# Klondike Area Central Incubation/Outplanting Facility

Chandindu River Salmon Enumeration Weir

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June 2, 2000

• Collect data on the Chandindu River, a river located in the Tr'on dëk Hwech'in traditional area, to determine the availability of brood stock to support an incubation/outplanting facility and a restoration program.

Prepared for:

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**Fisheries and Oceans Canada**
Habitat Restoration and Salmon Enhancement Program

**The Yukon River Panel**
Restoration and Enhancement Fund

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# Table of Contents

Many thanks to the following people who directly contributed to the success of the Chandindu River salmon enumeration project:

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* * *

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* * *

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**The Yukon River Salmon Restoration and Enhancement Fund**
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**The underlining concepts of a Klondike Area Central Incubation/Outplanting Facility are: (1) to aid in the management of weak or depleted stocks by restoring these stocks to former healthy sizes that could better withstand fishing pressure and natural mortality, and consequently, (2) produce more fish to benefit Yukon and Alaskan fishers on the Yukon River.**

Mixed stock fisheries normally base allowable harvests on the total run abundance. Weak salmon stocks can be unduly impacted by this practice. By restoring weak or depleted stocks in the Tr'on dëk Hwech'in Traditional Territory we reduce some of the impacts of this practice to salmon stocks in the area.

We are interested in "kick starting" weak salmon stocks in the Klondike area by artificially incubating eggs to the fry stage. During the natural life history of salmon only about 30% of the eggs survive to become fry.[1] By conducting this program we would like to increase the number of fish over a six year cycle by increasing egg to fry survival from about 30% to approximately 80% in controlled circumstances.[2] These fry would then be outplanted into their natal streams.

The resulting greater number of adult salmon returning to the river should then be more likely to withstand the fishing pressures and the natural challenges that exist in their life cycle. This program would have a limited life span as the intent is to temporarily help the weak or depleted stocks, not to continually outplant fry to streams in perpetuity. We are sensitive to the impacts of large hatcheries and their potential negative impacts on wild fish stocks. We are attempting to develop a program that will minimize negative effects on wild stocks.

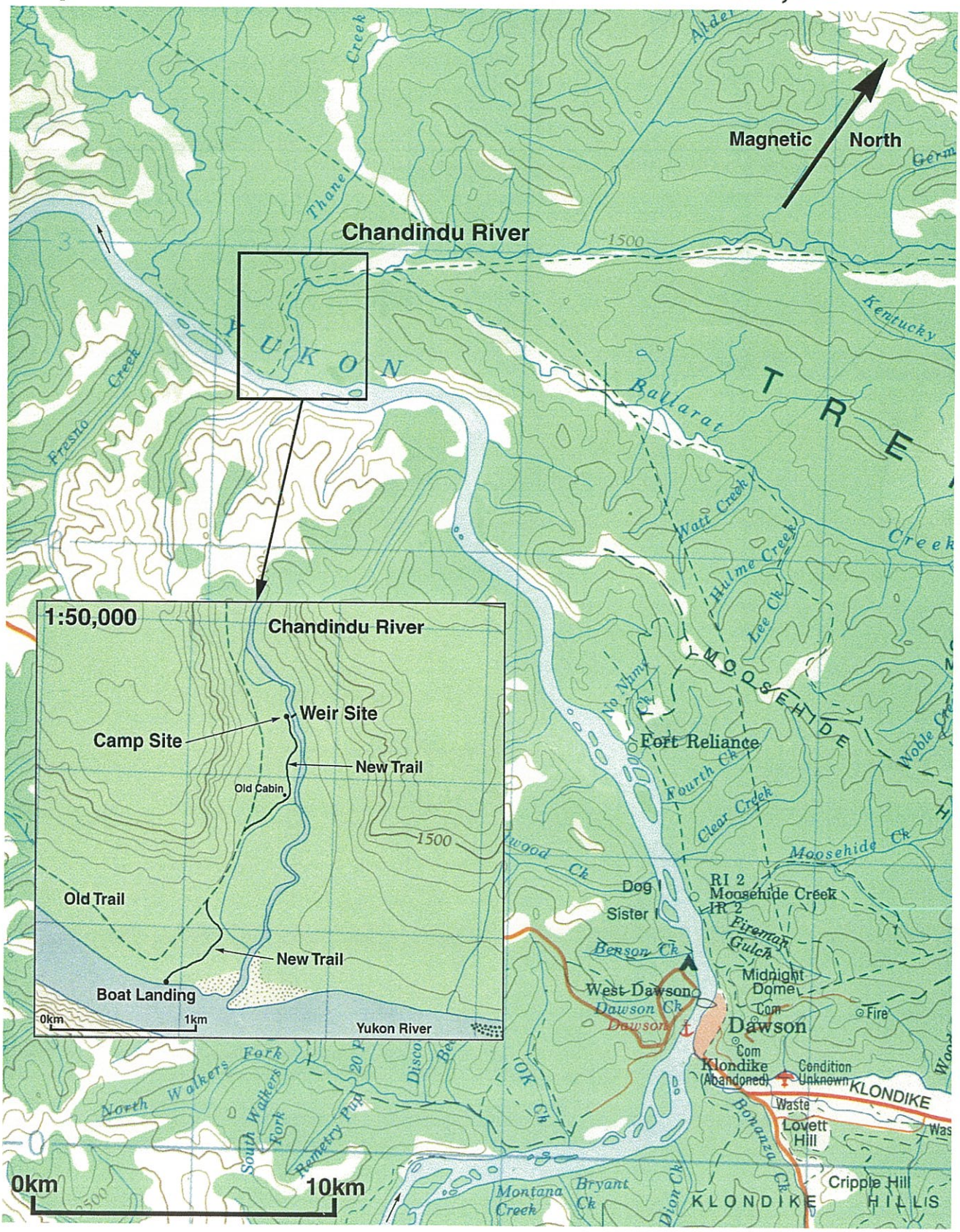
Each project carried out to date is an essential step in developing a complete program to achieve the above objectives. To this end we have carried out the following studies:

- Summary of Streams in the Tr'on dëk Hwech'in Traditional Area, A Search for Candidate Streams to Support a Program Based on a Klondike Area Central Incubation/Outplanting Facility
- Field Studies On Candidate Streams/Stream Surveys, A Component of Project CRE-05-97
- Klondike Area Central Incubation/Outplant Facility Site Evaluation
- Klondike Area Central Incubation/Outplant Facility Feasibility Study Progress Report
- Klondike Area Central Incubation/Outplanting Facility Chandindu River Salmon Enumeration Weir, Brood Stock Feasibility 1998

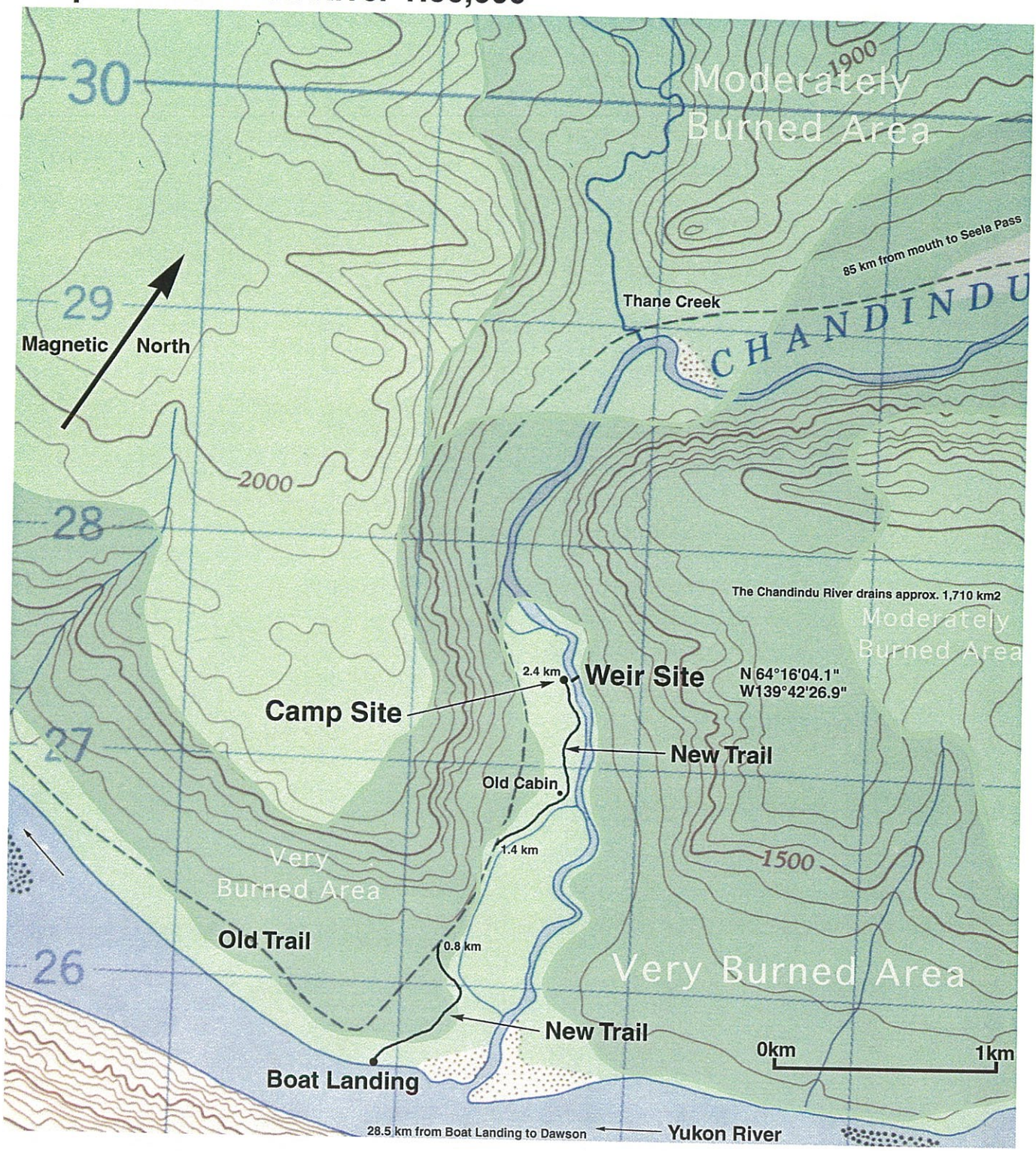
The Chandindu River was identified in the first two studies as being a candidate for restoration. It is only one of the rivers we are looking at to support a facility in order to spread out the costs associated with such a program. In the 1998 Chandindu River Salmon Enumeration Weir project, sufficient broodstock was available to support restoration efforts. However, extremely low numbers of salmon were counted system-wide and numbers from the 1998 Chandindu River Salmon Enumeration Weir were not deemed to be representative of a more typical year's run.

**The primary goal of this study is to look at how many chinook salmon are utilizing the Chandindu River for spawning purposes and to better determine whether enough salmon exist to support a restoration program. A restoration program would be based on artificially incubating eggs collected from Chandindu River salmon and outplanting the resulting increased number of fry back into the river.**

# Map 1. Yukon River Downstream from Dawson 1:250,000



## Map 2. Chandindu River 1:50,000



The Yukon River Commercial Fishing Association and the Tr'on dëk Hwech'in First Nation operated a salmon enumeration weir on the Chandindu River in 1998. Results from this weir, plus information gathered in earlier studies, reinforced the belief that present-day numbers of salmon utilizing the Chandindu River are much lower than historic numbers. The objective of operating a weir on the Chandindu River in 1999 was to once again obtain hard counts to determine whether enough salmon exist to support a restoration program.

The following illustrates how it was concluded that the Chandindu River should be looked at more closely and how a restoration program would work.

Of the 132 Chandindu River chinook salmon that passed through the weir in 1998, seventeen were female.[3] Stock composition in the Upper Yukon River indicates that on average, 39% of the run were female.[4] After applying this ratio to the number of salmon observed at the weir, we could then estimate that 51 females could have been present. The 1998 chinook salmon run was 53% below the recent cycle average (92-97). Factoring in the lower number of salmon in 1998, one could assume that in an average year 97 females could have been present. Using Fisheries and Oceans Habitat and Enhancement Branch protocols where only 30% of females can be taken for brood stock, eggs could have been taken from 29 of these females.[5] If the average fecundity of those fish were upwards of 6000 eggs per female, a conservative estimate given the large size of salmon observed in the Chandindu River, then 174,838 eggs could have been taken and raised to fry.[6] At a survival rate of 80%, typically found in similar facilities to the one proposed, 139,870 fry could have been released back into the Chandindu River.[7] At a 2% survival rate from fry to adult, 2,797 adults could have returned to the Yukon River.[8]

Average exploitation rates have been approximately 70% in recent years. With this rate factored in we could estimate that 839 salmon could have returned to the Chandindu River from the broodstock taken.[9] The remaining female salmon would spawn naturally and would produce fish in addition to this increase. If this were to continue for a full six year cycle the stock on the Chandindu River would be significantly increased and better able to deal with the effects of the mixed stock fisheries.

Comparing traditional knowledge to all the recent information on the Chandindu River suggests that this salmon stock may be depleted from historic levels. If this stock received the increases shown above it could be the "kick-start" needed to allow the stock to grow to more closely reflect its historic levels.

1. Department of Fisheries and Oceans, Biological Science Branch, Pacific Biological Station, Nanaimo. Edited by C. Groot and L. Margolis, UBC Press 1991 *Pacific Salmon Life Histories*

2. Personal communication with Lawrence Vano regarding average survival rates of the Whitehorse Rapids Fish Hatchery.

3. Klondike Area Central Incubation/Outplanting Facility, Chandindu River Salmon Enumeration Weir, Brood Stock Feasibility 1998

4. In consultation with Pat Milligan, F&OC, the female composition was based on the sex ratios found at the Fish Ladder in Whitehorse over the recent cycle average 1992-97

5. Habitat and Enhancement Branch, DFO

6. Average fecundity based on Personal Communication with Lawrence Vano, Manager, Whitehorse Rapids Fish Hatchery.

7. Personal Communication with Pat Milligan regarding the average survival rates from the Whitehorse Rapids Fish Hatchery.

8. Rates based on Personal Communication with Pat Milligan, DFO

9. Statistics based on personal communication with Pat Milligan, DFO

# Introduction

The Chandindu River is both a chinook and a chum salmon spawning stream located in the Tr'on dëk Hwech'in Traditional Territory. The watershed drains approximately 1,710 square kilometres. From its headwaters at Seela Pass to its mouth, it passes through 85 kilometres of rugged Oglivie Mountains to join the Yukon River 28.5 kilometres downstream from Dawson City, Yukon (Map 1) and approximately 100km upriver from the Canada/U.S. Border. The Yukon River Basin is the fifth largest drainage in North America. It flows through the Yukon and Alaska from northern British Columbia to the Bering Sea.

The Tombstone River, Little Twelve Mile River, Ballarat Creek and Thane Creek are all tributaries of the Chandindu River. The traditional name used by First Nations to identify the Chandindu is "TThë dëk", meaning obsidian tools, due to the historical uses of the geological formations in the area. Similarly, the traditional name that identified Thane Creek, was based on the dog salmon (chum) that migrated to the creek every year. Contemporary local people, and many historic references, refer to the Chandindu River as the "Twelve Mile [River]".

Under the recently signed Tr'on dëk Hwech'in Land Claims Agreement, that First Nation now holds a large area at the mouth of the Chandindu River. This area is Type A Settlement Lands where the First Nation hold both surface and sub-surface rights (Tr'on dëk Hwech'in Land Claim Agreement, section 5.4.0, Blocks R-1A/R3A, March 1998). In addition to the Settlement Lands, under the Land Claim Agreement, a territorial park will be established that will encompass much of the headwaters of the Chandindu River (see Appendix for map). As a result of these agreements and of other regulatory mechanisms such as the Yukon Placer Authorization (Gov. Of Canada, 1993), the Chandindu River enjoys a high standard of habitat protection.

There have been both subsistence fisheries and commercial fishing operations at the mouth of this river for many years (Cox et al., 1997). Percy Henry, a Tr'on dëk Hwech'in elder, remembers a big camp at the mouth of the Chandindu called "Twelvemile". He said a "lot of people" lived there year round and there were "thousands of fish".[1] Elder Rowena Flynn, talks about the presence of "good big fish" there in July. She recounts a method

of fishing without a boat where two strings were tied across the stream with one tied to the net. When one string was pulled, the net would go across the river and when the net was full, the other string brought the net back into shore.[2] Mabel Henry's grandmother lived at the Twelvemile with a few others, eating "fish, meat, berries and just some dried fish".[3] Martha Taylors' husband and brother built what might be the first fishwheel on this section of the river at the Twelvemile. Before that, her mother used a big dipper made of willow. She used to catch "lots of fish". Chlora Mason remembers getting 200-300 fish a day in the fish wheel.[4]

Percy DeWolfe and his partner set up by the Chandindu River in 1898 and sold their catch to the Dawson City market.[5] In 1959 Jack Flynn operated a fish wheel on the opposite side of the Yukon from the mouth of the Chandindu. He sold to the Northern Commercial Company who, in turn, sold to the North West Mounted Police. The Old Crow Division wanted two tonnes that year and Flynn was talking about putting in another wheel.[6]

Members of the Takkudh Gwitchin travelled down the Chandindu from the Black City area every year in June or July. In 1922 and 1923, Annie Henry remembers seeing king salmon about 40-50 miles up from the mouth.[7]

In 1909, there were dams on the headwaters of the Little Twelvemile and the Tombstone rivers.[8] The Little Twelvemile dam may have stopped fish from ascending the river. The dam has since been removed.[9] The Little Twelve mile dam was reportedly ten feet high but contemporary photos dispute this.

Willy deWolfe reported chum salmon spawning in the Chandindu River.[10] A study in 1977 documented salmon spawning.[11] A number of studies were carried out in 1985. Low numbers of spawning chinook were seen during an aerial survey. Again that year, spawning at the mouth was reported by Steve Kormendy and a redd was confirmed just below Ballarat Creek.[12] A beach seining project in the same year found chinook fry in the mouth of the river.[13] In 1996, Al von Finster from DFO reported on a mud slide at the head of the Twelvemile and concluded that it would probably degrade the habitat for the chinook but would enhance the area for chum.[14]

Dawson City Museum, TD 474

Twelve Mile Landing 1906

**Photo 1**

Above: Chandindu River Salmon Enumeration Weir 1999 (photo by Jody Cox)

In a more recent conversation with Steve Kormendy Sr., a local long-time trapper and fisherman, who has spent much time in the area, he recounted seeing "many king salmon pooling up below the falls on the Little Twelve Mile River". He said that the salmon would try to ascend the falls and in the process "beat themselves to death". He also remembered talking with members of the Royal Canadian Mounted Police who had, at the time (possibly in the 1950's or 60's), recently travelled to the area, and seen "the river red with the backs of salmon" just below the mouth of the Little Twelve Mile River on the Chandindu.[15]

During 1997, a stream survey was conducted as part of a Yukon Panel Restoration and Enhancement Fund project (CRE-05). On July 27, twenty-one chinook were observed as high up as the Tombstone River.[16] During 1998, which was a particularly poor year for salmon runs in the Yukon, a weir project (RE-11-98) was carried out and 132 chinook and 35 chum salmon were counted migrating through the weir.[17] In the course of this study a total of 239 chinook and 92 chum salmon were observed migrating through the weir on the Chandindu River. Run sizes in 1999 were also considered to be poor, therefore, it is quite possible that run sizes in more typical years are larger.

Traditional knowledge, reports, and sightings of salmon have offered differing results but on the whole suggest a reliable, but depleted, population of chinook salmon on the Chandindu River.

1. "Salmon Resources, Chandindu/Twelvemile River" June 14, 1992 Memo to file from Al von Finster, FISS Support Files, DFO.
Percy Henry, Interviewed by Marilyn Jensen, July 31, 1997.

2. Rowena Flynn, Interviewed by Ingrid Johnson, July 31, 1997.

3. *Moosehide (Edha Dadhechan Ket'et): An Oral History*, pp.10-11, 23.

4. Shirley Henderson (Flynn), "Twelve Miles Oral History" (Whitehorse: Aboriginal Languages Services, 1992).

5. *Dawson Weekly News.* Obituaries of Percy de Wolfe. February 22, 1951 and March 1st, 1951.

6. W.K. Elliot, Whitehorse Fishery Officer. Correspondence to the Area Director of Fisheries, Vancouver, B.C. July 27, 1959. RG 23 Box 35 f.716-22-1 Part 4.

7. Annie Henry, interviewed by Marilyn Jensen and Percy Henry, July 31, 1997.

8. H.J. McKay, Inspector of Fisheries. Correspondence, 1909. RG 23, vol. 280., File 3384, Part 1.

9. Personal communication with Greg Skuce, October 30, 1997.

10. M.S. Elson and L.W. Steigenberger. *Measurements of chinook salmon collected in the Yukon River commercial fishery near Dawson City in 1975 and 1976.* (Northern Natural Resources Services Ltd. Feb. 1977), p.14.

11. Elson and Steigenberger: DFO files, 1977 in P.A. Milligan, W.O. Rublee, D.D.Cornett and R.A.C. Johnson. "The Distribution and Abundance of Chinook Salmon (Oncorhynchus tshawytscha) in the Upper Yukon River Basin as Determined by a Radio-Tagging and Spaghetti Tagging Program: 1982-1983", Department of Fisheries and Oceans, Canadian Technical Report of Fisheries and Aquatic Sciences. No. 1352, (1985), p.78

12. "Chandindu River", August 22, 1985, Memo to Tim Young from Al von Finster, DFO.

13. "Beach Seining at Mouth of Chandindu River", July 2, 1985. FISS Support Files, DFO.

14. "Landslide: Little Twelve Mile River", April 3, 1996. Memo from Al von Finster, FISS Support Files, DFO.

15. Personal communication with J. Duncan in the summer of 1998.

16. Duncan, Jake November 12, 1997 *Field Studies On Candidate Streams/Stream Surveys. A Component of Project CRE-05-97*

17. Klondike Area Central Incubation/Outplanting Facility, Chandindu River Salmon Enumeration Weir, Brood Stock Feasibility 1998

## Photo 2

Above: Filling 400 Sandbags for the weir

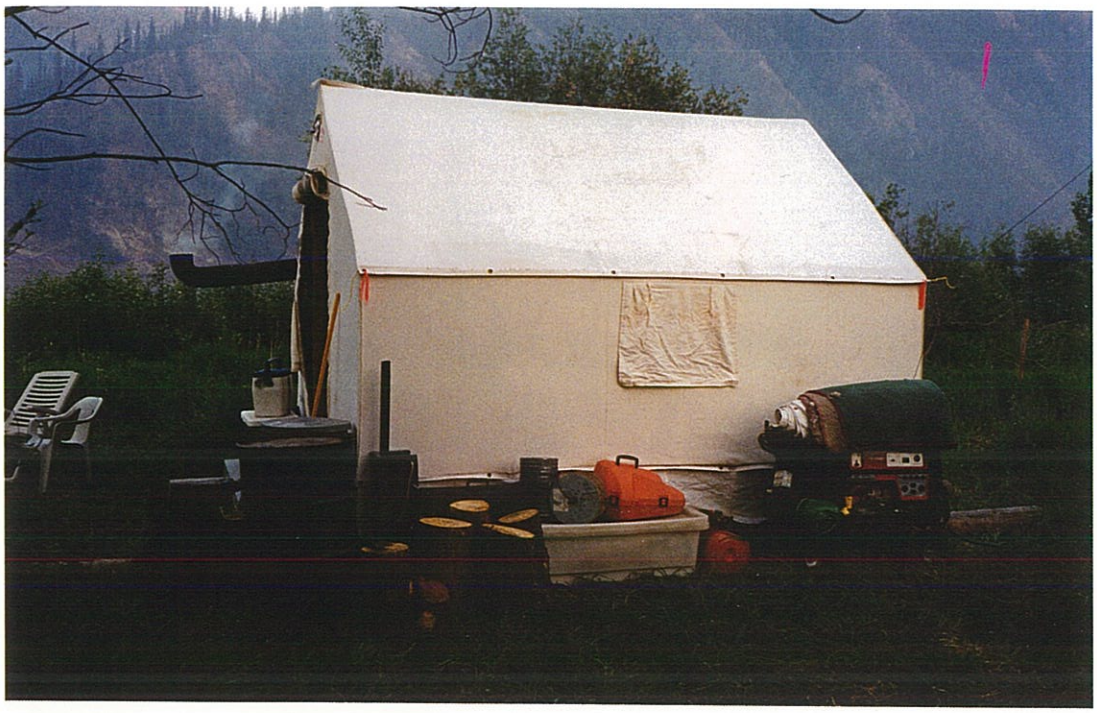
## Photo 3

Above: The crew takes a break after getting the sandbags on site

## Photo 4

Above: Temporary camp set up at landing during forest fires

## Photo 5



Above: Temporary camp

## 1. Preliminary Work

Water use fees were paid and reports from 1998 were handed in to the Yukon Territory Water Board as per the project's permit requirements.

On June 8th weir positions were posted at the offices of the Tr'on dëk Hwech'in First Nation. Consultations with the employment department of the First Nation commenced and a list of candidate workers was compiled. Weir attendant jobs were posted locally for 5 days and 17 people responded. Interviews were held on the evenings of June 17th and 18th and 14 of the 17 people were interviewed. One position was filled by a returning worker and one full-time and one part-time position were also filled. A 12 days on and 4 days off shift was arranged to adequately employ the part-time person. It was also decided that, due to the interest level of the returning worker (Jay Farr), he be trained for the Project Coordinator position in preparation for future positions.

Project details were reviewed with the returning worker on the 6th of June and again on the 10th. During this time material lists, food lists, and supplies for the weir were worked out. Maintenance was then preformed on the many items of equipment between June 11th and June 15th. Data sheets were developed and sampling gear was assembled. All gear was then packed for freighting to the weir site.

Initial trips to the Chandindu River on the 16th of June were made difficult by poor visibility due to extreme smoke in the area from forest fires (photo 7). Concerns were raised at this time; particularly that the area of the Chandindu River valley near the weir might be threatened by Dawson District Forest Fire #11. Consultation with DIAND commenced and contingency plans were made. It was decided that a temporary camp should be erected at the Chandindu River landing and that camp materials, supplies and all fuel be stored there in the event that the forest fire became more of a threat.

A presentation to the Tombstone Steering Committee was done by project personnel on June 19th. This presentation addressed the Steering Committee's mandate to determine the final park boundaries of the Tombstone Territorial Park. The presentation informed the Steering Committee on salmon resources in the Chandindu River watershed and the development of the proponents salmon restoration plan for the area. This presentation, described in more detail in "Conclusions" of this report, had great effect on the Steering Committee's decision regarding park boundaries (see Appendix for map).

## 2. Project Permitting and Authorization

Collection Permits were applied for at Fisheries and Oceans Canada in June and authorization to sample salmon from the Chandindu River was granted on June 30th under License No. CL99-42 (see Appendix).

As per Yukon Territory Water Board Type B Water Use License MS98-100, reports from 1998 weir operations were submitted to them and Water Use Fees paid. The Water Use License is a five year license and was granted on August 30th, 1998. Reports from the project are due on or before the anniversary date until August 30th, 2003.

## 3. Weir Construction and Freighting of Materials

The weir was cached on site over the 1998-99 winter, so intense freighting was not necessary. Needed repairs to the weir's Live Box were made prior to its installation and additional weir materials brought to the site. Spare conduit fencing, tripods, and stringers were freighted and cached at the weir site in anticipation of future repairs. Sandbags and new stucco wire fencing were purchased and freighted in. Wall tent frames and camping supplies were freighted to the site also, along with the weir attendants' personal gear.

## Photo 6

Above: Boats at landing readied for camp evacuation

## Photo 7

Above: Poor visibility on Yukon River during forest fires

## Photo 8

Above: Forest fires flaring up at the mouth of the Chandindu River

## Photo 9

Above: Forest fire hot-spots across the river from the weir camp site

## 4. Upgrades to Trails

Upgrades to the ATV trails were not necessary to freight initial materials and supplies to the weir site. However, after the large forest fire in the area and the camp's evacuation, much work was needed to clear the trail from trees and debris (see section 5, below). After the fire, 3 ATV bridges were rebuilt and approximately 1.5km of trail was re-cut.

## 5. Camp Set-Up and Weir Installation

Initially, the wall tent camp was erected, 400 sandbags were filled and moved on site, and the weir was installed from June 25th to June 30th (photos 2&3). The original start-up goal for weir operations was July 1st. This date had to be reconsidered after forest fires in the area, particularly Dawson District Fire No.11 (DA-011), flared up and became unmanageable.

The Dawson Region was plagued with many, extremely large and uncontrollable forest fires in the summer of 1999. Necessary resources to manage the numerous fires were slow for DIAND to procure and fires threatening the townsite of Dawson received the highest priority. Due to these priorities, DA-011 was left to burn in an uncontrolled state. Consultations with DIAND personnel were carried out during this time in order to best ensure the crew's safety and to protect the project's equipment, both of which were located in the likely path of the fire.

It was decided on June 30th that the camp should be removed from the weir site and placed at the mouth of the Chandindu River due to the fire activity and extremely poor weather conditions which were aggravating the situation. A temporary camp was then set-up at the landing and trips to the weir were made twice daily to remove the extensive debris that was accumulating on it. Weir materials were stored underwater to protect them from fire damage. Large freighting boats were parked at the landing and readied for a quick evacuation (photo 6).

In the early morning hours of July 1st, Fire DA-011 grew dramatically (photos 8-13&23), burned the entire left bank of the lower Chandindu River and crossed over to the right bank approximately 1km above the weir site. The fire continued burning toward the mouth of the Chandindu River until it made its way to the Yukon River valley. By the end of the day the fire had burned all the way to the Fifteenmile River (Map 2).

In the morning of July 1st, the temporary camp was evacuated. All camp materials were put into the awaiting freighter boats and cached on the far side of the Yukon River. Project personnel were transported back to Dawson and plans to check on equipment were made.

By July 7th, Fire DA-011 had grown from 775 hectares to 12,000 hectares. At this time, the entire camp had been removed, but the weir remained in the river (photos 19-22). Trips from Dawson to the weir were made daily to clear accumulating debris. The cached equipment was checked on these trip as well. Smoke in the area was so thick at times that these daily trips were dangerous and sometimes impossible (photo 7).

From July 12th to the 17th the weir crew was outfitted by Forestry and busy firefighting in the area. A sprinkler line was laid out to protect the camp area. Spot fires were extinguished along the ATV trail and ATV bridges were replaced (photos 14-18). By the 17th of July the fire was under control. During this time the weir was repaired, and once again "fish-proofed". Counting began on July 16th at 10AM and the first salmon was recorded on the 17th at 5PM.[1]

Camp materials were again freighted to the weir site. The wall tents were once again erected and the electric bear fence was set-up. By July 18th the camp was completely set-up and operational.

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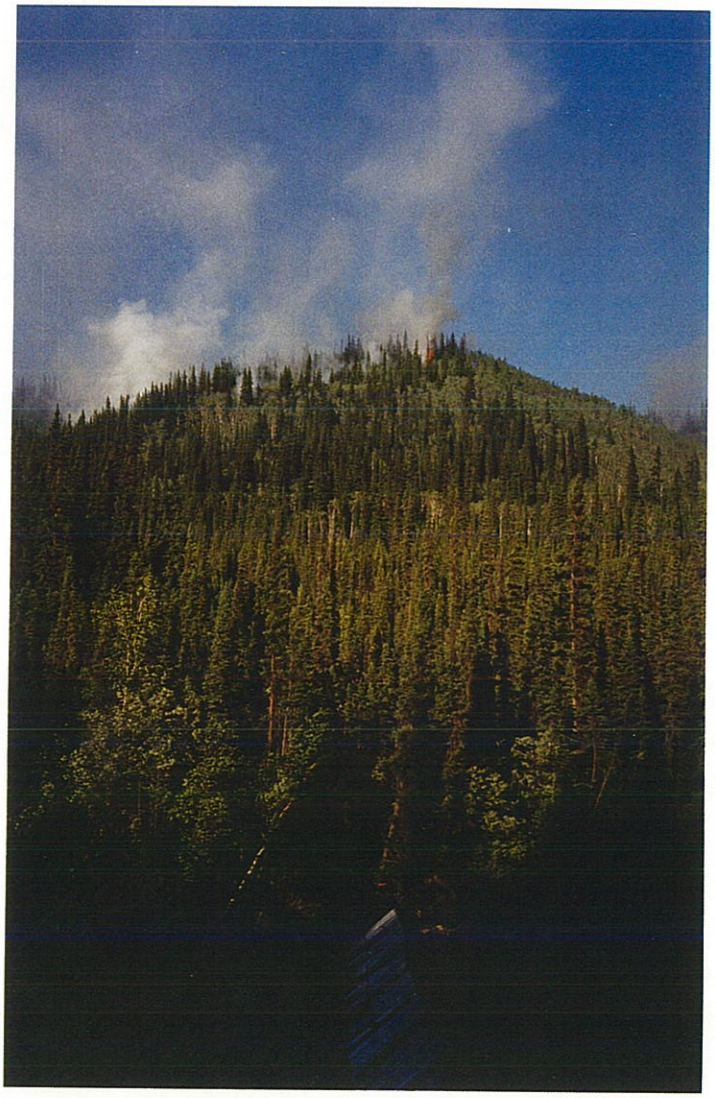
[1] Please See Appendix - August 13th, 1999 - F&Oc Memorandum, Subject: "Observations: Overflight Of Chandindu River, July 30th, 1999", by Al von Finster

**Photo 10**



Above: Forest fires picking up in high winds
(weir in forground)

## Photo 11

Above: Fires at the mouth of the Chandindu River

## Photo 12

Above: Crowning forest fire at the mouth of the Chandindu River

**Photo 13**

Above: Fire flaring up on hill by the weir site