new graph environment

Al Irvine
New Graph Environment
al@newgraphenvironment
250-777-1518
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Safety Plan - 2023-063-sern-peace-fish-passage

The latest version of this pdf can be downloaded here.

A zip file which includes kml (google earth) and gpx (garmin) files of the sites to be potentially assessed can be downloaded here. Georeferenced pdf maps can be accessed and downloaded here.

A summary of sites to be potentially assessed is included as Table 2.

Accommodations

Al - 2013 Toyota Tundra black w/flatdeck and yellow can-am quad:

- 4037 Estavilla Drive, Prince George, BC V2K 2T8 - Contact Cleo phone: 250-617-5938

Mateo - 2007 Toyota Tacoma - gold with canopy:

- 3112 Austin Road East, Prince George, BC V2K 2K7 - Contact Denise phone: 250-612-2061

Table 1: Crew members details and emergency contacts

name	email	phone	satellite	emerg_name	emerg_email	emerg_phone
Allan Irvine	al@newgraphenvironment.com	250-777-1518	allanirvine75@inreach.garmin.com	Tara Stark	tara.stark@gmail.com	250-505-9854
Mateo Winterscheidt	matwint45@gmail.com	672-998-				

name	email	phone	satellite	emerg_name	emerg_email	emerg_phone
5293	807-790-9843	Felicitas Winterscheidt	fhwinterscheidt@gmail.com	519-636-5251		
Nathan Prince	tlucoordinator@mlib.ca	250-617-5930	–	–	–	–
Eran Spence	espence@mlib.ca	–	–	–	–	–
Eugenia Isadore	–	–	–	–	–	–
Tristan Salonas	–	–	–	–	–	–
Bianca Prince	–	–	–	–	–	–
John Demont	–	–	–	–	–	–

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Equipment Checklists

Personal Equipment Checklist	•
GPS	headlamp
Suncreen	hard hat
Bugspray	steel toed boots
Polarized glasses	clinometer
Bear Spray	field vest
phone/camera	note book
battery pack booster for phone	Extra clothes
Hat	rain gear
first aid kit personal	hand lens
Waders	GPS Case waterproof
Boots	Notebook waterproof
Ski poles	Drysuits
water	Snorkels
food	Goggles
gloves work	Fanny pack
glasses safety	–

Crew Equipment Checklist	•
Hand saw	pilon x 2
Linesman Gloves x 3	Measuring board
Backroads Mapbook	Scale
Locational maps	Permits
Background Documents	Fish ID book
radio road	Site Cards / Field Guide
Inreach	Minnow Traps
Field Safety Plan	Catfood
first aid kit level 1	Flagging
First Aid binder stocked	Laptop w/basecamp
Throw bags	GPS cable

Crew Equipment Checklist	•
polaski	Lazer level
shovel	Assessment cards fish passage
fire extinguisher backpack	UAV
fire extinguisher pressurized	Flow meter
Battery booster	ATV
Compressor 12V	bucket rigid x 2
Rubber boots (no-slip soles)	bucket foldable
Small BT Speaker (for bears)	clove oil kit w/ instructions
Oakton Multimeter	gloves leather
Backpack Electrofisher	sharpies
stop nets x 4	ATV gas
salt blocks	ATV lock
loose salt	UAV battery charger
dip nets x 2	wader disinfectant kit
tape measure hand	GPS batteries
tape measure eslon	ATV helmets

Nearest Hospitals

Figure 1: University Hospital of Northern British Columbia - 1475 Edmonton St., Prince George, BC V2M 1S2 - 250-565-2000

Field Plan

Field work methods will result in products feeding reporting formats such as here for 2021 and here for 2022. We generally follow procedures in:

- fish passage assessments (MoE 2011)
- habitat confirmations (Fish Passage Technical Working Group 2011).

Presence/absence of fish, species composition/density and distribution limits can be useful for prioritizing which crossings are a best fit for fish passage restoration and help inform follow up

monitoring so electrofishing and minnowtrapping may be conducted. Standard Fish and Fish Habitat Inventory Standard Field Form site cards are used to gather habitat data. Field guide is here

We have PIT tagging equipment so we could consider tagging fish captured at electrofishing sites to help us better understand population sizes and fish movement upstream and downstream of sites over the years.

We are running digital field form tests using a product called Mergin Maps which syncs with QGIS. Crews can access projects with a free account. Please send me your usernames and we can begin to share projects/forms.

A guide to freshwater fish id such as McPhail and Carveth (1993) can be useful and can be downloaded here.

Check In Procedures

Call, text or inreach Tara Stark (2505059854) each morning to share the plan for the day (i.e. name of roads and sites). Check in time is before 7 pm each evening although we regularly check in throughout the day (ex. at arrival to site, 1pm and 4pm) on the inreach or by text and report position/provide updates.

Procedures for Failed Check-In - for Check in person

Procedures are summarized in the following Figure. If phone call or inReach check-in is not received by 7pm send text to inreach units, call or text cell phones of field crew members. If no response please call accommodations then personal emergency contacts to see if they have heard anything. Wait 1 hour and text inreach, text or call cell phones and personal emergency contacts and accomodations again. Repeat after 2 hours (9 pm) - if no response then notify the RCMP of a missing persons in field.

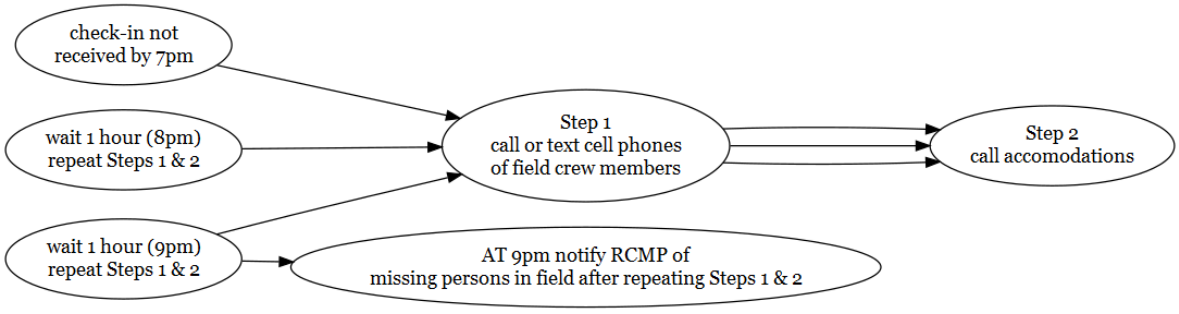

Figure 2: Procedures for failed check-in

Table 2: Potential sample locations.

id	Stream	utm_easting	utm_northing	my_priority_comments
1002200002	–	497881	6093688	RB confirmed much further u/s. Wetland modelled u/s. Could be important habitat for fish from Mcleod Lake.
1002200012	–	505036	6083591	Low gradient, potential for fish from McLeod Lake.
1002200023	–	497847	6098592	Close to Pack River. Intermittent only.
1002200024	–	498142	6099441	Rainbow captured below culvert in 2019. 5.8% gradient upstream.
1002200026	–	503364	6085983	Rainbow captured upstream in 2019. Low gradient.
1002200114	Whiskers Creek	503815	6084239	RB confirmed further u/s. Could be on private property.
1002200182	–	500322	6086196	Could be important habitat for McLeod Lake populations.
1002200301	–	490978	6075926	Needs phase 1. Small lake and wetland area u/s.

id	Stream	utm_easting	utm_northing	my_priority_comments
1002200310	–	495091	6075167	Extensive wetland areas u/s.
1002200604	–	501970	6087814	Close to McLeod Lake.
1002200610	–	507402	6078546	RB confirmed u/s in 2019, crossing is close to lake.
1002200721	–	494798	6076935	15 ha lake modelled u/s.
1002200779	Tsatchuka Creek	500641	6089777	CCG and RB confirmed just u/s in 2019.
1002200820	–	497859	6080557	Extensive low gradient habitat modelled u/s. Wetland d/s.
1002201053	–	495788	6104672	Low gradient and confirmed fish presence upstream.
1002201057	–	491412	6108420	Low gradient, near Pack River.
1002201497	Iroquois Creek	485865	6082583	Big wetland and lake areas u/s.
1002201549	–	468992	6091696	RB confirmed u/s.
1002201739	–	491694	6075172	Small lake and wetland u/s. <2% gradient for 2km
1003700002	Copper Creek	519651	6041047	Wetland and small alkes modelled u/s. RB and LKC confirmed u/s.
1003700009	–	519282	6053039	Close to Redrocky Lake and Creek. RSC confirmed d/s. 2 beaver dams before lake.
1003700010	Redrocky Creek	519142	6053232	Lots of low gradient habitat upstream. Fish presence confirmed upstream and downstream.
1003700015	–	517172	6054491	Numerous wetland areas u/s.
1003700023	–	510944	6071753	BB confirmed u/s.
1003700024	–	510944	6072479	RB confirmed u/s. Very close to crooked river.
1003700033	–	518950	6049401	<3% gradient modelled u/s. Wetland area d/s.
1003700034	–	518780	6049013	Wetland d/s. Aerial imagery indicates small stream u/s.
1003700069	–	497931	6058600	By Weedon Lake. Extensive low gradient system u/s. Looks like it would only be quad accessible.
1003700158	–	514595	6042933	Big lake d/s. Sampling could provide insight.
1003700159	–	514552	6042473	Davie Lake d/s.
1003700401	–	502053	6068062	Trib to Weedon Creek, fish confirmed in mainstem.
1003700539	–	517482	6050857	Big wetland area d/s before crooked river. Looks like it could be backwatered.
1003700554	–	514480	6055337	Very low <1% gradient u/s.
1003700756	–	518495	6043292	Near Davie Lake. Big wetland area d/s, could be hard to find channel.
1003700783	–	512459	6047492	Large wetlands modelled u/s.
1003701075	–	523702	6043877	Two ~15 ha lakes u/s. Big system.
1003701558	Altezega Creek	513139	6067042	BB confirmed just u/s of crossing. Two tribs branch off u/s, RB confirmed in both.
1003701847	–	514806	6059929	Near Kerry Lake. Numerous fish confirmed at crossing. RSC confirmed ~2km further u/s

id	Stream	utm_easting	utm_northing	my_priority_comments
1003701877	–	533788	6043313	FISS site comments indicate gravels dominate bed material. Big wetland area u/s.
1003701948	–	509650	6074535	Habitat modelled at 2-4% u/s.
1003702091	–	525430	6040190	7% gradient modelled for 500m u/s.
1003702092	–	529456	6042564	FISS comments indicate gravel dominated stream, ~1m channel width and ~6% gradient.
1003702093	–	530883	6041402	FISS sample sites u/s. ~1.5m channel width and 3% gradient.
1003702096	–	526746	6042320	Near Chuchinka, big system. 4% gradient u/s before next crossing.
1003702097	–	538599	6042073	Stream modelled as intermittent near crossing, but transitions further up. Numerous fiss sites u/s. BB confirmed d/s of crossing. Would be good to confirm if still intermittent.
1003702267	–	509576	6022486	5ha wetland just u/s.
1003702445	–	494126	6054451	Near Weedon Lake. No other crossings for 4km upstream, low gadient modelled.
1003702450	–	499594	6063840	Wetland areas d/s.
1003702614	–	496810	6054799	Near Weedon Lake. Small wetland u/s.
1003702643	–	509676	6024372	Small wetland d/s. Trib to Caine, fish confirmed on mainstem. Fish sampling here would provide insight into activity.
1003702657	–	512238	6058185	Small system, near Kerry Lake.
1003702663	–	511737	6059317	Small wetland d/s. ~7% gradient u/s.
1003702696	–	533505	6038481	BB confirmed just d/s. Stream modelled as intermittent, but there’s fiss sites u/s from 2000.
1003702697	–	534063	6038611	Intermittent. RB confirmed u/s and d/s.
1003702816	–	521801	6023168	Near Crooked River main. 4-5% gradient u/s.
1003702819	–	522885	6028814	Small wetland d/s and small wetland and lakes further d/s.
1003702959	–	494179	6055954	Stream tagged as intermittent in 400m up and downstream of culvert only. Large wetland area u/s.
1003703069	–	532930	6041109	RB confirmed d/s. Fiss comments indicate boggy wetland u/s on side channel.
1003703209	–	518241	6034397	LW, RB, CAS and WSU confirmed in lake just u/s.
1003703210	–	515197	6040662	Low gradient, multiple channels branch ~500m u/s.
1003703222	–	516257	6039297	Large wetland and Davie Lake d/s. Fish sampling would help provide insight on stream use from lake populations.
1003703290	–	505345	6063873	<2% gradient modelled u/s for 2km.
1003703294	–	510132	6066588	Small wetland and lake area u/s. Large wetland d/s.
1003703332	–	504023	6062961	<2% gradient for about 2km u/s.
1003703344	–	541712	6041062	Stream meanders through very long wetland area u/s. Fiss comments d/s confirm very wide channel with riffle pool morphology.
1003703412	–	523447	6025500	Two branches of trib u/s. Fish confirmed in both. Small lakes and wetlands u/s. Looks backwatered from aerial imagery. Difficult access on railway.

id	Stream	utm_easting	utm_northing	my_priority_comments
1003703446	–	541771	6041245	RB confirmed u/s, before and after small lake. Wide channel and good habitat confirmed from fiss site comments. Looks like it could be a ford from aerial imagery.
1016600013	–	507839	6109509	Small wetland d/s and further u/s.
1016600017	Trappers Creek	511719	6111243	Fish confirmed near confluence d/s.
1016600144	–	561214	6069733	SU confirmed d/s. Potential pscis barrier u/s, dry at time of survey in 2013.
1016600177	–	555014	6066237	6% gradient modelled u/s for ~1km
1016600194	–	512459	6110112	Stream modelled as intermittent only. Hard to tell from aerial imagery if it is present. Would be good to confirm.
1016600517	–	558115	6045717	RB confirmed d/s and u/s in Wicheeda Lake.
1016600618	–	535212	6054692	Small wetland just u/s of crossing, and Bills lake beyond wetland.
1016600844	–	530696	6069870	Pscis point directly u/s rates habitat as high.
1016600903	–	552022	6065162	Beaver dam just u/s. RB confirmed ~1.2km u/s.
1016600930	–	559535	6068448	PSCIS barrier u/s, indicates low hab value. MW, RB, and confirmed at confluence with table river.
1016601023	–	537621	6077106	Close to Anzac. Potential barrier u/s. Beaver activity observed in hab con done in 2001.
1016601042	Shadforth Creek	539505	6080508	RB caught u/s, multiple species confirmed d/s. FISS comments indicate there are two tall impassable cascades.
1016601126	–	517908	6090742	Bridge u/s assessed by new graph in 2019.
1016601161	–	527450	6085512	Important connection between Chudnuslida Lake and Chuyazega Creek. Many fish species confirmed in Lake.
1016601241	Atunatche Creek	525589	6135248	RB confirmed d/s. Cascade immediately u/s.
1016601376	–	509231	6102131	Crossing on trib very close to parsnip confluence. Fish not confirmed but very likely.
1016601529	–	585286	6055724	DV and BT confirmed u/s. Fish sampling and fiss survey already done. Needs Phase 1.
1016601708	–	541929	6080850	RB confirmed u/s. FISS comments u/s indicate confined canyon in upper reaches with steep eroding banks.
1016601997	–	513209	6103858	Modelled as intermittent. FISS coments u/s indicate 7% gradient, not much other info on survey.
1016602206	–	503509	6104749	Stream is intermittent only. 2% gradient u/s.
1016602358	–	578952	6051039	7% gradient modelled for ~1.5km, then gets steeper. FISS coments indicate stream bed is dominated by boulders.
1016602412	–	587700	6034879	Intermittent stream. Small wetland d/s.
1016602413	–	588301	6035135	5% gradient modelled for 300m u/s, then increases to 8% for 2km.
1016602415	–	586627	6034459	Stream tagged as intermittent only. Close to Parsnip mainstem.

id	Stream	utm_easting	utm_northing	my_priority_comments
1016602495	–	573084	6051387	PSCIS barrier, moderate hab value recorded. Fish observed in outlet pool. FISS comments 500m u/s from 1998 say there is no stream.
1016602569	–	511789	6097372	Modelled as intermittent only. Very close to parsnip mainstem.
1016602610	–	515362	6095019	~3% gradient for 1km u/s. Close to parsnip with many tribs u/s.
1016602686	–	515158	6093463	RB confirmed at crossing. Close to parsnip river and extensive low gradient habitat modelled u/s.
1016602744	–	525937	6091250	Trib of Reynolds Creek which is a potential FSW
1016602773	–	533240	6067629	Crossing matched to pscis crossing 125353. Barrier, low habitat value listed. But big stream, with RB confirmed u/s.
1016602778	–	519657	6091283	Smaller stream, <4% gradient
1016602782	–	525277	6078635	Close to parsnip mainstem.
1016602875	–	561839	6036174	~2% gradient u/s for 2km.
1016602876	–	560770	6035845	Stream modelled as intermittent u/s. Trib to Wichcika Creek, potential FSW
1016602938	–	502501	6109613	Bruce Lake ~40ha located u/s
1016603206	–	538256	6060532	Ford just u/s on deactivated road.
1016603263	–	553393	6067228	LSU and SU confirmed downstream. Barriers u/s on both tribs and low hab value beyond. Would be good to confirm fish presence and habitat u/s of this crossing.
1016603267	–	537693	6064700	PSCIS barrier. Hab con already done d/s. Hab con and fish sampling u/s would be helpful.
1016603340	–	526004	6075462	Initial 6% gradient for 500m, then decreases to 3. Railroad access could be difficult, no roads nearby.
1016603358	–	527287	6074153	LNC confirmed d/s. 7% gradient modelled for 700m u/s. On railroad so access could be difficult.
1016603359	–	528183	6073538	Fish points on parsnip mainstem nearby. Sampling could provide insight into trib use. Crossing is on railroad.
1016603408	–	514062	6102812	Trib of colbourne creek, a potential FSW. Access on railroad could be difficult.
1016603416	–	517841	6098947	Huge wetland area d/s. Railroad crossing.
1016603422	–	519267	6097653	40ha lake u/s. Big wetland area d/s. Looks backwatered.
1016603757	–	547959	6085825	FISS comments u/s indicate there is good habitat but there is a “possible dry channel”.
1016603766	–	548731	6055671	CC confirmed d/s. Modelled crossing just 200m u/s.
1016604103	–	547866	6062903	Very low gradient modelled u/s. MW and CC confirmed on Table River mainstem not far from confluence.
1016604128	–	549361	6052999	Trib to parsnip river. WSU, NSC, RB and MW all confirmed d/s. Hab con and sampling u/s would help provide insight into fish distribution and extent.
1016604151	–	525148	6093602	Big wetland area u/s. 8% gradient modelled d/s for 1km.

id	Stream	utm_easting	utm_northing	my_priority_comments
1024704177	–	520033	6097383	Big wetland complex d/s. Low gradient modelled u/s.
1024718617	–	499997	6114874	Lake/wetland area d/s.
1024740958	–	555907	6066722	MW confirmed in Table River near confluence of this trib. Fish sampling here would help to find out if they're using this stream.
1024743865	–	513404	6047518	Low gradient <2% modelled for >3km u/s. Unsure if crossing is present after reviewing aerial imagery.
124957	–	536350	6079907	Small stream. Approx 500 m low gradient habitat modelled upstream. Spawning area for BT?
124962	–	534472	6079388	Dry in August, 2013 when culvert was assessed. But RB and BT caught u/s in 2001. Could be worth following up.
124998	–	577502	6038240	Two culverts, medium hab value. Sampling conducted at crossing up the road in 2022, fish confirmed.
125123	–	581477	6049921	Aprox. 500 m of habitat modelled upstream <22%. Modelled crossing 16601469 should be assessed if possible.
125136	–	567360	6052242	Larger stream with nice looking habitat in photos. ~300 m upstream habitat gain likely.
125140	–	567964	6052408	Larger stream. RB confirmed u/s in 1998. Medium habitat value. Gradient 10% in upper reaches.
125149	–	572048	6050308	PSCIS barrie, assessed in 2013. Could use reassessment. Habitat looks good in photos.
125156	–	573027	6049517	Marlim 2013 assessment comments indicate suitable rearing and spawning habitat. Stream path appears to differ from mapped route.
125177	–	570910	6052500	Small watershed, RB caught u/s.
125179	–	570307	6052836	Large stream with BT u/s.
125180	–	569664	6053048	Larger stream with near 1km habitat modelled <5% average gradient. Falls u/s but fish were caught in the past above.
125186	–	565429	6052678	Larger stream.
125190	–	564295	6051731	Smaller stream with fish present just downstream.
125191	–	563938	6051519	6% gradient upstream. Assessed by Triton in 1998. No confirmed fish presence. Small channel.
125194	–	563293	6050578	Assessed in 2022. Fish sampling could be helpful. High habitat value.
125243	–	547236	6063534	Habitat looks decent from photos. RB confirmed downstream and up.
125246	–	544913	6063262	PSCIS barrier, lists hab value as low. But looks ok in photos.
125250	–	540654	6063548	Smaller stream with railway (16603291) and road (16601881) crossing upstream. Upstream modelled as lower gradient.
125252	–	538484	6063864	Confirmed pscis barrier upstream. Confirmed fish presence upstream. Streambed was dry when assessed in 2013.

id	Stream	utm_easting	utm_northing	my_priority_comments
125254	–	537225	6065150	WSU upstreawm. Railway downstream (16603279) and crossing just upstream (16602281). Looks like potentially difficult surveying and habitat unlikely to be suitable farther than 200m upstream due to small size of watershed.
125375	–	529254	6060865	Larger stream. Prioritised by Marlim in 2013.
125428	–	554092	6042229	–
57620	–	526540	6055442	Prioritised by Marlim in 2013.
57624	–	529249	6060872	Prioritized in Marlim in 2013. Large stream. Good habitat .
57629	–	529879	6060100	Prioritized in Marlim 2013. PSCIS 57624 downstream.
57633	–	529997	6061210	Gravels in photos.
57634	–	530042	6061188	Gravels in photos.
57637	–	531235	6064213	Prioritized in Marlim 2013. Upstream PSCIS crossing 57659 is a ford. Need to check modelled crossing 16600804.
57689	–	552647	6040957	Larger steam with wetland/lake area upstream.
57712	–	563165	6044061	Upstream of good sized wetland/lake area. Same crossing as 124973. Habitat looks decent in photos.
57718	–	532021	6065509	High hab value. Could be important habitat between parsnip river and tacheeda lakes. Fish confirmed downstream but not up. Good candidate for hab con and/or fish sampling.
6539	Hammett Creek	489924	6077207	Fish confirmed in culvert during last assessment in 2006. Backwatered and swamp u/s and d/s.
6544	–	506992	6075727	Trib to crooked river and close to Carp Lake. Small pond and wetland habitat upstream.
6558	Moffatt Creek	486281	6087080	No confirmed fish presence. Wide stream. Cascade obstacle downstream, obs from 1996. Would be good to confirm if still a obstacle.
6562	–	496264	6103523	Narrow channel. Beaver activity around culvert. Small lake upstream.
6617	–	491515	6102130	Surrounded by wetland complex, lake u/s.
6621	–	500203	6067482	Fish presence confirmed above and below culvert in 2006. Wide channel and extensive spawning and rearing habitat modelled upstream. Fish sampling would be insightful.
6622	–	498183	6061326	Was backwatered and beaver dams present when last assessed in 2006. Big system with tribs and lakes u/s. Would be good to know if stream is fish bearing.
6623	–	495925	6058427	Extensive network of low gradient modelled spawning and rearing u/s. Fish confirmed u/s of culvert. Close to Weedon Lake, could be important system.
6624	–	495244	6053899	Wetland habitat. Fish known to be present d/s of culvert. Close to Weedon Lake.
6746	–	536670	6076366	Large stream, fish known in reach.
6828	Crocker Creek	548810	6084301	Confirmed fish presence upstream. No road. Two culverts. Probably used to prevent flooding.

Table 3: Electrofishing Locations

id	stream_name	utm_easting	utm_northing	pscis_assessment_comment
6746	–	536670	6076366	Failed - on constriction - baffled culvert - Fish at culvert - inlet pool depth 8cm - some introduced materials downstream natural weir
125000	–	577540	6038199	High priority candidate for restoration. Good habitat. Surveyed upstream continuosly for 350 m to beaver influenced wetland area where walking became difficult. Then stream was visited again upstream at 1.6 km upstream from crossing then again at approximately 2.5 km upstream of crossing. Undercut banks provide areas of deep cover ad Large woody debris is scattered througout. Overhanging vegetationalso provides cover througout. Pools observed were somewhat shallow but were preseetevery 20 - 30 m or so. Minnowtrapping conducted upstream and downstream of crossing. Electrofishing conducted downstream of the crossing. No fish captured upstream of the culvert. First beaver dam located approximately 330m upstream of the culvert.
125179	–	570307	6052836	High priority candidate for restoration with habitat for rearing and overwintering upstream. Surveyed upstream for 520 m with no barriers to fish passage present. Bull trout and rainbow recorded upstream. Some deep pools for overwintering and rearing. Large woody debris and undercut banks throughout. Sections of gravel suitable for spawning. Good flow. Surveyed downstream for 360 m. No barriers observed and none likely downstream of surveyed section due to gradients. Abundant large woody debris and gravels suitable for spawning.
125180	–	569664	6053048	High priority candidate for restoration. Good habitat. Surveyed upstream of PSCIS crossing 125186 for a distance of 515 m. Good flow and abundant cover. Large woody debris and pools throughout. Frequet pockets of gravel suitable for spawning. Good candidate.
125231	–	549962	6065140	High priority candidate for restoration. Good habitat. Surveyed for 600m to new bridge (modelled crossing 16603641). Some deep pools and bounlders, udercut banks, gravels throughout. Abundant large wody debris throughout. Some debris steps from 30 - 70 cms high. No barriers. Rainbow trout known upstream (FIDQ 2020). Good candidate for rehabilitation.
125261	Fern Creek	534600	6067770	Two additional culverts at 0.9m diameter.

References

Fish Passage Technical Working Group. 2011. “A Checklist for Fish Habitat Confirmation Prior to the Rehabilitation Fo a Stream Crossing.”https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/land-based-investment/forests-for-tomorrow/checklist-for-fish-habitat-confirmation-201112.pdf.

McPhail, J. D., and R Carveth. 1993. “Field Key to the Freshwater Fishes of British Columbia.”https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nr-laws-policy/risc/field

_key_to_freshwater_fishes_of_bc_field_size_water_resistant_version.pdf.
MoE. 2011. “Field Assessment for Determining Fish Passage Status of Closed Bottom Structures.”BC Ministry of Environment (MoE). https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/land-based-investment/forests-for-tomorrow/field-assessment-for-determining-fish-passage-status-of-cbs.pdf.