Riparian and In-stream Assessment of the Bulkley River System

An Examination and Priorization of Impacts on the Tributaries to the Bulkley River Mainstem

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Abstract

Sixty eight tributaries to the Bulkley River were examined by topographic maps and air photo interpretation to assess the degree and nature of impacts on these stream by transportation and hydro-electric powerline corridors, and agriculture/grazing/municipal land use. Of these 68, twenty eight were recognized as having high to severe degree of impacts on high value fish habitat. The remainder were of moderate to low concern. The most significant source of impacts to these streams is identified as agricultural/rangeland and municipal land-use. An "impact corridor" through the length of the Bulkley River valley is identified. The management implications of these impacts are discussed and future work and research is recommended. Sampling of many of the streams to determine fish species present and distributions is the single most significant recommended action.

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1.0 Introduction

The Bulkley River is approximately 200 km in length between Bulkley Lake and the northern boundary of the Bulkley Forest District. In this distance are 68 tributaries accounting for approximately 525 km of high value fish habitat (estimate based on gradient of streams). The Bulkley watershed is an important salmon and steelhead system, but also contains other significant species including trout (*Oncorhyncus* spp.) and char (*Salvelinus* spp.), whitefish (*Prosopium* spp.) and numerous other taxa (cyprinids, cottids, etc.).

In the past the effects of forest activities on stream hydrology and ecosystems has been of primary concern, with other impacts such as transportation corridors and agriculture/rangeland receiving less attention. However, the effects of these land uses on the streams draining these areas are receiving greater attention. As such, an overview of the tributaries to the Bulkley River between Bulkley Lake and Boulder Creek was conducted to assess the impacts of agriculture/livestock, residential/municipal development, transportation corridors, and hydro-electric powerline crossings on the small streams.

2.0 Background

Riparian vegetation provides several functions to stream; the modification of microclimate, alteration of nutrient inputs from hillslopes, contribution of organic matter to streams and floodplains, and retention of inputs (Gregory et al 1991). Riparian plant communities provide an abundant diverse array of food resources, and much of the food base to streams; from 66% (Nelson and Scott 1962) to 99% (Fisher and Likens 1973) of the energy input to stream ecosystems is from allochthonous (terrestrial derived) organic material. In addition, riparian vegetation strongly influences in-stream primary productivity through attenuation of light energy (Minshall 1978).

The relative importance of allochthonous and autochthonous (originating in-stream) energy sources is one of the primary determinants of stream structure and function (Murphy et al 1981), with a large proportion of invertebrate communities in temperate streams having evolved life cycles synchronized to the autumnal input of tree leaves (Petersen and Cummins 1974). Input of terrestrial invertebrates is also an important energy contribution, accounting for 5-10% by weight of litter into some streams, and occurring principally in spring and summer when input of plant material is low (Mason and Macdonald 1982). It has been reported that removal of this streamside vegetation [through logging] alters the source of leaves and wood to streams, shifting the composition of this matter for 50-80 years (Gregory et al 1987).

Land use activities involving riparian areas and stream crossings in the Bulkley River valley may have significant impacts on aquatic ecosystems. Consequent effects of these impacts on stream ecology (and ultimately resident fishes) include, but are not limited to:

1) Agriculture/livestock clearing of land (i.e. lack of or insufficient buffer strip):
   * Altered temperature regime; increased stream temperature in summer and decreased in winter, altering timing of development (fish & aquatic insects) and life cycles (aquatic insects).
   * Reduced large woody debris recruitment to streams for cover, stream bed stability and channel heterogeneity.
   * Reduced terrestrial energy inputs of insects and leaf litter (Autumn) affecting stream ecology.
   * Shift in stream energy source from heterotrophic production (reliant on outside influence) to autotrophic (reliant on in-stream primary production).
   * Reduced bank stability leading to greater bank erosion, sediment transport, and siltation.
   * Nutrient loading from runoff rich in nitrogen, phosphorous and trace elements.

2) Municipal/residential/urban proximity:
   * Land clearing with all of the effects listed above, plus
   * Contaminated runoff from streets, sewers, etc.
   * Domestic dumping of refuse.
   * Water withdrawals.

3) Transportation corridors (railways, highways, secondary arteries)
   * Localized effects of altered temperature regime.
   * Contaminated surface runoff from road surfaces.
   * Sedimentation from road surfaces.
   * Constriction of flow (culverts, etc.).
   * Channelization of stream.

4) Hydro-electric powerline crossings
   * Localized effects of altered temperature regime.
   * Compaction of stream-bed at un-bridged crossings through creek, disturbance downstream from sediment transport as vehicles cross stream.
   * Increased runoff from right-of-way, possibly contaminated (herbicides, pesticides).

These impacts obviously affect not only fish present but also the channel morphology, stream physical and chemical conditions, and the biotic system from the base (primary production) to the top carnivores (trout, salmon). For these reasons, an assessment of riparian conditions and localized stream crossings is important.

3.0 Methods

The 68 tributaries (excluding the Telkwa and Morice rivers) to the Bulkley River between Bulkley Lake and Boulder Creek were examined at 1:50,000 scale topographic maps to determine impacts (rail, power-line, highway and secondary road crossings) and to rank stream reaches by gradient for fish habitat (<8% grade high value, 8-12% moderate value, >12% low value). Records of fish observations (e.g. Hancock 1983, FHIP 1991, AGRA 1996, and local knowledge) were examined in order to establish known presence of species in each tributary. Maps of rangeland/grazing leases were examined to determine locations where these land uses may impact the streams. Air photos (1990-1996, see Table 1) were examined to determine extent and nature of impact and potential future impacts.

Stream summaries were developed for those streams which had obvious impacts (see Appendix 1) detailing existing impacts and potential effects of these impacts. Amount of habitat available, amount impacted, and fish species present are also outlined.

From this analysis, three maps were drawn up:

1) Fish presence and habitat map: Indicating areas of high medium and low 'quality' areas for fish (Figure 1).
2) Impact map: Streams were color coded according to the number and extent of impacts on them (Figure 2).
3) Priority map: Combined the fish habitat map and the impact map (Figure 3).

Prior to constructing the impact map, streams were ranked according to priority on a scale of 1-6. The divisions, though arbitrary, were based on:

Priority 1: *Severe Degradation*: Multiple impacts, obvious impacts on air-photos, large extent (in area) of streamside affected, primarily by non-point sources. Most of available habitat impacted. Important fish species known to be present. High potential for fish habitat. Close proximity to a town for recreational/educational value.

Priority 2: *High Priority*: Same requirements as Priority 1 except less proportion of available habitat impacted.

Priority 3: *Moderate-High Priority*: Fewer impacts than Priorities 1 and 2, lesser extent (area and proportion of available habitat) of impact, generally point sources rather than non-point sources

Priority 4: *Moderate Priority*: Similar to priority 3 but with less habitat or few fish species present.

Priority 5: *Low-Moderate Priority*: Few localized point impacts, small length of available habitat

Priority 6: *Low Priority*: One or two impacts only, isolated and small scale. Fish not known to be present and habitat unlikely to maintain large populations of salmonid or other regionally significant species.

These priorities are guidelines only, some streams could be placed in different priority (upgraded or downgraded) as additional information comes available.

4.0 Assessment of Streams

Sixty eight streams were assessed between Bulkley Lake and the northern boundary of the Bulkley Forest District (Boulder Creek). These streams were prioritized by the number and degree of impacts, the length of potential fish habitat and the presence of significant (i.e. salmonid or regionally important) fish. These streams were prioritized as (see Tables 2 & 3):

Priority 1 - 5 streams (7.3% of streams)
Priority 2 - 24 streams (35% of streams)
Priority 3 - 9 streams (13.2% of streams)
Priority 4 - 9 streams (13.2% of streams)
Priority 5 - 4 streams (6% of streams)
Priority 6 - 17 streams (25% of streams)

Table 4 lists the fish species reported present in the Bulkley River watershed.

Extent of Impacts

Twenty eight (43%) of the streams are considered highly or severely degraded (Priorities 1 & 2). The most significant cause of this degradation is the clearing of land to stream edges (i.e. removal of riparian vegetation) for agriculture and livestock uses, and residential and municipal developments. The estimated 125 km of degraded habitat of these 28 streams accounts for approximately 24% of the total high quality fish habitat in the 68 streams (estimate approximately 525 km of high quality habitat). The 28 creeks in these highest two priorities have an estimated 290 km of high quality habitat, therefore 40-45% of the habitat of these 28 streams is highly to severely degraded.

The 18 stream ranked as priorities 3 and 4 (Tables 2 & 3) contribute a further 46 km of moderately degraded streams bringing the total up to approximately 170 km of 525 km (~32%) of habitat degraded to some extent.

Twenty one streams (31% of all the stream assessed) are classed as low priority. These streams have very few impacts or little habitat for supporting fish populations.

Nature of Impacts

In general, the areas impacted are the lower reaches of the streams, close to the Bulkley River (Figure 4) along an "Impact Corridor". Topographically, transportation corridors, powerlines and land use are confined to the Bulkley River valley, particularly in the lower areas of the Bulkley River (i.e. Moricetown). Transportation and powerline corridors cross tributary streams primarily in the lower 2 km of the stream in the confined area of the Bulkley River valley north of Telkwa and in the lower 4 km in the more open valley east of Telkwa. Land use activities are primarily in the lower 4-5 km. Above this point forest harvesting activities predominate.

The most severely degraded streams are those associated with urban areas (Smithers, Telkwa, Houston). These are (see Tables 2 & 3, Figure 3):

Buck Creek :
Municipal development - channelization, urban runoff, loss of riparian area.
Round Lake Creek:
Agriculture/livestock - nutrient loading, runoff, loss of riparian area
Kathlyn and Chicken Creeks:
Agriculture/municipal development - urban and rural runoff, nutrient loading, residential refuse dumping, loss of riparian area
Toboggan Creek:
Agriculture/livestock - runoff, loss of riparian areas, risk of terrain failure.

These impacts carry with them the effects outline in the Background.

An important distinction between the 28 high priority streams (Priorities 1 & 2) and the 18 moderate priority (Priorities 3 & 4) is the type of impact (see Table 3). The

high priority stream have primarily non-point source impacts such as land clearing. These impacts are over large areas without a single identifiable impact on the stream. In contrast, the moderate priority stream are primarily multiple point impacts (i.e. transportation and hydro-electric powerline crossings).

From a riparian perspective, these land use activities are of primary concern with the point impacts (transportation and powerline crossings) being of far less importance. For the reasons outlined in the Background, this loss of riparian habitat along private land, agriculture/livestock, and municipal/residential development is the primary 'stumbling block' to rehabilitating these impacted streams.

5.0 Management Implications

The identification of an Impact Corridor along the Bulkley River (Figure 4) suggests that management efforts be emphasizd along the lower reaches of the tributaries. Future emphasis should be directed at the 28 highest priority streams (Priorities 1 & 2, Table 2), with these streams being analyzed in detail. It is recommended that these streams now be assessed with the intent of determining what can be done for rehabilitation (see Section 6). Issues to be addressed include:

- ⇒ To what extent is each stream bordered by private land (and thus not under government jurisdiction)?
- ⇒ What is the potential habitat for each stream, what species are present and what is their distribution? - An in-depth inventory is required
- ⇒ The option of "writing a stream off" needs to be considered. For example, Round Lake Creek is severely degraded, of short length (and so little habitat), surrounded by private land, and of questionable historical value. Is this stream worth rehabilitating or are resources better spent on other streams?

Most of the greatest impact occurs on private land (residential, agriculture) or that under some form of government jurisdiction (municipalities, Band Council). Therefore, management to ensure stream restoration will require inter-governmental and private landowner co-operation.

6.0 Conclusions and Recommendations

The twenty eight identified streams are the most significantly impacted with the greatest potential for fish habitat to maintain wild populations of trout and salmon. Those streams nearest to urban centers are in the greatest need of detailed assessment and rehabiliatation. Areas of agriculture and rangeland are also having detrimental effects on stream conditions through the loss of riparian cover and its associated functions (i.e. shading, terrestrial energy sources, and bank stability). Further investigations and research (some recommendations follow) are required to adequately address rehabilitating these impacted streams and their ecology.

Recommended future actions to mitigate the impacts outlined in this document are (see also Table 5 and individual stream summaries in Appendix 1):

- On-site detailed assessment and prescriptions for all of the Priority 1 & 2 streams. The following streams are recommended for a detailed analysis (in order of priority):
  - Toboggan Creek system (including lower Owen, Elliot and Glacier Gulch creeks)
  - Kathlyn Creek system (including Chicken and lower Simpson creeks)
  - Buck Creek
  - Round Lake Creek
  - Canyon Creek
  - Driftwood Creek
  - Beavery Creek system
  - McDowell Creek
  - Corya Creek
  - Robin Creek
  - Richfield Creek
  - Byman Creek
  - Tyhee Lake Creek
  - All others of Priority 2

- Construction of 'Restoration Summaries' to identify the requirements, cost, approach, and expected results of a program to reduce the impact on each of the high priority streams.

- Riparian planting of trees and bushes along reaches presently denuded. This will require cooperation between landowners and municipalities, but would go a long way to improving the streams for fish.
- Armoring of channel at un-bridged crossings (i.e. powerline crossings)
- Mandatory buffer strips on land under government jurisdiction and along high profile areas

Recommended research activities include:

- Investigating the effects of lost riparian function on stream ecology, particularly the altered temperature regime, reduced terrestrial energy inputs and reduced large woody debris recruitment. This should be done with field studies and computer modelling.
- Determining the most appropriate species for riparian planting to restore riparian function
- Analysis of runoff from road surfaces and agricultural land to determine contaminants and nutrient levels entering the streams
- Value of creating greater quantity of habitat upstream of the impact. Will fish travel upstream and take up residence upstream of the impact?

7.0 Literature Cited

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Table 1: Flight lines used in air-photo interpretation of Bulkley River tributaries

Lakes Forest District (Maxan and Foxy creeks, Watson-Ailport system)

90098
96063
90098

Morice Forest District (Watson-Ailport system to Vallee and Thompson creeks)

94027
94032
94036
94046
94057
94062
94065
94072
94073

Bulkley Forest District (Vallee and Thompson creeks to Boulder Creek)

92027
92046
92069
92084
92086
92087
92090
92091
92093
92094
92099
92100
92103
92119
92135

Table 2: Priorities of Streams Tributary to the Bulkley River

Priority 1 (n=5)

Buck Creek
Round Lake Creek
Kathlyn Creek
Chicken Creek (Kathlyn Creek System)
Toboggan Creek

Priority 2 (n=23)

Maxan Creek	Tyhee Lake Creek
Watson Creek	Canyon Creek
Ailport Creek	Driftwood Creek
Cesford Creek	Maney Creek
Richfield Creek	Unnamed creek north of Maney Creek
Byman Creek	Owen Creek (Toboggan Creek system)
McQuarrie Creek	Elliot Creek (Toboggan Creek system)
Stock Creek	Glacier Gulch Creek (Toboggan Creek system)
Vallee Creek	Simpson Creek (Kathlyn Creek system)
Robin Creek	Corya Creek
Helps Creek	Atrill Creek
McDowell Creek	

Priority 3 (n=9)

Foxy Creek (Maxan Creek system)	Deep Creek
Unnamed creek north of Watson Creek	Coffin Lake Creek
Johnny David Creek	Thompson Creek
Barren Creek	Trout Creek
Unnamed creek south of Helps Creek	

Priority 4 (n=9)

Crow Creek	Seymour Lake Creek
Sunset-Elwin system	John Brown Creek
Unnamed creek northeast of McKilligan creek	Boulder Creek
Unnamed creek southwest of McKilligan Creek	Mathews Creek
Unnamed creek west of Barren Creek	

Priority 5 (n=4)

Unnamed creek between Emerson and Dockrill creeks
Edwards Creek
Unnamed creek north of Telkwa river
Gramaphone Creek

Table 2: Priorities of Streams Tributary to the Bulkley River (continued)

Priority 6 (n=18)	
Unnamed creek north of Crow Creek	Aitken Creek
Unnamed creek east of Aitken Creek	McKilligan Creek
Unnamed creek north of Houston	Emerson Creek
Unnamed creek south of Emerson Creek	Dockrill Creek
Unnamed creek south of Meed Creek	Newitt Creek
Beavery Creek system	Twin Creek
Casqua creek	Meed Creek
Unnamed creek south of Kwun Creek	Reiseter Creek
Unnamed creek north of Kwun Creek	Kwun Creek

Table 3: Nature and extent of impacts, and fish species present, of Bulkley River tributaries

Stream	Proportion of high value habitat impacted (estimated)	Principal Impact	Approx. length of Stream impacted (estimated)	Fish Species Present
PRIORITY 1				
Buck Creek	40%	Municipal/residential development NPS - land clearing	4 km	CO, PK, CH, ST RB, MW
Round Lake Creek	100%	NPS - land clearing agriculture/livestock	6.5 km	CT, RB
Kathlyn Creek	100%	Multiple NPS impacts municipal/residential/agriculture	7 km	CO, PK, ST, RB CT, MW, DV
Chicken Creek	100%	Multiple NPS impacts municipal/residential/agriculture	1 km	CO, PK, ST, CT DV, CC
Toboggan Creek	100%	Multiple NPS impacts agriculture/livestock	12 km	CO, PK, ST, CT RB, DV, MW
		TOTALS	30.5 km severely degraded habitat	8 species of concern

Stream	Proportion of high value habitat impacted (estimated)	Principal Impact	Approx. length of Stream impacted (estimated)	Fish Species Present
PRIORITY 2				
Maxan Creek	10-20%	NPS - land clearing	2 km	CO, CH, RB, DV
Watson Creek	33%	NPS - land clearing Powerline crossing	3 km	CO, RB, ST, DV
Ailport Creek	25%	NPS - land clearing	2 km	CO, RB, DV
Cesford Creek	33%	Powerline crossing NPS - land clearing	2.5 km	RB
Richfield Creek	50%	Powerline crossing NPS - land clearing	2-3 km	CO, CH, RB, ST
Byman Creek	30%	NPS - land clearing Powerline crossing	5 km	CO, CH, ST, RB

Table 3: Nature and extent of impacts, and fish species present, of Bulkley River tributaries (continued)

Stream	Proportion of high value habitat impacted (estimated)	Principal Impact	Approx. length of Stream impacted (estimated)	Fish Species Present
Priority 2 (continued)				
McQuarrie Creek	10%	NPS - land clearing Channelization	2 km	CO, ST, RB
Stock Creek	80%	NPS - land clearing	4 km	CT, RB
Vallee Creek	20%	NPS - land clearing	2 km	RB, CT
Robin Creek	100%	NPS - land clearing	5 km	Not available
Helps Creek	40%	Powerline crossing NPS - land clearing	2 km	CO, ST, CT
McDowell Creek	100%	NPS - land clearing	7 km	Not available
Tyhee Lake Creek	100%	NPS - land clearing agriculture/livestock	2 km	GPW
Canyon Creek	25%	NPS - land clearing residential development	11 km (approx.)	CO, PK, RB ST, DV
Driftwood Creek	55%	NPS - land clearing agriculture/livestock	13 km (approx.)	CO, CH, RB ST, DV
Maney Creek	85%	NPS - land clearing agriculture/livestock	3 km	Not available
Unnamed creek north of Maney Creek	60%	NPS - land clearing agriculture/livestock	2 km	Not available
Owen Creek	45%	Powerline crossing NPS - land clearing	2 km	CO?, PK?, ST?, DV?
Elliot Creek	100%	NPS - land clearing Powerline crossing	2 km	CO, DV
Glacier Gulch Creek	80%	Multiple point impacts	4 km	CO, ST, CT?, DV?
Simpson Creek	100%	Powerline crossing NPS - land clearing	2 km	CO, RB, CT, MW
Beavery Creek system	60%	Multiple point impacts NPS - land clearing	8 km	Not available
Corya Creek	30%	Multiple point impacts Residential development (Moricetown)	4.5 km	RB, DV
Atrill Creek	35%	Multiple point impacts	2 km (approx.)	RB, CT
		TOTALS	94.5 km (approx.) of highly degraded habitat	9 species of concern

Table 3: Nature and extent of impacts, and fish species present, of Bulkley River tributaries (continued)

Stream	Proportion of high value habitat impacted (estimated)	Principal Impact	Approx. length of Stream impacted (estimated)	Fish Species Present
PRIORITY 3				
Foxy Creek	<10%	Secondary road crossings	1 km	CH, RB, CO, DV, MW
Unnamed creek north of Watson Creek	<10%	Powerline crossing	<1 km	Not available
Johnny David Creek	30%	Multiple crossings NPS - land clearing	4 km	Not available
Barren Creek	30%	Multiple crossings NPS - land clearing	2 km	RB
Thompson Creek	80%	NPS - land clearing Powerline crossing	10.5 km	RB
Deep Creek	30%	NPS - land clearing	4.5 km	Not available
Coffin Lake Creek	40%	Powerline crossing	3 km	CT, RB, DV
Unnamed creek south of Helps Creek	50%	Multiple point impacts	2 km	Not available
Trout Creek	<10%	Multiple point impacts	<1 km	CO, PK, ST, CT
		TOTALS	29 km of degraded habitat	8 species present of concern

Stream	Proportion of high value habitat impacted (estimated)	Principal Impact	Approx. length of Stream impacted (estimated)	Fish Species Present
PRIORITY 4				
Crow Creek	<10%	Localized point impacts	1 km (approx.)	RB, CO
Sunset-Elwin system	<20%	Localized point impacts	1-2 km (approx.)	RB, MW
Unnamed creek northeast of McKilligan Creek	30%	Multiple localized point impacts	1.5 km	Not available
Unnamed creek southwest of McKilligan Creek	80%	Multiple localized point impacts	2 km	Not available

Table 3: Nature and extent of impacts, and fish species present, of Bulkley River tributaries (continued)

Stream	Proportion of high value habitat impacted (estimated)	Principal Impact	Approx. length of Stream impacted (estimated)	Fish Species Present
PRIORITY 4 (continued)				
Mathews Creek	100%	Localized point impacts	2.5 km	Not available
Seymour Lake Creek	100%	NPS - land clearing Residential development	2 km	Not available
John Brown Creek	20%	Multiple localized point impacts	2 km	CH, CT, RB, DV, CO
Boulder Creek	25%	Multiple localized point impacts	<1 km	RB, PK, DV
Unnamed creek west of Barren Creek	75%	Multiple localized point impacts	3 km	Not available
		TOTALS	16 km of moderately degraded habitat	7 species present of concern

Stream	Proportion of high value habitat impacted (estimated)	Principal Impact	Approx. length of Stream impacted (estimated)	Fish Species Present
PRIORITY 5				
Unnamed creek between Emerson and Dockrill Creeks	<20%	Few localized point impacts	0.5 km	Not available
Edwards Creek	20%	Few localized point impacts	0.2 km	Not available
Unnamed creek north of Telkwa River	10%	Few localized point impacts	<0.2 km	Not available
Gramaphone Creek	<10%	Secondary road crossing	<0.1 km	RB, CO?, DV?
		TOTALS	1 km of slightly degraded habitat	1-3 species present of concern

Table 4 Fish Species Reported in Bulkley River Tributaries

Common Name	Scientific Name	Code
Cutthroat trout	*Oncorhynchus clarkii* (formerly *Salmo*)	CT
Rainbow trout	*O. mykiss* (formerly *Salmo gairdneri*)	RB
Steelhead	*O. mykiss* (formerly *Salmo gairneri*)	ST
Coho salmon	*O. kisutch*	CO
Chinook salmon	*O. tshawytscha*	CH
Pink salmon	*O. gorbuscha*	PK
Sockeye salmon	*O. nerka*	SK
Kokanee	*O. nerka*	KO
Dolly varden	*Salvelinus malma*	DV
Mountain whitefish	*Prosopium williamsoni*	MW
Giant pygmy whitefish	*Prosopium sp.*	GPW
Longnose sucker	*Catastomus catastomus*	LSU
Sculpin (general)	*Cottus*	CC
Longnose dace	*Rhinichthys cataractae*	LNC
Prickly sculpin	*Cottus asper*	CAS
Pacific lamprey	*Lampetra tridentata*	PL

Table 5: Recommended Sampling of Bulkley River Tributaries

1) Detailed Sampling (fish presence, distribution in system, and on-site description of stream/system)

Robert Hatch Creek (tributary to Richfield Creek)
McDowell Creek
Atrill Creek
Beavery Creek system

2) General Sampling (fish presence and distribution only)

Robin Creek
Tyhee lake Creek

3) Overview Sampling (fish species presence only)

Unnamed creek north of Watson creek
Johnny David Creek
Unnamed creek west of Barren Creek
Unnamed creek northeast of McKilligan Creek ("Summit Creek")
Unnamed creek southwest of McKilligan Creek
Mathews Creek
Edwards Creek
Unnamed creek between Edwards and Dockrill Creeks
Deep Creek
Unnamed creek south of Helps Creek
Unnamed creek north of Telkwa River
Maney Creek
Unnamed creek north of Maney Creek

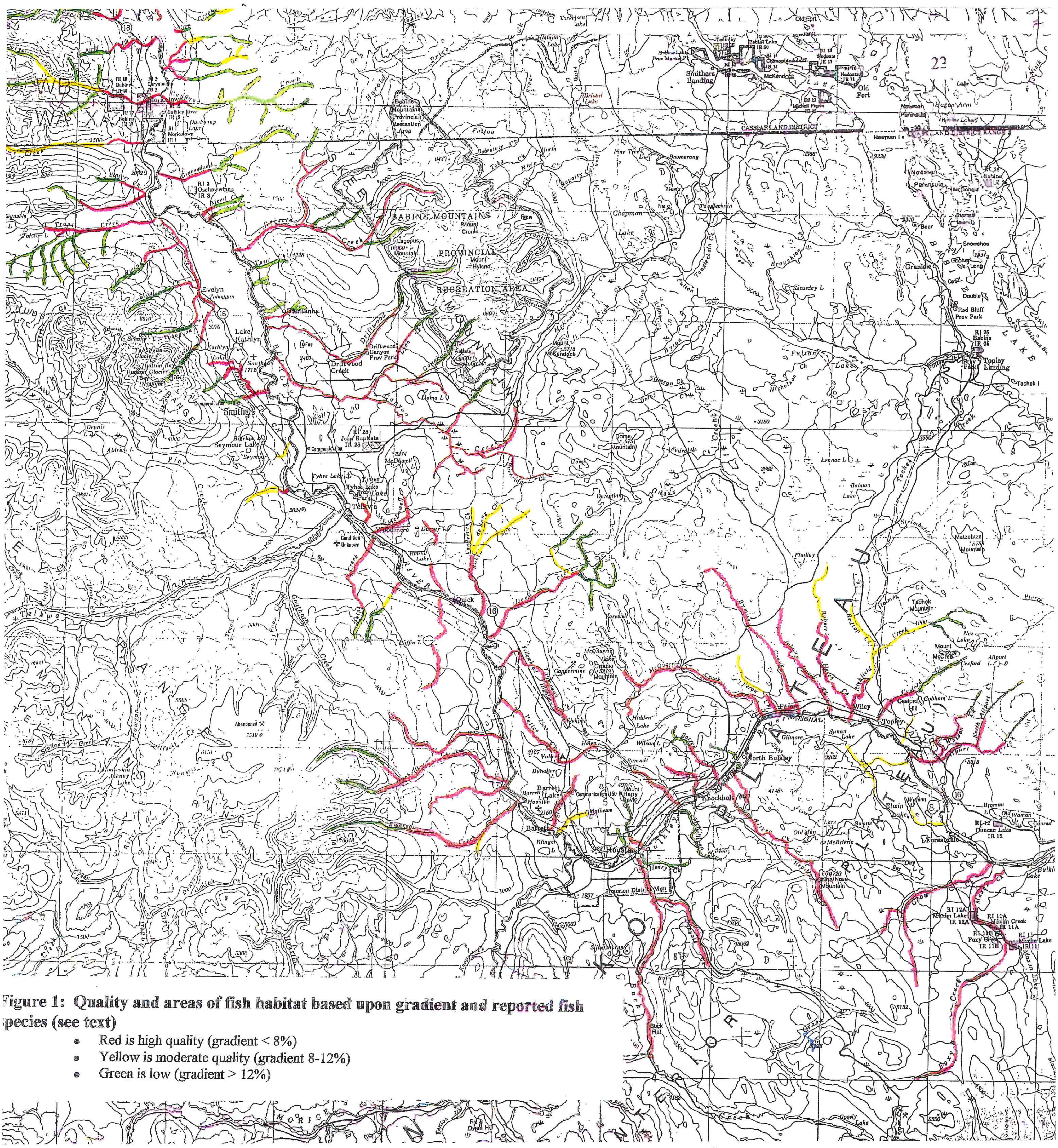


Figure 1: Quality and areas of fish habitat based upon gradient and reported fish species (see text)

- Red is high quality (gradient < 8%)
- Yellow is moderate quality (gradient 8-12%)
- Green is low (gradient > 12%)

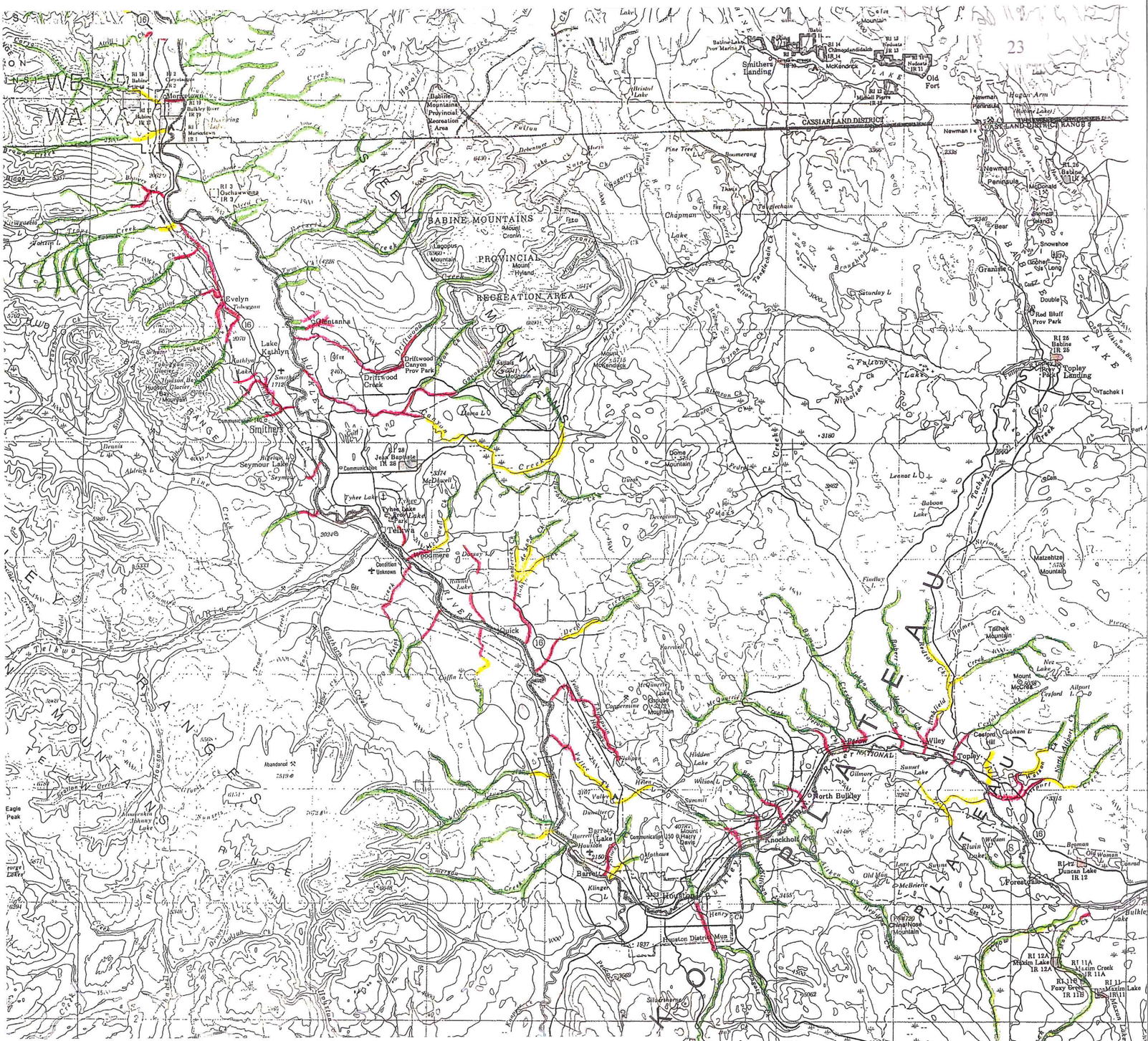


Figure 2: Impact density and degree of degradation (see text)

- Red is high degree of impact
- Yellow is moderate degree of impact
- Green is low to no degree of impact

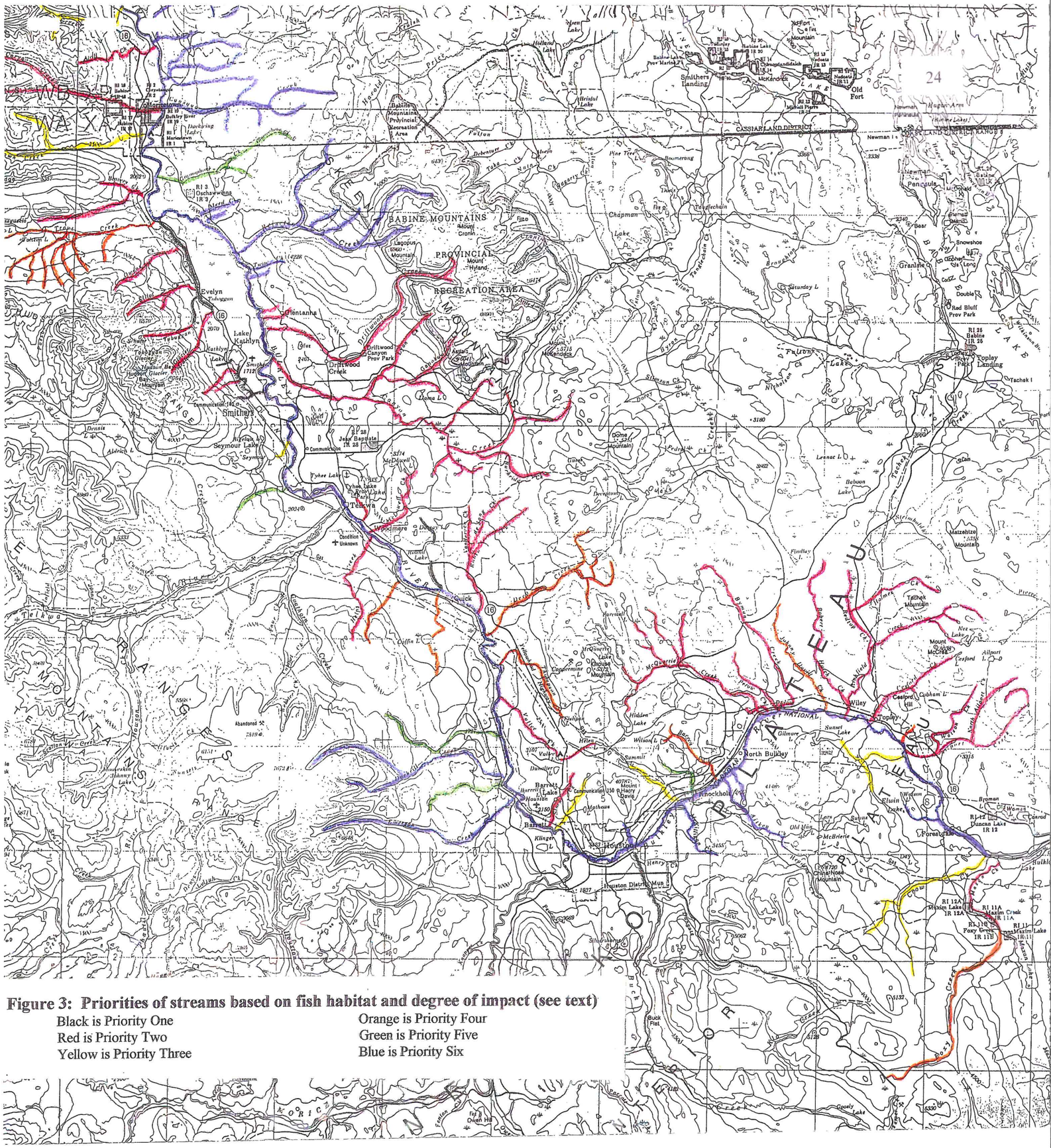
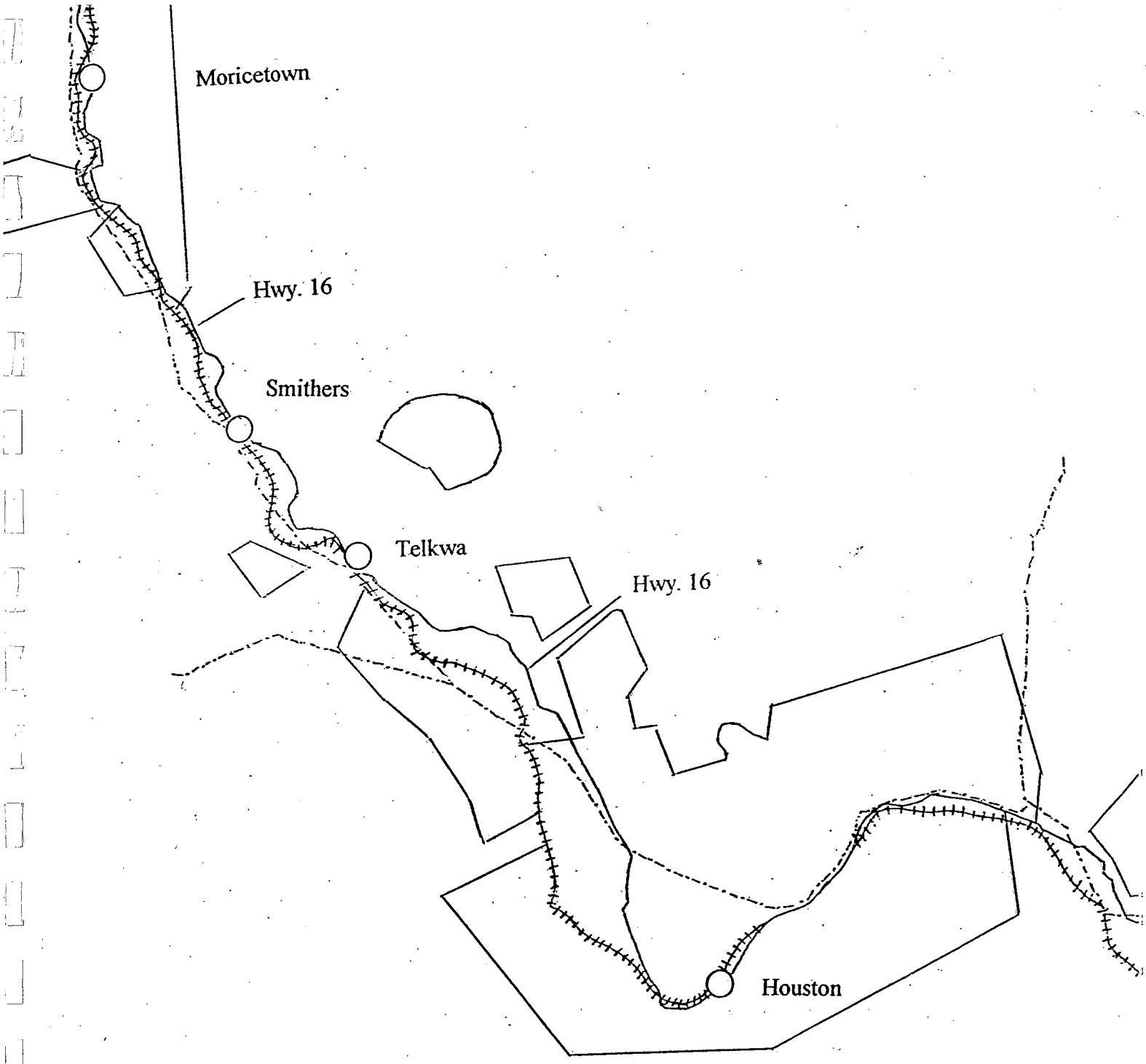


Figure 3: Priorities of streams based on fish habitat and degree of impact (see text)

Black is Priority One
Red is Priority Two
Yellow is Priority Three
Orange is Priority Four
Green is Priority Five
Blue is Priority Six


Moricetown
Hwy. 16
Smithers
Telkwa
Hwy. 16
Houston
Highway
Rail lines
Power lines
Land use boundaries

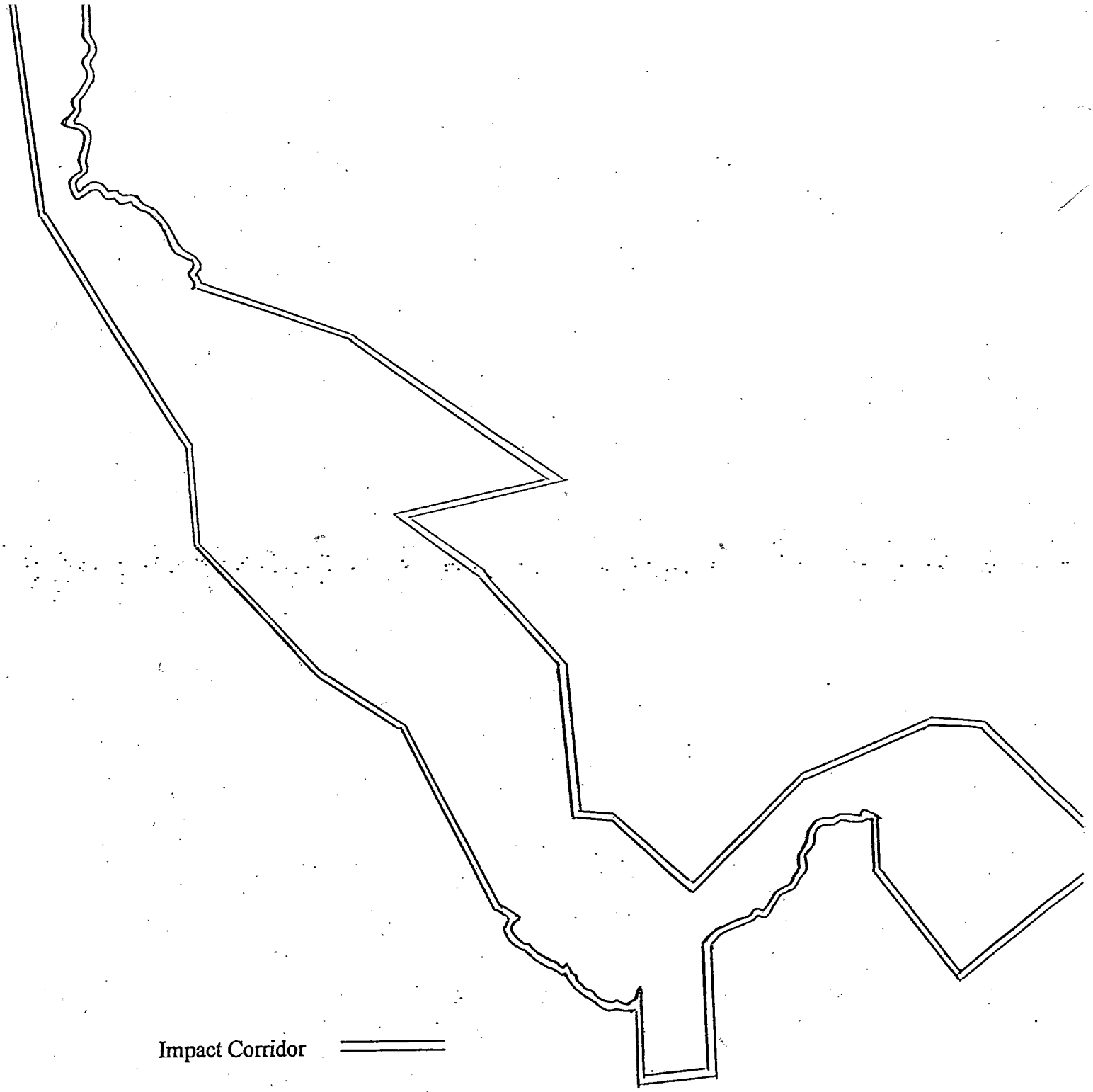

Impact Corridor

Figure 4: High priority stream, transportation corridors, and land use in the Bulkley River valley.

Secondary arteries are not shown and the land-use boundaries are approximate

Appendix 1

Stream Summaries for Creeks of Priority 1-5

(Streams are presented in order from Bulkley Lake to Boulder Creek)

Name(s): Maxan Creek

Watershed Code: 46-6800

Length of high value habitat (km): approximately 13 km (lower reach, below Maxan lake)

Length of high value habitat impacted (km): 2

Proportion of mainstem length which is high value habitat (estimated %): 100

Proportion of high value habitat impacted (%): 10-20

Fish species present:

Chinook and coho salmon, rainbow trout and dolly varden. (sockeye salmon present in Maxan Lake in 1970's)

Impacts:

- Secondary road crossing near mouth
- Land clearing (agriculture)

Riparian/in-stream effects of impacts:

Compaction of sediment at road crossing
Increased stream temperature due to increased exposure at cleared areas
Reduced large woody debris at cleared areas
Reduced terrestrial inputs (insects, leaf litter, etc.) at cleared areas
Runoff from cleared land (agriculture) leading to localized nutrient enrichment, introduction of pesticides, fertilizers if used, and contribution to bank erosion

Comments:

Heavy agricultural impact in lower 1-2 km, no buffer strips at all - stream is completely exposed
Road crossing at mouth is through creek (un-bridged)
Small patches of cleared area (due to road proximity to creek) up length of creek
Large flood plain throughout length, stream meanders
Few impacts (forestry related) above approximately 2 km

Priority (with rationale): 2

The large area of impact on high quality fish habitat and demonstrated presence of fish (chinook, coho, rainbow, dolly varden) make lower Maxan Creek a high priority.

Name(s): Foxy Creek

Watershed Code: 46-6800-010

Length of high value habitat (km): 15

Length of high value habitat impacted (km): Approx. 12 km

Proportion of mainstem length which is high value habitat (estimated %): 80

Proportion of high value habitat impacted (%): <10%

Fish species present:
Chinook salmon, rainbow trout, (coho salmon outplanted to lower Foxy in 1990), dolly varden, mountain whitefish, longnose sucker, long nose dace, prickly sculpin, Pacific lamprey

Impacts:

- Secondary road crossings (2) at 0.1 and 10.5 km upstream from confluence with Maxan Creek
- Road through creek at lower crossing
- Mine/mineral processing operation near headwaters (Equity Silver)

Riparian/in-stream effects of impacts:
Compaction of sediment at lower crossing
Principally forestry effects (slumping from road building, clearcuts, etc.) - forestry point source impacts

Comments:
Heavy braiding downstream of lower road crossing
Some evidence of lateral channel movement upstream of crossing at 10.5 km
Vehicle road crossing (unbridged) through creek at 0.1 km
Forest activities in upper reaches

Priority (with rationale): 3
Foxy Creek is a high value fish bearing stream with few non-forestry related impacts. The mine in the upper reaches (now inactive) has historically been of concern and may be of concern again if it mills ore from other locations. At this time the priority for Foxy Creek is moderate-high. If (when?) the mine facilities become active again this stream's priority may be upgraded to high.

Name(s): Crow Creek

Watershed Code: 46-6700

Length of high value habitat (km): 14.5

Length of high value habitat impacted (km): Approx. 1 km

Proportion of mainstem length which is high value habitat (estimated %): 80-100

Proportion of high value habitat impacted (%): <10

Fish species present:

Rainbow trout (coho fry outplanted near Maxan Lake road crossing in 1990)

Impacts:

- Railway crossing at 0.1 km
- Secondary road crossings (3) at 4.5, 5, and 10.5 km
- Some agricultural activity
- Forestry activities

Riparian/in-stream effects of impacts:

Localized increased stream temperature due to canopy removal at cleared land and at road crossings
Reduced large woody debris recruitment at cleared land
Localized runoff from cleared land altering nutrient input

Comments:

Swampy land at mouth
Above approximately 1 km creek meandering in wide valley, no obvious impacts
Some evidence of historical large scale hillslope failure
Heavily impacted by logging activities

Priority (with rationale): 4

The low impact (in area) by agriculture, demonstrated presence of few fish species (one) and over-riding influence of forest activities make Crow Creek a moderate priority from the perspective of non-forestry related activities.

Name(s): Sunset Lake Creek/ Elwin Lake Creek

Watershed Code: 46-6610/46-6610-010

Length of high value habitat (km): 7.5 km (Sunset) / 2 km (Elwin)

Length of high value habitat impacted (km): 1-2 km

Proportion of mainstem length which is high value habitat (estimated %): 100% for each

Proportion of high value habitat impacted (%): < 20%

Fish species present:
Rainbow trout, Rocky Mountain whitefish

Impacts:

- Secondary road crossings (4) at 4.5 and 7 km on Sunset Lake Creek, and 0.2 and 1.5 km on Elwin Lake Creek (from confluence with Sunset Lake Creek)
- Land clearing (agriculture)

Riparian/in-stream effects of impacts:
Localized increased temperature at road crossing due to canopy opening

Comments:
Land clearing near Sunset Lake with road crossing of creek - appears to be sufficient riparian corridor
Forestry activities in upper reaches

Priority (with rationale): 4
The few obvious impacts, riparian corridor left at agricultural land, and few fish species makes this system a moderate priority.

Name(s): Watson Creek

Watershed Code: 46-6600

Length of high value habitat (km): 10.5

Length of high value habitat impacted (km): 3

Proportion of mainstem length which is high value habitat (estimated %): 85

Proportion of high value habitat impacted (%): 30%

Fish species present:
Coho salmon, rainbow and steelhead trout, dolly varden

Impacts:

- Powerline crossing at 2 km
- Highway 16 crossing at 3 km
- Land clearing

Riparian/in-stream effects of impacts:
Increased stream temperature due to increased exposure at powerline crossing and land clearing
Sediment compaction at powerline crossing by road crossing (un-bridged) through stream
Reduced large woody debris recruitment at land clearing
Increased runoff containing agricultural/livestock waste - runoff flows also may contribute to localized bank erosion/sediment introduction

Comments:
Lower 2 km excellent coho rearing habitat (FHIIP 1991)
Agricultural land clearing along floodplain in lower reaches, a fringe of trees left as a buffer
Clearing on north side of the highway
Stream in flat bottom valley, meandering
Highway crossing well forested

Priority (with rationale): 2
The high impacts on the lower reaches, high fish potential and habitat quality, and the demonstrated presence of fish (coho, steelhead, rainbow, dolly varden) makes Watson Creek a high priority.

Name(s): Unnamed creek north of Watson Creek

Watershed Code: 46-6510 (tentative)

Length of high value habitat (km): 2.75

Length of high value habitat impacted (km): < 1 km

Proportion of mainstem length which is high value habitat (estimated %): 100

Proportion of high value habitat impacted (%): 10-20%

Fish species present: No information available

Impacts:

- Highway 16 crossing at 1 km
- Powerline crossing at 1.2 km

Riparian/in-stream effects of impacts:

Expect usual powerline impacts (sediment compaction and increased temperature due to canopy opening)

Comments:

Insufficient air-photo analysis, assessment based on maps
Appears to be few land clearing impacts

Priority (with rationale): 3

The entire length appears to be high quality fish habitat (based on gradient). The presence of rainbow (steelhead) trout upstream in the Watson Creek system and the unknown conditions of this stream are balanced by the low number of apparent impacts, making it a moderate-high priority.

Recommendations:

Sampling to determine fish species present should be conducted.

Name(s): Cesford Creek

Watershed Code: 46-6500

Length of high value habitat (km): 7.5

Length of high value habitat impacted (km): 2.5

Proportion of mainstem length which is high value habitat (estimated %): 70

Proportion of high value habitat impacted (%): 33 (one third)

Fish species present:
Rainbow trout

Impacts:

- Railway crossing at 0.1 km
- Highway 16 crossing at 0.6 km
- Secondary road crossing at 1.2 km
- Powerline crossing at 2.5 km
- Land clearing

Riparian/in-stream effects of impacts:
Localized sediment compaction (un-bridged crossing) and stream temperature increase at powerline crossing
Increases in stream temperature and surface runoff from cleared areas

Comments:
Flood plain in lower reaches cleared for agriculture
Quarry adjacent to creek
Stream braiding in agriculture clearing below highway crossing
Secondary road crossing through agriculture clearing with buffer strip
McRea Creek (a tributary) has forest activities in upper reaches, no impacts otherwise.

Priority (with rationale): 2
The presence of rainbow trout, multiple impacts and the areal extent of the land clearing makes this system a high priority.

Name(s): Richfield Creek (A.K.A. Findley Creek)

Watershed Code: 46-6400

Length of high value habitat (km): 5 km (mainstem), 16.5 km (Robert Hatch Creek)

Length of high value habitat impacted (km): 2-3 km

Proportion of mainstem length which is high value habitat (estimated %): 33%

Proportion of high value habitat impacted (%): 50%

Fish species present:

Coho and chinook salmon, rainbow and steelhead trout

Impacts:

- Railway crossing at 0.25 km
- Highway 16 crossing at 1 km
- Powerline crossings (3) 1.5 and 9.5 km on Richfield Creek, 0.3 km on Robert Hatch Creek
- Secondary road crossing at 8.5 km
- Land clearing
- Urban development (north of Topley)

Riparian/in-stream effects of impacts:

Increased stream temperature at powerline crossing and cleared land due to opening of canopy
Sediment compaction at powerline crossing due to road through creek
Decreased terrestrial energy inputs, increased surface runoff and refuse disposal in areas of land clearing and urban development.

Comments:

Fish barrier at 4.8 km impassable to all species (FHIIP, 1991)
Agricultural land clearing in lower reaches, bars and braiding at creek mouth
Urban development (north of Topley)
Agricultural clearing on east side above highway
Well forested above fish barrier, some forest activity
Forest activities on tributaries
Evidence of silting between highway and mouth (historical)(Hancock et al, 1983)

Priority (with rationale): 2

The high degree of development and impacts in the lower reaches, number of fish species present, and unknown nature of Robert Hatch Creek (a potentially very important tributary below the barrier) makes this system a high priority.

Recommendations:

Sampling for fish in Robert Hatch Creek and a site assessment and description is recommended. Robert Hatch could be a very important access for fish below the barrier.

Name(s): Johnny David Creek

Watershed Code: 46-6300 (tentative)

Length of high value habitat (km): 13

Length of high value habitat impacted (km): 4

Proportion of mainstem length which is high value habitat (estimated %): 100

Proportion of high value habitat impacted (%): 30

Fish species present: No information available

Impacts:

- Highway 16 crossing at 1.5 km
- Powerline crossing at 2 km
- Land clearing

Riparian/in-stream effects of impacts:

The land clearing may result in increased stream temperature, increased surface runoff, and decreased large woody debris recruitment to the stream

Comments:

Land clearing near mouth with narrow buffer strips
Some forest activities in upper reaches
Highway and powerline crossings are treed, impact is low (no evidence in air-photos)

Priority (with rationale): 3

Land clearing in lower reaches, the probability of fish species present similar to those present upstream (coho, chinook, steelhead, and rainbow in Richfield Creek), and the low degree of other impacts makes this a moderate-high priority.

Recommendations:

Sampling to determine fish species present is recommended.

Name(s): Byman Creek

Watershed Code: 46-6200

Length of high value habitat (km): 18

Length of high value habitat impacted (km): Approx. 5 km

Proportion of mainstem length which is high value habitat (estimated %): 90

Proportion of high value habitat impacted (%): 30

Fish species present:
Coho and chinook salmon, steelhead and rainbow trout.

Impacts:

- Railway crossing at 0.2 km
- Highway 16 crossings (2) at 0.3 and 1.5 km
- Secondary road crossings (2) at 0.3 and 11.5 km
- Powerline crossing at 2.5 km
- Land clearing
- Local discharges (residential) at Perow

Riparian/in-stream effects of impacts:
Localized increases in stream temperature due to canopy opening at powerline crossing. Localized sediment compaction by powerline road through creek (un-bridged) above Perow
Increased stream temperature and surface runoff, and reduced large woody debris recruitment in areas of land clearing
Domestic discharges from Perow

Comments:
Near mouth, land clearing on west side with narrow buffer strips
Stream confined by highway and railway in lower reach
Land clearing near highway
Large bars in-stream downstream of highway
Land clearing, east side above highway
No impacts on tributary above Perow

Priority (with rationale): 2
The multiple impacts, high degree of land clearing along stream edges, confinement (channelization?) between highway and railway, presence of residential development (Perow) with its consequent impacts, and presence of multiple important fish species makes Byman Creek a high priority.

Name(s): McQuarrie Creek

Watershed Code: 46-6100

Length of high value habitat (km): 16 km

Length of high value habitat impacted (km): 2

Proportion of mainstem length which is high value habitat (estimated %): 100

Proportion of high value habitat impacted (%): Approx. 10 km

Fish species present:
Coho salmon, steelhead and rainbow trout

Impacts:

- Railway crossing at 0.1 km
- Highway 16 crossing at 0.15 km
- Secondary road crossing at 0.4 km
- Powerline crossing at 0.8 km
- Land clearing
- Channelization

Riparian/in-stream effects of impacts:
The area of cleared lands may result in increased stream temperature and runoff, and reduced large woody debris recruitment
Channelization results in loss of habitat, loss of instream cover, and formation of homogenous ecology in that reach

Comments:
Important steelhead spawning and rearing system (FHIIP 1991)
Lower one km heavily channeled, with open cleared fields and very limited riparian cover; entrenchment and channelization severe
Past forest activities in upper reaches

Priority (with rationale): 2
Though impacts are only in the lower reaches, this stream is very important to coho and steelhead. The forestry activities in the upper reaches need to be assessed and the lower 2 km examined in detail. The importance of this stream to fish, and heavy impacts in the lower 2 km make this stream a high priority.

Recommendations: Assess forest activities along the mainstem McQuarrie Creek and describe the lower reaches of McQuarrie Creek.

Name(s): Barren Creek

Watershed Code: 46-6010

Length of high value habitat (km): Approx. 7 km

Length of high value habitat impacted (km): 2

Proportion of mainstem length which is high value habitat (estimated %): 90

Proportion of high value habitat impacted (%): Approx. 30%

Fish species present:
Rainbow trout

Impacts:

- Railway crossing at <0.1 km
- Highway 16 crossing at 0.5 km
- Secondary road crossings (2) at 0.7 and 2 km
- Powerline crossing at 1 km
- Land clearing

Riparian/in-stream effects of impacts:
Increased stream temperature and reduced large woody debris recruitment and terrestrial energy inputs may impact the stream in the cleared areas

Comments:
Cleared fields below highway
From highway to powerline, 50% of the distance is cleared-alternating cleared to stream edge and forested.
Powerline crossing well forested-no obvious impacts
Small area of canopy opening immediately upstream of powerline crossing
Light forestry activities in upper reaches.

Priority (with rationale): 3
Relatively light impacts, these confined to the lower reaches, and the small number of species present (one) makes this creek a moderate-high priority.

Name(s): Unnamed west of Barren Creek

Watershed Code: 46-5900 (tentative)

Length of high value habitat (km): 4

Length of high value habitat impacted (km): 3

Proportion of mainstem length which is high value habitat (estimated %): 66% (two-thirds)

Proportion of high value habitat impacted (%): 75

Fish species present: No information available

Impacts:

- Railway crossing at 0.5 km
- Highway 16 crossing at 0.7 km
- Powerline crossing at approximately 1 km
- Secondary road crossing at 2 km
- Land clearing

Riparian/in-stream effects of impacts:

Increased stream temperature and decreased large woody debris recruitment and terrestrial energy input in areas of cleared land

Increased stream temperature at powerline crossing due to canopy opening

Comments:

Extensive open fields below highway

Opening of canopy at powerline crossing

Priority (with rationale): 4

Moderately light degree of impact over a relatively small area, together with unknown fish species present makes this a moderate priority.

Recommendations:

Sampling for fish presence is recommended.

Name(s): Unnamed creek north-east of McKilligan Creek ("Summit Creek")

Watershed Code: 46-5800 (tentative)

Length of high value habitat (km): 5

Length of high value habitat impacted (km): 1.5

Proportion of mainstem length which is high value habitat (estimated %): 70

Proportion of high value habitat impacted (%): 30

Fish species present: No information available

Impacts:

- Railway crossing at 0.1 km
- Highway 16 crossing at approximately 0.7 km
- Powerline crossing at approximately 1 km
- Secondary road crossing at approximately 1.5 km
- Cleared land

Riparian/in-stream effects of impacts:

Stream temperature increases due to canopy removal at powerline crossing and areas of cleared land

Comments:

Powerline crossing exposed
Upper reaches swampy
Generally well forested except lowest kilometer

Priority (with rationale): 5

Low degree of impacts, confined to lower reaches and unknown use by fish makes this stream a low-moderate priority

Recommendations:

Sampling to determine fish species present is recommended.

Name(s): Unnamed creek south-west of McKilligan Creek

Watershed Code: 46-5700 (tentative)

Length of high value habitat (km): 2.5

Length of high value habitat impacted (km): 2

Proportion of mainstem length which is high value habitat (estimated %): 60

Proportion of high value habitat impacted (%): 80

Fish species present: No information available

Impacts:

- Railway crossing at approx. 0.2 km
- Highway 16 crossing at approx. 0.6 km
- Secondary road crossings (2) at 0.6 and 2.5 km
- Powerline crossing at 1 km

Riparian/in-stream effects of impacts:

Expect usual effects - sediment compaction and localized stream temperature increase at powerline crossings

Comments:

Air photos not available - assessment done from maps

Priority (with rationale): 4

Multiple localized impacts makes this creek a cause of moderate concern. This priority is to be upgraded if fish presence is demonstrated.

Recommendations: Sampling for fish species present is recommended.

Name(s): Buck Creek (Lower-below barriers)

Watershed Code: 46-5600

Length of high value habitat (km): 11 km

Length of high value habitat impacted (km): 4

Proportion of mainstem length which is high value habitat (estimated %): 100

Proportion of high value habitat impacted (%): Approx. 40%

Fish species present:
Coho, pink and chinook salmon, steelhead and rainbow trout, Rocky mountain whitefish, and kokanee (in Goosly Lake)

Impacts:

- Municipal/residential development (Houston)
- Highway 16 crossing at 0.5 km
- Railway crossing at 0.5 km
- Land clearing

Riparian/in-stream effects of impacts:
Channelization of lower reaches causing reduction in habitat, loss of in-stream cover, and homogenization of stream morphology and ecology
Runoff from municipality carrying contaminants
Discharges to stream from municipality
Increased stream temperature due to lack of cover in lower 2 kilometers
Localized compaction of sediment at powerline crossing

Comments:
Severely channelized and exposed though Houston
Powerline has road running through it
Above powerline, stream is well forested
Small amount of land clearing on bench immediately upstream and downstream of Dungate Creek
Erosion, silting and scouring reported in lower river (FHIIP 1991)
forest activities in upper reaches
Barrier (falls) to some species at approx. 11 km
Barrier (cascade) to some species at approx. 6 km

Priority (with rationale): 1
The high degree of impact in the lower reaches and the importance of this stream for numerous species makes Buck Creek of highest priority.

Name(s): Mathews Creek

Watershed Code: 46-5400 (tentative)

Length of high value habitat (km): 2.5

Length of high value habitat impacted (km): 2.5

Proportion of mainstem length which is high value habitat (estimated %): 33%

Proportion of high value habitat impacted (%): 100%

Fish species present: No information available

Impacts:

- Railway crossing at 0.5 km
- Highway 16 crossing at 2 km
- Powerline crossing at 2 km
- Land clearing

Riparian/in-stream effects of impacts:

Comments:

Highway crossing in upper reaches has little->no impact
Moderate amount of land clearing, generally good riparian cover
Incomplete photos for complete analysis

Priority (with rationale): 4

The low degree of impact, retention of riparian cover, and unknown presence/absence of fish, makes this stream a moderate priority

Recommendations:

Sampling to determine fish species present in Mathews Creek is recommended.

Name(s): Stock Creek

Watershed Code: 46-5300

Length of high value habitat (km): 5

Length of high value habitat impacted (km): 4

Proportion of mainstem length which is high value habitat (estimated %): 70

Proportion of high value habitat impacted (%): 80

Fish species present:
Cutthroat and rainbow trout

Impacts:

- Railway crossing at approx. 0.5 km
- Secondary road crossing at 0.75 km
- Highway 16 crossing at 3 km
- Powerline crossing at 4.5 km
- Cleared land

Riparian/in-stream effects of impacts:
Increased stream temperature and reduced large woody debris recruitment and terrestrial energy inputs (insects, leaf litter) in areas of cleared land.

Comments:
Small area of cleared land (upper reaches) cleared to ravine lip
Large amount of clearing to stream edge in lower reaches

Priority (with rationale): 2
Important fish species present, the large area impacted, and the number of impacts (multiple impacts) make this creek a high priority.

Name(s): Unnamed creek (between Emerson and Dockrill Creeks)

Watershed Code: 46-5100 (tentative)

Length of high value habitat (km): 3

Length of high value habitat impacted (km): 0.5 km

Proportion of mainstem length which is high value habitat (estimated %): 35

Proportion of high value habitat impacted (%): <20%

Fish species present: No information available

Impacts:

- Railway crossing at < 0.1 km
- Secondary road crossing at 0.5 km
- Cleared land

Riparian/in-stream effects of impacts:

Localized increase in stream temperature at powerline crossing and cleared lands

Comments:

Cleared land immediately downstream and adjacent to road on north bank
Forest activities in mid and upper reaches

Priority (with rationale): 5

Low degree of impacts over small areas and uncertainty of fish species present makes this a low-moderate priority

Recommendations: Sampling to determine fish species present in the lowest one kilometer is recommended.

Name(s): Edwards Creek

Watershed Code: 46-4900 (tentative)

Length of high value habitat (km): Approx. 10 km

Length of high value habitat impacted (km): Approx. 2 km

Proportion of mainstem length which is high value habitat (estimated %): 80

Proportion of high value habitat impacted (%): 20

Fish species present: No information available

Impacts:

- Railway crossing at 0.5 km
- Secondary road crossing at 2 km
- Land clearing

Riparian/in-stream effects of impacts:

Comments:

Land below secondary road crossing is cleared with narrow shelterbelt of trees for upper 1.5 km, lower 0.5 km is timbered.
Above secondary road crossing, well forested with extensive past forest activities.

Priority (with rationale): 5

Few impacts and unknown presence of fish makes this a low priority, but the larger area of cleared land at the mouth is of some concern.

Recommendations:

Sampling for fish species present is recommended.

Name(s): Vallee Creek

Watershed Code: 46-4800

Length of high value habitat (km): 11.0 km (to Helen Lake)

Length of high value habitat impacted (km): 2 km

Proportion of mainstem length which is high value habitat (estimated %): 80

Proportion of high value habitat impacted (%):

Fish species present:
Cutthroat and rainbow trout (throughout to Vallee Lake), cutthroat to Helen Lake

Impacts:

- Secondary road crossing @ 2 km
- Cleared land on lower reaches

Riparian/in-stream effects of impacts:
Increased stream temperature due to riparian removal
Reduced large woody debris recruitment
Risk of hillside failure

Comments:
There is a potential for hillside failure in the lower reaches due to land clearing. One gully is already present on the Northeast side of the creek.
The valley is well forested at the road crossing - this does not seem to present a problem.

Priority (with rationale): 2
There is potential for slope failure in lower reaches (steep slopes, cleared at top) and the presence of rainbow and cutthroat trout make this a high priority.

Name(s): Thompson Creek

Watershed Code: 46-4700

Length of high value habitat (km): 13

Length of high value habitat impacted (km): 10.5 km

Proportion of mainstem length which is high value habitat (estimated %): 100

Proportion of high value habitat impacted (%): 80

Fish species present:
Rainbow trout (present in Fishpan Lake)

Impacts:

- Powerline crossing at 0.5 km
- Secondary road crossings (5) at 2.5, 4.5, 7,10.5, and 13 km upstream
- Highway 16 crossing at 4.5 km
- Cleared lands at mouth

Riparian/in-stream effects of impacts:
Risk of slope failure near cleared lands
Increased water temperature
Decreased large woody debris recruitment

Comments:
Mouth of creek is incised, the cleared land at top may be susceptible to wasting. Upper reaches (near Fishpan Lake) show signs of gullying along banks. Thompson is a deeply incised creek.

Priority (with rationale): 3
There are few direct impacts, but the risk of wasting due to land clearing and the presence of rainbow trout make this a moderate-high priority.

Name(s): Deep Creek

Watershed Code: 46-4600 (tentative)

Length of high value habitat (km): Approx. 15

Length of high value habitat impacted (km): 4.5

Proportion of mainstem length which is high value habitat (estimated %): 100

Proportion of high value habitat impacted (%): 30

Fish species present: No information available

Impacts:

- Highway 16 crossing at 2 km
- Secondary road crossing at 4 km
- Land clearing

Riparian/in-stream effects of impacts:

Channelization reduces available spawning & rearing habitat
Stream temperature increases due to increased exposure
Reduced large woody debris recruitment

Comments:

Some land clearing along lower reaches
Tributaries are channelized through fields
Mid to upper reaches not impacted
Stream is not as entrenched as Thompson and Vallee Creeks, so there is a lesser risk of failure
Not all air photos are available

Priority (with rationale): 3

The multiple impacts and extent of land clearing with potential consequent effects on stream conditions makes this stream a moderate-high priority

Recommendations:

Sampling for fish species present should be conducted. This stream has potential to be moved to a higher priority dependent upon the fish species present.

Name(s): Robin Creek

Watershed Code: 46-4500 (tentative)

Length of high value habitat (km): 5

Length of high value habitat impacted (km): 5 km

Proportion of mainstem length which is high value habitat (estimated %): 100

Proportion of high value habitat impacted (%): 100

Fish species present: No information available

Impacts:

- Secondary road crossing at 2 km
- Highway 16 crossing at 5 km
- Land clearing

Riparian/in-stream effects of impacts:

Localized slumping and increased sedimentation affecting stream channel morphology and sediment regime
Increased stream temperature and reduced large woody debris recruitment at cleared areas
Runoff from agriculture/livestock drainage

Comments:

Wide, meandering stream
Heavily impacted by clearing of land
Very low risk of terrain failure/wasting
Good fish habitat

Priority (with rationale): 2

The meandering nature of the stream (low flushing rates), the effects of land clearing, and the presence of rainbow and cutthroat trout in similar sized creeks upstream (Round Lake Creek) and downstream (Vallee Creek), indicating a high probability of fish in the stream, makes Robin Creek a high priority.

Recommendations:

Sampling to determine fish species present in Robin Creek and their distribution is recommended.

Name(s): Coffin Lake Creek (local name)

Watershed Code: 46-4400

Length of high value habitat (km): Approx. 8 km

Length of high value habitat impacted (km): 3

Proportion of mainstem length which is high value habitat (estimated %): 66 (two thirds)

Proportion of high value habitat impacted (%): 40

Fish species present:
Cutthroat and rainbow trout, and dolly varden are present throughout.

Impacts:

- Railway crossing at 0.25 km
- Powerline crossing at 2.5 km

Riparian/in-stream effects of impacts:
Substrate compaction due to road through creek (un-bridged at powerline crossing)
Increased stream temperature due to stream exposure
Reduced large woody debris recruitment
Increased siltation/sedimentation from bank runoff

Comments:
Powerline crossing has a road through the creek. A large expanse of the creek is open (exposed) at this point.

Priority (with rationale): 3
The powerline is an opening over a large area without cover and shelter. The road running through the creek at the powerline crossing is of concern. These impacts with the extensive length of high value habitat and the demonstrated presence of rainbow, cutthroat and dolly varden make this creek a moderate-high priority.

Name(s): Round Lake Creek (local name)

Watershed Code: 46-4300

Length of high value habitat (km): 6.5

Length of high value habitat impacted (km): 6.5 km

Proportion of mainstem length which is high value habitat (estimated %): 80

Proportion of high value habitat impacted (%): 100

Fish species present:
Cutthroat and rainbow trout are present to Round Lake

Impacts:

- Highway 16 crossing at 3 km
- Secondary road crossings at 0.1 km and 4.5 km above lake
- Agriculture, dairy farms and land clearing

Riparian/in-stream effects of impacts:
Agricultural, dairy farm runoff
Nutrient loading
Livestock destruction of riparian areas/compaction of substrate
Increased temperature due to exposed surface area
No large woody debris recruitment
Drastically reduced cover and terrestrial inputs (insects, leaf litter, etc.)

Comments:
Heavily impacted along length by dairy farms, agriculture, grazing, etc.

Priority (with rationale): 1
The presence of rainbow and cutthroat trout, potential for fish habitat, use of the creek by agriculture and livestock, and the density of the impacts (cumulative effects) make this creek of highest priority.

Name(s): McDowell Creek

Watershed Code: 46-4200 (tentative)

Length of high value habitat (km): 7

Length of high value habitat impacted (km): 7

Proportion of mainstem length which is high value habitat (estimated %): 75

Proportion of high value habitat impacted (%): 100

Fish species present: No information available

Impacts:

- Highway 16 crossing at 0.4 km
- Secondary road crossing at 2 km
- Land clearing

Riparian/in-stream effects of impacts:

Increased stream temperature and decreased large woody debris is expected along cleared areas
Terrain failure/slumping may affect stream channel morphology and sediment regime

Comments:

From Highway to the Bulkley River the terrain is flat, both stream edges are cleared with very thin buffer strips.
Upstream of highway, stream is incised with land clearing to lip on south side and to creek edge on north side.
Headwaters are in cleared fields
North side appears susceptible to failure, south side is forested

Priority (with rationale): 2

Multiple impacts, and the high probability of fish presence (Helps Creek immediately downstream contains coho, steelhead and cutthroat) makes this a high priority.

Recommendations:

Sampling for fish species present and distributions is recommended. As well, a stream description of this creek is desirable.

Name(s): Helps Creek

Watershed Code: 46-4100

Length of high value habitat (km): 5.5

Length of high value habitat impacted (km): 2

Proportion of mainstem length which is high value habitat (estimated %): 45

Proportion of high value habitat impacted (%): 40

Fish species present:
Coho salmon, steelhead and cutthroat trout

Impacts:

- Railway crossing at 0.5 km
- Powerline crossing at 1 km
- Secondary road crossing at 1km
- Land clearing

Riparian/in-stream effects of impacts:
Localized sediment compaction due to road crossing and increased stream temperature due to canopy opening at powerline crossing
Increased stream temperature and surface runoff, reduced large woody debris recruitment and terrestrial energy inputs (insects, leaf litter, etc.) in areas of cleared land

Comments:
Below secondary road and Bulkley River extensive cleared land to creek edge, some of it with some leave strip.
Powerline crossing through cleared area
Part of cleared area is old Bulkley River channel
Powerline crossing in the upper reach, road through stream and canopy opening.

Priority (with rationale): 2
Extensive impacts of land clearing and powerline right-of-way and presence of coho, cutthroat and steelhead make this creek a high priority.

Name(s): Tyhee Lake Creek (local name)

Watershed Code: 46-4000 (tentative)

Length of high value habitat (km): 2

Length of high value habitat impacted (km): 2

Proportion of mainstem length which is high value habitat (estimated %): 100

Proportion of high value habitat impacted (%): 100

Fish species present: Giant pygmy whitefish (in lake)

Impacts:

- Highway 16 crossing at approximately 0.2 km
- Secondary road crossing at approximately 0.5 km
- Land clearing

Riparian/in-stream effects of impacts:

Increased stream temperature and surface runoff, and decreased large woody debris recruitment and terrestrial energy inputs in areas of cleared land

Comments:

Swampy area on west side of upper reaches, land cleared on east side
Lower half of creek has narrow leave strips through the cleared land.
Lake is polluted (agriculture, livestock runoff)
Lake contains regionally significant fish species (giant pygmy whitefish)
May be ephemeral
Creek has incised lower couple of hundred meters, some bank erosion.

Priority (with rationale): 2

Due to proximity to rural areas, the potential high fish value, and that it may contain important or regionally significant species (i.e. giant pygmy whitefish), Tyhee Lake Creek is of high priority. Due to its proximity to Telkwa it may have educational value as well.

Recommendations:

Sampling of fish species to determine species present, and the distribution of those species, is recommended.

Name(s): Unnamed creek south of Helps Creek

Watershed Code: 46-3900 (tentative)

Length of high value habitat (km): < 1 km

Length of high value habitat impacted (km): Approx. 0.4 km

Proportion of mainstem length which is high value habitat (estimated %): 66%

Proportion of high value habitat impacted (%): 40

Fish species present: No information available

Impacts:

- Railway crossing at < 0.1 km
- Powerline crossing at 0.75 km
- Forestry activity on west bank

Riparian/in-stream effects of impacts:

Comments:

Deeply incised
High risk of terrain failure
Impacts are moderate, in comparison to other systems nearby

Priority (with rationale): 4

Short length of quality habitat, moderate impact, and fish presence not determined makes this a moderate priority.

Recommendations:

Sampling for fish species present in this stream is recommended.

Name(s): Unnamed tributary north of Telkwa River

Watershed Code: 46-3800 (tentative)

Length of high value habitat (km): 2

Length of high value habitat impacted (km): <0.2

Proportion of mainstem length which is high value habitat (estimated %): 60

Proportion of high value habitat impacted (%): 10

Fish species present: No information available

Impacts:

- Railway crossing at < 0.1 km
- Secondary road at 0.5 km
- Cleared land

Riparian/in-stream effects of impacts:

Potential for terrain failure due to land clearing to lip of stream valley

Comments:

Lower reaches incised, but banks well forested, cleared on top to lip.
Above road, creek is in shelterbelt of trees for approximately 1 km then "lost" into cleared fields (ephemeral at this point??)
Once creek hits hills it is into well-forested valleys

Priority (with rationale): 5

Only two crossings of the creek (rail and secondary road), the shelterbelt of trees along the cleared fields, and the uncertainty of fish presence makes this a moderate priority.

Recommendations:

Sampling for fish species present should be conducted.

Name(s): Seymour Lake Creek (local name)

Watershed Code: 46-3700 (tentative)

Length of high value habitat (km): 2

Length of high value habitat impacted (km): 2

Proportion of mainstem length which is high value habitat (estimated %): 90

Proportion of high value habitat impacted (%): 100

Fish species present: No information available

Impacts:

- Railway crossing at 0.5 km
- Secondary road crossing at 0.5 km
- Powerline crossing at 2 km
- Residential impacts along length
- Cleared land

Riparian/in-stream effects of impacts:

Increased temperature and reduced large woody debris recruitment in cleared areas
Surface urban/residential runoff containing waste and contaminants

Comments:

Upper one-third of stream is forested
Gully is forested, relatively steep
From ~100m above railway tracks creek flows through open area, no cover whatsoever - agricultural land

Priority (with rationale): 4

Very heavily impacted, unsuitable cover, residential impacts. Not known what fish species are present. Very difficult to rehabilitate and of questionable value to do so. Assigned a moderate priority.

Name(s): Kathlyn Creek

Watershed Code: 46-3500

Length of high value habitat (km): 7

Length of high value habitat impacted (km): 7

Proportion of mainstem length which is high value habitat (estimated %): 70

Proportion of high value habitat impacted (%): 100

Fish species present:

Coho and pink salmon, steelhead, rainbow and cutthroat trout, rocky mountain whitefish

Impacts:

- Power line crossing 2 km above lake
- Highway 16 crossings (3) at 1, 2.5, and 4 km
- Secondary road crossings (3) at < 0.1 km, 3 km, and 0.5 km above lake
- Rail crossings 0.5 km above lake
- Municipal and residential development (Smithers & surrounding area)
- Agriculture and land clearing from first highway crossing (1 km) to third crossing (4 km). Land clearing for first kilometer above lake.

Riparian/in-stream effects of impacts:

Nutrient loading from municipal/residential areas adjacent to stream
Loss of habitat due to channelization
Reduction of large woody debris recruitment from land clearing
Temperature increases in areas of land clearing due to exposure of surface
Residential dumping of refuse
Reduced terrestrial energy inputs (insects, leaf litter, etc.) along cleared areas
Urban runoff containing contaminants

Comments:

Very narrow leave strip of trees through cleared lands
Creek is forested from first highway crossing to Bulkley River. However this reach is channelized and approximately 70% rip-rap.
Kathlyn Lake is heavily polluted (agriculture and livestock runoff)

Priority (with rationale): 1

The multiple impacts, number and variety of fish species present, and the recreational/educational value of this stream makes it of highest priority.

Name(s): Chicken Creek

Watershed Code: 46-3500-010 (tentative)

Length of high value habitat (km): 1

Length of high value habitat impacted (km): 1

Proportion of mainstem length which is high value habitat (estimated %): 33

Proportion of high value habitat impacted (%): 100

Fish species present:

Coho and pink salmon. Steelhead and cutthroat trout reported in Kathlyn Lake and Kathlyn Creek and tributaries above Chicken Creek.

Impacts:

- Rail crossing at 1.5 km
- Secondary road crossing at 1.5 km
- Powerline crossing at 2 km
- Municipal and residential development (Smithers)

Riparian/in-stream effects of impacts:

Nutrient loading from municipal and residential development
Reduced large woody debris due to land clearing
Residential dumping of refuse
Urban runoff containing contaminants

Comments:

Chicken Creek is heavily impacted by powerline & rail crossings and residential development. Some concern of terrain slumping on north side of creek between the highway and railway.

Priority (with rationale): 1

The creek is heavily impacted, contains important fish species, has heavy recreational use and has potential for education. Therefore, Chicken Creek is of highest priority.

Name(s): Simpson Creek

Watershed Code: 46-3500-020

Length of high value habitat (km): 2

Length of high value habitat impacted (km): 2

Proportion of mainstem length which is high value habitat (estimated %): 33

Proportion of high value habitat impacted (%): 100

Fish species present:
Coho salmon, rainbow and cutthroat trout, and Rocky Mountain whitefish

Impacts:

- Highway 16 crossing at < 0.1 km
- Rail crossing at 0.75 km
- Powerline crossing at 1.5 km
- Land clearing

Riparian/in-stream effects of impacts:
Braiding/lateral movement of creek at powerline
Localized temperature increases and reduced large woody debris recruitment through small cleared areas

Comments:
No impact above the powerline crossing, terrain becomes steep
Noticeable widening (i.e. lateral movement) of creek at powerline crossing.
From powerline to railway crossing & edge of residential development well forested. Below this the creek flows through alternating forested and small cleared areas.

Priority (with rationale): 2
The multiple impacts, number and variety of fish species present, proximity to town and potential for recreational/educational use makes Simpson Creek a high priority.

Name(s): Canyon Creek (A.K.A. Carr Creek, Cass Creek)

Watershed Code: 46-3400

Length of high value habitat (km): Approx. 40 km + tributaries

Length of high value habitat impacted (km): Approx. 11 km

Proportion of mainstem length which is high value habitat (estimated %): 90

Proportion of high value habitat impacted (%): 25

Fish species present:

Coho and pink salmon, rainbow trout (suspected to be steelhead) and Dolly Varden

Impacts:

- Secondary road crossings (4 on Canyon mainstem at 5, 8.5, 20, and 36 km; 2 on tributaries at 6 km on Ganokwa and 1.5 km on Lyons creeks)
- Residential development (lower reaches)
- Land clearing (lower reaches)
- Irrigation (private land, lower reaches)

Riparian/in-stream effects of impacts:

Terrain failure/slumping may affect stream channel morphology and sediment regime
Reduced large woody debris recruitment in cleared areas
Increased stream temperature at cleared areas (narrow buffer strips)
Water withdrawal for irrigation under low flow conditions may affect fish access

Comments:

Coho in upper creek FHIIP 1991)
Barrier above Telkwa High Road
Logging in upper Ganokwa creek
Lowest reach deeply entrenched and confined. Large amounts of land cleared on north side. High risk of failure along here.
Snake Road area - large amounts of cleared, residential land, leave strips left but narrow strips and not in continuous large patches.
Upstream of Snake Road - Large cleared areas - north bank has high risk of failure. Geomorphologically large scale failure has happened in the past in this area.
Agriculture to stream edges overlooking steep banks.
South of "Four Corners" agriculture is decreased, creek still entrenched. Some land clearing to stream edge. Forest activities begin.

Priority (with rationale): 2

Due to the heavy impacts and potential for further impacts in the lower reaches, the diversity and importance of fish species present, and the recreational/educational value of this stream, along with its proximity, it is classified as high priority.

Name(s): Driftwood Creek

Watershed Code: 46-3300

Length of high value habitat (km): 24 km

Length of high value habitat impacted (km): 13 km

Proportion of mainstem length which is high value habitat (estimated %): 90

Proportion of high value habitat impacted (%): 55%

Fish species present:
Coho and chinook salmon, dolly varden, and rainbow (suspected steelhead) trout

Impacts:

- Secondary road crossings (6) at 2 km, 7 km, 9 km, 10.5 km and 1 km on the mainstem, and 0.1 km on Cygnet Creek
- Land clearing

Riparian/in-stream effects of impacts:
Terrain failure/slumping may affect stream channel morphology and sediment regime

Comments:
Coho in upper reaches (FHIPP 1991)
Creek is deeply entrenched at mouth, some clearing to ravine edge below first road crossing.
Agriculture clearing to edge above road, high risk of terrain gullying and failure.
North side of creek worse than south side
Upstream of fossil beds agricultural clearing becomes less dense, stream has some riparian vegetation.
Tributaries are almost completely > 20%, except lower reaches of Cygnet Creek
Historically slight erosion and scouring of gravel bars in lower reaches (1977) (Hancock et al, 1983)

Priority (with rationale): 2
The high degree of impact on the lower reaches, the presence of several important fish species throughout the creek, proximity to town, and high recreational/educational value makes Driftwood Creek a high priority.

Name(s): Maney Creek

Watershed Code: 46-3200 (tentative)

Length of high value habitat (km): 3.5

Length of high value habitat impacted (km): 3 km

Proportion of mainstem length which is high value habitat (estimated %): 65

Proportion of high value habitat impacted (%): 85

Fish species present: No information available

Impacts:

- Secondary road crossings (2) at 1.75 km and 2 km
- Residential development (Glentanna)
- Cleared land

Riparian/in-stream effects of impacts:

Reduced large woody debris recruitment in cleared areas
Stream temperature increase in cleared area due to lack of cover
Increased bank erosion and runoff at cleared areas
Nutrient loading/ runoff from agriculture and livestock
Reduced terrestrial inputs (insects, leaf litter, etc.) in upper reaches

Comments:

Flows through cleared fields with very little leave-strip (insufficient cover)
Fields begin two-thirds of the way from the Bulkley River to road crossing and extend to headwaters
Lower reaches well forested, little impact
Good potential fish habitat (based on gradient)

Priority (with rationale): 2

The high degree of impact over large areas along the upper reaches and the potential for fishes (good habitat, but not sampled) makes Maney Creek a high priority.

Recommendations:

Sampling of Maney Creek for fish species present is recommended

Name(s): Unnamed creek north of Maney Creek

Watershed Code: 46-3100 (tentative)

Length of high value habitat (km): 3.5

Length of high value habitat impacted (km): 2

Proportion of mainstem length which is high value habitat (estimated %): 90

Proportion of high value habitat impacted (%): 60

Fish species present: No information available

Impacts:

- Secondary road crossing (2) at 1.5 and 2 km
- Land clearing

Riparian/in-stream effects of impacts:

Reduced large woody debris recruitment in cleared areas
Stream temperature increase in cleared area due to lack of cover
Increased bank erosion and runoff at cleared areas
Nutrient loading/ runoff from agriculture and livestock
Reduced terrestrial inputs (insects, leaf litter, etc.) in upper reaches

Comments:

Deeply incised creek
Below road well forested (therefore little risk of slope failure)
Above road field cleared right to stream edge, all the way to headwaters
Possible cascade barrier to anadromous species at creek mouth

Priority (with rationale): 2

Upper reaches heavily impacted, these impacts may be carried downstream to affect downstream conditions. Unknown if fish are present. A high priority.

Recommendations: Sampling to determine fish species present is recommended. Assessment of the potential of the topography at the mouth to act as a barrier to passage is also recommended

Name(s): Toboggan Creek

Watershed Code: 46-2400

Length of high value habitat (km): Approx. 12 km

Length of high value habitat impacted (km): 12

Proportion of mainstem length which is high value habitat (estimated %): 70

Proportion of high value habitat impacted (%): 100

Fish species present:

Coho and pink salmon, steelhead, cutthroat and rainbow trout, dolly varden, Rocky Mountain whitefish (in lake), kokanee (historically in lake)

Impacts:

- Highway 16 crossing 0.2 km
- Secondary road crossing (4) at 2.5, 6.5, 7 and 12 km
- Rail crossing (2) at 7.5 and 8 km
- Power line crossing at approximately 12 km
- Land clearing

Riparian/in-stream effects of impacts:

Terrain failure/slumping may affect stream channel morphology and sediment regime in the lower reaches
Stream temperature increase over large expanses of cleared areas
Decreased large woody debris recruitment due to large areas of cleared land
Agricultural and livestock runoff-nutrient loading

Comments:

Lowest reaches have cleared lands adjacent to entrenched creek - high risk of failure
The heavy land use adjacent to Toboggan Creek below Toboggan Lake, including the access roads (three crossings) are of greater concern than the upstream highway crossing (above lake) or the railway crossing..
Lush riparian growth reported in 1991 (FHIIP, 1991)
Air-photos indicate very narrow buffer strips along cleared fields

Priority (with rationale): 1

Land clearing effects on terrain stability, the number of crossings (road, rail, power), extent of adjacent land use for agriculture and livestock, and the number and diversity of fish species present makes Toboggan Creek of highest priority.

Name(s): Owen Creek

Watershed Code: 46-2400-010 (tentative)

Length of high value habitat (km): 4.5

Length of high value habitat impacted (km): 2

Proportion of mainstem length which is high value habitat (estimated %): 50

Proportion of high value habitat impacted (%): 45

Fish species present:

Not reported, but coho and pink salmon, dolly varden and steelhead are all reported in the Toboggan mainstem above this creek.

Impacts:

- Rail crossing at 0.5 km
- Secondary road crossing at 1 km
- Powerline crossing at approximately 2 km
- Land clearing upstream of mouth

Riparian/in-stream effects of impacts:

Increased stream temperature due to opening of canopy at powerline crossing
Channel braiding at powerline

Comments:

Lateral channel movement at powerline crossing

Priority (with rationale): 2

Owen Creek has developed land near its mouth, that combined with the numerous crossings, the creeks potential for numerous fish species, and contribution to an already established Priority 1 drainage (Toboggan Creek) makes this a high (Priority 2) priority.

Name(s): Elliot Creek

Watershed Code: 46-2400-020

Length of high value habitat (km): 2

Length of high value habitat impacted (km): 2

Proportion of mainstem length which is high value habitat (estimated %): 25

Proportion of high value habitat impacted (%): 100

Fish species present:
Coho salmon and dolly varden

Impacts:

- Powerline crossing at 1.5 km
- Secondary road crossing at 2 km
- Land clearing

Riparian/in-stream effects of impacts:
Increased stream temperature at cleared fields due to lack of cover
Reduced large woody debris recruitment at cleared fields
Lateral channel movement at powerline crossing

Comments:
Well timbered up high, some small clearing near mouth with Toboggan Creek
Air-photos indicate very narrow buffer strips along cleared fields

Priority (with rationale): 2
Though impacts to creek are relatively light, the presence of coho salmon, potential presence of other important species, proximity to town, and contribution to an already established Priority 1 drainage (Toboggan Creek) makes Elliot Creek a high (Priority 2) priority.

Name(s): Glacier Gulch Creek

Watershed Code: 46-2400-030

Length of high value habitat (km): 5

Length of high value habitat impacted (km): 4

Proportion of mainstem length which is high value habitat (estimated %): 60

Proportion of high value habitat impacted (%): 80

Fish species present:
Coho salmon and steelhead. (Cutthroat trout in Toboggan Lake, dolly varden in Toboggan Creek and tributaries)

Impacts:

- Railway crossing at 0.5 km
- Powerline crossing at 2 km
- Secondary road crossing at 3.5 km
- Land clearing
- Water intake to Lake Kathlyn residential area

Riparian/in-stream effects of impacts:
Stream temperature increase at cleared lands due to increased exposure
Possibly increased erosion at powerline crossing

Comments:
Powerline crossing is in steep country, this may lead to increased erosion/sedimentation
Clearing of land occurs in lower 10% of stream
Impacts on this creek are relatively light.

Priority (with rationale): 2
Though impacts to creek are light, the presence of coho salmon, potential presence of other important species, proximity to town, and contribution to an already established Priority 1 drainage (Toboggan Creek) makes Glacier Gulch Creek a high (Priority 2) priority.

Name(s): Trout Creek (A.K.A. Sheddy Creek)

Watershed Code: 46-2300

Length of high value habitat (km): 14

Length of high value habitat impacted (km): 1-2 km

Proportion of mainstem length which is high value habitat (estimated %): 90

Proportion of high value habitat impacted (%): 10-20%

Fish species present:
Coho and pink salmon, steelhead and cutthroat trout.

Impacts:

- Highway 16 crossing at 0.1 km
- Railway crossing at 0.8 km
- Secondary road crossings at 9 and 11 km (2 at 11 km)
- Powerline crossing at approximately 1 km

Riparian/in-stream effects of impacts:
Terrain failure/slumping may affect stream channel morphology and sediment regime

Comments:
Upper reaches well timbered, no impacts
Barrier at 0.8 km - Falls impassable
A short, rocky stream, only lightly used for spawning (FHIIP, 1991)
The lower reaches of all tributaries indicate good habitat (gradient)
railway trestle well above creek, no obvious impact from air-photos
Immediately above powerline forest activities to lip of ravine.
Appears that bank may be slumping/gullying
Very steep banks-creek deeply incised
Air photo analysis only up as far as powerline, not available above this point

Priority (with rationale): 3
Due to the importance of this stream to fish, the barrier hampering access to the higher reaches, and impacts appearing to be primarily confined to the lower couple of kilometers, trout Creek as ranked as moderate-high priority.

Name(s): Beavery Creek

Watershed Code: 46-2200 (tentative)

Length of high value habitat (km): 13 km

Length of high value habitat impacted (km): Approx. 8 km

Proportion of mainstem length which is high value habitat (estimated %): 50%

Proportion of high value habitat impacted (%): 60

Fish species present: No information available

Impacts:

- Highway 16 crossings (7)
- Railway crossings (4)
- Secondary road crossings (4)
- Powerline crossings (4)
- Cleared land in lower reaches

Riparian/in-stream effects of impacts:

Comments:

Air photos not available - assessment done from maps and documentation

Priority (with rationale): 2

Multiple impacts, land clearing with its consequent effects, and the potential high value habitat of this stream makes it a high priority.

Recommendations: Sampling for fish species present and distribution is recommended. On site assessment of these numerous impacts in an ice-free season is also recommended.

Name(s): Gramaphone Creek

Watershed Code: 46-2100

Length of high value habitat (km): 10

Length of high value habitat impacted (km): <0.1 km

Proportion of mainstem length which is high value habitat (estimated %): 55

Proportion of high value habitat impacted (%): 10

Fish species present:
Rainbow trout. (Coho salmon and dolly varden also suspected)

Impacts:
- Secondary road crossings (2) at 2 km (one on each fork)

Riparian/in-stream effects of impacts:
Localized livestock trampling of vegetation and compaction of sediment

Comments:
Sufficient air-photos not available to conduct detailed air-photo analysis. Assessment based on maps and local knowledge
Livestock crossing through creek at road

Priority (with rationale): 5
The limited impacts and few fish species present gives Gramaphone Creek a rank of low-moderate priority.

Name(s): John Brown Creek

Watershed Code: 46-2000

Length of high value habitat (km): Approx. 10 km

Length of high value habitat impacted (km): 2 km

Proportion of mainstem length which is high value habitat (estimated %): Approx. 50%

Proportion of high value habitat impacted (%): 20

Fish species present:
Chinook and coho salmon, cutthroat and rainbow trout, and dolly varden

Impacts:

- Highway 16 crossing at 0.25 km
- Railway crossing at 1.2 km
- Powerline Crossing at 2 km
- Old dam at water supply (Moricetown)

Riparian/in-stream effects of impacts:
Localized increased stream temperature due to cleared lands

Comments:
Some braiding downstream of highway crossing
Great potential for lateral movement at power line crossing
Cleared land at powerline crossing on north side, adjacent to creek. South side set back with 200-300 m buffer strip.

Priority (with rationale): 4
The presence of fish and relatively light impacts suggest a rank of moderate priority for John Brown Creek.

Name(s): Corya Creek

Watershed Code: 46-1800

Length of high value habitat (km): 14

Length of high value habitat impacted (km): 4.5 km

Proportion of mainstem length which is high value habitat (estimated %): 80

Proportion of high value habitat impacted (%): 30

Fish species present:
Rainbow trout and dolly varden

Impacts:

- Highway 16 crossing at 2 km
- Railway crossing at 2.5 km (mainstem) and 1.25 km (tributary)
- Residential impacts (Moricetown) at 2 km
- Powerline crossing at 3.5 km
- Secondary road crossings (2 on tributaries)
- New water source (water withdrawal)

Riparian/in-stream effects of impacts:
Localized increase in stream temperature at powerline crossing due to increased exposure.
Terrain failure/slumping may affect stream channel morphology and sediment regime.

Comments:
Channel braiding is apparent at the stream crossings.
All tributaries, except lowest 2, > 20% gradient
1.6 m cascade 0.25 km upstream is a potential barrier
Impacts immediately below highway crossing include slumping and lateral channel movement
Lower reach (below highway) cleared to north side, channel is wide near highway and incised for lower section
Slope failure of channel wall (from forestry activity?) approximately 3 km upstream

Priority (with rationale): 2
Multiple impacts, presence of rainbow trout and dolly varden, and residential impacts make this a high priority stream.

Name(s): Boulder Creek (A.K.A. Straw Creek)

Watershed Code: 46-1400

Length of high value habitat (km): 4

Length of high value habitat impacted (km): <1 km

Proportion of mainstem length which is high value habitat (estimated %): 30

Proportion of high value habitat impacted (%): 25

Fish species present:
Pink salmon, rainbow trout and dolly varden

Impacts:

- Rail crossing at 0.4 km
- Highway 16 crossing at 2 km
- Power line crossing at 2 km

Riparian/in-stream effects of impacts:
Localized stream temperature increases and bank erosion due to loss of vegetation at crossings may occur

Comments:
Opening up of canopy
Well forested for most of the stream length (lower reaches)
Canopy opening at railway crossing

Priority (with rationale): 4
The presence of pink salmon and dolly varden suggest that even though impacts to this stream are light it be ranked a moderate priority.

Name(s): Atrill Creek

Watershed Code: 46-1600 (tentative)

Length of high value habitat (km): 5.5

Length of high value habitat impacted (km): Approx. 2

Proportion of mainstem length which is high value habitat (estimated %): 60

Proportion of high value habitat impacted (%): 35

Fish species present:
Rainbow and cutthroat trout

Impacts:

- Railway crossing at 1 km
- Highway 16 crossing at 2 km
- Powerline crossing at 2.5 km
- Cleared land

Riparian/in-stream effects of impacts:
Expect effects for powerline crossing and cleared lands in line with the others reported
Grazing and trampling along stream

Comments:
Air-photo coverage not available, assessment based on maps
Suspect large expanse of cleared land above powerline (from maps)

Priority (with rationale): 2
The apparent impacts combined with lack of air-photo analysis, a large area in lower reaches available for land uses, and unknown what fish species are present makes Atrill Creek a high priority.

Recommendations: Sampling for fish species present and distribution in the lower 5 km is recommended.