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Porcupine River Watershed Fisheries Information Summary Report

Prepared for:

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The North Yukon Land Use Planning Commission retained Environmental Dynamics Inc. to complete this project with the objective of facilitating a comprehensive integration of existing fish and fish habitat knowledge into the North Yukon regional land use planning process. A number of people contributed directly to the project, providing direction and/or technical support. These included: Shawn Francis, Nicole Parry, Tim Sellars, and Graham Baird. Jeff Hamm provided GIS support and was responsible for the final presentation of mapped data. Al von Finster provided specific input regarding the characterization of fish habitat. As well, during the November 2nd, 2004, Fisheries Workshop held in Old Crow, community members and Elders provided corrections, insights, and additional interpretations to the mapped fisheries information associated with this project. The table below lists all Fisheries Workshop participants.

Community Workshop Participants	North Yukon Planning Commission Members
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Peter Tizya	
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DISCLAIMER

The information presented in this report is designed to act as a comprehensive summary of existing fisheries information. Sources of information include documented Traditional Knowledge, past scientific/technical documentation (primarily from the early 1970s), recent scientific/technical documentation, as well as personal communications and experience. It should be understood that some information presented is based upon interpretations of such sources. It is therefore recommended that users interested in specific data present in this report consult the original source of information to verify the context and substance of specific details.

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1.0 INTRODUCTION

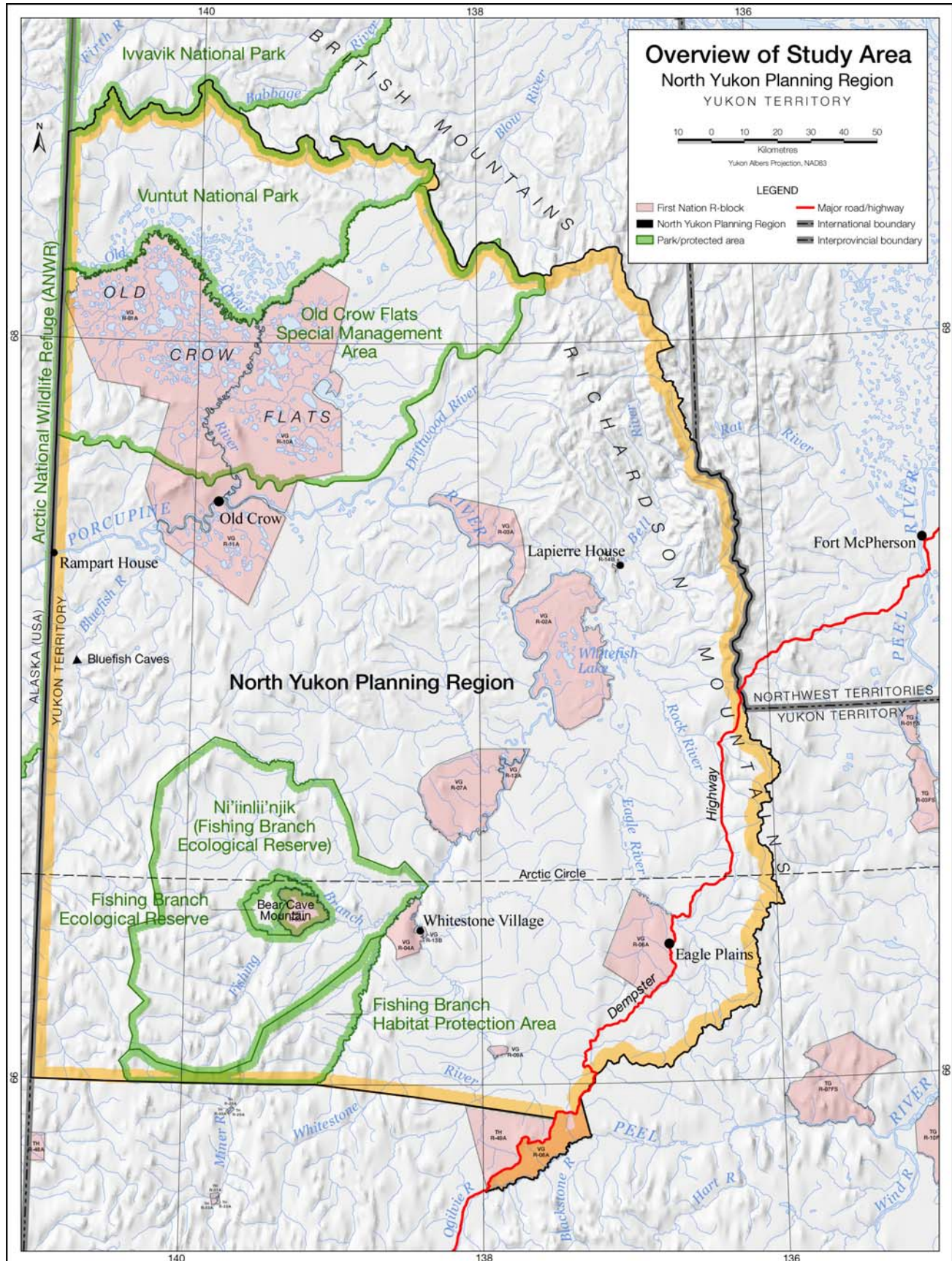
Fish and their habitat are integral components of northern ecosystems. Therefore values associated with fish and fish habitat have fundamental implications for the planning of most land use activities and must be considered thoroughly in this regard. From a general biological perspective, the inclusion of fish and fish habitat into a land use planning exercise has benefits for many other species, both aquatic and terrestrial.

This project was undertaken to facilitate the incorporation of such fish related information into the North Yukon Regional Land Use Planning process. The planning area of this process is virtually equivalent to the entire Porcupine River drainage within Canada (see Figure 1). The Porcupine River is a large tributary to the Yukon River, with approximately half of its watershed in Alaska where it joins the Yukon River at Fort Yukon. The Canadian portion of the Porcupine watershed has four major 3rd order tributaries; the Old Crow, Bell, Whitestone, and Miner Rivers. As well, two major 4th order tributaries (Eagle and Fishing Branch Rivers) and a large number of 3rd and 4th order tributaries of various smaller sizes contribute to the drainage¹. The only permanent settlement within the watershed is the village of Old Crow (home of the Vuntut Gwitchin First Nation). The Eagle Plains Lodge /gas station complex on the Dempster Highway is also within the Planning Region. Prior to European colonisation, seasonal settlements existed in various locations throughout the watershed, such as at the well-known location of Tlo’Kut near Old Crow. After the onset of colonisation and the establishment of the fur trade, four additional small settlements existed at various times. These included the Hudson’s Bay Posts of Rampart House and La Pierre House, as well as Johnson Creek and Whitestone Villages. Figure 1 provides an overview of the study area.

Large populations of freshwater and anadromous fish have always held a central role in local culture and economy. Various fisheries currently take place for roughly 8 months of the year; from spring break-up in May until January. This includes gillnetting for freshwater species throughout the open water season and during the late fall/early winter through the ice. As well jigging for arctic grayling and burbot through the ice is undertaken during the late fall and early winter. Salmon fisheries are conducted in accordance with the upstream migrations past the Old Crow area (as most significant spawning destinations appear to be upstream from Old Crow). Generally, chinook salmon (*Oncorhynchus tshawytscha*) are targeted throughout the month of July, chum (*Oncorhynchus keta*) are targeted throughout September, and coho salmon (*Oncorhynchus kisutch*) are targeted through the ice from late October through December. Currently, both freshwater and salmon species are utilised extensively for human consumption, as well as for dog food. Traditional Knowledge indicates that historical harvests were much higher, particularly of freshwater fish. Further to this, not only were harvests higher, but they were spread throughout the watershed. Currently, fish harvests are much more concentrated in the vicinity of Old Crow. Changing lifestyles and a decreased reliance on dogs for transportation have likely decreased the overall fish harvest, particularly in the case of freshwater fish species.

¹ For the purposes of this study, the Yukon River was considered a 1st order stream, with the Porcupine a 2nd order stream, and tributaries of the Porcupine considered as 3rd order and so on.

Figure 1. Overview of Study Area



2.0 METHODS

The project was conducted in a number of phases as described below.

- 1) *Development of an approach:* A meeting was held with representatives of the federal Department of Fisheries and Oceans, the Yukon Government, and the North Yukon Land Use Planning Commission and the Vuntut Gwitchin First Nation. A plan regarding how to best present the fisheries summary information in a visual (ie: mapped) form was discussed and agreed upon. Known sources of information were also discussed, and methods of interpretation were agreed upon.
- 2) *Information gathering and analysis:* Sources of current, past, and historical information regarding fish in the Porcupine River watershed were gathered, reviewed, and interpreted.
- 3) *Digital mapping of collected information:* Relevant information was mapped according to the categories listed below.
 - Summary points for the Porcupine River as well as each 3rd order and certain 4th order tributaries²: containing information regarding fish species present, species codes, identifiable data gaps and level of knowledge available, and available references.
 - Identified and inferred spawning areas for chinook, chum, or coho.
 - Suspected or potential spawning areas for chinook, chum, or coho.
 - Important wetland/lake areas for freshwater fish.
 - Identified and inferred overwintering habitats for freshwater fish.
 - Suspected or potential overwintering habitats for freshwater fish.
 - Documented historic fish trap locations³.
- 4) *Workshop:* A workshop was held in Old Crow on November 2, 2004, with community members to discuss the information compiled to date and to provide an opportunity for community members to contribute further Traditional/Local knowledge to fill in knowledge gaps and enhance existing interpretations.
- 5) *Completion of Mapping and Reporting:* The mapped information was revised to incorporate the results of the workshop. A biologist from Environmental Dynamics Inc. conducted the mapping of fisheries information, while a GIS specialist from the Yukon Planning Council provided the final presentation of the mapped information. A biologist from Environmental Dynamics Inc. also prepared a summary and analysis of mapped information in the form of this report.

² For the purposes of this study, the Yukon River was considered a 1st order stream, with the Porcupine a 2nd Order stream, and tributaries of the Porcupine considered as 3rd order and so on.

³ Prior to the introduction of large gillnets, highly efficient in-stream traps and net systems were constructed and utilised to harvest fish. A variety of methods and styles were used in various different types of sites/conditions. Some use of fish traps by Old Crow residents continued through the 1960s.

3.0 SUMMARY RESULTS

Fisheries information gathered in this project has been categorized by habitat function for mapping/visual purposes. It has also been listed according to the summary points mapped/documentated for selected 2nd (Porcupine mainstem), 3rd, and 4th order streams². This includes all stream summary data, as well as salmon spawning, overwintering habitat (all species), and historic fish trap locations have also been included in this summary regarding each stream (Sections 3.1) (see maps in Appendices 1 to 10). Information regarding important wetland/lake areas and 30 specific lakes has been summarized separately in Sections 3.2 and 3.3, respectively (see maps in Appendices 2 and 4)

Table 1 lists all species of fish identified in the Porcupine River watershed. They are listed with their respective species code by which they are referred to in this report and the associated map products (codes taken from Fisheries Information Summary System - FISS).

Table 1. Fish Species Identified in the Porcupine River Watershed

Category	Common Name	Scientific Name	Species Code
Salmon Species	chinook salmon	<i>Oncorhynchus tshawytscha</i>	CH
	chum salmon	<i>Oncorhynchus keta</i>	CM
	coho salmon	<i>Oncorhynchus kisutch</i>	CO
Freshwater Game Fish Species	arctic grayling	<i>Thymallus arcticus</i>	GR
	least cisco	<i>Coregonus sardinella</i>	CS
	broad whitefish	<i>Coregonus nasus</i>	BW
	lake whitefish	<i>Coregonus clupeaformis</i>	LW
	Burbot (loche)	<i>Lota lota</i>	BB
	inconnu (coney)	<i>Stenodus leucichthys</i>	IN
	northern pike	<i>Esox lucius</i>	NP
	LW/IN hybrid ⁴	<i>Stenodus-Coregonus hybrid</i>	LW/IN Hybrid
Other Fish Species	longnose sucker	<i>Catostomus catostomus</i>	LSU
	lake chub	<i>Couesius plumbeus</i>	LKC
	slimy sculpin	<i>Cottus cognatus</i>	CCG
	spoonhead sculpin ⁵	<i>Cottus ricei</i>	CRI
	round whitefish	<i>Prosopium cylindraceum</i>	RW
	trout perch	<i>Percopsis omiscomaycus</i>	TP
	arctic lamprey	<i>Lampetra japonica</i>	AL

3.1 Stream Summary Information

Refer to maps in Appendices 1 through 10 for further information regarding the location of individual streams, salmon spawning areas, overwintering habitats, and historic fish trap locations, respectively. The map in Appendix 3 shows the location of all stream summary points. Summary information for each stream is presented below in Tables 2 to 32.

⁴ The presence of small numbers of Stenodus-Coregonus hybrid was documented in the early 1970s. The numbers captured were minimal and little further information was documented (Bryan et al.-1974, Steigenberger et al-1975(2)(3)).

⁵ Limited to portions of the upper La Chute River.

It should be noted that the Porcupine River watershed in Canada contains many extremely remote areas with limited access. Therefore, there is limited information available regarding many parts of the watershed. In this regard, streams have been ranked in terms of the level of knowledge available. A ranking of Very Low, Low, Low to Moderate, or Moderate has been assigned to each stream summary.

Each comment regarding a stream is indicated as to whether it was from a scientific/technical source (S), a source from Traditional Knowledge (T), or Local Knowledge (L). References for all sources of information are also noted in each section and complete information for all references can be found in Section 6.0.

The identification of documented and potential salmon spawning and overwintering areas was conducted using available information. Salmon spawning and fish overwintering habitats have been mapped in two categories: 'Identified and Inferred,' and, 'Suspected or Potential.' 'Identified and Inferred' indicates areas where salmon spawning or fish overwintering has been documented or where it can reasonably be assumed that it may take place. Such areas are not intended to indicate that spawning or overwintering takes place in the entirety of said area, but rather that such fish activity may be found in various locations throughout the area. 'Suspected or Potential' indicates areas where salmon spawning or fish overwintering has been identified as possible or probable based upon the presence of one or more indicators. As such, it must be stressed that streams and lakes not indicated as 'suspected or potential' salmon spawning and/or overwintering areas may in fact include such habitats, but that such indicators have not been identified for said body of water.

Fish in the Porcupine watershed utilise a wide variety of habitats at various stages on an annual basis, as well as throughout their lives. If a particular body of water is accessible and has suitable habitat conditions, fish are likely to utilise it at some point during the year and/or their life cycle. It must be noted, therefore, that all streams and water bodies should be considered rearing habitat for fish, unless otherwise proven.

The historic location of fish traps has been documented through interviews with elders in Old Crow, Dawson, and Fort McPherson. As well, the Vuntut Gwitchin First Nation's Oral History Project and similar such documentation of Traditional fisheries Knowledge in the early 1970s has provided further locations (Anderton & Frost-2002(1) & 2003(2), Steigenberger et al.-1975(1)).

Table 2. Summary Information for Porcupine River Mainstem

<i>Stream:</i>	Porcupine River Mainstem
<i>Drainage:</i>	Yukon River
<i>Level of Knowledge:</i>	Moderate
<i>Documented Species Present:</i>	CH, CM, CO, GR, BB, IN, NP, CS, BW, LW, RW, LSU, LKC, CCG, TP, AL, LW/IN Hybrid
<i>Identified or Inferred Salmon Spawning Areas:</i>	CM at mouths of Bluefish River & David Lord Creek.
<i>Suspected or Potential Salmon Spawning Areas:</i>	CH and /or CM in areas of the upper Porcupine River.
<i>Identified or Inferred Overwintering Habitat:</i>	Throughout mainstem
<i>Suspected or Potential Overwintering Habitat:</i>	N/A
<i>Documented Historic Fish Trap Locations:</i>	-
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Extent of CM spawning locations in mainstem • Spawning locations in mainstem for freshwater species • Overwintering of juvenile CH and/or CO in the mainstem
<i>Other comments:</i>	<ul style="list-style-type: none"> • Entire mainstem is overwintering habitat for all freshwater species (S)(T) • Entire mainstem is a migration route for all species (S)(T)
<i>References:</i>	Steigenberger et al.-1974 & 1975(1&2&3) & 1977, Bryan et al.-1973, McCart-1974, Cox-1999, Boyce-1998, Anderton-2003(1), Peter pers comm.-2004, Kaye pers comm.-2004

Table 3. Summary Information for Caribou Bar Creek

<i>Stream:</i>	Caribou Bar Creek
<i>Drainage:</i>	Porcupine River
<i>Level of Knowledge:</i>	Low
<i>Documented Species Present:</i>	GR, LSU, CCG
<i>Identified or Inferred Salmon Spawning Areas:</i>	-
<i>Suspected or Potential Salmon Spawning Areas:</i>	-
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	-
<i>Documented Historic Fish Trap Locations:</i>	One in lower reaches
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/absence of species • Patterns of use by all species
<i>Other comments:</i>	<ul style="list-style-type: none"> • Possible significant groundwater source (spring) located adjacent to stream observed in 2003 aerial survey (S) • Overwintering not suspected (T).
<i>References:</i>	Bryan et al.-1973, Steigenberger et al.-1974, Anderton-2003(1), Frost pers comm.-2004

Table 4. Summary Information for Bluefish River

<i>Stream:</i>	Bluefish River
<i>Drainage:</i>	Porcupine River
<i>Level of Knowledge:</i>	Moderate
<i>Documented Species Present:</i>	GR, BW*, LW*, IN*, CS*, BB*, LSU*, NP, RW*, LKC*, CCG, LW/IN Hybrid* *(uncertain if these were captured at mouth of Bluefish or in the River itself)
<i>Identified or Inferred Salmon Spawning Areas:</i>	-
<i>Suspected or Potential Salmon Spawning Areas:</i>	-
<i>Identified or Inferred Overwintering Habitat:</i>	In lower reaches
<i>Suspected or Potential Overwintering Habitat:</i>	In upper reaches and at Bluefish Lake outlet
<i>Documented Historic Fish Trap Locations:</i>	In lower reaches
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Use by other species • Hydrological significance to fish & their habitat in the area
<i>Other comments:</i>	<ul style="list-style-type: none"> • Portions of this river are seasonally dry and other areas of up-welling water are open in winter--indicating overwintering habitat for fish—exact location may shift from year to year (T)(S) • Overwintering GR confirmed in open water area in lower reaches
<i>References:</i>	Bryan et al.-1973, Steigenberger et al.-1975(1) & 1977, Frost pers comm.-2004, Anderton-2003(2), Anderton pers comm.-2004

Table 5. Summary Information for Old Crow River

<i>Stream:</i>	Old Crow River
<i>Drainage:</i>	Porcupine River
<i>Level of Knowledge:</i>	Moderate to Low
<i>Documented Species Present:</i>	CH, CM, CO, GR, BB, IN, NP, CS, BW, LW, RW, LSU, LKC, CCG, TP, LW/IN Hybrid
<i>Identified or Inferred Salmon Spawning Areas:</i>	CH in very upper reaches above Thomas Creek
<i>Suspected or Potential Salmon Spawning Areas:</i>	CM in very upper reaches
<i>Identified or Inferred Overwintering Habitat:</i>	In very upper reaches only
<i>Suspected or Potential Overwintering Habitat:</i>	In further portions of upper reaches
<i>Documented Historic Fish Trap Locations:</i>	Several in lower and upper reaches
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • CM spawning locations • Current presence of CO (reference is historic) • Extent of CH spawning locations • Extent of CH & CM populations present • Identification of overwintering habitats
<i>Other comments:</i>	<ul style="list-style-type: none"> • Watershed supports very large freshwater fish populations (T) • Very large overwintering population of GR in headwaters (open in winter) (S) • Similar overwintering is suspected in one or more tributaries to the Crow River (S)
<i>References:</i>	Bryan et al.-1973, Anderton-2002(1) & 2003 (1)(2), Anderton pers comm.-2004, McCart-1974, von Finster-

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	1994, Steigenberger et al.-1974 & 1975(1)(3), Frost pers comm.-2004
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Table 6. Summary Information for Schaeffer Creek

Stream:	Schaeffer Creek (Crow River)
<i>Drainage:</i>	Old Crow River
<i>Level of Knowledge:</i>	Moderate to Low
<i>Documented Species Present:</i>	GR, WF, BW*, LW*, BB, LSU, CS, IN*, NP *(Note these species captured near the mouth of Schaeffer Creek) (S).
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	-
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	-
<i>Documented Historic Fish Trap Locations:</i>	Near mouth and in smaller tribs.
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/absence of other species • Patterns of use by all species • Understanding of migratory and other relationships with lakes
<i>Other comments:</i>	<ul style="list-style-type: none"> • Stream is a very important migratory corridor for fish--drains a large portion of lakes/wetlands in western Crow Flats (S).
<i>References:</i>	Frost pers comm.-2004, Anderton-2002(1) & 2003(2), Anderton pers comm.-2004, Steigenberger et al.-1975(3), von Finster-1994

Table 7. Summary Information for Johnson Creek

Stream:	Johnson Creek (Crow River)
<i>Drainage:</i>	Old Crow River
<i>Level of Knowledge:</i>	Very Low
<i>Documented Species Present:</i>	CM*, CO*, GR, BB
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	-
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	-
<i>Documented Historic Fish Trap Locations:</i>	In lower reaches and smaller tribs.
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/absence of other species • Patterns of use by all species • Presence/absence of salmon • Understanding of migratory and other relationships with lakes
<i>Other comments:</i>	<ul style="list-style-type: none"> • CM* and CO* reference is isolated T.K. account in lower 10km--stream appears limited re: salmon potential • Should be considered very important migration route for other species--drains large part of east Crow Flats
<i>References:</i>	Bryan et al.-1973, Anderton and Frost-2002(1) & 2003(2), von Finster-1994

Table 8. Summary Information for Black Fox Creek

<i>Stream:</i>	Black Fox Creek
<i>Drainage:</i>	Old Crow River
<i>Level of Knowledge:</i>	Low
<i>Documented Species Present:</i>	CH*, GR, WF, BB, IN, NP, RW, LSU
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	-
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	In lower ½ of creek
<i>Documented Historic Fish Trap Locations:</i>	Several in lower and upper reaches
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/Absence of other species • Patterns of use by all species • Presence/absence of salmon • Presence/absence of overwintering habitat • Understanding of migratory and other relationships with lakes
<i>Other comments:</i>	<ul style="list-style-type: none"> • Important migratory corridor--drains large part of east C. Flats (S) • Reference. to CH* is isolated T.K. account of one fish being caught--40 miles up (T) • Large historic catch in lower 10km--only WF (T).
<i>References:</i>	Peter pers comm.-2004, Kaye pers comm.-2004, Anderton and Frost-2002(1) & 2003(2), Steigenberger et al.-1975(1), Bryan et al.-1973

Table 9. Summary Information for Timber Creek

<i>Stream:</i>	Timber Creek
<i>Drainage:</i>	Old Crow River
<i>Level of Knowledge:</i>	Low
<i>Documented Species Present:</i>	CH, CM*, GR, BB, LSU, CCG
<i>Identified or Inferred Salmon Spawning:</i>	CH in mid reaches
<i>Suspected or Potential Salmon Spawning:</i>	CH & CM throughout except in lowest reaches
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	Throughout except in lowest reaches
<i>Documented Historic Fish Trap Locations:</i>	In lower reaches
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/absence of other species • Patterns of use by all species • Presence/absence of overwintering habitat • Current presence/absence of CM
<i>Other comments:</i>	<ul style="list-style-type: none"> • Current spawning destination for CH (S) • T.K. reference "not many CM"--indicates possible limited use (T) • Very likely stream with important overwintering habitat--open water documented in stream and in lakes at base of Timber Hill (T)(S)
<i>References:</i>	Bryan et al.-1973, Steigenberger et al.-1975(1), Anderton-2002(1) & 2003(1)(2), Anderton pers comm.-2004, D. Kassi pers comm.-2004, Frost pers comm.-2004, Peterson pers comm.-2004

Table 10. Summary Information for Surprise Creek

<i>Stream:</i>	Surprise Creek
<i>Drainage:</i>	Old Crow River
<i>Level of Knowledge:</i>	Very Low
<i>Documented Species Present:</i>	GR, BB*, WF*, NP*, LSU*, RW
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	-
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	-
<i>Documented Historic Fish Trap Locations:</i>	In lower reaches and smaller tributaries
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/absence of other species • Patterns of use by all species • Presence/absence of overwintering habitat • Understanding of migratory and other relationships with lakes
<i>Other comments:</i>	<ul style="list-style-type: none"> • Should be considered an important migratory route--drains large portion of western Crow Flats *Note that these species were captured near the stream mouth (S)
<i>References:</i>	Bryan et al.-1973, Steigenberger et al.-1975(3), Anderton and Frost-2002(1)

Table 11. Summary Information for Thomas Creek

<i>Stream:</i>	Thomas Creek
<i>Drainage:</i>	Old Crow River
<i>Level of Knowledge:</i>	Very Low
<i>Documented Species Present:</i>	GR, CCG, CM*--single T.K. reference (uncertain if "in" or "at" Thomas Cr.)
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	-
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	Throughout
<i>Documented Historic Fish Trap Locations:</i>	Near mouth—2-5 miles upstream
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/absence of other species • Patterns of use by all species • Presence/absence of overwintering habitat
<i>Other comments:</i>	<ul style="list-style-type: none"> • Stream was noted in 1975 report as possible spawning destination for CH--however no further information has indicated this (T) • Fish caught in trap were migrating downstream • Habitat appears poor for salmon (2003)--and w/lots of beaver dams (S)
<i>References:</i>	Steigenberger et al.-1975(1), Bryan et al.-1973, Anderton-2003(1)(2), Njootli pers comm.-2004, Charlie pers comm.-2004*

Table 12. Summary Information for Bilwaddy Creek

Stream:	Bilwaddy Creek
<i>Drainage:</i>	Old Crow River
<i>Level of Knowledge:</i>	Very Low
<i>Documented Species Present:</i>	CH
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	CH in lower reaches
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	In lower reaches
<i>Documented Historic Fish Trap Locations:</i>	-
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/Absence of other species • Patterns of use by all species • Presence/absence of overwintering habitat • Spawning destination of CH
<i>Other comments:</i>	<ul style="list-style-type: none"> • CH once noted in this stream (S) • Open water & overflow areas strongly indicate overwintering habitat--as well as proximity to same in upper Crow River (S) • Majority of stream is in Alaska
<i>References:</i>	Steigenberger et al.-1975(1), Anderton pers comm.-2004

Table 13. Summary Information for Upper Crow River

Stream:	Upper Crow River
<i>Drainage:</i>	Old Crow River
<i>Level of Knowledge:</i>	Moderate
<i>Documented Species Present:</i>	CH, GR, LW, CS, BB, LSU, NP, RW, CM*--single T.K. reference (uncertain if CM was "in" or "at" Thomas Cr.)
<i>Identified or Inferred Salmon Spawning:</i>	CH in border area—from below Bilwaddy Cr. up into Alaska side
<i>Suspected or Potential Salmon Spawning:</i>	CH in areas below known area, CM in same areas as CH identified.
<i>Identified or Inferred Overwintering Habitat:</i>	Large area that straddles border
<i>Suspected or Potential Overwintering Habitat:</i>	Areas below known area down to below Thomas Cr.
<i>Documented Historic Fish Trap Locations:</i>	Several including one in Alaska
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/absence of other species • Patterns of use by all species • Extent and location of CH spawning • Presence/absence of CM
<i>Other comments:</i>	<ul style="list-style-type: none"> • Upstream from this point can be considered a major overwintering area for all species--particularly GR (up to 20,000) (S) • CH salmon spawning documented just downstream of Bilwaddy Cr. in 2003 (S)
<i>References:</i>	Steigenberger et al.-1975(1) & 1977, Anderton-2003(1), Anderton pers comm.-2004, Bryan et al.-1973, Charlie pers comm.-2004*

Table 14. Summary Information for Big Joe Creek

<i>Stream:</i>	Big Joe Creek
<i>Drainage:</i>	Porcupine River
<i>Level of Knowledge:</i>	Low
<i>Documented Species Present:</i>	GR, WF
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	-
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	-
<i>Documented Historic Fish Trap Locations:</i>	Near/at mouth and in upper reaches/small tribs.
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/absence of other species • Patterns of use by all species is unknown
<i>Other comments:</i>	<ul style="list-style-type: none"> • Historically large harvest from this stream--however not currently (T) • Stream drains approx. 1/2 of the "Bluefish" wetland/lake complex--therefore suspected to be important migratory corridor (S)
<i>References:</i>	Anderton-2002(1) & 2003(2), Anderton pers comm.-2004

Table 15. Summary Information for David Lord Creek

<i>Stream:</i>	David Lord Creek
<i>Drainage:</i>	Porcupine River
<i>Level of Knowledge:</i>	Moderate
<i>Documented Species Present:</i>	GR, BW, LW, BB, IN, LSU, RW, CCG, LW/IN Hybrid, CM* (*2 summer CM once observed)
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	-
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	Possible throughout lower 1/2 of stream
<i>Documented Historic Fish Trap Locations:</i>	At/near mouth
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Patterns of use by all species is poorly understood • Presence/absence of overwintering habitat
<i>Other comments:</i>	<ul style="list-style-type: none"> • Important grayling stream-large numbers are known to migrate downstream into the Porcupine during the fall (T) • Possible chinook spawning "redd" observed (but not confirmed) in 2003 (S) • Isolated case of summer CM observed in mid-upper reaches of stream (L)—catch of summer CM near Old Crow virtually non-existent
<i>References:</i>	Peter pers comm.-2004, Frost pers comm.-2004, Anderton-2002(1) & 2003(1)(2), Anderton pers comm.-2004, Steigenberger et al.-1975(1) & 1977, Bryan et al.-1973

Table 16. Summary Information for Driftwood River

Stream:	Driftwood River
<i>Drainage:</i>	Porcupine River
<i>Level of Knowledge:</i>	Moderate
<i>Documented Species Present:</i>	GR, BW, LW, IN, BB, NP, LSU, RW, CCG, LW/IN Hybrid
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	-
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	Possible throughout lower ½ of stream
<i>Documented Historic Fish Trap Locations:</i>	One in lower reaches
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Patterns of use by all species • Presence/absence of other species • Presence absence of overwintering habitat
<i>Other comments:</i>	<ul style="list-style-type: none"> • Overwintering potential exists (S) • Dynamic stream channel (S) • Uncertain if all species listed were caught only near the mouth or further upstream.
<i>References:</i>	Bryan et al.-1973, Anderton and Frost-2002(1), McCart-1974, Steigenberger et al.-1975(3) & 1977, Netro pers comm.-2004

Table 17. Summary Information for Berry Creek

Stream:	Berry Creek
<i>Drainage:</i>	Porcupine River
<i>Level of Knowledge:</i>	Low
<i>Documented Species Present:</i>	GR, WF, LW, RW, NP, LSU, CCG
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	-
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	-
<i>Documented Historic Fish Trap Locations:</i>	One in lower reaches
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Patterns of use by all species • Presence/absence of other species
<i>Other comments:</i>	<ul style="list-style-type: none"> • Stained water (L) • Overwintering is not suspected (S) • WF LSU & NP were caught in fall time fish trap near mouth (T)
<i>References:</i>	Bryan et al.-1974, Steigenberger et al.-1975(3), Anderton-2002(1), Anderton pers comm.-2004, Tizya pers comm.-2004

Table 18. Summary Information for Bell River

<i>Stream:</i>	Bell River
<i>Drainage:</i>	Porcupine River
<i>Level of Knowledge:</i>	Low
<i>Documented Species Present:</i>	CH*, CM*, CO*, GR, LW, IN, BB, NP, LSU, RW, LKC, CCG, TP, AL, LW/IN Hybrid
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	In upper Bell River
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	Throughout mainstem
<i>Documented Historic Fish Trap Locations:</i>	-
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Confirmation of overwintering in lower Bell mainstem • Overwintering use in the upper Bell • Current presence/absence of CH*, CM*, & CO* in watershed (references are historic)
<i>Other comments:</i>	<ul style="list-style-type: none"> • Watershed supports very large freshwater fish pops.(S) • Suspected overwintering habitat throughout Bell mainstem--including upper Bell (S) • Very large grayling populations utilise upper Bell (L)
<i>References:</i>	Steigenberger et al.-1974 & 1975(1)(3), Bryan et al.-1973, McCart-1974, Cox-1999, Anderton-2002(1) & 2003(1)(2)(3), Anderton pers comm.-2004

Table 19. Summary Information for Eagle River

<i>Stream:</i>	Eagle River
<i>Drainage:</i>	Bell River
<i>Level of Knowledge:</i>	Low
<i>Documented Species Present:</i>	GR, IN, CS, NP, LSU, RW, LKC, CCG, TP
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	-
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	Throughout mainstem
<i>Documented Historic Fish Trap Locations:</i>	-
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/absence of other species, patterns of use by all species • Presence/absence of over-winter habitat
<i>Other comments:</i>	<ul style="list-style-type: none"> • Stream has tributary inputs of varying water quality (natural sources) (S) • Possible overwintering habitat throughout mainstem (S) • Lakes in headwaters suspected to be significant fish habitat (T)
<i>References:</i>	Bryan et al.-1973, Anderton pers comm.-2004, Steigenberger et al.-1975(1)

Table 20. Summary Information for Rock River

<i>Stream:</i>	Rock River
<i>Drainage:</i>	Bell River
<i>Level of Knowledge:</i>	Low
<i>Documented Species Present:</i>	CH*, GR, LSU, RW, CCG
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	Limited CH possibility in mid-reaches of river
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	In mid reaches
<i>Documented Historic Fish Trap Locations:</i>	-
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/absence of other species • Patterns of use by all species • Presence/absence of salmon • Presence/absence of overwintering areas
<i>Other comments:</i>	<ul style="list-style-type: none"> • Note that report of CH* is an isolated account from T.K.--no other indications of salmon have been documented (T) • Lower half of stream appears poor for salmon habitat (S) • Winter open water/overflow sources (S)
<i>References:</i>	Bryan et al.-1973, Steigenberger et al.-1975(1), Anderton-2003(1)(2)(3)

Table 21. Summary Information for Waters River

<i>Stream:</i>	Waters River
<i>Drainage:</i>	Bell River
<i>Level of Knowledge:</i>	Low
<i>Documented Species Present:</i>	CH*, CM*, GR, WF, NP, LSU, RW, CCG
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	CH and/or CM
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	Throughout
<i>Documented Historic Fish Trap Locations:</i>	Near mouth
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/absence of other species • Patterns of use by all species • Presence/absence of overwintering habitat • Current presence/absence of salmon
<i>Other comments:</i>	<ul style="list-style-type: none"> • Refs. to CH* and CM* are from T.K.--not clear if caught near mouth or in stream itself--habitat potential exists (T) • Potential overwintering habitat--but assessments of such produced conflicting results (S)
<i>References:</i>	Steigenberger et al.-1975(1)(3), McCart-1974, Anderton-2002(1) & 2003(1)(2)(3)

Table 22. Summary Information for La Chute River

<i>Stream:</i>	La Chute River
<i>Drainage:</i>	Bell River
<i>Level of Knowledge:</i>	Low
<i>Documented Species Present:</i>	CH*, GR, WF, LSU, RW, CCG, CRI-(headwaters only), (plus LW, IN, BB, NP in lower 1-2km only)
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	CH and/or CM in mid to upper reaches
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	Throughout
<i>Documented Historic Fish Trap Locations:</i>	Near mouth and in mid-reaches
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/absence of other species • Patterns of use by all species • Current presence/absence of CH • Presence/absence of overwintering habitat
<i>Other comments:</i>	<ul style="list-style-type: none"> • Report of CH* is an isolated account from T.K.--no current documentation (T) • CO reference from T.K. documented in 2003 was incorrect—verified from source to be CH, not CO. • Some potential for salmon habitat exists (S) • Possible overwintering habitat exists(S)(T) • Large migrations of GR (downstream in fall) (T)
<i>References:</i>	Steigenberger et al.-1975(1)(3), Anderton-2002(1) & 2003(1)(2)(3), Anderton pers comm.-2004, Linklater pers comm.-2004

Table 23. Summary Information for Little Bell River

<i>Stream:</i>	Little Bell River
<i>Drainage:</i>	Bell River
<i>Level of Knowledge:</i>	Very Low
<i>Documented Species Present:</i>	GR
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	-
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	Throughout
<i>Documented Historic Fish Trap Locations:</i>	At or near mouth
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence absence of other species • Patterns of use by all species • Presence/absence of overwintering habitat
<i>Other comments:</i>	<ul style="list-style-type: none"> • Some potential as salmon habitat exists (S) • Possible overwintering habitat exists(S)(T) • Large migrations of GR (downstream in fall) (T)
<i>References:</i>	Steigenberger et al.-1975(1)(3), Anderton-2002(1) & 2003(1)(2)(3), Anderton pers comm.-2004, Linklater pers comm.-2004

Table 24. Summary Information for Upper Bell River

<i>Stream:</i>	Upper Bell River
<i>Drainage:</i>	Bell River
<i>Level of Knowledge:</i>	Low
<i>Documented Species Present:</i>	GR, CCG
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	CH and/or CM (more likely CH)
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	Throughout
<i>Documented Historic Fish Trap Locations:</i>	-
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/absence of other species • Patterns of use by all species • Current presence/absence of salmon • Presence/absence of overwintering habitat
<i>Other comments:</i>	<ul style="list-style-type: none"> • Habitat appears favourable for salmon (S) • Possible overwintering habitat (S).
<i>References:</i>	Anderton-2003(1)(2)(3)

Table 25. Summary Information for Tizya Creek

<i>Stream:</i>	Tizya Creek
<i>Drainage:</i>	Porcupine River
<i>Level of Knowledge:</i>	Low
<i>Documented Species Present:</i>	GR, IN, WF, BB, NP
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	-
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	Throughout
<i>Documented Historic Fish Trap Locations:</i>	In lower reaches and near/at outlet of Whitefish Lake
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence of other species • Patterns of use by all species • Presence/absence of overwintering areas
<i>Other comments:</i>	<ul style="list-style-type: none"> • Existing data is historical (Traditional Knowledge) • This stream drains a large portion of the Whitefish wetland/lake complex--T.K. indicates that it was very productive (T) • Potential overwintering (T)
<i>References:</i>	Peter pers comm.-2004, Tizya pers comm.-2004, Linklater pers comm.-2004, Anderton and Frost-2002(1), Steigenberger et al.-1975(1)

Table 26. Summary Information for Johnson Creek

<i>Stream:</i>	Johnson Creek (Porcupine River)
<i>Drainage:</i>	Porcupine River
<i>Level of Knowledge:</i>	Very Low
<i>Documented Species Present:</i>	CM*, WF, GR, BW, BB, CS, NP, RW, LSU
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	-
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	-
<i>Documented Historic Fish Trap Locations:</i>	One in lower reaches
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence of other species • Patterns of use by all species
<i>Other comments:</i>	<ul style="list-style-type: none"> • Documented information is historic (Traditional Knowledge)--ref. to CM* may be at mouth of creek or a short distance upstream (T) • Little information currently documented
<i>References:</i>	Anderton and Frost-2002(1)

Table 27. Summary Information for Cody Creek

<i>Stream:</i>	Cody Creek
<i>Drainage:</i>	Porcupine River
<i>Level of Knowledge:</i>	Very Low
<i>Documented Species Present:</i>	GR, NP, CCG
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	-
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	-
<i>Documented Historic Fish Trap Locations:</i>	One near mouth
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/absence of other species • Patterns of use by all species
<i>Other comments:</i>	<ul style="list-style-type: none"> • Habitat does not appear to have potential for use by salmon--and lots of beaver dams
<i>References:</i>	Bryan et al.-1973, Anderton-2001 & 2002(1) & 2003(1)

Table 28. Summary Information for Whitestone River

<i>Stream:</i>	Whitestone River
<i>Drainage:</i>	Porcupine River
<i>Level of Knowledge:</i>	Moderate to Low
<i>Documented Species Present:</i>	CH, CM*, GR, BW, LW, BB, IN, CS, NP, LSU, RW, LKC, CCG
<i>Identified or Inferred Salmon Spawning:</i>	CH throughout area upstream from McPharlon Creek for 50-60 Km
<i>Suspected or Potential Salmon Spawning:</i>	Possible small extension of documented spawning areas and possible CM spawning also upstream from McPharlon Cr.
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	Throughout
<i>Documented Historic Fish Trap Locations:</i>	One near mouth of Chance Cr. at old Village
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Extent of CH spawning • Patterns of use by all species • Presence/absence of CM • Confirmation/extent of overwintering habitat
<i>Other comments:</i>	<ul style="list-style-type: none"> • CH spawning destination in upper Whstn--above McPharlon Cr (S) • Current presence/absence of CM unconfirmed--one recent report & historic refs. (T.K.) as well (L)(T) • Suspected overwintering habitat in mainstem (S)
<i>References:</i>	Bryan et al.-1973, Steigenberger et al.-1975(1) & 1977, Cox-1999, Anderton-2001 & 2002(1) & 2003(1), Anderton pers comm.-2004, Tobler pers comm.-2004

Table 29. Summary Information for Chance Creek

<i>Stream:</i>	Chance Creek
<i>Drainage:</i>	Whitestone River
<i>Level of Knowledge:</i>	Low
<i>Documented Species Present:</i>	GR, IN, NP, BB, LSU, RW, CCG
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	-
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	-
<i>Documented Historic Fish Trap Locations:</i>	One in lower reaches
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/absence of other species • Patterns of use by all species • Possible stone remains of fish trap in lower 2km
<i>Other comments:</i>	<ul style="list-style-type: none"> • LSU and NP most abundant--from T.K. (T) • Site of rock structure/barrier in lower 2km observed in 2001 (S)
<i>References:</i>	Anderton-2001 & 2002(1)

Table 30. Summary Information for Miner River

<i>Stream:</i>	Miner River
<i>Drainage:</i>	Porcupine River
<i>Level of Knowledge:</i>	Moderate
<i>Documented Species Present:</i>	CH, CM, CO, GR, LW, IN, BB, LSU, RW, LKC, CCG
<i>Identified or Inferred Salmon Spawning:</i>	CH throughout area between F. Branch River and Fishing Cr.
<i>Suspected or Potential Salmon Spawning:</i>	Possible CM in lower reaches
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	Throughout
<i>Documented Historic Fish Trap Locations:</i>	-
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Patterns of use by all species • Presence/absence of overwintering habitat • Patterns of use by juvenile CH • Presence/absence of CM or CO
<i>Other comments:</i>	<ul style="list-style-type: none"> • Major spawning destination of Porcupine CH (S) • Below F. Branch is CO/CM migration route (S)(T) • Possible CM spawning and/or rearing (and CO) in lower reaches (S) • Suspected overwintering habitat throughout mainstem (S)(T)
<i>References:</i>	Bryan et al.-1973, Steigenberger et al.-1975(1) & 1977, Timpany-1997, Cox-1999, Anderton-2001 & 2002(1)(2) & 2003(1), Nukon pers comm.-2004

Table 31. Summary Information for Fishing Branch River

<i>Stream:</i>	Fishing Branch River
<i>Drainage:</i>	Porcupine River
<i>Level of Knowledge:</i>	Moderate
<i>Documented Species Present:</i>	CH, CM, CO, GR, BW, BB, LW, IN, LSU, NP, RW, CCG
<i>Identified or Inferred Salmon Spawning:</i>	CH, CM, and CO in mid-reaches (CM concentrated around Bear Cave Mtn. & CH mainly just below confluence of North Fork)
<i>Suspected or Potential Salmon Spawning:</i>	Possible extension of CH spawning area upstream, plus North Fork and lower reaches
<i>Identified or Inferred Overwintering Habitat:</i>	Major overwintering area for GR & RW near Bear Cave Mtn.
<i>Suspected or Potential Overwintering Habitat:</i>	Possible extension of identified area to North Fork and lower reaches
<i>Documented Historic Fish Trap Locations:</i>	-
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Patterns of use by all species • Extent of CH spawning • Extent of CO spawning • Patterns of use by all species in North Fork
<i>Other comments:</i>	<ul style="list-style-type: none"> • Major spawning destination for CM (T)(S) • Also spawning destination for CH & CO--extent unknown • Major overwintering area--GR in particular (up to 15,000) (S) • Less knowledge available on North Fork
<i>References:</i>	Bryan et al.-1973, Steigenberger et al.-1975(1) &1977, Boyce-1997, Timpany-1997, Cox-1999, Siegel-1986, Anderton-2002(1)(2) & 2003(1)

Table 32. Summary Information for Fishing Creek

<i>Stream:</i>	Fishing Creek
<i>Drainage:</i>	Miner River
<i>Level of Knowledge:</i>	Low
<i>Documented Species Present:</i>	GR, CCG
<i>Identified or Inferred Salmon Spawning:</i>	-
<i>Suspected or Potential Salmon Spawning:</i>	Lower reaches have CH potential
<i>Identified or Inferred Overwintering Habitat:</i>	-
<i>Suspected or Potential Overwintering Habitat:</i>	Throughout
<i>Documented Historic Fish Trap Locations:</i>	No
<i>Data Gaps:</i>	<ul style="list-style-type: none"> • Presence/absence of other species • Patterns of use by all species • Presence/absence of overwintering • Significance of inputs to habitat downstream
<i>Other comments:</i>	<ul style="list-style-type: none"> • Very important stream--Miner water quality heavily impacted by this trib--suspect productivity increased (S) • Suspect overwintering habitat (S) • This stream warrants special consideration and further research
<i>References:</i>	Anderton-2002(2), 2003(1)

3.2 Lake and Wetland Complexes/Areas

In light of the documented importance of lake/wetland areas from a fisheries perspective (see Section 4.1), all areas of lakes have been highlighted in the three general zones. These include areas of small lakes along the Porcupine, Bell, and Eagle Rivers that are outside of the core Old Crow Flats, Bluefish, and Whitefish wetland areas (see maps in Appendices 2 and 4). In many cases very small lakes have been identified as having important fish habitat values (including some overwintering). In one case, a very small pond, no more than 1 metre in depth, located adjacent to the Porcupine River was found to contain large numbers of juvenile burbot in early September. In other cases, large lakes are found to be void of fish throughout the year. Such lakes void of fish tend to generally be shallow, lacking any direct connection to a creek/river or other waterway (Anderton-2004). See map in Appendix 2 for further information.

3.3 Specific Lake Information

Information on 30 specific lakes was mapped from sources including past scientific/technical studies and Traditional Knowledge. The information presented is generally quite limited and/or of a “snapshot” nature. As well, with more than 2,000 such lakes in the watershed, it represents a small sample of specific lake fisheries data. Lakes identified as having overwintering populations of fish, or are suspected to provide such habitat, have been mapped with such respective habitats for streams. However, in such cases, the information sources should be considered extremely limited. As far as technical/scientific information is concerned, it is unlikely that significant further information exists. However, it cannot be doubted that a significant volume of undocumented Local and Traditional Knowledge exists regarding many lakes. Traditional Knowledge documented to date has focussed heavily on stream related questions (ie: location of fish traps), with little to no emphasis on lakes (Anderton-2002(1) & 2003(2)). The information collected regarding each lake is presented below in Tables 33 to 62. Also see map in Appendix 2.

Table 33. Specific Information for Unknown Lake 1

<i>Lake:</i>	Unknown Lake 1
<i>Drainage:</i>	Porcupine Mainstem
<i>Known Species Present:</i>	NP
<i>Overwintering:</i>	Unknown
<i>Other Comments:</i>	lake behind Donald's cabin (T)
<i>References:</i>	Frost pers comm.-2004

Table 34. Specific Information for Unknown Lake 2

<i>Lake:</i>	Unknown Lake 2
<i>Drainage:</i>	Porcupine Mainstem
<i>Known Species Present:</i>	NP
<i>Overwintering:</i>	Unknown
<i>Other Comments:</i>	lake behind Donald's cabin (T)
<i>References:</i>	Frost pers comm.-2004

Table 35. Specific Information for Bluefish Lake

<i>Lake:</i>	Bluefish Lake
<i>Drainage:</i>	Bluefish River
<i>Known Species Present:</i>	GR
<i>Overwintering:</i>	Suspected
<i>Other Comments:</i>	Not too much GR in lake, always open water or thin ice at lake outlet--possible overwintering area (T).
<i>References:</i>	Frost pers comm.-2004

Table 36. Specific Information for Fish Lake (Old Crow)

<i>Lake:</i>	Fish Lake (near Old Crow)
<i>Drainage:</i>	Porcupine Mainstem
<i>Known Species Present:</i>	GR, BW, LW CS, LSU, NP
<i>Overwintering:</i>	Yes
<i>Other Comments:</i>	Lake was found to have overwintering populations of BW and CS in April 1973 (S), known to be winter fishery here (L).
<i>References:</i>	Steigenberger et al.-1975(3) & 1977, Anderton pers comm.-2004

Table 37. Specific Information for Vunutukla Lake (also called Donut Lake)

Stream:	Vunutukla Lake (Donut Lake)
Drainage:	Crow River
Known Species Present:	CS, NP, LSU
Overwintering:	Not suspected
Other Comments:	Lake appears to be used seasonally--w/associated in/out migrations (S), overwintering habitat is considered unlikely as water was anoxic in March 1974 (S), nothing but LSU in fish net (T).
References:	Steigenberger et al.-1975(3), Kaye pers comm.-2004

Table 38. Specific Information for Unknown Lake 3

Lake:	Unknown Lake 3
Drainage:	Drainage uncertain--possibly none
Known Species Present:	None
Overwintering:	Not suspected
Other Comments:	Shallow lake, no fish were present in July 1973, likely freezes to the bottom in winter--although no winter sampling conducted (S).
References:	Steigenberger et al.-1975(3)

Table 39. Specific Information for Jackfish Lake

Lake:	Jackfish Lake
Drainage:	Schaeffer Creek (Crow Flats)
Known Species Present:	GR, NP
Overwintering:	Unknown
Other Comments:	GR are not there anymore (T), brought fish up Porcupine to L. Pierre House for trading (T).
References:	Linklater pers comm.-2004

Table 40. Specific Information for Unknown Lake 4

Lake:	Unknown Lake 4
Drainage:	Schaeffer Creek (Crow Flats)
Known Species Present:	WF
Overwintering:	Unknown
Other Comments:	Used to be lots of WF in lake (T).
References:	D. Kassi pers comm.-2004

Table 41. Specific Information for Zelma Lake

Lake:	Zelma Lake
Drainage:	Schaeffer Creek (Crow Flats)
Known Species Present:	WF, NP
Overwintering:	Unknown
Other Comments:	(T)
References:	H. Kassi pers comm.-2004

Table 42. Specific Information for Unknown Lake 5

Lake:	Unknown Lake 5
Drainage:	Schaeffer Creek (Crow Flats)
Known Species Present:	NP
Overwintering:	Unknown
Other Comments:	Lots of NP in this lake (T).
References:	H. Kassi pers comm.-2004

Table 43. Specific Information for Old Chief Lake

Lake:	Old Chief Lake
Drainage:	Schaeffer Creek (Crow Flats)
Known Species Present:	GR, IN
Overwintering:	Unknown
Other Comments:	Huge IN there in 1970s--"tip your boat" size (T)
References:	P. Josie pers comm.-2004

Table 44. Specific Information for Willow Lake

Lake:	Willow Lake
Drainage:	Schaeffer Creek (Crow Flats)
Known Species Present:	WF
Overwintering:	Strongly Suspected
Other Comments:	Steigenberger mentions supporting overwintering fish in early 1970s-- no other information provided (S), many WF killed with seismic explosions conducted in 1940-50s--lots of fish in this lake (T).
References:	Steigenberger et al.-1975(1), P. Josie pers comm.-2004

Table 45. Specific Information for Chinnitlui Lake

Lake:	Chinnitlui Lake
Drainage:	Little Flat Creek (into Johnson Creek--C. Flats)
Known Species Present:	GR, BW, BB, LW, CS, LSU, NP
Overwintering:	Not suspected.
Other Comments:	Lake was anoxic and without fish in March 1974, likely seasonal use only for feeding/rearing-w/seasonal in/out migrations, one BW was tagged here in summer 1972 and recaptured near O.C. in the fall (S).
References:	Steigenberger et al.-1975(3) & 1977

Table 46. Specific Information for Unknown Lake 6

Lake:	Unknown Lake 6
Drainage:	Little Flat Creek (into Johnson Creek--C. Flats)
Known Species Present:	CS, NP
Overwintering:	Not suspected.
Other Comments:	(S)
References:	Steigenbeger et al.-1977

Table 47. Specific Information for Husky Lake

Lake:	Husky Lake
Drainage:	Black Fox Creek
Known Species Present:	WF
Overwintering:	Suspected
Other Comments:	Husky Lake fished for WF before 1930, probably a winter fishery (T).
References:	Steigenberger et al.-1975(1)

Table 48. Specific Information for Whitefish Lake

Lake:	Whitefish Lake
Drainage:	Surprise Creek
Known Species Present:	CS, NP
Overwintering:	Suspected
Other Comments:	(S) Lots of NP in this lake (T).
References:	Steigenberger et al.-1977, Linklater pers comm.-2004, Anderton pers comm.-2004

Table 49. Specific Information for Unknown Lake 7

Lake:	Unknown Lake 7
Drainage:	Old Crow River
Known Species Present:	GR, LW, CS, NP
Overwintering:	Unknown
Other Comments:	(S)
References:	Steigenberger et al.-1977

Table 50. Specific Information for Unknown Lake 8

Lake:	Unknown Lake 8
Drainage:	Porcupine Mainstem
Known Species Present:	None
Overwintering:	Not suspected
Other Comments:	(S)
References:	Steigenberger et al.-1977

Table 51. Specific Information for Tack Lake

Lake:	Tack Lake
Drainage:	Big Joe Creek
Known Species Present:	GR, CS, NP
Overwintering:	Unknown
Other Comments:	(S), Lots of NP in lake, but number going down (T).
References:	Steigenberger et al.-1977, Peter pers comm.-2004

Table 52. Specific Information for Unknown Lake 9

<i>Lake:</i>	Unknown Lake 9
<i>Drainage:</i>	Big Joe Creek
<i>Known Species Present:</i>	None
<i>Overwintering:</i>	Not suspected
<i>Other Comments:</i>	(S)
<i>References:</i>	Steigenberger et al.-1977

Table 53. Specific Information for Unknown Lake 10

<i>Lake:</i>	Unknown Lake 10
<i>Drainage:</i>	Big Joe Creek
<i>Known Species Present:</i>	GR, BW, CS, NP
<i>Overwintering:</i>	Suspected.
<i>Other Comments:</i>	(S)
<i>References:</i>	Steigenberger et al.-1977, Anderton pers comm.-2004

Table 54. Specific Information for Unknown Lake 11

<i>Lake:</i>	Unknown Lake 11
<i>Drainage:</i>	Porcupine Mainstem
<i>Known Species Present:</i>	NP
<i>Overwintering:</i>	Unknown
<i>Other Comments:</i>	Fish lake--Caught whitefish here in 1950s and 1960s (T)
<i>References:</i>	P.Josie pers comm.-2004

Table 55. Specific Information for Cadzow/Fish Lake

<i>Lake:</i>	Cadzow/Fish Lake
<i>Drainage:</i>	Porcupine Mainstem
<i>Known Species Present:</i>	GR, WF, BW, NP
<i>Overwintering:</i>	Suspected
<i>Other Comments:</i>	Low oxygen levels and no fish found in March 1974-however winter fishery has been documented (S). WF and NP were gillnetted under the ice in the 1940s & 1950s (T)
<i>References:</i>	Steigenberger et al.-1975(1)(3) & 1977, Anderton pers comm.-2004

Table 56. Specific Information for Unknown Lake 12

<i>Lake:</i>	Unknown Lake 12
<i>Drainage:</i>	Porcupine Mainstem
<i>Known Species Present:</i>	NP
<i>Overwintering:</i>	Unknown
<i>Other Comments:</i>	"Old fish lake" for GR and WF. No further information provided (T).
<i>References:</i>	Steigenberger et al.-1975(1)

Table 57. Specific Information for Kohk Vun Lake

<i>Lake:</i>	Kohk Vun Lake
<i>Drainage:</i>	No known drainage—not thought to be connected to any water-body
<i>Known Species Present:</i>	None
<i>Overwintering:</i>	Not suspected
<i>Other Comments:</i>	Shallow lake, appears to not be used by fish--sampled in July 1973, not likely overwintering habitat (S)
<i>References:</i>	Steigenberger et al.-1975(3)

Table 58. Specific Information for Unknown Lake 13

<i>Lake:</i>	Unknown Lake 13
<i>Drainage:</i>	Bell River
<i>Known Species Present:</i>	BW, LW, IN, NP, LSU
<i>Overwintering:</i>	Not suspected.
<i>Other Comments:</i>	Water was found to be anoxic during March 1974--with no fish present, indication of seasonal feeding/rearing--w/seasonal in/out migrations (S)
<i>References:</i>	Steigenberger et al.-1975(3)

Table 59. Specific Information for Whitefish Lake

<i>Lake:</i>	Whitefish Lake
<i>Drainage:</i>	Tizya Creek
<i>Known Species Present:</i>	
<i>Overwintering:</i>	Suspected
<i>Other Comments:</i>	Lake very important for fish production--people from all over fished here en-route from L. Pierre House to Johnson Creek and Whitestone and vice-versa (T), possible overwintering habitat (T).
<i>References:</i>	Anderton & Frost-2002(1), Anderton pers comm.-2004, Peter pers comm.-2004

Table 60. Specific Information for Unknown Lake 14

<i>Lake:</i>	Unknown Lake 14
<i>Drainage:</i>	Porcupine Mainstem
<i>Known Species Present:</i>	BW
<i>Overwintering:</i>	Suspected.
<i>Other Comments:</i>	Lake where winter spearing of big BW took place (T), location provided is vague-----this lake is most likely candidate but not 100% certain.
<i>References:</i>	Steigenberger et al.-1975(1)

Table 61. Specific Information for Unknown Lake 15

<i>Lake:</i>	Unknown Lake 15
<i>Drainage:</i>	Johnson Creek (Porcupine)
<i>Known Species Present:</i>	BW
<i>Overwintering:</i>	Suspected.
<i>Other Comments:</i>	Lake where winter spearing of big BW took place (T), location provided is vague-----this lake is most likely candidate but not 100% certain.
<i>References:</i>	Steigenberger et al.-1975(1)

Table 62. Specific Information for Nahoni Lake

<i>Lake:</i>	Nahoni Lake
<i>Drainage:</i>	Miner River
<i>Known Species Present:</i>	
<i>Overwintering:</i>	Unknown
<i>Other Comments:</i>	Lots of fish (T), location is not 100% certain, however appears to be only significant lake on the Miner River---reference is for Nahoni Lake on the Miner River.
<i>References:</i>	Nukon pers comm.-2004

4.0 DISCUSSION

The information summarized in this report represents a comprehensive documentation of existing fisheries knowledge regarding the Canadian portion of the Porcupine River watershed. Most existing information has been obtained and summarized/synthesized into this report and associated map products.

It should be noted that as with fish populations, fish habitat is not a static resource. Rather, it is influenced by a complex and dynamic set of factors, components, and systems that work together to create a particular set of conditions in a particular place and time. That is, the biotic and abiotic components of ecosystems that result in aquatic habitats favourable to fish are dynamic and in constant flux. For example, a particularly dry summer may result in lower than average groundwater discharges throughout the following winter. Alternatively, an extremely cold winter could result in a lake that normally overwinters fish becoming anoxic. Both of these examples have the potential to significantly impact overwinter populations of fish. Another example of the dynamic nature of fish habitat could be changes in natural water quality due to changes in subsurface hydrological pathways (i.e. exposure to different areas of bedrock). As mentioned above, the factors and variables influence habitat conditions are many and complex. From a Land Use Planning perspective, understanding processes that create favourable fish habitat can provide an opportunity to plan land-use developments in a manner that may work within natural processes and systems. Through this approach, such planning can effectively minimize or prevent impacts upon fish populations and their habitat.

4.1 Lake and Wetland Complexes/Areas

The general level of knowledge regarding lakes in the Porcupine River system is very low, therefore there is limited understanding of the patterns of fisheries use regarding the lake/wetland complexes. However, the importance of the many lakes and wetlands within the Porcupine River system has been clearly documented, and cannot be emphasized enough. Traditional Knowledge documented in 2002 and 2003 has demonstrated that large areas of lakes associated with the Old Crow Flats, the flats south of Old Crow (Bluefish Wetlands), and the flats found between the Porcupine, Bell, and Eagle Rivers (Whitefish Lakes area), are critical for the production of large volumes of freshwater fish species (Anderton 2002(1) & 2003(2)). See map in Appendix 4 for further detail.

Due to the size of the Old Crow Flats area, it figures most prominently in terms of historic fish trap locations and catch sizes. For example, 54% of all fish trap locations mapped in this exercise were located within the Old Crow River watershed. In many such locations, seasonal catches were reported to be very large (i.e.: 10,000 fish in a summer). In addition, traps located in the Bluefish wetland south of Old Crow and in the Whitefish lakes area were also reported to have been highly productive (Anderton 2002(1) & 2003(2)).

Scientific/technical information collected in the early 1970s regarding specific lakes in various locations throughout the Porcupine watershed has provided further information regarding fish utilisation and habitats. It appears that some are not utilised at all by fish, while others are utilised on a seasonal basis (for feeding/rearing), but are anoxic or freeze solid during the winter. And, some others are of a depth and water quality to also provide overwintering habitat (Steigenberger et al.-1975(3) & 1977).

This further compliments some Traditional Knowledge documented in 2003 which indicates that fish traps were constructed and used in the upper portions of watersheds in the spring and the lower portions of drainages (i.e. confluences of tributaries and a major river) in the fall. Such accounts indicate a generalized pattern of people harvesting the large populations of fish as they migrated upstream toward the full extent of their utilisation of a watershed in the spring, and then again harvesting them as they migrated downstream to overwintering habitats in the fall (also likely associated with seasonal trapping/hunting patterns). While this spring upstream and fall downstream migration is a simplified concept of patterns of fish habitat usage (with actual patterns of use likely being more complicated and with differences between species), it can be seen as reflecting a generalized pattern of use in the lake/wetland areas (Anderton-2003(2)).

Some further complimentary Traditional and technical/scientific information is that certain lakes were dominated by a particular species of fish. Lake studies in the early 1970s found that while a lake may contain several species of fish (although frequently only 2 or 3), that one species would be dominant in numbers (Steigenberger et al.-1975(3) & 1977). This finding was confirmed through Traditional Knowledge at the November 2, 2004 Fisheries workshop held in Old Crow, where an elder mentioned that each lake draining into Schaeffer Creek in Crow Flats holds a different kind of fish (Kaye pers comm.-2004)

Traditional and scientific knowledge has confirmed that a net loss of surface area covered by water in the Old Crow Flats is currently taking place. The causes of this loss are unknown, however possible contributing factors include climate change (possible related changes in permafrost conditions) and natural succession (Anderton pers comm.-2004). The associated impact on fish populations remains unknown. Due to the lack of past baseline and current data, the significance of such impacts cannot be speculated upon at this time.

4.2 Salmon Species

Porcupine River salmon populations and their habitat are generally better understood than freshwater species in the watershed. Despite this fact, relatively little information exists regarding most aspects of the populations, with the sole exception of fall chum salmon spawning in the Fishing Branch River.

4.2.1 Chinook Salmon

The Porcupine River chinook stocks have undergone various changes over time. Traditional Knowledge documented in 2002 indicated that prior to 1916, chinook returns in the Porcupine were quite large, but subsequently declined. Such Traditional Knowledge also indicated that at times during the past century, very few chinook continued to migrate past Old Crow (Anderton-2002(1), Anderton pers comm.-2004). The possible loss of historic Bell River stocks may have also taken place during this time. However, research conducted in the early 1970s indicated overall much lower returns than current information (2001-2004) suggests. This indicates that Porcupine Rivers chinook stocks may now be stronger than in the past.

The historic presence of chinook salmon in the Bell River system has also been reasonably established through Traditional Knowledge and other historic accounts (Anderton-2002(1), Anderton pers comm.-2004, Cox-1999). However, investigations in the early 1970s, as well as further research conducted in 2003 and 2004 has found no indication of chinook in this watershed (Steigenberger et al.-1975, Anderton-2003(1)(3), Anderton pers comm.-2004). Habitat that may be suitable for chinook spawning has been identified in three areas of the Bell River watershed, and while their current absence cannot yet be substantially concluded, it is suspected (Anderton-2003(1)(3)).

Traditional and scientific knowledge has confirmed the location of five spawning destinations for Porcupine River chinook, with the largest and most significant such location being the Miner River (Steigenberger et al.-1975, Anderton-2001 & 2002(1)(2) & 2003(1)(2), Anderton pers comm.-2004). A limited amount of juvenile sampling has indicated that the majority of juvenile chinook in the Miner River may not remain to rear and over-winter in the River, but rather possibly migrate downstream in the spring (Anderton-2002(2)). Further investigation is required to confirm if this is the case, and, to indicate whether juvenile chinook rearing dynamics in the other four destinations are similar. If the majority of juvenile chinook do not rear in their natal stream, or non-natal streams along the Porcupine River, it will indicate that the majority of Porcupine River chinook behave differently than those in the upper Yukon River watershed.

Considering the amount of habitat within the Porcupine River which appears to have some potential for chinook spawning, it is likely that the system is considerably underutilised in this regard (Anderton-2003(1)). Further, considering a possible increase in overall run strength during the past 30 years, the Porcupine River chinook salmon deserve further attention and study. Maps located in Appendix 6 provide further information regarding documented and potential chinook spawning habitat.

4.2.2 Chum Salmon

Declines in Porcupine River fall chum returns during the late 1990s and 2000-2002 have prompted considerable concern for managers at local, regional, and international levels. A significant subsistence chum fishery exists in the vicinity of Old Crow, and therefore the situation is of considerable local concern. Local measures have been taken to increase spawning escapement. Chum returns in 2003 and 2004 have shown some improvement, however, the concern remains. Re-building these stocks is currently a goal of managers at all levels.

The major spawning destination for chum salmon migrating up the Porcupine River has long been known to be the Fishing Branch River. An enumeration weir on the Fishing Branch has been providing population estimates since the early 1970s. However, recent findings as well as Traditional and Local Knowledge have indicated that chum salmon also spawn in other locations. While the strength of populations spawning in other locations remains unknown, there is some preliminary indication that, at least during some years, such populations may be significant in size (Anderton-2003(2), Anderton pers comm.-2004). Further to this, in 2004 two such chum spawning locations were identified in the Porcupine mainstem within an approximate 50 kilometre radius of Old Crow. While residents of Old Crow frequented these areas, spawning chum have not been noticed there in the past. Whether this is a new phenomena or not remains uncertain. In 1998, radio tagged chum were located in the vicinity of these locations late in the season (Boyce-1999). Regardless, the significance of chum salmon spawning in the Porcupine River mainstem and other tributaries, as well as the general dynamics of Porcupine River chum stocks, require further investigation.

The historic presence of chum salmon in the Bell River system has also been reasonably established through Traditional Knowledge and other historic accounts (Anderton-2002(1), Anderton pers comm.-2004, Cox-1999). However, investigations in the early 1970s, as well as research conducted in 1998 and 2001 found no indication of chum in this watershed. Some suitable spawning habitat has been identified the Bell River watershed, and while their contemporary absence cannot yet be substantially concluded, it is suspected (Steigenberger et al.-1975, Boyce-1999, Anderton-2003(1)). Maps located in Appendix 7 provide further information regarding documented and potential chum spawning habitat.

4.2.3 Coho Salmon

Porcupine River coho stocks are the least understood of the salmon species returning to the watershed. As they migrate late in the year, the vast majority pass Old Crow after the River has frozen. Therefore, little information regarding their migratory destinations or run strength is available. However, the coho are a prized food fish, and a subsistence fishery is conducted near Old Crow. It is known that some coho do spawn in the Fishing Branch River. A few coho salmon usually pass through the Fishing Branch chum weir in mid October, and these are thought to be the beginning of coho returns. Significant numbers of juvenile coho have also been captured in the Fishing Branch River (Steigenberger et al.-1975(1), Boyce-1997, Timpany-1997). A single documented historical reference to coho in the Bell River exists, however, no further information has indicated this (Cox-1999). However, with no further information regarding the strength or migratory patterns of these salmon, little more can be concluded. Further research/assessment of this species is required.

4.3 Natural Factors Affecting Fish Habitat Quality

As has been established in this report, information regarding fish populations and their habitat in the Porcupine River watershed is limited. As well, gathering information using standard methodology in such isolated conditions is generally very expensive. Further, from a land use management perspective, such information is limited in context and at times possibly misleading in terms of fish habitat usage. Understanding fish habitat usage in a northern system such as the Porcupine watershed may require a novel approach.

A constant barrier to developing such understandings is the migratory nature of virtually all fish populations. That is, habitats are utilised on a seasonal basis, rendering “snapshot” fish sampling less effective. An understanding of the limiting factors in terms of fish habitat and associated productivity may provide a greater understanding of fish habitat in the Porcupine River watershed. Understanding and assessing the indicators of such factors may be a preferable and cost-effective means of ensuring that land-use activities do not impact adversely on fish habitat.

4.3.1 Winter Water Flows

Winter water flows are believed to represent a significant limiting factor regarding fish habitat availability and productivity in the Porcupine River watershed. There is limited groundwater storage in the Porcupine watershed relative to the previously glaciated upper Yukon Basin in Canada. Due to this, as well as low winter temperatures and associated low flows, the amount and quality of overwintering habitat is considered to be critical limiting factor of fish populations. Such habitat is generally found where there is sufficient depth and inputs of oxygenated water to maintain adequate dissolved oxygen levels throughout the winter. Locations of such habitats typically can be found in the Porcupine River mainstem and certain lakes. As well, important overwintering habitat for fish is found in locations where there is sufficient groundwater discharge throughout the winter at a temperature that prevents total freezing of the stream.

In some cases this may be evident by a constant large area of open water such as in the Fishing Branch River or the upper reaches of the Old Crow River. In other cases, groundwater discharge may occur in lower volumes and spread over a greater area of streambed. This results in constant flow under the river ice and smaller areas of thin ice or open water throughout the length of a stream. Such examples can be found in the Miner and Whitestone Rivers. As well, areas of groundwater discharge are critical for salmon spawning habitat. That is, fall chum salmon spawn in areas of groundwater discharge, while chinook salmon generally spawn downstream of discharge areas. In either case, a sufficient flow of water of a suitable quality is required.

4.3.2 Natural Water Quality (Bedrock Geology)

Natural water quality is another limiting factor with regard to the productivity of aquatic ecosystems in the Porcupine River watershed. Considering the critical nature of winter groundwater flows, the natural quality of groundwater discharges is highly significant to the value of potential overwintering habitat. Examples include sources of water discharging from bedrock formations of limestone (such as in the region of the North Olgivie Mountains), which tend to be hard, with high concentrations of dissolved calcium and magnesium compounds. Such hard water sources appear to be highly productive for aquatic life. On the other hand, sources of water discharging from bedrock formations of sulphurous shale found throughout the Eagle Plains area tend to have higher concentrations of heavy metals such as iron, zinc, or aluminium, and may also be acidic (low pH). These sources tend to produce aquatic environments with limited biological productivity and in some cases may be completely abiotic (von Finster pers comm.-2004). Bedrock geology, therefore, may provide an indicator of water quality in a given area, and may indicate the fish habitat potential of a given water source. Such indications should, of course, always be verified through sampling and analysis.

4.3.3 Dissolved Nutrients

A further factor affecting water quality is the natural level of dissolved nutrients (ie: nitrates, phosphates, potassium). Streams with groundwater inputs exhibiting higher levels of such dissolved nutrients appear to be more biologically productive than those with lower levels. A dramatic example in the study area is found in the Miner River watershed. There, the upper portions of the River (upstream of Fishing Creek) have a clean and bright cobble/gravel substrate with little or no attached algae. However, Fishing Creek appears to be highly nutrient rich, evident in significant algal growth attached to the bottom and throughout the stream. As Fishing Creek joins the Miner River, the change in the River is dramatic. The River bottom changes from clean and bright upstream, to being covered in a dark layer of algae at and below the confluence. Interestingly, the portion of the Miner with documented chinook spawning activity ranges upstream from the mouth of the Fishing Branch River to immediately downstream of Fishing Creek. While the habitat of the Miner River upstream of Fishing Creek appears to be quite good for chinook, limited investigations to date have found no evidence of their spawning or presence (Anderton-2002(2) & 2003(1)(3), Anderton pers comm.-2004), Steigenberger et al.-1975). This is not to suggest that the Miner River upstream of Fishing Creek is biologically unproductive, on the contrary this portion of the River appears to be highly productive for large populations of arctic grayling. The point is that the change in character of the Miner downstream is so dramatic that it may provide an interesting example of how natural nutrient levels/inputs can affect the biological productivity of a stream.

4.4 Fish Habitat and Land Use Planning

Sources of water that exhibit indications of being productive as fish habitat must be considered as such, regardless of the presence or absence of fish at the time of sampling. As mentioned previously, this is due

to the migratory nature of virtually all fish populations in the Porcupine watershed. Fish utilise certain habitats on a seasonal basis, and therefore such important habitats may at times appear to be void of fish. As well, dynamic population characteristics may create circumstances where populations of fish appear absent from a particular habitat in a particular year, however, may subsequently rebound to utilise said habitat.

From a land-use perspective, watercourses and bodies associated with potential impacts from a land use activity must be assessed for fish habitat values. Flowing or standing water under winter conditions having the potential to support fish should be considered important fish habitat. Such identified fish habitats must be considered appropriately in terms of water extraction activities and other activities associated with such habitat.

From a fish habitat management perspective, it would be a preferable option to target water extraction/consumption from water sources with natural qualities that do not favour fish. Further, in this regard it will be critical to consider the nature of potential developments at the Land Use Planning level. For example, most foreseeable large-scale development activity in the Porcupine River watershed will occur primarily during the winter, with most requiring substantial volumes of water for the construction of winter roads as well as supplying camps and possible industrial applications. Therefore, to facilitate such requirements of water supply, planning for the appropriate location and provision of infrastructure prior to actual project specific planning may be critical for protection of critical fish habitats as defined in this report.

Further to this, the impending effects of climate change should also be factored into land-use planning. Climate change has important implications for the availability of water. Should drier summers become standard for the Porcupine River region, less water will be available to re-charge groundwater reserves. This will decrease groundwater flows during critical winter periods, thereby reducing the current availability of overwintering habitats. This further highlights the importance of protecting winter water flows of a quality and quantity suitable for fish overwintering habitats.

5.0 CONCLUSION

As the first comprehensive Chapter 11 Land Use Plan mandated under the Yukon First Nations Umbrella Final Agreement, the North Yukon Regional Land Use Plan has the unique potential to “do development right.” Very little development of any kind has impacted the Porcupine River watershed and from a fish habitat perspective, it is virtually “pristine”. The opportunity represented by the Chapter 11 Land Use Planning process is therefore highly significant. As well, the results of the process and the lessons learned can provide a model for other planning processes throughout the Yukon, although some factors related to fish habitat may differ from region to region.

The information presented in this report is at this time the most complete available source of fisheries information regarding the Porcupine River watershed. It can therefore provide a valuable basis from which to consider land use activities in terms of fish populations and their habitat. As additional knowledge and information becomes available, it should be incorporated into future planning and assessment activities.

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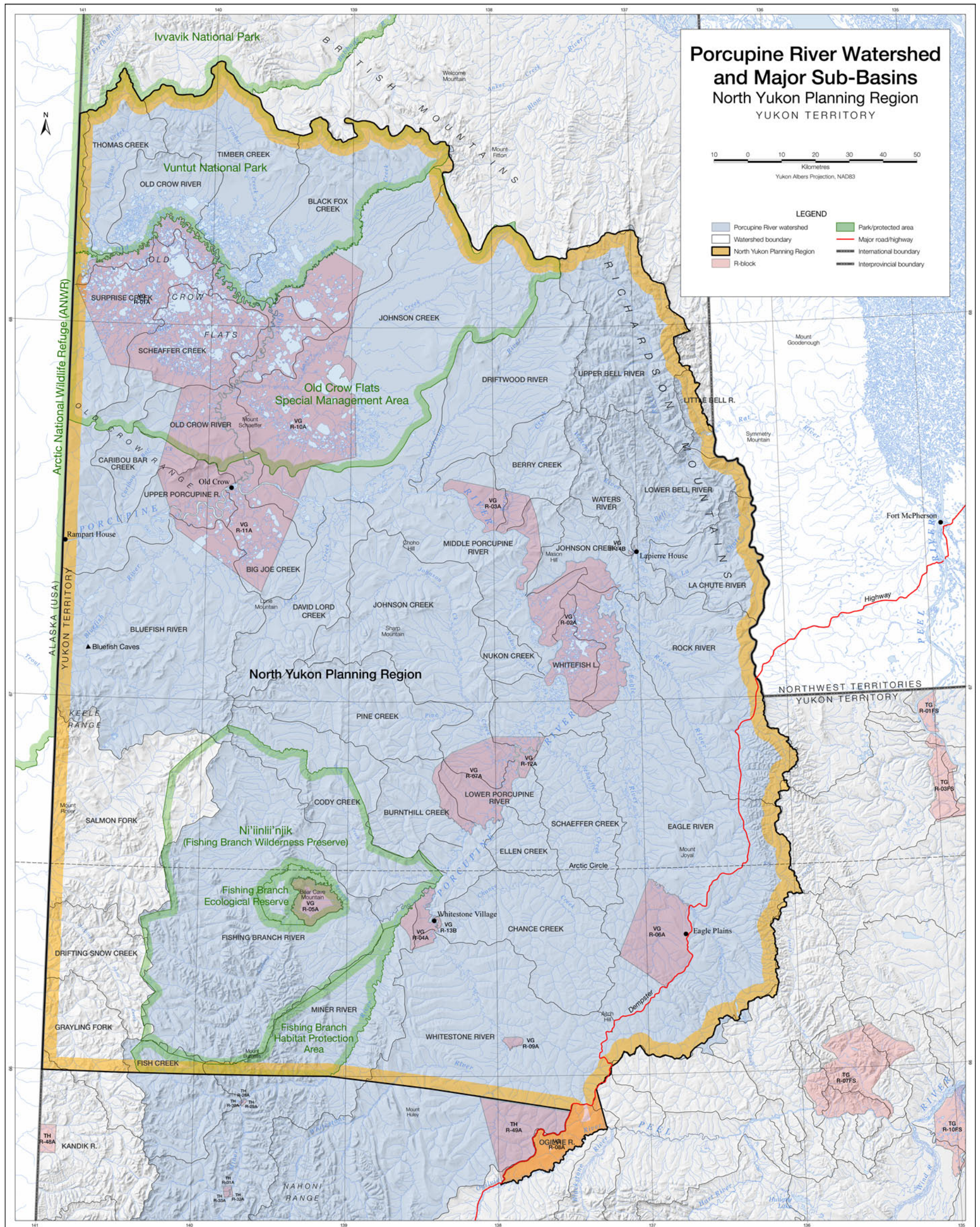
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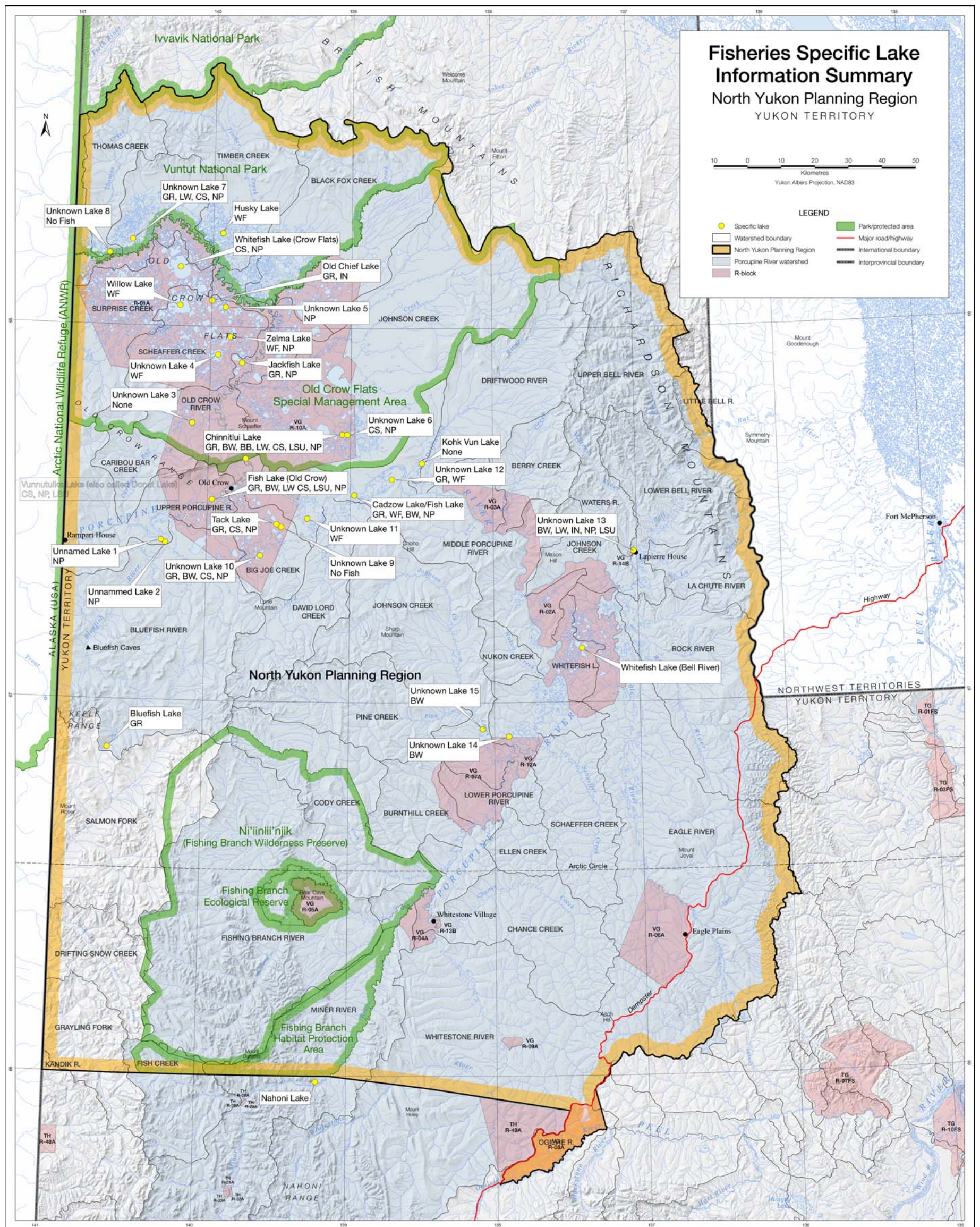
APPENDIX 1: Porcupine River Watershed and Major Sub-Basins Map



Data sources:

Thematic data: 1:250,000 watersheds, planning regions (North Yukon Planning Commission); 1:250,000 parks/protected areas, R-blocks (Yukon Environment)
Base data: 1:250,000 National Topographic Database (NTDB); 90m shaded relief (Yukon Environment)

APPENDIX 2: Fisheries Specific Lake Information Summary Map

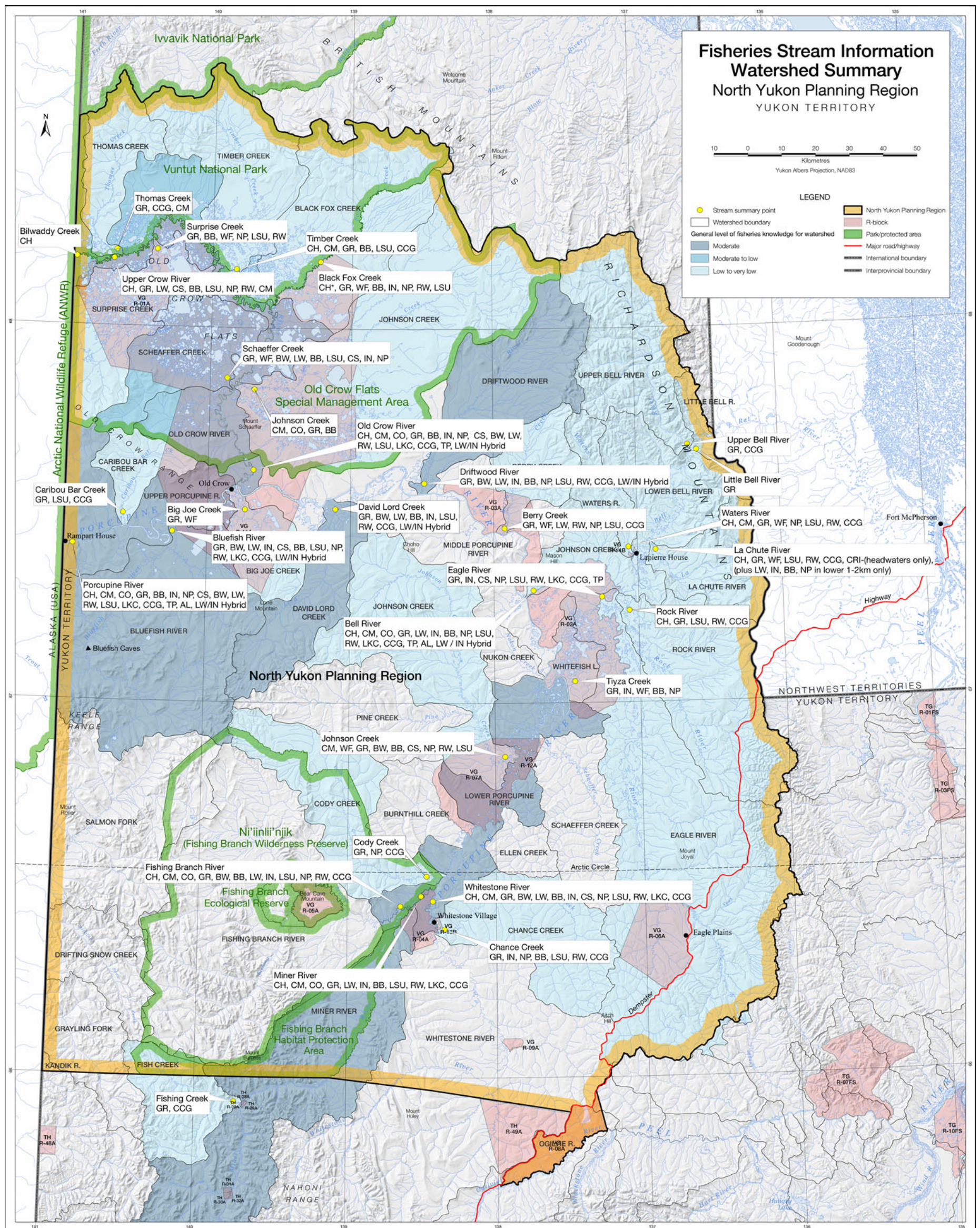


Data sources:

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Category	Common Name	Scientific Name	Species Code	
Salmon Species	chinook salmon	<i>Oncorhynchus tshawytscha</i>	CH	
	chum salmon	<i>Oncorhynchus keta</i>	CM	
	coho salmon	<i>Oncorhynchus kisutch</i>	CO	
Freshwater Game Fish Species	arctic grayling	<i>Thymallus arcticus</i>	GR	
	least cisco	<i>Coregonus sardinella</i>	CS	
	broad whitefish	<i>Coregonus nasus</i>	BW	
	lake whitefish	<i>Coregonus clupeaformis</i>	LW	
	Burbot (loche)	<i>Lota lota</i>	BB	
	inconnu (coney)	<i>Stenodus leucichthys</i>	IN	
	northern pike	<i>Esox lucius</i>	NP	
	LW/IN hybrid	<i>Stenodus-Coregonus hybrid</i>	LW/IN Hybrid	
	Other Fish Species	longnose sucker	<i>Catostomus catostomus</i>	LSU
		lake chub	<i>Couesius plumbeus</i>	LKC
slimy sculpin		<i>Cottus cognatus</i>	CCG	
spoonhead sculpin		<i>Cottus ricei</i>	CRI	
round whitefish		<i>Prosopium cylindraceum</i>	RW	
trout perch		<i>Percopsis omiscomaycus</i>	TP	
	arctic lamprey	<i>Lampetra japonica</i>	AL	

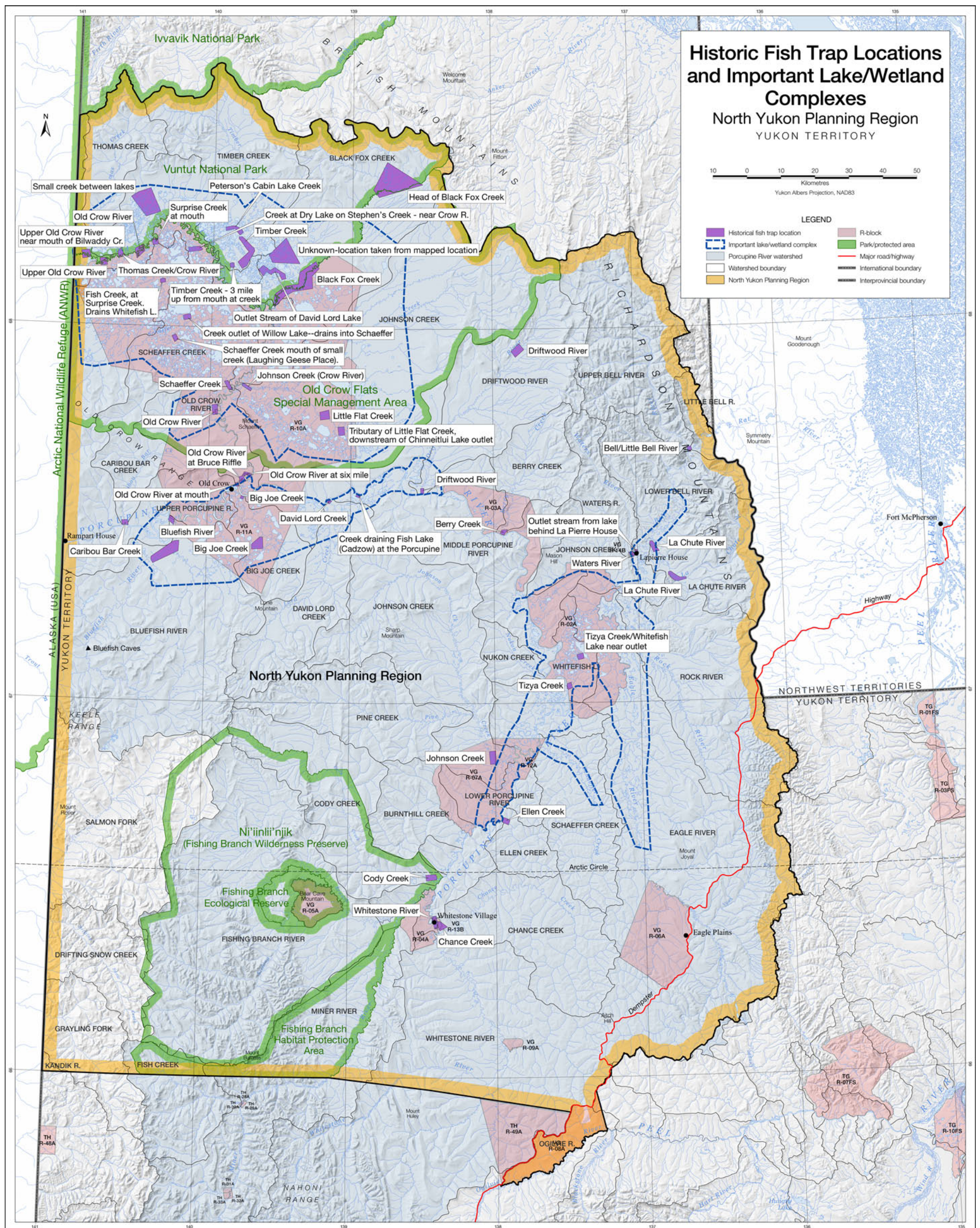
APPENDIX 3: Fisheries Stream Information Watershed Summary Map



Data sources:
 Thematic data: 1:250,000 Porcupine River watershed fisheries summary (Environmental Dynamics Inc.); 1:250,000 watersheds, planning regions (North Yukon Planning Commission); 1:250,000 parks/protected areas, R-blocks (Yukon Environment). Base data: 1:250,000 National Topographic Database (NTDB); 90m shaded relief (Yukon Environment)

Category	Common Name	Scientific Name	Species Code
Salmon Species	chinook salmon	<i>Oncorhynchus tshawytscha</i>	CH
	chum salmon	<i>Oncorhynchus keta</i>	CM
	coho salmon	<i>Oncorhynchus kisutch</i>	CO
Freshwater Game Fish Species	arctic grayling	<i>Thymallus arcticus</i>	GR
	least cisco	<i>Coregonus sardinella</i>	CS
	broad whitefish	<i>Coregonus nasus</i>	BW
	lake whitefish	<i>Coregonus clupeaformis</i>	LW
	Burbot (loche)	<i>Lota lota</i>	BB
	inconnu (coney)	<i>Stenodus leucichthys</i>	IN
	northern pike	<i>Esox lucius</i>	NP
	LW/IN hybrid	<i>Stenodus-Coregonus hybrid</i>	LW/IN Hybrid
	longnose sucker	<i>Catostomus catostomus</i>	LSU
	lake chub	<i>Couesius plumbeus</i>	LKC
Other Fish Species	slimy sculpin	<i>Cottus cognatus</i>	CCG
	spoonhead sculpin	<i>Cottus ricei</i>	CRI
	round whitefish	<i>Prosopium cylindraceum</i>	RW
	trout perch	<i>Percopsis omiscomaycus</i>	TP
	arctic lamprey	<i>Lampetra japonica</i>	AL

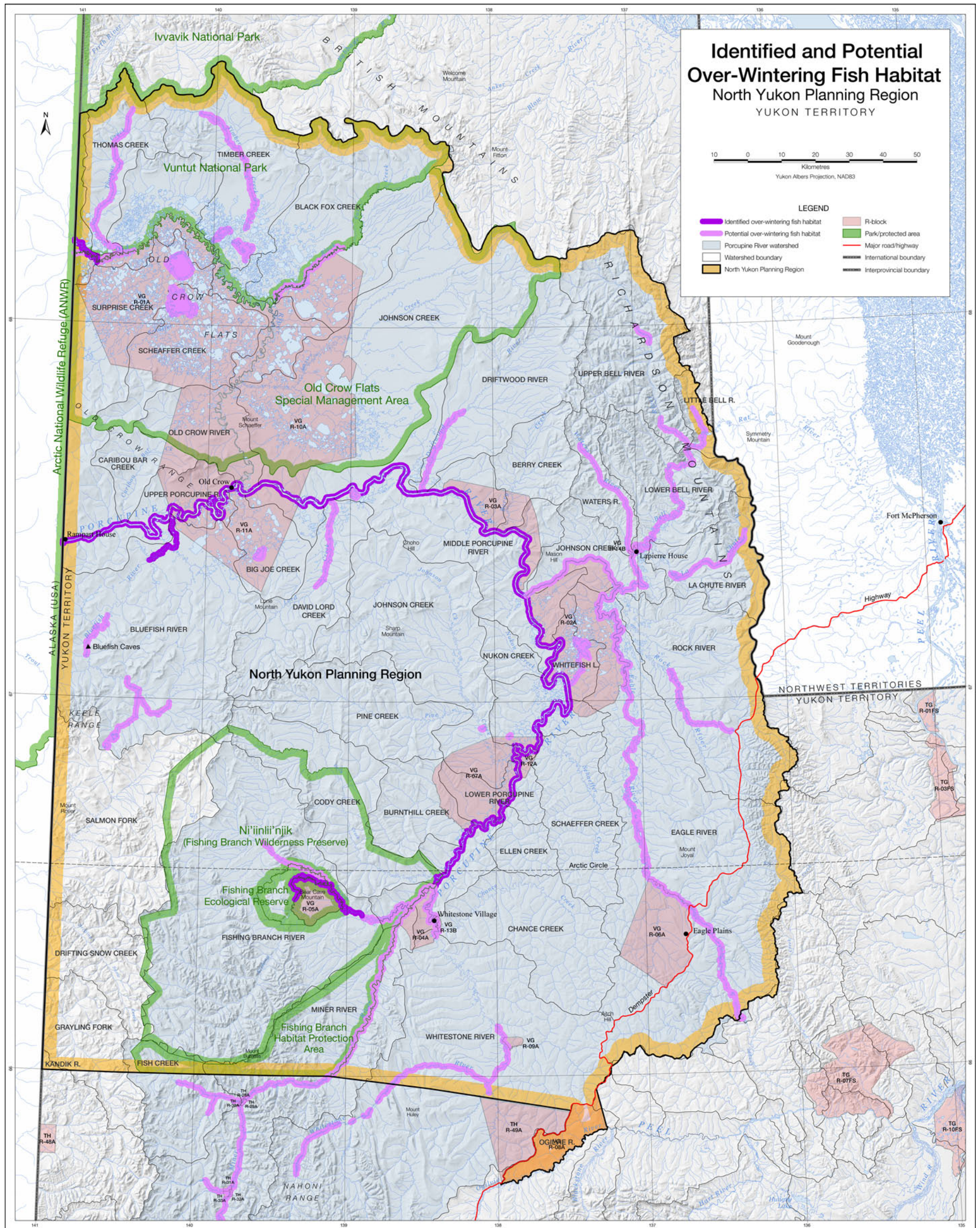
APPENDIX 4: Historic Fish Trap Locations and Important Lake/Wetland Complexes Map



Data sources:

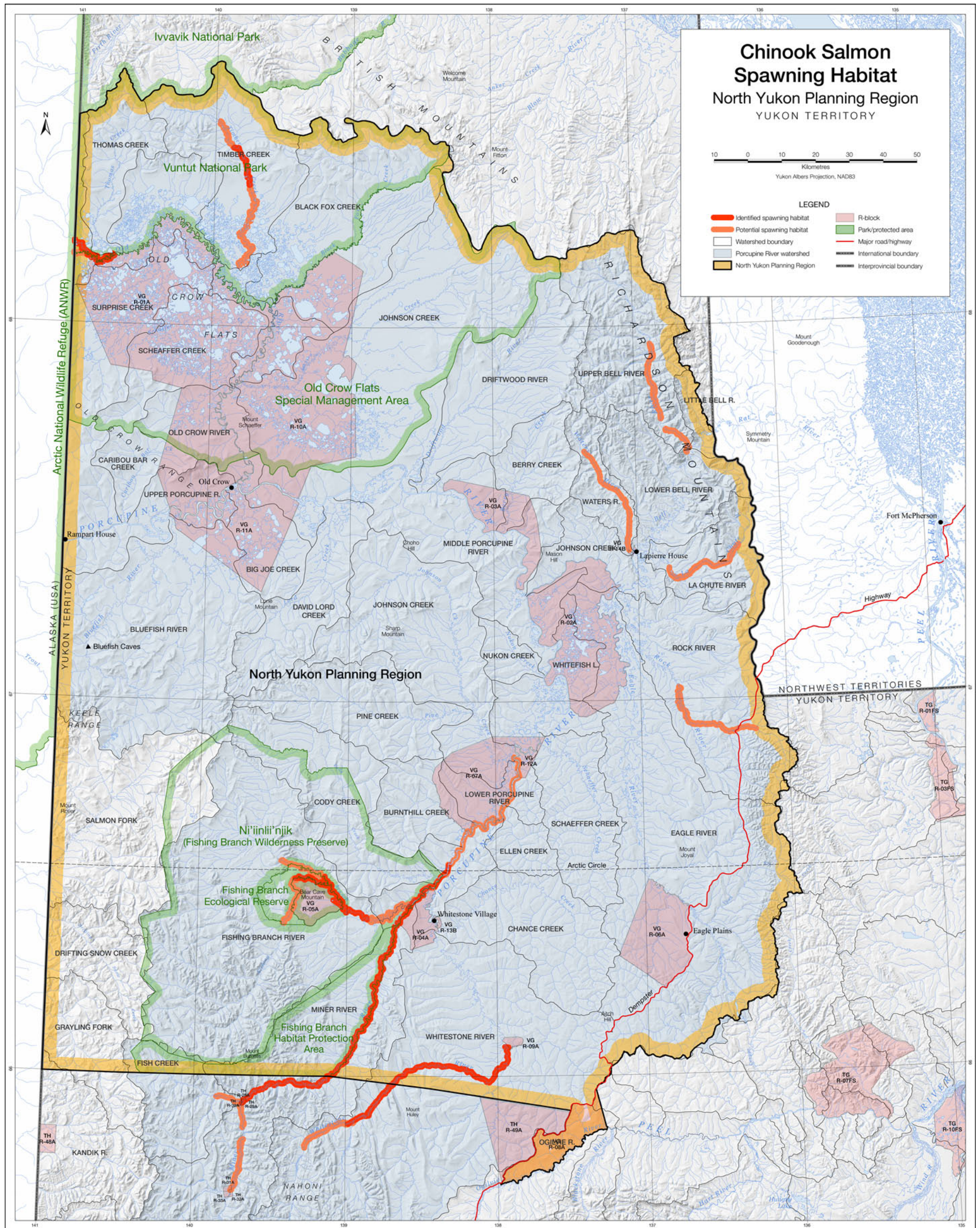
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 Base data: 1:250,000 National Topographic Database (NTDB); 90m shaded relief (Yukon Environment)

APPENDIX 5: Identified and Potential Over-Wintering Fish Habitat Map



Data sources:
 Thematic data: 1:250,000 Porcupine River watershed fisheries summary (Environmental Dynamics Inc.), 1:250,000 watersheds, planning regions (North Yukon Planning Commission); 1:250,000 parks/protected areas, R-blocks (Yukon Environment)
 Base data: 1:250,000 National Topographic Database (NTDB); 90m shaded relief (Yukon Environment)

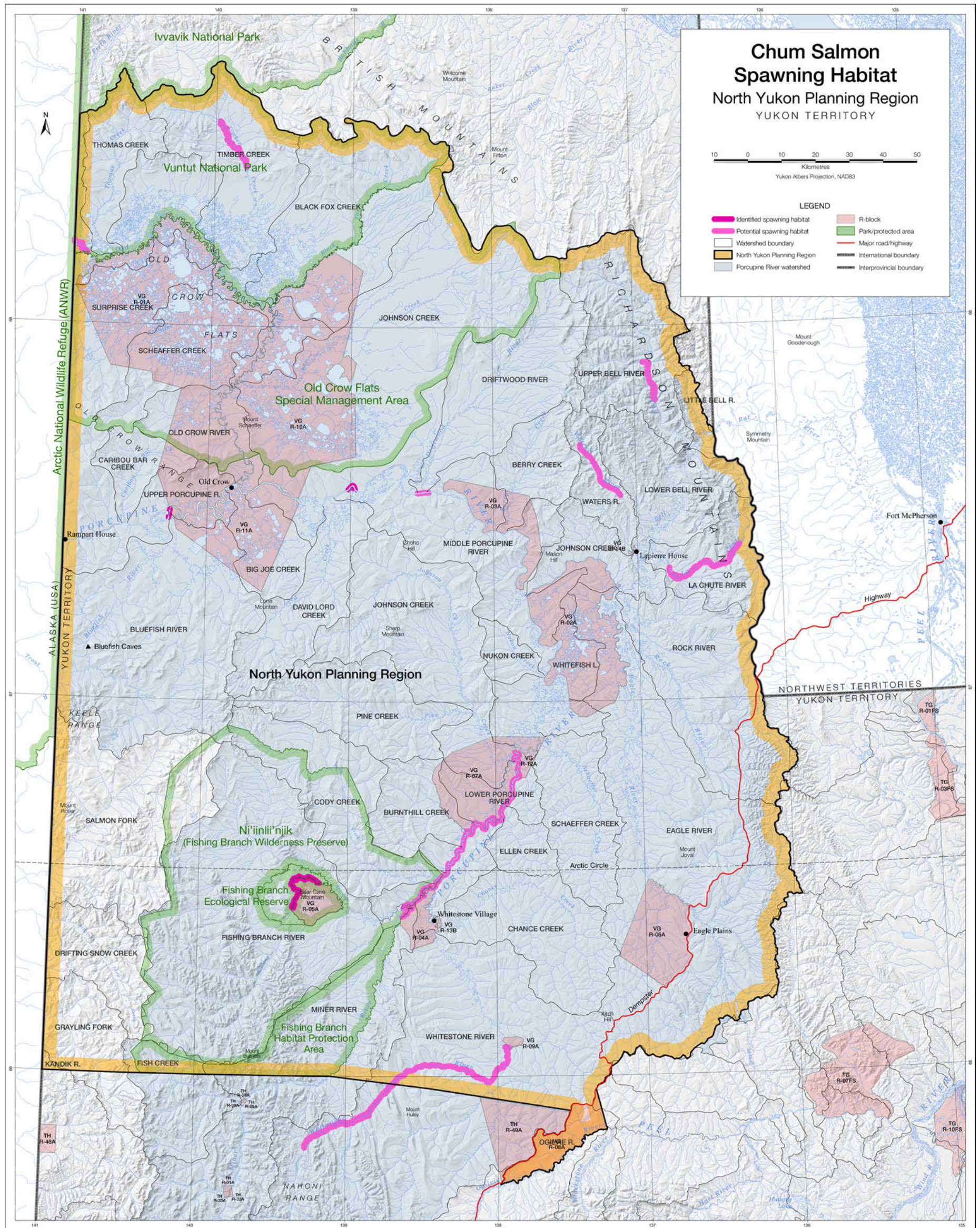
APPENDIX 6: Chinook Salmon Spawning Habitat Map



Data sources:

Thematic data: 1:250,000 Porcupine River watershed fisheries summary (Environmental Dynamics Inc.), 1:250,000 watersheds, planning regions (North Yukon Planning Commission); 1:250,000 parks/protected areas, R-blocks (Yukon Environment)
 Base data: 1:250,000 National Topographic Database (NTDB); 90m shaded relief (Yukon Environment)

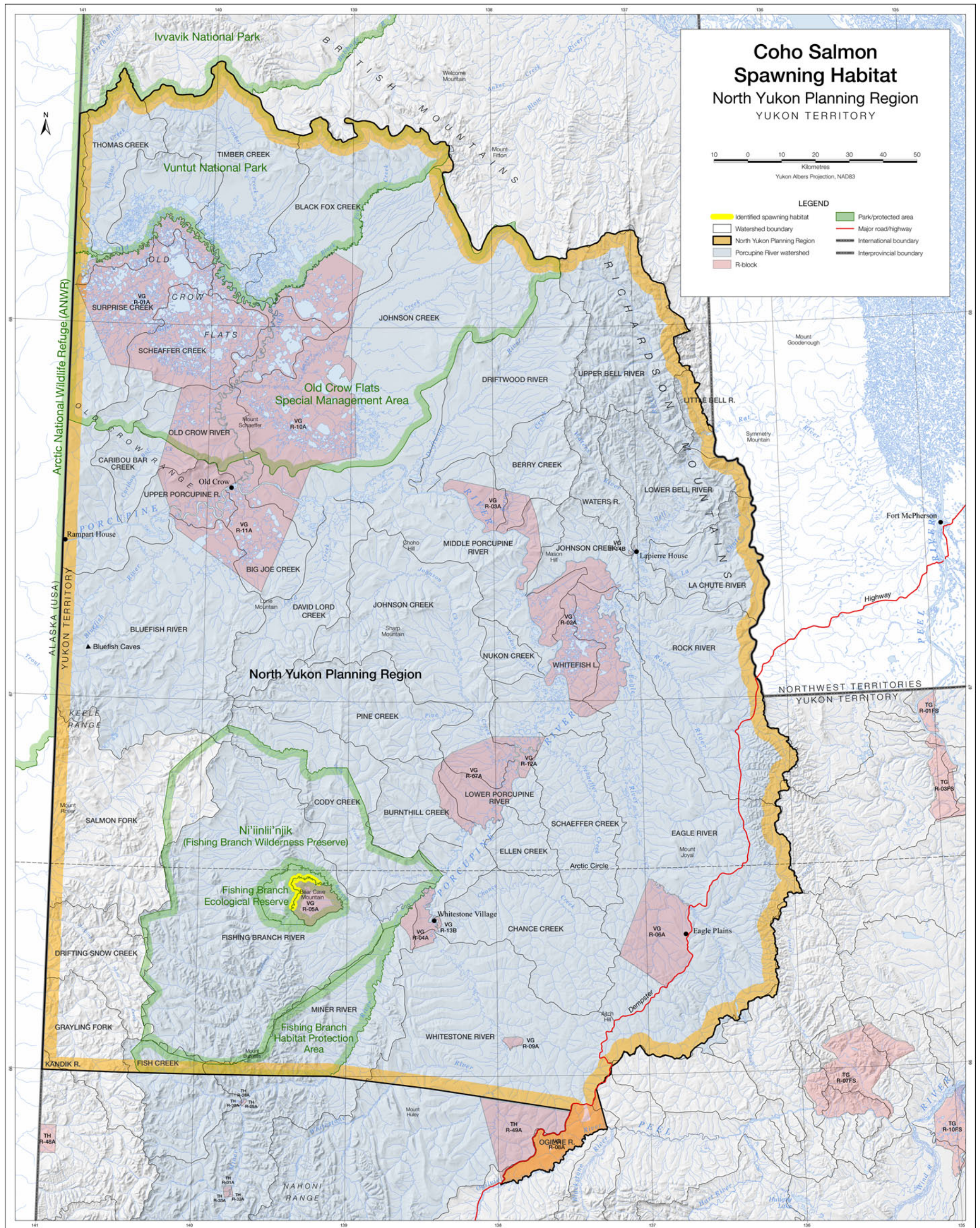
APPENDIX 7: Chum Salmon Spawning Habitat Map



Data sources:

Thematic data: 1:250,000 Porcupine River watershed fisheries summary (Environmental Dynamics Inc.), 1:250,000 watersheds, planning regions (North Yukon Planning Commission); 1:250,000 parks/protected areas, R-blocks (Yukon Environment)
 Base data: 1:250,000 National Topographic Database (NTDB); 90m shaded relief (Yukon Environment)

APPENDIX 8: Coho Salmon Spawning Habitat Map



Data sources:

Thematic data: 1:250,000 Porcupine River watershed fisheries summary (Environmental Dynamics Inc.), 1:250,000 watersheds, planning regions (North Yukon Planning Commission); 1:250,000 parks/protected areas, R-blocks (Yukon Environment)
Base data: 1:250,000 National Topographic Database (NTDB); 90m shaded relief (Yukon Environment)

APPENDIX 9: Records of past and present areas of fishing activity by VGFN members

Notes were compiled from a fisheries information workshop held in Old Crow, YT, November 2, 2004.

MAP_NO	YYMMDD	POLY_NO	SPEAKER	LOCATION	COMMENTS	LND_USE	SEASON	SPECIES	HAB_USE
Fisheries	20041102		Don Frost	Caribou Creek	doesn't think GR overwinter here			GR	R
Fisheries	20041102		Don Frost	Bluefish River	used to trap way up the bluefish. There are really deep pools near bluefish lake	TP FI		GR	OW
Fisheries	20041102		William Josie	Bluefish River	redds seen near the mouth of the bluefish				SP
Fisheries	20041102		Harvey Kassi	Bluefish River	mouth of the bluefish holds freshwater species, but not sure which ones				XX
Fisheries	20041102		Don Frost	Bluefish River	didn't see WF up the bluefish, but definitely NP, and AG			NP GR	R
Fisheries	20041102		Don Frost	Bluefish River	Asks "Are there any remains at bluefish caves for fish?" AI (DFO) suggests looking into it				XX
Fisheries	20041102		Peter Josie	All Over	Has been noticing red sores on the mouths of WF			WF	XX
Fisheries	20041102		Don Frost	Lake behind his cabin	has NP			NP	R
Fisheries	20041102		John Joe Kaye	Donut Lake/ Crow River	lakes and creeks are drying up and things are dying			WF GR NP LSU	XX
Fisheries	20041102		Don Frost	Schaeffer Creek	fish would come out of the creek in the hundreds, years ago they would catch 300/ day		FA	GR CH LSU NP WF	R
Fisheries	20041102		Harvey Kassi	Schaeffer Creek	many species funnel into schaeffer creek from many of the other creeks				R
Fisheries	20041102		Harvey Kassi	Schaeffer Creek	last couple of springs, 50 miles down schaeffer creek on the west side			NP	R
Fisheries	20041102		John Joe Kaye	Schaeffer Creek	many lakes around schaeffer creek and the crow river. Each lake seems to hold a different species and they all mix when they come down into Schaeffer creek and the crow river. Fish sp. Are examples only			NP WF GR	R
A1	20041102	200	Peter Josie	Willow Lake	Peter and John Joe took an Aluminum boat down schaeffer creek from willow lake. Saw evidence of seismic activity. 40-50 pounds of dynamite were used. Killed many whitefish.			WF	R
A2	20041102	201	Peter Josie	Old Chief Lake	"Tip your boat" inconnu (very big). Last there in the 1970's			GR IN	R
A1	20041102	203	Stan Sr.	Husky Lake	fish trap on Thomas Creek 2-5 miles up from crow river. Fish moving downstream. Used in the late 1800's to early 1900's. Muskrats would come out of dens.	FI FT TP	SP	MK	R
A1	20041102	204	Harvey Kassi/John Joe	Tetlin Joh			SP	BB	R
A1	20041102	206	Joel Peter		Fish trap, fish moving downstream, last used in the 1940's	FT	SP	WF GR	R
Chinook 3	20041102		Hanna Netro	Whitestone	no king on whitestone or crow river			WF GR	R
A2	20041102		Fanny Charlie	Inuvik	grandson caught coho in Inuvik	FI		CO	R
A2	20041102	205	Harvey Kassi	Zelma Lake				NP RW	R
	20041102		Erwin	LaChute Creek	probably has king salmon			CH	XX
Chinook 1	20041102	301	Don Frost	Crow River	3 bends below Schaeffer Creek on the Crow River. Caught CH in the 1960's	FI		CH	R
Chinook 1	20041102	302	Erwin	Jackfish Lake	grayling not there anymore, brought fish up porcupine to LaPierre House for trading	FI TR		NP GR	R
	20041102		Stan Sr.	Porcupine River	caught CH on river upstream from Old Crow	FI		CH	R
Chinook 1	20041102	303	Edith Josie	Whitestone	mouth of Whitestone, catch CO with nets after area is ice covered	FI	FA WI	CH CM CO	
Chinook 1	20041102	304	Danny Kassi	Timber Hill	open in winter. Base of timber hill on north side because of a warm spring				XX
A2	20041102	305	Don Frost	Timber Hill	camp NW of Timber Hill, fished lakes all around camp	FI		GR NP	Sp
A2	20041102	306	Don Frost	Timber Hill	bad ice below timber hill				XX
General use	20041102	1	Donald Frost	Bluefish River	Lots of little fish, not much grayling. Little fish are eaten by loche and northern pike; In wintertime few deep pools but much of creek is open.			GR NP BU	R
General use	20041102	2	Donald Frost	Bluefish River	overwintering area for fish; no water last summer (2004) between pools.		WI		Ow
General use	20041102	3	Donald Frost	David Lord Creek	In fall (Sept.) all fish come downstream to Porcupine River because there is no lake or open water for fish to overwinter.		FA		XX
General use	20041102	4	Donald Frost	Bluefish Lake	Lake dried up; Donald was there 40 years ago and it is a lot drier now; open water at creek mouth in winter; not very much grayling in that lake.			GR	R
General use	20041102	5	John Joe Kaye	Old Crow - south of community	Lakes drying up; hard to say where open water is - you have to find it.				XX
General use	20041102	6	Erwin Linklater + Joel Peter	Tach Lake	Lots of northern pike but numbers are going down.			NP	R
General use	20041102	7	Erwin Linklater	David Lord Creek	Fish trap location, last used in 1961	FT			R
General use	20041102	8	Erwin Linklater + William Josie	David Lord Creek	Hundreds of juvenile fish (suspect chinook salmon or grayling); 10-20 walk up the creek?; lots of eels on Porcupine River this year - more than usual.			CH GR	R
General use	20041102	9	Stan Njootli Jr.	Porcupine River	Freshwater clams and lamprey			LAMP CL	R
General use	20041102	10	John Joe Kaye	Porcupine River	Open water so trail portage needed; deep rough water.	TR			XX
General use	20041102	11	John Joe Kaye	Driftwood River	Good area for beaver.			BV	R
General use	20041102	12	Peter Josie	Porcupine River	Good place for dog salmon (chum salmon), right across from mouth of Driftwood River.			CM	R
General use	20041102	13	Peter Josie	Porcupine River	Good place for both king (chinook) and dog (chum) salmon in big eddy.			CM CH	R
General use	20041102	14	Peter Josie	Porcupine River	Liddia Thomas goes jigging for loche here.	FI		BU	R
General use	20041102	15	Marvin Frost	Porcupine River	Area good for catching salmon	FI		SAL	R
General use	20041102	16	Marvin Frost	Porcupine River	Area good for catching salmon	FI		SAL	R
General use	20041102	17	Peter Josie + Stan Njootli Sr.	Crow River	Nets set for coho salmon here (PJ); grayling, cisco and suckers at Crow Point into mid-January.	FI		CO GR CI LSU	R
General use	20041102	18	Peter Josie	Driftwood River	Deep pools good for grayling (fishing) in fall time	FI	FA	GR	R
General use	20041102	19	Peter Josie	Porcupine River	Main area for nets at Kluklut (whitefish and chum)	FI		WF CM	R
General use	20041102	20	Erwin Linklater + Joel Peter	Porcupine River	Fish overwinter area - lots of thin ice and otter tracks (winter)		WI	OT	Ow
General use	20041102	400	Dick Nukon	Cathedral Rocks - Miner River	Grayling and open water at this area on Miner River in winter.			GR	R
General use	20041102	401	Dick Nukon	Mahoney Lake - Miner River	Lots of fish in Mahoney Lake (small lake up Miner River); lots of grayling and some open water in winter on Miner River.			GR	R

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General use	20041102	402	Erwin Linklater, Joel Peter	Whitestone River	Whitestone River has good open water areas in winter.				
General use	20041102	403	Erwin Linklater, Joel Peter	Porcupine River	Porcupine River is open in winter at mouth of Burnthill Creek.				
General use	20041102	20	Peter Tizya	Porcupine River	Fish trap location, caught whitefish, jackfish and suckers in fall.	FT	FA	WF NP LSU	R
General use	20041102	21	Peter Tizya	Porcupine River	Moses Tizya caught salmon on this stretch of river.	FI		SAL	R
General use	20041102	22	Peter Tizya	LaPierre House	Peter Tizya walked from LaPierre House to Salmon Cache in summer with a geologist (working with Dempster Lateral Pipeline). Followed old winter trail route. Lots of mosquitos in July.	TR	SU		XX
General use	20041102	23	Peter Tizya + Erwin Linklater	Tizra Creek	Big whitefish come down creek			WF	R
General use	20041102	24	Erwin Linklater	Porcupine River	Big whitefish here all year. Dennis Frost caught big jackfish and coney (inconnu) in winter under ice.	FI	WI	NP IN WF	R
General use	20041102	25	Erwin Linklater	Whitefish Lake	Good ducks in summer - same as Old Crow Flats		SU	WA	R
Chum	20041102	26	Hannah Netro	Fishing Branch??	No chum spawning in North Fork			CM	XX
Chum	20041102	27	Hannah Netro	David Lord Creek	Chum salmon spawning way up David Lord Creek.			CM	Sp
Chum	20041102	28	Peter Josie	Driftwood River	No spawning salmon at mouth of Driftwood River.				XX
Coho	20041102	29	Peter Tizya	Driftwood River trib, S. of Driftwood Hill	Winter caribou fence location.	CF		CA	R
Coho	20041102	30	Peter Tizya	N. end of Berry Creek	Summer caribou fence location.	CF		CA	R
Coho	20041102	31	Erwin Linklater + Joel Peter	Caribou Bar Creek	No salmon spawning at Caribou Bar Creek.				XX
Coho	20041102	32	Stan Njootli Sr.	W. Chinaidlai Lake	Sara Abel told story of fishing while they were fixing up caribou fence. It was their backup in case they did not get caribou - they ate fish instead.	CF FI		CA	R
Coho	20041102	33	Peter Tizya	N. White Snow Mountain	Mountain with berries so thick you can hear them explode when you walk on them (fall).	TR	FA		XX
Chum	20041102	34	Donald Frost	Timber Creek	Didn't catch salmon here in fall.	FI	FA		XX
Chum	20041102	35	Fanny Charlie	Thomas Creek	Caught dog (chum) salmon in Thomas Creek in fall.	FI	FA	CM	R
Chum	20041102	36	Erwin Linklater + William Josie	N. of Donut Lake (AKA Vunnutuhle Lake)	Randal Tetlich's tent frame - set nets and caught chum salmon over a number of years.	CA FI		CM	R
Chum	20041102	37	Erwin Linklater + William Josie	David Lord Creek	Freddie Frost saw dead chum salmon at mouth of David Lord Creek in fall.		FA	CM	R
Chum	20041102	38	Hannah Netro	Driftwood River	No salmon spawning up Driftwood River.				XX
Chum	20041102	39	Hannah Netro	Driftwood River	No salmon spawning at mouth of Driftwood River, but lots of loche (burbot) and other fish in river; fish trap was located on Driftwood River where they lived.			BU	R
Chum	20041102	40	Hannah Netro	Porcupine River	Moved house to point on Porcupine River.	CA			XX
Chum	20041102	41	Danny Kassi	Old Crow Flats	Dead whitefish in lake as a result of seismic exploration in 1950s. Clear lake with lots of muskrat.			WF MK	R
Chum	20041102	42	Danny Kassi	Old Crow Flats	Creek comes out of lake here - they used to catch lots of whitefish at this place.	FI		WF	R

APPENDIX 10: Field codes for records of past and present areas of fishing activity

LND_USE	SEASON	SPECIES	HAB_USE
HU=Hunting	SP=spring(Apr-June)	AF=Arctic Fox	R=Range
TO=Tools	SU=summer(June-Aug)	CA=Caribou	B=Breeding
TB=Taboo	WI=winter(Oct-Apr)	MO=Moose	X=Birthing (nesting, calving, lambing)
CL=Clothing	FA=fall(Aug-Oct)	MR=Marten	S=Staging area
CO=Collecting	We=early winter(Oct-Jan)	MI=Mink	C=Concentration area
FI=Fishing	WI=late winter(Feb-Apr)	LX=Lynx	A=All Functions
WF=Wildlife/Fish	<< month >>	BV=Beaver	M=Migration Corridor
VI=Village	<< range of months >>	WA=Waterfowl sp.	* = Mineral Lick
TR=Travel/trade routes		BB=Black Bear	Sp=Spawning
ST=Stories		GB=Grizzly Bear	Re=Rearing
TP=Trapping		MX=Muskox	D=Denning
LG=Legend		SH=Sheep	Ow=Over-wintering
GA=Gathering places		WV=Wolverine	XX=not defined
SS=Sacred site		WO=Wolf	
CA=Camp		MK=Muskrat	
GR=Gravesite		PB=Polar Bear	
FT=Fish trap		NOHA=Northern Harrier	
CF=Caribou fence		GHOW=Great-horned Owl	
		OWL=Owl sp.	
		SEOW=Short-eared owl	
		BAEA=Bald Eagle	
		GOEA=Golden Eagle	
		EA=Eagle sp.	
		SNOW=Snowy Owls	
		OSPR=Osprey	
		FA=Falcon sp.	
		PEFA=Peregrine Falcon	
		CORA=Common Raven	
		SACR=Sandhill Crane	
		OT=Otter	
		TR=Trout sp.	
		GR=Grayling	
		CH=Chinook Salmon	
		CM=Chum Salmon	
		WF=Whitefish	
		NP=Northern Pike	
		IN=Inconnu	
		LSU=Long-nosed sucker	
		CO=Coho Salmon	
		RW=Round Whitefish	
		BU=Burbot (Loche)	
		LAMP=Lamprey	
		CL=Clams	
		SAL=Salmon	
		CI=Cisco	