SERNbc – Fish Passage Planning - Williston

Final Report

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Prepared by:

Society for Ecosystem Restoration in North Central BC
1560 Highway 16 East
Vanderhoof, B.C. V0J 3A0

Prepared for:

Fish and Wildlife Compensation Program

Fish Passage Technical Working Group
Landbase Investment
Province of BC

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Executive Summary

Past road construction and associated stream crossings have caused barriers to fish passage. The need to replace these structures to restore fish passage is often complicated by issues of current responsibility or tenure of the associated road. The current road permit holder may not be required to replace the structures and restore fish habitat, as the crossings were "built to the standards of the day", and many funding agencies are not interested in assessing and potentially replacing these structures due to the underlying accountability for the road, that is held by the road permit holder. This administrative challenge is moderated to some degree by

1) fish passage funding partners who invest in fish passage restoration on non-status roads
2) road permit holders replacing culverts and restoring fish passage, and
3) other proponents contributing to culvert replacements and fish passage restoration in response to mitigation or compensation related requirements associated with larger development projects.

The Society for Ecosystem Restoration in North Central BC (SERNbc)[1] implemented a fish passage planning project funded by BC Hydro through the Peace Fish and Wildlife Compensation program as well as the BC Ministry of Forests Lands and Natural Resource Operations Landbase Investment Program. The project focused on fish passage restoration planning within the Williston watershed (areas draining into Williston Lake). The society may have a unique opportunity to focus on the value to fish and fish habitat, and effectively set aside administrative hurdles and partner with a variety of funding agencies, industry, First Nations and/or other stakeholders to identify and resolve key fish passage barriers.

For the Williston study area, the planning process identified a number of key priority watersheds or basins within the overall Williston study area:

- **Watersheds** - Ingenika River, Nation River, Finlay River, Parsnip River, Omineca River, Mesilinka River and Osilinka River.
- **Basins** – Tenakihi, Munro and Swannell

The priorities are based on the number of crossings, potential habitat gain, presence of Bull Trout and priority for local First Nations.

In addition, an integrated approach to fish passage planning was developed and proposed as a part of the project. This process is a holistic value-focused approach to fish passage restoration planning. A high level discussion of the recommended approach is included for consideration by organizations and proponents interested in fish passage restoration.

[1] www.sernbc.ca

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1 Introduction

Past road construction and associated stream crossings have caused barriers to fish passage. The need to replace these structures to restore fish passage is often complicated by issues of current responsibility or tenure of the associated road. The current road permit holder may not be a required to replace the structures and restore fish habitat, as the crossings were "built to the standards of the day", and many funding agencies are not interested in assessing and potentially replacing these structures due to the underlying accountability for the road, held by the road permit holder. This administrative challenge is moderated to some degree by

4) fish passage funding partners who invest in fish passage restoration on non-status roads
5) road permit holders replacing culverts and restoring fish passage, and
6) other proponents contributing to culvert replacements and fish passage restoration in response to mitigation or compensation related requirements associated with larger development projects.

The Society for Ecosystem Restoration in North Central BC (SERNbc)[2] implemented a fish passage planning project funded by BC Hydro through the Peace Fish and Wildlife Compensation Program as well as the BC Ministry of Forests Lands and Natural Resource Operations Landbase Investment Program. The project focused on fish passage restoration planning within the Williston watershed (areas draining into Williston Lake). The society may have a unique opportunity to focus on the value to fish and fish habitat, and effectively set aside administrative hurdles and partner with a variety of funding agencies, industry, First Nations and/or other stakeholders to identify and resolve key fish passage barriers.

2 Objectives

2.1 Project Objectives

The project has two key objectives

1) Develop and document an integrated fish passage prioritization exercise
2) Develop priorities for fish passage assessments and restoration in the Williston drainage (Study Area)

The provincial Fish Passage Technical Working Group (TWG) has done significant work on the development of systems and standards to support fish passage assessment planning and implementation. This project looks to build on this solid foundation through the engagement of First Nations, the incorporation of their interests and priorities and the use of a value-focused approach, in an attempt to overcome administrative or jurisdictional impediments that may exist in the restoration of fish passage.

Outputs from the process include the identification of priority areas for future fish passage restoration in the Williston study area as well as the documentation of processes that could be used by a wide range of project partners in the Williston and other parts of the province in an integrated and holistic planning process.

2.2 Alignment with Strategic Direction

The project documented here aligns with a number of the strategic objectives of the 2014 Peace Basin Plan[3], specifically identified as follows:

Conservation

- Maintain or improve the status of species or ecosystems of concern.

[2] www.sernbc.ca

[3] BCHydro. 2014. 2014 Peace Basin Plan. Peace Fish and Wildlife Compensation program.

- Maintain or improve the integrity and productivity of ecosystems and habitats.

Sustainable Use

- Maintain or improve opportunities for sustainable use, including harvesting and other uses.

Community Engagement

- Build and maintain relationships with stakeholders and aboriginal communities.

3 Study Area

The study area is described as all watersheds that drain into Williston Lake (SeeFigure 1) and is the area of interest for the Peace Fish and Wildlife Compensation Program.

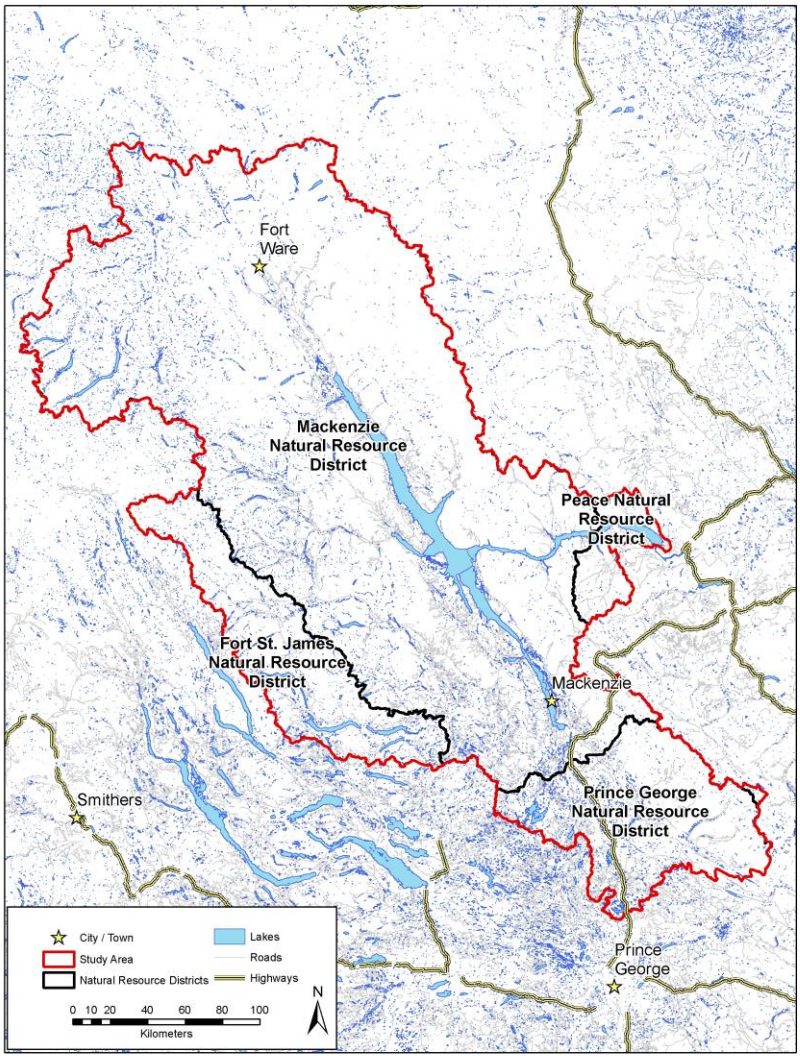

Figure 1. Study area for the SERNbc fish passage planning project.

As the project is focused on a strategic-level planning process around fish passage, this broad area was the basis of discussions with government, First Nations and stakeholder contacts. Results of the planning process did, in some cases, identify watersheds or sites of specific interest, where subsequent work could be focused.

4 Methods

The following approach was used in the implementation of this project

4.1 Gathering Information

In support of a strategic level discussion about fish passage within the Williston Drainage, base data and current status of fish presence, habitat value and watershed sensitivity is important. This base fisheries and habitat information can be used to support a prioritization of the watersheds in the Study Area. The following information was secured in support for the project:

- Fish distribution (observation points) – including species[4]
- Provincial Stream Crossing Inventory System (PSCIS)[5] assessment points
- Fish passage and potential habitat gain modeling[6]

In addition, the following base data was also secured to support mapping, discussions and reporting

- Roads
- Rivers, streams, lakes
- Parks and Protected Areas
- Roads structures (culverts and bridges)
- Watershed and Basin Boundaries – Fresh Water Atlas (FWA)
- Natural Resource Districts

4.2 First Nations and Stakeholder Engagement

The goal of "engagement" was to developed

1. a better understanding of fisheries values, areas of concern, priorities for investment in fish passage restoration within the Study Area, and
2. an understanding of the challenges, successes and opportunities with identifying, ranking and funding fish passage restoration.

The following groups were contacted

- First Nations with traditional territory overlapping the study area[7]
- Ministry of Forests, Lands and Natural Resource Operations – branch, region and district staff in fish passage, ecosystems, stewardship and engineering
- Department of Fisheries and Oceans
- Consultants active in fish, fish habitat and fish passage work within the study area
- Forest Companies active within the study area

SERNbc is involved in ongoing discussions with many of these groups and individuals through this and other restoration related planning and implementation initiatives.

[4] Metadata: http://catalogue.data.gov.bc.ca/dataset/known-bc-fish-observations-and-bc-fish-distributions

[5] Product of the BC Ministry of Forests Lands and Natural Resource Operations
Fish Passage Technical Working Group: https://www.for.gov.bc.ca/hcp/fia/landbase/standards/fishpassage.htm.
PSCIC Userguide: https://www.for.gov.bc.ca/ftp/hcp/external/!publish/web/fia/PSCIS-User-Guide.pdf
PSCIS Metadata: http://catalogue.data.gov.bc.ca/dataset/pscis-assessments

[6] Norris, S. 2011. Fish Passage GIS Analysis. Completed for the Fish Passage Technical Working Group. BC Ministry of Environment (now Ministry of Forests, Lands and Natural Resource Operations).

[7] The intent for specific conversations regarding Fish Passage with all First Nations was not fully realized. Some of the conversations identified overall concern for fish barriers, while other conversations identified basins or interest and sites of interest to the First Nations. These conversations are ongoing, in coordination with other work that SERNbc is involved with, as it pertains to First Nations dialogue, communications and engagement with the activities of SERNbc.

4.3 Prioritization of Fish Passage Assessment and Restoration

Four key sources if information have been used to generate priority areas for future fish passage assessment and restoration in the study area:

- Indicator #1 - Number of culverts on known or inferred fish streams, measured as density (culverts/km^2) – captures a high level measurement of potential issues that may exist
- Indicator #2 - Number of culverts on known or inferred fish streams where Bull Trout has been confirmed, measured as density (culverts/km^2) - to capture the importance of dealing with potential habitat exclusion for Bull Trout as a species at risk.[8]
- Indicator #3 - Potential habitat gain[9] – a broad level assessment of fish habitat above crossings – to capture the potential habitat gain assuming culverts are barriers
- Indicator #4 - First Nations identified sites or drainages[10]

Indicators #1, #2, and #3 were calculated for each of the Fresh Water Atlas (FWA) watersheds and basins within the study area. Where indicator results for a drainage were in the upper 50% percentile for that indicator, the watershed or basin was flagged as "Priority". This information was then combined with areas flagged through Indicator 4, to generate an overall priority at the watershed level and at the basin level based on the following criteria:

- Three or four "Priority" Indicators = Higher Priority
- One or two "Priority" Indicators = Moderate Priority
- No "Priority" Indicators = Lower Priority

The resulting priority represents a "relative priority" within the study area, comparing watersheds or basins with others in the project area.

The priority for fish passage assessment and restoration was calculated for and applied to two different scales across the study area, 1) watersheds[11] and 2) basins[12] as outlined in the BC Fresh Water Atlas (See Figure 3).

4.4 Reporting

Following the engagement and discussions with First Nations and stakeholders, a report was developed (this document) to communicate the results and conclusions of the project. The report includes a series of maps to document areas to consider for further assessment and restoration work. The report also includes a discussion on an overall process that can be used to complete integrated fish passage restoration planning.

[8] Bull Trout streams were identified as those streams associated with points of known Bull trout presence as captured here: http://catalogue.data.gov.bc.ca/dataset/known-bc-fish-observations-and-bc-fish-distributions

[9] The Fish Passage standards/procedures developed by the BC provincial government, through the Fish Passage Technical Working Group, have a detailed field procedure to measure "habitat gain" - https://www.for.gov.bc.ca/hcp/fia/landbase/standards/fishpassage.htm. The model used in this analysis, is a strategic level assessment completed by the same group, that looks at potential habitat about a crossing based on known or inferred fish presence and stream gradient (25%). The results of such should be seen as a high-level strategic assessment to guide prioritization for assessment and restoration work and not a definitive assessment of habitat gain.

[10] It is important to note that the First Nations priority flag is a work in progress. Detailed input from all First Nations with traditional territory in the Williston study area has not been fully secured. On-going discussions will help with this. It is also important to note that First Nations also communicated a general concern with fish and fish habitat across their traditional territory.

[11] Stream Order 7 and 8 streams were used to designate watersheds.

[12] Stream Order 2 to 6 streams were used to designate basins.

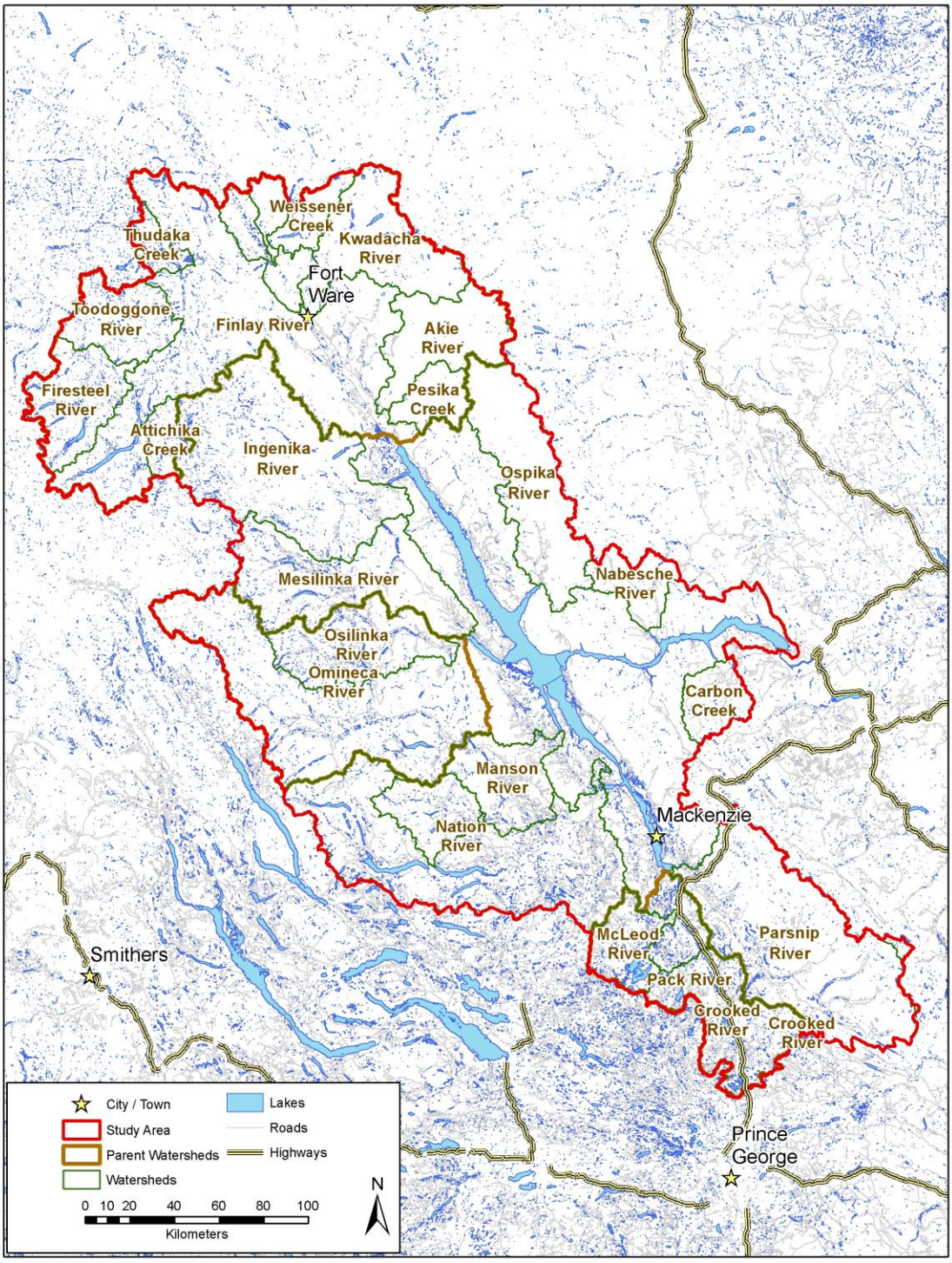

Figure 2. Watersheds within the Williston Lake study area.

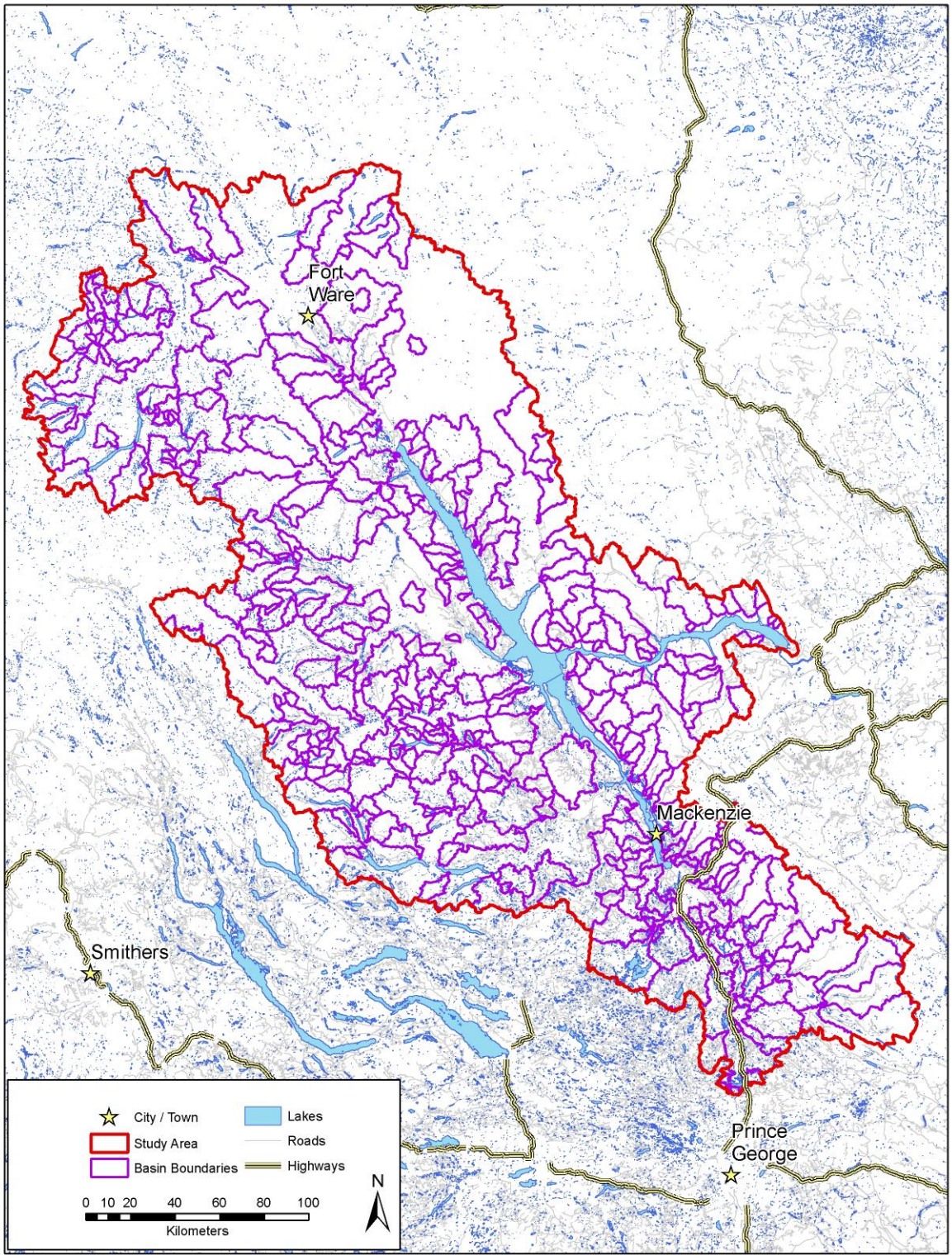

Figure 3. Basins within the Williston Lake study area.

5 Results

The results of the project are focused in two areas:

1) Williston Study Area Priorities – input and resulting priorities for fish passage assessments in the study area.
2) Fish Passage Planning Process – recommended steps and/or process to develop integrated and informed fish passage priorities within a landscape.

To support the prioritization of fish passage investments in the study area, the area was broken into watersheds and basins as identified in the BC Fresh Water Atlas (FWA) (See Figure 3). These watersheds and basins were the units prioritized for fish passage investments. Both watershed and basin scale prioritization was used to support investments at a variety of scales.

5.1 Priority for Fish Passage Assessments and Treatments in the Williston Drainage

Priorities watersheds and basins identified for fish passage assessment and restoration area captured by watershed and basin in Figure 4 and Figure 5.

The higher priority basins and watersheds identified above, are those that have importance or priority identified within 3 or 4 of the indicators. Future investments in culvert assessments and restoration should start with these areas. For the higher priority units identified, Table 1 identifies the indicators that are relevant to the prioritization.

Table 1. Contributing indicators for the higher priority watersheds and basins within the Williston Lake study areas.

Watershed	Unit	Indicator #1 (Culverts on Fish Streams)	Indicator #2 (Culverts and Possible Bull Trout Streams)	Indicator #3 (Potential Habitat Gain)	Indicator #4 (First Nation Priority)
Ingenika River	Watershed	Y	N	Y	Y
Nation River	Watershed	Y	Y	Y	Y
Finlay River	Watershed	Y	N	Y	Y
Parsnip River	Watershed	Y	Y	Y	
Omineca River	Watershed	Y	Y	Y	
Mesilinka River	Watershed	Y	Y	Y	
Osilinka River	Watershed	Y	Y	Y	
Tenakihi Creek	Basin	Y	Y	Y	
Munro Creek	Basin	Y	Y	Y	
Swannell River	Basin	N	Y	Y	Y

See Appendix A (Table 3 and Table 4) for rationale for priority ranking for all watershed and basin units.

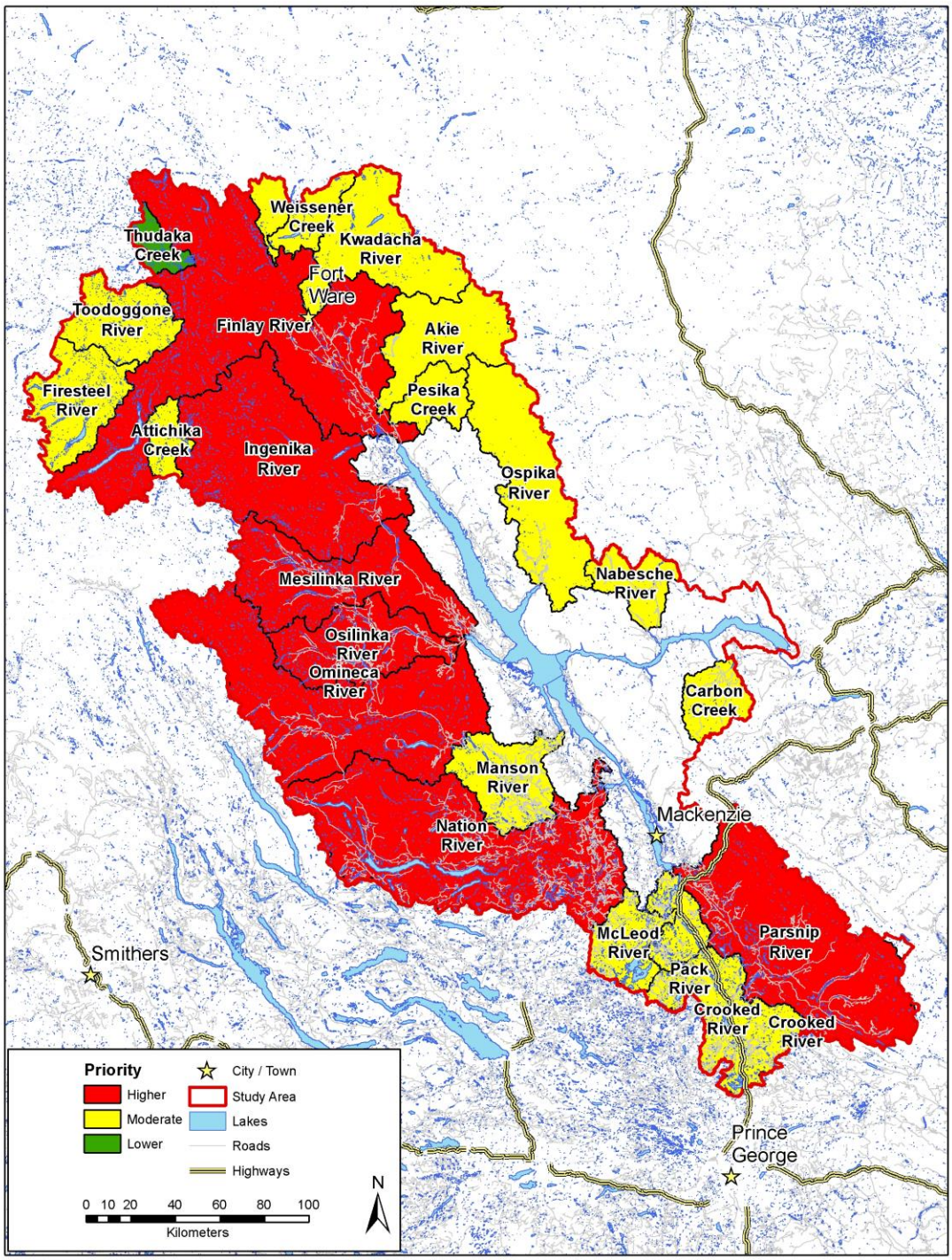

Figure 4. Watershed-level priority for fish passage assessment and restoration within the Williston Lake study area.[13]

[13] White area on this map represent areas that did not have seven or eight order watersheds. Refer to the basin level map below for priorities within this area.

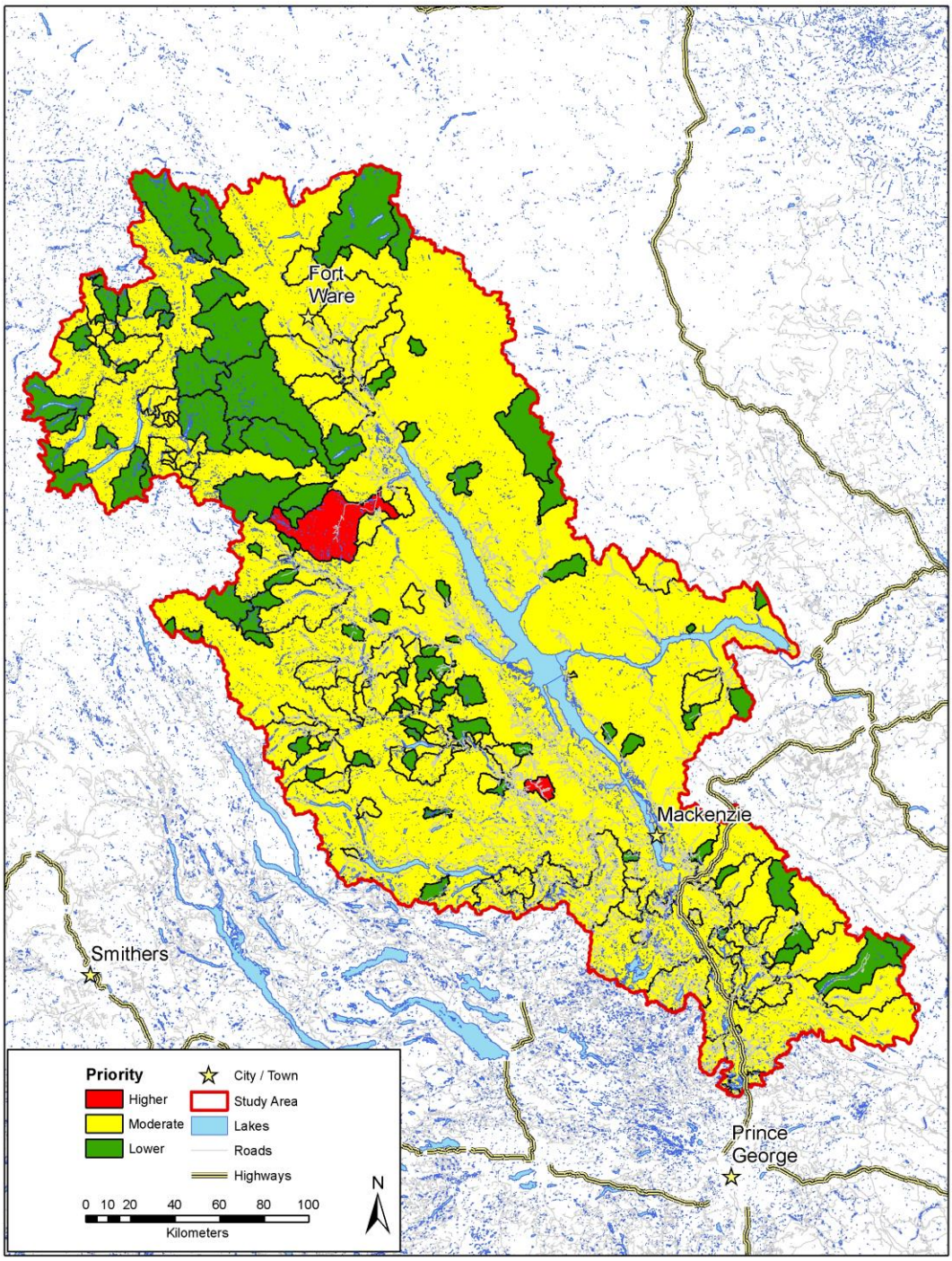

Figure 5. Basin-level[14] priority for fish passage assessment and restoration within the Williston Lake study area.

[14] Where landbase within the Study Area did not have a specific basin area designated, a default of Moderate Priority was designated.

A further refinement of the prioritization could involve more significant weight being given to First Nations priorities and interests. Further shortlisting the priority units in this way may better support decision making around the current limited funding opportunities that exist for fish passage assessments and restoration works.

Table 2. Watersheds and Basins identified by First Nations as Priority.

Basin	Unit	Fist Nations Priority	Analysis Priority
Ingenika River	Watershed	Y	Higher
Nation River	Watershed	Y	Higher
Finlay River	Watershed	Y	Higher
Ospika River	Watershed	Y	Moderate
Firesteel River	Watershed	Y	Moderate
Pesika Creek	Watershed	Y	Moderate
Swannell River	Basin	Y	Higher
Lafferty Creek	Basin	Y	Moderate

A base level of information is available for each of the "Higher Priority" units identified in Table 1. This information includes the indicator information used to prioritize the watersheds/basins. Figure 6 displays this information, including available PSCIS data, for the example "Higher Priority" watershed unit Mesilinka, as an example.

5.1.1 Past Fish Passage Assessment and Remediation Work

Another factor that should be considered when planning fish passage restoration is the work that has been undertaken to date. Although the presence of past assessment work should not be the only factor that drives priority or future assessments, the recognition of this past investment should be made when considering where to allocate funding, e.g. if a minor amount of assessment dollars are available, it may make the most sense to confirm potential habitat gain for a culvert that has already been flagged as a barrier to fish.

Figure 7 displays the previous fish passage restoration work that has been completed in the Williston study area, as captured through PSCIS.

In addition to the specific information outlined above, stakeholder engagement also provided a perspective on the development of an integrated approach to planning fish passage restoration within a given study area. The results of these conversations are captured in Section 6- Discussion, below.

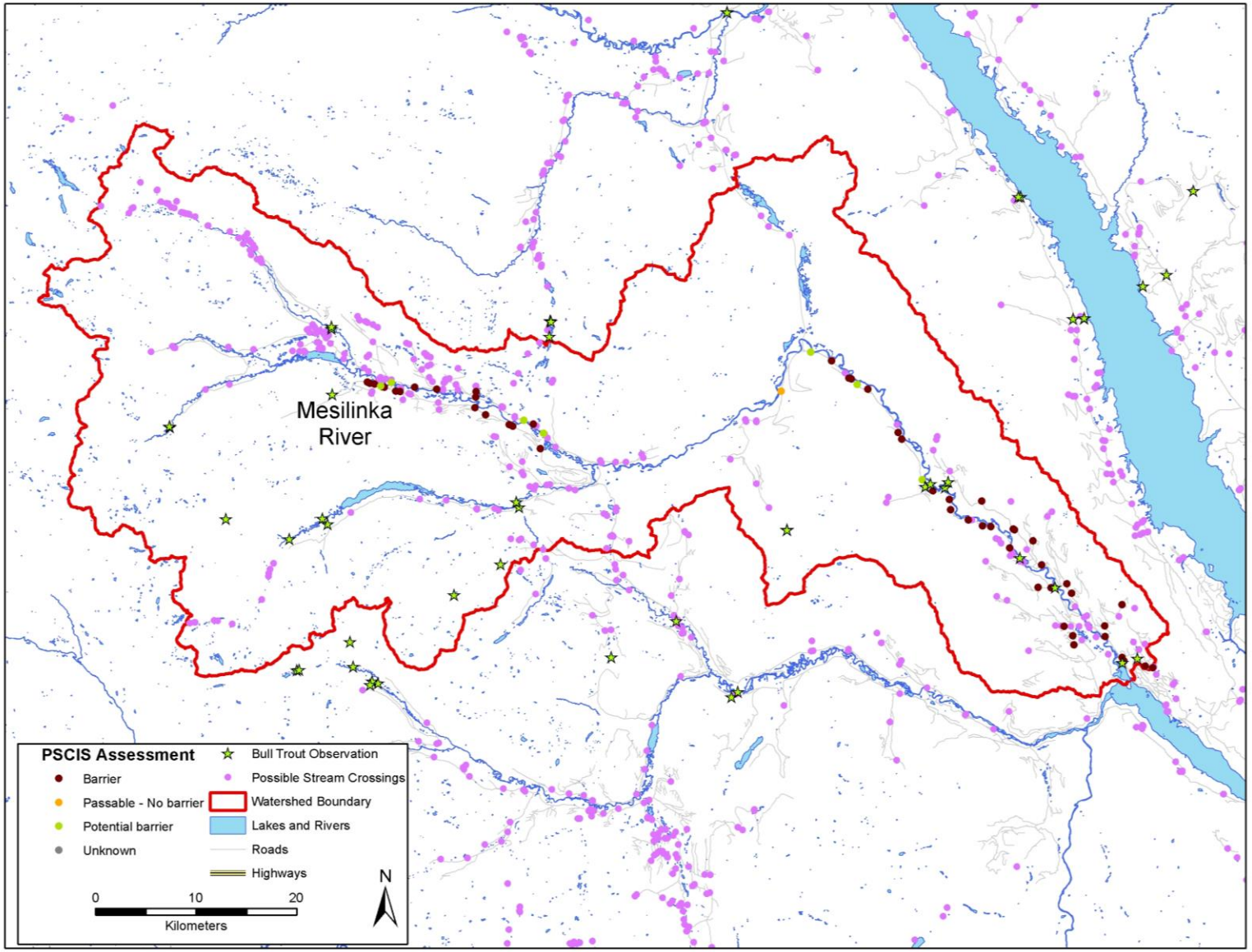

Figure 6. Example "Higher Priority" watershed and available background information.

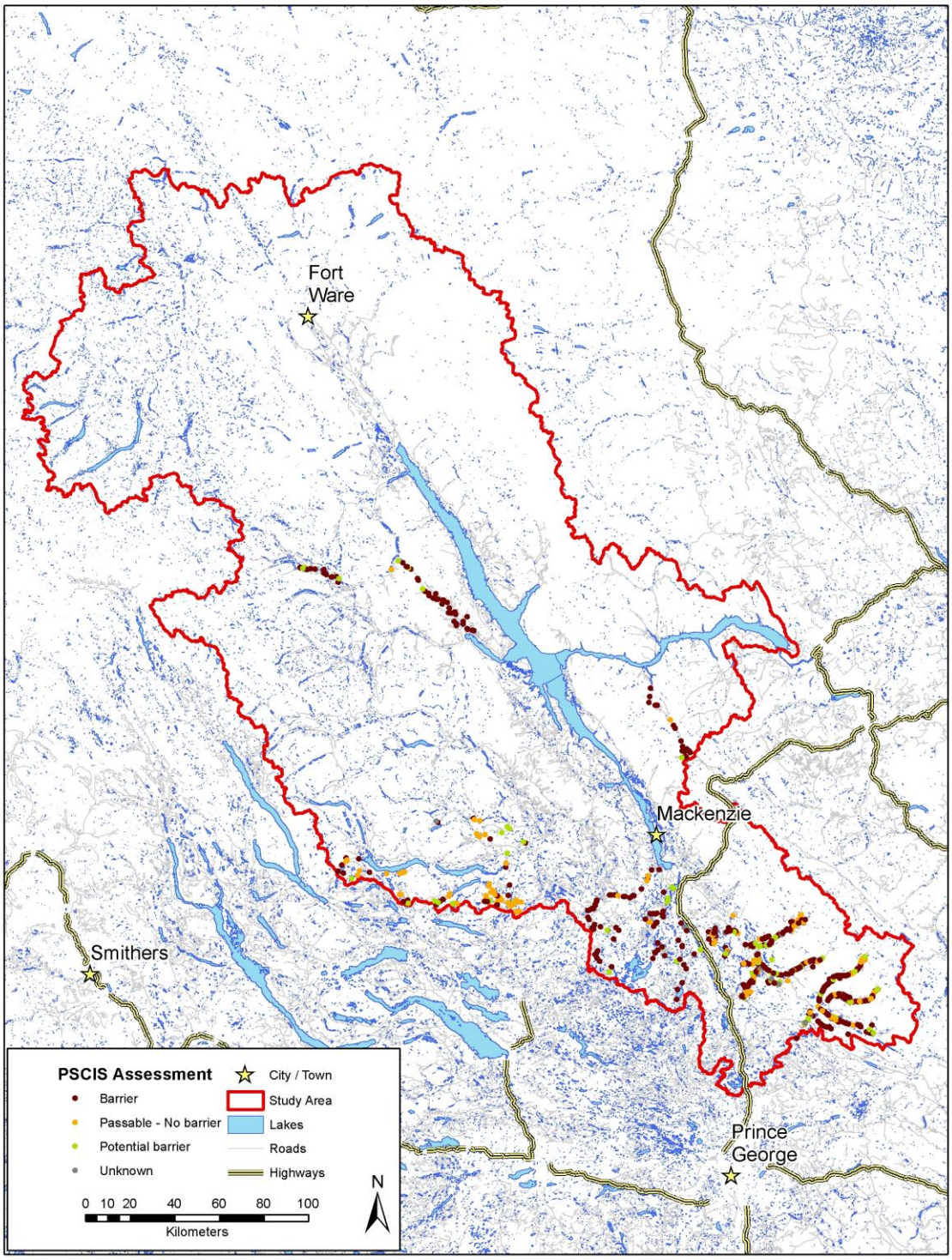

Figure 7. Previous fish passage assessment work completed within the study area.

6 Discussion

The fish passage planning project within the Williston has identified a few key challenges and opportunities in the implementation of fish passage restoration work. These factors are not necessarily new to those exposed to fish passage restoration effort, but are documented here to provide context to the integrated planning process also shared.

6.1 Key Challenges

6.1.1 Responsibility and Accountability

There are a number of different proponents that may be involved in the maintenance and/or replacement of a stream crossing. If the road is either the responsibility of the provincial government (i.e. Forest Service Road or provincial highway), or permitted to another proponent in the form of a Road Permit, the owner or organization responsible for the road is usually the organization replacing the culvert, and at the least they should be involved in the planning and approval of the work. On non-status roads, the provincial government through FLNRO is ultimately responsible for the roads, and should be involved in any culvert replacement discussions. Other transportation related stream crossings such as rail lines are the responsibility of the related tenure holders.

Older culverts or stream crossings may not allow for fish passage, even though they were built to the "standards of the day". If not specifically to address fish passage through an alternate funding source, culverts generally do not get replaced unless there are other safety, engineering or hydrologic reasons to replace them, e.g. that poses a safety, significant environmental risk or that access is or may be limited. Given this, if a stream crossing is considered "stable" then it may not be replaced for as long as is possible.

6.1.2 Funding for Culvert Replacements

Funding for culvert replacements is limited to a few programs and/or proponent types. In addition, many of these funding sources will not contribute to replacement of culverts on roads that are permitted to private entities, even though the culverts may not be slated for replacement (See discussion in Section 6.1.1 above). Given this, there are situations were significant habitat access could be secured through culvert replacement, some that may not require significant investment, that are not being assessed or considered given current road status and/or responsibilities.

6.1.3 Lack of Coordination/Reporting

When culverts are assessed and/or replaced, the related information is not necessarily tracked or reported to a central system or organization in support of a coordinated approach to fish passage restoration. If assessed and replaced through the provincial governments Fish Passage funding, or through related partnerships, reporting to PSCIS is required and supports coordinated tracking of these crossings. If independent of this program, the information is not reported to a central repository in support of integrated planning.

6.1.4 Prohibitive Costs

There are stream crossing where the costs of crossing replacements are very significant (i.e. hundreds of thousands of dollars or more). An example of this is culverts that are placed at the bottom of a ravine or gully and then topped with a significant amount of fill. These sites are a specific challenge when it comes to fish passage restoration. In addition, stream crossings associated with larger transportation corridors such as provincial highways or rail lines generally pose a greater challenge to replace for the restoration of fish passage.

6.2 Opportunities

6.2.1 Treatment Options

Although fish passage restoration is widely seen as a "culvert replacement" treatment, there are also opportunities to implement other solutions that may not be as costly. Although the viability of such treatments is site specific (culvert size, stream gradient, outflow conditions, fish species, etc.), there is opportunities to baffle or "back-water" culverts in order to allow for fish passage. The ability of the resulting culvert and structures to pass enough water is a significant limitation to this

approach. Having said that, these solutions can allow for fish passage in situations where the site factors align and full culvert replacement may not be financially viable.

6.2.2 Major Projects

Significant investment is made by proponents of large land and resource development projects (i.e. mines, pipelines, etc.) as it pertains to compensation for habitat loss or degradation related to the project. To this end, investments can be made in projects that improve fish habitat, of which fish passage restoration may apply. Culvert replacements in the Nation River portion of the Williston study area have been facilitated through this mechanism. It represents a specific opportunity that drives both a business need for fish habitat restoration, and represents an alternate funding source for the works.

6.2.3 Information Management

The FPTWG of FLNRO has made significant headway in the management of information pertaining to culverts and fish passage. A further integration of this with other road permitting, road use/maintenance and culvert replacement information, regardless of proponent, would result in a number of benefits including

- better support for a holistic approach to fish passage restoration,
- better realized benefits of coordinated and integrated planning
- efficient means to identify and prioritize individual sites, align funding opportunities with needs on the ground, and remove sites from the candidate list if addressed

An opportunity may exist in the near term to dovetail this opportunity with the current implementation of the Natural Resource Road Act, as significant investments are being made in the road and access related spatial and attribute information in support of the Natural Resource Road Act.

6.3 Integrated Fish Passage Planning

In response to the *Key Challenges* regarding fish passage (Section 6.1) and in support of *Opportunities* that exist (Section 6.2) an integrated approach to fish passage planning and restoration is recommended.

Based on conversations and interviews of a series of different stakeholders, agency staff and First Nations, the following approach is proposed for the implementation of an integrated fish passage planning process. The process is considered "integrated" when it combines a current understanding of fish, fish habitat and fish barriers with the full range of stakeholders' values, interests and limitations in order to identify priorities for fish passage restoration. In this case "stakeholders" include governments, First Nations, funding agencies, industry, NGOs and other interested parties.

The objective of the process is to be "value-focused" – in that it focuses on fish and fish habitat and where the greatest benefit to this value can be realized. This does not mean that the process ignores the administrative realities of who is responsible for a given road and what projects may or may not be fundable from one funding agency or another, but it focuses first on fish and fish habitat benefit and then examines ways to partner for the benefit of this value.

6.3.1 Overall Approach

The following steps should be used in the implementation of this process

1. **Terms of Reference** – A terms of reference should document the project area being considered for planning and prioritization, the key stakeholder groups, engagement strategy for each group and the timeline for the completion of the planning work. The engagement strategy should just identify whom and how the different stakeholder will be engaged to contribute to the planning of fish passage within the study area.
2. **Gather Current Information** – Existing information on roads, streams, crossings, and fish and fish habitat should be secured, along with other information that could be used to prioritize one watershed over another across the study area. The FPTWG should be recognized as a key partner in securing this information, given their current systems and tools.
3. **Engage with Stakeholders** – In light of the information gathered in #2 above, engage with stakeholders to understand their perspectives, priorities and other information that may be relevant to the fish passage planning process (See Section 6.3.2).
4. **Identify Unique Opportunities** – Study areas will have unique opportunities that will be related to the landbase, current or proposed industrial activities, the nature of stakeholder or funding agencies within the area, etc. When considering fish passage within a given area, consideration should be given to these unique conditions that could support restoration.

5. **Develop Strategy** – Prioritization of the study area should then be completed based on a combination of the known info (#2 above) and engagement with stakeholder (#3 above). The plan will provide strategic level guidance to where future fish passage assessments and restoration should focus within the study area. The plan may also flag specific sites deemed important to certain stakeholders.

6.3.2 Stakeholder Engagement

Key stakeholders in fish passage planning for any geography will generally include the following groups

- **FLNRO - Natural Resource District – Stewardship and Engineering** - to provide context and history to roads, crossings and fish values within the district.
- **FLNRO – Regional Staff – Engineering and Aquatic/Ecosystems** – to provide context, history and identification of problem crossing sites that are being considered or are slated for replacement. Specific engagement surrounding Forest Service Roads.
- **FLNRO Resource Practices Branch – Fish Passage Technical Working Group** – to provide context, spatial data, assessment processes/standards, and overall support in fish passage restoration planning. The FPTWG is a possible funding source/partner through the provincial Landbase Investment Program. Given their investment and focus around this topic, the FPTWG should be considered a key component of any fish passage related work in the province.
- **First Nations** – Key to a values focused approach to fish passage planning, and in respect to the rights and title held by First Nations, engagement of each of the First Nations with traditional territory within the study area will allow for an understanding of key watersheds or areas of concern or interest. In addition, they may also be able to provide context in the form of historic fish and fish habitat values and traditional use that can contribute to watershed prioritization.
- **Road Permit Holders** – The engagement of road permit holders should be included in the process to 1) ensure their awareness of the planning process, 2) identify any specific areas or sites of interest or concern for them and 3) identify possible partnership opportunities should priorities align with their responsibilities. Road Permit holders will include the forest industry, BC Timber Sales, other natural resource sectors and other road permit holders.
- **Major Project Proponents** – Industry (or government) that is involved in major projects within or adjacent to the study area, as they may be required to engage in mitigation or compensation related activities. Such proponents may specifically benefit from an integrated planning process that provides due diligence around watershed priority, site selection and stakeholder engagement. Major projects may be governmental or private and could include mines, pipelines, hydro-electric development, transmission lines, roads/highways, etc.
- **Funding Partners** – In addition to the stakeholders outlined above, that may be possible funding partners, additional funding agencies should also be included in the discussions and planning, including but not limited to
    - BC Hydro funded Fish and Wildlife Compensation Program
    - Habitat Conservation Trust Fund

6.3.3 Identification of Sites and Responsibility

Following the development of an integrated plan for fish passage within a broader area, assessments should be completed for the prioritized watershed(s).[15] It is recommended that these assessments follow the processes and procedures identified by the FPTWG[16] - the assessment process designed by the FPTWG captures both the confirmation (or not) of fish passage as well as the potential habitat gain that could be realized through restoring of fish passage. It is important that a holistic approach is maintained during the assessment, capturing information for all stream crossings, regardless of status or proponent.

[15] SERNbc is aware of the crossing/culvert assessment project that has been funded by the Peace Fish and Wildlife Compensation Program within the Willison study area. Some of the areas identified within that project are consistent with the watersheds prioritized within this project. Coordination between these two related initiatives is occurring.

[16] Fish Passage Technical Working Group: https://www.for.gov.bc.ca/hcp/fia/landbase/standards/fishpassage.htm

Following the confirmation of a site as a fish blockage, and the confirmation of potential habitat gain, a key step is the confirmation of road status, and specifically the responsibility for the crossing. Current road tenure information (company name) is available online through the BC Provincial Governments "Mapview" system.[17] This information can then be confirmed through contact with the proponent and/or with district staff to confirm responsibility for the road.

As the Natural Resource Road Act continues to be implemented in BC in the coming years, there may also be changes to how road permitting, maintenance responsibility and the tracking and reporting of that information is coordinated and available for us in support of fish passage restoration.

7 Recommendations

The following recommendations are made, following the completion of this planning project:

1. **Fish Passage Assessment in Priority Areas** - Move to secure funding for the assessment and identification of fish passage priorities within the "higher priority" watersheds and basins within the study area. It should be expected that jointly funded projects will be required to move this recommendation forward. This effort should include
    a. Approaching key funding agencies to support the assessment of one of the priority watersheds
    b. Approach major project proponents of current projects (e.g. mining) and future projects (e.g. pipeline) for possible partnerships
    c. Following assessment, develop a "value-focused" plan for restoration within the watershed that could be actioned further through funding partnerships (partners to be aligned based on eligibility limitations).
2. **Fish Passage Planning in remainder of the Omineca Region –** In support of ongoing SERNbc support for fish passage assessment and restoration, it is recommended that the strategic level planning exercise carried out in the Williston Study Area be expanded to include the rest of the Omineca Region (the geographic scope of SERNbc). SERNbc has a unique opportunity to work with a range of funding partners and stakeholders to further fish passage restoration across the landscape.
3. **Ongoing First Nations Engagement** – Ongoing discussions with First Nations should be used to expand on the areas of priority that First Nations and their communities may be interested in.
4. **Expand Prioritization Indicators** – Through stakeholder conversations, it became clear that there may also be an opportunity to incorporate a measure of "watershed sensitivity" into the identification/prioritization of watersheds (not possible to secure and incorporate at the time of this reporting). The provincial government has developed a model that it currently uses to identify candidates for Fisheries Sensitive Watersheds designation. The same watersheds could be considered priority for fish passage assessments/restoration.
5. **Coordinated Tracking of Crossings** – Work should be undertaken to integrate information regarding crossings on fish streams. Opportunity may exist to support this level of coordination with the imminent implementation of the Natural Resources Road Act in B.C. See discussions regarding "Opportunities" above. This initiative would need to be driven by or supported significantly by the BC provincial government and specifically FLNRO.

8 Acknowledgements

SERNbc would like to acknowledge to funding partners in this project, including

- BC Hydro Peace Fish and Wildlife Compensation Program
- BC Provincial Government - Landbase Investment – Fish Passage Technical Working Group

[17] https://webmaps.gov.bc.ca/imfs/imf.jsp?site=mapview

Appendix A – Watershed and Basin Priority Rationale – All Units

Table 3 and 4 display the indicators that were present (designated with a "Y") for given watershed or basin units and the resulting "Priority" for fish passage restoration planning.

Table 3. Watershed Priority and Rationale

Watershed	Priority	Indicator #1[18]	Indicator #2	Indicator #3	Indicator #4
Ingenika River	Higher	Y	N	Y	Y
Nation River	Higher	Y	Y	Y	Y
Finlay River	Higher	Y	N	Y	Y
Parsnip River	Higher	Y	Y	Y	
Omineca River	Higher	Y	Y	Y	
Mesilinka River	Higher	Y	Y	Y	
Osilinka River	Higher	Y	Y	Y	
Fox River	Moderate	Y	N	N	
Manson River	Moderate	Y	N	Y	
Klawli River	Moderate	Y	N	Y	
Pack River	Moderate	Y	N	Y	
Ospika River	Moderate	Y	N	N	Y
Carbon Creek	Moderate	Y	N	N	
Nabesche River	Moderate	Y	N	N	
Firesteel River	Moderate	Y	N	N	Y
McCook River	Moderate	Y	N	N	
Akie River	Moderate	Y	N	N	
Attichika Creek	Moderate	Y	N	N	
Kwadacha River	Moderate	Y	N	N	
Pesika Creek	Moderate	N	N	N	Y
McLeod River	Moderate	Y	N	Y	
Weissener Creek	Moderate	Y	N	N	
Toodoggone River	Moderate	Y	N	N	
Crooked River	Moderate	Y	N	Y	
Thudaka Creek	Lower	N	N	N	

[18] Indicator #1 - Number of culverts on known or inferred fish streams
Indicator #2 - Number of culverts on known or inferred fish streams where Bull Trout has been confirmed
Indicator #3 - Potential habitat gain
Indicator #4 - First Nations identified sites or drainages

Table 4. Basin Priority with Rationale

Basin	Priority	Indicator #Y	Indicator #2	Indicator #3	Indicator #4
Tenakihi Creek	Higher	Y	Y	Y	
Munro Creek	Higher	Y	Y	Y	
Swannell River	Higher	N	Y	Y	Y
Sylvester Creek	Moderate	Y	N	Y	
Tacheeda Creek	Moderate	Y	N	Y	
Lay Creek	Moderate	Y	N	Y	
Ominicetla Creek	Moderate	N	Y	Y	
Wolverine Creek	Moderate	Y	N	N	
Chuchinka Creek	Moderate	Y	N	Y	
Moosmoos Creek	Moderate	Y	N	Y	
Ahdatay Creek	Moderate	N	N	Y	
Lignite Creek	Moderate	N	N	Y	
Anzac River	Moderate	N	N	Y	
Eklund Creek	Moderate	N	N	Y	
Isadore Creek	Moderate	Y	N	Y	
Ivor Creek	Moderate	Y	N	Y	
Clearwater Creek	Moderate	Y	N	Y	
Isola Creek	Moderate	Y	N	Y	
Frank Creek	Moderate	Y	N	N	
Gagnon Creek	Moderate	Y	N	Y	
Gataiga Creek	Moderate	Y	N	Y	
Blackwater Creek	Moderate	Y	N	Y	
Chichouyenily Creek	Moderate	Y	N	Y	
Kwanika Creek	Moderate	Y	N	Y	
Hammett Creek	Moderate	Y	N	Y	
Morfee Creek	Moderate	Y	N	N	
Lafferty Creek	Moderate	N	N	N	Y
Dastaiga Creek	Moderate	N	N	Y	
Strandberg Creek	Moderate	Y	N	Y	
Mugaha Creek	Moderate	N	N	Y	
Muskeg River	Moderate	Y	N	N	
Buth Creek	Moderate	Y	N	N	
Collins Creek	Moderate	N	N	Y	
Factor Ross Creek	Moderate	N	N	Y	
Gravel Hill Creek	Moderate	Y	N	N	
Pete Toy Creek	Moderate	Y	N	N	
Des Creek	Moderate	Y	N	Y	

Basin	Priority	Indicator #Y	Indicator #2	Indicator #3	Indicator #4
Dunlevy Creek	Moderate	N	N	Y	
McDougall River	Moderate	Y	N	Y	
Table Creek	Moderate	Y	N	N	
Police Creek	Moderate	Y	N	Y	
Scovil Creek	Moderate	Y	N	Y	
Teare Creek	Moderate	Y	N	N	
Ole Creek	Moderate	N	N	Y	
Squawkbird Creek	Moderate	Y	N	N	
West Nabesche River	Moderate	N	Y	N	
Weston Creek	Moderate	N	Y	N	
Point Creek	Moderate	Y	Y	N	
Whiskers Creek	Moderate	Y	N	Y	
Wichcika Creek	Moderate	Y	N	Y	
Tsedeka Creek	Moderate	N	N	Y	
Mischinsinlika Creek	Moderate	Y	N	Y	
Seven Mile Creek	Moderate	N	N	Y	
Ah Lock Creek	Moderate	Y	N	N	
Altezega Creek	Moderate	Y	N	Y	
Br?l?reek	Moderate	Y	N	Y	
Iroquois Creek	Moderate	Y	N	N	
Angusmac Creek	Moderate	Y	N	Y	
Little Gaffney Creek	Moderate	Y	N	Y	
Beaverpond Creek	Moderate	N	N	Y	
Estella Creek	Moderate	Y	N	Y	
Kazchek Creek	Moderate	Y	N	N	
Kelly Creek	Moderate	Y	N	N	
Kenny Creek	Moderate	N	N	Y	
Gaffney Creek	Moderate	Y	N	Y	
Klawdetelle Creek	Moderate	N	N	Y	
Germansen River	Moderate	Y	N	Y	
Gillis Creek	Moderate	Y	N	Y	
Moffatt Creek	Moderate	Y	N	Y	
Harrison Creek	Moderate	Y	N	N	
Jock Creek	Moderate	Y	N	Y	
Kemess Creek	Moderate	Y	N	Y	
McConnell Creek	Moderate	Y	N	N	
Caine Creek	Moderate	Y	N	Y	
Eleven Mile Creek	Moderate	Y	N	Y	
August Creek	Moderate	Y	N	N	

Basin	Priority	Indicator #Y	Indicator #2	Indicator #3	Indicator #4
Bonnington Creek	Moderate	N	N	Y	
Emerslund Creek	Moderate	Y	N	Y	
Goodasany Creek	Moderate	Y	N	Y	
Colbourne Creek	Moderate	N	N	Y	
Fall River	Moderate	Y	N	Y	
Granite Creek	Moderate	Y	N	N	
Antoine Louis Creek	Moderate	Y	N	Y	
Attycelley Creek	Moderate	N	N	Y	
Carcajou Creek	Moderate	N	N	Y	
Firth Creek	Moderate	Y	N	N	
Fish Creek	Moderate	Y	N	Y	
Flood Creek	Moderate	N	N	Y	
Blanchard Creek	Moderate	N	N	Y	
Suschona Creek	Moderate	N	N	Y	
Moosehorn Creek	Moderate	Y	N	Y	
Nina Creek	Moderate	N	N	Y	
Deserters Creek	Moderate	Y	N	N	
Destilida Creek	Moderate	N	N	Y	
Humphrey Creek	Moderate	Y	N	N	
Ten Mile Creek	Moderate	Y	N	N	
Del Creek	Moderate	N	N	Y	
Duckling Creek	Moderate	N	N	Y	
Redrocky Creek	Moderate	Y	N	Y	
Reed Creek	Moderate	Y	N	Y	
Table River	Moderate	Y	N	Y	
Plughat Creek	Moderate	Y	N	Y	
Discovery Creek	Moderate	Y	N	Y	
Holder Creek	Moderate	Y	N	Y	
O'Dell Creek	Moderate	Y	N	Y	
Ogden Creek	Moderate	Y	N	Y	
Teegee Creek	Moderate	Y	N	N	
Reynolds Creek	Moderate	N	Y	Y	
Wasi Creek	Moderate	Y	N	Y	
Stelkuz Creek	Moderate	N	N	Y	
Sturdee River	Moderate	N	N	Y	
Paul River	Moderate	N	Y	Y	
McGraw Creek	Moderate	N	N	Y	
Weedon Creek	Moderate	Y	N	Y	
Silver Creek	Moderate	N	N	Y	

Basin	Priority	Indicator #Y	Indicator #2	Indicator #3	Indicator #4
South Germansen River	Moderate	Y	N	Y	
Robinson Creek	Moderate	Y	N	Y	
Prospector Creek	Moderate	N	Y	N	
Trappers Creek	Moderate	Y	N	N	
Treb Creek	Moderate	Y	N	N	
Slate Creek	Moderate	Y	N	N	
Menard Creek	Moderate	Y	N	Y	
Wittsichica Creek	Moderate	Y	N	Y	
Rainbow Creek	Moderate	Y	N	Y	
Rolston Creek	Moderate	Y	N	N	
Tsatchuka Creek	Moderate	Y	N	Y	
Misinchinka River	Moderate	Y	N	Y	
Missinka River	Moderate	Y	N	Y	
Tutizika River	Moderate	N	N	Y	
Ravenal Creek	Moderate	Y	N	Y	
Russel Creek	Moderate	N	N	Y	
Thorne Creek	Moderate	Y	N	Y	
Tsaydiz Creek	Moderate	N	N	Y	
Haha Creek	Moderate	Y	N	Y	
Halobia Creek	Moderate	N	N	Y	
West Kwanika Creek	Moderate	Y	N	Y	
Little Discovery Creek	Moderate	Y	N	N	
Dors'at Creek	Moderate	N	N	Y	
Fern Creek	Moderate	Y	N	Y	
Lincoln Creek	Moderate	Y	N	Y	
Philip Creek	Moderate	Y	N	Y	
Bral Creek	Moderate	Y	N	N	
Caribou Creek	Moderate	Y	N	N	
Copas Creek	Moderate	Y	N	N	
Enquist Creek	Moderate	Y	N	Y	
Erickson Creek	Moderate	Y	N	N	
Northwest Creek	Moderate	Y	N	N	
Echo Creek	Moderate	Y	N	Y	
Echo Creek	Moderate	Y	N	Y	
Dog Creek	Moderate	N	N	Y	
Copper Creek	Moderate	Y	N	Y	
Ciarelli Creek	Moderate	Y	N	N	
Dunne Creek	Moderate	N	N	Y	

Basin	Priority	Indicator #Y	Indicator #2	Indicator #3	Indicator #4
Flegel Creek	Moderate	Y	N	N	
Bills Creek	Moderate	Y	N	Y	
West Kemess Creek	Moderate	Y	N	N	
East Kemess Creek	Moderate	Y	N	Y	
South Kemess Creek	Moderate	Y	N	N	
Attorney Creek	Moderate	Y	N	N	
Notary Creek	Moderate	Y	N	N	
Canty Creek	Moderate	Y	N	N	
JensenCreek	Moderate	Y	N	N	
Kliyul Creek	Lower	N	N	N	
Detni Creek	Lower	N	N	N	
Thane Creek	Lower	N	N	N	
Dedeeya Creek	Lower	N	N	N	
Joe Poole Creek	Lower	N	N	N	
Adams Creek	Lower	N	N	N	
Bob Fry Creek	Lower	N	N	N	
Andy Creek	Lower	N	N	N	
Bruin Creek	Lower	N	N	N	
Bernard Creek	Lower	N	N	N	
Bevel Creek	Lower	N	N	N	
Fries Creek	Lower	N	N	N	
Chowika Creek	Lower	N	N	N	
Chunamon Creek	Lower	N	N	N	
Cust Creek	Lower	N	N	N	
Cut Thumb Creek	Lower	N	N	N	
Hamlyn Creek	Lower	N	N	N	
Lamonti Creek	Lower	N	N	N	
Stott Creek	Lower	N	N	N	
Davis River	Lower	N	N	N	
Aylard Creek	Lower	N	N	N	
Lorimer Creek	Lower	N	N	N	
Lost Cabin Creek	Lower	N	N	N	
Colin Creek	Lower	N	N	N	
Suschua Creek	Lower	N	N	N	
Ducette Creek	Lower	N	N	N	
Pardonet Creek	Lower	N	N	N	
Schooler Creek	Lower	N	N	N	
Scott Creek	Lower	N	N	N	
Selwyn Creek	Lower	N	N	N	

Basin	Priority	Indicator #Y	Indicator #2	Indicator #3	Indicator #4
Weasel Creek	Lower	N	N	N	
Shovel Creek	Lower	N	N	N	
Tony Creek	Lower	N	N	N	
Six Mile Creek	Lower	N	N	N	
Rottacker Creek	Lower	N	N	N	
Wicked River	Lower	N	N	N	
Mica Creek	Lower	N	N	N	
Valleau Creek	Lower	N	N	N	
Tutu Creek	Lower	N	N	N	
Twenty Mile Creek	Lower	N	N	N	
Ursula Creek	Lower	N	N	N	
Cache Creek	Lower	N	N	N	
Boulder Creek	Lower	N	N	N	
Braathen Creek	Lower	N	N	N	
Albert Creek	Lower	N	N	N	
Ignatieff Creek	Lower	N	N	N	
Aley Creek	Lower	N	N	N	
Imperial Creek	Lower	N	N	N	
Beattie Creek	Lower	N	N	N	
Ed Bird Creek	Lower	N	N	N	
Etschitka Creek	Lower	N	N	N	
Jack Lee Creek	Lower	N	N	N	
Jellicoe Creek	Lower	N	N	N	
Groundhog Creek	Lower	N	N	N	
Macoun Creek	Lower	N	N	N	
Cowart Creek	Lower	N	N	N	
Kimta Creek	Lower	N	N	N	
Bijoux Creek	Lower	N	N	N	
Gauvreau Creek	Lower	N	N	N	
Mariposite Creek	Lower	N	N	N	
Chuyazega Creek	Lower	N	N	N	
Matetlo Creek	Lower	N	N	N	
Stack Creek	Lower	N	N	N	
Steele Creek	Lower	N	N	N	
Peck Creek	Lower	N	N	N	
McAllister Creek	Lower	N	N	N	
Belle Creek	Lower	N	N	N	
Chappelle Creek	Lower	N	N	N	
Chesterfield Creek	Lower	N	N	N	

Basin	Priority	Indicator #Y	Indicator #2	Indicator #3	Indicator #4
Ferriston Creek	Lower	N	N	N	
Flameau Creek	Lower	N	N	N	
Fumar Creek	Lower	N	N	N	
Jim May Creek	Lower	N	N	N	
Kadah Creek	Lower	N	N	N	
Katharine Creek	Lower	N	N	N	
McClair Creek	Lower	N	N	N	
Izaac Creek	Lower	N	N	N	
Jackfish Creek	Lower	N	N	N	
Atunatche Creek	Lower	N	N	N	
Jean Marie Creek	Lower	N	N	N	
Gopherhole Creek	Lower	N	N	N	
Balden Creek	Lower	N	N	N	
Evans Creek	Lower	N	N	N	
Fast Creek	Lower	N	N	N	
Abraham Creek	Lower	N	N	N	
Bower Creek	Lower	N	N	N	
Bowerheney Creek	Lower	N	N	N	
Bronlund Creek	Lower	N	N	N	
Carruthers Creek	Lower	N	N	N	
Folded Hill Creek	Lower	N	N	N	
Croydon Creek	Lower	N	N	N	
Cutbank Creek	Lower	N	N	N	
Cutoff Creek	Lower	N	N	N	
Genlyd Creek	Lower	N	N	N	
LaForce Creek	Lower	N	N	N	
Denkman Creek	Lower	N	N	N	
Moccasin Creek	Lower	N	N	N	
Pelly Creek	Lower	N	N	N	
Stalk Creek	Lower	N	N	N	
Hodda Creek	Lower	N	N	N	
Dream Creek	Lower	N	N	N	
Dresser Creek	Lower	N	N	N	
Delta Creek	Lower	N	N	N	
Haworth Creek	Lower	N	N	N	
Hiamadam Creek	Lower	N	N	N	
Patsuk Creek	Lower	N	N	N	
McCusker Creek	Lower	N	N	N	
North Anzac River	Lower	N	N	N	

Basin	Priority	Indicator #Y	Indicator #2	Indicator #3	Indicator #4
Didche Creek	Lower	N	N	N	
Hominka River	Lower	N	N	N	
Honeymoon Creek	Lower	N	N	N	
Hook Creek	Lower	N	N	N	
Old Friend Creek	Lower	N	N	N	
Olsen Creek	Lower	N	N	N	
Lawyers Creek	Lower	N	N	N	
Mulvaney Creek	Lower	N	N	N	
Niven River	Lower	N	N	N	
North Kwadacha River	Lower	N	N	N	
Obo River	Lower	N	N	N	
Saunders Creek	Lower	N	N	N	
Tabletop Creek	Lower	N	N	N	
Hoy Creek	Lower	N	N	N	
Pau Creek	Lower	N	N	N	
Hornway Creek	Lower	N	N	N	
Orion Creek	Lower	N	N	N	
Pilot Creek	Lower	N	N	N	
Polaris Creek	Lower	N	N	N	
Tom Creek	Lower	N	N	N	
Wheel Creek	Lower	N	N	N	
Rubyred Creek	Lower	N	N	N	
Quartzite Creek	Lower	N	N	N	
Vital Creek	Lower	N	N	N	
Tsaydaychi Creek	Lower	N	N	N	
Wooyadilinka Creek	Lower	N	N	N	
Yahwa Creek	Lower	N	N	N	
Twin Creek	Lower	N	N	N	
Yuen Creek	Lower	N	N	N	
Rognaas Creek	Lower	N	N	N	
Klakring Creek	Lower	N	N	N	
Zygadene Creek	Lower	N	N	N	
Spinel Creek	Lower	N	N	N	
Wrede Creek	Lower	N	N	N	
Thutade Creek	Lower	N	N	N	
Truncate Creek	Lower	N	N	N	
Trygve Creek	Lower	N	N	N	
Tucha Creek	Lower	N	N	N	
Vega Creek	Lower	N	N	N	

Basin	Priority	Indicator #Y	Indicator #2	Indicator #3	Indicator #4
Crocker Creek	Lower	N	N	N	
Tseehee Creek	Lower	N	N	N	
Warneford River	Lower	N	N	N	
Stevenson Creek	Lower	N	N	N	
Cook Creek	Lower	N	N	N	
Wendy Creek	Lower	N	N	N	
3 Mile Creek	Lower	N	N	N	
Big Creek	Lower	N	N	N	
Goat Creek	Lower	N	N	N	
Porter Creek	Lower	N	N	N	
Paquette Creek	Lower	N	N	N	
West Dog Creek	Lower	N	N	N	
Chamberland Creek	Lower	N	N	N	
Connaghan Creek	Lower	N	N	N	
Dwyer, Creek	Lower	N	N	N	
Edmunds Creek	Lower	N	N	N	
Henschel Creek	Lower	N	N	N	
Porcupine Creek	Lower	N	N	N	
Grahame Creek	Lower	N	N	N	
Akieka Creek	Lower	N	N	N	
Fredrikson Creek	Lower	N	N	N	
Drybrough Creek	Lower	N	N	N	