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Natural Resource Consultants

**Porcupine River Chinook Radio
Tracking/Telemetry 2004**

CRE-17-04

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January 2005

ABSTRACT

On August 1st, 2nd, and 3rd, 2004, aerial telemetry flights were conducted over most of the Porcupine River watershed in Canada to locate chinook salmon (*Oncorhynchus tshawytscha*) previously fitted with radio transmitters downstream on the Yukon River in Alaska. This project was part of a Yukon River basin-wide chinook radio telemetry study undertaken by the Alaska Department of Fish and Game and various other partners. Six radio tagged chinook (from 2004) were located within the Porcupine River watershed. In addition, a number of tags from an equivalent 2003 project were still transmitting, and seven such 2003 tags were located in the Porcupine system. Four of the seven 2003 tags located this year were not located during the 2003 telemetry surveys; therefore, additional information regarding the destination of 2003 radio tagged chinook was also obtained. Chinook located from the 2004 tagging program were found in the Miner, Fishing Branch, and Old Crow Rivers. Chinook located from the 2003 tagging program were found in the Miner, Fishing Branch, and Timber Creek (a tributary of the Old Crow River).

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1.0 INTRODUCTION

The Porcupine River is one of the largest tributaries in the Yukon River system. It extends from its mouth at Fort Yukon, Alaska, across the Canada/U.S. border where it drains a large portion of the north Yukon and most of the Vuntut Gwitchin First Nation's Traditional Territory. The Porcupine River has a number of large tributaries in Canada, including three significant rivers that form its headwaters: the Whitestone, Miner, and Fishing Branch Rivers. The only settlement within the Porcupine River watershed is the village of Old Crow, located approximately 80 kilometres east of the Canada/U.S. border at the mouth of the Old Crow River. Old Crow has a population of roughly three hundred, mainly Vuntut Gwitchin First Nation members. Figure 1 illustrates the Canadian portion of the Porcupine River watershed.

Three species of salmon migrate up the Porcupine River. These include a chinook run that passes Old Crow mainly during the month of July, a chum run that passes Old Crow mainly in September, and a coho run that passes Old Crow between early October and late January. The coho and chinook salmon runs in the Porcupine River system are an important food fish to the Vuntut Gwitchin; the preferred chinook being a large summer salmon, while the coho is caught during the late fall/winter. Vuntut Gwitchin Citizens fish both runs in the vicinity of Old Crow. The Vuntut Gwitchin also depend on the chum run for a substantial subsistence fishery. There have also been limited reports of summer chum and coho in the vicinity of Old Crow.

A significant lack of information regarding chinook salmon stocks in the Porcupine River system has been identified as an issue that needs to be addressed. Filling such information gaps has been identified as a priority to ensure the future success of stock and habitat management.

In 2002, limited radio telemetry surveys were conducted over some headwater tributaries of the Porcupine River to track any signals of the 768 radio tags placed in chinook salmon on the lower Yukon River by the Alaska Department of Fish and Game (ADF&G) (Osborne et al, 2003). This survey work was conducted in conjunction with other aerial survey work being carried out for another project (CRE-15-02), with limited results (Anderton, 2002). In 2003, a comprehensive telemetry survey including most of the Porcupine River watershed was undertaken. With strong returns and an increased total number of tags applied (1,097) in the lower Yukon River, an excellent sample of migratory distribution and destinations/patterns throughout the watershed was obtained with close to four times as many tags crossing the U.S./Canada border (CRE-17N-03) (Mercer & Eiler, 2004). In 2004, a comprehensive telemetry survey was again conducted over most of the watershed. However, all indications suggest low 2004 Porcupine River chinook returns, as well, less tags were applied (995) in the lower Yukon River than in 2003 (Eiler pers. com., 2004).

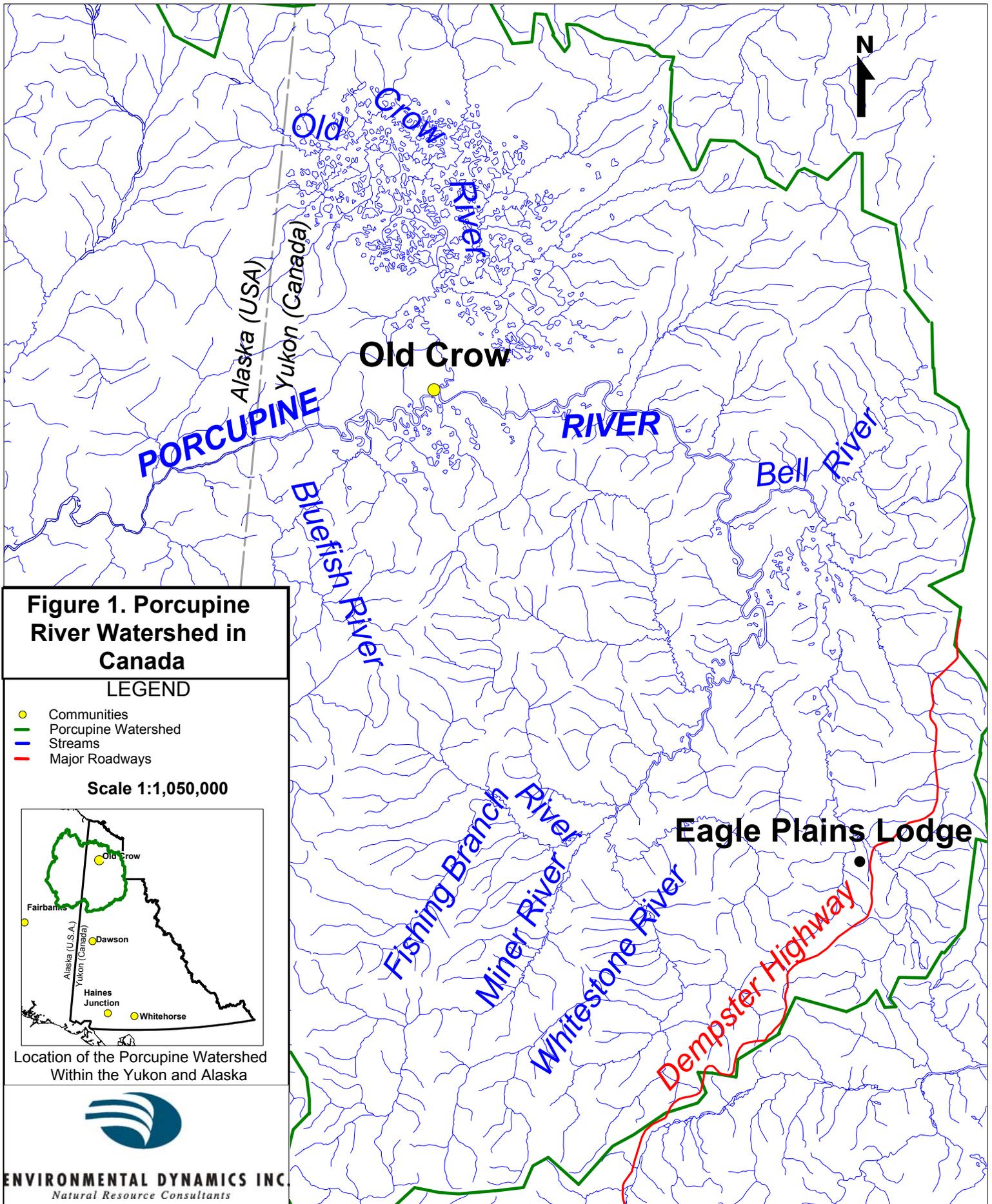
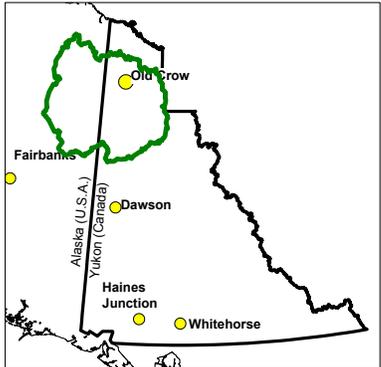


Figure 1. Porcupine River Watershed in Canada

LEGEND

- Communities
- Porcupine Watershed
- Streams
- Major Roadways

Scale 1:1,050,000



Location of the Porcupine Watershed Within the Yukon and Alaska



2.0 METHODS

On July 31st, August 1st, 2nd, and 3rd, 2004, a telemetry survey using a Cessna 172 fixed-wing aircraft was conducted over the majority of the Porcupine River watershed in Canada. Telemetry was carried out using two ATS R4500 receivers, programmed in accordance with the Yukon River basin-wide chinook radio tagging/telemetry project coordinated by the Alaska Department of Fish and Game. Flights were typically at an altitude of 200m to 300m above the streams surveyed. Radio tag signals located were decoded; the specific tags identified, and associated aircraft locations were recorded by GPS. These functions were performed electronically with the R4500 receivers; however, a manual record was also kept simultaneously (on standardised forms) to assist with data interpretation. A logistical delay limited the amount of surveying that could be achieved on July 31st, with the bulk of it being carried out on August 1st, 2nd, and 3rd.

While most streams of significance within the Canadian portion of the watershed were flown, some were not covered due to time constraints. Those streams (or portions thereof) not covered were considered to be of lesser potential for the presence of chinook at the time that the work was conducted. These included:

- Porcupine main-stem below the mouth of the Bluefish River
- Bluefish River, upstream from lower 10 Km (as the crow flies)
- Schaeffer Creek (tributary of Old Crow River)
- Surprise Creek (tributary of Old Crow River)
- Porcupine main-stem between the mouth of the Bell River and the mouth of the Driftwood River
- Eagle River (tributary of Bell River)
- Rock River (tributary of Bell River)

Smaller tributary streams were not surveyed, with the exception of a few with particular attributes in regards to salmon habitat.

Analysis of all telemetry data was conducted. The locations of each radio tag are mapped and reported according to the GPS location associated with the highest signal strength for a given tag, as recorded by the R4500 receivers.

3.0 RESULTS

Chinook radio tag signals were received and decoded with associated aircraft locations fixed in the watersheds of two major tributaries of the Porcupine River, as well as in the Porcupine River mainstem and/or the community of Old Crow. An automated telemetry receiver station located near the U.S./Canada border recorded a total of eight 2004 tags during the upstream chinook migration (Eiler pers. com., 2004).

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However, a total of thirteen tags were located in the telemetry surveys. Seven of those located were tags from the 2003 program, four of which were not located during 2003 telemetry surveys. Therefore, the locations of these four tags also provides some further information regarding the 2003 chinook returns to the Porcupine River watershed. The continued transmission of some 2003 tags was an unexpected event encountered in telemetry surveys throughout the Yukon River watershed. Table 1 details information associated with all 2004 tags that crossed the U.S./Canada border on the Porcupine, while Table 2 details information associated with all 2003 tags located during the 2004 surveys. Figures 2 & 3 illustrate the location of all radio tags tracked during the 2004 telemetry surveys.

Table 1. Details of 2004 Tags that Crossed the U.S./Canada border

2004 Tags						
Date Located	Fish #	Frequency	Code	Status	Location	Lat./Long.
Aug. 1 st , 2004	94	843	22	Motion	Miner River , approximately 3 km ¹ downstream from the Terrace Ridge tributary ²	N 66.32817 ° W 138.72177 °
Aug. 1 st , 2004	27	783	24	Motion	Miner River , approximately 3 km downstream from the Terrace Ridge tributary	N 66.32683 ° W 138.7374 °
Aug. 1 st , 2004	509	922	99	Motion	Fishing Branch River , approximately 2 km downstream from the North Fork.	N 66.50072 ° W 139.1115 °
Aug. 2 nd , 2004	259	902	48	Motion	Old Crow River , approximately 10 km downstream from the mouth of Schaeffer Cr.	N 67.7791 ° W 139.9642 °
Aug. 1 st , 2004	3017	1033	41	No Motion (Mortality)	Old Crow community , tag later recovered from fishery	N 67.58135 ° W 139.7779 °
Aug. 1 st , 2004	92	724	24	Motion	Old Crow community , tag later recovered from fishery	N 67.5645 ° W 139.8236 °
Border Only	413	942	71	N/A	Not located in Telemetry Surveys	N/A
Border Only	144	723	47	N/A	Not located in Telemetry Surveys, but recovered from fishery	N/A

N/A = Not Applicable

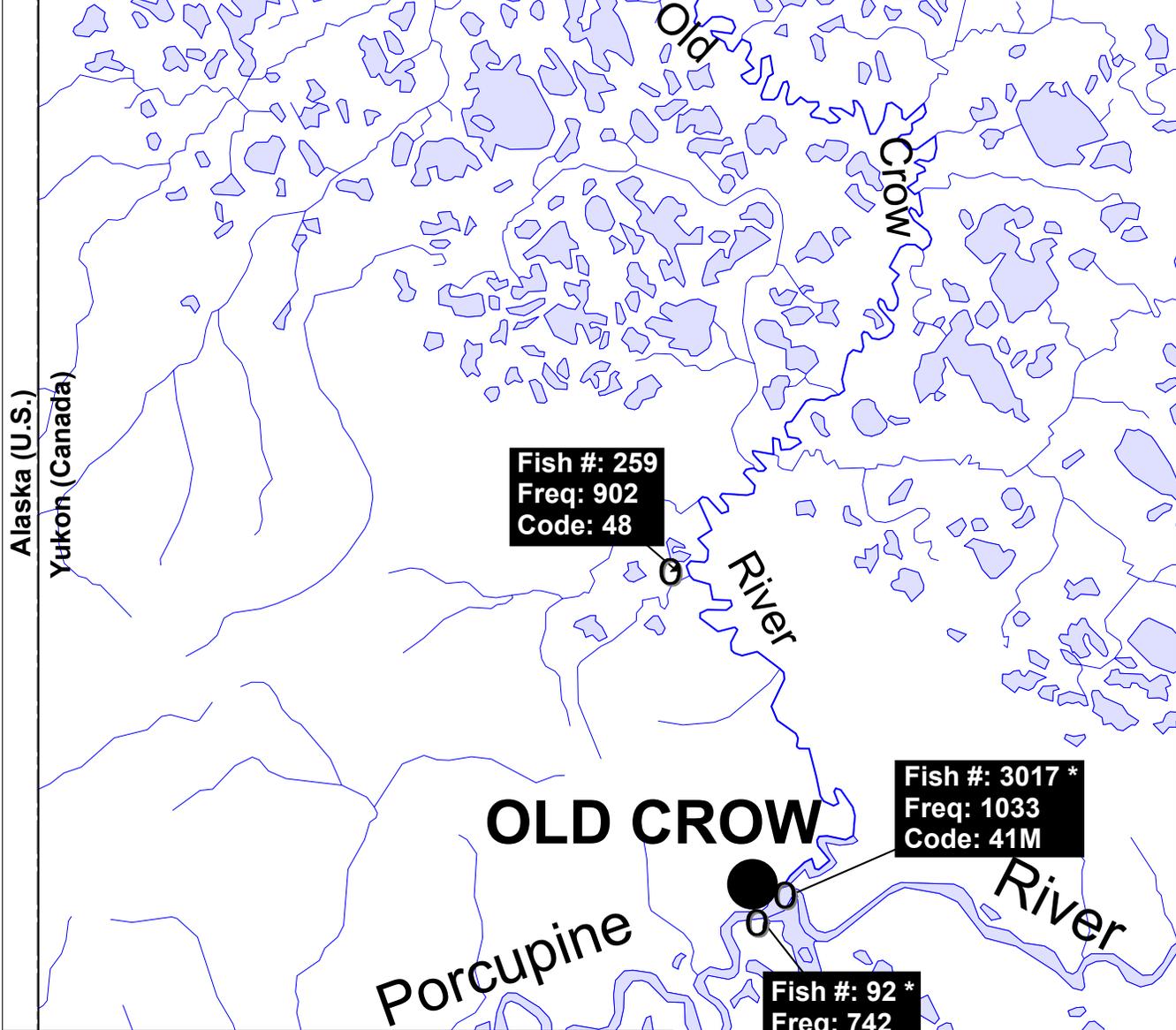
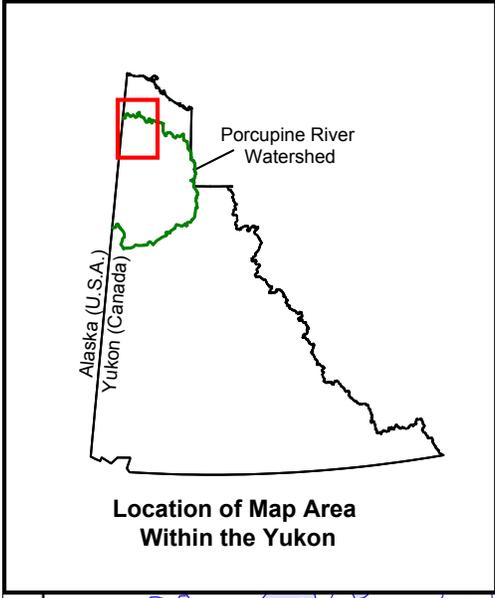
¹ All distances are “as the crow flies” along the river, not actual river distance.

² The Terrace Ridge tributary is a large unnamed creek entering the Miner River from the west adjacent to a low ridge, indicated on maps as “Terrace Ridge,” and approximately 18-20 km upstream (as the crow flies) from the Fishing Branch River.

Table 2. Details of 2003 Tags Located during 2004 Telemetry Surveys

2003 Tags Located						
Date Located	Frequency	Code	Status	2003 Location	2004 Location	Lat./Long.
Aug. 1 st , 2004	902	19	Motion	Not Located	Miner River , approximately 7 km upstream from Terrace Ridge tributary	N 66.2490 ° W 138.8130 °
Aug. 1 st , 2004	902	21	No Motion (Mortality)	Not Located	Miner River , approximately 6 km upstream from Terrace Ridge Tributary	N 66.2560 ° W 138.7954 °
Aug. 1 st , 2004	902	98	No Motion (Mortality)	Miner River, approximately 7 km upstream from Terrace Ridge tributary	Miner River , approximately 4 km upstream from Terrace Ridge tributary	N 66.2698 ° W 138.7779 °
Aug. 1 st , 2004	783	12	No Motion (Mortality)	Not Located	Miner River , just below mouth of Terrace Ridge tributary	N 66.31287 ° W 138.7700 °
Aug. 1 st , 2004	683	72	No Motion (Mortality)	Miner River, near upstream end of Cathedral Rocks ³	Miner River , approximately 6 km downstream of Terrace Ridge tributary	N 66.35825 ° W 138.7107 °
Aug. 1 st , 2004	683	39	No Motion (Mortality)	Fishing Branch River, approximately 2 km downstream of N. Fork.	Fishing Branch River , approximately 6 km downstream of N. Fork	N 66.45799 ° W 139.0393 °
Aug. 2 nd , 2004	843	99	No Motion (Mortality)	Not Located	Timber Creek (Tributary of Old Crow River)	N 68.3527 ° W 139.7318 °

³ The Cathedral Rocks, indicated on maps, include an outcropping of eroded pillars along the eastern side of the Miner River approximately 40 km (as the crow flies) upstream from the mouth of the Fishing Branch River.



Freq: 843
Code: 99M

Fish #: 259
Freq: 902
Code: 48

Fish #: 3017 *
Freq: 1033
Code: 41M

Fish #: 92 *
Freq: 742
Code: 24

FIGURE 2: NORTHERN PORCUPINE RIVER WATERSHED
Chinook Radio Tags Located in 2004

2004 Tags ○ * Captured in Fishery

2003 Tags ○ Scale: 1:470,000 (approx.)



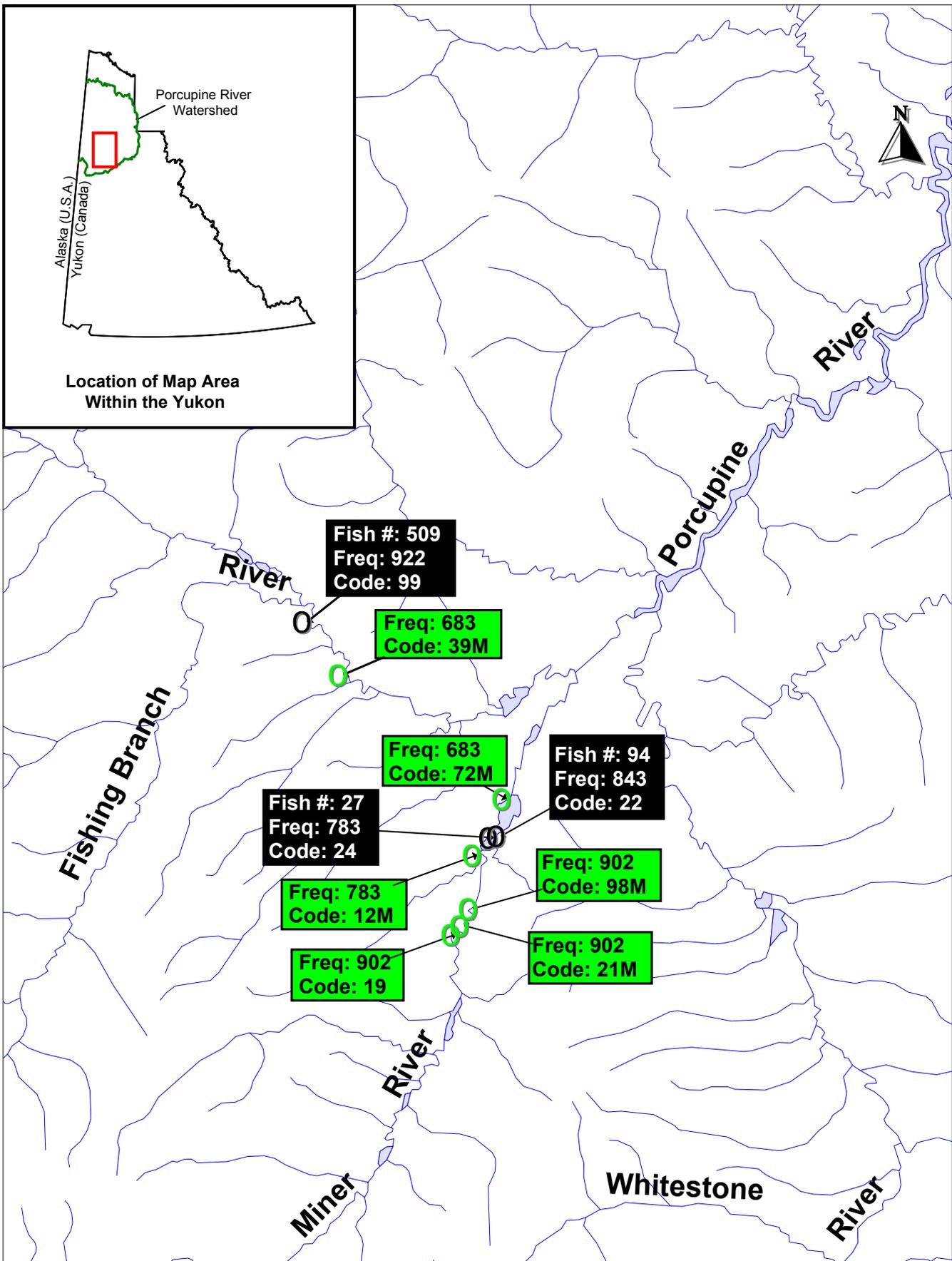


FIGURE 3: SOUTHERN PORCUPINE RIVER WATERSHED

Chinook Radio Tags Located in 2004

2004 Tags ○

2003 Tags ○

Scale: 1:490,000 (approx.)



4.0 DISCUSSION/CONCLUSIONS

The location of a number of radio tags from both the 2004 and 2003 programs provides valuable information regarding the destination of tags from both years. Further, a comparison of results from both years is valuable.

4.1 Location of 2004 Tags

A total of eight 2004 program tags were recorded as passing a receiver station located near the U.S./Canada border on the Porcupine River. As noted in Section 3.0, six of these tags were located during the telemetry surveys. Of the two not located during the surveys, one was recovered in the Old Crow fishery, and one remains at large. Of the six tags located during the surveys, two were found in the lower Miner River, one was located in the Fishing Branch River, one was located in the Old Crow River, and two were located in or near the community of Old Crow (captured in fishery).

During the 2004 surveys, spawning redds (and possible redds) were observed in the Miner, upper Whitestone, Fishing Branch, and Timber Creek (tributary to Old Crow R.). While significant numbers of redds were observed in the Miner River, numbers were considerably lower than in previous years (Anderton, 2002 & 2003). Small numbers of redds or possible redds were observed in Timber Creek as well as the Whitestone and Fishing Branch Rivers. It is also interesting to note that in 2004, the greatest concentrations of redds (and the two radio tag locations) in the Miner River were in the lower portion of the river, downstream of the Terrace Ridge tributary. This is in contrast to observations in previous years, where areas observed to have the greatest concentrations of spawning redds were located in the area of river between Cathedral Rocks and Mount Dewdney (Anderton, 2001, 2002, & 2003).

The one 2004 radio tag located in the Old Crow River was found approximately 20-25 km upstream (as the crow flies) from its' confluence with the Porcupine River. There have been no indications of chinook spawning in this area of the Old Crow River and the habitat is not particularly suitable, therefore it is possible that the fish was still "in-transit" toward a spawning destination further upstream in the Old Crow watershed. However, considering that the tag was recorded as passing the border receiving station on July 12th, it would appear that the fish was travelling very slowly. Alternatively, it is possible that the fish was no longer alive and was drifting downstream from an upstream spawning area. However, the long distance of the tag location from known or suspected spawning grounds, as well as the extremely low water levels throughout the summer, suggests that this possibility was unlikely. Figure 4 illustrates the distribution of all 2004 tags that were recorded as having crossed the U.S./Canada border on the Porcupine River.

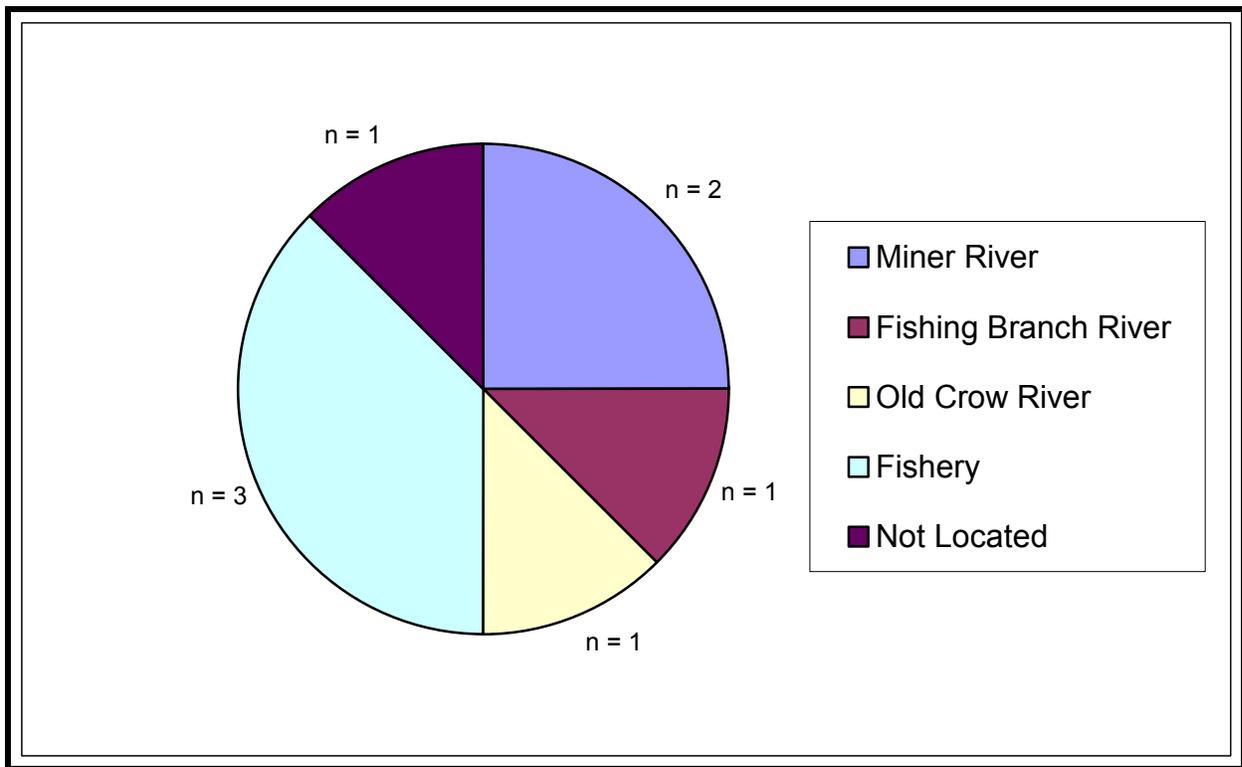


Figure 4: Distribution of 2004 Radio Tags in the Porcupine River Watershed

4.2 Location of 2003 Tags

During the 2003 chinook migration, a total of thirty tags were recorded as passing the receiver station located near the U.S./Canada border on the Porcupine River. Seven 2003 tags were located during the 2004 telemetry surveys. As noted in Section 3.0, four of these were not located in 2003. Of these four tags, three were located in the lower Miner River, while one was located in Timber Creek, a tributary of the Old Crow River. During the 2003 telemetry surveys on the Porcupine River, twenty tags were located. Therefore, combined with the results of 2004, twenty-four tags from 2003 have now been located.

It should be noted that the 2003 tag located in Timber Creek represents significant and new information. The location of radio tagged chinook in the Old Crow River during 2003 was the first confirmation of a spawning population in that tributary. Two tags were located at that time, one of which was in the upper portion of the Old Crow river, near the U.S./Canada border, and the other was located in the Old Crow mainstem near the mouth of Black Fox Creek. The latter tag was suspected to be “in-transit,” as that area (and the majority) of the Old Crow River mainstem is not suitable chinook spawning habitat (Anderton, 2003). The location of a further 2003 tag in Timber Creek provides confirmation of an additional spawning destination for chinook stocks returning to the Old Crow River watershed. While documented Traditional Knowledge has indicated the historical presence of chinook in Timber Creek, the radio tag in this location represents the first confirmation of the contemporary presence of chinook salmon within the boundaries of Vuntut National Park.

Several possible spawning redds were observed in Timber Creek within an area of the stream 5-10 km upstream from the location of the 2003 radio tag, which would be in keeping with the tag having drifted downstream (at some point over the year) from the spawning area.

It should be noted that of the four 2003 tags not located, two of them passed the U.S./Canada border on August 2nd and 5th. They were therefore missed in the telemetry surveys which flew as far downstream as Caribou Bar creek on August 2nd. The other two tags not located passed the border on July 11th and 21st.

Of the four 2003 tags not located in 2003, but subsequently located in 2004, one passed the border on August 5th, after the completion of all surveys. This tag was the one located in Timber Creek during 2004 surveys. Another passed the border on July 25th, and the other two passed the border on July 2nd, and July 6th. These three were all located in the Miner River during 2004 surveys. It is conceivable that the one passing the border on July 25th may have been migrating in portions of the Porcupine River mainstem not surveyed during 2003 surveys. However, the fact that the two tags which crossed the border on July 2nd and 6th were not located during 2003 surveys is somewhat of an anomaly, as this was essentially on month before the survey timing. Figure 5 illustrates the distribution of all thirty 2003 recorded as having crossed the U.S./Canada border.

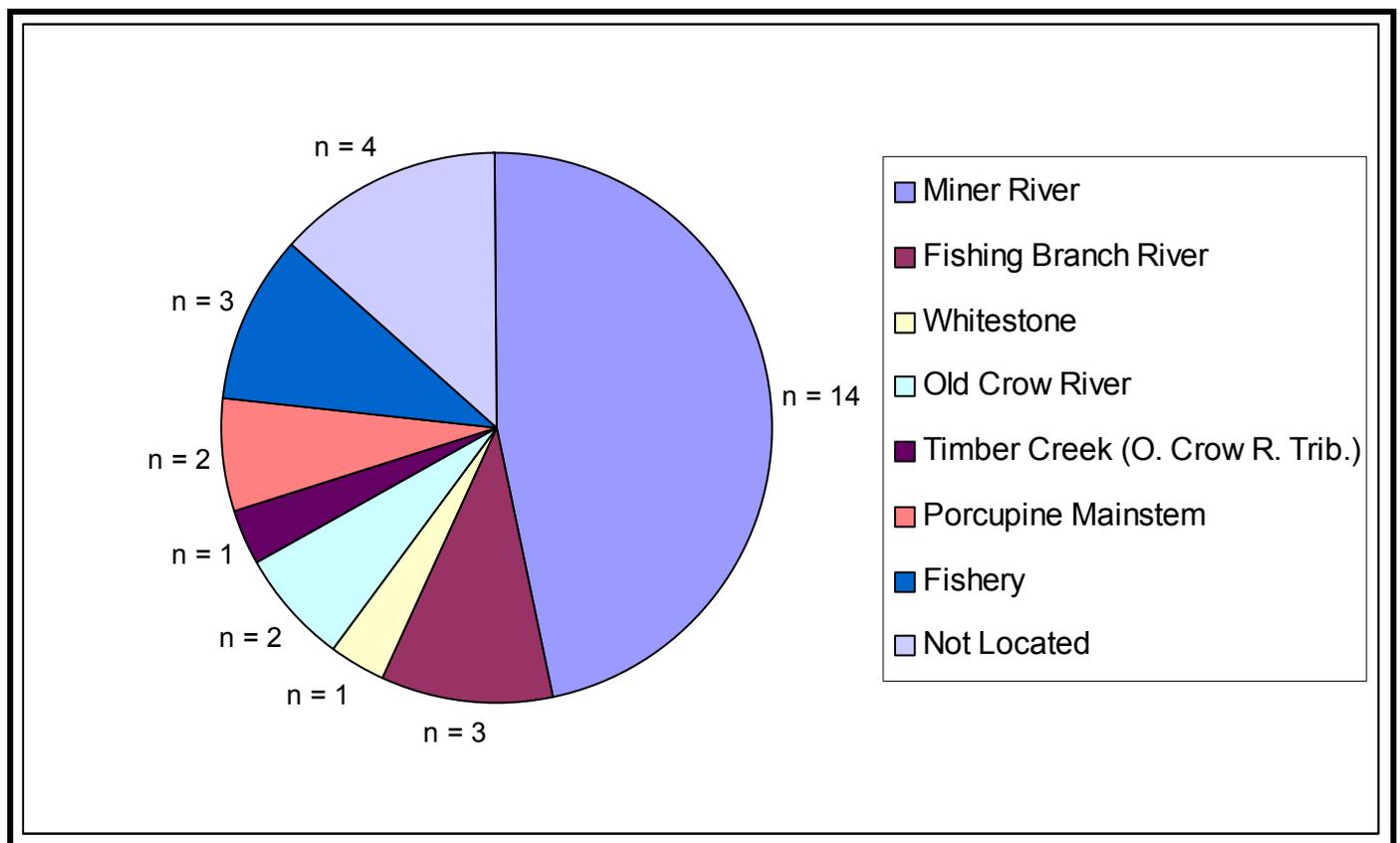


Figure 5: Distribution of 2003 Radio tags in the Porcupine River Watershed in 2003 and 2004

4.3 Comparison of 2003 and 2004 Results

It is valuable to compare 2003 and 2004 results both in terms of tag destinations and the number of tags located in each stream, as well as the total number of tags returning to the watershed. A limited telemetry survey of the Miner, Whitestone, and Fishing Branch Rivers in 2002 is also of some comparative value.

4.3.1 Indicators of Run Strength

In 2003, thirty radio tags were recorded as crossing the U.S./Canada border on the Porcupine River. In 2004, only eight were recorded. The difference in number of tags is remarkable, and may reflect general run strength in a non-quantitative fashion. Chinook returns in 2003 were noted as being particularly strong throughout the upper Yukon River watershed, therefore the number of tags returning to the Porcupine can also be considered indicative of a strong run. The eight tags returning to the Porcupine in 2004 is therefore also indicative of a lower return. However, this dramatic difference is not reflected in returns to upper Yukon River tributaries. While 2004 did see a drop in radio tag returns to some upper Yukon tributaries, such declines were generally marginal (Osborne, pers. comm., 2005). As well, the fact that three out of eight radio tags (38 %) were captured in the 2004 fishery, while only three or four out of thirty radio tags (10-13 %) were captured in the 2003 fishery also indicates a much weaker run in 2004.

Observations of spawning redds and other indicators of salmon were also very limited in 2004. In 2003, extensive areas of spawning redds were observed during telemetry surveys in the upper Whitestone and throughout the lower 80 km of the Miner River. As well some redds were observed in the Fishing Branch and upper Old Crow Rivers, although river conditions were less than ideal for observation of the river bottom (Anderton, 2003). As well, reports from the Old Crow fishery indicated that returns were very strong throughout the summer. In contrast, during 2004 telemetry surveys, much lower concentrations of redds were observed in the Miner River, and very few redds were observed in the Whitestone and Fishing Branch Rivers. No Redds were observed in the upper Old Crow River, while a few possible redds were observed in Timber Creek.

While a variety of factors may have influenced such a decrease in Porcupine River chinook returns, it should be noted that environmental conditions were dramatically different in 2003 and 2004. In 2003, the summer was unusually wet, with unusually high water levels throughout the later half of the summer. In 2004, the summer was unusually dry, with unusually low water levels throughout the entire summer.

It is also valuable to note that in 2002, a limited telemetry survey for radio tagged chinook salmon was conducted over significant portions of the Miner, Whitestone, and Fishing Branch rivers. However, only three tags were located at that time, one in the lower Miner, one in the Fishing Branch, and one near the mouth of the Whitestone River. Based on reports from the Old Crow fishery, as well as aerial observations of spawning redds, it is thought that the run strength in 2002 was greater than in 2004, but not as strong as in 2003. As well, the number of tags applied to Yukon River chinook salmon differed in each year, with the most tags applied in 2003. Therefore it is evident that a direct comparison of number of radio tags located in each year is not necessarily a good direct comparison of run strength, rather it may be considered a very general indicator.

4.3.2 Tag Destinations

While the difference in returns of tags to the Porcupine River watershed between 2003 and 2004 make comparisons difficult, some generalized patterns can be identified, particularly when considered in context with other available information regarding chinook stocks. A variety of work, including 2003 and 2004 telemetry surveys, has clearly indicated that the Miner River is the major spawning destination for Porcupine River chinook salmon (Anderton, 2001, 2002, & 2003). The relative importance of the other three tributary watersheds (Whitestone, Fishing Branch, and Old Crow rivers) supporting spawning chinook populations is less clear. During 2003 surveys, more spawning redds were identified in the Whitestone than the Fishing Branch or the Old Crow Rivers, however, only one 2003 radio tag was located in the Whitestone while three were located both in the Fishing Branch and Old Crow River watersheds (Anderton, 2003). During 2004 surveys, low numbers of spawning redds were identified in all three of these tributary watersheds; however, no radio tags were located in the Whitestone, while one was located in each of the Fishing Branch and Old Crow Rivers.

While comparisons of the relative importance of the Whitestone, Fishing Branch, and Old Crow Rivers may not be practical with currently available information, it is clear that small spawning runs of chinook salmon do utilize areas in these tributary watersheds.

5.0 RECOMMENDATIONS

Chinook telemetry surveys conducted in 2003 and 2004, as well as other research conducted throughout the watershed, has provided a greater understanding of the migratory patterns and habitat use of this salmon species in the Canadian portion of the Porcupine River watershed. As the body of knowledge in this regard grows, the ability to ensure the conservation of Porcupine chinook stocks and their habitats improves. Based upon the results of this project, the following future work is recommended.

- Estimations of Porcupine River chinook run-strength.
- Further documentation of the extent and patterns of chinook spawning and rearing in the Whitestone, Fishing Branch, and Old Crow Rivers.
- Develop “model of habitat use” for the life cycle of Porcupine chinook salmon.

6.0 ACKNOWLEDGEMENTS

Funding for this project was provided by the Yukon River Panel’s Restoration and Enhancement (R&E) Fund. The R&E fund was established under the Yukon River Agreement to conserve salmon stocks originating from Yukon River. Pat Milligan and Rick Ferguson (Fisheries and Oceans Canada) provided technical support to the project, William Josie (Vuntut Gwitchin First Nation – Natural Resources) provided general project direction and assistance with logistics. Stan Njootli Jr. (Assistant) and Kibbe Tetlichy also participated in the telemetry surveys. Jake Duncan and Gerry Couture also provided logistical/equipment assistance during the telemetry surveys.

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