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LOWER DONJEK RIVER
CHINOOK SALMON HABITAT and STOCK ASSESSMENT

final report to

YUKON RIVER PANEL

prepared by

Darrell K. Otto

for

WHITE RIVER FIRST NATION

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ACKNOWLEDGEMENTS

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The overall objective of this study has been to identify areas of the Lower Donjek River drainage utilized by chinook salmon, to conduct a pilot survey for future restoration and enhancement work in the area, and to initiate community involvement by WRFN members which hopefully might lead to stewardship of the salmon resources within their traditional territory. The project initiated these objectives by addressing the following specific areas:

1. Verify the utilization of the lower Donjek and 3 of its major tributaries as rearing habitat for juvenile chinook salmon through fry trapping.

2. Identify the use of these tributaries as spawning habitat for returning adult chinook.

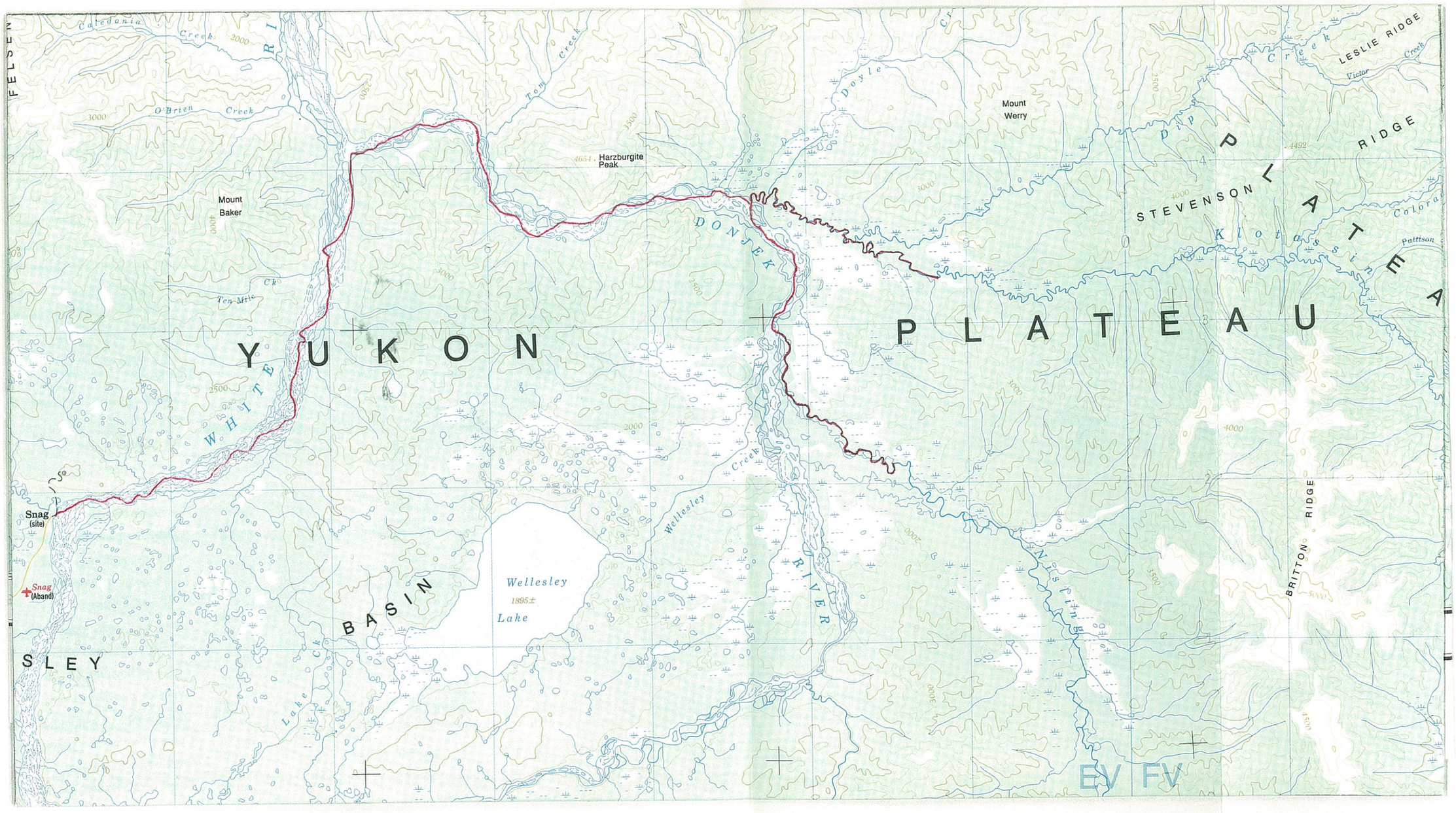
3. Identify any obvious "bottlenecks" which might impede optimum utilization of the streams as rearing or spawning habitat.

4. Investigate the possible employment of back (clear water) channels in a glacial river as juvenile chinook habitat, through fry trapping in these areas.

5. Serve as a pilot study to develop a strategic plan for future chinook salmon restoration and enhancement work in the lower Donjek by identifying impediments to access and other, as yet unidentified, problem areas.

6. Provide baseline data on chinook salmon resources in a remote area of the Yukon for which scant current knowledge currently exists, and subsequently allow the existing resources to be taken into consideration in light of stock management, and any future upstream development projects.

The streams surveyed during the course of the investigation were overflown by fixed-wing aircraft on September 16, 1997. At that time all appeared to have adequate discharge in their lower reaches to allow spawners to migrate upstream, and to be accessed by a habitat survey crew in a small boat.



Map of the study area indicating the access route to Lower Donjek River, Klotassin River and Nisling River. Scale 1:250,000.

FIELD INVESTIGATIONS METHODS:

The first component of the field investigations for the chinook habitat assessment of the Lower Donjek River and its tributaries was completed by boat. The boat survey was carried out in mid-July of 1998. This portion of the habitat study involved travelling up the respective streams by small craft to investigate impediments to spawner migration, and minnow trapping to test for the presence of chinook juveniles. The streams were traversed upstream from the mouth as far as possible by small craft, or until the time apportioned for study of the particular stream ran out. Baited minnow traps were initially scheduled to be set for 24 hour periods in a variety of representative stream habitat types to test for the presence of juvenile chinook salmon, and other species of fish inhabiting the stream for which the trapping protocol for juvenile chinook salmon is effective. This trapping procedure was also carried out in backwater channels of the Donjek River, at points downstream of the respective confluences of the Nisling and Klotassin Rivers. Setting the traps in the Donjek River, downstream of the outlets of the other two rivers was intended to investigate the possibility of juvenile chinook moving out of their natal streams to rear in backwater channels of the mainstem Donjek. The specific protocol used for the baiting of minnow traps is from the document "Protocol for the Baiting of G-Type Minnow Traps" Fisheries and Oceans, Whitehorse Habitat and Enhancement Branch. In summary this protocol involves baiting the traps with a "walnut-sized portion" of salmon roe placed inside a perforated clear plastic bag. Due to the amount of time that was spent in the field during the course of this study without access to refrigeration, preserved salmon roe was used rather than previously frozen roe from Yukon River chinook salmon.

Water quality testing was also part of the survey of the streams. Temperature, pH, dissolved oxygen, as well as water hardness were measured at the mouth of each of the streams, as well as at the furthest point travelled upstream. Temperatures, as well as pH and dissolved oxygen level were taken using electronic meters, while water hardness was tested using a Hach® Kit. Water quality sampling was conducted concurrently with the habitat survey. Ideally, water quality data would have been collected over the course of at least one full year to document the intra-annual highs and lows of the parameters, however, owing to the difficulty of accessing these streams, this was not feasible. Documenting water quality data in mid-summer gave indications of the quality of surface flow in the streams.

In general the project was conducted by assembling an investigative "crew" consisting of 4 individuals, as well as an appropriate boat, camping gear, supplies, meters, fry traps etc. and transporting these to the White River, at Snag, Yukon. The original project plan had called for the

investigators to travel by riverboat down the Donjek River from the Alaska Highway crossing. During the course of trip preparations it was discovered that the White River could be navigated from Snag to the mouth of the Donjek, which significantly reduced the distances to be travelled in accessing the study streams. As the survey crew moved up the Donjek River they would stop to camp for a period of time near the mouth of each of the streams being investigated. Once a camp was established, the crew moved up the stream on a daily basis to carry out the investigations. As work on one stream was completed, the survey crew moved up the Donjek River to the mouth of the next stream, establishing a new camp, and repeating the survey process. When the investigations were complete, the surveyors proceeded back down the Donjek River and then up the White River to Snag, Yukon where the boat portion of the survey ended.

The second portion of the chinook habitat study involved overflights of the Lower Nisling and Klotassin Rivers and Dip Creek. The overflights, which were made by helicopter in mid-August were conducted primarily to enumerate and document the movements of, adult chinook spawners. A fishwheel, operated by WRFN members operated at the mouth of the Donjek River from mid-July to mid-August. This fishwheel had a dual purpose role, serving both as a research tool, and to investigate the feasibility of harvesting chinook salmon for community food fish needs. Information gathered from the fishwheel harvest was utilized to give a general indication of the timing of chinook spawner migration into the Lower Donjek system. This information was then utilized to determine the optimum timing for helicopter overflights. Also, during the helicopter overflights, minnow trapping was conducted in back channels of the Donjek River.

The field crew for the boat survey portion of the study consisted of 4 individuals: 1 survey leader, and 3 support personnel. Three of the survey personnel were representatives of WRFN. Helicopter survey work was completed by a pilot and two surveyors, one of whom was a WRFN member. Data analysis and the writing of this report were completed by the project leader.

RIVERBOAT SURVEY RESULTS:

The initial departure of the survey crew for the boatwork portion of the study was from Snag, Yukon at 1500h on July 3, 1998. The survey leader was Darrell Otto and the support personell consisted of WRFN members Tim Glazier, Victor Sam, and Louis Ranigler. The four crew members proceeded down the White River to the confluence of the Donjek River. The crew and their gear were loaded into a 5.5 metre (18 ft.) aluminum riverboat with a 50 horsepower propeller driven outboard motor as the main source of power, and a 20 horsepower propeller driven unit as an emergency backup. Discharge in the White River was very high owing to

unusually warm temperatures which had existed in the area for several weeks preceding the departure date. Although the distance from Snag to the Donjek River mouth is just over 30 km. in a straight line, the actual distance traveled by the boat exceeded this distance significantly. The White River is extensively braided at this point and flows through the floor of a wide valley. Most of the river is very shallow and fast. Finding a channel which is deep enough to allow passage of a boat, even with a flat bottom, can be difficult, and forward progress usually necessitates weaving back and forth across the width of the river. Due to constant shifting of the silt and cobble substrate which lines much of the riverbed, these navigable channels are constantly moving within the confines of the valley floor. Changes in water depth constantly expose and bury submerged objects such as boulders or waterlogged trees. Piloting a riverboat through these conditions requires a skilled operator with good ability to "read" the waters ahead for submerged obstacles and shallow gravel bars.

On the first day the crew traveled down the White River to the Donjek, and then proceeded upstream for a distance of approximately 8 km., and made camp for the night. The outboard motor had overheated several times during the course of the day and inspection of the engines cooling system revealed that the metal liner surrounding the water pump had been eroded. This rapid and excessive wear of the pump was attributed to the heavily sedimented water passing through the system. Several trips had been made down the White, and up the Donjek River earlier in the week to cache gasoline for use during the habitat survey. In addition to the water pump damage, submerged rocks had caused major damage to the propeller blades. Although spare propellers had been purchased for the trip, the frequency and extent of the damage indicated that there was a good possibility that the spares would be insufficient to last through the trip. The decision was then made to return to the White River and then upstream to Snag, and that a "jet-drive" unit would be purchased, which would eliminate the use of a propeller. The use of a jet drive would allow the riverboat to travel through shallower water without risk of mechanical damage to the propeller.

On the morning of July 4 the crew set out down the Donjek using the 20 horsepower backup engine. Upon entering the White River, which had risen further overnight, it quickly became obvious that the engine had insufficient power to push the crew and all the gear up the White River against the current. During downstream travel on the White River, readings from the Global Positioning System (GPS) indicated that the velocity of the current in the deeper channels of the river was often in excess of 20 km/hour, and in places exceeded 25 km/hour. The majority of gear was jettisoned near the mouth of the Donjek River, which lightened the load in the boat

considerably. This loss of weight improved the rate of upstream progress, but the return trip to Snag still required over 9 hours to complete, compared with a trip of less than 2 hours on the way downstream. Further damage to the propeller occurred during the upstream trip which required replacement with a new unit.

The 50 horsepower propeller driven engine was replaced with a 40 horsepower "jet drive" unit. Due to the inefficiency of a jet drive relative to a propeller drive, the effective power of the new engine was 28 horsepower. However, the jetdrive allowed the riverboat to maneuver in shallower waters of lower velocity. On the second ascension of the Donjek River only 3 crew members were present. In addition to this, most of the equipment and provisions necessary for the study had already been moved into the area of the study. The ability to travel outside of the swiftest channels, combined with the weight reduction greatly increased the rate of upstream travel in the glacier-fed rivers throughout the rest of the investigation. The trip resumed down the White River from Snag on July 7, 1998 at 1900h, and the confluence of the Donjek River was reached at 2045h, where the cached supplies were reloaded into the riverboat, and travel up the Donjek resumed.

The Klotassin River was reached on July 8, 1998. The mouth of the river is somewhat difficult to locate from the Donjek due to the braided narrow channels which exist near the edges of the larger river. The most reliable visual indicator of the location of the mouth of the Klotassin River is a row of exceptionally tall spruce trees which grow along its banks. After the Klotasssin River was located, a camp was established near the mouth of the river, and the survey of chinook salmon habitat in the Klotassin River and Dip Creek began .

The survey of the Klotassin River and Dip Creek were completed on July 9 and 10, 1998. The crew moved upstream by riverboat each morning, minnow traps were set and water quality, as well as other relevant data, were recorded. The original intent of the project was to survey the Klotassin River much further upstream than what proved to be possible. The 1998 season represented an exceptional year with respect to low water levels throughout the Yukon Territory. Environment Canada reports that during July of 1998 precipitation in the study area was 51% below the thirty year average. The low water meant that movement in the stream by boat was difficult and that upstream access was limited. The low water at the time of the survey restricted upstream movement in the Klotassin River to a point just upstream from the Dip Creek inlet (62° 32' 17"N 139° 22' 16"W). During the minnow trapping procedures in the Klotassin River the traps were set in areas which appeared to provide good shelter for juvenile chinook such as under large woody debris. Although the results of the minnow trapping procedures indicate that very few

juvenile chinook existed in the stream (Table 1), this is somewhat misleading. In several cases as the traps were being set and placed in the water, schools of juvenile chinook salmon were seen in the immediate vicinity. For some reason they were reluctant to enter the baited traps.

Dip Creek could not be accessed at all by means of boat. Water levels in the mouth of the creek were less that 30 cm.. A heavy load of fine material had also been deposited in the lowest reaches of the creek which made wading in the streambed very difficult. Water quality data was collected and minnow traps set in the lowest reach of Dip Creek.

Figure 1: Lower reaches of Klotassin River, July 1998. Riparian vegetation is heavy and gravel bar exposed due to low water level.

Figure 2: Lower Reaches of Klotassin River. Note gravel bar on inside radius of bend and eroding cutbank with overhanging vegetation on outer radius.

On July 11, 1998 the survey of the Nisling River began. The Nisling River was accessed from the Donjek River in a channel located at 62° 27.15'N 139° 28.76W. This channel, which was easily navigated at the time of the survey, was located to the north of a second channel completely blocked to small craft access by a series of large log jams. The entrance to the Nisling River, is made obvious by a plume of clear water which extends into, and eventually mixes with, the heavily sediment laden water of the Donjek River (Figure 3). A camp was established along the lower reaches of the Nisling River, and the stream was surveyed between July 11 and July 13, 1998. The Nisling River is in general wider, less winding, and the shoreline more "open" than that of the Klotassin River (Figure 4). Evidence was found of many large log jams having existed in recent years throughout the lowest reaches of the Nisling River. These large log jams appear to either have been pushed up on shore, or the stream channel has diverted around them (Figure 5). No major impediments to upstream access in the Nisling River by boat occurred due to log jams when the northernmost channel was used to access the river from the Donjek. As was the case in the Klotassin River, upstream access in the Nisling by boat was restricted by low water levels in the 1998 season. The Nisling River could therefore not be ascended as far upstream as had originally been intended, and minnow trapping as well as other data collection within the river had to be restricted to points downstream from a point 62° 24.61'N 139° 21.41'W.

During the boat work portion of the study on the Nisling River, a possible site for the future installation of a chinook salmon enumeration weir was found, and subsequently surveyed. The site was found in the lower reaches of the river at a point located at 62° 26.85'N 139° 26.99'W. Wetted width of the river at the time of the survey was 29.8 metres and the estimated mean depth was 0.5 metres. Stream velocity at the site was estimated utilizing the "orange peel" method over a 30 metre distance. The average of 3 trials indicated that mean stream velocity at this point was slightly in excess of 1 metre/second. The data collected from the site indicates that the estimated discharge of the Nisling River at the time of the survey was just under $15m^3$ /second.

On July 13, during the survey of the Nisling River, a bald eagle was observed feeding on a gravel bar along the east bank of the river. As the boat approached, the eagle took flight, temporarily abandoning its meal. Further investigation revealed that the eagle's prey was a freshly killed male chinook salmon. The dark red colouration of the salmon indicated that it was approaching sexual maturity (Figure 6). This provides evidence that in the 1998 season, chinook spawners had begun moving into the Nisling River by the end of the second week in July. Bald eagles were observed regularly along the Nisling River during the boat survey, and were possibly congregating in preparation for the arrival of the spawning salmon. On July 14, during the return

trip down the Donjek River, the crew made a short stop at the mouth of the Klotassin River. At that time 2 adult chinook salmon were observed milling in clear water approximately 100 metres upstream from the of the mouth of the river.

The boat survey portion of the chinook salmon habitat survey in the lower Donjek drainage was terminated on July 14, 1998 with the return of the crew to Snag via the Donjek and White Rivers.

Habitat Descriptions:

The Klotassin River is very meandering and exhibits a typical pattern of a gravel bar on the inside, and an unstable collapsing bank on the outer radius, of each bend (Figures 1& 2). The river was generally quite shallow with a mixed substrate ranging from silt through to large cobbles. Areas of cobble/gravel which appeared to be suitable for spawning chinook salmon were common throughout the portions of the stream surveyed. The stream gradient in the lower reaches is low in general, and most of the lower sections of the river are glide zones with occasional riffle zones. Areas of clean gravel and/or cobbles occur, but are not extensive, in the reaches of the stream surveyed. Exceptionally tall white spruce trees line much of the rivers banks, and as the bank erodes on the outer radius of bends the trees which have fallen into the river produce areas which would appear to be good habitat for juvenile chinook salmon. Areas consisting of mixtures of willow, alder and some grasses are also found along the banks of this stream. On the basis of its physical characteristics the Klotassin River does appear to have potential as both a spawning and rearing stream for chinook salmon.

In comparison with the Klotassin River the Nisling River is wider and more open, has a greater volume, and exhibits significantly more unsedimented gravel and cobble substrate (Figure 4). The Nisling River has a steeper gradient in the lower reaches, which results in more riffle to glide, and riffle to pool stream characteristic changes; the higher stream velocity produces more extensive areas of clean gravel and cobbles. The Nisling River exhibits more stable streambanks with less slope, and is in general, less winding than the Klotassin River. Back channels are very common in the lower reaches of the river, and these, in conjunction with numerous log jams along the shore of the river and on the outer radius of bends, appear to provide extensive habitat for juvenile chinook salmon. Riparian vegetation along the Nisling River is in general, similar to that found along the Klotassin although the areas of mixed alder, willow and grasses are more common. The habitat characteristics of the Nisling River appear to indicate that its potential as a chinook salmon spawning and rearing stream is high.

There was some evidence of beaver activity in several of the back channels in the lower reaches of the Nisling River. At one point the main channel of the river had been dammed and the flow was diverted through a back channel along the forest floor. At no point was the river completely blocked to boat access due to beaver activity. The beavers which were seen during the boat work portion of the investigation were large and appeared to have little fear of humans.

Figure 3: Confluence of North Fork of Nisling River with Donjek River. Entrance to Nisling River is obvious due to long plume of clear water.

Figure 4: Upstream view in lower reaches of Nisling River. This stream is less meandering and the banks have a more gradual slope and are more "open" than the Klotassin River.

Figure 5: Large debris jam on streambank in lower reaches of Nisling River. These were very common along the north fork of the river, but the channel was navigable. The south fork was completely blocked by a large debris jam which extended for several kilometres.

Figure 6: Fresh carcass of a male chinook salmon, partially consumed by a bald eagle, found on July 13, 1998 in lower Nisling River. The presence of this maturing chinook salmon indicates that spawner migration into the Nisling River has begun.

II) AERIAL SURVEY RESULTS:

The second portion of the investigation involved survey of the streams by helicopter during the estimated height of chinook spawner activity. Determination of the timing of the chinook spawner migration into the watershed was made by utilizing daily harvest data obtained from the WRFN fishwheel which was operating at the mouth of the Donjek River. The aerial survey portion of the study was completed between August 14 and 17, 1998. Overflights of the survey streams were completed from a Bell Jet Ranger III helicopter supplied by Trans North Helicopters of Whitehorse. Flights originated from, and were terminated at Burwash Landing, Yukon. These surveys were completed by survey leader, Darrell Otto and WRFN member Roland Peters. It had originally been intended that helicopter overflights would be initiated and terminated at White River Lodge on the Alaska Highway, as helicopter fuel was to be available at this site, but the Lodge did not open during the 1998 season. Originating the helicopter flights from Burwash Landing significantly increased "ferrying" time to and from the survey areas, especially the Klotassin River.

The chinook salmon spawner count of the Nisling River and minnow trapping in the Donjek River were completed uneventfully on the first two days of the overflight portion of the survey. The Nisling River was surveyed from the confluence of the Klaza River downstream to the Donjek. A grizzly bear was seen wading in the stream, and was presumably fishing, at the junction of the Klaza and the Nisling Rivers. The first chinook salmon observed in the Nisling River was an expired spawner spotted almost immediately downstream from the initiation point of the overflight at 62° 05.35'N 138° 29.18'W. Many of the redds seen in the substrate of the river at the time of the survey had already been abandoned, indicating that spawning activity in the river had been in progress for some time. During the course of the helicopter overflight, numerous adult and juvenile bald eagles were seen in the treetops along the length of the rivers surveyed. Schools of whitefish could also be seen in the river on a regular basis.

The spawner count of the Klotassin River was begun on August 15, 1998 at approximately 1400h, after retrieving the previously set minnow traps from back channels located in the Donjek River at points immediately downstream from the confluences of the Klotassin and Nisling Rivers. After surveying to a point approximately 5 km upstream from the confluence with the Donjek River, the helicopter had to be set down abruptly on a gravel bar due to a mechanical failure which had caused overheating of the engine. Examination of the engine indicated that repairs could not be completed. Due to the remote nature of this portion of the Klotassin River radio contact could not be made, and it was necesary to engage the emergency locator transmitter.

The helicopter pilot and survey crew spent the night on the gravel bar until a search and rescue plane could locate them, which occurred at approximately 0430h on August 16, 1998. The crew were picked up by a second helicopter shortly after daybreak on August 16, 1998 and then returned to Burwash Landing. Overflights could not be continued on August 16, 1998 while mechanical repairs were being completed on the helicopter. The survey of the Klotassin River and Dip Creek was to be reinitiated on August 17, 1998. After ferrying from Burwash Landing to the Klotassin River, an attempt was made to make a new count of the chinook spawners in the river. Due to a combination of high gusty winds and the rows of tall spruce trees which grow along much of the bank of the Klotassin River, counting of salmon in the stream proved to be too dangerous. The helicopter was spun around by the gusting winds and within 5 minutes of beginning the survey the decision was made by the survey leader to abandon the overflight of the river due to the danger of the helicopter making contact with the trees. The helicopter then returned to Burwash Landing and the helicopter overflight portion of the survey was terminated.

Minnow Trapping:

Some habitat descriptions have been abbreviated to save space within the tables. See Appendix I for key to abbreviations.

Table 1: July 8, 1998: A total of 5 minnow traps were set near the mouth of **Klotassin River**. The traps were set the in clear water immediately upstream from the boundary with the heavily silted waters of the Donjek River. Traps were set at approximately 2100h on July 8, and retrieved at approximately 0900h on July 9, 1998.

Date of Set	Set #	Duration of Set	Substrate	Habitat	Chinook (age class)	White-fish	Arctic Grayling	Burbot
July 8/98	1	12 hours	Silt/Sand	LWD /CB/ Pool	0	36	0	0
"	2	"	Silt/Sand	OHV/SWD/ Pool	0	1	0	0
"	3	"	Silt/Sand	OHV/ Steep bank/ Muddy Pool	0	11	0	1
"	4	"	Silt	ISV/ Steep bank/ Pool	0	0	0	0
"	5	"	Silt	SWD/ Steep bank / Pool	0	12	0	1

Table 2: July 9, 1998: A total of 2 minnow traps (Sets # 1 & 2) were set in **Dip Creek** within a 100 metre distance upstream from the confluence with the Klotassin River.A total of 3 minnow traps (Sets 3, 4 & 5) were set in the **Klotassin River** within a 1 kilometre distance downstream from the mouth of Dip Creek. Traps 1 & 2 were set at approximately 1400h on and traps 3, 4 & 5 at 1600h on July 9, 1998. All traps were retrieved 24 hours later.

Date of Set	Set #	Duration of Set	Substrate	Habitat	Chinook (age class)	White-fish	Arctic Grayling	Burbot
Dip Creek								
July 9, 1998	1	24 hours	Silt/Sand	OHV/SWD / Shallow	0	0	0	0
"	2	"	Sand	SWD / ISV/ Shallow	1(0+)	24	0	1
Klotassin River								
"	3	24 hours	Silt/Sand	Cutbank/ SWD	0	0	0	2
"	4	"	Silt	Cutbank/ LWD/ Pool	0	0	0	0
"	5	"	Silt	Cutbank/ LWD/ Pool	0	0	0	0

Table 3: July 9, 1998: Minnow trapping in backwater channels along N. bank of **Donjek River** within a 2 km. distance downstream from confluence of Klotassin River. Traps set in spring fed clear water back channels extending into the river bank. Traps were set at approximately 2100 hours on July 9, and retrieved 36 hours later on July 11, 1998.

Date of Set	Set #	Duration of Set	Substrate	Habitat	Chinook (age class)	White-fish	Arctic Grayling	Burbot
July 9/98	1	36 hours	Silt	Pool / SWD	0	40	0	0
"	2	"	Silt	Pool / SWD	0	75	0	1
"	3	"	Silt / Gravel	Pool / LWD	0	5	0	1

Table 4: July 11, 1998: Minnow trapping in **Nisling River**. A total of 10 traps were set in a variety of representative habitats in the lower reaches of the river beginning at the confluence with the Donjek River and upstream to a point 62° 24.46'N 139° 21.41'W. Traps were set beginning at 1620 hours on July 11 and retreived approximately 24 hours later on July 12, 1998.

Date of Set	Set #	Duration of Set	Substrate	Habitat	Chinook (age class)	White - fish	Arctic Grayling	Burbot	Sucker
July 11/98	1	24 hours	Silt	SWD / Rootmass	0	0	0	0	0
"	2	"	Silt	LWD / Debris Jam	0	3	0	0	0
"	3	"	Silt	Back channel LWD /SWD Steep Bank	0	0	0	0	1
"	4	"	Silt / Moss	Back channel LWD / Cutbank	0	0	0	3	0
"	5	"	(Red) Silt	Back channel / Grad. slope / Shallow	0	0	0	0	0
"	6	"	Silt/ Gravel / Mossy	Back channel / LWD / Debris Jam	0	0	0	2	0
"	7	"	Silt	Back channel / LWD / Cutbank	0	0	0	2	0
"	8	"	not visible	Under Large Log Jam	2 (0+)	0	0	1	0
"	9	"	Silt / Mossy	Back channel /Under Log Jam	2 (0+)	0	0	1	0
"	10	"	Silt / Mossy	Back channel / SWD Jam / Cutbank	0	0	0	2	0

Table 5: August 13, 1998: Minnow trapping in back channel of **Donjek River** approximately 500 metre below southernmost confluence of Nisling River. Flows in back channel were reduced relative to middle channels, and best described as a "glide" section, but water was heavily sedimented. Traps were set at 1145h on August 13, and recovered on August 15 at approximately 1100h.

Date of Set	Set #	Duration of Set	Substrate	Habitat	Chinook (age class)	White - fish	Arctic Grayling	Burbot	Sucker
Aug. 13/98	1	48 hours	Silt/Gravel	LWD	0	0	0	0	0
"	2	"	Silt/Gravel	LWD	0	0	0	0	0
"	3	"	Silt/Gravel	LWD	0	2	0	0	0

Table 6: August 13, 1998: Minnow trapping in back channel of **Donjek River** approximately 1 kilometre below confluence of Klotassin River. Flows in back channel were reduced relative to middle channels, and best described as a "glide" section, but water was heavily silted. Traps were set at 1215h on August 13, and recovered on August 15 at approximately 1130h.

Date of Set	Set #	Duration of Set	Substrate	Habitat	Chinook (age class)	White - fish	Arctic Grayling	Burbot	Sucker
Aug. 13/98	1	48 hours	Inorganic Silt	LWD	0	1	0	0	0
"	2	"	Inorganic Silt	LWD	0	5	0	0	0
"	3	"	Inorganic Silt	LWD	0	1	0	0	0

Spawner Enumeration in Nisling and Klotassin Rivers:

Nisling River, August 14, 1998.

Table 7: Count of chinook salmon spawners and mortalities completed by 2 surveyors from a helicopter. **Nisling River** was surveyed from the junction of the Klaza River downstream to the Donjek River following the northernmost fork.

	Total Count of Live Chinook Spawners			
Date	**Surveyor 1**	**Surveyor 2**	**Average**	**Mortalities**
August 14/98	101	119	110	32

Klotassin River, August 15, 1998.

Table 8: Count of chinook salmon spawners and mortalities in a portion of the Klotassin River, completed by 2 surveyors from a helicopter. River was surveyed from the Donjek River upstream for a distance of approximately 5 kilometres. Survey had to be abandoned at this point due to a mechanical failure of the aircraft.

	Total Count of Live Chinook Spawners			
Date	**Surveyor 1**	**Surveyor 2**	**Average**	**Mortalities**
August 14/98	4	4	4	1

Water Quality:

Table 9: July 9, 1998: Water quality measurements made at 1015h in clear water at the mouth of the Klotassin River.

Temp. (°C)	Dissolved O_2 (mg/l)	pH	Hardness (mg/l)
10.4	9.11	7.61	102.6 (6 gr./gallon)

Table 10: July 9, 1998: Water quality measurements made at 1600h in shallow water at the mouth of Dip Creek.

Temp. (°C)	Dissolved O_2 (mg/l)	pH	Hardness (mg/l)
11.1	8.65	7.28	119.7 (7 gr./gallon)

Table 11: July 11, 1998: Water quality measurements made at 1550h in clear water in the northernmost channel of the confluence of the Nisling River with the Donjek River.

Temp. (°C)	Dissolved O_2 (mg/l)	pH	Hardness (mg/l)
12.0	8.85	7.13	85.5 (5 gr./gallon)

CONCLUSIONS:

Although there were a number of logistical problems encountered during the course of this survey which curtailed the amount of data which could be collected, the general objectives of the project were achieved. This investigation has shown that the Lower Donjek River can be accessed, and many aspects of the fisheries resources documented by a crew traveling in a small craft. Some insight into the chinook salmon and freshwater fisheries resources of the Lower Donjek drainage has been attained, and more importantly this project has initiated a keen interest amongst White River First Nation members regarding these resources which exist within their traditional territory. The development of a stewardship of the salmon and freshwater fisheries resources in the Lower Donjek by White River First Nation is highly plausible, following the completion of Land Claims and the establishment of a Renewable Resources Council.

This study has also shown that chinook salmon utilized both the Klotassin and Nisling Rivers in 1998, as both spawning and rearing habitat. The extent of utilization of these rivers by juvenile chinook has not been adequately determined. In the case of the Klotassin River and Dip Creek, the degree of utilization by adult spawners has not been adequately determined. There appears to have been some impediment to juvenile chinook entering the baited minnow traps. This failure of juvenile chinook to enter the minnow traps during trapping procedures in the Klotassin River, also occurred in the Nisling. When the traps were being set, in both back channel habitat and under large logs in the mainstem of the river, chinook fry were seen in the area. However, juvenile salmon failed to enter the traps in numbers which were representative of their presence within the stream. The trapping procedures outlined by Fisheries and Oceans, Whitehorse document "Baiting of G-type Minnow Traps" were adhered to closely. The single deviation from the protocol, which may have created reluctance by the fry to enter the traps, was the use of preserved, as opposed to previously frozen, salmon roe as bait.

The general "rule of thumb" which states that areas of streams which support healthy populations of Arctic grayling during the summer months will also provide acceptable habitat for juvenile salmon, can be used as an indication of the capacity of the Klotassin and Nisling Rivers to support chinook fry. Adult grayling were easily angled from both the Klotassin and Nisling Rivers. Although no juvenile grayling appeared in the minnow traps, this may be due to the small size of the grayling fry in early July. Fish of this size could have escaped through the mesh of the traps. It is also possible that juvenile grayling do not utilize the same rearing areas as the chinook fry and/or that the baiting method used was ineffective for Arctic grayling.. It is obvious from the minnow trapping procedures that the Klotassin River provides premium habitat for juvenile round

whitefish. Observations made during both the boat work portion of the study and during the helicopter overflights show that large schools of adult whitefish can be found in both of these rivers as well. Whitefish juveniles appear to utilize the heavily sedimented waters of the Donjek River mainstem as well, providing that the velocity of the water is not excessive. Minnow traps set in silted "glide" areas of side channels of this heavily braided river, or in clear water pools which had been cut off from the main channels by decreasing water levels regularly yielded juvenile whitefish. This was especially true in areas of the Donjek River below, and adjacent to, the mouth of the Klotassin River.

Actively spawning populations of chinook salmon were present in significant numbers along the entire length of the Nisling River upstream to the confluence with the Klaza River, at the time of the aerial survey. An expired spawner was spotted immediately downstream from the confluence of these two rivers, and several abandoned redds were noted. The population of chinook spawners in the Klotassin River could not be assessed for the reasons indicated above. However, 2 adult chinook were seen in the lowest reaches of the Klotassin River on July 14, the final day of the boat survey, and a total of 4 adult chinook were seen in the 5 kilometre stretch of the river which was surveyed during the curtailed overflight on August 15. This information indicates that chinook spawners utilized the Klotassin River and/or its tributary streams in 1998. The information collected during the course of this study does not allow an estimate to be made of the total number of adult chinook which spawned in the tributaries of the Donjek River in 1998. It is important to note that the border escapement of spawning populations of chinook salmon into the Canadian portion of the Yukon River in 1998 were 49% below the 10 year average (Fisheries and Oceans, Whitehorse, provisional data). A fishwheel was operated by WRFN members under their community food fishing licence, near the mouth of the Donjek River, for a total of 23 days beginning on July 22, through to August 17, 1998. The 23 days of operation yielded a total of 138 chinook salmon, all of which appeared to be in good physical condition. The last chinook salmon was caught on August 14. The numbers of chinook caught during the first few days that the fishwheel was in operation appear to indicate that the migration of chinook into the Donjek River was already well underway on July 22, the date the wheel was initially installed. The ratio of male:female chinook caught in the wheel was 3:1 a ratio which is consistent with data collected at other sites along the upper Yukon River in 1998 (Otto, 1998; Fisheries and Oceans, Whitehorse provisional data) . The first sighting of adult chinook in the Nisling River was on July 13, and at the time of the aerial survey on August 13, active spawning was still in progress, and a number of the salmon sighted in the Nisling River had not yet "paired off". The large groups of salmon could

also have been all males because of the skewed ratio of males:females. In the Klotassin River, the first adult chinook were sighted on July 14, and at the time of the attempted aerial survey one month later, active chinook spawners were still present. This appears to indicate that the run timing within these rivers is extended. Taking into account that 111 live, and 32 expired chinook salmon were observed in the Nisling River at the time of the aerial survey combined with the fact that chinook spawning population border escapement in 1998 was 49% below the 10 year average, and that the upper portions of the river and its tributaries were not surveyed, the total chinook spawning population of the Nisling River should be considerable in an average year. It should also be noted that the actual counts made of chinook spawners in the rivers during the helicopter overflights are very likely low estimates of the total number of salmon actually present. The major source of error during the counts was the inability to see fish in the river in areas where insufficient light penetrated the water in the stream. This occurred over significant portions of both rivers due to the tall white spruce trees which grew to the edge of the river banks. As the Klotassin, and to a lesser extent, the Nisling River are winding rivers, large portions of these streams would be shaded by the tall trees which reduced visibility into the water. These heavily shaded areas could conceivably have held an unknown proportion of the total chinook salmon population which present in the rivers at the time of the aerial survey. During the overflights of the Nisling River, large areas of what appeared to be good quality spawning substrate was uninhabited. This could be that because of the low numbers of spawners in 1998 many potential spawning sites remained unused. Surveying the river in a year when numbers of spawning chinook are at, or above average would give a better indication as to the capacity of the Nisling River to support populations of spawning chinook salmon.

The two major limiting factors in regard to surveying the Lower Donjek River and its tributaries by boat in 1998 were exceptionally low water levels and unexpectedly high fuel consumption. It had originally been intended that a canoe equipped with a small outboard engine would be towed by the riverboat to the tributary rivers and this would allow access to the upper portions of these streams. Towing the canoe down the fast-moving White and Donjek Rivers proved to be too dangerous. The riverboat would on occasion, run aground on gravel bars and the trailing canoe would have then continued downstream at a high speed, acting as a projectile and posing serious risk to the occupants of the riverboat. For this reason plans to bring the canoe along during the boat work portion of the study were abandoned. In years with average or higher water levels, the upper portions of the Klotassin and Nisling Rivers, and likely Dip Creek would have been accessible by riverboat.

During the course of the study the amount of fuel used far exceeded what had been anticipated. The fuel consumption was highest when moving upstream in the Donjek and White Rivers. The most extreme example of fuel consumption occurred during the final upstream leg from the mouth of the Donjek River to Snag, in the White River. This trip, representing a distance of approximately 30 kilometres, required almost 90 litres of fuel. It should be noted however, that because of the convoluted nature of the navigable channel in the White and to a lesser extent the Donjek River, the actual distance traveled exceeds the actual distance between any two given points. Future investigations of these rivers should take into account the amount of fuel required, and prepare accordingly by placing fuel at strategic points along the rivers before the investigations begin. Strategic locations for fuel storage would be on the Donjek River at the confluence of the White River, and along the Donjek River just downstream from the mouth of the Nisling River.

The investigation of the chinook salmon resources in the Lower Donjek River in conjunction with a salmon harvest feasibility study involving the previously described fishwheel, has given rise to considerable interest by White River First Nation members with respect to the salmon and freshwater fisheries resources which exist within their traditional territory. Harvest of chinook salmon within the Lower Donjek River drainage by White River First Nation had been virtually non-existent for over 40 years, previous to the 1998 season. The arrival of significant quantities of fresh and dried chinook salmon into the community of Beaver Creek during July and August of 1998, as well as the locating of other freshwater fish resources, especially whitefish, within the traditional territory seems to have made an important, positive impact in the community. Pursuant to recognizing that these renewable resources exist within the traditional territory, protection of these resources for future use is now an important issue for WRFN members. This is the first step toward WRFN members taking a stewardship role in protecting the fisheries resources of the Lower Donjek River. Once Land Claims settlements are complete and a Renewable Resources Council established for WRFN Traditional Territory, members of the First Nation can play a greater role in making decisions on future upstream developments and harvest patterns of fish and wildlife in the area.

APPENDIX I:

Key to Abbreviations Used in Habitat Descriptions.

Cutbank = An unstable stream bank with a slope greater than 90°; usually due to erosion.

ISV = Instream vegetation.

LWD = Large woody debris

OHV = Overhanging vegetation

SWD = Small woody debris

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