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Ministry of Environment

Re: Scientific Fish Collection Permit Application

This permit application can also be viewed online at this link. A summary of sites proposed for assessment, including historic fish presence records from FISS, is provided in Tables 2 to 3. Fish species known to occur within each watershed are summarized in Table 4. An overview map showing potential sample locations is presented in Figure 1. A KML and GPX file of all sites is attached to the application and can also be downloaded at this link. The KML includes detailed site-specific information accessible by clicking on each location, with brief summaries of background reports where available.

Brief description of project/activities

This work is a multi-year collaboration of many groups and an initiative of the Society for Ecosystem Restoration Northern BC. Funding for the project is through the Fish and Wildlife Compensation Program and the Provincial Fish Passage Technical Working Group. Fieldwork is being led by Al Irvine, R.P.Bio., of New Graph Environment Ltd., in collaboration with field and office teams from McLeod Lake Indian Band. Previous reports are provided below:

- https://newgraphenvironment.github.io/Parsnip_Fish_Passage/
- https://newgraphenvironment.github.io/fish_passage_parsnip_2021_reporting/
- https://newgraphenvironment.github.io/fish_passage_peace_2022_reporting/
- https://newgraphenvironment.github.io/fish_passage_peace_2023_reporting/
- https://newgraphenvironment.github.io/fish_passage_peace_2024_reporting/

Rationale for sampling

Rationale for sampling is to inform fish presence/absence, species composition/density, abundance estimates, movement, growth, and survival as part of habitat confirmations and effectiveness monitoring related to fish passage restoration at barrier culverts. Habitat confirmation methodology information can be referenced in the above reports which builds on the Fish Passage Technical Working Group Phase 2 protocol. Presence/absence of fish, species composition/abundance, distribution limits and fish movement can be useful for prioritizing which crossings are a best fit for fish passage restoration and inform baseline as well as follow up effectiveness monitoring.

Methodologies

Sampling methodologies will be dependent on the site, fish species suspected, type of habitat encountered, risks to aquatic organisms potentially present (Table 1) and ongoing communications. Sampling methods may include minnowtrapping, electrofishing, and dip netting upstream and downstream of current and past barrier culvert locations.

Sampling is proposed at streams included in Tables 2 - 3 where we will be performing habitat confirmation assessments and follow up site visits related to past habitat confirmations/fish passage remediations.

PIT Tagging

As part of this permit application we are proposing tagging for provincial jurisdiction species only. PIT tagging is not proposed for salmon species. When time allows and tagging is expected to improve knowledge of a system, our study plan is to electrofish small sites both upstream and downstream of priority culvert “barrier” sites and implant Biomark APT12 PIT tags in the abdominal cavity of select fish over 60mm in fork length. To anesthetize fish prior to PIT tagging, we use a clove oil solution at 0.1mL/L (1:10,000), which provides effective sedation with minimal residual effects (Fernandes et al. 2017). The solution is prepared by dissolving clove oil in ethyl alcohol at a 1:9 ratio before mixing into water (Fernandes et al. 2017). Site location (UTM), fish length and weight will also be collected. In addition to providing information on abundance upstream and downstream of potential culvert restoration sites, the study will also provide information for monitoring programs to document fish movement, growth and survival at sites over multi-year time frames. Main objectives are to:

1. Determine if fish are moving into restored areas

2. Determine if before any remediation is conducted - fish are moving through sites where stream crossing structures (culverts) likely cause connectivity issues
3. Evaluate if productivity of the systems are increasing following bridge installation and/or if fish are moving upstream/downstream of where replaced/removed structures are located

Dependent on how relevant tracking information would be to inform restoration actions, we may wish to tag select fish over 60mm in each site sampled. We would like to apply for a permit allowing a maximum of 600 fish tagged with a maximum of 150 fish/stream. Although we are requesting a maximum of 150 fish/stream, we have listed 150 fish of each species per stream because we will not know the species composition of the sites until the sampling occurs. In general, only salmonid and burbot species will be tagged with likely species present being rainbow trout, bull trout, and burbot. Based on past assessments in the same and similiar systems in the region, the number of fish tagged per stream are very likely to be much less than 150, however we are requesting the maximum number of fish to be tagged to facilitate permit application procedures and allow for flexibility in the field based on actual sampling results.

Risks associated with project/activities and associated mitigation

Table 1: Risks and mitigation

Impact	Mitigation
High Voltage Injuries	Use the minimum effective voltage. Avoid contacting fish with the anode. Avoid electrofishing directly adjacent to metal culverts.
Disruption of Spawning	Avoid electrofishing during highest risk periods in likely spawning habitat.
Physical Stress on Fish	Quick/gentle handling and release of captured fish.
Injury from PIT Tagging Surgeries	Shallow insertion of tags and use of fresh sterile syringes every approximately 10 surgeries
Mortality in traps due to predation and starvation	Ensure all traps set are retrieved within 24 hours.

Please note that the sampling will be completed before October 31 (end of August till early October) however the end-date of the sampling period is listed as Dec 31 on the application to allow time outside of the busy field season for the data to be processed, QA'd and organized so that required reporting can be as informative as possible when submitted. An example of how we have been presenting results and methodologies from past assessments can be referenced in reports above.

Please do not hesitate to contact me if you need more information or have any questions or concerns.

Al Irvine, R.P.Bio

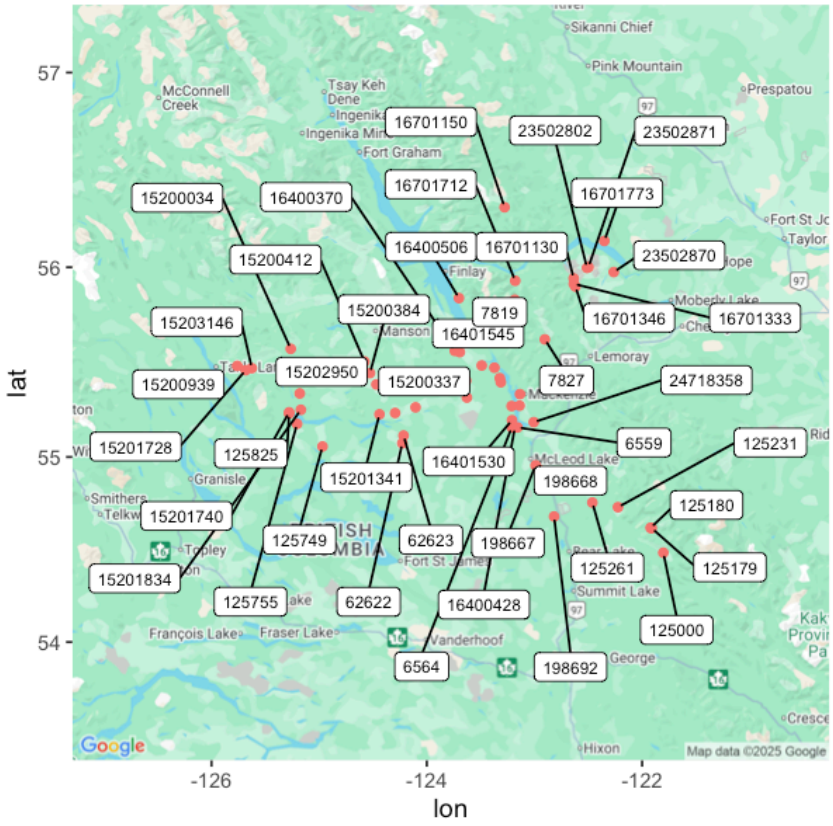

Figure 1: Location of potential sample sites.

Table 2: Potential sampling locations.

Site ID	Stream Name	Watershed Code	UTM Zone	UTM Easting	UTM Northing	Watershed Group Code
125000	Tributary To Parsnip River	236-738000-00000-00000-0000-0000-000-000-000-000-000-000	10	577541	6038215	PARS
125179	Unnamed Tributary To Missinka River	236-614900-20900-03300-0000-0000-000-000-000-000-000-000	10	570307	6052836	PARS
125180	Tributary To Missinka River	236-614900-20900-00000-0000-0000-000-000-000-000-000-000	10	569665	6053046	PARS
125231	Tributary To Table River	236-450800-15400-00000-0000-0000-000-000-000-000-000-000	10	549962	6065137	PARS
125261	Fern Creek	236-358400-00000-00000-0000-0000-000-000-000-000-000-000	10	534601	6067771	PARS
125749	Unnamed Tributary To Airline Creek	237-625800-53700-00000-0000-0000-000-000-000-000-000-000	10	374238	6102796	NATR
125755	Glaucers Creek	237-671800-00000-00000-0000-0000-000-000-000-000-000-000	10	359563	6116606	NATR
125825	Purvis Creek	237-673200-00000-00000-0000-0000-000-000-000-000-000-000	10	355055	6122848	NATR
15200034	–	237-792500-61000-00000-0000-0000-000-000-000-000-000-000	10	357257	6160917	NATR
15200337	Moosmoos Creek	237-528900-48700-00000-0000-0000-000-000-000-000-000-000	10	406967	6138657	NATR
15200384	–	237-528900-57600-16500-2290-0000-000-000-000-000-000-000	10	403312	6145393	NATR
15200412	Gillis Creek	237-528900-57600-00000-0000-0000-000-000-000-000-000-000	10	400259	6152248	NATR
15200939	Nation River	237-000000-00000-00000-0000-0000-000-000-000-000-000-000	10	325553	6152065	NATR
15200985	–	237-077300-00000-00000-0000-0000-000-000-000-000-000-000	10	458491	6137652	NATR
15201007	–	237-062300-00000-00000-0000-0000-000-000-000-000-000-000	10	459777	6140085	NATR
15201341	–	237-449000-00000-00000-0000-0000-000-000-000-000-000-000	10	408422	6121011	NATR
15201343	–	237-393200-00000-00000-0000-0000-000-000-000-000-000-000	10	417680	6121619	NATR

Site ID	Stream Name	Watershed Code	UTM Zone	UTM Easting	UTM Northing	Watershed Group Code
15201576	–	237-331000-04000-00000-0000-0000-000-000-000-000-000-000	10	429809	6124738	NATR
15201728	–	237-897400-00000-00000-0000-0000-000-000-000-000-000-000	10	330395	6149308	NATR
15201740	Fish Creek	237-673600-00000-00000-0000-0000-000-000-000-000-000-000	10	355086	6123605	NATR
15201834	–	237-688000-00000-00000-0000-0000-000-000-000-000-000-000	10	362065	6124875	NATR
15202084	–	237-124500-19300-00000-0000-0000-000-000-000-000-000-000	10	460163	6130113	NATR
15202950	–	237-713900-19200-08800-0000-0000-000-000-000-000-000-000	10	361739	6134520	NATR
15203146	–	237-877600-00000-00000-0000-0000-000-000-000-000-000-000	10	334061	6150367	NATR
16400370	–	230-913400-47700-11700-2890-0000-000-000-000-000-000-000	10	453321	6157621	PARA
16400428	–	230-906900-15800-00000-0000-0000-000-000-000-000-000-000	10	488458	6112359	PARA
16400506	–	230-901300-00000-00000-0000-0000-000-000-000-000-000-000	10	456059	6188410	PARA
16400714	–	230-910500-00000-00000-0000-0000-000-000-000-000-000-000	10	469038	6148922	PARA
16400738	–	230-905500-00000-00000-0000-0000-000-000-000-000-000-000	10	491471	6131967	PARA
16401519	–	230-907800-00000-00000-0000-0000-000-000-000-000-000-000	10	486512	6124976	PARA
16401530	–	230-907400-00000-00000-0000-0000-000-000-000-000-000-000	10	486724	6116602	PARA
16401533	Dastaiga Creek	230-909100-00000-00000-0000-0000-000-000-000-000-000-000	10	479617	6141422	PARA
16401545	Blackwater Creek	230-913400-00000-00000-0000-0000-000-000-000-000-000-000	10	456256	6156862	PARA
16401547	–	230-910000-00000-00000-0000-0000-000-000-000-000-000-000	10	476480	6147560	PARA

Site ID	Stream Name	Watershed Code	UTM Zone	UTM Easting	UTM Northing	Watershed Group Code
16401699	Gagnon Creek	230-905800-00000-00000-0000-0000-000-000-000-000-000-000	10	491234	6125187	PARA
16401990	–	230-908900-00000-00000-0000-0000-000-000-000-000-000-000	10	480206	6138995	PARA
16701130	–	230-846900-11400-00000-0000-0000-000-000-000-000-000-000	10	522727	6199674	PCEA
16701150	–	230-860500-56200-00000-0000-0000-000-000-000-000-000-000	10	482825	6240727	PCEA
16701333	–	230-846900-18000-00000-0000-0000-000-000-000-000-000-000	10	522811	6196513	PCEA
16701346	–	230-846900-21000-00000-0000-0000-000-000-000-000-000-000	10	523799	6194962	PCEA
16701712	–	230-871000-00000-00000-0000-0000-000-000-000-000-000-000	10	488844	6198242	PCEA
16701773	–	230-828500-00000-00000-0000-0000-000-000-000-000-000-000	10	540327	6221480	PCEA
198667	Tsatchuka Creek	230-906800-65600-00000-0000-0000-000-000-000-000-000-000	10	500641	6089777	CARP
198668	Tributary To Mcleod Lake	230-906800-71800-00000-0000-0000-000-000-000-000-000-000	10	501971	6087814	CARP
198692	Tributary To Kerry Lake	230-906800-97600-22400-0000-0000-000-000-000-000-000-000	10	511734	6059315	CRKD
23502802	–	230-815600-04500-63200-0210-0000-000-000-000-000-000-000	10	530426	6205816	UPCE
23502870	Track Creek	230-815600-09900-00000-0000-0000-000-000-000-000-000-000	10	545962	6203536	UPCE
23502871	Gaylard Creek	230-815600-04500-00000-0000-0000-000-000-000-000-000-000	10	531258	6206271	UPCE
24718358	Buth Creek	230-906600-00000-00000-0000-0000-000-000-000-000-000-000	10	499574	6115412	PARA
62622	Unnamed Tributary To Tributary Of Chuchi Lake	237-447200-60000-00000-0000-0000-000-000-000-000-000-000	10	421633	6103622	NATR
62623	Suschona Creek	237-372000-61800-00000-0000-0000-000-000-000-000-000-000	10	422422	6108185	NATR

Site ID	Stream Name	Watershed Code	UTM Zone	UTM Easting	UTM Northing	Watershed Group Code
6559	–	230-906900-02100-00000-0000-0000-000-000-000-000-000-000	10	489968	6112333	PARA
6564	–	230-906900-19500-00000-0000-0000-000-000-000-000-000-000	10	486579	6112299	PARA
7819	Trib To Clearwater Creek	230-870800-11500-24500-0000-0000-000-000-000-000-000-000	10	488605	6187223	PCEA
7827	Trib To Clearwater Creek	230-870800-00000-00000-0000-0000-000-000-000-000-000-000	10	506054	6164113	PCEA

Table 3: Potential sample site details

Site ID	Stream Name	Species Upstream	# Fish Tags
125000	Tributary To Parsnip River	–	150
125179	Unnamed Tributary To Missinka River	BT;RB	150
125180	Tributary To Missinka River	RB	150
125231	Tributary To Table River	RB	150
125261	Fern Creek	BB;C;CBC;DC;DV;LSU;RB;RSC;SU	150
125749	Unnamed Tributary To Airline Creek	–	150
125755	Glaucers Creek	BB;CC;CSU;LSU;NSC;RB;RB/CT;RSC;SP;SU	150
125825	Purvis Creek	BB;BT;CAS;CSU;LKC;LSU;LT;LW;MW;PW;RB;RSC;SU	150
15200034	–	–	150
15200337	Moosmoos Creek	BB;BT;CCG;RB;SP	150
15200384	–	–	150
15200412	Gillis Creek	–	150
15200939	Nation River	RB	150
15200985	–	–	150
15201007	–	RB	150
15201341	–	–	150
15201343	–	CCG;LKC;RB;SP	150
15201576	–	–	150
15201728	–	–	150
15201740	Fish Creek	BT;RB	150
15201834	–	–	150
15202084	–	RB	150
15202950	–	–	150
15203146	–	–	150
16400370	–	LKC;SP	150
16400428	–	PCC;RB	150
16400506	–	–	150
16400714	–	–	150
16400738	–	–	150
16401519	–	LKC;RB	150
16401530	–	RB	150
16401533	Dastaiga Creek	SP	150

Site ID	Stream Name	Species Upstream	# Fish Tags
16401545	Blackwater Creek	BB;BT;CC;CSU;DV;GR;LKC;LSU;MW;RB	150
16401547	–	RB;SP	150
16401699	Gagnon Creek	BB;BMC;BT;C;CAS;CC;CCG;CSU;LKC;LSU;LW;NSC;PCC;RB;RSC;SP;SU;WSU	150
16401990	–	RB	150
16701130	–	LKC;LSU;LT;RB	150
16701150	–	–	150
16701333	–	–	150
16701346	–	–	150
16701712	–	–	150
16701773	–	–	150
198667	Tsatchuka Creek	CCG;RB	150
198668	Tributary To Mcleod Lake	–	150
198692	Tributary To Kerry Lake	–	150
23502802	–	–	150
23502870	Track Creek	–	150
23502871	Gaylard Creek	BT;RB	150
24718358	Buth Creek	–	150
62622	Unnamed Tributary To Tributary Of Chuchi Lake	CSU;RB;RSC	150
62623	Suschona Creek	CSU;LKC;LSU;RB	150
6559	–	–	150
6564	–	–	150
7819	Trib To Clearwater Creek	–	150
7827	Trib To Clearwater Creek	BT;DV;LSU;RB;RSC	150

Table 4: Fish species recorded in the Fisheries Information Summary System within the freshwater atlas watershed group areas where the potential sample sites are located.

Scientific Name	Species Name	BC List	COSEWIC	Carp Lake	Crooked	Nation	Parsnip Arm	Parsnip	Peace Arm	Upper Peace
Catostomus catostomus	Longnose Sucker	Yellow	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Catostomus columbianus	Bridgelip Sucker	Yellow	–	–	Yes	–	–	–	–	–
Catostomus commersonii	White Sucker	Yellow	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Catostomus macrocheilus	Largescale Sucker	Yellow	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Scientific Name	Species Name	BC List	COSEWIC	Carp Lake	Crooked	Nation	Parsnip Arm	Parsnip	Peace Arm	Upper Peace
Chrosomus eos	Northern Redbelly Dace	Yellow	–	–	–	–	–	–	–	Yes
Chrosomus neogaeus	Finescale Dace	Yellow	–	–	–	–	–	–	–	Yes
Coregonus clupeaformis	Lake Whitefish	Yellow	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cottus aleuticus	Coastrange Sculpin (formerly Aleutian Sculpin)	Yellow	–	–	–	–	–	Yes	–	–
Cottus asper	Prickly Sculpin	Yellow	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cottus cognatus	Slimy Sculpin	Yellow	–	Yes	–	Yes	Yes	Yes	Yes	Yes
Cottus hubbsi	Mottled Sculpin	Blue	SC (Nov 2010)	–	–	Yes	–	Yes	–	Yes
Cottus rhotheus	Torrent Sculpin	Yellow	–	–	–	–	–	–	–	Yes
Cottus ricei	Spoonhead Sculpin	Yellow	NAR (May 1989)	–	–	–	Yes	–	–	Yes
Couesius plumbeus	Lake Chub	Yellow	DD	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Culaea inconstans	Brook Stickleback	Yellow	–	–	–	–	–	–	–	Yes
Esox lucius	Northern Pike	Yellow	–	–	Yes	–	–	–	–	Yes
Hiodon alosoides	Goldeye	Blue	–	–	–	–	–	–	–	Yes
Hybognathus hankinsoni	Brassy Minnow	No Status	–	Yes	Yes	Yes	Yes	–	–	–
Lota lota	Burbot	Yellow	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mylocheilus caurinus	Peamouth Chub	Yellow	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Notropis atherinoides	Emerald Shiner	Unknown	–	–	–	–	–	–	–	Yes
Notropis hudsonius	Spottail Shiner	Red	–	–	–	–	–	–	–	Yes
Oncorhynchus clarkii	Cutthroat Trout	No Status	–	–	–	–	–	–	–	Yes
Oncorhynchus clarkii lewisi	Westslope (Yellowstone) Cutthroat Trout	Blue	SC (Nov 2016)	–	–	–	–	–	–	Yes
Oncorhynchus mykiss	Rainbow Trout	Yellow	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oncorhynchus nerka	Kokanee	Yellow	–	–	–	Yes	Yes	Yes	Yes	Yes
Osmerus dentex	Rainbow Smelt	Unknown	–	–	–	Yes	–	Yes	–	–
Perca flavescens	Yellow Perch	Unknown	–	–	–	–	–	–	–	Yes
Percopsis omiscomaycus	Trout-perch	Yellow	–	–	–	–	–	–	–	Yes
Platygobio gracilis	Flathead Chub	Yellow	–	–	–	–	–	–	–	Yes

Scientific Name	Species Name	BC List	COSEWIC	Carp Lake	Crooked	Nation	Parsnip Arm	Parsnip	Peace Arm	Upper Peace
Prosopium coulterii	Pygmy Whitefish	Yellow	NAR (Nov 2016)	–	–	Yes	Yes	Yes	Yes	Yes
Prosopium cylindraceum	Round Whitefish	Yellow	–	–	–	–	–	Yes	–	–
Prosopium williamsoni	Mountain Whitefish	Yellow	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ptychocheilus oregonensis	Northern Pikeminnow	Yellow	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rhinichthys cataractae	Longnose Dace	Yellow	–	–	Yes	Yes	Yes	Yes	–	Yes
Rhinichthys falcatus	Leopard Dace	Yellow	NAR (May 1990)	–	–	–	–	–	–	Yes
Richardsonius balteatus	Redside Shiner	Yellow	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Salvelinus confluentus	Bull Trout	Blue	SC (Nov 2012)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Salvelinus fontinalis	Brook Trout	Exotic	–	–	Yes	–	Yes	Yes	–	Yes
Salvelinus malma	Dolly Varden	Yellow	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Salvelinus namaycush	Lake Trout	Yellow	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sander vitreus	Walleye	Yellow	–	–	–	–	–	–	–	Yes
Thymallus arcticus	Arctic Grayling	Yellow	–	–	–	Yes	Yes	Yes	Yes	Yes
–	Chub (General)	–	–	Yes	Yes	–	Yes	Yes	–	–
–	Dace (General)	–	–	–	–	–	Yes	Yes	–	Yes
–	Lamprey (General)	–	–	–	–	Yes	–	–	–	–
–	Minnow (General)	–	–	Yes	Yes	–	Yes	Yes	–	Yes
–	Northern Pearl Dace	–	–	–	–	–	–	–	–	Yes
–	Salmon (General)	–	–	–	–	Yes	–	–	–	–
–	Sculpin (General)	–	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes
–	Smelt (General)	–	–	–	–	–	Yes	–	–	–
–	Squanga	–	–	–	Yes	–	–	–	–	–
–	Sucker (General)	–	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes
–	Whitefish (General)	–	–	Yes	Yes	Yes	Yes	Yes	Yes	Yes

References

Fernandes, I. M., Y. F. Bastos, D. S. Barreto, L. S. Lourenço, and J. M. Penha. 2017. “The Efficacy of Clove Oil as an Anaesthetic and in Euthanasia Procedure for Small-Sized Tropical Fishes.”*Brazilian Journal of Biology = Revista Brasleira De Biologia* 77 (3): 444–50. https://doi.org/10.1590/1519-6984.15015.