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Ministry of Water, Land and Resource Stewardship  
and  
Fisheries and Oceans Canada

### **Re: Scientific Fish Collection Permit Application**

Please note that permitting to Fisheries and Oceans Canada is requested for inventory purposes only. PIT tagging is NOT proposed for salmon species. PIT tagging is proposed to the Provincial Ministry of Water, Land and Resource Stewardship (WLRS) for provincial jurisdiction species only to monitor fish movement and growth over multiple years.

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 file (google earth) and GPX file (for garmin gps devices) of all sites is attached to the application with latest versions downloadable [here](#) or [here](#). The KML includes detailed site-specific information accessible by clicking on each location in google earth, 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 Habitat Trust Conservation Foundation, Ministry of Transportation and Infrastructure and the Provincial Fish Passage Technical Working Group. Al Irvine, R.P.Bio from New Graph Environment Ltd. is leading the fieldwork with field and office collaboration with teams from the Office of Wet'suwet'en (contact Julia Onderwater - [Julia.Onderwater@wetsuweten.com](mailto:Julia.Onderwater@wetsuweten.com) or Dave Dewit - [david.dewit@wetsuweten.com](mailto:david.dewit@wetsuweten.com)), Gitksan

Watershed Authorities (contact Alicia Fernando - [afernando@gitksanwatershed.com](mailto:afernando@gitksanwatershed.com) ) and Gitksan Environmental Services (contact Chaz Ware - [chaz.ware@gitksanbusiness.com](mailto:chaz.ware@gitksanbusiness.com) ). Previous reports are provided below:

- [https://www.newgraphenvironment.com/fish\\_passage\\_bulkley\\_2020\\_reporting/](https://www.newgraphenvironment.com/fish_passage_bulkley_2020_reporting/)
- [https://www.newgraphenvironment.com/fish\\_passage\\_skeena\\_2021\\_reporting/](https://www.newgraphenvironment.com/fish_passage_skeena_2021_reporting/)
- [https://www.newgraphenvironment.com/fish\\_passage\\_bulkley\\_2022\\_reporting/](https://www.newgraphenvironment.com/fish_passage_bulkley_2022_reporting/)
- [https://www.newgraphenvironment.com/fish\\_passage\\_skeena\\_2022\\_reporting/](https://www.newgraphenvironment.com/fish_passage_skeena_2022_reporting/)
- [https://www.newgraphenvironment.com/fish\\_passage\\_skeena\\_2023\\_reporting/](https://www.newgraphenvironment.com/fish_passage_skeena_2023_reporting/)
- [https://www.newgraphenvironment.com/fish\\_passage\\_skeena\\_2024\\_reporting/](https://www.newgraphenvironment.com/fish_passage_skeena_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, cutthroat trout, and dolly varden. Based on past assessments in the same and similar 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. Use of clove oil to anesthetize fish.
Injury from PIT Tagging Surgeries	Shallow insertion of tags and use of fresh sterile syringes every approximately 10 surgeries

Impact	Mitigation
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

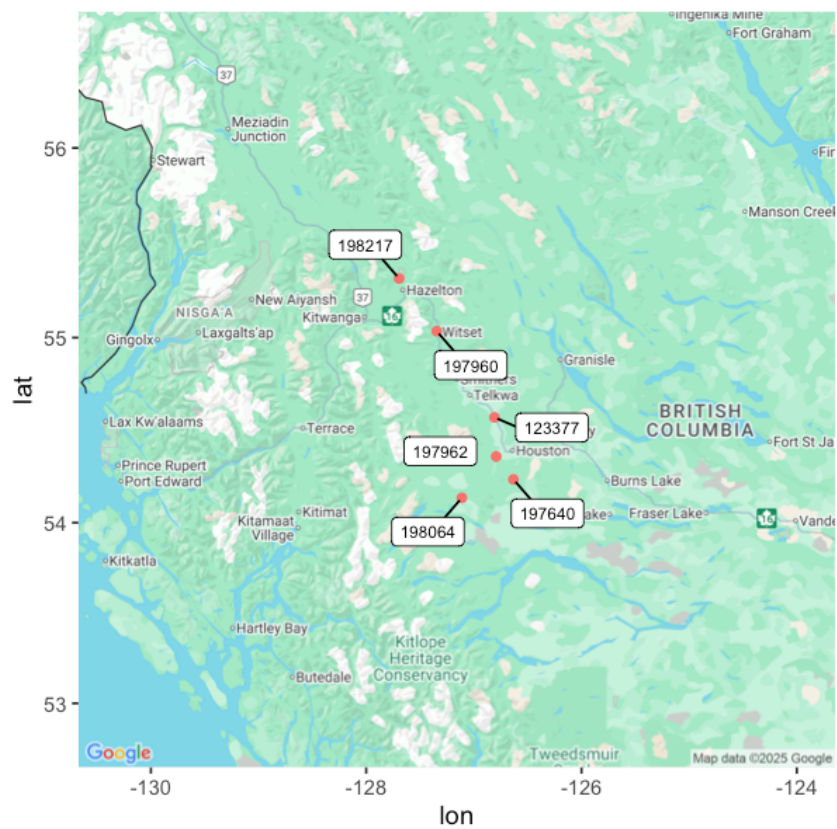


Figure 1: Location of potential sample sites.

Table 2: Potential sampling locations.

Site ID	Stream Name	Watershed Code	UTM Zone	UTM Easting	UTM Northing	Watershed Group Code
123377	Thompson Creek	460-517700-00000-00000-0000-0000-000-000-000-000-000-000	9	641633	6049398	BULK
197640	Tributary To Buck Creek	460-636000-36664-00000-0000-0000-000-000-000-000-000-000	9	654312	6012383	BULK
197960	Corya Creek	460-185400-00000-00000-0000-0000-000-000-000-000-000-000	9	605786	6099884	BULK
197962	Peacock Creek	460-600600-07100-00000-0000-0000-000-000-000-000-000-000	9	643460	6025890	MORR
198064	Tributary To Lamprey Creek	460-600600-36400-26300-0000-0000-000-000-000-000-000-000	9	623369	6000283	MORR
198217	Sik-E-Dakh	400-448500-00000-00000-0000-0000-000-000-000-000-000-000	9	582874	6130541	KISP

Table 3: Potential sample site details

Site ID	Stream Name	Species Upstream	# Fish Tags
123377	Thompson Creek	CT;DV;RB	150
197640	Tributary To Buck Creek	RB	150
197960	Corya Creek	DV;RB	150
197962	Peacock Creek	–	150
198064	Tributary To Lamprey Creek	DV	150
198217	Sik-E-Dakh	–	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	Bulkley	Kispiox	Kalum	Morice	Zymoetz
Catostomus catostomus	Longnose Sucker	Yellow	–	Yes	Yes	–	Yes	Yes
Catostomus commersonii	White Sucker	Yellow	–	Yes	Yes	Yes	Yes	–
Catostomus macrocheilus	Largescale Sucker	Yellow	–	Yes	Yes	Yes	Yes	Yes
Chrosomus eos	Northern Redbelly Dace	Yellow	–	Yes	–	–	–	–
Coregonus clupeaformis	Lake Whitefish	Yellow	–	Yes	Yes	–	Yes	–
Coregonus sardinella	Least Cisco	Blue	–	–	–	Yes	–	–
Cottus aleuticus	Coastrange Sculpin (formerly Aleutian Sculpin)	Yellow	–	Yes	Yes	Yes	Yes	–
Cottus asper	Prickly Sculpin	Yellow	–	Yes	Yes	Yes	Yes	Yes
Cottus cognatus	Slimy Sculpin	Yellow	–	–	Yes	Yes	–	–
Couesius plumbeus	Lake Chub	Yellow	DD	Yes	Yes	Yes	Yes	–
Entosphenus tridentatus	Pacific Lamprey	Yellow	–	Yes	–	Yes	Yes	–
Gasterosteus aculeatus	Threespine Stickleback	Yellow	–	–	Yes	Yes	–	–
Hybognathus hankinsoni	Brassy Minnow	No Status	–	Yes	–	–	–	–

Scientific Name	Species Name	BC List	COSEWIC	Bulkley	Kispiox	Kalum	Morice	Zymoetz
Lampetra ayresii	River Lamprey	Yellow	–	–	–	Yes	–	–
Lota lota	Burbot	Yellow	–	Yes	Yes	Yes	Yes	Yes
Mylocheilus caurinus	Peamouth Chub	Yellow	–	Yes	Yes	Yes	Yes	Yes
Oncorhynchus clarkii	Cutthroat Trout	No Status	–	Yes	Yes	Yes	Yes	Yes
Oncorhynchus clarkii	Cutthroat Trout (Anadromous)	No Status	–	Yes	Yes	–	–	Yes
Oncorhynchus clarkii clarkii	Coastal Cutthroat Trout	Blue	–	Yes	Yes	Yes	Yes	Yes
Oncorhynchus clarkii lewisi	Westslope (Yellowstone) Cutthroat Trout	Blue	SC (Nov 2016)	–	Yes	Yes	–	–
Oncorhynchus gorbusha	Pink Salmon	Not Reviewed	–	Yes	Yes	Yes	Yes	Yes
Oncorhynchus keta	Chum Salmon	Not Reviewed	–	Yes	Yes	Yes	Yes	Yes
Oncorhynchus kisutch	Coho Salmon	Not Reviewed	–	Yes	Yes	Yes	Yes	Yes
Oncorhynchus mykiss	Rainbow Trout	Yellow	–	Yes	Yes	Yes	Yes	Yes
Oncorhynchus mykiss	Steelhead	Yellow	–	Yes	Yes	Yes	Yes	Yes
Oncorhynchus mykiss	Steelhead (Summer-run)	Yellow	–	Yes	–	–	Yes	–
Oncorhynchus mykiss	Steelhead (Winter-run)	Yellow	–	–	Yes	–	–	Yes
Oncorhynchus nerka	Kokanee	Not Reviewed	–	Yes	Yes	Yes	Yes	Yes
Oncorhynchus nerka	Sockeye Salmon	Not Reviewed	–	Yes	Yes	Yes	Yes	Yes
Oncorhynchus tshawytscha	Chinook Salmon	Not Reviewed	E/T/SC/DD/NAR (Nov 2020)	Yes	Yes	Yes	Yes	Yes
Prosopium coulterii	Pygmy Whitefish	Yellow	NAR (Nov 2016)	Yes	Yes	–	Yes	–



Scientific Name	Species Name	BC List	COSEWIC	Bulkley	Kispiox	Kalum	Morice	Zymoetz
Prosopium coulterii pop. 3	Giant Pygmy Whitefish	Yellow	NAR (Nov 2016)	Yes	–	–	–	–
Prosopium cylindraceum	Round Whitefish	Yellow	–	–	–	Yes	–	–
Prosopium williamsoni	Mountain Whitefish	Yellow	–	Yes	Yes	Yes	Yes	Yes
Ptychocheilus oregonensis	Northern Pikeminnow	Yellow	–	Yes	Yes	–	Yes	Yes
Pungitius pungitius	Ninespine Stickleback	Unknown	–	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
Salvelinus confluentus	Bull Trout	Blue	SC (Nov 2012)	Yes	Yes	Yes	Yes	Yes
Salvelinus fontinalis	Brook Trout	Exotic	–	Yes	–	–	Yes	–
Salvelinus malma	Dolly Varden	Yellow	–	Yes	Yes	Yes	Yes	Yes
Salvelinus namaycush	Lake Trout	Yellow	–	Yes	Yes	–	Yes	–
–	All Salmon	–	–	–	Yes	Yes	–	–
–	Arctic Char	–	–	–	–	–	Yes	–
–	Chub (General)	–	–	–	Yes	–	–	–
–	Cutthroat/Rainbow cross	–	–	Yes	Yes	Yes	–	–
–	Dace (General)	–	–	–	–	–	Yes	–
–	Lamprey (General)	–	–	Yes	Yes	Yes	Yes	–
–	Minnow (General)	–	–	Yes	Yes	–	Yes	–
–	Mottled Sculpin	–	–	Yes	–	–	–	–
–	Salmon (General)	–	–	Yes	Yes	–	Yes	Yes
–	Sculpin (General)	–	–	Yes	Yes	Yes	Yes	Yes
–	Squanga	–	–	–	Yes	–	–	–
–	Stickleback (General)	–	–	–	Yes	Yes	–	–
–	Sucker (General)	–	–	Yes	Yes	Yes	Yes	Yes
–	Verified DV BT hybrid	–	–	–	–	Yes	–	–
–	Whitefish (General)	–	–	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 Brasileira De Biologia* 77 (3): 444–50. <https://doi.org/10.1590/1519-6984.15015>.