	2017-10-15	3
Moberly Marsh/Gadsden Provincial Park	2017-10-29	1
Moberly Marsh/Gadsden Provincial Park	2017-10-30	1
private residence Hilltop Road	2017-11-03	1
private residence Hilltop Road	2017-11-06	3
Columbia Lake -- Rockbeach	2018-04-16	2
private residence Hilltop Road	2018-04-19	5
Invermere--Windermere Creek/Lake Windermere	2018-04-23	1
private residence Hilltop Road	2018-04-25	11
Columbia Lake -- Rockbeach	2018-04-26	2
Columbia Lake--Lot 48	2018-04-26	5
private residence Hilltop Road	2018-05-02	35
Moberly Marsh/Gadsden Provincial Park	2018-05-04	6
private residence Hilltop Road	2018-05-08	1
Golden--Reflection Lake	2018-05-09	2
Columere Park	2018-05-10	5
private residence Hilltop Road	2018-05-11	7

private residence Hilltop Road	2018-09-18	4
CWWS-Columbia Lake -Shoreline near Columbia Ridge	2018-09-29	4
Columbia Lake -- Rockbeach	2018-10-02	3
Brisco Rd North	2018-10-05	1
CWWS-Columbia Lake -Shoreline near Columbia Ridge	2018-10-05	4
Golden--9-mile slough	2018-10-05	2
Golden--Reflection Lake	2018-10-05	2
Invermere--Lakeview Meadows	2018-10-05	1
James Chabot Provincial Park	2018-10-05	2
Lake-Windermere--Rushmere Road	2018-10-05	3
Reflection Lake	2018-10-05	2
Columbia Lake -- Rockbeach	2018-10-08	2
CWWS-Columbia Lake -Shoreline near Columbia Ridge	2018-10-11	8
Athalmer Bridge- Pete's Marina	2018-10-15	5
Invermere - Lakeview Meadows	2018-10-15	4
Parson - Wells Landing	2018-10-15	1
CA-BC-Windermere Lake(50.4721, -115.9955)	2018-10-20	1
CWWS-Columbia Lake -Shoreline near Columbia Ridge	2018-10-27	3
Columbia River at Forster's Landing	2019-01-15	2
Athalmer Bridge- Pete's Marina	2019-04-16	2
Invermere--Lakeview Meadows	2019-04-16	2
Golden--Reflection Lake	2019-05-01	1
Golden--Reflection Lake	2019-05-05	17
Golden--Reflection Lake	2019-05-05	7
Invermere--Kin Beach/Lake Windermere	2019-05-06	2
Invermere--Windermere Creek/Lake Windermere	2019-05-06	1
Private beach-Baltac Road	2019-05-06	5
Radium Hot Springs--Saw Mill Pond	2019-05-07	4
Radium Hot Springs--Saw Mill Pond	2019-05-07	18
Radium Hot Springs--Saw Mill Pond	2019-05-08	40
Radium Hot Springs--Saw Mill Pond	2019-05-08	25
Invermere--Cardiff Ave Beach/Lake Windermere	2019-05-09	8
Radium Hot Springs--Saw Mill Pond	2019-05-10	25
Columbia lake CA-BC-East Kootenay F (50.2902,-115.8703)	2019-05-11	38
Radium Hot Springs--Saw Mill Pond	2019-05-12	6
Radium Hot Springs--Saw Mill Pond	2019-05-21	2
Radium Hot Springs--Saw Mill Pond	2019-06-11	1
Radium Hot Springs--Saw Mill Pond	2019-07-09	1
Golden--Reflection Lake	2019-09-08	1
private residence Hilltop Road	2019-09-18	44
Total Number of Horned Grebe		1927

COLUMBIA VALLEY LOCAL CONSERVATION FUND (CVLCF) FINAL REPORT 2019

General Instructions

- Final reports must be submitted **by 4:00 pm MT January 31, 2020** to the Kootenay Conservation Program. Email final report to info@kootenayconservation.ca.
- All areas of the final report must be answered.

Section A – GENERAL INFORMATION

1. Project Title (as indicated in application): Marion Creek Benchlands Forest Restoration Project

2. Proponent

- a) Legal Name: The Nature Conservancy of Canada
- b) Organization Registration #: 11924 6544 RR0001
- c) Mailing Address: #200-825 Broughton Street, Victoria, BC Postal Code: V8W 1E5
- d) Contact: Richard Klafki
- e) Telephone #: 250-688-6270 f) Fax #: n/a
- g) Email: richard.klafki@natureconservancy.ca

3. Partner (*if applicable*)

- a) Legal Name:
- b) Organization Registration #:
- c) Mailing Address: Postal Code:
- d) Contact:
- e) Telephone #: f) Fax #:
- g) Email:

Section B – PROJECT INFORMATION

1. Project Location: RDEK Area F
(ie: RDEK area, watershed, direction from major centre, etc)

2. Total Project Value: \$43,010.90

3. CVLCF Contribution: \$12,473.00

4. Non-CVLCF Contribution: \$24,369.14

5. Single or multiple year project: Single

Section C – PROJECT SUMMARY

1. Please provide a single paragraph describing your project, its objective (goals) and the results. As this summary will be used in CVLCF communications, clearly state the issues addressed and avoid overly technical descriptions. Maximum 2000 characters (~290 words).

The goal of this project was to restore at least 16 ha of Rocky Mountain Douglas-fir forest to dry open forest structure on the Marion Creek Benchlands conservation property. Restoration of open forest structure and core grassland communities in areas where forest ingrowth and encroachment have occurred will improve critical habitat for species such as Mule Deer, Elk, American Badger, and Lewis's Woodpecker, reduce the risk of catastrophic wildfire to nearby communities, and enhance the resiliency of imperiled Rocky Mountain Douglas-fir systems in the face of a changing climate.

The project focused on vegetation management units with high levels of forest ingrowth that were susceptible to an increased risk of catastrophic wildfire. These units also had a limited amount of viable habitat for wildlife. During the 2019-20 winter season, NCC successfully completed a restoration prescription and hand slashing treatments on three units totaling 18.3 ha, and further identified a large unit that will be treated by volunteers in the spring of 2020. Treatment of that final unit in the spring will signal the completion of slashing treatments required on the property, and NCC will be able to shift focus towards eventual plans to maintain these restoration efforts through the use of prescribed fire.

2. OPTIONAL: If your project lends itself to sparking interest through a compelling sound bite (for potential use in CVLCF communications), please tell us what that would be. Maximum 1050 characters (~150 words).

This project addresses the urgent need to enhance critical habitat for species at risk such as American Badger and Lewis' Woodpecker, to improve grazing and overwintering grounds for ungulates such as Elk and Mule Deer, and to reduce the risk of catastrophic wildfire to local communities. Fire suppression and habitat alteration due to climate change contributes to forest ingrowth in areas that were historically open forests and grasslands, which increases the risk of wildfire while also decreasing the amount of habitat available for wildlife. By strategically thinning forests to restore open forest conditions NCC will not only improve critical species-at-risk habitat, but will also improve the resiliency of these ecosystems in the face of a changing climate and reduce the risk of catastrophic wildfire.

3. Biodiversity Targets (please list, maximum 90 words):

Dry Interior Douglas-fir ecosystems
American Badger
Common Nighthawk
Lewis's Woodpecker
Elk/Mule Deer
Open forest/grassland vegetation communities

4. IUCN Threats to Target (please list, maximum 90 words):

7.1 Fire and Fire Suppression/7.1.1 Increase in Fire Frequency/Intensity
7.1 Fire and Fire Suppression/7.1.2 Suppression in Fire Frequency/Intensity
8.1 Invasive Non-Native/Alien Species
11.1 Habitat Shifting and Alteration
11.2 Droughts

Section D – PROJECT DELIVERABLES AND RESULTS

1. Identify the deliverables outlined in your application in the table below (50 words/field) and list the results of each. Please include copies of any relevant communications products (brochures, posters, videos, websites, photos of signage, etc.) resulting from this project. Add an attachment if you need more room.

Deliverables	Results
1. Based on the Property Management Plan (PMP) for the Marion Creek Benchlands Conservation Area (NCC 2018) and Rocky Mountain Trench climate modeling, assess which vegetation management units on the Marion Creek Benchlands conservation property are most vulnerable to the effects of climate change.	A registered professional forester (RPF) was contracted to develop a Vegetation Management Plan. The plan focused on prioritizing treatment units throughout the property based on levels of forest ingrowth and relative habitat value.
2. Develop forest stewardship prescriptions that take into account conservation values, climate change and limit soil conditions.	An RPF was selected and contracted to prepare a detailed forest restoration prescription for each treatment unit. These prescriptions were based on recommendations in the Vegetation Management Plan, and addressed archaeological concerns by prescribing activities to occur on frozen soils and without the use of large machinery.
3. Implement prescriptions on the Marion Creek Benchlands conservation property.	A local forestry contractor was selected to implement slashing treatments on 18.3 ha according to the restoration prescription. All treatments were completed by hand, with slash either being dispersed or burned in a pile depending on the volume of slash generated.
4. Enhance land management and community partnerships in the RDEK Area F region.	NCC staff regularly communicate with the public and neighbors, who are aware of the benefits of forest restoration and are supportive of NCC's restoration work so far. Volunteers with the Lake Windermere Rod & Gun club will be invited onto the property in spring 2020 to help complete slashing treatments on the last remaining unit on the property.

Section E – PROJECT EFFECTIVENESS

1. Please evaluate the effectiveness of the project using objective standards, quantifiable criteria and/or quality control measures identified in your application/proposal. Maximum 2000 characters (~290 words).

Objective 1

Result: Jeff Allen (Registered Professional Forester) prepared a Vegetation Management Plan for NCC's Marion Creek Benchlands Conservation Area in 2013, which highlighted the ecological units most in need of forest restoration treatments.

Objective 2

Result: Jeff Allen prepared a restoration prescription to guide forest slashing treatments. The prescription covered three distinct treatment units (3.6, 5.5, and 9.2 ha) and took into account climate change modeling, wildlife habitat needs, as well as community needs via the reduction of wildfire risk.

Objective 3

Result: A total of 18.3 ha of ingrown forest was successfully restored by January 31, 2020.

Objective 4

Result: NCC staff regularly communicated with the public and neighbors, who are supportive of NCC's restoration work so far. NCC staff attend meetings with MFLNRORD biologists and the Rocky Mountain Trench Ecosystem Restoration program to coordinate restoration on adjacent landscapes. NCC staff plan to host volunteers from the Lake Windermere Rod & Gun club in spring of 2020 to complete further treatments.

2. What are the top 3 lessons learned from the project that would be important to communicate to others doing similar work throughout the RDEK? Maximum 1050 characters (~150 words).

1. The "lop and scatter" treatment approach works well in areas with relatively low volumes of slash. In order to reduce fire hazard when the slash loading gets higher, it's recommended to burn small piles of slash in appropriate areas.
2. While implementing restoration treatments in the winter is good for limiting soil disturbance, it is important to limit or postpone work immediately following large snowfall and/or rain events. Deep snow covers small trees and lower branches get buried under snow they are often missed, and small trees may get cut at the snow line rather than at the prescribed stump height. Melt/rain events may cause access vehicles to create muddy ruts that could possibly allow invasive plants to take hold.
3. It is important to treat the area for invasive plants before and monitor/treat for them after restoration projects.

Section F – FURTHER COMMENTS

1. Please provide any further comments including recommendations for future conservation efforts. If your project produced a narrative or scientific report or additional project products (e.g. maps, photos), attach them as an Appendix (maximum 90 words).

1. Follow-up monitoring of treated areas should be a priority for the NCC to determine effectiveness of treatments.
2. NCC staff should prepare to maintain the open forest and grassland communities in the future through the use of prescribed fire, working with the MFLNRORD biologists, BC Wildfire Service, and the Rocky Mountain Trench ER society to complete landscape-level prescribed burning.

Section G – FINANCIAL REPORT

1. Please submit a financial report for the project outlining revenue and expenditures with a comparison to the budget submitted with your CVLCF application. **Use the Final Budget Reporting form provided.** Details on any discrepancies from the budgeted amounts or items are required (maximum 90 words).

The overall project came in over budget due to additional funds being allocated for prescription development and contractor oversight. The in-kind work by wildlife clubs that was originally budgeted did not occur during the time line for this project, rather it is scheduled for spring 2020.

Columbia Valley Local Conservation Fund (CVLCF) Final Reporting Budget

Proponent:

Project Title:

Please include both cash and in-kind amounts, and itemize all projected revenues and expenditures, confirmed and pending (including in-kind contributions). Please ensure revenues and expenses balance.

Be sure to identify the specific component(s) of the project allocated to the Columbia Valley Local Conservation Fund. Record them in the "CVLCF Funding" column.

Please remove all green text upon completion of this Budget Form.

REVENUES:					
Funders	APPLICATION		FINAL REPORTING		Additional Comments
	Estimated Cash Amount	In-kind Amount	Actual Funds Received	Actual In-kind	
CVLCF	\$12,473.00		\$12,473.00		
Other Contributions (please list below)					
BC Hydro - FWCP	\$22,000.00		\$22,000.00		
Nature Conservancy of Canada	\$1,382.00		\$1,184.57		
Local Wildlife clubs (Lake Wintermere & Canal Flats)		\$2,000.00	\$0.00		
U.S. Fish and Wildlife Service			\$1,184.57		
Flanagan Foundation			\$6,168.76		
Total Amounts	\$35,855.00	\$2,000.00	\$43,010.90	\$0.00	
TOTAL REVENUE	\$37,855.00		\$43,010.90		

[illegible]

COLUMBIA VALLEY LOCAL CONSERVATION FUND (CVLCF) FINAL REPORT 2019

General Instructions

- Final reports must be submitted **by 4:00 pm MT January 31, 2020** to the Kootenay Conservation Program. Email final report to info@kootenayconservation.ca.
- All areas of the final report must be answered.

Section A – GENERAL INFORMATION

1. Project Title (as indicated in application): Lake Windermere Community-Based Watershed Monitoring Project

2. Proponent

- a) Legal Name: Lake Windermere Ambassadors Society
- b) Organization Registration #: S-57451
- c) Mailing Address: PO Box 601, 625 4th Street, Invermere BC Postal Code: V0A 1K0
- d) Contact: Shannon McGinty
- e) Telephone #: (250) 341 6898 f) Fax #:
- g) Email: info@lakeambassadors.ca

3. Partner (*if applicable*)

- a) Legal Name:
- b) Organization Registration #:
- c) Mailing Address: Postal Code:
- d) Contact:
- e) Telephone #: f) Fax #:
- g) Email:

Section B – PROJECT INFORMATION

1. Project Location: Lake Windermere, District of Invermere, RDEK Area F
(ie: RDEK area, watershed, direction from major centre, etc)

2. Total Project Value: \$43,203.00

3. CVLCF Contribution: \$10,000.00

4. Non-CVLCF Contribution: \$33,203.00

5. Single or multiple year project: Single year funding requested; project is multi-year ongoing

Section C – PROJECT SUMMARY

1. Please provide a single paragraph describing your project, its objective (goals) and the results. As this summary will be used in CVLCF communications, clearly state the issues addressed and avoid overly technical descriptions. Maximum 2000 characters (~290 words).

Our project had three main goals/objectives:

- 1) To empower citizens and decision-makers with current, comprehensive, and reliable data about Lake Windermere's water quality and ecological health;
- 2) To strengthen a community ethic of stewardship and conservation in the Lake Windermere watershed;
- 3) To promote support for science-based management on behalf of local and regional governments.

We were able to achieve these goals through:

- continuing to collect scientific data about the lake, creeks, and public beaches (as per MOE guidelines);
- continuing to collect information about waterfowl populations using the lake;
- building on our preliminary attempts at flow monitoring by improving our flow logger setup and continuing to collect data to develop a rating curve for Windermere creek and Abel creek;
- collecting data that will lead to preparation of a State of the Lake report in 2020 (analyzing at least 10 years of data and highlighting long-term changes to water quality, sensitive habitat and foreshore areas, and summarizing our current understanding of water quantity/flows and fish and wildlife populations) and beginning work on the State of the Lake Report;
- continuing to update our water data portal website with graphs, tables, and information that can be used as an educational tool for classrooms and individuals; and,
- compiling all of this information into resources for stewardship and conservation education and outreach, targeting opportunities to improve water quality, restore and protect fish and wildlife habitat, and provide management recommendations that will help preserve ecological integrity of shorelines and upland areas.

2. OPTIONAL: If your project lends itself to sparking interest through a compelling sound bite (for potential use in CVLCF communications), please tell us what that would be. Maximum 1050 characters (~150 words).

Support received from the CVLCF has been instrumental in the Lake Windermere Ambassadors being able to continue to deliver and grow our programming. We have been able to collect extensive baseline water quality and quantity data over the past nine years, build connections for the community with the health of Lake Windermere, create projects to improve ecological condition of Lake Windermere, and manage threats to the watershed as they arise.

3. Biodiversity Targets (please list, maximum 90 words):

- 1) Monitoring and protection of large and small hydro-riparian systems (Columbia River/Lake Windermere/Windermere Creek/Abel Creek)
- 2) Monitoring and protection of shallow open water (shallow areas of Lake Windermere/transition to north and south portions of the Columbia Wetlands) We aim to reduce threats to these systems through ongoing monitoring and community-based action to help improve water quality, shoreline health, and wildlife habitat, and thus help protect important flora and fauna of these ecosystems.

4. IUCN Threats to Target (please list, maximum 90 words):

- 1) Invasive and Problematic Species – Work with EKISC and Aquatic Invasive Plant Survey completed in fall
- 2) Climate Change (Droughts, Temperature Extremes, and Storms/Floods) - improved our flow and temperature monitoring and communication about water conservation and irrigation practices in summer.
- 3) Pollution (Run Off) - improved our understanding of how storm runoff impacts tributary stream quality through weekly monitoring, and increased our water quality monitoring to look at a wider range of pollutants in Lake Windermere including heavy metals
- 4) Recreational Disturbance - Ongoing education and outreach to the boating community about the relationship between responsible boating practices and lake health

Section D – PROJECT DELIVERABLES AND RESULTS

1. Identify the deliverables outlined in your application in the table below (50 words/field) and list the results of each. Please include copies of any relevant communications products (brochures, posters, videos, websites, photos of signage, etc.) resulting from this project. Add an attachment if you need more room.

Deliverables	Results
≥ 40 Citizen science volunteers trained in water monitoring, invasive species ID, and/or fish and grebe ID or survey procedures	Annual Creek and Lake monitoring program saw a total of 24 volunteers who contributed 67.5 hours total. These volunteers were trained as Citizen Scientists in water monitoring. Throughout the fall we had an additional 16 volunteers trained through our fall creek sampling (3) and Lake Keepers Workshop (13) for a total of 40 Citizen Scientists
≥ 1,000 Individuals reached by educational stewardship information at public events, markets, boat launches, and other venues	Since March of this year The Ambassadors have interacted with 1,422 individuals through events such as shoreline cleanups, Wings Over the Rockies Presentation, Paddle Palooza Festival, Farmers Market, local classroom visits and field trips, boat launch outreach, and free kids summer camps.
≥ 5 Educational articles or pieces in local media highlighting monitoring project, results, and/or stewardship education, plus CVLCF funding contribution ≥ 1 Educational brochure or handout related to improving water quality and/or taking direct action to reduce impacts to biodiversity	Since April of 2019 the Ambassadors have published monthly education articles in the pioneer and on our website, totaling 11. The Ambassadors developed and printed two educational brochures related to water quality and stewardship this summer, and printed our Green Boating Guides.
≥ 1 Management recommendation for local governments or citizens to improve water quality and conservation ≥ 3 Presentations to decision-makers about water quality results and management recommendations ≥ 2 Presentations to non-decision makers about results	4 Management recommendations were provided to DOI and 3 were provided to RDEK, progress of recommendations is being tracked. We have provided a total of 3 water quality presentations, for the public, DOI, and RDEK, additionally we provided many lakeshore communities with a written update and will be presenting at their AGM's this spring
≥ 1 Grebe and/or waterbird surveys ≥ 1 Fish counts ≥ 1 New or expanded partnership with fishing community to help "crowd source" information about fish catches/sightings and undertake fish counts /under-ice observations	One Grebe study is scheduled for October of this year. The Ambassadors have connected with a consulting firm to conduct fish counts. We have developed a relationship with the LWRGC to share data, and have crowd sourced information on fish populations through distribution of surveys to fisher people.
1 Final report in fall 2019 summarizing annual findings Develop rating curve for Windermere Creek Track website traffic and # of visitors to water data site	The 2019 Water Quality Report has been completed and shared. We are working with local experts to develop the rating curve on Windermere Creek. We are continuously tracking website traffic and spent much time this year updating our water data site to provide visitors with the most available up to date information relating to water quality

Section E – PROJECT EFFECTIVENESS

1. Please evaluate the effectiveness of the project using objective standards, quantifiable criteria and/or quality control measures identified in your application/proposal. Maximum 2000 characters (~290 words).

This project continues to deliver benefits to the residents and visitors of the Lake Windermere watershed. In 2019 we were able to empower citizens and decision-makers with current, comprehensive, and reliable data about Lake Windermere's water quality and ecological health. This was accomplished through four types of monitoring efforts (lake, creeks, beaches, and specialized surveys), performed weekly and seasonally from April to October. Empowerment came through the sharing of results by a variety of means including presentations, workshops, published reports, articles, and "pulse checks", and online data access. We were also able to strengthen a community ethic of stewardship and conservation in the Lake Windermere watershed. While hard to measure we feel we met this objective through our community outreach and citizen science programs. We trained 40 new citizen scientists of all ages in water sampling procedures (both on the lake and creeks), and interacted directly with 1,422 individuals at a variety of events to share stewardship information on Lake Windermere. Lastly, we promoted support for science-based management on behalf of local and regional governments. This was accomplished through the publishing of two scientific reports (2019 Annual Water Quality Report, and 2019 Aquatic Invasive Plant Survey), a total of 7 management recommendations based on this year's findings and the Lake Windermere Management Plan made to the District of Invermere and Regional District of East Kootenay (while also following up on prior year recommendations), and continuing to act as the Lake Management Committee for both local governments.

2. What are the top 3 lessons learned from the project that would be important to communicate to others doing similar work throughout the RDEK? Maximum 1050 characters (~150 words).

1. Data Sharing is essential and builds efficiencies. We work closely with several groups (Living Lakes Canada, BC Lake Stewardship Society, East Kootenay Invasive Species Council) and are constantly learning about what is happening within the watershed that has an impact on Lake Windermere. Without these open lines of communication there would be much duplication in works being done
2. Take a step back and look at the bigger picture. We know that the climate is changing, with this there is a lot of uncertainty around how it will effect freshwater resources. We began our 10 Year State of the Lake Report this year and are still working on it, but being able to step back and look at everything provides a lot of direction on where to focus moving forward.
3. Leverage the funding. We were able to leverage additional funding support from several sources to help support future programs, all thanks to the initial investment by the CVLCF

Section F – FURTHER COMMENTS

1. Please provide any further comments including recommendations for future conservation efforts. If your project produced a narrative or scientific report or additional project products (e.g. maps, photos), attach them as an Appendix (maximum 90 words).

See attachments

Section G – FINANCIAL REPORT

1. Please submit a financial report for the project outlining revenue and expenditures with a comparison to the budget submitted with your CVLCF application. **Use the Final Budget Reporting form provided.** Details on any discrepancies from the budgeted amounts or items are required (maximum 90 words).

Columbia Valley Local Conservation Fund (CVLCF) Final Reporting Budget

Proponent: Lake Windermere Ambassadors Society

Project Title:

Please include both cash and in-kind amounts, and itemize all projected revenues and expenditures, confirmed and pending (including in-kind contributions). Please ensure revenues and expenses balance.

Be sure to identify the specific component(s) of the project allocated to the Columbia Valley Local Conservation Fund. Record them in the "CVLCF Funding" column.

Please remove all green text upon completion of this Budget Form.

REVENUES:					
Funders	APPLICATION		FINAL REPORTING		Additional Comments
	Estimated Cash Amount	In-kind Amount	Actual Funds Received	Actual In-kind	
CVLCF	\$10,000.00		\$10,000.00		
Columbia Valley Community Foundation	\$6,000.00		\$5,000.00		Staff hours, public outreach & education, kids' programs, etc.
Columbia Basin Trust	\$8,000.00		\$10,325.00		Sample shipping / lab analysis, data analysis, final report preparation, some admin
Donations (Local Businesses, Individual Donors)	\$445.00		\$810.00		From farmer's markets, fundraisers, requests for support, membership donations
District of Invermere - Fee For Service	\$1,000.00		\$1,000.00		Supports core expenses (e.g. rent, admin fees)
Regional District of East Kootenay - Development Tax	\$1,000.00		\$1,000.00		Supports core expenses (e.g. rent, admin fees)
Volunteer work hours		\$2,100.00		\$2,080.00	130 hours @ 16.00 / hour
Volunteer boat donation for lake tours & sampling events		\$1,200.00		\$1,600.00	Boat driving time, boat use, and fuel costs (4 outings)
Local business support		\$500.00		\$273.00	Advertising and equipment donations
Interior Health Authority		\$1,500.00		\$1,500.00	Sampling fees & shipment, hosting Seem Beach app & website info
East Kootenay Invasive Species Council		\$1,000.00		\$1,000.00	Towards veliger (mussels) sampling & education
District of Invermere - use of tin boat and fuel		\$5,875.00		\$5,025.00	At least 16 lake sampling excursions and 2 aquatic invasives excursions (\$270 per outing), plus delivery & fuel
Living Lakes Canada, Columbia Basin Watershed Network, Columbia Lake Stewardship Society, BC Lake Stew. Society		\$1,500.00		\$2,300.00	Professional support and advising (hours & mileage), equipment/resource sharing
Goldeneye Ecological Services		\$800.00		\$1,290.00	Towards aquatic invasives sampling
Total Amounts	\$26,445.00	\$14,475.00	\$28,135.00	\$15,068.00	
TOTAL REVENUE	\$40,920.00		\$43,203.00		

EXPENSES:									
Expense Items	Details (if applicable)	APPLICATION				FINAL REPORTING			
		Cash	In-kind	Total Budget	CVLCF Funding	Actual Cash Spent	Actual In-Kind	Actual Total Budget	CVLCF Funding
Bookkeeping	\$100/month * 12 months plus \$500 for payroll	\$1,700.00		\$1,700.00	\$300.00	\$2,804.00		\$2,804.00	\$300.00
Professional support, advising, and resource sharing	From relevant program partners (CBWN, EKISC, LLC, RCLSS, CLSS)		\$1,500.00	\$1,500.00			\$1,500.00	\$1,500.00	
Office Utilities	\$280/month X 12 months	\$3,360.00		\$3,360.00	\$500.00	\$3,080.00		\$3,080.00	\$500.00
Telephone & Internet	\$110/month X 12 months	\$1,320.00		\$1,320.00	\$200.00	\$496.00		\$496.00	\$200.00
Advertising, media promotions, equipment donations	Local business support		\$500.00	\$500.00			\$273.00	\$273.00	
Contingency	Unexpected expense	\$150.00		\$150.00	\$40.00	\$150.00		\$150.00	\$40.00
Lake Monitoring									
Program Coordinator	80 hrs X \$30/hr (60 hours sampling + 10 hours volunteer coordination/logistics + 10 hours equipment calibration / care / troubleshooting)	\$2,400.00		\$2,400.00	\$1,200.00	\$2,400.00		\$2,400.00	\$1,200.00
Summer Student	72 hrs X \$16/hr (12 outings @ 6 hours per outing)	\$1,152.00		\$1,152.00	\$600.00	\$1,152.00		\$1,152.00	\$600.00
Volunteer Labour	85 hours X \$16/hr (17 outings @ 5 hours per outing)		\$1,360.00	\$1,360.00			\$1,360.00	\$1,360.00	
Volunteer boat driving time, boat use, and fuel	3 days X \$400/day, for sampling or events		\$1,200.00	\$1,200.00			\$1,600.00	\$1,600.00	
Boat delivery (DOI Public Works)	30 hrs X \$35/hr		\$1,035.00	\$1,035.00			\$1,035.00	\$1,035.00	
Use of boat and fuel (DOI Public Works)	At least 17 outings with boat @ \$210 per outing (half day)		\$3,570.00	\$3,570.00			\$3,990.00	\$3,990.00	
Mileage	10 km X 17 sample trips = 170 km X \$0.53/km Plus shipping samples from Cranbrook courier (x3), at 260km round trip = 260 km X \$0.53/km	\$500.00		\$500.00	\$200.00	\$500.00		\$500.00	\$200.00
Printing for data sheets & final report	Waterproof Paper, printer ink, field sheets & notebooks & professional report printing (at least 20 hard copies)	\$300.00		\$300.00	\$100.00	\$770.00		\$770.00	\$100.00
Project Supplies	Pens/markers, labels, Batteries, Replacement Chemicals & Calibration Liquids	\$550.00		\$550.00	\$50.00	\$550.00		\$550.00	\$50.00
Shipping	\$60/shipment X 5 shipments	\$300.00		\$300.00	\$100.00	\$200.00		\$200.00	\$100.00
Lab Analysis (anions, metals, nutrients, coliforms, alkalinity, TDS)	\$350/shipment X 3 shipments (April, May, September)	\$1,050.00		\$1,050.00	\$1,050.00			\$1,050.00	\$1,050.00
Contractor - Annual Data Review & Reporting	35 hrs X \$30/hr	\$1,050.00		\$1,050.00	\$475.00	\$1,050.00		\$1,050.00	\$475.00
Beach Monitoring									
Program Coordinator	5 hrs X \$30/hr	\$150.00		\$150.00	\$50.00	\$200.00		\$200.00	\$50.00
Summer Student	15 hrs X \$16/hr	\$240.00		\$240.00	\$100.00	\$190.00		\$190.00	\$100.00
Data sheets, sample shipment & analysis fees	Interior Health Authority in-kind support		\$1,500.00	\$1,500.00			\$1,500.00	\$1,500.00	
Mileage	20km * 13 sample trips = 260km @ 0.53c/km	\$138.00		\$138.00		\$138.00		\$138.00	
Tributary Monitoring									
Program Coordinator	30 hours X \$30/hr (5 months @ 6 hours per month)	\$900.00		\$900.00	\$600.00	\$1,100.00		\$1,100.00	\$600.00
Summer Student	30 hours X \$16/hr	\$480.00		\$480.00	\$200.00	\$280.00		\$280.00	\$200.00
Volunteer Labour	20 hours X \$16/hr		\$320.00	\$320.00			\$320.00	\$320.00	
Printing for data sheets & final report	Paper & ink	\$50.00		\$50.00		\$50.00		\$50.00	
Mileage	120 km X \$0.53/km (6 round trips to Windermere) Plus shipping samples from Cranbrook courier (x4) at 260 km round trip	\$620.00		\$620.00	\$200.00	\$620.00		\$620.00	\$200.00
Shipping	4 shipments X \$60/shipment (April, May, June, September)	\$240.00		\$240.00	\$100.00	\$200.00		\$200.00	\$100.00
Lab Analysis (TSS, Metals, Alkalinity, E. coli)	\$350/shipment X 4 shipments	\$1,400.00		\$1,400.00	\$770.00	\$1,400.00		\$1,400.00	\$770.00
Invertebrate taxonomy analysis & shipment	Vancouver-based invertebrate taxonomist	\$700.00		\$700.00	\$200.00	\$500.00		\$500.00	\$200.00
Contractor - Data Review/CABIN entry & Reporting	25 hrs X \$30/hr	\$750.00		\$750.00	\$300.00	\$950.00		\$950.00	\$300.00
Public Outreach									
Program Coordinator	60 hours X \$30/hr	\$1,800.00		\$1,800.00		\$1,800.00		\$1,800.00	
Summer Student	80 hours X \$16/hr	\$1,280.00		\$1,280.00		\$1,500.00		\$1,500.00	
Volunteers	25 hours X \$16/hr	\$400.00		\$400.00		\$400.00		\$400.00	
Printing for outreach materials	Brochures, signage, banners for display booth	\$1,000.00		\$1,000.00		\$1,000.00		\$1,000.00	
Aquatic Invasives Sampling Program									
Program Coordinator	10 hours X \$30/hr	\$300.00		\$300.00	\$100.00	\$300.00		\$300.00	\$100.00
Professional Fees	50 hrs X \$40/hr	\$2,000.00	\$800.00	\$2,800.00	\$2,000.00	\$3,200.00	\$800.00	\$4,000.00	\$3,351.54
Travel	700 km X \$0.53/km	\$370.00		\$370.00	\$370.00	\$370.00		\$370.00	\$370.00
Meals	3 days X \$65/day	\$195.00		\$195.00	\$195.00	\$135.00		\$135.00	\$135.00
Motorized vessel, sampling equipment, ID books and GPS	Boat (\$500/ full day X 2 days) + fuel + sampling equipment		\$1,290.00	\$1,290.00			\$1,290.00	\$1,290.00	
Veliger (invasive mussels) staff time, sampling equipment and lab fees	East Kootenay Invasive Species Council		\$1,000.00	\$1,000.00			\$1,000.00	\$1,000.00	
Total Expenses		\$26,445.00	\$14,475.00	\$40,920.00	\$10,000.00	\$28,135.00	\$15,068.00	\$43,203.00	\$10,000.00



**lake windermere
ambassadors**

healthy water for healthy communities

2019 Annual Report

www.lakeambassadors.ca

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Prepared by Shannon McGinty, BSc
Program Coordinator, Lake Windermere Ambassadors

Published December 2019

Thank you to our funders and supporters

Columbia Basin **trust** **LUSH**

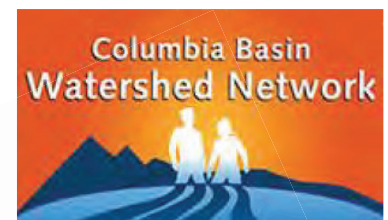


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EXECUTIVE SUMMARY

The Lake Windermere Ambassadors are a society of community volunteers and cross-sector stakeholders representing local business, recreation, tourism, commercial marinas, water stewardship, ecological conservation, second homeowners, year-round residents, First Nations, two local governments, and youth. The Ambassadors evolved from foundations created by the highly successful Lake Windermere Project which ran from 2005-2010. Since 2010, our organization has been monitoring water quality and working with stakeholders in the Lake Windermere watershed in pursuit of our vision.

Our mandate is the protection of Lake Windermere in perpetuity. We aim to achieve this through our Vision and Mission Statements:

Vision: *An ecologically healthy Lake Windermere with balanced management approaches that support recreation and traditional uses, high fish and wildlife values, and economic prosperity in the region.*

Mission: *Through collaboration of representatives of key community sectors, the Lake Windermere Ambassadors will serve as a resource for future projects benefiting the health of Lake Windermere.*

The Lake Windermere Ambassadors have been designated the Lake Management Committee by the Regional District of the East Kootenay and the District of Invermere. The primary role of the Lake Management Committee is to assist each district in implementing the recommendations in the Lake Windermere Management Plan and providing comment on development referrals.

This report details highlights and project work completed from January to December 2019.

Healthy water for healthy communities

MESSAGE FROM THE PROGRAM COORDINATOR

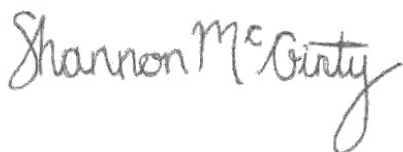
The Lake Windermere Ambassadors have undergone many projects over the past eight years, and this year was no different. As Lake Windermere faces new threats, challenges, and opportunities we adapt our programming to match them. In 2019 the Ambassadors engaged the community through outreach and education, monitored water quality and quantity, and built and maintained partnerships with a variety of water stewardship organizations to improve both our programming and assist in theirs.

The Ambassadors main focus has been community outreach and education; this allows all of our other work to have a meaningful impact. This year we employed a variety of methods to reach as much of the community as possible. We used many traditional methods, including newsletters, articles in the paper and Farmers Market outreach, along with some more involved methods including free summer camps, boat launch outreach, and signage installations. Through each method we were able to share the importance of Lake Windermere to our community and provide direction on keeping the lake healthy.

Our next largest focus area is on water quality and quantity monitoring. We were able to expand our monitoring program this year to include water quantity which hasn't been included in previous years. Although we are still developing this side of the program we were able to collect a full season's worth of input data on Windermere and Abel Creeks. As the understanding of water quality is ever expanding we too are adapting our program to be relevant and useful to the Lake Windermere watershed.

As a new addition to The Ambassadors in late 2018, I was excited for the 2019 year, and prepared to do a lot of learning. Moving into 2020 I am continuing to learn, but optimistic that I will be able to continue to improve on The Ambassadors programming. We are planning to publish a ten-year State of the Lake Report, complete an updated Sensitive Habitat Inventory Map, improve public access, and continue to grow our outreach and education this year, along with our ongoing programming.

I am truly honoured to be a part of The Ambassadors and to be able to contribute to the work being done to protect and improve this critical resource in our community.



Shannon McGinty, BSc.
*Lake Windermere Ambassadors
 Program Coordinator*



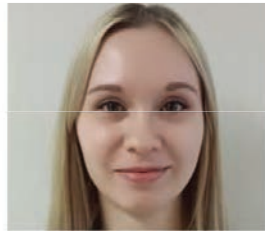
THE TEAM



Paul Christy
President



Shawn Ridsdale
Vice President



Jennifer Beverley
Secretary



Taoya Schaefer
Treasurer



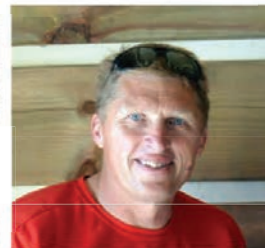
Gurmeet Brar
Director at Large



Buzz Harmsworth
Director at Large



Paola Albano
Director at Large



Max Fanderl
Director at Large



Katie Watt
Director at Large



Shannon McGinty
Program Coordinator



Keri Malanchuk
Water Stewardship Intern

Local Government Advisors



Susan Clovechok
Regional District of East Kootenay



Ute Juras
District of Invermere

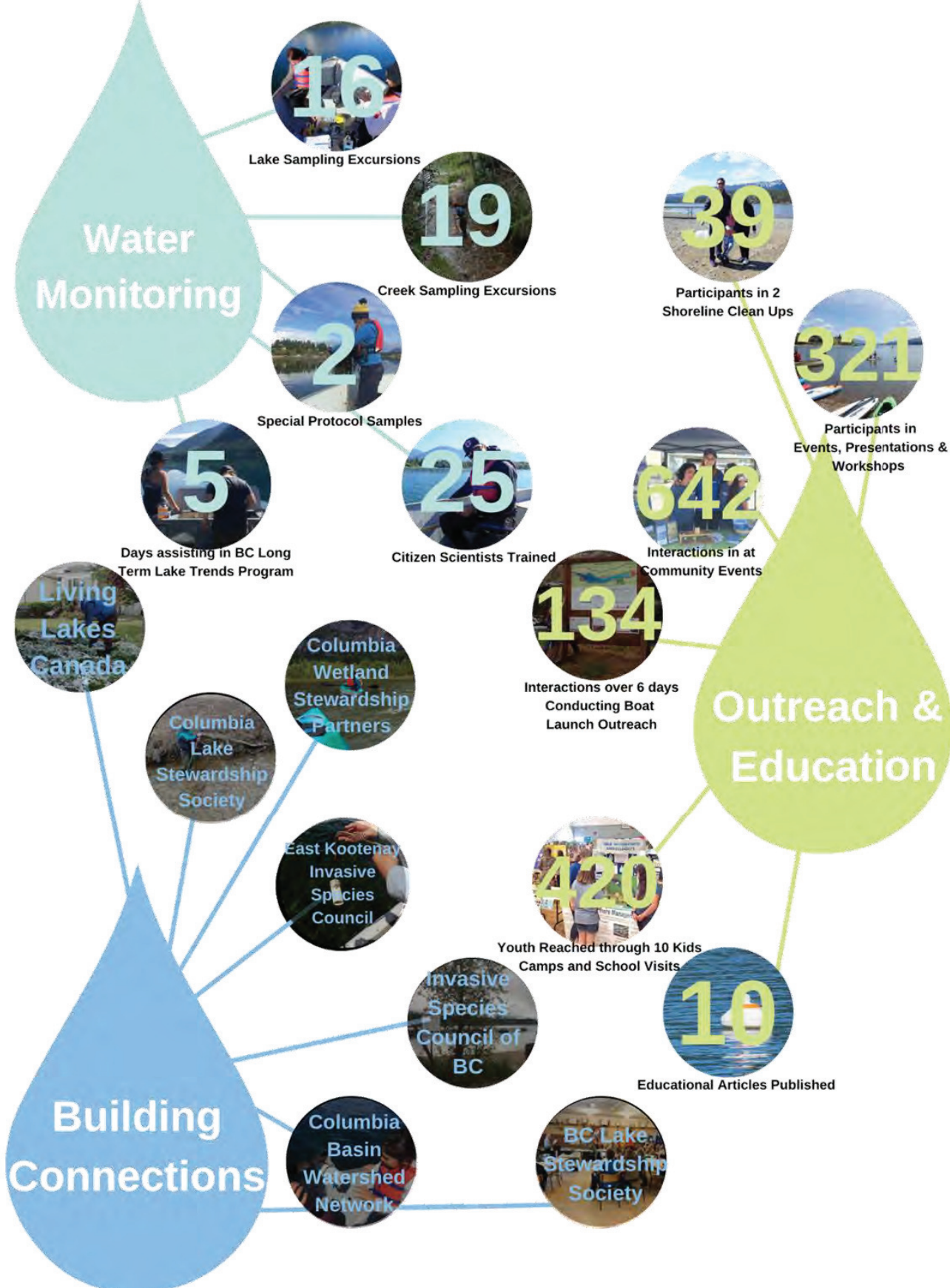


Mark Thomas
Shuswap Band



VACANT
Akisqnuq First Nation

HIGHLIGHTS



PROJECT WORK

The Ambassadors focussed this year's work in three main project areas: Outreach and Education; Water Monitoring; and Building Connections. Through each avenue, we were able to meet our work plan goals and see success in our program.

Outreach and Education

In 2019 the Ambassadors engaged with the community through a many methods of outreach. We had an overall impression reaching approximately 6,500 community members and visitors; we directly interacted with 1,556 individuals. Below is a list of every thing we did and participated in this year to connect with the community:

- Whiteway Outreach
- Snowflake Festival
- Invermere Coffee and Tea Festival
- Winter Whiteway Clean Up
- 8th Annual General Meeting
- Spring Shoreline Clean Up
- JA Laird Shoreline Clean Up
- Wings Over the Rockies Creek Sampling Demonstrations
- 2nd Annual Paddle Palooza
- Laird Environmental Education Fair
- Presentation at 2020 BC Budget Consultations
- Farmers Markets
- Boat Launch Outreach
- Educational signage installations
- Canada Day Festival
- Free Kids Summer Camps
- Valley Appreciation Day
- Community Paddle Night
- Lake Windermere Aquathon
- Salmon Festival
- BC Rivers Day Paddle and Film
- Kootenay Conservation Program Annual Fall Gathering
- BC Lake Stewardship Society Annual Meeting
- Columbia River Treaty Negotiation Update Meetings
- Columbia River Transboundary Conference
- Vancouver International Film Fest
- Windermere Valley Ski Swap
- Toby Creek Nordic Ski Club Annual General Meeting
- Columbia Basin Watershed Network Annual Meetings
- Community Water Quality Presentation
- Water Quality Presentation to District of Invermere Mayor and Council
- Online presence
- Educational Articles
- Columbia Basin Alliance for Literacy Presentation
- Columbia Valley Community Foundation Annual General Meeting
- Classroom Presentation at Eileen Madson Primary
- Partnership with Wildsight on Know Your Watershed education
- LakeKeepers Workshop



Boat Launch Outreach and Educational Signage Installations



This year the Ambassadors were able to bring a project that began in 2017 to completion, although the effect of the project will continue for the foreseeable future. In 2019, the Ambassadors published our updated Green Boating Guides. These include information for boaters, both motorized and non-motorized, of how to minimize your impact while still enjoying the lake. We handed out 63 Green Boating Packages (include the Green Boating Guide, and other relevant information), and have many more to hand out next year!

Paired with the education we were able to install a large lake map sign, provided in part by the District of Invermere and the Sign Artist, and four Clean, Drain, Dry signs, provided by the Invasive Species Council of BC. The large lake sign can be found adjacent to Pete's Marina at the public Athalmer Motorized Boat Launch, while the Clean, Drain, Dry signs are located at:

- Public Athalmer Motorized Boat Launch
- Public Athalmer Non-Motorized Boat Launch
- Bayshore Boat Launch
- Windermere Beach

Overall we found the public to be receptive to the education being provided and often interested in learning more about the health of the lake, changes over the past few years, public access opportunities, enforcement of zoning and structures on the lake, and plant growth in the lake.



Free Kids Summer Camps

2019 was the second year that we ran free kids summer camps. We were able to expand our offering to six public camps held at James Chabot Provincial Park, and two at Shady Brook Resort in July and August. Our camps covered a variety of topics all related to the Lake Windermere watershed. We had 87 kids participate over the whole summer, some of that being repeat attendees at multiple camps. Providing we continue to have the capacity, we will continue to run these camps for the community.



Educational Articles

From April to November we published monthly articles in the Newspaper and a couple supplementary articles on our website. These articles ranged in topics but aimed to provide the community with information related to Lake Windermere and watershed health. The table below outlines articles published and topics covered:

Date	Location	Title	Author
April 18, 2019	Columbia Valley Pioneer	Critters of the Lake	Shannon McGinty
May 16, 2019	Columbia Valley Pioneer	Slow Down to Avoid Watery Conflicts	Shawn Ridsdale
May 23, 2019	Columbia Valley Pioneer	Finding Fish	Shannon McGinty
June 13, 2019	www.lakeambassadors.ca	All Plastics Lead to the Ocean	Keri Malanchuk
June 27, 2019	Columbia Valley Pioneer	Just What are we Testing for in These Waters?	Shannon McGinty
July 11, 2019	Columbia Valley Pioneer	What is Swimmers Itch?	Shannon McGinty
August 8, 2019	www.lakeambassadors.ca	Mooring Buoy Info	Keri Malanchuk
August 22, 2019	Columbia Valley Pioneer	What's in your Sunscreen	Shannon McGinty
September 12, 2019	Columbia Valley Pioneer	Not so Golden to have Goldfish in the Lake	Shannon McGinty
October 17, 2019	Columbia Valley Pioneer	Columbia River Treaty Meeting to Come to Town	Shannon McGinty
November 14, 2019	Columbia Valley Pioneer	Watching our Water Foot Print	Shannon McGinty

In addition to these articles, we published weekly “Pulse Checks” from April to September highlighting the findings from that week’s water monitoring and providing education on water monitoring parameters.

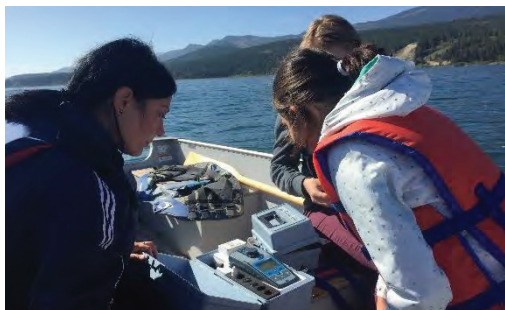
Lake Keepers Workshop

In partnership with the BC Lake Stewardship Society (BCLSS), we hosted a Lake Keepers Workshop in late October 2019. This workshop focussed on:

- Lake Ecology
- Lake Monitoring – Parameters & Program Design
- Care and Management of Lakes and Riparian Areas
- Aquatic Plants
- Watershed Assessments & Planning
- Invasive Species

Ten individuals completed the two-day workshop that consisted of one full day in class and one day in the field. We were lucky enough to have Norm Zirnhelt of BCLSS host and lead the workshop, and Jess Paloposki of the East Kootenay Invasive Species Council provide a guest presentation on the effects of invasive species and mitigation efforts.





Water Monitoring

2019 marked the ninth year of sampling for the Lake Windermere Ambassadors, with baseline data collected for four years prior during the Lake Windermere Project. This year we were able to continue our annual program, and expand to cover more areas becoming more pertinent in a changing climate. The program continued to focus on the lake, tributaries, and beaches.

Lake Windermere Monitoring

Our 2019 sampling season began with our participation in the [BC Government Long Term Lake Trends](#) project on April 19, 2019, collecting detailed freshet data. We then continued our weekly Lake Monitoring starting on May 21, 2019 through to September 24, 2019. During this time, we completed 18 excursions, and trained 25 citizen scientists, who gave a total of 84.5 volunteer hours. Our standard sampling regime was conducted in accordance with recommendations from the Ministry of Environment in the updated Water Quality Objectives for Lake Windermere, released November 2010. This includes weekly measurements of specific conductivity, pH, temperature, dissolved oxygen, and turbidity. Weekly field observations for air temperature, water depth, water clarity, wind speed and direction, and cloud cover were also recorded. Lastly, total and dissolved phosphorous were tested monthly. A continuous water temperature logger was installed near Fort Point to collect more accurate and representative water temperature data.



In addition to our standard sampling regime, we completed two special protocol excursions, and monitored for invasive mussels. The two special protocol excursions were an Aquatic Invasive Plant survey on September 17, 2019, and a Water Bird Survey on October 10, 2019. Monitoring for invasive mussels was done with Substrate Samplers installed at six locations on the east side of the lake, Lakeview Meadows, Terra Vista Community Association, Akiskinook Resort, Windermere Public Beach, Cardif Cove Marina, and Lakeshore Campground. Through this sampling, no invasive species were found to be present in Lake Windermere.

Results and interpretations from all lake sampling will be shared in our 2019 Water Quality Report, and will be used toward completing our 2020 State of the Lake Report. Both reports will be shared locally, provided to stakeholder groups, made available online

(our website, social media, and Ministry of Environments Eco-Catalogue), and through presentations and community outreach.

Tributary Monitoring

Similar to lake monitoring we monitored two tributaries that flow into Lake Windermere. Windermere Creek and Abel Creek received weekly monitoring from May 22, 2019 to September 4, 2019, plus one final collection on October 18, 2019. Our sampling protocol followed the Columbia Basin Water Quality Monitoring Project's protocols, which are closely aligned to the Canadian Aquatic Biomonitoring Network's sampling methodology. Weekly measurements taken include streamflow, specific conductivity, pH, temperature, dissolved oxygen, and turbidity. Weekly field observations for air temperature, wind speed and direction, and cloud cover were also recorded. Total and dissolved phosphorous were tested monthly, and invertebrate samples were collected monthly for eDNA analysis. Both Windermere and Abel creek have HOBO Water Level Loggers on them collecting continuous data.



This data is currently being shared through our [Data Portal](#) website, and will be used in the 2020 State of the Lake Report.



Public Beach Monitoring

In collaboration with the Interior Health Authority, we collected weekly beach water quality samples from Kinsmen, James Chabot, and Windermere Beach May 13, 2019 to August 19, 2019 (excluding long weekends). Samples were analyzed for *E.coli* through the Interior Health Authority laboratories. All public beaches met Ministry of Environment objectives for total *E. coli* counts throughout the summer season.

Building Connections

Much of the work we do is not possible without the support and collaboration with other similar groups. We work with other groups both locally and at a provincial level. Some key projects we received support with this year include:

- Living Lakes Canada Ground Water Monitoring Project providing data sharing opportunities to better understand the flow of water into and out of Lake Windermere
- Columbia Wetlands Stewardship Partners water sample collections to be analyzed for groundwater analysis
- East Kootenay Invasive Species Council providing both educational opportunities and collecting water samples on Lake Windermere to monitor for invasive species



- Columbia Basin Watershed Network providing Summer Mapping Program and Equipment Replacement Grants

Lake Management Committee

From everything in this report to installation of the Slow/No Wake Buoys in Taynton Bay, recommendations to local government and increasing public access opportunities the Ambassadors continue to complete work related to the implementation of the non-regulatory Lake Windermere Management Plan. We did not receive any referrals from the District of Invermere or Regional District of East Kootenay for development and crown land tenure applications on the foreshore of Lake Windermere in 2019. We are confident that we will continue to receive these as they do come in, and will respond to each accordingly.

Financials

The fiscal year for the Ambassadors runs from October 1st to September 30th each year. This year the Ambassadors saw comparable income and spending to previous years, with an annual cash flow of approximately \$94,000 supporting this program.

Full financial statements can be found online at lakeambassadors.ca or can be requested from our office at info@lakeambassadors.ca (250) 341 6898.



CONCLUSIONS

2019 was another successful year for the Lake Windermere Ambassadors completing our education, outreach, and monitoring duties as the Lake Management Committee while continuing to grow and expand our programming where appropriate.

ACKNOWLEDGEMENTS

The work we do could not happen without our collaborators, partners, and mentors:

- Adventure Paddle School
- AG Valley Foods
- Akiskinook Resort
- Akisqnuq First Nation
- BC Lakes Stewardship Society
- Black Star Studios
- Café Allium
- Cardiff Cove Marina
- Canada Summer Jobs
- Canadian Freshwater Alliance
- Columbia Basin Trust
- Columbia Basin Watershed Network
- Columbia Lake Stewardship Society
- Columbia River Paddle
- Columbia Valley Community Foundation
- Columbia Valley Escape Rooms
- Columbia Wetlands Stewardship Partners
- Community Donors
- District of Invermere
- Fairmont Pizza and Ice Cream
- Fire Vixen
- East Kootenay Invasive Species Council
- Gerrys Gelati
- Golden Eye Ecological Services, Rachel Darvill
- Hearth2Homes
- Home Hardware
- Hopkins Harvest
- Invasive Species Council of BC
- Invermere Bakery
- Katie Watt, 2018-19 Whiteway Ambassador
- Keri Malanchuck, Water Stewardship Assistant
- Kootenay Conservation Program
- Kootenay River Runners
- Lakeshore Resort
- Lakeview Meadows
- Lake Windermere Aquathon Society
- Leo Burrito
- Living Lakes Canada
- LUSH Charity Pot
- Om Organics
- Our Committed Board of Directors
- Peppis Pizza
- POLIS
- Pynelogs Cultural Centre
- Rainbow Donkey Kids Clothing
- RBC Foundation
- Real Estate Foundation of BC
- Regional District of East Kootenay
- Shady Brook Resort
- Sign Artist
- Shuswap Indian Band
- Terra Vista Community Association
- Toby Creek Nordic Ski Club
- Ullr Bar
- Wildsight Invermere
- Windermere Community Association

**Lake Windermere Community Based
Water Quality Monitoring Program
2019 Final Report**



January 2020

**Report prepared by: Shannon McGinty, BSc.
Program Coordinator, Lake Windermere Ambassadors**

Lake Windermere Ambassadors (LWA)

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Executive Summary

The Lake Windermere Ambassadors direct a Community-Based Water Monitoring and Citizen-Science Education program within the Lake Windermere watershed. 2019 marked the thirteenth year of lake monitoring since the Lake Windermere Project began collecting water quality data in 2006.

In 2019, the Lake Windermere Ambassadors collected physical and chemical water quality parameters at three sample sites on Lake Windermere once weekly during the summer, from late May to September. The lake sampling regime included water temperature, turbidity/clarity, pH, conductivity, depth, and dissolved oxygen. Once monthly from May to September we collected Total Dissolved Phosphorus and Total Phosphorous. In addition, the LWA monitored substrate samplers at six sites on the east side of Lake Windermere for invasive mussels, as well as monitoring tributary flows and water quality at the outlet of Windermere Creek and Abel Creek. *E. coli* data was collected at public swim beaches weekly, from May until September, excluding weeks with a statutory holiday Monday, in partnership with the Interior Health Authority. Lastly, Goldeneye Ecological Services was contracted to complete an aquatic plant survey, and fall waterbird survey on Lake Windermere.

Findings from 2019 show that Lake Windermere's water quality continues to support aquatic life and recreation. The only parameter that deviated from the Ministry of Environment objectives was temperature on one occasion in June. Specific Conductivity and pH were both observed to be outside of the optimal range for aquatic life, but may have been impacted by faulty equipment. The three public swim beaches (Windermere, James Chabot Provincial Park, and Kinsmen) met Interior Health Authority guidelines for recreational quality during all sample collection dates in 2019. The annual aquatic plant survey found no invasive species in Lake Windermere for the tenth year of sampling. While overall there is a healthy abundance of vegetation throughout the lake there were a couple sites of concern that saw less healthy vegetation, particularly where sites saw higher boat traffic (Darvill, 2019). Further to last year's newly developed waterbird survey protocol and investigative report, this year's fall waterbird survey found 18 species observed, 889 individuals, with a number of them being rare sightings and species at risk. Invasive mussel larvae (veligers) were not detected in Lake Windermere as sampled for by the East Kootenay Invasive Species Council in 2019 (BC Conservation Officer Service, 2019).

Our major funders for this project and its final report include the Columbia Valley Local Conservation Fund, the District of Invermere, the Regional District of East Kootenay, the Columbia Basin Trust's Environment Large Grants program, LUSH Charity Foundation, and Royal Bank of Canada Foundation. Additional funding support for our 2019 programs came from the Columbia Valley Community Foundation, the Real Estate Foundation of BC, Canada Summer Jobs, the Columbia Basin Watershed Network, and BC Community Gaming Grants.

Questions about this report?

Contact: Lake Windermere Ambassadors
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250-341-6898

1. Introduction

Lake Windermere is one of two headwaters lakes located at the source of the Columbia River in southeast British Columbia, Canada. The “lake” itself is not a true lake and rather a long widening of the Columbia River, with an average depth of ~3-4m (10-13ft).

Historically, Lake Windermere has supported several species of fish, and is used by hundreds of species of resident and migratory birds (McPherson and Hlushak, 2008). Birds, fish, and wildlife all depend on the lake and its outflows to the Columbia Wetlands, which are one of the longest intact wetlands in North America and a wetland of international importance (Ramsar, 2004).

Humans also depend on Lake Windermere for its social, cultural, environmental, and economic values. Not only is it a drinking water source, but the lake is heavily used for recreation, motorized and non-motorized, in the summer and winter, for business opportunities, and traditional values.

1.1 - Climate

Lake Windermere sits within the Southern Rocky Mountain Trench in the Interior Douglas Fir (IDF) biogeoclimatic zone (Braumandl and Curran, 2002). The region is temperate and experiences all four seasons, characterized by relatively mild, cool winters and dry, hot summers.

Average annual precipitation is in the range of 300-400 mm (Urban Systems 2012; District of Invermere 2017), and most rainfall historically occurs between May and June. Spring freshet usually occurs between late May and early July.

The warmest days of the year have historically been recorded in July and August. 2019 varied from 2017 and 2018, which had been noted as being hot summer years, with significant forest fire activity and minimal summer precipitation. During the 2019 summer season, the region saw increased precipitation, cooler temperatures, and limited forest fire activity.

1.2 - Watershed Characteristics

Lake Windermere sits at approximately 800masl, and is bordered east and west by two distinct mountain ranges, the Purcells and the Rockies. The lake flows from south to north as part of the main channel of the Columbia River, which exits Columbia Lake approximately 20km upstream. Lake Windermere flushes on average every 47 days, contributing to its relatively good water quality (McKean and Nordin, 1985).

The main tributary entering Lake Windermere is Windermere Creek, a fourth-order mountain stream that drains an area of approximately 90 km² (NHC, 2013). Some of the major developments within the Lake Windermere watershed include an active gypsum mine, railroad, roads and highway, agricultural and grazing activities, golf courses, ski hills, urban and residential development, and historical forest harvesting (McPherson et al., 2018).

1.3 - Community-Based Water Monitoring

Concerns about increased development and changes to Lake Windermere in the early 2000's prompted the creation of a community-based water quality-monitoring program and watershed stewardship education initiative, in the form of the Lake Windermere Ambassadors.

The Lake Windermere Ambassadors (LWA) are a community-led, charitable non-profit society formed in 2010 with the mandate of protecting Lake Windermere in perpetuity. The LWA have overseen a Community-Based Water Monitoring program on Lake Windermere since their inception, using the assistance of volunteers, and substantial baseline data collected by Wildsight's Lake Windermere Project. Since 2010, the LWA have added to the monitoring program based on needs and available resources, including, tributary monitoring, invasive species monitoring, and wildlife surveys.

From 2006 to 2009, the Lake Windermere Project worked to assess the quality of Lake Windermere's waters for wildlife and human recreational uses. In 2010, the BC Ministry of Environment took those four years of data, and determined an updated list of Water Quality Objectives for Lake Windermere. These objectives are a benchmark against which the LWA can compare present conditions to evaluate if the lake water quality continues to be suitable for recreational and ecological needs.

By continuing to test lake water quality on a weekly basis in the summer, the LWA now have thirteen years of water quality data for Lake Windermere. This data allows the LWA to detect seasonal and annual changes in water quality, and to communicate information about Lake Windermere that will help inform sustainable watershed planning and restoration initiatives in the Upper Columbia watershed.

1.4 - Sample Sites

Water quality is sampled at three locations on Lake Windermere, which have been in the past monitored by the BC Ministry of Environment and by the Lake Windermere Project. These locations include North (Timber Ridge/Fort Point), Middle (Windermere) and South (Rushmere) sample sites (Figure 1).

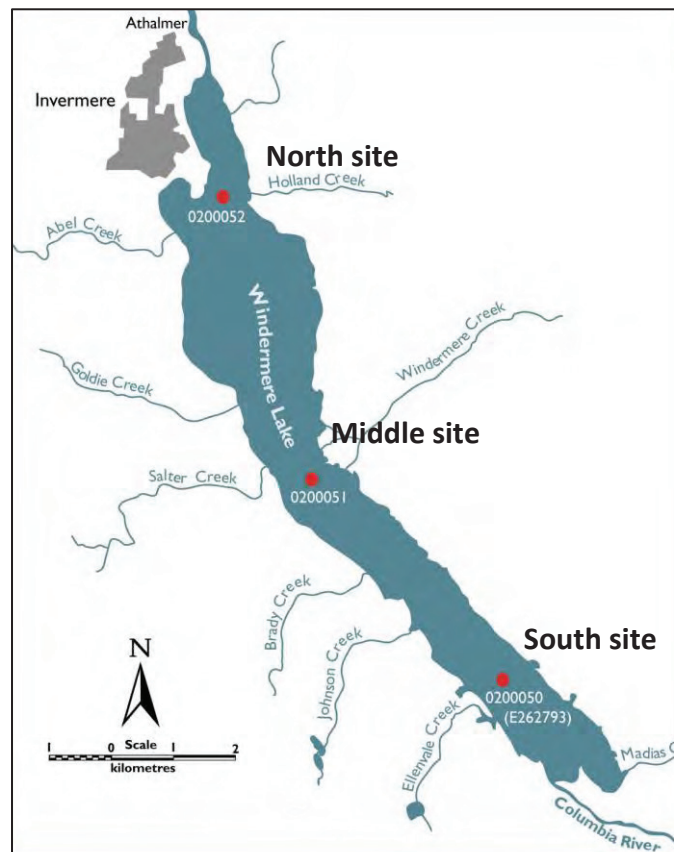


Figure 1: Lake Windermere Sampling Sites: North (0200052), Middle (0200051), and South (0200050).
(Image Source: Neufeld et al., 2010)

2. Lake Windermere Water Quality Results

2.1 - Temperature

Overview

Water temperature is critically important to lake health as it has direct impacts on water chemistry (ex. Dissolved oxygen, specific conductivity, water density) and influences the rate of chemical and biological reactions. This effects the ability for aquatic life to grow, survive, and reproduce in an environment (Alberta Regional Aquatics Monitoring Program, 2008).

Due to the shallow depth of Lake Windermere, it has a naturally elevated temperature relative to other freshwater lakes (Neufeld et al., 2010). Unlike deep lakes, Lake Windermere does not stratify into different layers of temperature and density within the water column (McKean and Nordin, 1985).

Warm and clear water makes Lake Windermere a desirable lake for human recreation. However, average summer water temperatures have historically exceeded the BC Ministry of Environment's (MOE) Temperature Guidelines for the protection of freshwater aquatic life (Neufeld et al., 2010). For example, many of the freshwater fish species observed in this lake have optimum temperature ranges below 18°C for rearing, spawning, and incubation (Ministry of Environment, 2017a), whereas historical monthly water temperatures in Lake Windermere have been recorded up to 25°C (Neufeld et al., 2010).

To adjust for the naturally warmer temperatures in Lake Windermere, the MOE set the maximum allowable average monthly water temperatures at 20°C, 25°C, and 23°C in June, July, and August respectively (Neufeld et al., 2010). These guidelines are based on the MOE recommendation that lake water temperatures should remain within $\pm 1^\circ\text{C}$ of natural conditions.

Results

During the 2019 summer season, there was only one instance where the water temperature exceeded the maximum threshold at the North and Middle sample stations. Average monthly temperatures remained consistently below the maximum threshold recommended by MOE (Figure 2a).

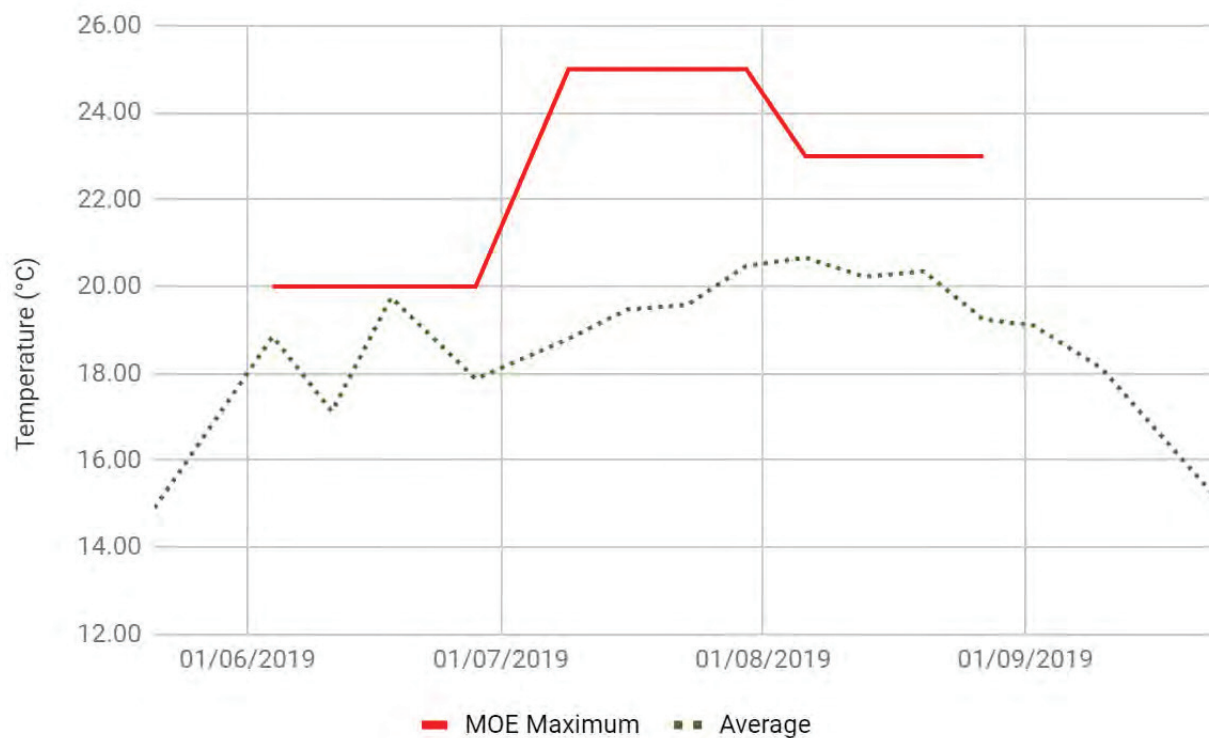
The highest temperature measured in 2019 was 22.6°C, recorded on August 6th at the North sample station (Figure 2b). For comparison, the highest temperature measured in 2018 was 23.6°C, on July 31st at the Middle sample site.

To address concerns related to sample time bias, we were able to install a continuous temperature logger located near the North sample site (Figure 2c). Data collected from this device indicated the highest temperature to be 21.89°C on August 9th, which remained in line with the results from our weekly monitoring.

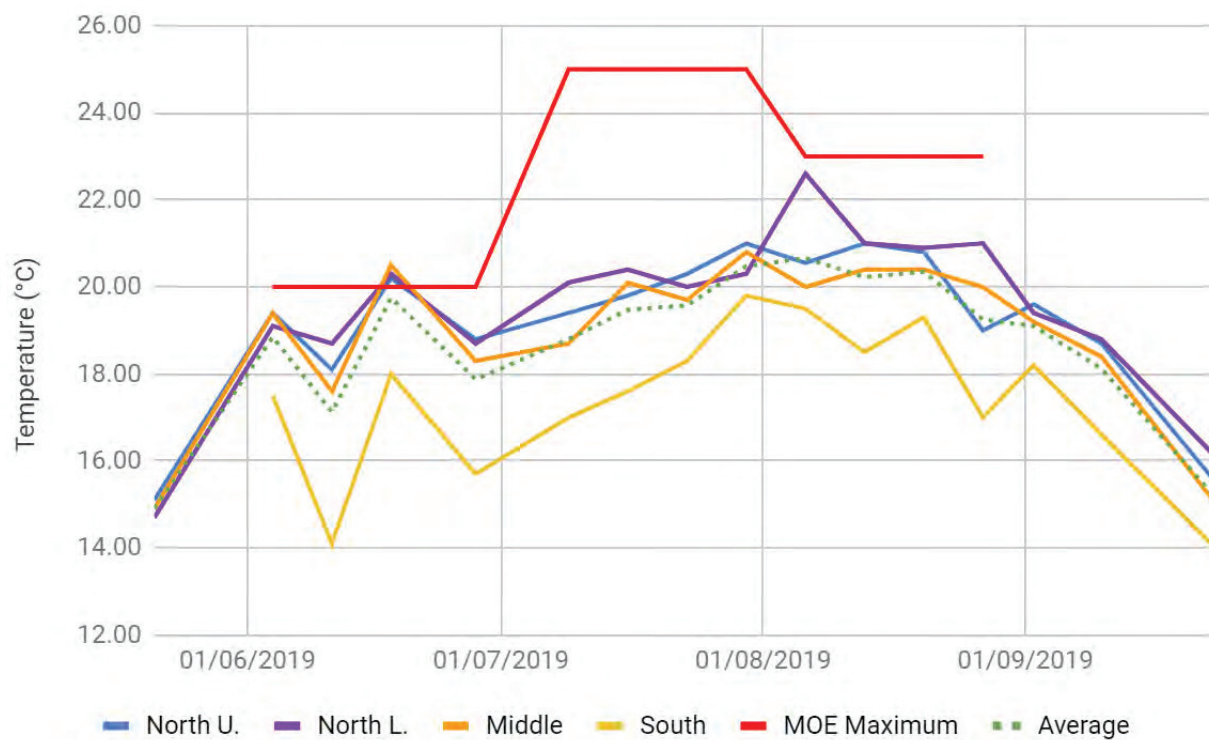


Summer Student, Keri Malanchuk (right), and volunteer, Shelly Hopkins (left), measuring water temperature and specific conductivity

(a)



(b)



(c)

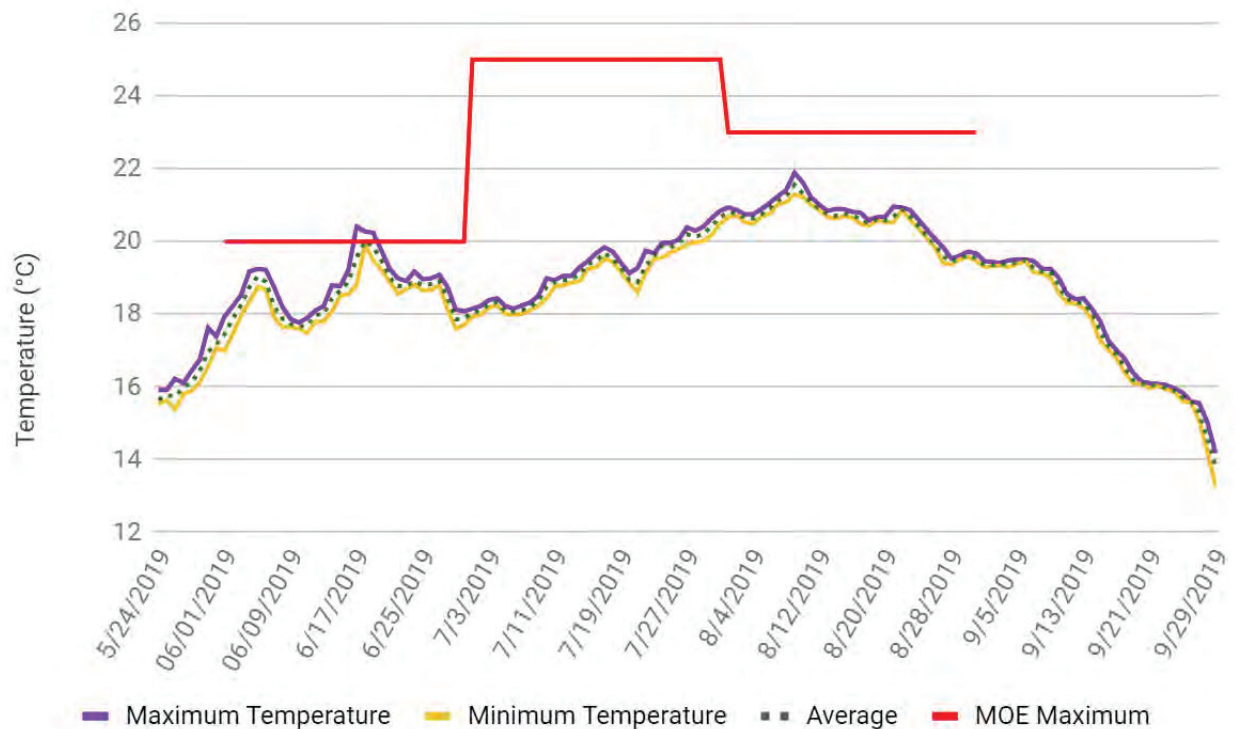


Figure 2: (a) Average water temperature for Lake Windermere, measured weekly from May 20 to September 24, 2019. (b) Water temperature results separated by sample site. (c) Water temperature measurements recorded by continuous temperature logger from May 24 to September 29, 2019.

Note: Lines are for interpretation only, and do not represent continuous measurements.

2.2 - Dissolved Oxygen

Overview

Dissolved Oxygen (DO) is another name for the free oxygen gas that has dissolved in water. Some amount of DO is required for almost all species of aquatic life to survive, but too much or too little oxygen can harm aquatic life and negatively affect water quality (Ministry of Environment, 2017a).

Oxygen can be transferred to water from the atmosphere or produced by submerged aquatic plants during photosynthesis. It is then removed from the water by respiration in aquatic plants and animals, chemical reactions, and organic decomposition. For example, a large amount of decomposing plant material within a lake can decrease DO concentrations in the water, because the oxygen is consumed during the decomposition process (Neufeld et al., 2010).

The capacity for water to hold dissolved oxygen is inversely related to water temperature. Meaning, warmer water holds less oxygen, and cooler water holds more oxygen (Ministry of Environment, 2017a).



Program Coordinator, Shannon McGinty, performing DO Titration.
Photo by Pat Morrow

The MOE recommends that DO should never drop below an instantaneous minimum of 5 mg/L, and the guideline for an average of five samples taken over a 30-day period is 8 mg/L (Neufeld et al., 2010; Truelson, 1997). It is also recommended that DO not exceed a maximum of 15 mg/L, in order to prevent negative effects of toxicity (Neufeld et al., 2010).

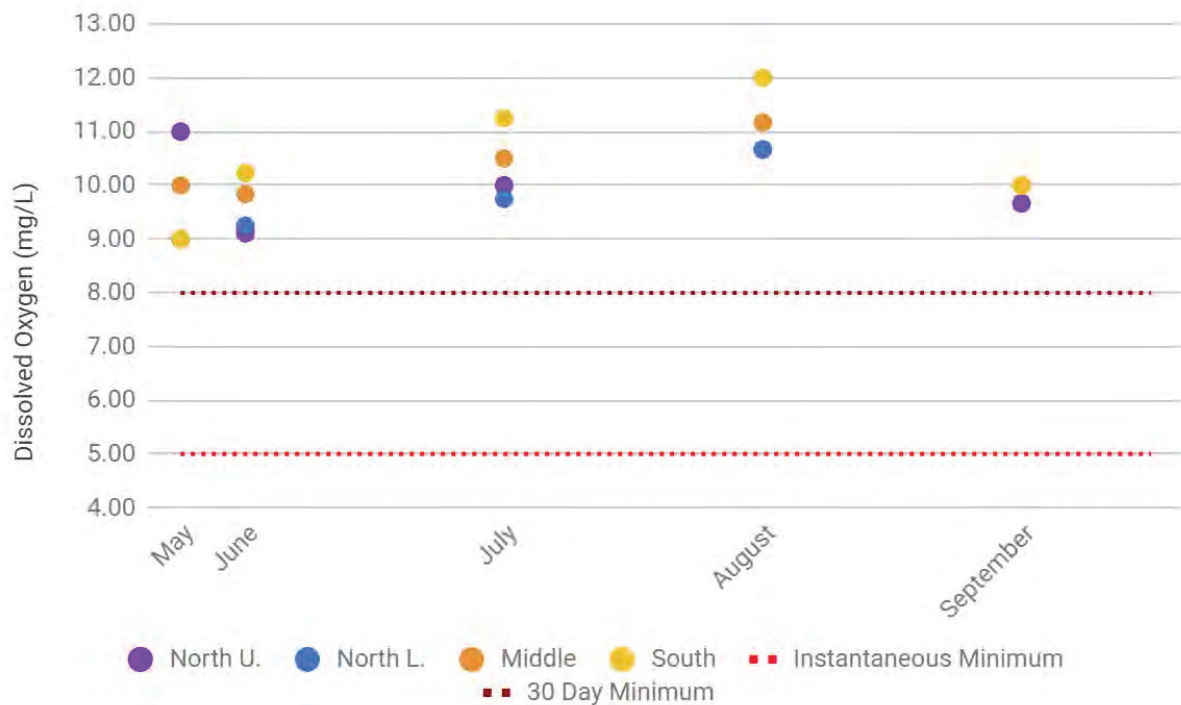
Results

During the 2019 summer season, DO values in Lake Windermere never dropped below the 5 mg/L minimum threshold recommended by MOE (Figure 3a). Instantaneous values ranged between a low of 8 mg/L and a high of 11.32 mg/L (Figure 3b).

The South sample site typically had higher DO values than the other sites. This may be due to the proximity to the Columbia wetlands, which have an abundance of aquatic plant life that are photosynthesizing and contributing oxygen to the water. It may also be due to the slightly cooler temperatures of water flowing out of the wetlands, since cooler water holds more oxygen.

It is important to acknowledge the Winkler titration method used for collecting DO results can come with significant human error if completed or interpreted incorrectly in the field. In previous years we have compared field titration results with readings from a YSI Pro20 Dissolved Oxygen meter, and found the titration results to be within ± 2 mg/L of the calibrated meter. This is a significant variation, suggesting the LWA should invest in a DO meter to independently verify the titration readings performed by citizen scientists and ensure a higher level of accuracy in future.

(a)



(b)

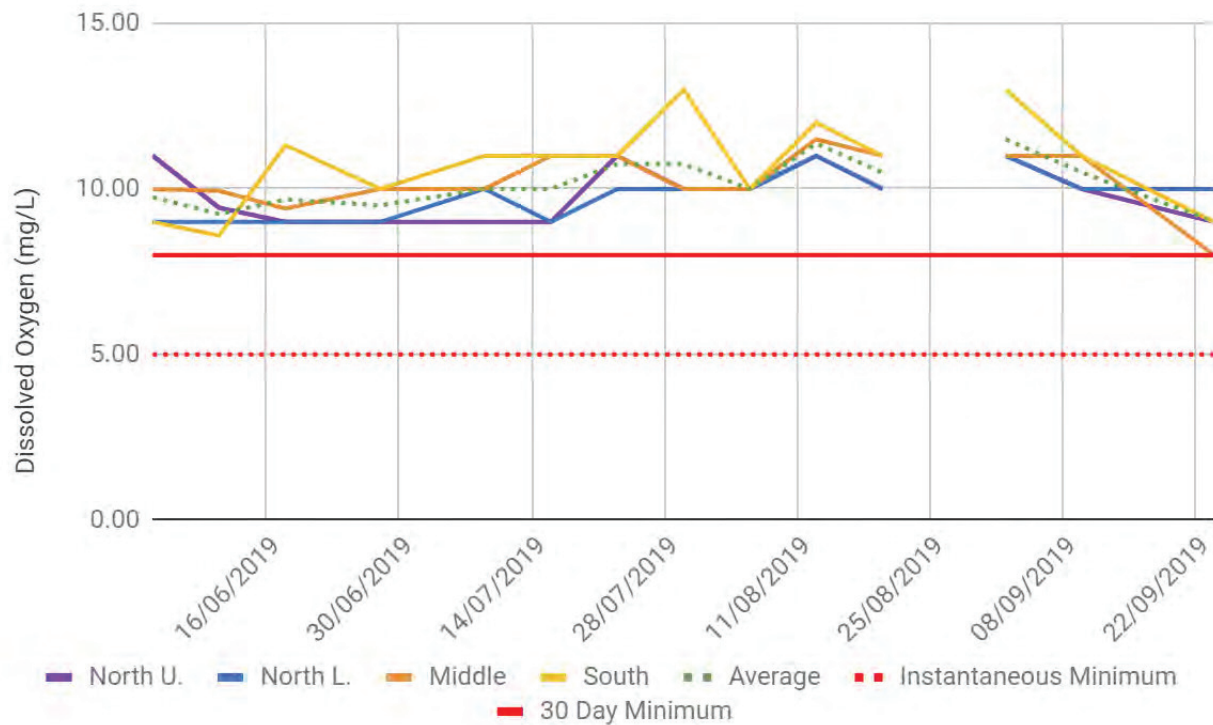


Figure 3: (a) 30-day mean values for dissolved oxygen, calculated for seventeen weeks between May 20 and September 24, 2019. (b) Weekly dissolved oxygen data for Lake Windermere, measured from May 20 to September 24, 2019 (missing data from the week of August 20, 2019).

Note: Lines are for interpretation only, and do not represent continuous measurements.

2.3 - Turbidity

Overview

Turbidity is a measure of the light scattered by particles suspended in water, and indicates the clarity of the water. When waters are highly turbid, such as when they are filled with lots of suspended sediment, light does not penetrate as easily to reach aquatic plants, which reduces photosynthesis. Fish can become stressed due to reduced ability to navigate, clogging of gills, and other physiological stressors (Ministry of Environment, 2017a).

Since aquatic life in Lake Windermere has adapted to seasonal flushes of sediment into the lake, the acceptable amount of turbidity depends on the time of year. The most turbid waters typically occur during “freshet” (the spring runoff period), or after heavy rainfalls.

The turbidity objectives for Lake Windermere are set to protect recreational water quality and aquatic life (Neufeld et al, 2010). During freshet (May 1 to August 15), in what is known as the “turbid flow period”, the 95th percentile of turbidity measurements taken in 5 days over a 30-day period should not exceed 5 NTU (turbidity units). During the “clear flow period” (August 16 to April 30), the maximum turbidity at any time



Volunteer Terri Eacrett measuring Turbidity

should be less than or equal to 5 NTU. Additionally, the objective for “clear flow” is that the average of 5 samples over 30 days should not exceed 1 NTU (Neufeld et al, 2010).

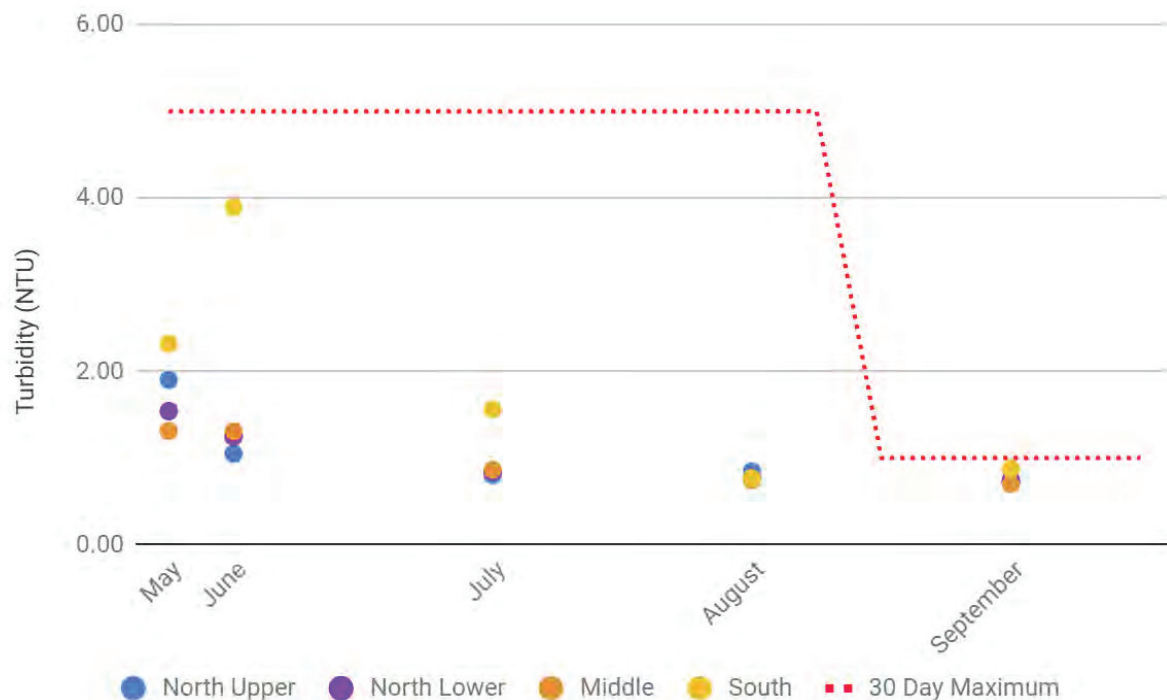
Results

Overall, turbidity in 2019 remained well within the acceptable ranges for recreational water quality and aquatic life. The mean 30-day turbidity values for 2019 did not exceed MOE Recommendations (Figure 4a).

The South sample site saw the highest peaks in turbidity (Figure 4b) likely due to sediment entering the Columbia River through Dutch Creek, and settling out in Lake Windermere. Wetlands usually help to attenuate high turbidity by slowing flows and allowing sediment to settle out; however, the sediment loads coming in through the wetlands in June may have been too high for this to occur. The result is that the South sample site exceeded maximum turbidity values on June 4th, with a reading of 6.75 (Figure 4b). This type of turbidity response is not uncommon for many river systems during freshet, because of the high volumes of meltwater runoff, which can erode lower-order stream channels and carry large amounts of sediment downstream.

During the clear flow period, we saw two instances where readings exceeded MOE objectives, August 20th North sample site 1.07 NTU and September 10th South sample site 1.08 NTU. This might have been due to the high wind events and rain showers in the seven days leading up to sampling, which could have caused sediment runoff into tributary streams and heavy mixing of the lake water to occur because of wave action.

(a)



(b)

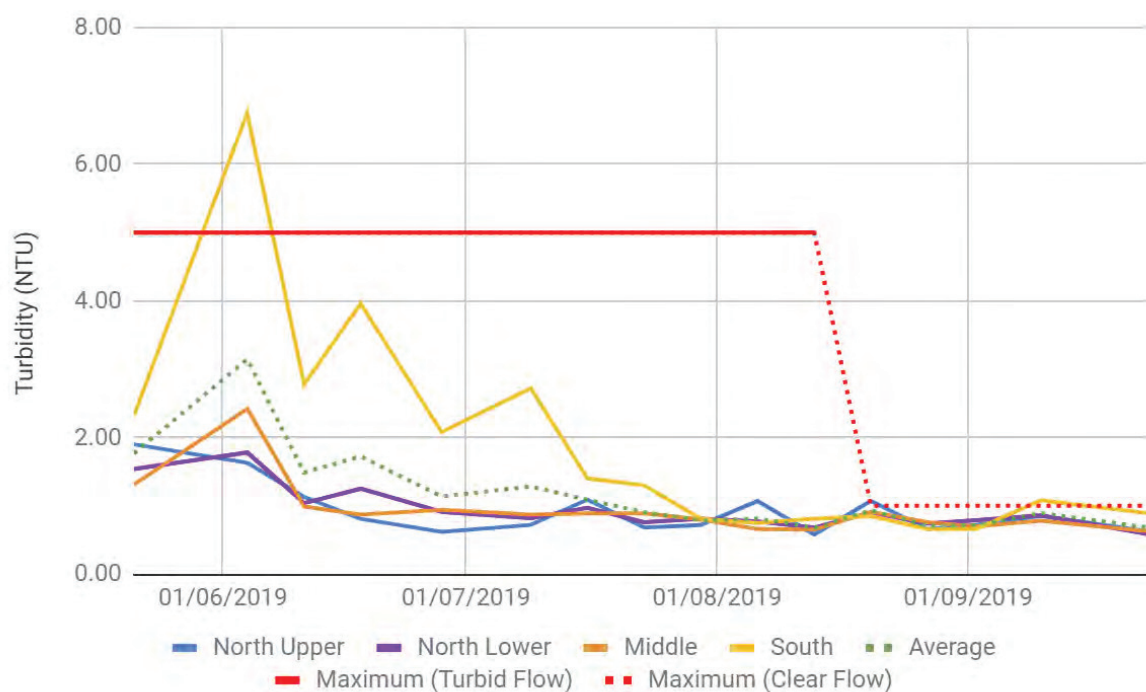


Figure 4: (a) 30-day mean values of turbidity for Lake Windermere, measured weekly from May 14 to September 24, 2019. (b) Weekly turbidity results separated by sample site.

Note: Lines are for interpretation only, and do not represent continuous measurements.

2.4 - pH

Overview

pH is a measure of the free hydrogen ion concentration (H^+) of a solution. pH is reported on a scale from 0 to 14. Solutions with a pH between 0-7 represent an acidic environment, and solutions with a pH between 7-14 represent a basic or alkaline environment.



Volunteer Lorin Inglis measuring pH

pH is reported in logarithmic units, meaning a change in one unit of pH represents a ten-fold change in the actual pH of the solution. For instance, water with a pH of 4.5 is ten times more acidic than water with a pH of 5.5, while water with a pH of 3.5 is one hundred times more acidic than water with a pH of 5.5.

The pH of natural lakes is rarely neutral, because of the presence of dissolved salts and carbonates, aquatic plants, and the mineral composition of the surrounding soils. pH can fluctuate daily as well as seasonally.

Many aquatic species are sensitive to sudden changes in pH, however most species have adapted to deal with the natural pH fluctuations of a lake that are spread over time. If the pH of a lake changes dramatically within a short time frame, it could

be an indicator of a pollution event or some other form of disturbance.

The water in Lake Windermere consistently trends towards slightly alkaline (pH values around 8.5), which is characteristic of lakes fed by water flowing over limestone bedrock materials present in the Canadian Rockies (BC Ministry of Health, 2007; Rollins, 2004). There is no MOE Objective set for pH in Lake Windermere; however, the majority of aquatic organisms prefer a habitat where pH stays within 6.5-9.0 (Neufeld et al, 2010).

Results

pH measured in 2019 was comparable to measurements taken in 2018, which ranged from 8.0 to 9.0. pH measurements for 2019 were recorded to be between 6.80 and 9.10 with an increasing trend as the summer went on (Figure 5a). pH may have an inverse relationship with turbidity, with less turbidity, there are fewer particles available to scatter sunlight that enters the water, and with greater amounts of light reaching submerged aquatic plants then sunlight would not be a limiting factor to photosynthesis or plant growth. This could have increased the bulk photosynthetic rate within the lake, removing more CO₂ from the water and causing the pH to rise over time.

pH is a difficult parameter to accurately measure in the field and the equipment used by the LWA is over ten years old. On May 21st it was observed that from the South sample site to the North sample site there was a change in 1 unit of pH, this is highly unlikely in a lake of this size. It is suspected that readings may not be entirely accurate and it is suggested that lab tests be done to determine the level of accuracy. If this information is found to be accurate it is recommended to look further into the cause of the increase.

(a)

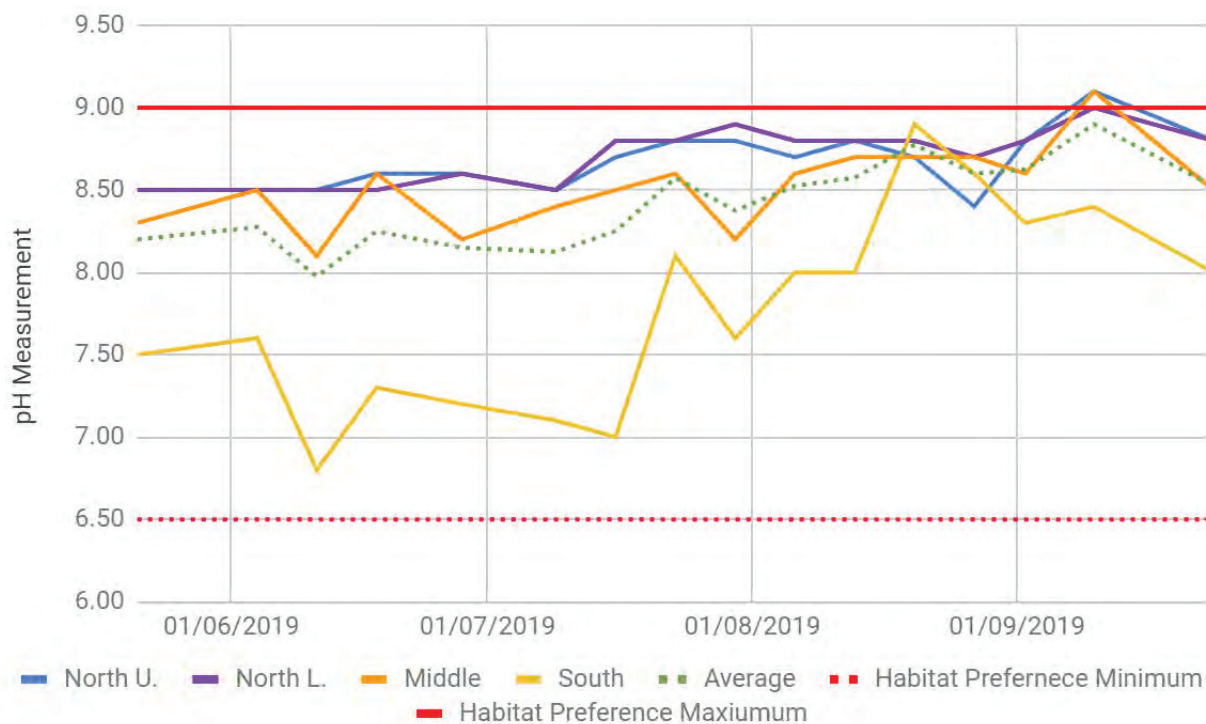


Figure 5: (a) Average pH for Lake Windermere as measured weekly between May 20 and September 24, 2019.

Note: Lines are for interpretation only, and do not represent continuous measurements.

2.5 - Specific Conductivity

Overview

Specific conductivity measures the ability of water to conduct an electrical current. It is affected by the presence and mobility of ions in the water. Conductive ions include dissolved salts and inorganic compounds, like chlorides, sulfides, and carbonates. For this reason, a measure of conductivity in water may be used as an indicator of water pollution.

Conductivity of water is directly related to water temperature, the warmer the water, the faster the mobility of the ions, and so the higher the conductivity (Behar, 1997). To account for this, we measure the Specific Conductivity which is corrected for the temperature. Specific conductivity of water is also affected by the bedrock geology of the surrounding area, with more weathering-prone bedrock (such as limestones or clays) giving rise to higher conductivity values than more stable bedrock (such as granite).

Specific conductivity can provide insights about pollutants such as sewage (because the addition of chloride, phosphate, and nitrate rapidly increases conductivity), road salts (high in chloride salts), or an oil spill (oil's organic nature and higher resistance to conducting electricity will reduce the conductivity).

Since specific conductivity values have remained consistent over time in Lake Windermere (on average between 200-300 $\mu\text{S}/\text{cm}$), there are no MOE objectives. It is, however, still important to monitor and observe if changes in conductivity are occurring which might negatively affect aquatic health. Freshwater streams can support diverse aquatic life with a conductivity range of 150 - 300 $\mu\text{S}/\text{cm}$ (Behar, 1997; Weaver and Northrup, 2016). Therefore, readings above or below these values should be treated with caution and possibly investigated further.

Results

Specific conductivity in Lake Windermere ranged between 169.90 to 361.60 $\mu\text{S}/\text{cm}$ in 2019 (Figure 6a). Specific conductivity was lowest at the South sample site, which is near the outlet of the southern wetlands.

Data gaps on August 6th and 27th are due to equipment failure; a temporary fix solved this problem for August 13th and 20th, but after the second failure it was determined our equipment was no longer sufficient. An identical unit was borrowed from Columbia Lake Stewardship Society for the remaining September sampling sessions.



Volunteer Kris Nickerson measuring water temperature and specific conductivity

(a)

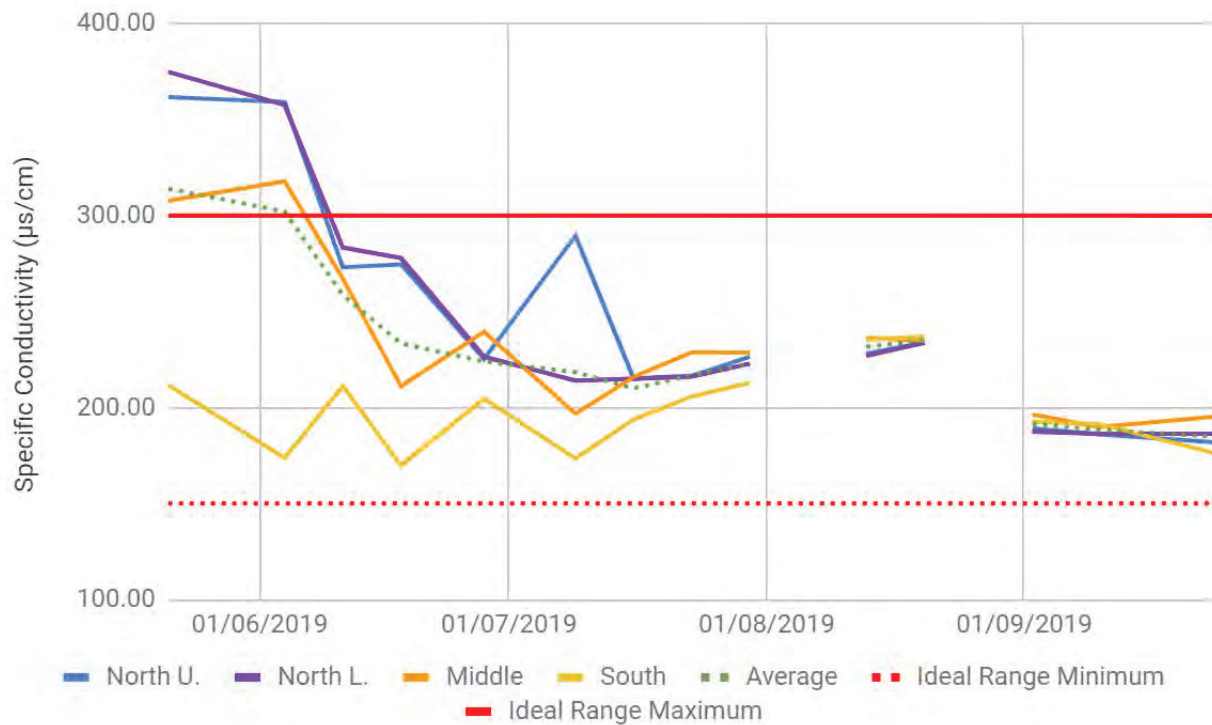


Figure 6: (a) Weekly specific conductance values separated by sample site measured from May 20 to September 24, 2019 (missing data from the week of August 6 and 27, 2019).

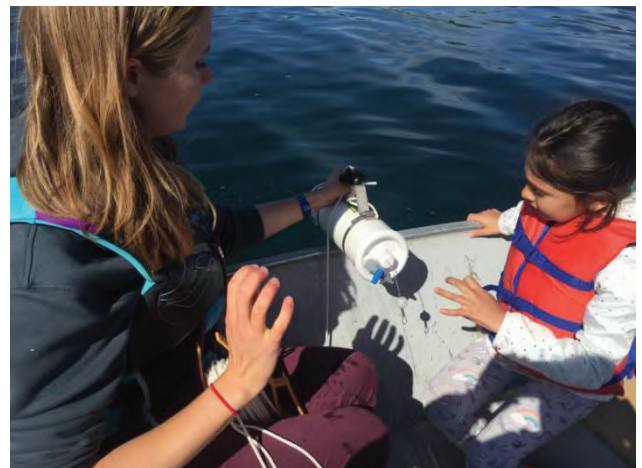
Note: Lines are for interpretation only, and do not represent continuous measurements.

2.6 - Phosphorus

Overview

Phosphorus (P) is a nutrient essential for life. P is used by plants and aquatic animals for processes involved in photosynthesis and metabolism. When present in low quantities, this nutrient can limit the growth of aquatic life. When present in high quantities, it can lead to excessive algae growth and overproduction of bacteria, which can severely compromise other forms of aquatic life and human health.

P exists in two main forms in water: dissolved and particulate. Dissolved P is readily available to algae and aquatic plants for growth and photosynthesis (US EPA, 2012). Particulate P is attached to particles in the water, and is not always available to aquatic plants or animals. “Total P” is a combined measurement of both the dissolved and particulate forms, and is often the parameter monitored during water quality objective studies.



Summer Student, Keri Malanchuk, demonstrating to volunteer, Emma Albano, how to use a Van Dorn to collect water sample from depths below the surface

Two major human-caused inputs of P to waterways in North America include agricultural runoff and wastewater. Within the Lake Windermere watershed, possible sources of P to the tributaries and the lake include: agricultural runoff, golf course and resort fertilizer runoff, waterfront lawn & garden fertilizer runoff, municipal stormwater runoff containing detergents and other phosphate-bearing chemicals, or leaky shoreline septic systems. Natural sources of P include nutrient cycling when plants and animals die and decompose, and soil mineral transport.

Historic sampling results indicate that Lake Windermere is “oligotrophic.” This means that low nutrient levels and clear waters have been the norm in this lake, and phosphorous is often limiting to the growth of aquatic life. As recently as 2015, however, the LWA found that water samples just after ice-off were significantly exceeding the MOE recommendations for total phosphorous concentrations in Lake Windermere. The Ministry of Environment (MOE) recommends Total Phosphorus in Lake Windermere not exceed a concentration of 10 µg/L (0.01 mg/L) in order to protect drinking water sources and aquatic life.

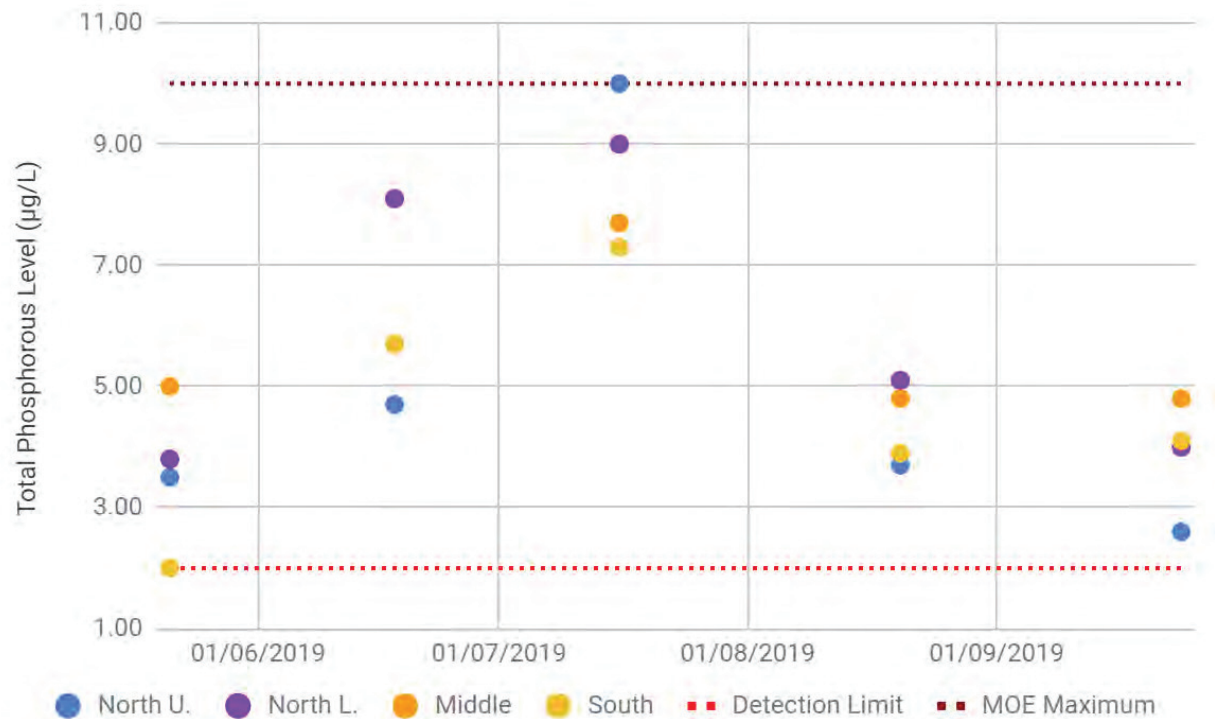
Results

2019 saw favourable results for Total and Dissolved P levels. The highest recorded value for Total P was 10.00 µg/L at the North sample site on July 16th, and the lowest value being 2.00 µg/L on May 21st at the South sample site (Figure 7a).

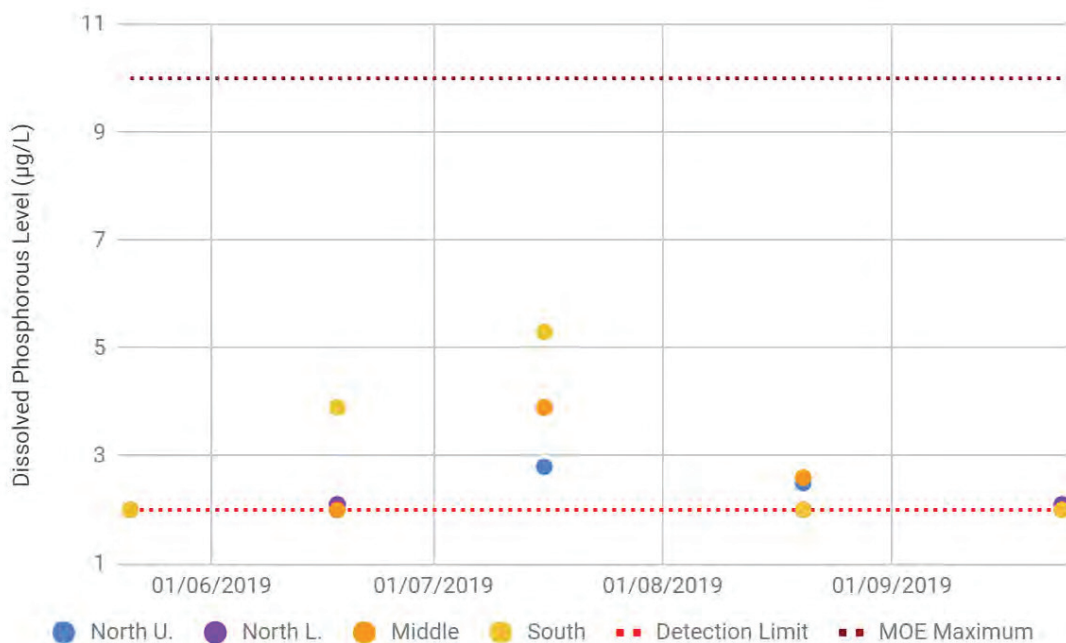
It is expected that Total Phosphorous be higher when turbidity is highest, this was not seen to be the case during the 2019 Sampling Season. This may indicate that throughout the season the sources of phosphorous to the Lake Windermere system fluctuated. It is difficult to point to the source of phosphorous as it occurs both naturally and through human inputs. It is important to continue to watch this trend for future management strategies.

The highest ever-recorded value of Total P by the LWA was 67 µg/L, on August 20th 2013 at the Middle sample site. This was more than six times the recommended limit, and prompted the LWA to increase monitoring for phosphorous. Since that date, twelve samples have exceeded for Total P and six have exceeded for Dissolved P (Figure 7c)

(a)



(b)



(c)

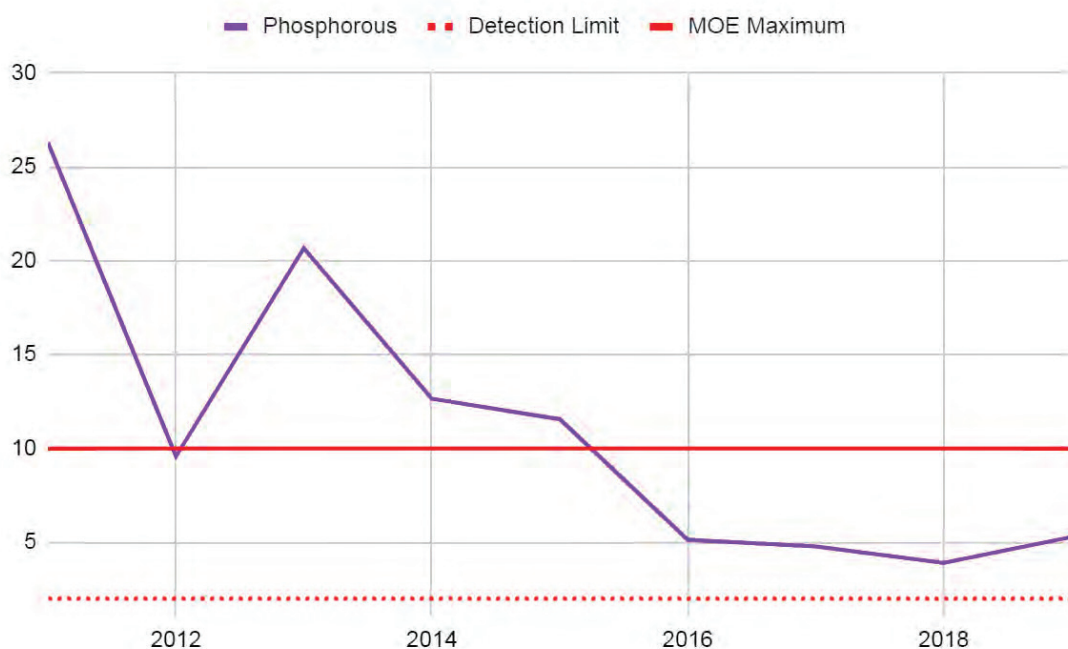


Figure 7: (a) Monthly Total Phosphorous, collected from Lake Windermere between May 21 and September 24, 2019. (b) Monthly Dissolved Phosphorous, collected from Lake Windermere between May 21 and September 24, 2019. (c) Average Total Phosphorous data, 2011-2019.

Note: Lines are for interpretation only, and do not represent continuous measurements. The “Detection limit” is the limit at which the extraction procedure can detect phosphorous in water; values below this line were considered “undetectable”.

2.7 - Secchi Depth



Program Coordinator, Shannon McGinty, taking a Secchi reading on Dorothy Lake during an algae bloom in mid June 2019.

Overview

Secchi depth, like turbidity, is a measure of the suspended particles in the water. These suspended particles can be a combination of zooplankton, phytoplankton, algae, pollutants, or sediment (clay and silt).

Clear water lets a beam of light penetrate more deeply into the lake than murky water. Sunlight is needed for aquatic plants to photosynthesize, and for phytoplankton to grow and reproduce (Ministry of Environment, 2017a).

Secchi data collected year after year can provide information about trends in water clarity. Secchi depth generally follows the inverse pattern of turbidity — that is, when turbidity is high, the Secchi depth is low because it is difficult to see deep into the water.

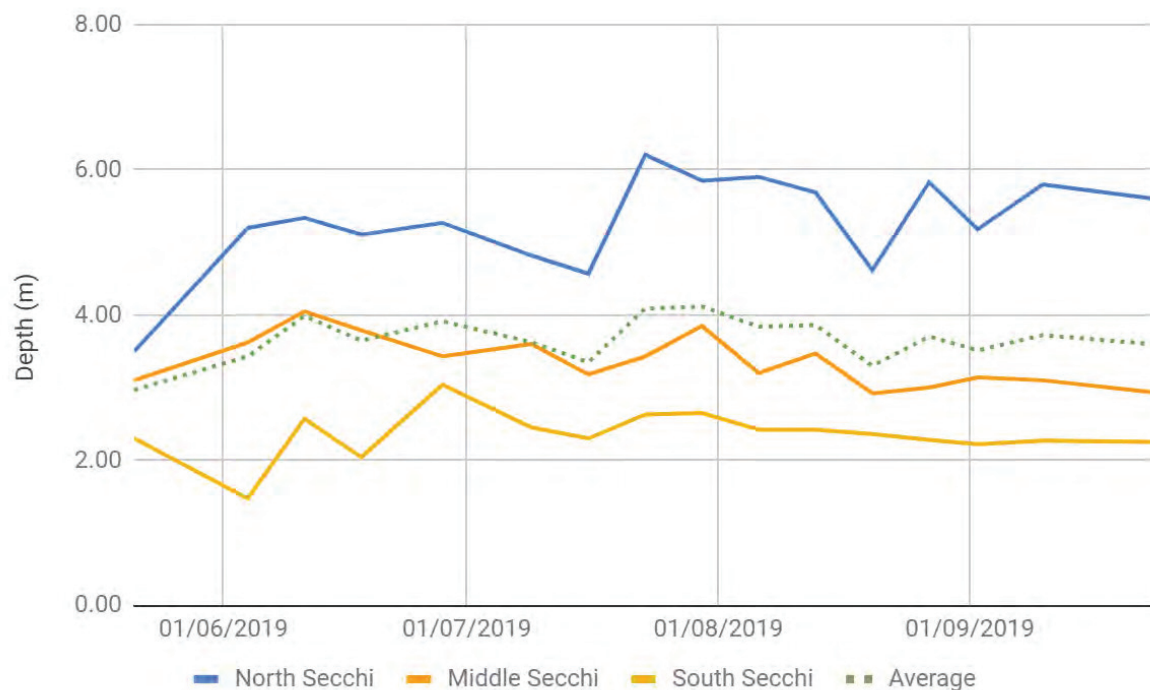
There is no objective set for Secchi depth in Lake Windermere (Neufeld et al., 2010). Following the objectives for turbidity, we should expect the Secchi depth to be lower in the spring during freshet, and higher in the summer as the lake flushes out over time.

Results

The average Secchi depth in 2019 across all sample sites was 3.67m (Figure 8a). Secchi depth was highest from July 23rd to September 24th, which corresponded with a low turbidity at this site during this time (Figure 8b).

Secchi depth tends to appear lower in the South sample site, simply because this site is much shallower than the North site. We can compare Secchi depth to Total depth to get a more accurate picture of how clear the water column is (Figure 8b); if the Secchi depth is the same as total depth, that means we were able to see all the way to the bottom of the lake. This is most common at the South sample site near the end of summer, when the water level gets lower and it is easier to see the bottom of the lake.

(a)



(b)

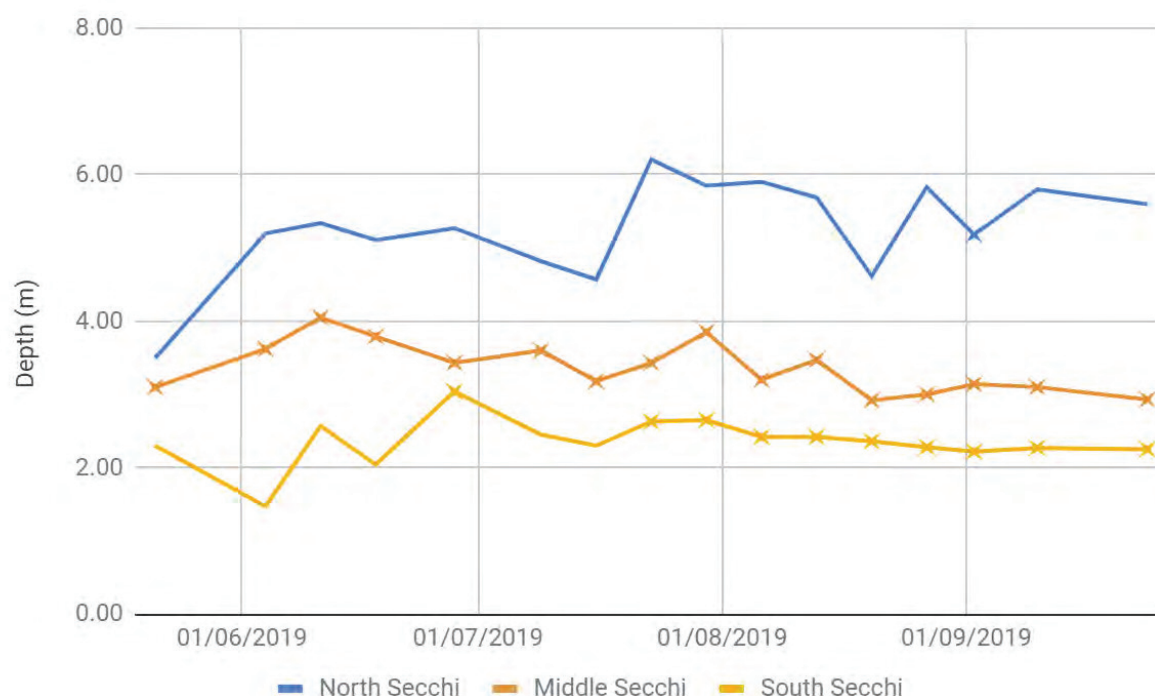


Figure 8: (a) Secchi depth (in metres) measured weekly for the sampling period May 21 to September 24, 2019. (b) Secchi and Total depth at each sample site, “X” represents where Secchi depth was same as Total depth. *Note: Lines are for interpretation only, and do not represent continuous measurements.*

2.8 - Total Depth

Overview

Lake Windermere is a widening of the main Columbia River channel, meaning it is different from typical lakes you might find in southern BC. The main difference is that it is very shallow - on average, between 3-4m depth in mid-summer. It also flushes much more quickly than an average lake, and has a better capacity to carry sediments and nutrients downstream because of this faster flow.

We do report the average water depth for all three sample sites in the lake, but this is not very representative of Lake Windermere as a whole. This is because the South end, where water flows in from the Columbia Wetlands, tends to be much shallower than the other two sites. The North sample site is measured at the deepest point in the lake, on average between 6-7m in depth.

In deeper lakes, the water will separate into layers with cooler denser water falling to the bottom. When water is separated into lighter and denser layers like this, it is called “stratification”. Lake



Volunteer Megan Lochhead measuring lake depth

Windermere does not stratify, so we usually don't see a very large difference between the North Upper and North Lower water quality samples.

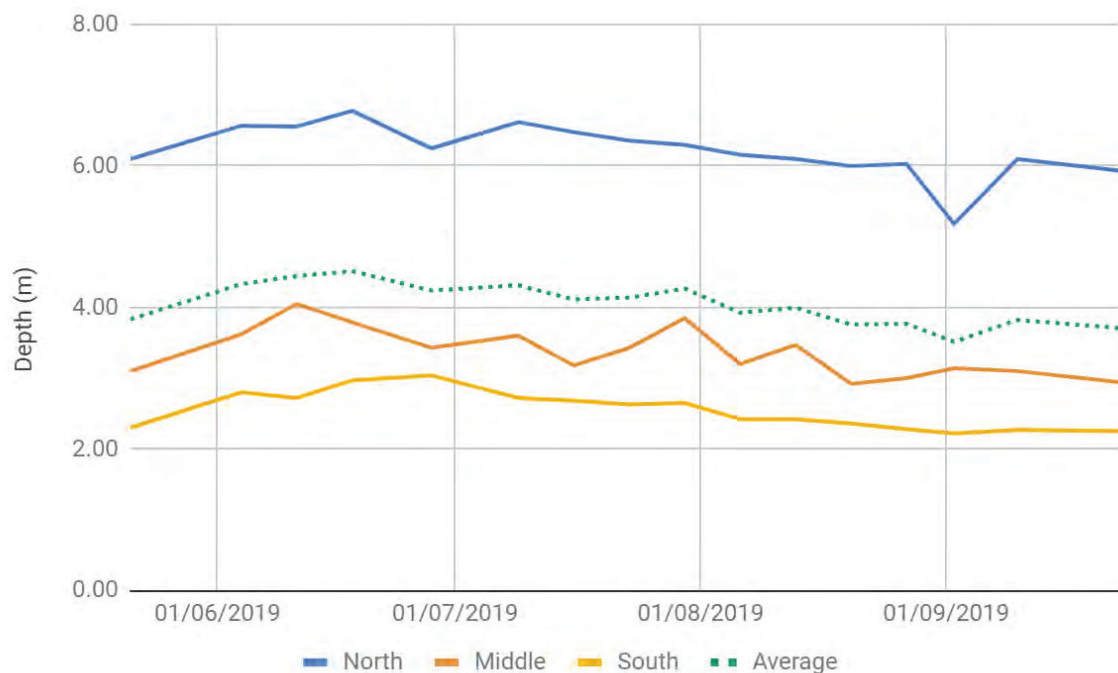
Depth can be an important consideration for aquatic life as well as for recreational boaters and drinking water users. Shallow water poses more risks because boaters can more easily be caught on sediment bars or clog their motors with aquatic vegetation growing up from the bottom of the lake. Shallower water also warms up more quickly, which can pose issues for drinking water quality and for the survival of aquatic life. There is no objective set for lake depth in Lake Windermere, but levels below 2m generally cause concern.

Results

Lake depth in 2019 followed the expected trend of being higher in spring during freshet, and gradually declining through the late summer due to less input from snowmelt runoff/precipitation and increased evaporation effects (Figure 9a). This trend was less pronounced than previous years due to a low snow pack winter, and increased precipitation throughout the summer season.

The deepest value, measured at the North sample site, was 6.78m on June 18th. The highest recorded value at this site since monitoring began in 2006 has been 7.3m, recorded in July 2012 and June 2013. Steeper rates of decline in water level have been recorded in recent years (Figure 9b). 2019 did not see as steep of a rate of decline as 2017 or 2018, but was observed to be an abnormal year based on recent weather patterns.

(a)



(b)

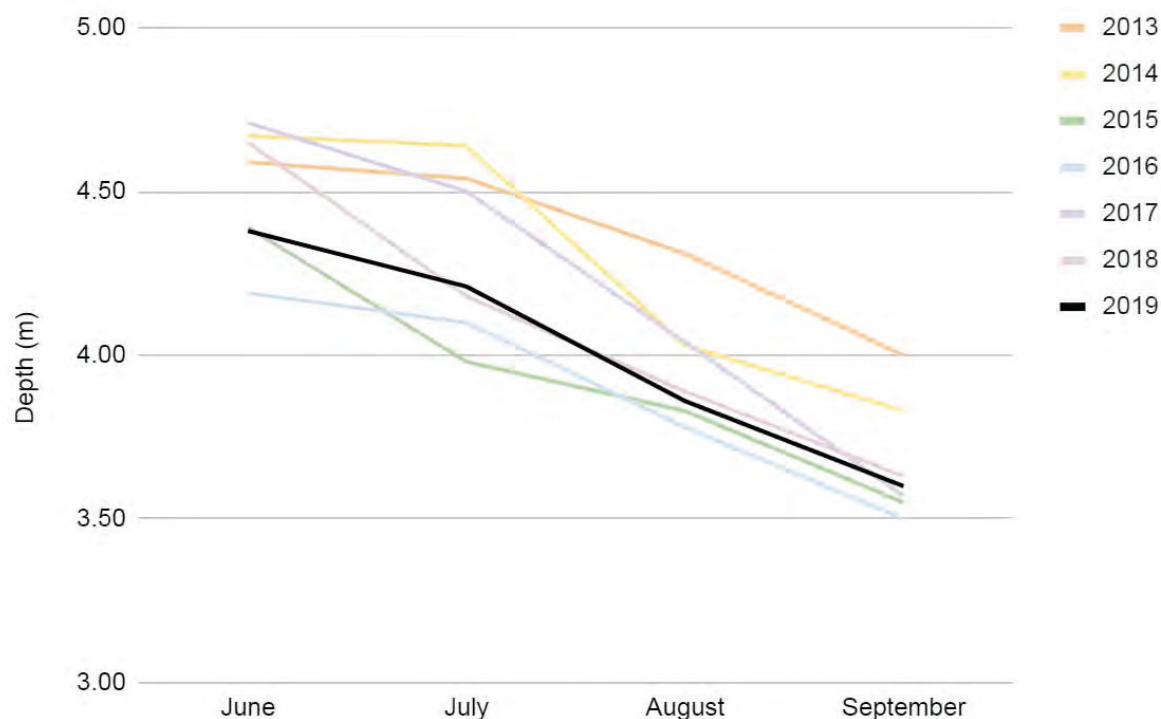
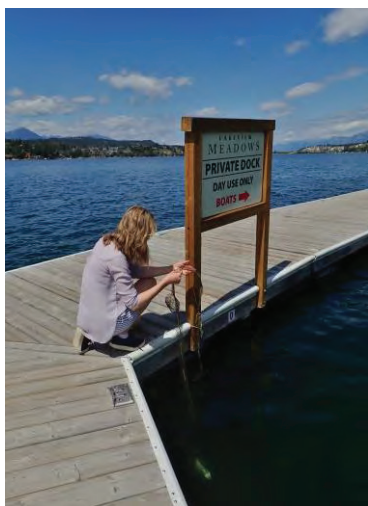


Figure 9: (a) Lake depth (in metres) measured weekly for the sampling period May 21 to September 24 2019.

(b) Average lake depth across all sites, 2013-2019.

Note: Lines are for interpretation only, and do not represent continuous measurements. Middle site moved locations in 2013, data collected prior to this date is not comparable.

3. Aquatic Plant Survey, Invasive Mussel and Veliger Sampling



Summer Student, Keri Malanchuk, checking substrate sampler at Lakeview Meadows

3.1 - Background

Being relatively clear and shallow throughout the summer, Lake Windermere allows for good light penetration, which helps promote aquatic plant growth beneath the surface. Aquatic plants improve water quality by filtering out nutrients that might otherwise be used for algae blooms, and by trapping sediments that would be disturbed by motorized boat and wave action. Without rooted aquatic plants to help hold sediment in place, increased turbidity can result which degrades water quality (Rideau Valley Conservation Authority, 2016). Excess plant growth, however, can impede motorized boating and provide shaded habitat for predatory fish species such as largemouth bass.

Zebra and quagga mussel species have already caused significant environmental, social, and economic damage throughout North America due to their rapid spread and devastation of entire lake ecosystems (Darvill, 2017). Until recently, invasive mussels were mostly confined to Eastern Canada and

the Southern United States; however, in 2016, invasive mussels were detected in two reservoirs in Montana (Ministry of Environment, 2017b) and in 2013 were found introduced in Lake Winnipeg, Manitoba (Lake Winnipeg Foundation, n.d.). This proximity to BC has increased the risk that an infected boat can pass through the border into BC waters, and Lake Windermere's proximity to two main borders of the province as well as its high recreational use further increase this risk of introduction.

Invasive species out-compete most other native species if allowed to establish. This often results in a loss of biodiversity and native species, which can have a cascading effect on water quality and fish & wildlife populations. The introduction and spread of invasive aquatic plants or mussels would not only be devastating to the economy, ecology and biodiversity of Lake Windermere, but to the entire Columbia Valley.

The LWA initiated an Aquatic Invasive Species (AIS) Inventory Project in 2009, which has seen an annual plant and veliger (mussel larvae) sampling occur on the lake in all years except 2013. Rachel Darvill (Goldeneye Ecological Services) was the lead biologist for aquatic plant sampling while Danny Smart (East Kootenay Invasive Plant Council) led the veliger sampling in 2019. In 2019, LWA installed six substrate samplers along the east side of Lake Windermere that were monitored monthly from June to August for zebra and quagga mussels.



Biologist, Rachel Darvill, identifying plants during AIS Inventory Project

3.2 - 2019 Sample Results

The 2019 survey marked the tenth year of invasive species sampling and included eleven lake-bottom (offshore) sampling locations and six shoreline-sampling locations, all at high-risk areas for invasive introduction around the lake.

No invasive species (plants, mussel larvae or mussels) were found during the offshore, shoreline plant surveys, substrate sampler monitoring, or the veliger testing.

It was noted that some survey sites (ex. Baltac Beach, Bayshore Condos, and Tretheway Docks) were almost completely devoid of aquatic plant communities (Darvill, 2019). The full 2019 AIS Inventory Report, published by Rachel Darvill, can be found on the LWA website under "Documents".



Boat scars on lake bottom observed by Rachel Darvill during aerial swan surveys for Columbia Wetlands Waterbird Surveys. Photo by Rachel Darvill.

4. Waterbirds

4.1 - Background

In 2018, LWA conducted their first Waterbird Survey, complete with a report highlighting the findings. This project was taken on to learn more about the bird populations using Lake Windermere. It was found that Lake Windermere provides significant bird habitat for large migrant flocks and breeding birds (Darvill, 2018). The lake is especially important for large flocks of migratory birds, such as American coots (*Fulica americana*), as well as four species of grebe - three of which are considered at-risk species (Darvill, 2018).

The LWA and Goldeneye Ecological Services undertook a boat survey in September 2019 to continue learning about bird populations on Lake Windermere.

4.2 - 2019 Sample Results

During the 2 hour and 48 minute survey 889 individuals were recorded, from a total of 18 different species. Of these sightings, the Surf Scooter, Cackling Goose, Greater Scaups, and large number of both Pied-billed Grebes and Red-necked Grebe's were rare sightings. Lastly, the Surf Scoter, California Gull, Horned Grebe, Western Grebe are all considered to be species at-risk that were recorded during this survey. The full survey inventory can be [found here](#).

It is strongly recommended that management strategies be designed that can work to accommodate both human-use values and bird conservation for Lake Windermere. Specific recommendations to achieve this balance of conservation and human uses include:

- undertaking additional breeding season and fall migratory bird studies for Lake Windermere,
- factoring waterbird and wetland conservation into land-use decisions for Lake Windermere,
- improving signage about motorized boating regulations in the Columbia Wetlands WMA, and
- improving public education about the use of eBird and the importance of conserving habitat values of Lake Windermere for migratory and at-risk bird species.

5. Swim Beach Water Quality

5.1 - Background

Escherichia coli (*E. coli*) is a type of fecal coliform bacteria found in the intestines of most healthy animals. *E. coli* in water can be an indicator of sewage or animal waste contamination, or it may come naturally from the soil. Most strains of *E. coli* are harmless, though some can produce toxins that cause illness in people. The count of *E. coli* colonies per 100mL of water is a common way to measure how much bacteria is present in the water; however, it is important to know that this value represents a total count of all colonies, and does not necessarily contain any strains that are capable of producing toxins that affect humans. A higher *E. coli* count simply increases the probability that the water may contain a toxin-producing strain.

The LWA have an ongoing agreement with the Interior Health Authority (IHA) to collect public beach water samples, samples are analyzed by the IHA laboratory for *E. coli* bacteria, in compliance with Health Canada Guidelines. This assesses whether swim beach water quality meets recognized health standards.

Samples are collected at three public beaches around the lake: James Chabot Provincial Park (Athlmer), Kinsmen Beach (Invermere), and Windermere Beach (Windermere).

The Health Canada Guidelines for recreational water used for “primary contact” activities (e.g., swimming):

- Geometric Mean Concentration (minimum of five samples taken over 30 days): ≤ 200 *E. coli*/100mL
- Single Sample Maximum Concentration: ≤ 400 *E. coli*/100mL

5.2 - 2019 Sample Results

The geometric mean did not exceed the Health Canada recommended limit of 200 colonies of *E. coli*/100 mL for any of the public beaches tested, nor did any single sample exceed 400 colonies of *E. coli*/100 mL. For Lake Windermere, the highest geometric mean values over a 30-day period were as follows:

James Chabot Provincial Park	15.5 <i>E. coli</i> /100 mL
Kinsmen Beach	27.17 <i>E. coli</i> /100 mL
Windermere Beach	8.67 <i>E. coli</i> /100 mL

The highest single sample in 2019 was 65 *E. coli* /100mL, recorded on August 12th at the East side of Kinsmen Beach. This is a popular dog swimming area, which might explain the slightly higher bacterial concentration at this location.

Results of swim beach sampling are updated throughout the summer season and can be found by searching for Kinsmen, James Chabot or Windermere beaches at

<https://www.interiorhealth.ca/YourEnvironment/DrinkingWater/Pages/WaterSamples.aspx>

6. Tributary inflow - Windermere and Abel Creek

6.1 - Background

Besides the main Columbia River channel, Windermere Creek is the major source of inflow into Lake Windermere. This tributary stream drains an area of approximately 90 km², and provides important fish spawning habitat (NHC, 2013). While Abel Creek is a much smaller tributary than Windermere Creek monitoring efforts are made as Abel Creek runs into Lake Windermere from the Paddy Ryan Lakes Reservoir used by the District of Invermere.

From 2007 to 2018, the Columbia Basin Water Quality Monitoring Program (CBWQM) ran on Windermere Creek. This project oversaw scientific data collection in streams of the East and West Kootenay, through fieldwork that was undertaken by local volunteers and non-profit organizations. LWA have continued monitoring of Windermere Creek, and additionally now monitor Abel Creek as well as a continuation of this project.

Water chemistry follows similar protocols and uses the same equipment as the lake water quality monitoring, with data collected for dissolved oxygen, specific conductivity, pH, turbidity, and temperature.

Flow/velocity measurements are crude, and taken using a meter stick to obtain surface velocity based upon the principle of conversion of kinetic to potential energy. This overestimates average channel flow, but underestimates actual surface flow due to friction. While not exact, if measured carefully and repeated the same way each time, this measurement can give us a general idea on how flow volumes change seasonally within a given area of stream.

In 2018, the LWA obtained four HOBO U20-L Water Level Loggers. In September 2018, the first logger was installed in a stilling well in Windermere Creek; the second was installed in April 2019 in Abel Creek. The third will be installed on the Athalmer Bridge at the outflow of the Columbia River from Lake Windermere.

The fourth is used as an atmospheric pressure gauge located at the LWA Office. These loggers measure water temperature and pressure to provide a reading on flow measurements to be used in compliment with surface velocity measurements.

2019 creek sampling results are still being analyzed and will be provided in a supplementary report.



Program Coordinator, Shannon McGinty, collecting eDNA Sample on Windermere Creek.

7. Acknowledgements

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- Columbia Valley Local Conservation Fund
- District of Invermere
- Regional District of East Kootenay
- Columbia Basin Trust's Environment Large Grants program
- LUSH Charity Foundation
- Royal Bank of Canada Foundation
- Columbia Valley Community Foundation
- Real Estate Foundation of BC
- Canada Summer Jobs
- Columbia Basin Watershed Network
- BC Community Gaming Grants

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- Tara Booty
- Nathan Li
- Clark Carpio
- Shelly Hopkins
- Lorin Inglis
- Terri Eacrett
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- Baiba and Pat Morrow
- Shawna McKay
- Meaghan Lochland

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- Ashley Dubois, Living Lakes Canada
- Raegan Mallison, Living Lakes Canada
- Kat Hartwig, Living Lakes Canada
- Norm Zirnhelt, BC Lakes Stewardship Society
- Rick Nordin, BC Lakes Stewardship Society
- Bill Thompson, Columbia Lake Stewardship Society
- Tom Dance, Columbia Lake Stewardship Society



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Appendix A

Sampling methodology

Water Quality

Lake Windermere is sampled following the BC Ministry of Environment Water Quality Assessment and Objectives for Lake Windermere (Neufeld et al. 2010). Water quality laboratory analysis was completed by CARO Analytical (Kelowna, BC). The following water quality data were collected at all three sample sites:

- a. Weekly (May - September) - in situ (field measured) data including depth, Secchi depth, water temperature, specific conductivity, pH, dissolved oxygen (DO), and turbidity.
- b. Monthly (April - September) - Total Phosphorous and Total Dissolved Phosphorous.

The North site was sampled at two depths (Upper and Lower) since this is the deepest part of the lake. The Upper water sample was collected at arms' reach approximately 30cm below the surface, while the Lower water sample was collected 1m above the lake bottom using a vertical VanDorn sampler. The Middle and South sites were sampled at arms' reach 30cm below the surface only.

Water sampling took place within a four-hour timeframe on Tuesday mornings, from May to September 2019. Volunteer citizen scientists were joined by at least one trained LWA staff member for all lake excursions and assisted with field data collection.

Lake Sample sites were first located by boat using a hand-held Garmin eTrex20 GPS and preprogrammed coordinates that align with the sample sites in Figure 1. Once at a sample site, depth and Secchi depth measurements were taken using a weighted Secchi disk and meter line. Water temperature and conductivity were read using a YSI Pro30 conductivity meter. pH was read using a Eutech Waterproof pHTestr 10. Dissolved Oxygen was collected using the Winkler titration method with a Hach Model OX-2P (0.2-20mg/L) Test Kit. Turbidity was read using a Hach 2100Q Portable Turbidimeter calibrated to 10 NTU.

When monthly phosphorous samples were collected, a cooler containing sample bottles was brought on board the boat. Water samples were collected into bottles, which were then kept, on ice while being shipped via ACE Courier to CARO laboratories in Kelowna for analysis.

Aquatic Plants

Please see Darvill (2019).

Waterbirds

Please see Darvill (2018).

Swim Beaches

Bacteriology samples were collected on Mondays between June and early September (excluding long weekend holidays) before 1:00pm from three public beaches (Windermere (3 site), James Chabot (3 sites), and Kinsmen (3 sites)). Sample bottles were filled using a triple-rinsed beaker dipped inverted below the water's surface then turned upright within the middle of the water column. Filled bottles were immediately kept on ice until delivery to the Invermere Health Unit located at 110 10 St, Invermere, BC with a copy of each associated requisition form. From there, custody of samples was transferred to the IHA and samples were sent to their labs for analysis.

Data analysis and QA/QC

Raw data were first subjected to a quality control evaluation, to assess the accuracy and validity of the laboratory and field methods. Field sampling protocols followed those outlined above.

Water Quality

Lake Windermere Ambassadors – 2019 Water Quality Results

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For in situ data collection, water quality instruments were calibrated once monthly as per manufacturer's specifications and expired or outdated solutions were discarded and replaced. All data was reviewed by the LWA for consistency and anomalies before being analyzed. Data was analyzed by plotting parameters over time in Google Sheets, for the current sampling year and past sampling years whenever possible. Geometric means of samples were taken where indicated, and included all samples taken within a 30-day period between start and end of sampling.

CARO laboratory's analysis for Total and Total Dissolved Phosphorous was completed using Persulfate Digestion / Automated Colorimetry (Ascorbic Acid) referencing the Guidelines for Canadian Drinking Water Quality (Health Canada Feb 2017). CARO assessed accuracy through use of laboratory control samples, trip blanks, and duplicate samples.

Aquatic Plants

Please see Darvill (2019).

Waterbirds

Please see Darvill (2018).

Swim Beaches

Sample results were obtained from the Interior Health Authority (IHA) and analyzed for geometric mean as well as individual sample result over time. Please contact the IHA if you have specific questions about their QA/QC protocol for lab samples.

https://www.interiorhealth.ca/FindUs/_layouts/FindUs/info.aspx?type=Location&loc=Invermere%20Health%20Centre&svc=&ploc=

Lake Windermere

Aquatic Invasive Plant Species Inventory

2019



Prepared for the Lake Windermere Ambassadors
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1. Introduction/Background

Invasive species are the second largest threat to biodiversity decline and extinctions worldwide, and they contribute to huge losses of habitat. An invasive species is considered to be a plant, animal, or fungus species that is deliberately or unintentionally introduced into an area that is outside of their natural habitat (ISCBC, 2017). Numerous accounts link invasive species to severe economic losses (Pimentel, Zuniga, & Morrison, 2005; Xu et al., 2006). Many invasive wildlife species are reservoirs of infectious diseases and pathogens, which threaten human health and domestic animals (Daszak, Cunningham, & Hyatt, 2000). Furthermore, they can negatively impact recreational pursuits, crops, and infrastructure such as hydroelectric power facilities (Province of British Columbia (BC), 2015), which is of special concern in BC given the large number of these facilities present.

On the other hand, beds of indigenous freshwater aquatic vegetation are comprised of a beneficial suite of species important to maintain for the health of shallow water lake ecosystems. While dense beds of aquatic macrophytes (i.e. plants) are often considered to be a nuisance to boaters and swimmers, submerged aquatic vegetation is a vital component of a balanced aquatic environment and provide necessary ecosystem services such as erosion control, nutrient absorption and cycling, and turbidity reduction (Hasler & Jones, 1949; Timms & Moss, 1984; Van den Berg et al., 1998). A healthy, biodiverse, functioning indigenous freshwater aquatic ecosystem is also more resistant to invasion by non-indigenous species.

Submerged aquatic vegetation is a vital food source for a number of wildlife species including beaver, painted turtles, invertebrates, ducks and geese. The abundance and diversity of birds has been shown to be higher in vegetated areas of lakes (Scheffer, 1998). Aquatic plants provide housing supplies to birds, for instance grebe species build floating nests comprised of emergent vegetation such as cattail (*Typha spp.*) and floating waterlily (*Nuphar spp.*); along with cover and food for amphibians, aquatic invertebrates (e.g. dragonfly larvae) and young fish. Materials from emergent vegetation have been used by Indigenous people for thousands of years for cultural traditional practices such as basket making and mat weaving, and some aquatic vegetation has been (and is presently) used by humans as a medicinal food source.

In 2007, the Canadian Wildlife Service determined that there were three possible ecosystem level threats to the Columbia Wetlands: invasive species, pollution events, and severe erosion (Hammond, 2007). Invasive plant and animals species were determined to be the most likely to occur in the Columbia Wetlands and if introduced, would pose the “greatest potential consequence” to the natural ecology (Hammond, 2007). Draft revisions to the Management

Plan for the Columbia Wetlands Wildlife Management Area reflect this concern, and include the management of invasive species as a top priority (Phase II Ventures Ltd., 2019). Furthermore, in the newly created strategic framework for the Columbia Wetlands Stewardship Partners, the importance of monitoring invasive species was highlighted and includes actions such as “[c]onduct periodic monitoring for invasive plants, animals and pathogens in the wetlands (Mahr, 2019).”

The Lake Windermere Aquatic Invasive Plant Species Inventory project has been operational since 2013. The project conducts shoreline and offshore inventories to determine the presence or absence of aquatic invasive plant species. Aquatic invasive plants can be transported through a variety of ways, but one of the main vectors of introduction is through recreational pursuits using a variety of equipment, e.g. kayaks, paddle boards, motorized boats. Lake Windermere appears to receive the highest amount of boating traffic within the entire Upper Columbia or contiguous Columbia Wetlands ecosystem, therefore ongoing diligence in monitoring the lake for the introduction of aquatic invasive plants is imperative.

2. Study Area

Lake Windermere (UTM: 571182; 5590080) is located near the headwaters of the Columbia River, a river system that begins in Canal Flats located about 30kms south of the most southerly end of Lake Windermere. Located within the Regional District of East Kootenay (RDEK), Lake Windermere is found in the Rocky Mountain Trench and Columbia River Valley within southeastern BC. The largest community sits at the northern end of the Lake and is called Invermere, which has a population of approximately 4000 permanent residents with that number growing during busy summer months. The village of Windermere (pop: 1,259) is located along the east side (Wikipedia, 2017). Lake Windermere is important to humans for a variety of purposes including freshwater provisioning and its significant cultural ecosystem services such as aesthetic views, fishing, birding, recreational boating, and cross-country skiing.

Lake Windermere extends for approximately 17.7 kilometers and is 0.7 to 2 kilometers wide. Much of Lake Windermere is classified as a shallow open water wetland, a transition zone between lakes and marshes where the depth of water is often less than 2 meters (Alberta Wetland Policy, 2017). There are some deeper sections, with the greatest depth being approximately 5.5 meters and located near the northwest end. There is a high diversity and abundance of biodiversity found at Lake Windermere and in the Columbia Wetlands, including a number at species at risk. Lake Windermere has been documented as important stopover habitat for large congregations of waterbirds during both spring and fall bird migration (Darvill, 2017a). There have been 165 bird species recorded at Lake Windermere, including 17 listed as

species-at-risk such as the red-listed Western Grebe (*Aechmophorus occidentalis*), red-listed American White Pelican (*Pelecanus erythrorhynchos*), federally Threatened Bank Swallow (*Riparia riparia*) and blue-listed California Gull (*Larus californicus*) (Darvill, 2019).

The first 180 kilometers of the Columbia River are known as the Columbia Wetlands, a Ramsar site recognized for its international significance. Lake Windermere is considered to be a part of the contiguous Columbia Wetlands ecosystem, but the Ramsar designation excludes both Lake Windermere and Columbia Lake from this status. Other designations currently being pursued for the Columbia Wetlands, including both Lake Windermere and Columbia Lake, are 'Important Bird and Biodiversity Area' and 'Key Biodiversity Area'.

3. Methods

3.1. Shoreline surveys

Shoreline surveys were completed on September 13, 2019 and lasted seven hours. Survey methodology was consistent with previous years of survey effort and adhered to the protocol outlined in the 'Canadian Columbia Basin Regional Framework for an Aquatic Invasive Species Program: 2015 to 2020' (Inter-Ministry Invasive Species Working Group (IMISWG), 2015). Shoreline sampling occurred at six pre-established survey stations, which were selected because those sites pose a higher risk of invasion compared to other shoreline locations since there are higher levels of use. High-risk sites included locations that are known to have higher amounts of trailered boat traffic (boats coming in from other areas that could be affected by aquatic invasive species) on public land.

Principal consultant and biologist R. Darvill conducted the aquatic invasive plant sampling at each station, with the assistance of a volunteer. A thatched rake with a 9.7 meter long rope was used for sampling aquatic plants in the water. The rake was tossed into the water as far as possible and pulled back to the shoreline. The rake collected plants below the surface of the water at the specific location where it was thrown. Rake pulls occurred at the initial feature (e.g. public boat launch) as well as at three sites located 100 meters upstream of the initial feature, and at three sites located 100 meters downstream of the initial feature. All upstream and downstream sampling sites were separated by 25 meters. Two rake throws were conducted at each of the seven sites.

While aquatic invasive plant detection was the primary focus of this study, all indigenous aquatic plants were identified to the species level when possible. In total, seven sites were sampled at each of the six survey station locations. However, at two of the survey stations (i.e.

Fairmont Side Channel, End of Ruault Road), it was not possible to sample at seven sites due to obstructions such as private property (i.e. Fairmont Side Channel), or bushy riparian vegetation. The six shoreline survey stations were sampled in the following order: Baltac Beach, Fairmont Side Channel, Rushmere Community Docks, end of Ruault Road, 'Unofficial boat launch near Bayshore Condos', and Althalmer/Pete's Marina.

3.2. Offshore surveys

The 2019 offshore surveys utilized the IMISWG (2015) methods for sampling aquatic invasive plants on the lake from a boat. Using IMISWG methodology ensures that inventories can be repeatable over time to maintain consistency with previous years of survey effort. Given the relatively large spatial scale of Lake Windermere and given limited resources, a modification is made to the IMISWG protocol each year. The IMISWG protocol recommends that continuous surveys be conducted every 100 meters. However, this project's scaled-down survey effort continues to focus at 11 high-risk locations, which was also done during the 2015-2018 years of survey effort.

An aluminum boat with outboard motor (provided by the District of Invermere), was used to conduct offshore surveys. A crew of two people conducted the surveys: R. Darvill, S. McGinty. All offshore sampling occurred on September 17, 2019 at 11 pre-established survey stations considered to be at high-risk for introduction of aquatic invasive plant species. As with shoreline surveys, high risk locations were considered to be those areas with an increased incidence of trailered boat traffic (boats coming from other waterbodies), public boat launches, and boat marina's. At each survey location, four rake pulls were conducted (two off the right side and two off left side of boat). In previous years of survey effort, only one rake toss was conducted off each side of the boat (Darvill, 2018). The rake was tossed into the water as far as possible and pulled back to the boat, enabling the rake to collect plants present on the lake bottom. An additional four rake toss/pulls were conducted at the end of a 100 meter transect, two off the right and two off the left hand side of boat.

All aquatic plants collected on the thatched rake were recorded to the family level and where possible to the species level. During the 100 meter transect and between the two rake toss sites, when possible a single observer would record all of the additional plant species seen with the naked eye from the boat. For all 100 meter transects, the boat travelled northward, parallel to the shoreline. The 11 survey stations were sampled in the following order: Rushmere, Indigenous Beach (formally referred to as Indian Beach in previous years or survey effort), Lakeshore Resort, Ruault Road, Tretheway Docks, Akiskinook Resort, end of Coy Road,

Baltac Beach, Lakeview Meadows, ‘unofficial boat launch near the Bayshore Condos’ and Althalmer/Pete’s Marina.

4. Results

4.1. Shoreline surveys

No aquatic invasive plant species were detected during shoreline surveys. A list of indigenous aquatic plant species that were observed using rake pull methodology are listed in Appendix 1. There was a notable lack of aquatic plants detected at the following survey stations: Baltac Beach, End of Ruault Rd, and Unofficial boat launch near Bayshore Condos. For the aquatic plants that were detected, common species included *Myriophyllum sp.* (indigenous milfoil species) and *Chara sp.* (muskgrass).

All watermilfoil species (*Myriophyllum sp.*) detected during surveys had nine (or less) leaflet pairs per leaf. Indigenous watermilfoil species have 5-10 leaflet pairs, whereas invasive Eurasian Watermilfoil (*Myriophyllum spicatum*) has leaves with 12-21 leaflet pairs (Minnesota Sea Grant, 2016). Therefore, all watermilfoil species detected in 2019 were assumed to be indigenous aquatic plant species. The Potamogeton species identified in the excel table (Appendix 1 and 2) with parenthesis stating ‘short/narrow leaves’, could be either *P. gramineus* or *P. obtusifolius*, or possibly another related Potamogeton species. Potamogetons can be hard to identify, depending on condition/stage of the plant and they hybridize fairly frequently to produce plants with hybrid characteristics (Thomas Wolf, personal communication, 2017). Since the purpose of these surveys is to detect invasive plants, species level determination is not required.

4.2. Offshore surveys

No aquatic invasive plant species were detected during offshore surveys. As with previous years of survey effort, dense areas or beds of indigenous aquatic plants were observed in specific locations such as Ruault Road and Althalmer/Pete’s Marina (Figure 1). There were some survey stations that were essentially devoid of aquatic plant communities, such as Baltac Beach, Unofficial boat launch near Bayshore Condos, and Tretheway Docks. While not a part of this study, during an aerial survey conducted on April 8, 2019 by the principal consultant during an annual bird survey, photographs of Lake Windermere were taken indicating that motor boats could be having an influence on the indigenous plant communities of Lake Windermere (Figures 2 and 3).



Figure 1. Image of dense indigenous aquatic plant beds detected at the Ruault Rd survey station during offshore surveys.



Figure 2. Aerial photograph taken on April 8, 2019 showing effects of motorboats on aquatic vegetation at Lake Windermere.



Figure 3. Aerial photograph taken on April 8, 2019 showing effects of motorboats on the aquatic plant community of Lake Windermere.

5. Discussion/Recommendations

Similar to previous years of survey effort, no aquatic invasive plant species were detected in 2019. To the best of the principal consultant's knowledge, no aquatic invasive plant species have been observed previously in Lake Windermere, or within the Columbia Wetlands ecosystem, with the exception of one Purple Loosestrife (*Lythrum salicaria*) infestation at Burgess and James Gadsden Provincial Park located north of Golden; this loosestrife infestation is managed annually by BC Parks. It is important to note that four non-indigenous fish species (i.e. Northern Pike, Smallmouth Bass, Largemouth Bass, Pumpkinseed Fish) have previously been documented to occur in Lake Windermere (Craig, 2015). Aligned to a previous recommendation made by the author (Darvill, 2017b), it is still recommended that a fish

inventory of Lake Windermere be completed, in order to determine the abundance and distribution of invasive fish, as well as the impacts that these species may be having on the ecology and wildlife of Lake Windermere, including potential effects felt by indigenous fish populations.

While assessing the distribution or abundance of aquatic plants was beyond the scope of this study, it was noted through aerial photography that recreational boats appear to be affecting the beds of aquatic macrophytes (or plants) in the lake. A study that took place in the Stockholm archipelago of the Baltic Sea, it was observed that:

“In inlets used as harbours for private boats (marinas) or adjacent to ferryboat routes, vegetation cover and species richness declined significantly more with depth than in reference inlets not exposed to disturbance by boating activities. In marinas, turbidity was significantly higher than in reference inlets. Accordingly, a canonical correspondence analysis showed that the abundance of species sensitive to poor light conditions, such as Chara spp. and Ruppia spp. were negatively correlated with marinas while Myriophyllum spicatum and Ceratophyllum demersum that are common in nutrient rich turbid habitats were positively correlated with marinas. (Eriksoon, Sandstrom, Isaeus, Schreiber, & Kara, 2004).”

During the 2019 Lake Windermere Aquatic Invasive Plant Species Inventory, the most common species at many of the survey stations were indigenous species of *Myriophyllum* and *Chara sp.* *Chara* was often found in low amounts at boat launch locations where little other plant life was detected. However, at some marina's surveyed (e.g. Althalmer/Pete's Marina, Akisknook Docks), there was a high abundance of indigenous *Myriophyllum spp.* (milfoil) observed. The findings of the 2019 Lake Windermere surveys support the work completed by Eriksoon, Sandstrom, Isaeus, Schreiber, & Kara (2004), in that *Myriophyllum* seems to be found in higher abundance at boat dock locations or marinas.

Research has shown that motorboats can dramatically reduce aquatic plant biomass either through direct cutting or through scouring of the substrate where plants are rooted (Asplund & Cook, 1997). Since aquatic vegetation is essential for ecological integrity and for several wildlife species, it is recommended that assessing potential impacts of recreational activities on the aquatic plant communities of Lake Windermere be investigated. In a study by Van Nes et al., (1999) it was suggested that in areas where there are competing interests between nature conservation and recreation, that a compromise can be achieved by assigning certain areas of a lake to recreation and other parts should be left for nature conservation. This may be an important consideration to make in order to achieve more of a recreational/ecological balance

at Lake Windermere, and in order to ensure that the ecological values of Lake Windermere are able to persist alongside human use well into the future. This compromise may also be realistic and achievable for Lake Windermere because the areas that have a high diversity and abundance of aquatic vegetation are typically the areas that are not desirable for recreational boating, for instance plants can clog intakes on motors. Furthermore, if it is of interest to quantify the historical changes of submerged aquatic vegetation in Lake Windermere, it is recommended to conduct a study that focuses specifically on this. This type of research would use different methodology such as rake sampling combined with aerial photograph interpretation and hydroacoustics (Zhu et al., 2007).

6. Acknowledgements

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8. Appendices

Appendix 1. Results from the Lake Windermere shoreline surveys for aquatic invasive plants on September 13, 2019.

Survey Station	AIS sampling location	Aquatic Plants Identified (ranked in order of % in the pull)	Observations/Notes
1. Baltac Beach	Launch (Public Boat Launch) UTM: 0570748; 5593608	Pull 1: No plants Pull 2: Chara sp.	Small Chara sp. fragment.
	South 1 (25m) UTM: 0570750; 5593583	Pull 1: No plants Pull 2: No plants	
	South 2 (50m) UTM: 0570760; 5593559	Pull 1: No plants Pull 2: No plants	
	South 3 (75m) UTM: 0570779; 5593544	Pull 1: No plants. Pull 2: No plants	
	North 1 (25m) UTM: 0570739; 5593631	Pull 1: <i>Elodea canadensis</i> (1 fragment) Pull 2: <i>Chara</i> sp. (1 fragment), <i>Myriophyllum</i> sp. (1 fragment)	
	North 2 (50m) UTM: 0570728; 5593656	Pull 1: <i>Myriophyllum</i> sp., <i>Najas</i> sp. Pull 2: <i>Chara</i> sp.	
	North 3 (75m) UTM: 0570714; 5593672	Pull 1: <i>Chara</i> sp. Pull 2: <i>Chara</i> sp.	
2. Rushmere Community Docks	Launch (centre of private docks) UTM: 0574650; 5585352	Pull 1: <i>Myriophyllum</i> sp. Pull 2: No plants	
	South 1 (25m) UTM: 0574659; 5585334	Pull 1: <i>Utricularia</i> sp, <i>Hippuris vulgaris</i> , <i>Chara</i> sp. Pull 2: <i>Hippuris vulgaris</i> , <i>Chara</i> sp., <i>Myriophyllum</i> sp., <i>Potamogeton</i> sp. (short/narrow leaves)	Rake pulls conducted from a small dock.
	South 2 (50m) UTM: 0574666; 5585311	Pull 1: <i>Chara</i> sp., <i>Myriophyllum</i> sp., <i>Najas</i> sp. Pull 2: <i>Ranunculus aquatilis</i>	
	South 3 (75m) UTM: 0574674; 5585287	Pull 1: <i>Chara</i> sp., <i>Myriophyllum</i> sp. Pull 2: <i>Elodea canadensis</i> , <i>Chara</i> sp.	Large aquatic plant diversity washed up ph shore. Large raft of American Coots nearby (350).
	North 1 (25m) UTM: 0574637; 5585375	Pull 1: <i>Ranunculus aquatilis</i> , <i>Myriophyllum</i> sp. Pull 2: <i>Ranunculus aquatilis</i> , <i>Myriophyllum</i> sp.	
	North 2 (50m) UTM: 0574623; 5585394	Pull 1: <i>Chara</i> sp., <i>Myriophyllum</i> sp., <i>Elodea canadensis</i> , <i>Najas</i> sp., <i>Hippuris vulgaris</i> Pull 2: <i>Chara</i> sp.	
	North 3 (75m) UTM: 0574611; 5585417	Pull 1: <i>Chara</i> sp., <i>Potamogeton</i> sp. (short/narrow leaves) Pull 2: <i>Utricularia</i> , <i>Chara</i> sp., <i>Myriophyllum</i> sp., <i>Najas</i> sp.	Mainly bare substrate.
3. Fairmont Side Channel	Boat launch UTM: 0580441; 5577289	Pull 1: <i>Potamogeton</i> sp. (likely <i>P. vaginatus</i>), <i>Chara</i> sp. Pull 2: <i>Potamogeton</i> sp. (likely <i>P. vaginatus</i>), <i>Chara</i> sp.	Outhouse, picnic tables, garbage cans.
	South 1 (25m) UTM: 0580421; 5577269	Pull 1: <i>Potamogeton</i> sp. (likely <i>P. vaginatus</i>), <i>Chara</i> sp. Pull 2: <i>Potamogeton</i> sp. (likely <i>P. vaginatus</i>), <i>Chara</i> sp.	Could not go further south to sample; private property. Did not sample here 2015-2019.
	North 1 (25m)	Pull 1: <i>Potamogeton</i> sp. (likely <i>P. vaginatus</i>), <i>Chara</i> sp. Pull	

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	UTM: 0580450; 5577309	2: <i>Potamogeton</i> sp. (likely <i>P. vaginatus</i>), <i>Potamogeton richardsonii</i>	
	North 2 (50m) UTM: 0580451; 5577332	Pull 1: <i>Potamogeton</i> sp. (likely <i>P. vaginatus</i>), <i>Potamogeton richardsonii</i> , <i>Chara</i> sp. Pull 2: <i>Potamogeton</i> sp. (likely <i>P. vaginatus</i>), <i>Potamogeton richardsonii</i> , <i>Chara</i> sp.	
	Additional Notes: It was not possible to sample at more than three locations at Fairmont Side Channel due to private property.		
4. End of Ruault Road	Boat Launch UTM: 0572641; 5587665	Pull 1: <i>Chara</i> sp., <i>Myriophyllum</i> sp., <i>Najas</i> sp. Pull 2: <i>Chara</i> sp., <i>Potamogeton richardsonii</i>	
	North 1 (25m) UTM: 0572619; 5587674	Pull 1: <i>Chara</i> sp., <i>Myriophyllum</i> sp., Pull 2: <i>Chara</i> sp., <i>Myriophyllum</i> sp.,	Bulrushes located north of 25 m did not enable for pulls further north. Did not sample here in 2015-2019.
	South 1 (25m) UTM: 0572664; 5587657	Pull 1: <i>Chara</i> sp., <i>Myriophyllum</i> sp., <i>Megalodonta beckii</i> Pull 2: <i>Chara</i> sp., <i>Myriophyllum</i> sp., <i>Najas</i> sp.	Much <i>Myriophyllum</i> washed up on shoreline.
	South 2 (50m) UTM: 0572687; 5587647	Pull 1: No plants Pull 2: <i>Myriophyllum</i> sp. (1 fragment)	Very rainy and windy conditions during pull.
	South 3 (75m) UTM: 0572711; 5587639	Pull 1: No plants Pull 2: No plants.	Very rainy and windy conditions during pull.
	Additional Notes: Could not sample northwards beyond the 25m north survey station due to extensive shoreline plants.		
5. Unofficial boat launch near Bayshore Condos	Launch UTM: 0569389; 5595010	Pull 1: No plants Pull 2: No plants	
	North 1 (25m) UTM: 0569390; 5595037	Pull 1: No plants Pull 2: No plants	
	North 2 (50m) UTM: 0569380; 5595059	Pull 1: <i>Najas</i> sp. (1 fragment) Pull 2: <i>Najas</i> sp., <i>Potamogeton</i> sp. (short/narrow leaves)	
	North 3 (75m) UTM: 0569363; 5595076	Pull 1: <i>Najas</i> sp., <i>Chara</i> sp. Pull 2: <i>Chara</i> sp., <i>Najas</i> sp.	
	South 1 (25m) UTM: 0569390; 5594986	Pull 1: No plants Pull 2: No plants	
	South 2 (50m) UTM: 0569389; 5594972	Pull 1: <i>Chara</i> sp. Pull 2: <i>Myriophyllum</i> sp., <i>Chara</i> sp.	
	South 3 (75m) UTM: 0569401; 5594942	Pull 1: <i>Chara</i> sp. Pull 2: <i>Chara</i> sp.	
6. Althamer/ Pete's Marina	Boat Launch UTM: 0569527; 5596336	Pull 1: <i>Elodea canadensis</i> , <i>Myriophyllum</i> sp., <i>Najas</i> sp. Pull 2: <i>Myriophyllum</i> (1 fragment)	Most heavily used public boat launch access point on Lake Windermere.
	South 1 (25m) UTM: 0569536; 5596313	Pull 1: <i>Myriophyllum</i> sp., <i>Najas</i> sp., <i>Potamogeton richardsonii</i> , <i>Chara</i> sp., <i>Elodea canadensis</i> Pull 2: <i>Chara</i> sp., <i>Myriophyllum</i> sp., <i>Potamogeton</i> sp. (short/narrow leaves), <i>Potamogeton richardsonii</i> , <i>Najas</i> sp.,	
	South 2 (50m) UTM: 0569543; 5596290	N/A	No survey; extensive riparian shrubs obstructing sampling location.
	South 3 (75m)	N/A	No survey; extensive riparian shrubs obstructing sampling location. Did not sample here in 2015-2019.
	North 1 (25m) UTM: 0569523; 5596361	Pull 1: <i>Najas</i> sp., <i>Chara</i> sp., <i>Potamogeton richardsonii</i> , <i>Myriophyllum</i> sp., <i>Elodea canadensis</i> Pull 2: <i>Najas</i> sp., <i>Chara</i> sp., <i>Potamogeton richardsonii</i> , <i>Myriophyllum</i> sp., <i>Elodea canadensis</i>	

Lake Windermere Aquatic Invasive Species Sampling – 2019

	North 2 (50m) UTM: 0569515; 5596382	Pull 1: <i>Najas sp.</i> , <i>Myriophyllum sp.</i> , <i>Potamogeton richardsonii</i> , <i>Chara sp.</i> Pull 2: <i>Najas sp.</i> , <i>Myriophyllum sp.</i> , <i>Potamogeton richardsonii</i> , <i>Chara sp.</i> , <i>Elodea canadensis</i>	
	North 3 (75m) UTM: 0569507; 5596414	Pull 1: N/A Pull 2: N/A	Did not throw the rake as there were several salmon here spawning. Could see well through shallow clear water, saw the following: <i>Potamogeton sp.</i> (short/narrow leaves), <i>Elodea canadensis</i> , <i>Potamogeton richardsonii</i> , <i>Chara sp.</i> , <i>Najas sp.</i> , <i>Myriophyllum sp.</i> , <i>Sago</i> , <i>Ranunculus aquatilis</i> , <i>Potamogeton pectinatus</i> , <i>Potamogetan vaginatus</i> .

Appendix 2. Results from the rake pulls conducted during offshore aquatic invasive plant inventories at 11 survey stations on Lake Windermere, on September 17, 2018.

Survey Station	GPS coordinates (UTM)	Distance from shore (m)	Rake Pull # or transect survey	Aquatic Plant Species
Rushmere	0574794; 5585427	N/A	1	<i>Chara sp., Potamogeton natans</i>
Rushmere	0574794; 5585427	N/A	2	<i>Chara sp., Potamogeton natans</i>
Rushmere	0574794; 5585427	N/A	3	<i>Chara sp., Potamogeton natans</i>
Rushmere	0574794; 5585427	N/A	4	<i>Potamogeton natans, aquitic moss, Chara sp.</i>
Rushmere	N/A	N/A	100 m transect	<i>Chara sp., Potamogeton natans</i>
Rushmere	0574733; 5585505	159	1	<i>Chara sp., Elodea canadensis, Potamogeton natans, Potamogeton sp. (short/narrow leaves), aquatic moss</i>
Rushmere	0574733; 5585505	159	2	<i>Chara sp. Potamogeton natans, Potamogeton richardsonii</i>
Rushmere	0574733; 5585505	159	3	<i>Chara sp., Potamogeton natans</i>
Rushmere	0574733; 5585505	159	4	<i>Chara sp., Potamogeton natans, Myriophyllum sp., Potamogeton sp. (short/narrow leaves)</i>
Lakeshore Resort	0574820; 5586547	46	1	<i>Chara sp.</i>
Lakeshore Resort	0574820; 5586547	46	2	<i>Chara sp.</i>
Lakeshore Resort	0574820; 5586547	46	3	<i>Chara sp., Utricularia sp., Najas sp., Myriophyllum sp.</i>
Lakeshore Resort	0574820; 5586547	46	4	<i>Chara sp., Potamogeton sp. (leaves disintegrated), Potamogeton sp. (short/narrow leaves)</i>
Lakeshore Resort	N/A	N/A	100m transect	No additional plant species seen.
Lakeshore Resort	0574729; 5586612	124	1	<i>Chara sp., Najas sp., aquatic moss, Potamogeton sp. (leaves disintegrated)</i>
Lakeshore Resort	0574729; 5586612	124	2	<i>Najas sp., Potamogeton sp. (leaves disintegrated), Megalodonta beckii, Chara sp.</i>
Lakeshore Resort	0574729; 5586612	124	3	<i>Chara sp. Potamogeton sp. (leaves disintegrated), Najas sp.</i>
Lakeshore Resort	0574729; 5586612	124	4	<i>Chara sp., Potamogeton sp. (leaves disintegrated), Myriophyllum sp.</i>
Ruault Road	0573140; 5587220	30	1	<i>Elodea canadensis, Myriophyllum sp., Megalodonta beckii</i>
Ruault Road	0573140; 5587220	30	2	<i>Elodea canadensis, Myriophyllum sp., Potamogeton richardsonii, Megalodonta beckii</i>

Lake Windermere Aquatic Invasive Species Sampling – 2019

	5587220					
Ruault Road	0573140; 5587220	30	3		<i>Elodea canadensis</i> , <i>Myriophyllum</i> sp., <i>Potamogeton richardsonii</i>	
Ruault Road	0573140; 5587220	30	4	100m transect	<i>Elodea canadensis</i> , <i>Myriophyllum</i> sp., <i>Potamogeton richardsonii</i> , <i>Potamogeton praelongus</i> , <i>Ranunculus aquatilis</i>	
Ruault Road	N/A	N/A			Only additional plant was <i>Potamogeton natans</i> . Diverse and abundant beds of aquatic vegetation.	
Ruault Road	0573085; 5587309	119	1		<i>Myriophyllum</i> sp., <i>Potamogeton natans</i>	
Ruault Road	0573085; 5587309	119	2		<i>Myriophyllum</i> sp., <i>Potamogeton praelongus</i> , <i>Potamogeton natans</i> , <i>Megalodonta beckii</i>	
Ruault Road	0573085; 5587309	119	3		<i>Myriophyllum</i> sp., <i>Potamogeton richardsonii</i>	
Ruault Road	0573085; 5587309	119	4		<i>Myriophyllum</i> sp., <i>Utricularia</i> sp., <i>Potamogeton richardsonii</i>	
Indigenous Beach	0572504; 5589039	110	1		No aquatic plants.	
Indigenous Beach	0572504; 5589039	110	2		No aquatic plants.	
Indigenous Beach	0572504; 5589039	110	3		<i>Chara</i> sp., <i>Najas</i> sp., <i>Potamogeton</i> sp. (short/narrow leaves), <i>Elodea canadensis</i> , <i>Myriophyllum</i> sp.	
Indigenous Beach	0572504; 5589039	110	4	100m transect	<i>Chara</i> sp., <i>Potamogeton</i> sp. (leaves disintegrated), <i>Potamogeton</i> sp. (short/narrow leaves), <i>Myriophyllum</i> sp.	
Indigenous Beach	N/A	N/A			Additional species: <i>Potamogeton natans</i> , <i>Potamogeton richardsonii</i> . Sandy substrate, little plant life.	
Indigenous Beach	0572416; 5589115	59	1		<i>Chara</i> sp., aquatic moss	
Indigenous Beach	0572416; 5589115	59	2		<i>Chara</i> sp., aquatic moss	
Indigenous Beach	0572416; 5589115	59	3		<i>Chara</i> sp.	
Indigenous Beach	0572416; 5589115	59	4		<i>Chara</i> sp., <i>Potamogeton</i> sp. (short/narrow leaves), <i>Najas</i> sp.	
Tretheway Docks	0571745; 5589729	104	1		<i>Chara</i> sp.	
Tretheway Docks	0571745; 5589729	104	2		<i>Chara</i> sp., <i>Myriophyllum</i> sp. (1 fragment)	
Tretheway Docks	0571745; 5589729	104	3		<i>Chara</i> sp., <i>Myriophyllum</i> sp., <i>Elodea canadensis</i>	
Tretheway Docks	0571745; 5589729	104	4	100m transect	<i>Chara</i> sp.	
Tretheway Docks	N/A	N/A			No additional plant species seen. Sandy substrate with little plant life detected.	
Tretheway Docks	0571645; 5589790	N/A	1		No aquatic plants. Sandy substrate with some rocks and freshwater mussels present.	
Tretheway Docks	0571645;	N/A	2		No aquatic plants. Sandy substrate with some rocks and freshwater mussels present.	

Lake Windermere Aquatic Invasive Species Sampling – 2019

	5589790				
	0571645; 5589790	N/A	3	No aquatic plants. Sandy substrate with some rocks and freshwater mussels present.	
Tretheway Docks					
	0571645; 5589790	N/A	4	No aquatic plants. Sandy substrate with some rocks and freshwater mussels present.	
Tretheway Docks					
	0571281; 5591443	69	1	<i>Myriophyllum sp.</i>	
Akisknook Docks					
	0571281; 5591443	69	2	<i>Myriophyllum sp.</i>	
Akisknook Docks					
	0571281; 5591443	69	3	<i>Myriophyllum sp., Najas sp.</i>	
Akisknook Docks					
	0571281; 5591443	69	4	<i>Myriophyllum sp., Elodea canadensis, Potamogeton pectinatus</i>	
Akisknook Docks					
	N/A	N/A	100m transect	Deep water, could not see lake bottom during transect.	
Akisknook Docks					
	0571236; 5591551	84	1	<i>Myriophyllum sp., Elodea canadensis, Najas sp.</i>	
Akisknook Docks					
	0571236; 5591551	84	2	<i>Myriophyllum sp., Elodea canadensis, Potamogeton richardsonii</i>	
Akisknook Docks					
	0571236; 5591551	84	3	<i>Elodea canadensis, Myriophyllum sp.</i>	
Akisknook Docks					
	0571236; 5591551	84	4	<i>Myriophyllum sp., Elodea canadensis,</i>	
Akisknook Docks					
	0570204; 5590738	77	1	<i>Chara sp., Najas sp., Myriophyllum sp.</i>	
End of Coy Road					
	0570204; 5590738	77	2	<i>Chara sp., Najas sp., Myriophyllum sp., Potamogeton vaginatus</i>	
End of Coy Road					
	0570204; 5590738	77	3	<i>Chara sp., Najas sp., Myriophyllum sp., Potamogeton sp. (short/narrow leaves)</i>	
End of Coy Road					
	0570204; 5590738	77	4	<i>Chara sp., Najas sp., Potamogeton sp. (short/narrow leaves)</i>	
End of Coy Road					
	N/A	N/A	100m transect	No additional plant species seen.	
End of Coy Road					
	0570174; 5590838	84	1	<i>Chara sp., Elodea canadensis, Potamogeton sp. (short/narrow leaves), Megalodonta beckii</i>	
End of Coy Road					
	0570174; 5590838	84	2	<i>Chara sp., Potamogeton sp. (short/narrow leaves)</i>	
End of Coy Road					
	0570174; 5590838	84	3	<i>Chara sp., Megalodonta beckii, Potamogeton sp. (short/narrow leaves)</i>	
End of Coy Road					
	0570174; 5590838	84	4	<i>Chara sp.</i>	
End of Coy Road					
	0571112; 5593401	91	1	<i>Chara sp.</i>	
Baltac Beach					
	0571112; 5593401	91	2	No aquatic plants detected.	
Baltac Beach					
	0571112; 5593401	91	3	No aquatic plants detected.	
Baltac Beach					

Lake Windermere Aquatic Invasive Species Sampling – 2019

	5593401				
	0571112; 5593401	91	4		<i>Chara sp.</i>
Baltac Beach			100m transect		No additional plant species seen. Sandy substrate with little plant life; mussels present on lake bottom.
Baltac Beach	N/A	N/A			
Baltac Beach	0571009; 5593448	64	1		<i>Chara sp., Potamogeton sp.</i> (leaves disintegrated)
Baltac Beach	0571009; 5593448	64	2		<i>Chara sp.</i>
Baltac Beach	0571009; 5593448	64	3		No aquatic plants detected.
Baltac Beach	0571009; 5593448	64	4		No aquatic plants detected.
Lakeview Meadows	N/A	N/A	1		<i>Elodea canadensis, Chara sp., Najas sp., Myriophyllum sp., Megalodonta beckii, Potamogeton sp.</i> (short/narrow leaves), <i>Potamogeton pectinatus</i>
Lakeview Meadows	0570183; 5594068	N/A	2		<i>Chara sp., Potamogeton pectinatus, Potamogeton vaginatus, Najas sp., Elodea canadensis, Megalodonta beckii, Myriophyllum sp.</i>
Lakeview Meadows	0570183; 5594068	N/A	3		<i>Chara sp., Potamogeton vaginatus, Najas sp., Potamogeton sp.</i> (short/narrow leaves)
Lakeview Meadows	0570183; 5594068	N/A	4		<i>Chara sp., Myriophyllum sp., Elodea canadensis, Potamogeton sp.</i> (short/narrow leaves)
Lakeview Meadows	N/A	N/A	100m transect		Dense beds of <i>Myriophyllum</i> seen. Glare off water; hard to ID plants.
Lakeview Meadows	0570189; 5594172	96	1		<i>Chara sp., Myriophyllum sp.</i>
Lakeview Meadows	0570189; 5594172	96	2		<i>Chara sp.</i>
Lakeview Meadows	0570189; 5594172	96	3		<i>Chara sp.</i>
Lakeview Meadows	0570189; 5594172	96	4		<i>Chara sp., Elodea canadensis</i>
Unofficial boat launch near Bayshore Condos	0569449; 5595035	101	1		<i>Myriophyllum sp., Chara sp.</i>
Unofficial boat launch near Bayshore Condos	0569449; 5595035	101	2		<i>Myriophyllum sp., Chara sp.</i>
Unofficial boat launch near Bayshore Condos	0569449; 5595035	101	3		<i>Chara sp., Potamogeton praelongus, Potamogeton pectinatus</i>
Unofficial boat launch near Bayshore Condos	0569449; 5595035	101	4		<i>Chara sp., Myriophyllum sp., Potamogeton pectinatus</i>
Unofficial boat launch near Bayshore Condos	N/A	N/A	100m transect		Deep water, could not see lake bottom during transect.
Unofficial boat launch near Bayshore Condos	0569427; 5595149	97	1		<i>Chara sp.</i>
Unofficial boat launch near Bayshore Condos	0569427; 5595149	97	2		<i>Chara sp.</i>

Lake Windermere Aquatic Invasive Species Sampling – 2019

Unofficial boat launch near Bayshore Condos	0569427; 5595149	97	3	<i>Chara sp.</i>	
Unofficial boat launch near Bayshore Condos	0569427; 5595149	97	4	<i>Chara sp.</i>	
Althamer/Pete's Marina	0569572; 5596300	22	1	No plants.	
Althamer/Pete's Marina	0569572; 5596300	22	2	<i>Myriophyllum sp.</i>	
Althamer/Pete's Marina	0569572; 5596300	22	3	<i>Myriophyllum sp., Najas sp., Potamogeton vaginatus, Potamogeton pectinatus, Potamogeton richardsonii</i>	
Althamer/Pete's Marina	0569572; 5596300	22	4	<i>Myriophyllum sp., Potamogeton sp. (leaves disintegrated), Chara sp., Potamogeton pectinatus</i>	
Althamer/Pete's Marina	N/A	N/A	100m transect	Winds with ripples on water, could not ID underwater plants.	
Althamer/Pete's Marina	0569538; 55996404	19	1	<i>Chara sp., Potamogeton richardsonii</i>	
Althamer/Pete's Marina	0569538; 55996404	19	2	<i>Chara sp., Myriophyllum sp., Potamogeton pictinatus, Potamogeton vaginatus</i>	
Althamer/Pete's Marina	0569538; 55996404	19	3	<i>Chara sp., Potamogeton pectinatus, Myriophyllum sp., Elodea canadensis</i>	
Althamer/Pete's Marina	0569538; 55996404	19	4	<i>Myriophyllum sp., Chara sp., Potamogeton pictinatus, Potamogeton vaginatus, Potamogeton richardsonii</i>	

COLUMBIA VALLEY LOCAL CONSERVATION FUND (CVLCF) FINAL REPORT 2019

General Instructions

- Final reports must be submitted **by 4:00 pm MT January 31, 2020** to the Kootenay Conservation Program. Email final report to info@kootenayconservation.ca.
- All areas of the final report must be answered.

Section A – GENERAL INFORMATION

1. Project Title (as indicated in application): Securement of Columbia River Wetlands: Edgewater Con. Property

2. Proponent

- a) Legal Name: The Nature Trust of British Columbia
- b) Organization Registration #: BC Societies Act # X9934, Charitable Reg. # 10808 9863 RR 0001
- c) Mailing Address: Suite 500 - 888 Dunsmuir Street, Vancouver, BC Postal Code: V6C 3K4
- d) Contact: Chris Bosman, Kootenay Conservation Land Manager
- e) Telephone #: 250-489-8549 f) Fax #: N/A
- g) Email: cbosman@naturetrust.bc.ca

3. Partner (*if applicable*)

- a) Legal Name:
- b) Organization Registration #:
- c) Mailing Address: Postal Code:
- d) Contact:
- e) Telephone #: f) Fax #:
- g) Email:

Section B – PROJECT INFORMATION

- 1. Project Location:** Securement project took place within RDEK Electoral Area G, approximately 6 km north of Radium Hot Springs, just south of the community of Edgewater.
(ie: RDEK area, watershed, direction from major centre, etc)
- 2. Total Project Value:** \$1,276,062.91
- 3. CVLCF Contribution:** \$400,000.00
- 4. Non-CVLCF Contribution:** \$876,062.91
- 5. Single or multiple year project:** Single year/event project, though CVLCF funds were provided over two years.

Section C – PROJECT SUMMARY

1. Please provide a single paragraph describing your project, its objective (goals) and the results. As this summary will be used in CVLCF communications, clearly state the issues addressed and avoid overly technical descriptions. Maximum 2000 characters (~290 words).

On July 18, 2019 after more than four years of effort, the Nature Trust of British Columbia (NTBC) and its partners acquired the 171.5-hectare (423.7 acre) Columbia River Wetlands Edgewater Conservation Property, located just north of Radium Hot Springs.

This outstanding property contains a mosaic of habitats, including open forest, shrub-steppe, grassland, steep clay banks, wetland and riparian floodplain. Located within a biogeoclimatic zone of provincial conservation concern, the very dry cool Interior Douglas Fir, it also serves as critical habitat for many species, including the Red-listed American Badger and the Blue-listed Grizzly Bear.

Located adjacent to the Columbia Wetlands Wildlife Management Area (WMA), its wetland complex is contiguous with a RAMSAR site, designated as a Wetland of International Importance because of the significant migratory bird habitat in the area. The property functions as a wildlife corridor by creating a linkage up and down the river valley, while also providing some connectivity across the valley, from the Rocky Mountains to the Purcell Ranges. Its securement contributes to landscape level biodiversity conservation in the Columbia Valley by adding to existing NTBC conservation land, while also tying into the Columbia National Wildlife Area as well as, the Provincial Columbia Wetlands WMA.

An important project for the Columbia Valley, the acquisition provides the opportunity to realize many ecological benefits through stewardship efforts in future, while also removing the property and its ecological values from threats such as development, which has been common in the region in recent decades.

2. OPTIONAL: If your project lends itself to sparking interest through a compelling sound bite (for potential use in CVLCF communications), please tell us what that would be. Maximum 1050 characters (~150 words).

The Columbia River Wetlands Edgewater Conservation Property acquisition includes 423 acres (171.5 hectares) and features outstanding habitat and connectivity for Grizzly Bears and American Badgers, both species of conservation concern. It also provides habitat for Elk, Mule Deer, White-tailed Deer and Moose.

"The Property has incredible diversity, ranging from wetlands to grasslands and open forest habitats," said Chris Bosman, Kootenay Conservation Land Manager for The Nature Trust of BC. "From the upper benches, the views across the Columbia Valley and up and down the Rocky Mountain Trench are stunning. As a multi-generational family ranch, the land has been well cared for over the years by the conservation minded Tegart family. The Nature Trust looks forward to carrying on the tradition of responsible land stewardship".

3. Biodiversity Targets (please list, maximum 90 words):

1) Conservation of a biogeoclimatic area of conservation concern (IDF_{ck}); 2) Conservation of habitat for species of conservation concern (American badger, Grizzly Bear); 3) Conservation of other key habitat values and attributes (Ungulate Winter Range, stopover on Pacific Flyway, etc); 4) Expansion of existing conservation lands & protections in the area, providing resilience and landscape level habitat for a full suite of wildlife species & contributes to ecosystem health & function; 5) Wildlife corridor connectivity up/down the Columbia River & across the Rocky Mountain Trench, allowing for genetic dispersal.

4. IUCN Threats to Target (please list, maximum 90 words):

1) Residential & Commercial Development - Threats from human settlements or other non-agricultural land uses with a substantial footprint; 2) Agriculture & Aquaculture - Threats from farming and ranching as a result of agricultural expansion and intensification, including silviculture, mariculture and aquaculture (includes the impacts of any fencing around farmed areas; 3) Human Intrusions & Disturbances - Threats from human activities that alter, destroy and disturb habitats and species associated with non-consumptive uses of biological resources

Section D – PROJECT DELIVERABLES AND RESULTS

1. Identify the deliverables outlined in your application in the table below (50 words/field) and list the results of each. Please include copies of any relevant communications products (brochures, posters, videos, websites, photos of signage, etc.) resulting from this project. Add an attachment if you need more room.

Deliverables	Results
1. Discussions & visits with landowners over their interest in sale & partial donation of property to NTBC. 2. KCP conducts property evaluation and ranking. 3. Funding secured from KCP for professional property appraisal, undertaken. 4. Landowner presented with appraisal and agrees in principle to sell for appraised Fair Market Value.	1. Meetings took place from 2015 - 2018. 2. KCP Evaluation completed January 31, 2017. 3. Professional appraisal completed July 27, 2017. 4. Appraisal presented to vendor on August 2017.
5. Application to ECCC's Ecological Gifts Program for a split receipt donation. 6. NTBC Board formally endorses Edgewater Property acquisition. 7. NTBC begins fundraising efforts for acquisition. 8. Lawyers representing NTBC and the vendor sign a Purchase and Sale Agreement. 9. Environmental Site Assessment Phase One.	5. Submitted September 1, 2017 & later approval. 6. Completed during September 26, 2017 Board Mtg. 7. Fundraising efforts last from fall 2017 - winter 2019. 8. PSA signed off by both parties January 15, 2018. 9. Contractor completes ESA October 22, 2018 and finds no concerns that would impact PSA terms.
10. Management Direction Plan process undertaken between NTBC, Vendors and Contractor. 11. CVLCF Interim Report due. Fundraising target for property is reached. 12. Property conditions removed and sale of property is completed. 13. News release written and distributed.	10. Contractor works on management plan between October-December, completed December 10, 2018 and agreed to by both parties December 17, 2018. 11. Interim CVLCF report submitted November 1, 2018. By winter 2019, all project funds are secured. 12. Transfer of titles completed on July 18, 2019 13. News release issued July 18th, widely publicized.
14. Startup projects begin on the on property by NTBC staff and contractors. 15. Property hosts several tours/special events throughout summer and fall. 16. Final reports completed for a variety of funders. 17. CVLCF Final Report due.	14. Projects commence in late July 2018 and include invasive plant control, sign installation, development of public parking area, etc. 15. Tours included: including: Batfest (July 20), KCP Fall Gathering Tour (October 5), FWCP Columbia Region Board (October 16). 16. Final reporting out completed during fall 2019 17. Submitted prior to Dec 30, 2019
18. Grand Opening Event for partners, guests. 19. Start up projects on property continue.	18. Scheduled for June 16 or 17, 2019. 19. Start-up projects completed in Fall 2020.

Section E – PROJECT EFFECTIVENESS

1. Please evaluate the effectiveness of the project using objective standards, quantifiable criteria and/or quality control measures identified in your application/proposal. Maximum 2000 characters (~290 words).

NTBC believes the acquisition of the Columbia River Wetlands Edgewater Property succeeded in:

- 1) The conservation of the very cool Interior Douglas Fir (IDF_{fx}) Biogeoclimatic Zone, which is one of four provincial BEC zones that are of provincial conservation concern.
- 2) Securing habitat for at least two species-at-risk, the Red Listed American Badger (SARA Schedule 1, Endangered) and the Blue listed Grizzly Bear (SARA Schedule, Special Concern).
- 3) The protection of other key habitat values and attributes. The property is designated as Class 1 Ungulate Winter Range (UWR) for Mule Deer and Elk and Class 2 UWR for White-tailed Deer and Moose. The property also contains the Blue listed Common Cattail Marsh Habitat Type and provides important migratory habitat to up to 200 bird species, along the Pacific Flyway.
- 4) Expanding the conservation land footprint in the Columbia Valley, as the property directly abuts the 16,952 hectare provincial Columbia Wetlands WMA (a RAMSAR site of international importance), adds to 539 hectares of NTBC Conservation Properties nearby and also ties into the 1002 hectare Columbia National Wildlife Area in the vicinity, as well as a network of other parks and protected areas in the region.
- 5) Contributing to an intact, landscape-level wildlife corridor by providing connectivity up and down the Columbia River valley, while also maintaining a linkage across the valley, linking the Rocky Mountains in the east to the Purcell Mountains in the west. This is particularly important for wide ranging carnivores.
- 6) Permanently removing the property from many threats that have eroded ecological values in the Columbia Valley in recent decades, including: residential, tourism, commercial and industrial development.
- 7) Purchase at Fair Market Value (as appraised), plus a significant landowner donation through an ecogift.

2. What are the top 3 lessons learned from the project that would be important to communicate to others doing similar work throughout the RDEK? Maximum 1050 characters (~150 words).

- 1) 'Cast a wide net' in terms of fundraising efforts for land securement by approaching many funding agencies, individuals and organizations. This approach was successful for NTBC, as we were able to secure the requisite project amount earlier than was originally forecast.
- 2) The land acquisition process often requires a slow and steady approach. In this case, the securement process lasted more than four years. Developing strong working relationships with vendors and funders takes time, yet is critical to project success and clarifying expectations of what land conservation will look like.
- 3) Avoid a property purchase and sale in the middle of the summer, if possible. Many take summer vacation so, staff and contractor availability is constrained. To some extent, the public is not paying as close attention to the media during the summer months either, so exposure can be limited. Summer is also a very busy time for land management staff, a winter or spring property closing would have allowed more time for startup tasks.

Section F – FURTHER COMMENTS

1. Please provide any further comments including recommendations for future conservation efforts. If your project produced a narrative or scientific report or additional project products (e.g. maps, photos), attach them as an Appendix (maximum 90 words).

- 1) A recommendation to the CVLCF may be to consider better defining, through policy(?), how much and how often a land trust can apply to the fund for land acquisition efforts in the future.
- 2) CVLCF may want to consider revising report templates, to be more applicable for securement projects.
- 3) Property maps, news release and a photo gallery have been included as appendices to this report.
- 4) NTBC is very appreciative of the funding received through the CVLCF, it was critical to project success!

Section G – FINANCIAL REPORT

1. Please submit a financial report for the project outlining revenue and expenditures with a comparison to the budget submitted with your CVLCF application. **Use the Final Budget Reporting form provided.** Details on any discrepancies from the budgeted amounts or items are required (maximum 90 words).

Please see the attached CVLCF Final Project Budget Report for detailed financial information. There were some discrepancies between budgets and actuals. The largest deviations were in grant amounts budgeted vs. those actually received. For example, the HSP (SAR stream) wasn't applied to, while new grant programs came on-line (i.e. NHCP-LTCF, EGP LASF) that NTBC was able to secure. Meanwhile other grants provided more funding than anticipated. Also of note, the total project cost was ~\$36,000.00 more than budgeted due to increased costs for an ESA, Mgmt. plan, start-up costs, etc. But, this was all offset by increased revenue.



Columbia Valley Local Conservation Fund (CVLCF) Final Reporting Budget

Proponent:

Project Title:

Please include both cash and in-kind amounts, and itemize all projected revenues and expenditures, confirmed and pending (including in-kind contributions). Please ensure revenues and expenses balance.

Be sure to identify the specific component(s) of the project allocated to the Columbia Valley Local Conservation Fund. Record them in the "CVLCF Funding" column.

Please remove all green text upon completion of this Budget Form.

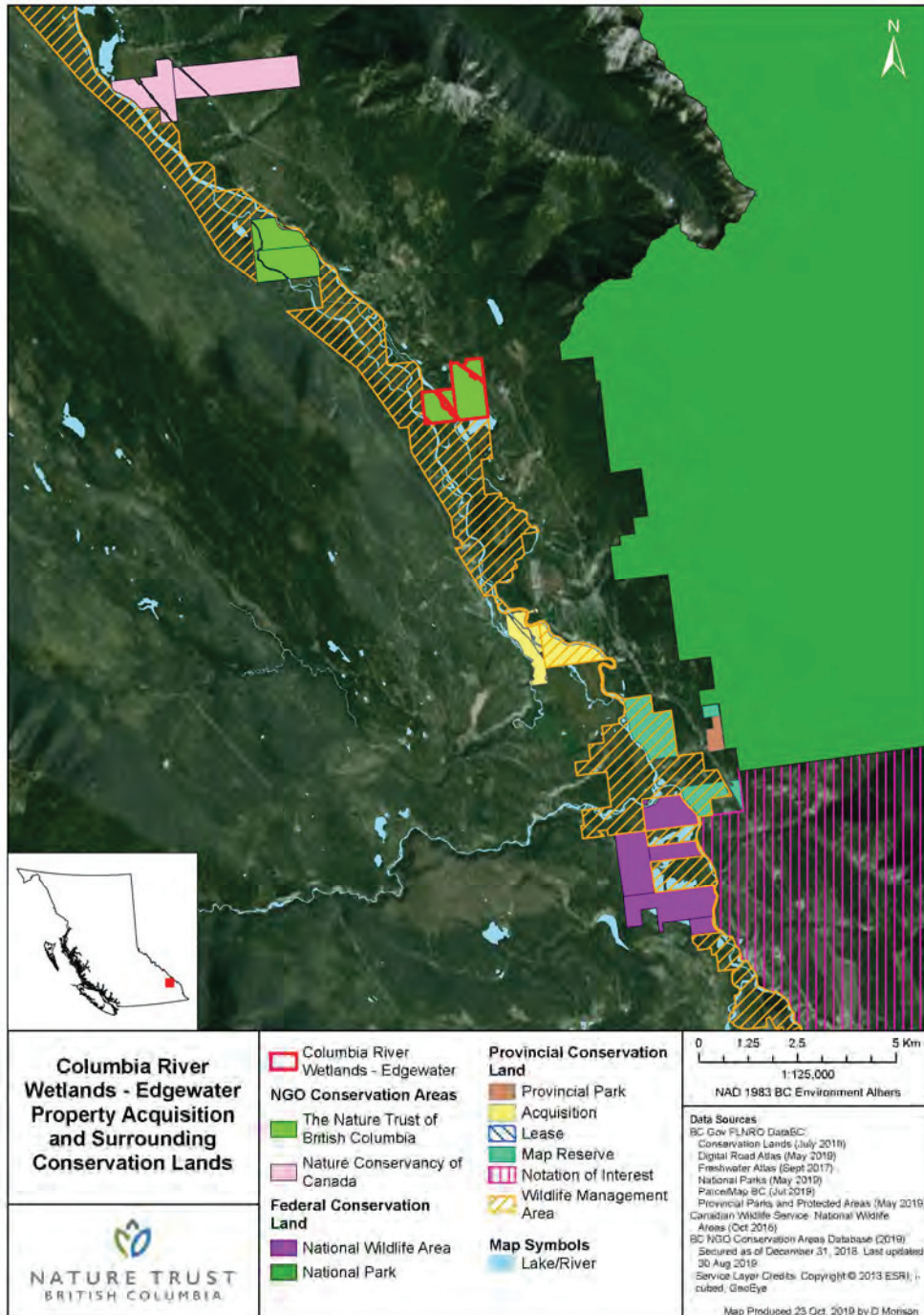
REVENUES:

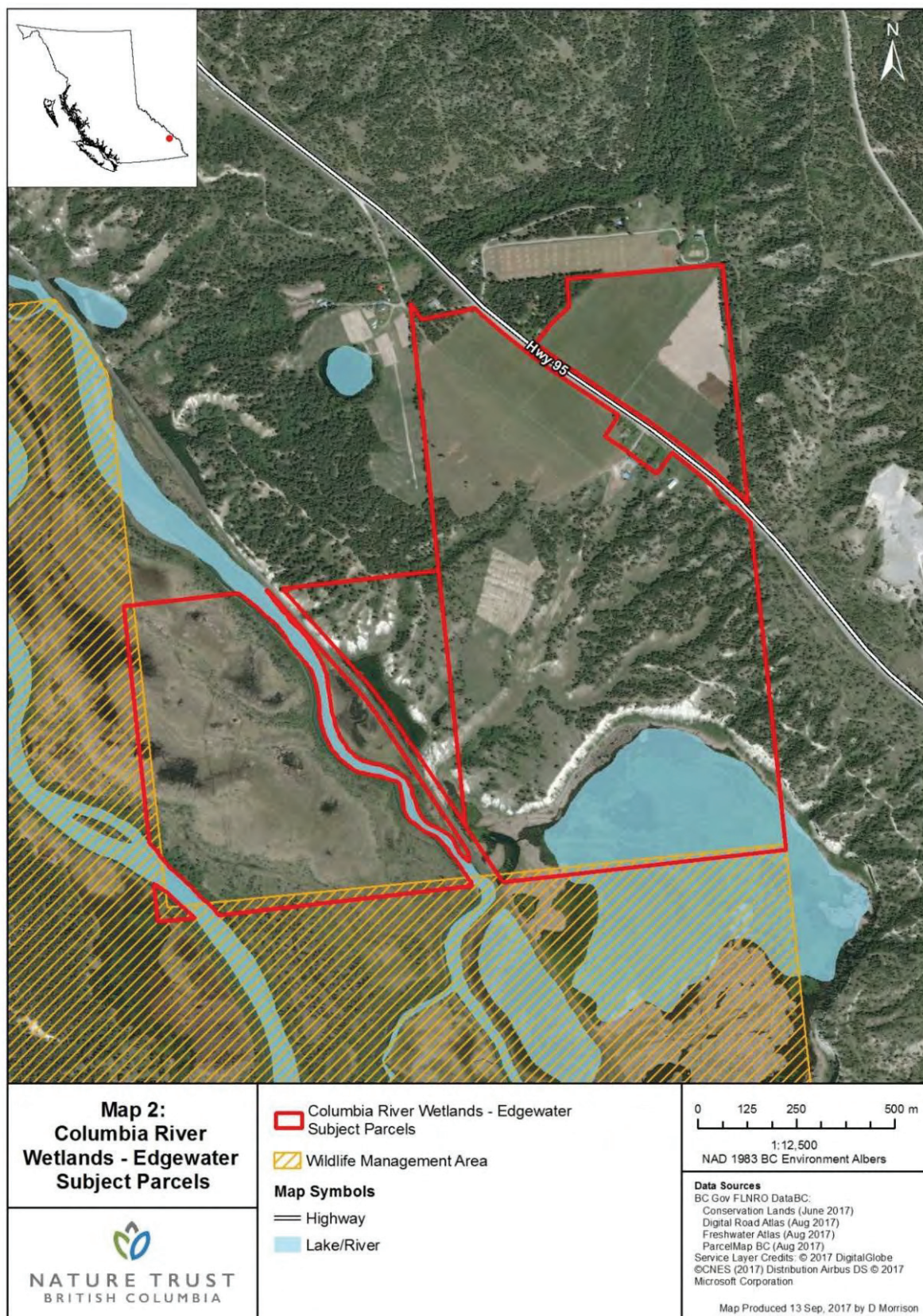
Funders	APPLICATION		FINAL REPORTING		Additional Comments
	Estimated Cash Amount	In-kind Amount	Actual Funds Received	Actual In-kind	
Denis & Rosemary Tegt		\$200,000.00		\$200,000.00	Split receipt donation via Environment & Climate Change Canada's Federal Ecological Gifts Program
Fish and Wildlife Compensation Program	\$3,150.00		\$3,150.00		Property Appraisal funded by FWCP via annual budget provided to the Kootenay Conservation Program
BCCF Land for Wildlife Funding	\$75,000.00		\$20,000.00		Funding provided by BC Conservation Foundation Land for Wildlife Fund
FWCP Land Securement Fund	\$300,000.00		\$400,000.00		Funding provided by Fish and Wildlife Compensation Program (Columbia Region) - Land Securement Fund
HCTF Acquisition Fund	\$100,000.00		\$200,000.00		Funding provided by Habitat Conservation Trust Foundation - Habitat Acquisition Fund
HSP (SAR stream)	\$75,000.00		\$0.00		Not Applicable
CVLCF	\$400,000.00		\$400,000.00		Funding provided by the RDEK's Columbia Valley Local Conservation Fund
Private Donations & Fish and Wildlife Clubs	\$86,832.00		\$39,042.45		Private donations and local Fish & Wildlife group donations (Lake Windermere, Canal Flats, Golden, Kootenay Wildlife Heritage Fund)
NHCP - Land Trust Conservation Fund	\$0.00		\$4,069.23		Funding provided by Natural Heritage Conservation Program administered by Wildlife Habitat Canada
EGP Land Acquisition Support Fund	\$0.00		\$9,801.23		Funding provided by Environment & Climate Change Canada's - Ecological Gifts Program Land Acquisition Support Fund
Total Amounts	\$1,039,982.00	\$200,000.00	\$1,076,062.91	\$200,000.00	
TOTAL REVENUE	\$1,239,982.00		\$1,276,062.91		

EXPENSES:									
Expense Items	Details (if applicable)	APPLICATION				FINAL REPORTING			
		Cash	In-kind	Total Budget	CVLCF Funding	Actual cash spent	Actual in-kind	Actual total budget	CVLCF Funding
Property Purchase at Fair Market Value (FMV)	Purchase Price of \$1,000,000	\$800,000.00	\$200,000.00	\$1,000,000.00	\$400,000.00	\$800,000.00	\$200,000.00	\$1,000,000.00	\$400,000.00
Property Appraisal	Completed by East Kootenay Appraisals (2017)	\$3,150.00	\$0.00	\$3,150.00	\$0.00	\$3,150.00		\$3,150.00	\$0.00
Property Management Plan	Plan Completed by Foul Bay Eco. Research Ltd. (2018)	\$2,000.00	\$0.00	\$2,000.00	\$0.00	\$6,666.00		\$6,666.00	\$0.00
Phase 1 Environmental Assessment	ESA Completed by Vast Resource Solutions (2018)	\$2,000.00	\$0.00	\$2,000.00	\$0.00	\$4,441.20		\$4,441.20	\$0.00
Start-up Costs	Includes staff time (Kootenay Region and Vancouver), signage, kiosk, travel costs, public parking area w/ fence, gate, walk thru, invasive plant treatments								
Property taxes - first year (exempt in future)	Taxation based on former farm status rate	\$2,000.00	\$0.00	\$2,000.00	\$0.00	\$22,532.13		\$22,532.13	\$0.00
Legal costs	Legal conveyance costs - McCarthy Tetrault	\$832.00	\$0.00	\$832.00	\$0.00	\$1,898.65		\$1,898.65	\$0.00
Endowment Fund (for future management)	Endowment is 20% of FMV	\$10,000.00	\$0.00	\$10,000.00	\$0.00	\$7,374.93		\$7,374.93	\$0.00
Goods and Services Tax (GST)	As a non-profit, NTBC pays half of 5% GST	\$200,000.00	\$0.00	\$200,000.00	\$0.00	\$210,000.00		\$210,000.00	\$0.00
		\$20,000.00	\$0.00	\$20,000.00	\$0.00	\$20,000.00		\$20,000.00	\$0.00
Total Amounts		\$1,039,982.00	\$200,000.00	\$1,239,982.00	\$400,000.00	\$1,076,062.91	\$200,000.00	\$1,276,062.91	\$400,000.00
TOTAL EXPENSES		\$1,239,982.00				\$1,276,062.91			

**Columbia Valley Local Conservation Fund
Final Report Appendices (Maps, News Release, Photo Gallery):**

Securement of Columbia River Wetlands Edgewater Conservation Property





Saving Land for Bears and Badgers

July 18, 2019

Cranbrook, BC— The Nature Trust of BC announces the protection of the Columbia River Wetlands - Edgewater property in the Kootenays.

Located near the community of Edgewater these conservation lands cover 423 acres (171.5 hectares) and feature outstanding habitat and connectivity for Grizzly Bears and American Badgers. They also provide winter range for Mule Deer, White-tailed Deer and Moose.

“The Edgewater property has incredible diversity, ranging from wetlands to grasslands and open forest habitats,” said Chris Bosman, Kootenay Conservation Land Manager for The Nature Trust of BC. “From the upper benches, the views across the Columbia Valley and up and down the Rocky Mountain Trench are stunning. As a multi-generational family ranch, the land has been well cared for over the years by a conservation minded family. The Nature Trust looks forward to carrying on the tradition of responsible land stewardship.”

This property will complement nearby Nature Trust conservation lands that are managed as part of the Columbia National Wildlife Area and Columbia Wetlands Wildlife Management Area. An additional benefit for wildlife is that the Edgewater property adjoins the Columbia Wetlands Wildlife Management Area which serves as significant migratory bird habitat for over 200 species.

“The Nature Trust of BC has been working in the Kootenay region for over 40 years,” said Nature Trust Director Bill Bennett. “As a volunteer Board member, I am proud of the many properties The Nature Trust has conserved for wildlife. As I look to the future, I am excited to be part of a dedicated team leaving a legacy for future generations in the Kootenays and across the province.”

The community came together in a big way to help The Nature Trust of BC protect the Columbia River Wetlands-Edgewater property. Key supporters of this project include the BC Conservation Foundation, Regional District of East Kootenay through the Columbia Valley Local Conservation Fund, Fish & Wildlife Compensation Program, Golden District Rod & Gun Club, Habitat Conservation Trust Foundation, Kootenay Wildlife Heritage Fund, Lake Windermere Rod & Gun Club and the Canal Flats Wilderness Club as well as individual donors. The acquisition of this property included a generous landowner donation from Denis and Rosemary Tegart.

The Nature Trust of British Columbia is a leader in land conservation in the province. We conserve and care for BC’s most critical natural habitats for vulnerable wildlife and plants. Since 1971 we have protected more than 175,000 acres (71,000 hectares) with our partners.

Media Contact

Robin Rivers, Communications Manager
The Nature Trust of BC
604.924.9771 or 1.866.288.7878
rrivers@naturetrust.bc.ca



Photo 1: Facing East, showing the impressive clay banks and slough which form part of the property (Graham Osborne)



Photo 2: Looking West, showing the clay bank, riparian and wetland habitat features of the property (Graham Osborne)



Photo 3: One of several smaller wetlands on the property (Graham Osborne)



Photo 4: Facing east, at the base of the clay banks, providing a unique perspective of the property (Graham Osborne)



Photo 5: Remnant grasslands exist on the property and contribute to its biodiversity values (Graham Osborne)



Photo 6: As a long-time ranch, parts of the property contain hayfields, which will continue to be cut by a local producer (Ian Moul)



Photo 7: There is one man-made wetland on the property; proof of the Tegart's strong and long-standing stewardship values (Ian Moul).



Photo 8: Badger burrows are found throughout the property demonstrating the high habitat capability on the property (Chris Bosman)



Photo 9 & 10: Grizzly Bears and Elk frequent the property (Denis and Rosemary Tegart)



Photo 11: The property has extensive irrigation waterworks, which will continue to function while water licenses will be maintained (Ian Moul)



Photo 12: The property contains several outbuildings. This barn provides habitat to several bat species, some believed to be endangered. This structure will remain; others will be removed in time (Ian Moul).



Photo 13: The property hosts the KCP Fall Gathering Tour Oct. 5, 2019, with the new public access area and info kiosk in the background (Chris Bosman)

Board Cheque Register

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Cheque Number	Vendor Name	Amount
62515	AKBLG	\$4,000.00
62516	ALBERTA FIRE CHIEFS ASSOCIATION	\$202.61
62517	CANADA POST CORPORATION	\$1,095.66
62518	CANADIAN TIRE #658	\$68.72
62519	CLARKSON CONTRACTING LTD.	\$206.59
62520	ELK PARK RANCH HOME OWNERS ASSOC	\$2,500.00
62521	FIREWISE CONSULTING LTD	\$22,383.90
62522	HIGH "R" EXPECTATIONS INC.	\$1,570.00
62523	MINISTER OF FINANCE	\$26.34
62524	RFE ALARMS LTD.	\$2,451.75
62525	STAPLES - DESJARDINS	\$870.54
62526	TRADITIONAL KNOWLEDGE AND LANGUAGE E SOCIETY	\$7,500.00
EFT014246	ACTION EQUIPMENT RENTAL	\$112.00
EFT014247	MICHELE BATES	\$558.00
EFT014248	BC ONLINE	\$3.00
EFT014249	BENEFITS BY DESIGN INC.	\$9,058.80
EFT014250	BLADE RUNNER	\$121.45
EFT014251	GARY BURFORD	\$911.52
EFT014252	CANADIAN TIRE #635	\$26.86
EFT014253	CV CHAMBER OF COMMERCE	\$10,000.00
EFT014254	CRANBROOK WATER CONDITIONING LTD	\$656.88
EFT014255	D & E ENTERPRISES JANITORIAL	\$1,470.00
EFT014256	STAN DOEHLE	\$253.14
EFT014257	ENCORE COOLING & HEATING	\$154.88
EFT014258	SIERMIL EZ COURIERS LTD.	\$117.31
EFT014259	FLAMEGUARD SAFETY SERVICES	\$694.05
EFT014260	FOOTHILLS SILVA CULTURE INC	\$3,491.25
EFT014261	GFL ENVIRONMENTAL INC. 2019	\$298,627.76
EFT014262	GUILLEVIN INTERNATIONAL INC	\$852.60

Board Cheque Register

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Cheque Number	Vendor Name	Amount
EFT014263	HEAVY METAL CO.	\$3,209.85
EFT014264	MICHAEL HOCKLEY	\$130.00
EFT014265	INVERMERE HARDWARE	\$50.36
EFT014266	JODY JACOB	\$94.50
EFT014267	BONNIE KARI	\$65.01
EFT014268	CHRIS KESSLER	\$175.00
EFT014269	KMB AUTO BODY	\$419.47
EFT014270	LIBERTY TIRE RECYCLING CANADA	\$4,200.00
EFT014271	MITECH BUSINESS SYSTEMS	\$196.85
EFT014272	OMEGA COMMUNICATIONS LTD	\$674.69
EFT014273	PACIFIC BLUE CROSS	\$47,331.79
EFT014274	SHARON PASOWISTY	\$1,110.49
EFT014275	RE-MATT INC	\$1,401.75
EFT014276	RESCUE CANADA INC	\$2,701.25
EFT014277	RM OFFICE SOLUTIONS LTD	\$1,510.78
EFT014278	SPERLING HANSEN ASSOCIATES	\$40,078.52
EFT014279	ST MARY RURAL RESIDENTS ASSOC	\$1,500.00
EFT014280	SUPERIOR PROPANE INC.	\$2,782.47
EFT014281	TRI-KON PRECAST CONCRETE	\$1,388.80
EFT014282	TURF N TIMBER CONTRACTING	\$787.50
EFT014283	UNIVERSAL DOORS & EXTERIORS	\$201.60
EFT014284	ILONA WEBSTER	\$71.53
EFT014285	ZION TRUCKING LTD.	\$1,155.00
62527	CANADIAN TIRE #658	\$168.61
62528	DIAMOND HEATING & SPAS (2008) LTD	\$132.56
62529	RICHARD EARLE	\$150.00
62530	ELK VALLEY CONTRACTING	\$1,545.36
62531	SUSAN HALVERSON & SONIA BLACKWELL	\$5,072.00

Board Cheque Register

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Cheque Number	Vendor Name	Amount
62532	INVESTORS GROUP TRUST CO. LTD.	\$632.50
62533	MINISTER OF FINANCE	\$200.00
62534	RDEK PETTY CASH c/o D. Renaud	\$200.00
62535	RFS CANADA	\$846.68
62536	SELKIRK COLLEGE	\$20,000.00
62537	SHAW BUSINESS	\$644.03
62538	TIN CRAFT HEATING & AIR CONDITIONING	\$1,365.00
EFT014286	A.C.E. COURIER SERVICE	\$550.83
EFT014287	AIR LIQUIDE CANADA INC	\$278.03
EFT014288	ALS CANADA LTD	\$492.46
EFT014289	Baynes Lake General Store	\$82.57
EFT014290	BELLOWS PROPERTY SERVICES	\$992.25
EFT014291	BI PUREWATER (CANADA) INC.	\$1,306.88
EFT014292	BLACK PRESS GROUP LTD	\$1,085.96
EFT014293	COLIN BREAKWELL	\$120.00
EFT014294	BRIGADE	\$3,357.38
EFT014295	BUSY BEE SANITARY SUPPLIES INC.	\$455.48
EFT014296	COLUMBIA BASIN BROADBAND CORP	\$3,315.20
EFT014297	COLUMBIA VALLEY FREIGHT	\$91.88
EFT014298	COLUMBIA LAKE TECHNOLOGY CENTER	\$21,000.00
EFT014299	JIM COSENS	\$67.50
EFT014300	MARIE COSENS	\$52.50
EFT014301	CRANBROOK SIGNS	\$226.24
EFT014302	CUPE LOCAL 2106	\$1,659.28
EFT014303	CYBERLINK SYSTEM CORP.	\$12,932.31
EFT014304	DAVIDDUKE HOLDINGS LTD	\$504.00
EFT014305	D & E ENTERPRISES JANITORIAL	\$1,552.70
EFT014306	DEVTEL COMMUNICATIONS	\$89.60

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Cheque Number	Vendor Name	Amount
EFT014307	EARTHRITE INDUSTRIES LTD.	\$52,500.00
EFT014308	eSCRIBE SOFTWARE LTD.	\$13,776.00
EFT014309	FORTIS BC - NATURAL GAS	\$1,188.78
EFT014310	GFL ENVIRONMENTAL INC. 2019	\$7,202.70
EFT014311	GLOBALSTAR CANADA	\$106.92
EFT014312	GP FUELS INC.	\$440.01
EFT014313	GREAT CANADIAN OIL CHANGE	\$141.74
EFT014314	MICHAEL HOCKLEY	\$157.50
EFT014315	JIM PATTISON BROADCAST GROUP	\$1,323.80
EFT014316	K.G.C. FIRE RESCUE INC.	\$1,805.05
EFT014317	KINBASKET WATER & SEWER CO LTD	\$6,683.04
EFT014318	KOOTENAY LANDSCAPE	\$1,358.70
EFT014319	LOTIC ENVIRONMENTAL	\$14,046.78
EFT014320	LUCKY STRIKE GAS	\$780.24
EFT014321	JENNIFER MACDONALD	\$26.82
EFT014322	MARTIN & LEVESQUE INC.	\$2,188.27
EFT014323	MAX S PLACE BAKERY LTD	\$57.23
EFT014324	McELHANNEY LTD.	\$8,139.76
EFT014325	DEAN McKERRACHER	\$45.00
EFT014326	ALLEN MILLER	\$31.86
EFT014327	MOMENTUM CONFERENCING	\$104.73
EFT014328	MORROW BIOSCIENCE LTD.	\$6,293.56
EFT014329	MELODY MUNRO	\$1,030.62
EFT014330	UAP INC	\$79.51
EFT014331	NEIL JOHNSON ELECTRIC	\$1,901.30
EFT014332	PRESTIGE INN CRANBROOK	\$1,211.04
EFT014333	ROBERT PREVOST	\$105.00
EFT014334	RALPH STEWART CONTRACTING LTD	\$95,780.62

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Cheque Number	Vendor Name	Amount
EFT014335	CLARA REINHARDT	\$58.04
EFT014336	RE-MATT INC	\$1,527.75
EFT014337	RICOH CANADA INC	\$222.75
EFT014338	SELKIRK SIGNS & SERVICES LTD	\$7,459.20
EFT014339	RACHAEL SMITH	\$574.57
EFT014340	MICHAEL SOSNOWSKI	\$529.36
EFT014341	SOUTHEAST RENTALS LTD	\$13,954.51
EFT014342	STEEDMAN ENTERPRISES	\$2,520.00
EFT014343	SUPERIOR PROPANE INC.	\$2,546.35
EFT014344	TA CONTRACTING	\$6,691.91
EFT014345	TAYNTON BAY ELECTRICAL LTD	\$705.52
EFT014346	TSUNAMI SOLUTIONS LTD	\$1,034.62
EFT014347	UNITED WAY	\$54.00
EFT014348	JANE WALTER	\$50.00
EFT014349	WASTE MANAGEMENT OF CANADA	\$27,279.94
EFT014350	TORIL WILDER	\$525.00
EFT014351	GERALD WILKIE	\$201.78
EFT014352	DENNIS WILKINSON	\$170.00
EFT014353	DAVID WILKS	\$45.00
EFT014354	WINDERMERE CENTEX	\$67.43
EFT014355	ZION TRUCKING LTD.	\$2,490.60
62539	BUILDING OFFICIALS ASSOCIATION OF BC	\$2,694.44
62540	JOSEPH CARAVETTA	\$55.03
62541	CPA OF BC	\$997.50
62542	DELL CANADA INC.	\$339.80
62543	HOME DEPOT	\$221.58
62544	NATURE CONSERVANCY OF CANADA	\$200.00
62545	SOUTH COUNTRY SERVICES	\$282.02

Board Cheque Register

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Cheque Number	Vendor Name	Amount
62546	STAPLES ADVANTAGE	\$39.17
EFT014356	ANYWEAR GARMENT COMPANY	\$352.80
EFT014357	SUSANNE ASHMORE	\$35.40
EFT014358	DOUG BARRACLOUGH	\$44.84
EFT014359	DAVID BERANEK	\$47.20
EFT014360	DAVE BOREEN	\$130.00
EFT014361	BUSY BEE SANITARY SUPPLIES INC.	\$186.40
EFT014362	BLAIR CHATTERSON	\$59.00
EFT014363	CORIX MULTI-UTILITY SERVICES	\$3,106.11
EFT014364	MARIE COSENS	\$518.35
EFT014365	LEE-ANN CRANE	\$45.00
EFT014366	Dominion GovLaw LLP	\$75.61
EFT014367	ESRI CANADA LIMITED	\$35,963.20
EFT014368	BARRY GARLAND	\$64.90
EFT014369	DALE GARRETT	\$22.42
EFT014370	HUB FIRE ENGINES & EQUIPMENT	\$133,547.46
EFT014371	HERB JANZEN	\$37.76
EFT014372	ILENE LOWING	\$22.42
EFT014373	BRYAN MATTHEWS	\$175.26
EFT014374	MERIDIAN ONE CAP	\$284.30
EFT014375	MSREK SYSTEMS	\$23.95
EFT014376	WILLIAM RAYMAN	\$134.36
EFT014377	ROCKY MTN PHOENIX	\$393.12
EFT014378	SELKIRK COLLEGE	\$20,000.00
EFT014379	SHANNONBROOK KENNELS	\$225.00
EFT014380	WAYNE STONE	\$37.76
EFT014381	TRI-KOTA CLEANING	\$200.00
EFT014382	JIM WESTWOOD	\$70.40

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Cheque Number	Vendor Name	Amount
EFT014383	VIRGINIA WEST	\$92.20
EFT014384	WINDERMERE CHILD CARE SOCIETY	\$136.00
62547	CANADIAN TIRE #658	\$325.10
62548	CRANBROOK FOOD BANK SOCIETY	\$20,000.00
62549	MINISTER OF FINANCE	\$262.71
62550	MINISTER OF FINANCE	\$45.03
62551	MINISTER OF FINANCE	\$244.66
62552	NEDERMAN CANADA LTD.	\$9,229.23
62553	PEAK SECURITY SERVICES	\$939.75
62554	SALVATION ARMY	\$10,000.00
62555	SALVATION ARMY	\$45,000.00
62556	SIGNWRITER	\$431.20
EFT014385	ACTION EQUIPMENT RENTAL	\$112.00
EFT014386	ADVANCED SAFETY MGMT LTD	\$436.80
EFT014387	BC HYDRO	\$42,298.60
EFT014388	WENDY BOOTH	\$1,890.00
EFT014389	CanCADD IMAGING SOLUTIONS LTD	\$361.50
EFT014390	CDW CANADA INC.	\$187.88
EFT014391	CIMA CANADA INC.	\$7,602.00
EFT014392	COLUMBIA VALLEY FREIGHT	\$374.06
EFT014393	CONNECTS WIRELESS KELOWNA	\$5,969.60
EFT014394	CUPE LOCAL 2106	\$1,669.04
EFT014395	D & E ENTERPRISES JANITORIAL	\$1,959.31
EFT014396	EMCO CORPORATION	\$197.11
EFT014397	flexiNET Broadband	\$44.80
EFT014398	GFL ENVIRONMENTAL INC. 2019	\$362,637.90
EFT014399	INVERMERE HARDWARE	\$103.26
EFT014400	INVESTORS GROUP TRUST CO. LTD.	\$632.50

Board Cheque Register

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Cheque Number	Vendor Name	Amount
EFT014401	IRIDIA MEDICAL	\$420.79
EFT014402	BONNIE KARI	\$75.00
EFT014403	KEEFER ECOLOGICAL SERVICES LTD.	\$44,686.75
EFT014404	KINBASKET WATER & SEWER CO LTD	\$89,220.34
EFT014405	MAX S PLACE BAKERY LTD	\$63.00
EFT014406	MPE ENGINEERING LTD.	\$65,649.53
EFT014407	RE-MATT INC	\$3,307.50
EFT014408	SUPERIOR PROPANE INC.	\$301.75
EFT014409	TRI-KOTA CLEANING	\$960.00
EFT014410	UNITED WAY	\$59.00
EFT014411	VALLEY VIEW CONTRACTING	\$2,346.75
EFT014412	WASTE MANAGEMENT OF CANADA	\$14,014.16
EFT014413	WSP CANADA INC	\$12,627.86
EFT014414	ZION TRUCKING LTD.	\$1,335.60

Total Cheques: 211**Total Amount of Cheques: \$1,798,490.35**

Resolved:

That the cheque register for the RDEK General Account in the amount shown above be approved as paid.

Chairperson: _____

Request for Decision

File No: 650 065

Date March 12, 2020
Author Anita Charest, Emergency Program Coordinator
Subject CEPF – EOC & Training Grant Application 2020

REQUEST

To approve the submission of a joint application with the RDEK, District of Invermere and Village of Canal Flats for upgrades to the Regional Emergency Operations Centre (REOC) in Cranbrook as well as municipal Emergency Operations Centres (EOC's) in the District of Invermere and Village of Canal Flats; and to provide additional emergency management training for the region.

OPTIONS

1. THAT a Community Emergency Preparedness Fund grant application for \$75,000 be submitted for upgrades and equipment for the Regional Emergency Operations Centre in Cranbrook and District of Invermere and Village of Canal Flats Emergency Operations Centres as well as provide additional emergency management training for the region, and that the RDEK to provide overall grant administration.
2. THAT a Community Emergency Preparedness Fund EOC and training grant application not proceed.

RECOMMENDATION

Option 1

BACKGROUND/ANALYSIS

The Community Emergency Preparedness Fund is a suite of funding programs intended to enhance the resiliency of local governments and their residents in responding to emergencies. Funding is provided by the Province of BC and is administered by the Union of BC Municipalities (UBCM).

Eligible activities and expenditures focus on purchase of equipment and supplies to maintain or improve EOC's, training and exercises to increase EOC capacity and establishing emergency communications systems or programs.

Since 2017 & 2018 emergency responses, the East Kootenay Emergency Management Program has continued to try to advance technology and improve working conditions at the Regional EOC to enable the program to better support emergencies in our region.

The following is a general summary of our requests:

Training:

- Critical Incident Stress Management training
- Incident Command System (ICS) training
- Rapid Damage Assessment training

- Attendance for Emergency Management staff at Emergency Preparedness & Business Continuity (EPBC) Conference in Vancouver BC (November 2020)

Regional EOC (REOC) Upgrades:

- Kitchen supplies to eliminate single use items used during training and activations, along with equipment to sanitize supplies
- Rapid Damage Assessment kits to allow staff to provide assessments to structures when damage has occurred
- Cabinets to store necessary forms and supplies
- Acoustical divider panel to eliminate noise between briefing section and working sections of REOC

District of Invermere EOC:

- Computer equipment to assist in municipal EOC activations
- Attendance for District of Invermere staff at EPBC Conference in Vancouver BC

Village of Canal Flats EOC:

- Attendance for Village of Canal Flats staff at EPBC Conference in Vancouver BC
- Computer equipment to assist in municipal EOC activations
- Cabinets to store necessary forms and supplies

SPECIFIC CONSIDERATIONS

Financial: Total amount requested is \$75,000. There is no expectation that additional funds will be required from the RDEK, District of Invermere or Village of Canal Flats. All expenditures are to be 100% funded by grant funds.

Purchasing Policy: Per the current RDEK Purchasing Policy, steps to sustainable purchasing and life cycle costing will be implemented when selecting equipment and supplies.

Process: Should the grant application be successful, staff will secure quotes and purchase equipment necessary per the Purchasing Policy guidelines. Review of the success of the project will be completed on an ongoing basis as part of each subsequent emergency event and through After Action Reports prepared following emergency events.

ec: Fiona Dercole, Protective Services Manager
Terry Balan, Protective Services Supervisor

Date March 30, 2020
Author Holly Ronnquist, CFO
Subject RDEK Cash Flow Update

BACKGROUND

This report has been prepared to provide a snapshot of possible effects of the Covid-19 event on the RDEK cashflow. At this time, it is anticipated that the event will have the most impact on the timing of cash flows and some reduction of revenue in services where fees make up a significant proportion of revenues.

INFORMATION

Attached are cash flow statements that show:

- Projected 2020 cash flow in normal operating conditions
- Projected 2020 cash flow with a possible delay of fees and the Municipal requisition revenues due to the Covid-19 event
- A summary of RDEK services most reliant on fees

The RDEK adopts a Revenue Anticipation Borrowing Bylaw every year to assist with cash flow until requisition payments from the Municipalities, First Nations and the Province are received on August 1st. Depending on the timing of capital and construction projects, the RDEK typically accesses interim financing of approximately \$1-4 million each year.

RDEK services are mostly funded through taxation revenue. It is anticipated that the Province of BC will deposit funds owing on August 1st as usual. It is possible that the some municipalities will implement a delay in collection of their own taxation which could result in a delay of payment to the RDEK (although there isn't a provision in legislation for adjusting the August 1 timeline for submission of municipal requisitions to the RDEK).

Most of the 100+ services of the RDEK rely on only a small amount of revenues through user fees. It is anticipated that the loss of those revenues will be mostly absorbed by operational savings. There are 7 services that have a higher reliance on user fees. The RDEK continues to operate the building inspection, planning and solid waste services and will see a continuation of some revenues. The attached summary highlights items that could mitigate or offset, the potential loss of revenue.

The second cash flow scenario, with possibly delays in revenues in 2020, demonstrates that the RDEK may need to draw upon the entire \$5 million currently authorized in the Revenue Anticipation Borrowing Bylaw. It is prudent to amend the bylaw, increasing the limit. This request will be presented at the May Board meeting.

Attachments

REGIONAL DISTRICT OF EAST KOOTENAY
CASH FLOW APRIL 1 TO OCTOBER 31 2020 - NORMAL OPERATIONS

	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER
CASH OUT OF BANK							
Major Construction Projects	\$ 1,000,000	\$ 1,525,000	\$ 1,307,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 450,000
Capital Projects	1,062,000	258,000	740,000	563,000	520,000	559,000	500,000
Operating Costs	1,440,000	2,470,000	3,300,000	3,630,000	4,490,000	1,910,000	1,990,000
Debenture, Loans and Interim Financing Pmts	550,020				54,000		550,020
Total Cash Expenditures	4,052,020	4,253,000	5,347,000	4,693,000	5,564,000	2,969,000	3,490,020
CASH INTO BANK							
Bank Balance Forward March 27/20	6,100,000						
User Fees	350,000	450,000	500,000	575,000	575,000	575,000	575,000
Gov't Grant Payments	238,000	1,980,000	220,000	1,078,000	718,000	444,000	550,000
CBT Community Initiatives Funding	1,200,000						
Other Revenue/PILTS/First Nations	20,000	-	-	657,000	352,487	-	
Interim Financing/Debenture Borrowing		1,500,000					300,000
Municipal Requisitions					7,337,923		
Provincial Requisitions					13,167,189		
Total Cash Deposits	7,908,000	3,930,000	720,000	2,310,000	22,150,599	1,019,000	1,425,000
Projected Net Cash Flow/Month	3,855,980 -	323,000 -	4,627,000 -	2,383,000	16,586,599 -	1,950,000 -	2,065,020
Projected Bank Balance	\$ 3,855,980	\$ 3,532,980	-\$ 1,094,020	-\$ 3,477,020	\$ 13,109,579	\$ 11,159,579	\$ 9,094,559

* currently have \$5 million revenue anticipation borrowing bylaw in place - none used to date

** projections are likely a little more aggressive on capital and operating costs that what will actually occur

Reserves - MFA Pooled Fund - good liquidity (5 days) \$ 21,590,000
Reserves - MFA Pooled Fund - CWF - good liquidity (5 days) \$ 3,560,000

REGIONAL DISTRICT OF EAST KOOTENAY

CASH FLOW APRIL 1 TO OCTOBER 31 2020 - IF REVENUE IS DELAYED DUE TO COVID-19

	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER
CASH OUT OF BANK							
Major Construction Projects	\$ 1,000,000	\$ 1,525,000	\$ 1,307,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 450,000
Capital Projects	1,062,000	258,000	740,000	563,000	520,000	559,000	500,000
Operating Costs	1,440,000	2,470,000	3,300,000	3,630,000	4,490,000	1,910,000	1,990,000
Debentures, Loans and Interim Financing Pmts	550,020				54,000		550,020
Total Cash Expenditures	4,052,020	4,253,000	5,347,000	4,693,000	5,564,000	2,969,000	3,490,020
CASH INTO BANK							
Bank Balance Forward March 27/20	6,100,000						
User Fees	87,500	112,500	125,000	287,500	718,750	718,750	575,000
Gov't Grant Payments	238,000	1,980,000	220,000	1,078,000	718,000	444,000	550,000
CBT Community Initiatives Funding	1,200,000						
Other Revenue/PILTS/First Nations	20,000	-	-	657,000	110,000	-	
Interim Financing/Debenture Borrowing		1,500,000					300,000
Municipal Requisitions					1,835,000		
Provincial Requisitions					13,167,189		
Total Cash Deposits	7,645,500	3,592,500	345,000	2,022,500	16,548,939	1,162,750	1,425,000
Projected Net Cash Flow/Month	3,593,480	- 660,500	- 5,002,000	- 2,670,500	10,984,939	- 1,806,250	- 2,065,020
Projected Bank Balance	\$ 3,593,480	\$ 2,932,980	-\$ 2,069,020	-\$ 4,739,520	\$ 6,245,419	\$ 4,439,169	\$ 2,374,149

* currently have \$5 million revenue anticipation borrowing bylaw in place - none used to date - may need to increase amount

** projections are likely a little more aggressive on capital and operating costs that what will actually occur

*** assumes receiving 25% of municipal requisition in August and remainder in December

Reserves - MFA Pooled Fund - good liquidity (5 days) \$21,590,000

Reserves - MFA Pooled Fund - CWF - good liquidity (5 days) \$ 3,560,000

RDEK SERVICES MOST RELIANT ON FEES

The following is a list of RDEK services where fees make up a significant portion of budgeted revenues and factors that could mitigate potential loss of revenue due to COVID-19:

	2020 Budget	% Revenue Budget	Mitigation
Building Inspection	\$ 410,300	36%	RDEK is still providing inspection services and processing permit applications. The \$115,000 transfer to the tax stabilization reserve in the 2020 budget could be reduced if necessary
CV Solid Waste	260,640	13%	expect some construction & demolition will continue
Central Solid Waste	788,000	13%	expect some construction & demolition will continue
EV Solid Waste	118,160	4%	expect some construction & demolition will continue
Planning	75,400	6%	RDEK is still processing applications. Some staff have been working on other projects
Regional Parks	29,900	6%	reduction in operating costs with less usage
CV Recreation	206,150	14%	reduction in operating costs with less usage

* Water & sewer services are not included in this list as outstanding balances go to taxes at year end. Lower revenues are expected due to lower consumption but the services should be able sustain within budgets.

** remainder of services would likely make up loss of fees with lower operating costs resulting from less use of service

*** revenue figures are based on a full year. It is not anticipated that revenues would be impacted for an entire year.

Request for Decision

File No: Khn 546 001

Date March 31, 2020
Author Shawn Tomlin, CAO
Subject Community Impact Investing

REQUEST

Endorse the CV Business support team request that MLAs Clovechok and Shypitka and MP Morrison advocate for Community Impact Investing.

OPTIONS

1. THAT the RDEK endorse the memo to MLAs Clovechok and Shypitka and MP Morrison requesting advocacy for proposed provincial and federal policies to support Community Impact Investing.
2. THAT the RDEK not endorse the memo to MLAs Clovechok and Shypitka and MP Morrison requesting advocacy for proposed provincial and federal policies to support Community Impact Investing.

RECOMMENDATION

Option 1

BACKGROUND/ANALYSIS

As part of a strategy to support local business and help with economic recovery after the COVID-19 pandemic, the CV Business Support team will be sending the attached memo to MLAs Clovechok and Shypitka and MP Morrison requesting that they advocate for provincial and federal policies supporting Community Impact Investment. They have requested endorsement from the RDEK in support of their request. If endorsed, the RDEK logo will be included with the other partners on the memo.

Attachment

Dear Mr. Clovechok, Mr. Shypitka, and Mr. Morrison,

RE: Community Impact Investment in British Columbia

The longer a dollar can circulate within a community, the greater its economic and social impacts.

Community Impact Investment Organizations (CIIOs) are new and innovative support system for rural and urban economic and business development that effectively bridge the gap between local investors and local ventures in need of financing. CIIOs are a cost effective, community owned and controlled impact fund. They enable residents to become partners in locally driven economic development, which leads to stronger and more sustainable economies.

CIIOs have successfully financed ventures across Canada that generate significant local impacts including: affordable housing; renewable energy, sustainable agriculture and food production; locally-owned small business development; technology; and community economic development projects.

For four years, [British Columbia's Community Impact Investment Coalition](#) (BC CIIC) has been in discussions with the provincial government to establish enabling regulations that emulate existing programs in other Canadian jurisdictions. These proposed policies and programs would redirect some of the billions of annual private investments, contributed by BC residents, back into sustainable, economic, environmental, and social impacts in our Province. Currently, the majority of British Columbians investments flow out of our Province and Country. Community investment programs mobilize community-owned capital, and build local capacity for a more sustainable and diversified economy in all corners of the Province. This is an inter-Ministry and bipartisan initiative.

The BC CIIC has provided a public copy of their [policy advocacy to the Province](#) on their website. In the policy package, there are recommendations, rationale and supporting documents for a Community Impact Investment Program in British Columbia. The recommendation to enable a community impact investing sector in BC is endorsed by the Union of BC Municipalities, the BC Chamber of Commerce, the BC Economic Development Association, the BC Co-operative Association, the Canadian Community Economic Development Network, the BC Rural Advisory Council, the BC Rural Centre, community impact investment organizations, Employment and Social Development Canada, and many other organizations across the province and country.

Implementing a Community Impact Investment program for British Columbia is a necessary systemic change to the way our financial and investment sector in BC currently operates. With recent Covid 19 economic crises looming, these policies and programs are more important now than ever.

There is sound reason to think that providing legislative and financial support for community investment vehicles (including Investment Co-ops) will significantly reduce other expenditures by provincial and federal governments. After the immediate crisis of this pandemic has passed,

many Canadians will be unemployed or in severe financial distress. Encouraging local investment options in BC offers one way to support British Columbians who might wish to direct a modest amount of their savings into investments that will help their worst-affected neighbors get back on their feet. Providing investors greater freedom to support local businesses, and providing a modest amount of support through the tax system, will reduce the burden on the public purse of EI and social assistance payments.

Please take action on these recommendations by endorsing these proposed policies and programs to the appropriate Ministers and staff in the Legislative Assembly and the House of Commons. The Community Impact Investment file sits with the Ministry of Jobs, Economic Development and Competitiveness provincially and with Employment and Social Development Canada federally.

Thank you for your time to review these documents.



*If you would like more information on these policy proposals,
please contact the BC Community Impact Investment Coalition
<https://www.BCInvestmentCoop.com/contact>*

Date March 25, 2020
Author Holly Ronnquist, CFO
Subject Rushmere Water System Parcel Tax Roll Bylaw

REQUEST

Adoption of Bylaw No. 2991, Rushmere Water System Parcel Tax Roll Bylaw.

OPTIONS

1. THAT Bylaw No. 2991 cited as “Regional District of East Kootenay – Rushmere Water System Parcel Tax Roll Bylaw No. 2991, 2020” be introduced.
2. THAT Bylaw No. 2991 cited as “Regional District of East Kootenay – Rushmere Water System Parcel Tax Roll Bylaw No. 2991, 2020” not proceed.

RECOMMENDATION

Option 1

BACKGROUND/ANALYSIS

The Rushmere Utility Advisory Commission has requested that the RDEK offer an opportunity for commutation (prepayment) of the debt portion of the parcel tax in conjunction with the upcoming financing renewal of the Municipal Finance Authority (MFA) debenture.

The Rushmere Water System Establishment Bylaw No. 2006 was adopted in 2007 for the purpose of constructing and operating a water system to serve Rushmere. The bylaw enacted collection of the parcel tax with an annual maximum requisition of \$81,500 or the product of \$10.00 per \$1,000 of the taxable assessed value of land and improvements, whichever is greater. The Bylaw did not allow for commutation.

Adoption of the proposed Parcel Tax Bylaw will enable the RDEK to offer Rushmere property owners a one-time opportunity for commutation in 2020. Staff support the commutation opportunity given that the number of parcels is relatively small.

SPECIFIC CONSIDERATIONS

Financial – Budget

Creation of a parcel tax roll bylaw will not result in changes to the 2020 – 2024 Financial Plan.

Financial – Parcel Taxes

The 2020 parcel tax for Rushmere is estimated at \$1,705, which includes \$1,115 for debt costs and \$590 for operating costs. If one or more properties elect to pre-pay the debt portion of the parcel tax, Finance will create and administer a second parcel tax for the operating portion of the parcel tax until the debenture is fully paid in 2040. This will result in a slight increase to salaries, benefits and shared overhead charged to the service.

Financial – Debenture Principal Balance/Estimated Commutation Amount

The principal balance at the time of renewal will be \$699,478. There are 44 taxable parcels in the water service area, so the cost of commutation for each parcel is estimated at \$15,897.

Financial – Parcel Tax Roll

The Bylaw instructs the Collector to create a parcel tax roll for the service. This step is not required as the Rushmere parcel tax roll was created in 2011.

Timeline

- April 3, 2020 Adoption of Rushmere Parcel Tax Roll Bylaw
- Early May, 2020 Letters mailed to all property owners
- August 15, 2020 Deadline for payment from property owners to RDEK
- September 15, 2020 Deadline for RDEK confirmation to MFA

Process

Following introduction, Bylaw No. 2991 will be considered for three readings and adoption on April 3, 2020.

Attachment

REGIONAL DISTRICT OF EAST KOOTENAY
BYLAW NO. 2991

A bylaw to direct the preparation of a parcel tax roll and impose a parcel tax for the Rushmere Water System Service Area.

WHEREAS Bylaw No. 2006 established the Rushmere Water System Service and authorizes the collection of a parcel tax to recover the costs for providing the service;

AND WHEREAS Bylaw No. 2007 authorizes the borrowing of funds for the purpose of constructing the Rushmere Water System;

AND WHEREAS pursuant to the *Local Government Act*, the Board may, by bylaw, provide for the preparation of a parcel tax roll for the purpose of imposing a parcel tax;

NOW THEREFORE, the Board of the Regional District of East Kootenay enacts as follows:

- 1. This Bylaw may be cited as “Regional District of East Kootenay – Rushmere Water System Parcel Tax Roll Bylaw No. 2991, 2020.”
- 2. The Collector is directed to prepare the Rushmere Water System Parcel Tax Roll for the purposes of imposing a parcel tax on all taxable parcels within the Rushmere Water System Service Area.
- 3. The Collector must include on the Rushere Water System Parcel Tax Roll all legal parcels of land within the Rushmere Water System Service Area that are connected, or that are reasonably capable of connection, to the Rushmere Water System.
- 4. The service for which the parcel tax will be and is hereby imposed is the Rushmere Water System Service.
- 5. The years for which the parcel tax will be imposed are 2020-2040.
- 6. The basis upon which the parcel tax will be imposed will be a single amount per parcel, in the amount of up to \$2,300 per parcel.
- 7. The portion of the parcel tax imposed for the construction of the Rushmere Water system, the borrowing for which is authorized under Bylaw No. 2007, may be commuted in 2020 for payment in cash paid to the Regional District of East Kootenay, provided such payment is made in the amount and by the date and time set by the Chief Financial Officer.
- 8. The properties which will be subject to the parcel tax will be shown on the Rushmere Water System Parcel Tax Roll, as authenticated annually.

READ A FIRST TIME the day of
READ A SECOND TIME the day of
READ A THIRD TIME the day of

ADOPTED the day of

CHAIR

CORPORATE OFFICER

Request for Decision

File No. Shh 038 046

Date March 26, 2020
Author Holly Ronnquist, CFO
Subject Suspension of Utility Penalties During Covid-19 Pandemic

REQUEST

Approve suspension of water and sewer utility late payment penalties during the Covid-19 Pandemic until August 31, 2020.

OPTIONS

1. THAT Bylaw No. 2992 cited as “Regional District of East Kootenay – Water and Sewer System Regulation and Fee Amendment Bylaw No. 2992, 2020” be introduced.
2. THAT Bylaw No. 2992 cited as “Regional District of East Kootenay – Water and Sewer System Regulation and Fee Amendment Bylaw No. 2992, 2020” be introduced as amended _____.
3. THAT Bylaw No. 2992 cited as “Regional District of East Kootenay – Water and Sewer System Regulation and Fee Amendment Bylaw No. 2992, 2020” not proceed.

RECOMMENDATION

Option 1

BACKGROUND/ANALYSIS

The Covid-19 Pandemic is an unprecedented event creating financial stress for a large number of property owners in the RDEK.

Regional Districts and Municipalities in BC are beginning to offer some relief through the deferral of utility payments. Several Municipalities in the RDEK boundary have already approved deferral or have utility payment deadlines that result in payment not being due until the fall.

The RDEK operates eight water utility services and two sewer utility services that charge quarterly utility fees. A 10% penalty is charged if customers do not remit payment by the due date. This report proposes that the RDEK suspend penalties for late payments on utilities for the period of the Covid-19 Pandemic. Quarterly billings will continue to be sent, but customers will have the option of paying at the conclusion of the Pandemic without penalty charges.

SPECIFIC CONSIDERATIONS

Financial – Cash Flow/Loss of Revenue

If all customers choose to defer payment of their utilities without penalty and the Pandemic is considered concluded August 31, 2020, the RDEK would see an estimated \$715,000 reduction in cash flow to August 31st which could result in a reduction of interest earnings or result in interest

charges for the utility services. There could also be a loss of approximately \$9,000 in penalty revenue for all utility services combined, compared to 2019.

Financial – Automatic Withdrawals

The RDEK currently provides automatic withdrawal of quarterly payments to 759 customers. Staff are currently considering options for working with these customers to suspend withdrawals if requested.

Process

The proposed bylaw has an expiry date of August 31, 2020. The Board would have the option to consider extending the date if desired.

Attachment

REGIONAL DISTRICT OF EAST KOOTENAY

BYLAW NO. 2992

A bylaw to amend Bylaw Nos. 1538, 1560, 1626, 1627, 1640, 1641, 1879, 2156, 2639 and 2851.

WHEREAS the following bylaws regulate and set fees for water and sewer systems:

Bylaw No. 2851 – East Side Lake Windermere Water System Regulation and Fee Bylaw
Bylaw No. 1879 – Edgewater Water System Regulation and Fee Bylaw
Bylaw No. 1640 – Elko Community Water System Regulation and Fee Bylaw
Bylaw No. 1538 – Holland Creek Water Distribution System Regulation and User Charge Bylaw
Bylaw No. 1641 – Moyie Water System Regulation and Fee Bylaw
Bylaw No. 2156 – Rushmere Water System Regulation and Fee Bylaw
Bylaw No. 2639 – Spur Valley Water System Regulation and Fee Bylaw
Bylaw No. 1627 – Windermere Community Water System Regulation and Fee Bylaw
Bylaw No. 1626 – Edgewater Sewer System Regulation and Fee Bylaw
Bylaw No. 1560 – Holland Creek Sewage Collection System Regulation and Fee Bylaw

AND WHEREAS the Board wishes to suspend penalties for late payments during the period of the Covid-19 Pandemic;

NOW THEREFORE, the Board of the Regional District of East Kootenay enacts as follows:

1. This Bylaw may be cited as “Regional District of East Kootenay – Water and Sewer System Regulation and Fee Amendment Bylaw No. 2992, 2020.”
2. The following section is added to Bylaw Nos. 1538, 1627, 1640, 1641, 1879, 2156 and 2639:

“The charge for arrears described in Section 10.2 will not apply during the period of the Covid-19 Pandemic.”
3. The following section is added to Bylaw No. 1560:

“The prompt payment discount described in Section 8.2 will be extended indefinitely during the period of the Covid-19 Pandemic.”
4. The following section is added to Bylaw No. 1626:

“The charge for arrears described in Section 8.2 will not apply during the period of the Covid-19 Pandemic.”
5. The following section is added to Bylaw No. 2851:

“The charge for arrears described in Section 11.2 will not apply during the period of the Covid-19 Pandemic.”
6. This Bylaw shall expire on August 31, 2020.

READ A FIRST TIME the day of

READ A SECOND TIME the day of

READ A THIRD TIME the day of

ADOPTED the day of

CHAIR

CORPORATE OFFICER