SMALL STREAM INVESTIGATIONS REGARDING RESTORATION AND ENHANCEMENT OF CHINOOK SALMON HABITAT ON SELECT TRIBUTARIES OF THE TAKHINI RIVER

PREPARED FOR
THE YUKON RIVER PANEL:
THE YUKON RIVER SALMON RESTORATION & ENHANCEMENT FUND

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SUMMARY

The Yukon River Salmon Restoration and Enhancement Fund was established as part of the U.S./Canada Interim Yukon River Salmon Agreement in 1995. Funds are made available for programs that are directly associated with Yukon River research and management activities in the U.S. and Canada for restoration and enhancement of Canadian origin salmon stocks. Blue River Consulting received funding from the Yukon River Salmon Restoration and Enhancement Fund, administered by the Yukon River Panel, to conduct small stream investigations and gather information on chinook salmon (*Oncorhynchus tshawytscha*) habitat that would aid fisheries resource managers in developing a restoration/enhancement study plan for select tributaries of the Takhini River. Small stream investigations were completed on nine tributaries of the Takhini River: Ibex River, Arkell Creek, AA (Easy Love) Creek, Mendenhall River, Stony Creek, Thirtyseven Mile Creek, Little River, Flat Creek and BB (Lucky Love) Creek in Aug.-Sept. 1997, and March 1998. The following study objectives were:

- To review the existing data base with information relevant to chinook salmon spawning and rearing habitats in the smaller streams of the Takhini River.
- To conduct field investigations providing up-to-date descriptions of chinook salmon habitat quality, quantity, upstream access by adults and juveniles, and to document human and other disturbances to these streams.
- To report the findings to the Yukon River panel identifying restoration and/or enhancement possibilities as well as recommendations with respect to human and other impacts.

As related to these objectives, an information review and consultations were carried out for each stream. Information was gathered on land and water use, mining activity, agricultural activity, forestry and fisheries information. Fieldwork was conducted from August to September 1997 and March 1998. The field program included stream surveys, adult chinook spawning surveys, juvenile chinook (jcs) sampling, an assessment of spawning and rearing habitats, and recording human impacts and other disturbances that may have an impact on salmonid bearing streams. Some of the information described in the Ibex River section regarding forest fire, beavers, predation and human disturbances may be applied to the other streams.

IBEX RIVER

Four adult chinook were observed in the Ibex River. Extent of spawning activity appears to have occurred within the 7 km from the mouth of the stream. Log jams and beaver dams upstream may pose a barrier to migration. Suitable spawning habitat may be available upstream in reaches #3 and #4. The results of the juvenile chinook trapping program suggest that extensive beaver activity (approx. 18km upstream from the mouth) in reach #3 has excluded jcs from utilizing habitat upstream, where there appears to be extensive favorable rearing habitat available.

Based on First Nations information and compared to survey results in 1980-81, and 1997 it appears that fewer adult chinook salmon are utilizing the Ibex River than have in the past. The small number of returning spawners observed over recent years suggests that the Ibex chinook salmon stock may be vulnerable to human and natural disturbances. A combination of factors may have contributed to the decline of the Ibex stock. First Nations are not utilizing beaver resources on their traditional lands as was practiced in the past. Beaver pelt prices have dropped to the point where it is uneconomical to engage in trapping and no government-sponsored program exists to encourage harvesting of beavers. The forest fire of 1958 burned much of the old spruce forest that once dominated the area and succession deciduous growth has produced favorable beaver habitat in riparian areas. Fire killed trees have entered the stream system and created logjams. A wolf control program in the 1980's may have further reduced the number of predators on beavers. Human activity in the valley may have further disturbed the number of wild predators out of the valley. Finally, loss of flow from Jackson Creek may have had an effect on stream hydrology and a positive effect on beaver habitat though to what degree remains uncertain. Chinook salmon may be threatened in the Ibex River. Recommendations include:

- limiting the commercial harvest of adult chinook salmon in order to allow a greater return of spawners.
- Once the number of returning spawners has increased fisheries managers may want to consider artificial incubation of brood stock in a hatchery such as the one established at McIntyre Creek and release fry back into the Ibex River.

- removal of log jams in reach #2.
- maintaining moderate beaver populations as opposed to eradication or allowing populations to increase unchecked.
- an incentive program for trappers and First Nations to trap beavers in affected areas if this is agreement with YTG beaver management guidelines.
- in conjunction with an incentive program, setting of a minimum beaver catch quota for owners of trapline concessions in the Ibex valley.
- opening up of beaver dams following DFO/YTG beaver management guidelines.

ARKELL CREEK

Little evidence of spawning activity was observed on Arkell with the exception of a possible redd located approximately 2.25 km upstream. Jcs were captured in reaches #1, #2 and #3. In reach #4 no jcs were caught though 10 jcs were observed immediately below the terminus of a cascade/waterfall. There is limited low impact land use in the valley. The number of adult spawners observed during the Foothills pipeline surveys appears to be low and compared to results in this survey evidence suggests that Arkell Creek may be under utilized by adult chinook salmon. Historically, First Nations carried on subsistence fishing on the Ibex River. Returning salmon probably utilized Arkell Creek to some degree. No barriers or obstructions to migration were observed in the lower reaches.

Chinook salmon may be threatened in Arkell Creek. As Arkell Creek is a tributary to the Ibex River management considerations for stock enhancement in the Ibex River could also apply to Arkell Creek with the exception of beaver management.

EASY LOVE (AA) CREEK

No jcs were caught in reach #1 below the beaver dams or above. Land use in the Easy Love Creek valley is presently limited to traffic along the trail that parallels the stream for purposes of trapping. An extensive agricultural land application is under review. Beaver activity in reach #1 may be a barrier to juvenile chinook salmon. With respect to beaver management, a number of options could be considered:

- an incentive program for trappers and First Nations to trap beavers in affected areas if this is agreement with YTG beaver management guidelines.
- in conjunction with an incentive program, a minimum beaver catch quota could be set for the owner of the trapline concession in the Easy Love Creek valley.
- opening up of beaver dams following DFO/YTG beaver management guidelines.

YTG Agricultural Branch may need to re-evaluate their policy in regard to agricultural lands that are under an agreement for sale and require land clearing. Land clearing practices in and around streams, particularly small streams may encourage successional deciduous growth near the margins of clearings and further encourage beaver activity. Consideration of a set back from the edge of the riparian zone may be necessary instead of the high water mark so that the riparian habitat is conserved.

MENDENHALL RIVER

There is no literature, traditional knowledge or other evidence to suggest that the Mendenhall River supported spawning chinook salmon. One jcs was caught approx. 18 km from the mouth. No obstructions or barriers were observed along the area of stream surveyed though beaver activity was observed. Site preference based on catch per unit effort (CPUE) suggests that the rearing capacity of the stream for jcs is questionable. Turbidity may be a limiting factor. Overall stream health based on benthic invertebrates is slightly less than acceptable. Clearing for agricultural activity was observed on the east side of the valley, upstream of the Alaska Highway crossing.

Recommend YTG Agricultural Branch re-evaluate their policy and consider of a set back from the edge of the riparian zone instead of the high water mark so that the riparian habitat is conserved and beaver activity is not encouraged.

STONY CREEK

No evidence of adult salmon or spawning activity was observed at the mouth. Jcs were captured in reaches #1 and #2. Previous studies indicate that jcs also utilize reach #3. No jcs were captured in reach #3 despite intensive efforts. At a number of locations just upstream was evidence that a heavy piece of equipment had walked into the stream and had moved material into the stream. Land and water use associated with mining and agriculture may have had a cumulative impact though this is inconclusive. The results of the trapping program suggest that the boulder cascades in reaches #2 and #3 may be an obstruction to juvenile upstream migration, particularly during summer low flows. The remaining concrete foundation of an old highway maintenance camp located just north of the highway is being undercut by stream action and appears to be eroding into the stream. Recommendations include:

- removal of the concrete foundation located adjacent to the stream above the highway.
- close monitoring of mining activities adjacent to the stream to ensure compliance with existing regulations.
- re-evaluated water use/withdrawl on Stony Creek. Consideration of suspending the issuance of new licenses pending further evaluation as water withdrawl may have an impact on rearing jcs. Also, Stony Creek should be re-investigated to determine whether land use, water use, or both have had a conclusive impact, as water levels during the 1997 survey may have been low.
- YTG Agricultural Branch re-evaluate their policy and consider of a set back from the edge of the riparian zone instead of the high water mark so that the riparian habitat is conserved and beaver activity is not encouraged.

THIRTYSEVEN MILE CREEK

There is no literature, traditional knowledge or other evidence to suggest that Thirtyseven Mile Creek supported spawning chinook salmon. Jcs were captured in reaches #1 and #2. No jcs were captured in reach #3. The results of the trapping program suggest that the beaver dams in reach #1 may pose an obstruction as fewer jcs reached the old highway crossing. The logjam immediately downstream of the highway crossing appears to be a barrier to jcs upstream migration. Reach #3 appears to be good rearing habitat based on the Site Assessment Rating. Beaver activity further upstream in reach #3 may pose a barrier to jcs upstream migration. A corral near the mouth does not prevent livestock from entering the stream. Below the old highway was a logjam comprised of debris that appeared to be materials that were once used to construct a bridge. The present bridge is roughly constructed and may washout during a spring freshet. Recommendations include:

- removal of the debris logjam downstream of the old highway crossing which appears to be a barrier to jcs migration. The bridgehead reserve belongs to YTG. Construction of a bridge capable of withstanding high-water events should be considered.
- an incentive program for trappers and First Nations to trap beavers in affected areas if this is agreement with YTG beaver management guidelines.
- in conjunction with an incentive program, a minimum beaver catch quota could be set for the owner of the trapline concession.
- opening up of beaver dams following DFO/YTG beaver management guidelines.
- YTG Agricultural Branch re-evaluate their policy and consider of a set back from the edge of the riparian zone instead of the high water mark so that the riparian habitat is conserved and beaver activity is not encouraged.

LITTLE RIVER

Though there is some literature and traditional knowledge that suggests the Little River supported spawning chinook salmon, the information is inconclusive and the physical evidence would suggest otherwise. Jcs were captured throughout the area surveyed and in significant numbers below the old highway crossing. Substrate appears to be a limiting factor to jcs rearing habitat. Recommendations include:

- adding more cobble, boulder and large woody debris cover into the stream. There is an abundance of fire killed coarse woody material available in the surrounding forest and sections of the stream are accessible by road.

- Construction of a bridge capable of withstanding high-water events should be considered. The bridgehead reserve belongs to YTG.
- YTG Agricultural Branch re-evaluate their policy and consider of a set back from the edge of the riparian zone instead of the high water mark so that the riparian habitat is conserved and beaver activity is not encouraged.

FLAT CREEK

From approximately 75 m upstream to a beaver dam located 400 m upstream, 18 carcasses were enumerated and 6 redds. Spawning was estimated to have taken place between the weir site (200 m upstream) and the beaver dam - an overall distance of 200 m. Jcs were caught in reaches #1, #2 and #3. In reach #3 no jcs were caught above the waterfall/canyon. The results of the trapping program suggest that the waterfall\canyon in reach #3 is a barrier. Jcs utilizing still waters behind beaver dams were only observed on Flat Creek. A fry release program confounds any attempts at determining whether obstructions or barriers exist. Mining and agricultural activity take place within the area. Recommendations include:

- tagging or clipping the adipose of all hatchery-raised fry so that wild stocks can be distinguished from hatchery stock. Alternatively, these fry could be released into the mainstem Takhini River without fins clipped.
- close monitoring of mining activities adjacent to the stream to ensure compliance with existing regulations.

Beaver activity in reach #1 may be an obstruction to jcs migration. Area of spawning activity is limited and fully utilized. The number of returning spawners may increase based on the increase in the number of fry released. The quality of spawning habitat is questionable. If emergence is successful then beaver dams should be removed to accommodate a possible greater number of returning spawners, and beaver activity monitored. With respect to beaver management, a number of options could be considered:

- an incentive program for trappers and First Nations to trap beavers in affected areas if this is agreement with YTG beaver management guidelines.
- in conjunction with an incentive program, a minimum beaver catch quota could be set for the owner of the trapline concession in the Flat Creek valley.
- opening up of beaver dams following DFO/YTG beaver management guidelines.
- YTG Agricultural Branch re-evaluate their policy and consider of a set back from the edge of the riparian zone instead of the high water mark so that the riparian habitat is conserved and beaver activity is not encouraged.

LUCKY LOVE (BB) CREEK

The results of the trapping program suggests that beaver activity approximately 500 m upstream from the mouth is a barrier to jcs upstream migration into reach #2 where there appears to be favorable rearing habitat available, as suggested by the Site Assessment Rating. Agricultural activity in the form of extensive land clearing, in some areas to the edge of the stream valley, was observed in the area.

Beaver activity in Lucky Love Creek may have had a positive impact on the quality of habitat for jcs. Within the areas between impoundments numerous jcs and grayling were observed utilizing deep pools. Water was found flowing in the stream below the beaver dams during the period of the winter survey. No restoration or enhancement activities are recommended for Lucky Love Creek.

ACKNOWLEDGEMENTS

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1 INTRODUCTION

Blue River Consulting was contracted by the Yukon River Panel to conduct small stream investigations and gather information on chinook salmon (*Oncorhynchus tshawytscha)* habitat that would aid fisheries resource managers in developing a restoration/enhancement study plan for select tributaries of the Takhini River.

1.1 STUDY OBJECTIVES

The following study objectives were detailed in the original proposal submitted to the Yukon River Panel in October 1996:

- To review the existing data base with information relevant to chinook salmon spawning and rearing habitats in the smaller streams of the Takhini River.
- To conduct field investigations providing up-to-date descriptions of chinook salmon habitat quality, quantity, upstream access by adults and juveniles, and to document human and other disturbances to these streams.
- To report the findings to the Yukon River panel identifying restoration and/or enhancement possibilities as well as recommendations with respect to human and other impacts.

SECTION 2

STUDY AREA

2 STUDY AREA

2.1 DESCRIPTION OF DRAINAGE BASIN

Studies were conducted on nine tributaries of the Takhini River north of Kusawa Lake. The Takhini River below Kusawa Lake flows northeast for 115km to its confluence with the Yukon River approximately 5km north of the Whitehorse city boundary. The Takhini River drains an area of 6990 km^2 with a mean annual discharge of $61.4m^3/s$. Mean annual precipitation for the area is 261.2 mm. August is the wettest month of the year with an average accumulation of 37.9 mm. (Yukon Weather Center). Most of the river valley is below the 800m elevation contour interval. The flanking mountains, from which the study tributaries originate, attain a maximum average height of approximately 2000 m.

The Takhini River meanders through a broad valley that was once the lakebed of glacial Lake Champagne. The river is actively eroding the glaciolacustrine deposition resulting in steep clay banks which is characteristic along much of the Takhini River's length. Tributaries exhibit similar clay bank characteristics in reaches that traverse the valley floor. Erosion patterns of the Takhini River and its tributaries have created wide terraces in the valley that have attracted agricultural development. Pockets of discontinuous permafrost occur through out the basin.

The entire basin lies within the boreal forest. However, vegetative cover may vary dramatically depending on elevation, aspect, slope and soil characteristics. In general, ground cover expresses itself in alpine tundra communities above tree line, fir/spruce/pine stands at mid elevations, aspen/pine/spruce forest in well drained low lands and black spruce/sedge/grass/shrub communities in saturated valley bottoms. Steep slopes at lower elevations with south or west aspects usually support sage/grass cover. Balsam poplar, willow and alder are generally found in association with watercourses. Beaver (*Castor canadensis*) activity plays a large and active role in shaping both vegetative and stream characteristics within the Takhini River basin.

The Takhini River is a major chinook spawning river. The majority of spawning takes place between the outlet of Kusawa Lake and Mendenhall River in late August and early September.

Much of the mainstem valley has seen an increase in human related development such as residential, agricultural and mining activities. Tributaries studied lie within the traditional lands claimed by the Kwanlin Dun, Ta'an Kwatch'an and Champagne Aishihik First Nations. Tributaries included in the study were: Ibex River, Arkell Creek, Mendenhall River, Little River, Thirtyseven Mile Creek, Stony Creek, Flat Creek, and unnamed tributaries identified as 'AA' and 'BB' by Hunka & Shuler in their 1988 report. In this report streams 'AA' and 'BB' are referred to as Easy Love Creek and Lucky Love Creek respectively. (Figure 1)

Table 1. Stream Location & FISS Code

NAME	MAP #	LATITUDE	LONGITUDE	WATERSHED CODE
Ibex River	105D/13	60^0 50'	135^0 48'	883
Arkell Creek	105D/13	60^0 48'	135^0 43'	883 1141
Little River	105D/13	60^0 54'	135^0 41'	880 1946
Flat Creek	105D/13	60^0 52'	135^0 31'	880 1275
Stony Creek	105D/13	60^0 47'	135^0 58'	880 3599
Thirtyseven Mile Creek	105D/13	60^0 52'	135^0 45'	880 2292
Mendenhall River	115A/16	60^0 45'	136^0 02'	880 3891
Easy Love (AA) Creek	105D/13	60^0 48'	135^0 53'	880 3059
Lucky Love (BB) Creek	105D/11	60^0 50'	135^0 20'	880 1297

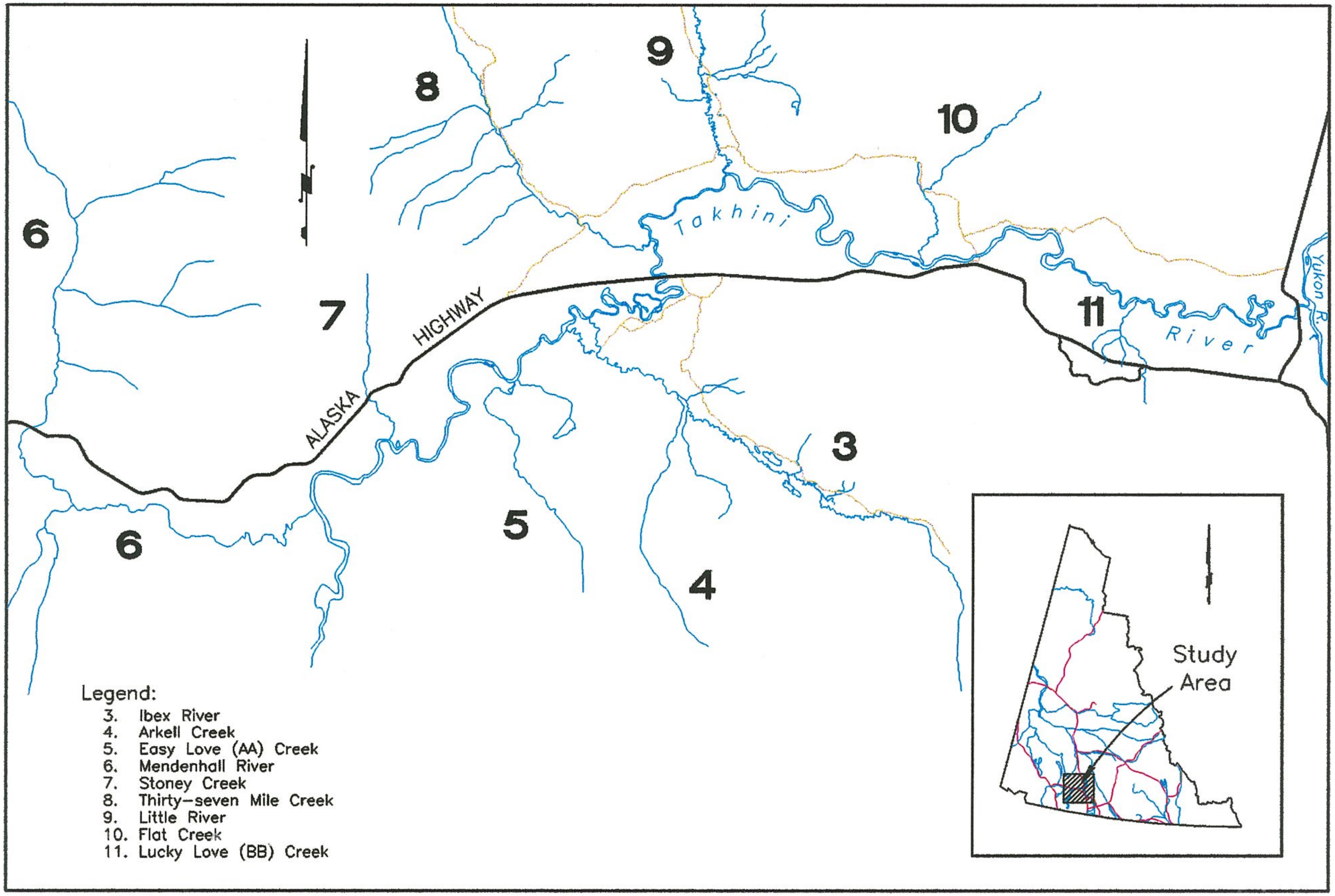


FIGURE 1 : STUDY AREA

5 0 5 10 15 Km

SCALE 1:250,000

SECTION 3

STUDY METHODS

3 STUDY METHODS

3.1 STREAM SURVEY

Data detailing stream characteristics was collected and recorded on DFO/MOE Stream Survey Forms (Appendix B). Methodologies used to gather data were consistent with the techniques prescribed in the DFO/MOE Stream Survey Field Guide 1989, The Streamkeepers Handbook (Taccogna & Munro eds. 1995), and the Stream Inventory Manual (MOE/DFO 1994 Draft). Stream habitat was assessed and recorded on a site per reach basis. Sites were chosen that best approximated average reach characteristics. Parameter averages are based on the assumption that the reach represents a stream segment of homogeneous habitat within definite boundaries. Site coordinates were determined and mapped using map and compass. Error was minimized by having two persons duplicate estimations. Completed stream survey forms in Appendix B.

3.2 WATER QUALITY

Water quality was measured insitu using a multiparameter probe (Horiba U-10 Water Quality Checker). Parameters included: pH, dissolved oxygen (mg/l), temperature (^{0}C), turbidity (NTU) and conductivity (mS/cm). Sample sites were located up stream of any disturbance to water quality that may have occurred as a result of associated data/sample collection. Quality control was further assured by recalibration of the multiparameter probe prior to field surveys.

3.3 WATER QUANTITY

Discharge was calculated as the product of an average stream velocity and a cross sectional area of stream. Wetted width was measured using a 30m surveyors tape. Depth was calculated by taking measurements at regular intervals across the wetted width with a calibrated wading staff and averaging the results. Velocity was calculated using floating object method with results averaged. Results and comparisons to historic flows are available in Appendix E.

3.4 MAPPING

Maps were obtained from various government offices and information from various studies was compiled onto field maps to assist in field investigations. Observed human related activities within or adjacent to stream courses were recorded, photographed and mapped. Potential obstructions to movements of adult and juvenile Chinook salmon were also recorded, photographed and mapped.

3.5 ADULT SALMON SURVEY

DFO technical staff provided information on salmon run timing so that the survey period would best coincide with adult salmon migrations, and sampling of benthic invertebrates. A late August survey was recommended. Streams were surveyed on foot and by canoe with the number of spawners and/or redds counted.

3.6 JCS MINNOW TRAPPING

Juvenile chinook salmon (jcs) were trapped in a number of locations to determine extent of upstream migration and if there was an existing obstruction and/or barrier to upstream access. Sampling was undertaken using baited Gee type minnow traps. A walnut sized portion of unpreserved Yukon River salmon roe was placed in a perforated sandwich bag. The trap was secured with a twist tie as per DFO protocol. Traps were set in a variety of stream habitats and flagged with florescent tape bearing the appropriate collection permit number. Whenever possible, traps were set for a twenty-four hour period. Captured jcs were anesthetized with "Alka Seltzer" (1-2 tablets per 4 litres), measured for fork length (to nearest mm), weighed using an Acculab Pocket Pro 150-B portable electronic scale (accuracy ±1gm), examined for fin clips and released after a revival period in a bucket of fresh water.

Jcs habitat preference was assessed using the standard method of calculating the catch per unit effort (CPUE= number of jcs/number of traps/number of days). CPUE included only captures in minnow traps at or near survey sites where no obstructions or barriers were observed. A previous study (Hunka & Shuler, 1988) used >10 JCS per trap/day as an indicator of habitat preference but no rationale was put forward.

It was initially proposed that seining be conducted along representative reaches to identify other species of fish utilizing the streams. In discussions with DFO technical staff prior to the field investigations the utility of this information was questioned and it was deemed a more efficient use of time and effort to focus on jcs minnow trapping and obtain jcs weights for comparison of condition factor which was not included in the project proposal. DFO technical staff acknowledged that fish sampling could be limited to minnow trapping.

The Yukon River Panel Joint Technical Review Committee suggested additional fish sampling and water quality work once per month for June, July and August though no additional funds were made available. As a result this component was not proceeded with.

Condition factor (K= weight in grams X 100/[length in centimeters]^{3}) was used to assess the overall condition or general health of jcs captured. A high condition factor is considered more desirable than a low condition factor (Moodie, 1993). K values included only captures of jcs in minnow traps at or near survey sites where no obstructions or barriers were observed.

A summary of trapping information is available in Appendix A.

3.7 BENTHIC SAMPLING

Benthic invertebrates were collected and enumerated following the methods outlined in the Streamkeepers Handbook (Taccogna & Munro eds. 1995) in order to assess water quality, as suggested by DFO technical staff. Sampling was conducted using a Surber sampler (30x30cm, 363micron mesh net). Three samples in varied habitat were collected per reach and combined to form a composite sample. Samples were preserved in a 70% solution of isopropyl alcohol. Benthic samples were sorted, identified using a Zeiss dissecting microscope and standard reference material, and enumerated. Error was minimized through duplication of analysis. Data was entered into Streamkeepers Invertebrate Survey form. The site assessment rating is a score (1, poor- 4, good) based on the average of combined scores with respect to the pollution tolerance index, EPT (Ephemeroptera, Plecoptera and Trichoptera) index, EPT to total ratio, and the predominant taxon ratio. The resulting average score gives a general rating of stream health at the site. Completed data forms are included in Appendix C.

3.8 WINTER SURVEY

Prior to the winter survey DFO technical staff were consulted regarding the measuring of winter stream flows, the collection of water samples and timing. It was suggested that the survey be conducted in late February or early March. The salt dilution technique was put forward as an alternate method of measuring winter flows and no objection was raised by DFO technical staff. Winter surveys of water quantity were limited to known spawning streams or streams areas with spawning potential: Flat Creek, Arkell Creek and Ibex River. Water samples were collected for analysis of dissolved metals from streams that had not previously been sampled, as suggested by DFO technical staff. These included Easy Love (AA) Creek, Lucky Love (BB) Creek, Arkell Creek, and Ibex River. Water sampling has been conducted in the Ibex River though sampling has been limited to an area 24km upstream and not within the spawning area. Water quality was measured insitu using a multiparameter probe (Horiba U-10 Water Quality Checker). Parameters included: pH, dissolved oxygen (mg/l), temperature (^{0}C), and conductivity (mS/cm). Quality control was assured by recalibration of the multiparameter probe prior to the survey.

The salt dilution method involves injecting a slug of sodium chloride (NaCl) into the stream and monitoring the change in conductivity over time as the salt slug passes a point downstream. The formula for calculating discharge is,

Above Left: Water sample collection on Easy Love Creek, Reach #1.
Above Right: Water sample collection on Arkell Creek, Reach #1.

Above and Below: Measuring discharge using salt dilution technique on Ibex River, Reach #1.

$$Q = \frac{1000 M_8 \Gamma_{g,,25}}{t\,\Sigma(L_T - L_o)}$$

where M_8 is the mass of NaCl injected, $\Gamma_{g,,25}$ is the gram-conductivity of NaCl (i.e. the conductivity in uScm^{-1} of 1g of NaCl in 1m^3 of solution at 25^{0}C), t is the sampling interval in seconds, L_T is the recorded conductivity in uScm^{-1} , and L_o is the natural conductivity of the stream. A sufficient quantity of NaCl is required to raise background conductivity by 50%. Distance between sampling point averaged 200m to allow for mixing of salt solution in the stream (Kite, 1994).

3.9 REVIEW OF EXISTING INFORMATION

FIRE

Forest cover in the Takhini valley was extensively modified by a large fire that burned 107,246 ha. in the summer of 1958. Fire 61, locally known as the Takhini Burn, affected eight of the nine tributaries addressed within the study area (Figure 2). The fire was started at the Stony Creek highway maintenance camp and burned in varying intensity as it spread east-northeast. The Mendenhall was spared by the Takhini Burn, however portions of its valley were affected by another fire in the same year. Fire history and map was obtained from the Laberge District Resource Management Officer, DIAND.

BEAVERS

Successional aspen growth resulting from the 1958 Takhini fire has provided an abundant preferred food source for beavers over much of the study area.

Traditional knowledge sources from Yukon First Nations indicate that the beaver once played an important role as a food source. This is no longer the case and the beaver is now rarely hunted for food in the Takhini basin.

Recent declines in demand for beaver pelts have dramatically reduced the harvest of beaver by trappers. Interviews of trappers in the Takhini basin confirm this trend.

A wolf control program that effected the southern half of the study area was conducted in 1983-1985. Wolf populations in the control area were reduced from 161 to 47 animals (Hayes et.al. 1991). "The gray wolf (*Canis lupus*) may be a significant predator of beavers wherever the two species occur" (Novak et.al. 1987). According to Al Baer, YTG., Wildlife Technician, wolf packs tend to establish home ranges and den sites well away from road corridors thus reducing wolf predation on beavers in these areas (pers. comm.). Almost all of the streams in the study area have road corridors which may have had an effect on wolf activity to one degree or another.

Both positive and negative effects have been attributed to beaver activity in fish bearing streams (DFO 1996). The complete relationship between beavers and salmon has yet to be completely studied or understood however, it is likely that chinook salmon are adapted to moderate beaver activity within their spawning and rearing habitats as they have shared these habitats since or prior to the last glaciation.

According to Harvey Jessup, acting Small Game Biologist, YTG., unharvested beaver populations in areas with low natural predation may crash due to disease. He suggested that setting minimum beaver quotas on trap lines might avert this possibility (pers. comm.).

AGRICULTURE

J. Gibson & Associates of Whitehorse conducted a study of the Takhini River watershed in 1993 for the Yukon Agricultural Association to,

"a) Assess the impact of agricultural use of fertilizers, herbicides/pesticides, fuel handling and farm practices on adjacent surface waters under ice-free conditions, b) determine the significance of the impact, if any, on downstream surface water quality, and c) make recommendations for the mitigation of downstream impacts, if any, and outline areas of future concern.

Of the individual streams sampled, those that are of specific interest to this report include Stony Creek, Thirtyseven Mile Creek, Little River, Flat Creek, and the Ibex River. In their report, J. Gibson & Associates followed the 1992 Canadian Water Quality Guidelines (CCREM). Water quality analysis results showed generally lower concentrations for suspended solids; turbidity, color and total phosphate than those measured in mainstem sample stations. Tributary stations showed higher levels of total alkalinity and total hardness. Levels of pH were also slightly higher in the tributary channels than in the mainstem Takhini River. Metal parameters- lead, chromium, copper and molybdenum were detected in tributary channel waters but not in mainstem Takhini River flows. Concentrations of these parameters were low, in most cases, slightly above their detection limits. Concentration ranges for metal parameters in the tributary channels are relatively consistent with those in the mainstem Takhini River. The guidelines for aquatic life were exceeded for parameters aluminum at all stations and iron at mainstem Takhini River stations T-1 (downstream of Mendenhall River), T-2 (downstream of Stony Creek), and T-6 (mouth of Takhini River). The report concluded that there is no impact on surface waters of the Takhini River within the study area from agricultural land uses. Surface waters of the Takhini River exceeded the maximum acceptable concentration for drinking water for parameters iron and total fecal coliforms. Fecal coliforms were present in all mainstem river-sampling stations at decreasing concentrations, and in all tributaries sampled. It was noted that the absence of land use adjacent to many of the tributaries meant that the presence of fecal coliforms could not be attributed to development.

Aquatic life guidelines for parameters aluminum and iron were exceeded. It was stated that the highest concentrations for aluminum occurred at mainstem Takhini River station downstream of Mendenhall River and downstream of Thirtyseven Mile Creek. It was further noted that the highest input values are from Thirtyseven Mile River and Little River, which have little or no land use development within their watersheds. Finally, the report stated that analysis results for herbicides and pesticides at HP-1 (downstream of Little R.) and HP-2 (upstream of Flat Ck.) showed that the herbicide MCPA was not detected in either sample and the multiple scan for water sampled at the mouth of the Takhini River showed non-detectable levels for all parameters analyzed. It appears that the report followed CCREM Drinking Water guidelines (1992) and not guidelines set for Freshwater Aquatic Life which are at a lower detection limit.

AGRICULTURAL POLICY

Once agricultural land applications receive approval an agreement for sale is drawn up with the applicant. Depending on the type of agricultural activity proposed there may be a requirement to clear a portion of the land. If the parcel of land is adjacent to a stream or other body of water a setback of 30 m from the highwater mark is established though, in conversations with YTG Agricultural Branch staff the setback may vary to 15m depending on the type of stream (David Beckman, Edward Lee, pers. comm.). Under some circumstances access to water is necessary for livestock. Provision is made to contain livestock near waterbodies with important wildlife values including fish, and these are assessed on a site-specific basis.

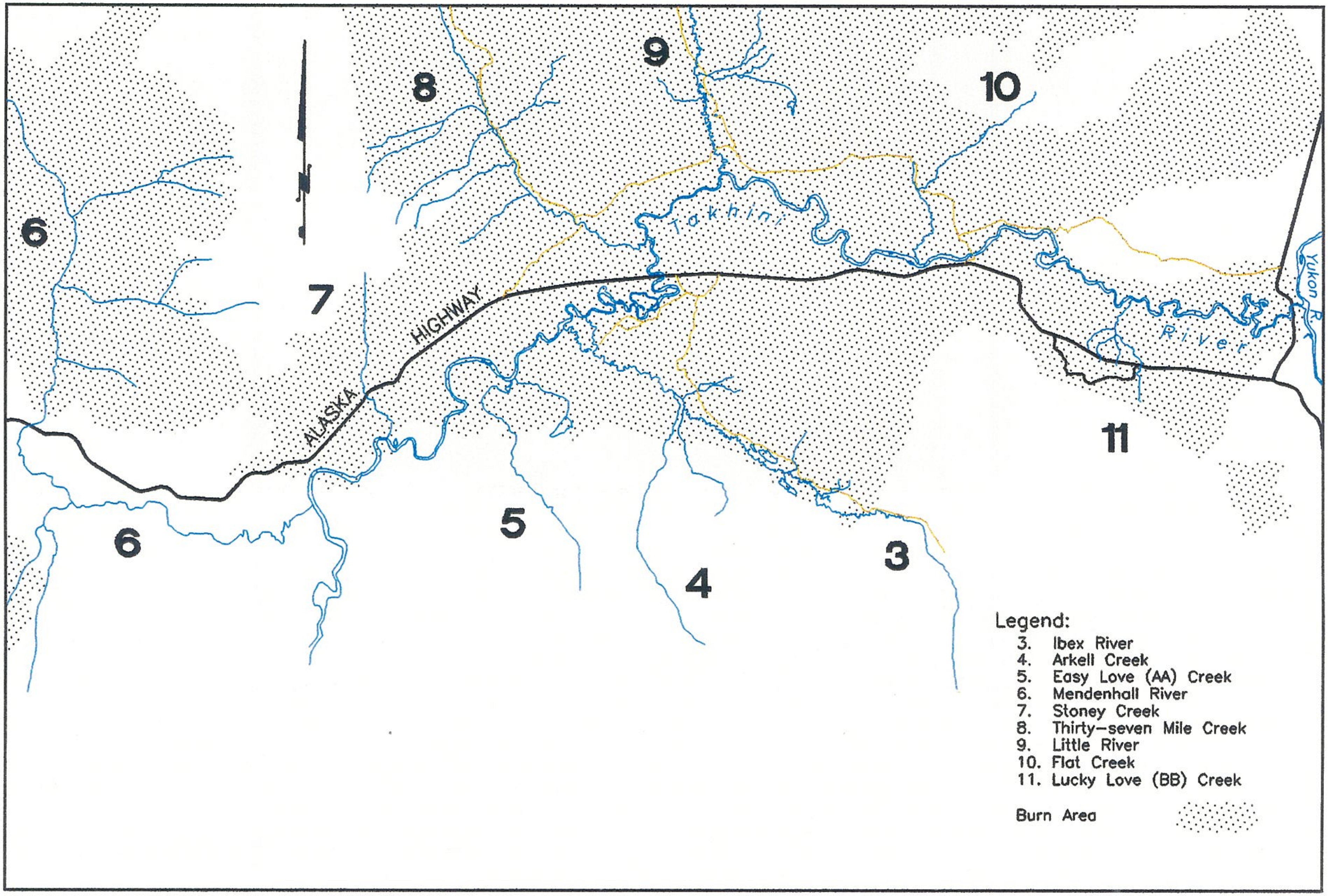


FIGURE 2 : 1958 FOREST FIRE

5 0 5 10 15 Km

SCALE 1:250,000

SECTION 4

IBEX RIVER

4 IBEX RIVER

4.1 LITERATURE REVIEW & CONSULTATIONS

Under the Yukon Placer Authorization (1993), the Ibex River is classified as a Type I- salmonid-spawning stream from the mouth to approximately 20 km upstream (end of reach #3).

DFO Stream Files indicate that as early as 1960 the Ibex River was surveyed from the air, though no adult salmon were observed general comment were made on substrate composition, water clarity and flow. On September 27, 1976 DFO personnel accompanied Beak Consultants of Calgary to inspect the river for the purposes of the proposed natural gas pipeline crossing (Foothills Oil Ltd.). A 500 m section of river was surveyed at the crossing site and physical characteristics were recorded. It was noted that the area surveyed lies within an old burn and that there was a lot of logs and debris in the river (27 logs were counted in a 100 foot section). Beak Consultants conducted 3 seines with no fish caught. The river was later flown and it was observed that the lower 3 miles (from the mouth) had "excellent looking spawning gravel." Above this area the river was observed to be "generally a mud bottom" with occasional gravel bars. Some beaver activity was observed 6 miles upstream from the mouth. In 1980 an aerial survey by Environmental Management Associates enumerated 5 adult chinook salmon. The first salmon was observed approximately 1.5 km upstream the mouth and the fifth salmon was observed in the Ibex River approximately 1km. upstream it's confluence with Arkell Creek. A subsequent aerial survey was conducted in 1981. On August 27, 10 adults were observed in reach #1 and one adult was observed in Arkell Creek.

Information included in the Fishery Information Summary System (FISS) deals primarily with activities surrounding the Foothills Gas Pipeline proposal (noted above). FISS map showing identified points was not available. Other species noted utilizing the Ibex River include arctic grayling (*Thymallus arcticus*), round whitefish (*Prosopium cylindraceum*), and slimy sculpin (*Cottus cognatus*).

Renewable Resources, Y.T.G. maintains a brood stock of Kokanee Salmon from Kathleen Lake at a pothole lake, which they refer to as Kokanee Lake. Scout Lake is stocked with chinook as well as rainbow trout. (Susan Thompson, pers. comm.).

In the 1950's flows from Jackson Lake, Louise Lake, Franklin Lake and Fish Lake were diverted for hydroelectric purposes into McIntyre Creek, which flows through Whitehorse directly into the Yukon River. Subsequently, flow into the Ibex River from Jackson Creek was altered. "Because of these diversions, McIntyre Creek currently carries a higher and more stable discharge than would occur under natural conditions." A feasibility study in 1981 sponsored Yukon Electric Company Limited (YECL) to increase the generating capacity on McIntyre Creek found no evidence of chinook salmon spawning in the creek. In 1989 a small population of salmon was observed spawning in McIntyre Creek (Beniston and Lister, 1991). Historical information could not be obtained from Yukon Energy Corp. regarding Jackson Creek discharge. Lake files at Renewable Resources, Y.T.G., Fisheries Branch also had no information on discharge. The resulting impact from the alteration of Jackson Creek flow into the Ibex River is not known.

Hunka and Shuler (1988) reported 2.4 JCS per trap/day. Beaver activity was first documented 10 km upstream. Very few jcs were caught with 8 jcs capture 3 km below the first beaver dam and only 1 jcs captured 2 km above the dam.

Water Resources, Indian & Northern Affairs, maintains a stream gauge station near the site of the proposed Foothills pipeline crossing. From 1993-96 Water Resources conducted a program to collect high quality, time series water quality data as part of a baseline water quality-monitoring program. The Ibex R. was one of twelve streams studied. Field measurements of air and water temperature, and stream discharge were made at the same time as water samples were collected for analysis of total and extractable metals. Insitu measurements and sample collection occurred weekly for the period of May to October in the years 1993-96. Data was also collected for the winter period (October-May) 1994-95. Benthic invertebrates were sampled (Hess sampler) in August 1993 and February 1994. Samples of total and fecal coliform bacteria were collected in August 1993 and August 1996. Overall results were compared to the eleven other streams (Johnstone et. al. 1997). Water quality results are in Appendix D. Water quantity results are in Appendix E.

Indian and Northern Affairs, Water Resources Division (1995) has compiled a summary of historical flow data on the Ibex River from their stream gauge located approximately 23km upstream (Appendix E).

The Resource Management Officer for the Laberge District noted that commercial and residential fuel wood cutting permits have been issued in the area but no timber harvesting permits.

Quartz Mining Claims were staked 31 km upstream from the mouth and expired in 1991.

Paul Bien has worked a trapline concession in the Ibex valley since 1970. In an interview he stated that there use to be lots of salmon below the big lake (Kokanee Lake) where he would subsistence fish. He commented that there was excellent gravel in the stream above Jackson Creek. He said that there use to be a lot more beaver in the Ibex valley all the way up to Ibex Lake. He was surprised to see them above tree line. Periodically he would see First Nations people harvesting beavers and collect the pelts as they passed through the valley. He mentioned that there use to be a large beaver dam below Jackson Creek at the sand dunes. He hasn't trapped in 10 years. (pers. comm.)

Linaya Workman, Renewable Resource Officer for the Champagne Aishihik First Nation (CAFN) spoke with band members Patti and Stella Jim, long-time residents of the Takhini Valley, and Chuck Hume, former Parks Canada Warden. Mr. Hume noted that there was a fish camp on the Ibex River in the area of reach #1, before the 1958 fire. Ms. Workman explained that for such a camp to exist, people fishing for subsistence would require a considerable population of salmon from which to harvest. Also, First Nations would need a reliable resource and expect a timely return of the salmon stock. Typically, 300 to 400 fish can be handled on drying racks though this may apply to fish camps located in larger rivers such as the Yukon. No numbers were available for salmon observed at the Ibex River fish camp. Of further note were the winter (spring) camps for beaver trapping. Ms. Workman pointed out that in the past government sponsored programs such as the Fur Harvest Enhancement Program provided an incentive for people to trap beavers. (pers. comm.)

First Nations have claimed lands throughout the valley.

Gibson & Assoc. (1993) collected a water sample approximately 1.5km upstream the mouth in July of 1993 for analysis of total metals and reported Northern Affairs Program water sampling results for 1987 and 1988 (Appendix D).

Three Agricultural Land Applications under review in Reach #1.

4.2 STREAM DESCRIPTION

Tributary descriptions are based on field investigations conducted between Aug.18/97 and Sept.17/97. Survey sites were chosen that best represented average reach characteristics.

The headwaters of the Ibex River originate high in the Boundary Range (Coast Mountains). The Ibex drains an area of approximately 852 km^2 and flows 62 km from its headwaters to its mouth. The Ibex supports a small spawning run of chinook salmon that utilize the lower reaches of the river.

Upper reaches of the Ibex are characterized by moderately steep grades and swift flows over boulder/cobble/gravel substrate within tight valley confinement. Middle reaches often meandered slowly through a narrow low gradient valley. Extensive beaver activity was observed in reaches #2 and #3. Beaver dams created large, heavily silted impoundments and often played an active role in diverting flow and creating new stream channels. Hydrology in these reaches was further effected by numerous logjams that are likely the result of the 1958 Takhini burn. Clean gravel/cobble substrates were observed immediately below breached dams and logjams. Reach #1 is characterized by moderately swift unobstructed flows over clean gravel/cobble substrate. Some stream channel braiding was evident. Two main roads, the Scout Lake Road and the Ibex River Road run through the valley. There is an extensive maze of wood cutting trails throughout the valley.

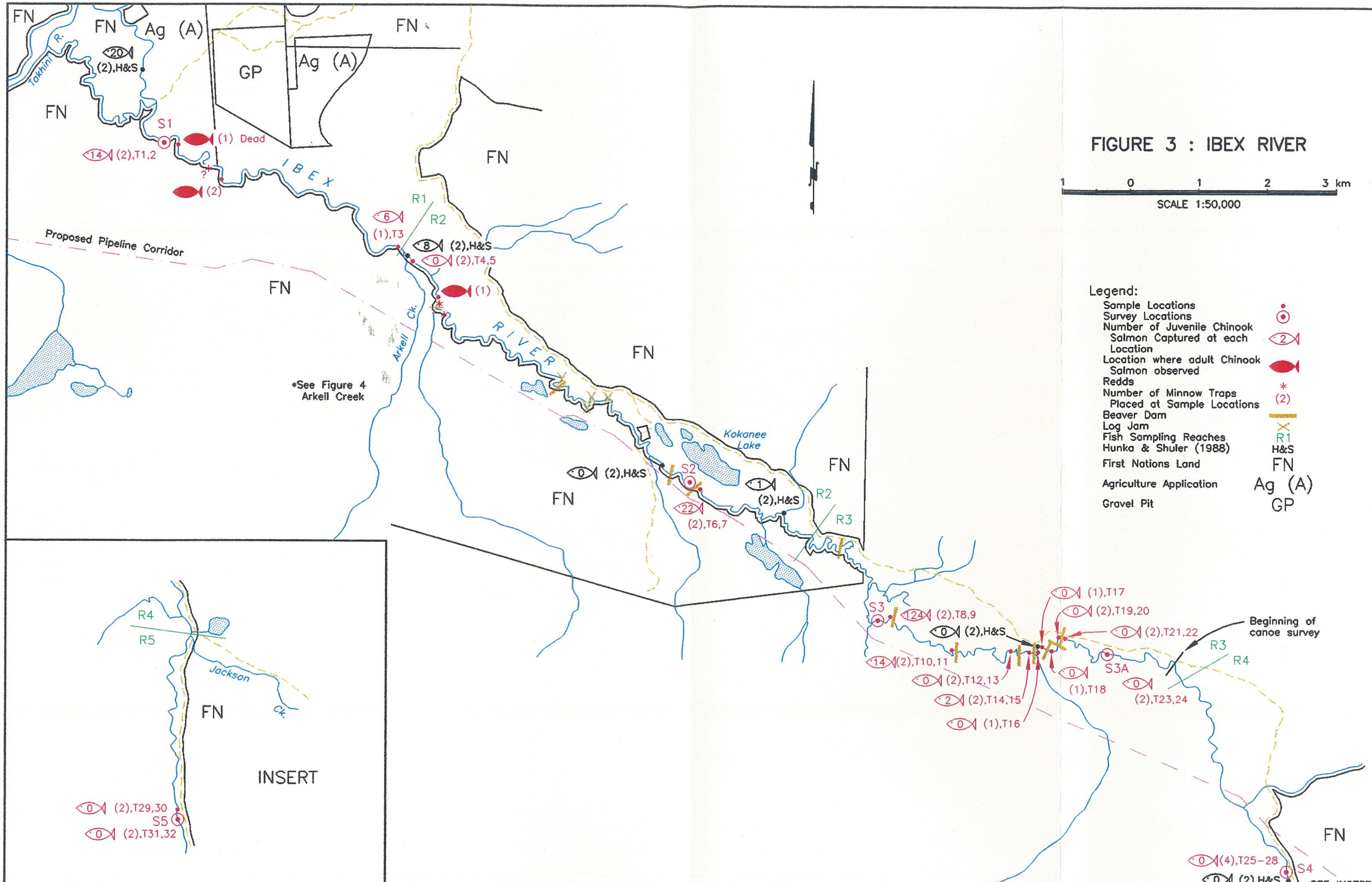
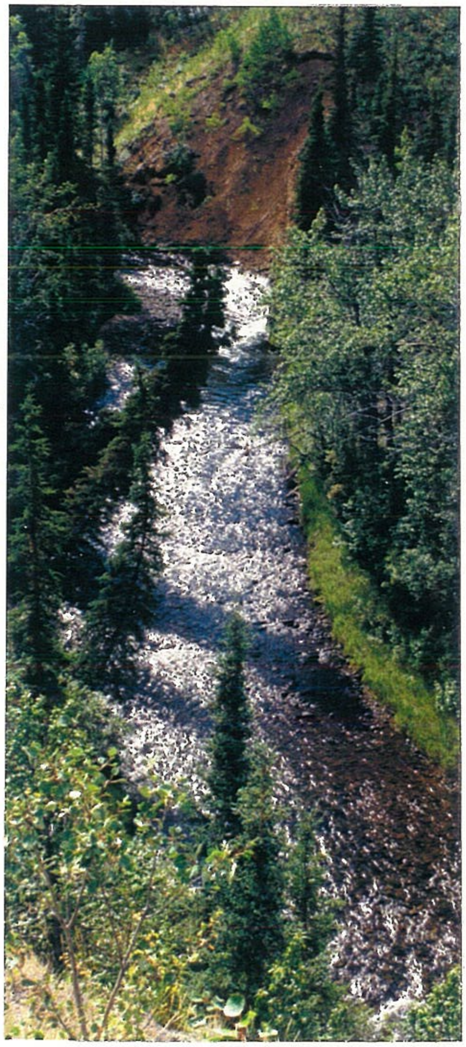
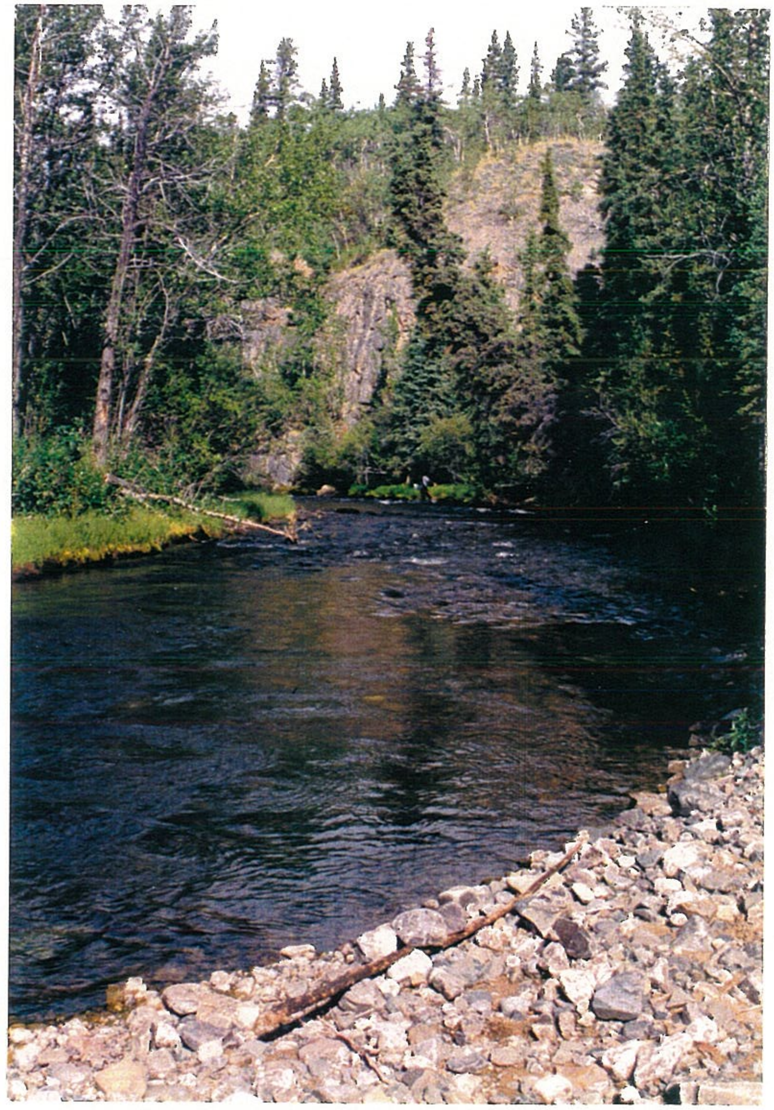


FIGURE 3 : IBEX RIVER



Above: Reach #5 above Jackson Creek.



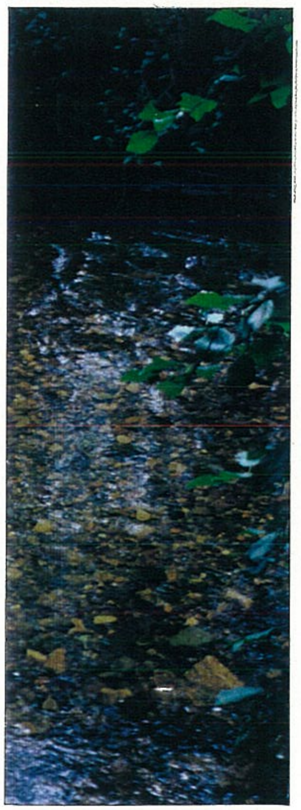
Above Right: Minnow trapping was conducted on this section of Reach #5. No JCS were captured as beaver activity in Reach #3 appeared to be a barrier to upstream migration

Above: Setting minnow trap below beaver dam in Reach #3.

Top Right: Beaver dam in Reach #3.

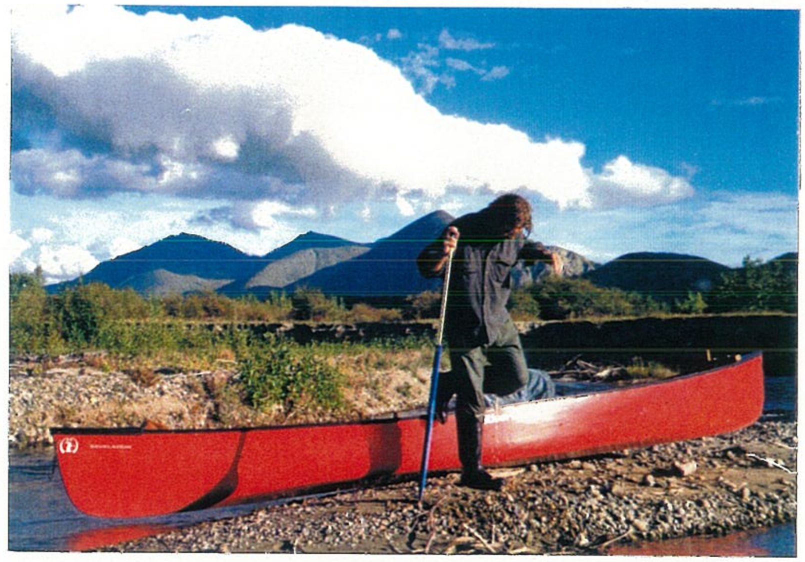
Middle Right: Directed stream as a result of the Above pictured dam.

Lower Right: Flooded timber in beaver impoundment also in Reach #3. Beaver activity was extensive in this reach and appeared to be a barrier to the upstream migration of JCS.



Above: An example of the substrate in an undammed portion of Reach #3.

Breached dam in Reach #3.



Reach #1 near the mouth.

Stream survey site in Reach #3.
(Note potential spawning gravel).

This pair of JCS were the farthest upstream migrants captured in trapping efforts.

4.2.1 Reach #1.

This reach begins at the mouth of the Ibex and extends upstream approximately 6 km to the confluence of the Ibex and Arkell creek. Arkell Creek contributes a significant amount of gravel cobble substrate into this reach. The valley is moderately broad at the mouth but narrows at the upper end of this reach. The stream channel was occasionally confined and flowed in an irregular pattern. Much of the vegetation was affected by the 1958 burn and is in an pine/aspen successional stage. However, some pockets of mature spruce forest survived along portions of the stream course. Fairly extensive tracts of grassy pastureland are found near the mouth of the Ibex. The stream has a low gradient throughout the reach and flows clear at a velocity of 0.95 m/s over gravel/cobble substrate. Mid-channel bar development was noted. The stream flows as 10% pool, 50% riffle and 40% run. Average channel width was 34.5 m; average wetted width was 30m with an average depth of 0.5 m. Bank height averaged 0.5 m throughout most of the reach however banks approaching 2-3 m in height were noted near the mouth. The Ibex enters the Takhini with some velocity through a shallow, sandy mouth. No cover was noted at the mouth that would constitute typical or advantageous northern pike (*Esox lucius*) habitat.

Some beaver activity was noted in reach #1 but no dam building was observed. A trail extends up to the stream bank on the north side of the valley about 2.5 km upstream of the mouth. Evidence was found indicating the area was used for sport fishing.

4.2.2 Reach #2.

Reach #2 begins above the confluence of the Ibex and Arkell Creek and extends upstream approximately 6.6 km. The valley is narrow and relatively flat throughout much of this reach. However, a few postglacial features such as eskers and ground moraine were noted. Much of the vegetative cover in the valley bottom consists of large marshy thickets of alder/willow. A few pockets of mature spruce forest escaped the 1958 fire. Stands of balsam poplar were commonly found growing in association with the stream course. Pine successional growth predominated on higher ground. The 1958 burn affected much of the reach. Old fire kill was observed both adjacent to and in the stream course. Logjams of a scale large enough to impound water or otherwise effect stream hydrology were documented at four locations within the reach. The stream flows in an irregular meander with occasional confinement over a low gradient. Velocities were equally low at an average of 0.5 m/s. The average channel width was 14.7 m. with an average wetted width of 10.2 m. and an average depth of 0.76 m. The stream tended to flow as a series of deep pools connected by runs with no riffling. Bank composition was mud/clay and averaged 0.9 m. in height. Stream substrate was approximately 90% fines and 10% gravel. Approaching reach #1 cobble begins to appear in the substrate and is imbedded with fines causing a degree of compaction.

Beaver activity was intense in this reach. Three dams were documented. However dam building was fairly modest in relation to the number of beaver observed as natural stream depth and bank composition may have allowed beavers an opportunity to den in the banks and not create impoundments. Numerous old beaver dams exist in reach #2 and many of them are breached. In a one hour period 12 beavers were observed, though some of the observations may have been recounts of a beaver which had swam downstream

Vehicle access to the stream bank is feasible by an old mining exploration road about mid reach. Little evidence of recent human activity was observed at this landing.

4.2.3 Reach #3.

Extending 6 km up stream from the top of reach #2, reach #3 flows over a moderately low grade in a tortuous meander channel pattern with occasional confinement through a narrow valley dominated by pine/aspen forest that has grown since the 1958 fire. Most of this reach is characterized by recent beaver activity. Eleven major dams, numerous smaller and older breached dams were encountered by canoe in this reach. Much of the stream channel has been affected by impounded water. Sections of stream course immediately below beaver activity flowed clear at 0.67 m/s over a gravel/cobble/boulder substrate. Above the beaver dams substrate was imbedded with fines. The stream flowed as 20% pool, 60% riffle and 20% run. Average channel width was 11.6 m. with an average wetted width of 10 m. and a mean depth of 0.37 m. Banks showed a fair degree of undercutting but appeared stable. Average bank height was 1.5 m. Arctic grayling were observed to be utilizing a variety of habitats within the beaver dam complex of reach #3.

Reach #3 contains evidence of old beaver activity as well as relatively recent constructions. It may be that overall beaver activity is migrating upstream though may be limited to extent of upstream migration as the 1958 fire did not penetrate into reach #5 leaving much of the old forest in tact.

4.2.4 Reach #4.

Reach #4 extends from the upper boundary of reach #3 for approximately 5 km to the confluence of the Ibex and Jackson Creek. The valley broadens through this reach. Valley and lower slope vegetative cover is primarily successional pine with pockets of mature white spruce forest in the riparian area toward the upper half of the reach. In the lower half poplar/willow/alder dominated as streamside vegetation. It may be argued that reach #4 is made up of two separate reaches. The lower section of reach #4 passes over an alluvial fan while upper boundary is below a narrow valley pass. The upper part of reach #4 is of moderate gradient and flows at 1.1 m/s with 10% pool, 25% riffle and 65% run. The stream is unconfined and flows in a sinuous channel pattern over a mixed substrate composed primarily of boulder/cobble in the upper portion which grades to cobble and gravel in the lower portion and into reach #3. The lower portion of reach #4 that may be potential salmonid spawning habitat. Average channel width was 15.5 m with an average wetted width of 10.4 m and a mean depth of 0.4 m. Bank height was 1.6 m. Approximately 35% of the bank was under cut but stability was high.

Beaver activity was observed in tributaries flowing into the Ibex but not in the mainstem. An active trap line and a wilderness tour operation were observed on lands adjacent to this reach. There is an extensive trail system in the area and there was evidence of angling observed in this reach. Access to the streamside can be made at the stream gauge station maintained by Water Resources, Northern Affairs Program.

4.2.5 Reach #5.

Reach #5 extends upstream from the confluence of the Ibex with Jackson Creek. The valley narrows at this point and the stream flows in a sinuous channel pattern within a confined valley. Upper slope vegetation alternated between pine and spruce. The valley floor was dominated by mature spruce with alder/willow growing immediately adjacent to streamsides. The stream flowed clear and moderately swift at 1.6 m/s. over a 1% grade with 10% pool, 50% riffle and 40% run. Average channel width was 15.8 m, wetted width was 10 m and mean depth was 0.4 m. Substrate was a mix of gravel/cobble/boulder. Some sand and bedrock was also observed. At some locations in the reach, rock outcrops extended from the hillside into the stream channel creating deep pools and eddies. Huge boulders had, in some instances, calved from the rock faces into the stream adding further cover. Bank height was measured at 0.4 m. Undercutting was observed along approximately 45% of the bank. Erosion was observed where the stream was cutting into the gravel/sand valley wall above Jackson Creek.

No sign of beaver activity was observed in reach #5.

Table 2 Summary of Ibex River Reach Physical Characteristics *

Reach	% Gradient	% Cover	% Pool/Riffle/Run	% Fines/Grave/Larges/Bedrock
R1	.5	10	10/50/40	10/40/40/10
R2	.5	20	30/00/70	90/10/00/00
R3	1	20	33/33/33/	40/50/10/00
R3A	1	15	20/60/20	10/50/40/00
R4	1.5	30	10/25/65	10/30/60/00
R5	1	25	10/50/40	05/40/50/05

*From DFO/MOE Stream Survey Form - Appendix B.

4.3 RESULTS: FIELD INVESTIGATIONS

Results of field measurements at representative reach survey sites:

4.3.1 Water Quality

Table 3 Summary of Ibex River Reach Water Quality

Reach	Date	Diss. O_2	Cond.	W. Temp	pH	Turb.
R1	Sept. 3/97	11.2	.096	8.9	8.16	1
R1	Mar. 15/98	14.48	.193	0.4	8.01	
R2	Aug. 25/97	12.04	.140	10.6	8.23	2
R3	Aug. 23/97	10.52	.131	8.6	7.72	2
R3A	Aug 23/97	11.02	.119	9.2	8.10	1
R4	Aug. 19/97	11.28	.114	9	8.11	1
R5	Aug. 19/97	10.74	.115	9.5	8.19	1
		mg/l	mS/cm	^{0}C		N.T.U.

4.3.2 Water Quantity

Table 4 Summary of Ibex River Reach Water Quantity

Reach	Date	Mean Velocity	Mean Width	Mean Depth	K**	Discharge
R1	Sept. 3/97	0.95	28.2	0.45	0.8	9.64
R1	Mar. 15/98					0.59
R2	Aug. 25/97	0.5	10.2	0.76	0.75	2.91
R3	Aug. 23/97	0.83	9.5	0.75	0.75	4.44*
R3A	Aug 23/97	0.67	10.0	0.37	0.8	1.98*
R4	Aug. 19/97	1.1	10.4	0.4	0.9	4.12*
R5	Aug. 19/97	1.6	10.0	0.4	0.9	5.76*
		m/s	m	m	0.75-0.9	m/s^3

* Period of precipitation prior to or during survey.
** K= Constant to account for bottom roughness (0.75-0.9, depending on if smooth or rough stream bottom), MOE/DFO (1994).

Winter flow in March 1998 was measured approximately 300 m downstream the confluence of Ibex River and Arkell Creek using the salt dilution technique. Numerous open water sections were observed and ice thickness was estimated at an average of 1.5 m.

4.3.3 Adult Chinook Salmon

Adult Chinook were observed in reaches #1 and #2. Chinook-spawning distribution was assessed in two surveys, one by canoe from August 22 to 26 beginning approximately 19 km. upstream and a second survey of reach #1 from September 2 to 3, by foot. Total number of adult chinook observed was 4 with the furthest upstream observation approximately 7 km. below a logjam. Another 300 m above the logjam appeared to be the possible diggings of a redd. No carcasses were observed above this point. Extent of spawning activity appears to have occurred within the 7 km from the mouth of the stream.

Table 5. Number of Adult Chinook Observed

Location Upstream (km)	Live	Dead	Total
R1 (2)		1	1
R1 (3)	2		2
R2 (7)	1		1
Total	3	1	4

A count of the number of observed redds was conducted simultaneously with the adult chinook spawning survey

Table 6. Number of Redds Observed

Location Upstream (km)	Redds/Excavations
R1 (2.75)	1
R2 (7)	2
Total	3

4.3.4 Juvenile Chinook Salmon

Jcs trapping was conducted at a site representative of each reach where lengths and weights of jcs caught were recorded to establish a jcs condition factor representative of that reach. (Table 7). Jcs were caught in reaches #1, #2 and #3. In reaches #4 and #5 no jcs were caught. Reaches #1, #2 and #3 were extensively surveyed by canoe and trapped from August 22 to 27, 1997. Summary in Appendix A.

Juvenile chinook salmon (jcs) were trapped in a number of locations to determine extent of upstream migration and if existing barriers posed as significant obstructions to upstream access.

Baited minnow traps were set in a variety of habitats extending 26.5 km. up the Ibex R. valley. Table 7 summarizes the numbers caught and catch per unit effort (CPUE = jcs/trap/day):

Table 7. JCS Catch Summary.

IBEX	S1	S2	S3	S3A	S4	S5
# Traps	2	2	2	2	4	4
# Days	2	4	2	2	4	4
# JCS	14	22	124	0	0	0
Mean CPUE	3.5	2.75	31	0	0	0

Site preference based on catch per unit effort (CPUE) suggests that reach #3 is preferred though this may be misleading as the highest catches (traps 8 and 9 - 124 total) occurred slightly downstream the commencement of intense beaver activity suggesting a bottleneck within the stream. Intense trapping activity in reach #3 to establish the extent of upstream migration may have skewed the results.

4.3.5 Observed Land Uses

Observed land uses in the Ibex River valley include commercial and residential fuel wood cutting, trapping, hunting, fishing and a variety of outdoor recreational activities. Pothole lakes in the valley have been stocked with sport fish and brood stocks. The Yukon Government has recently made road improvements to a gravel pit approximately 1 km north of reach #1. Signs of extensive livestock grazing were evident in the lower 2km of the valley, however no evidence of livestock interfering with natural stream processes was observed. In reach #5 above the survey site, debris was observed in the stream which appeared to be the remains of an old bridge that had washed out some years ago.

4.4 DISCUSSION

4.4.1 Water Quality

A water sample was taken from the Ibex River on March 15/98 300 m downstream from Arkell Creek for analysis of dissolved metals. Analysis of water quality data gathered on the Ibex River show the following parameters equaling or exceeding limits set for CCME freshwater aquatic life (FAL). Values in mg/l unless stated otherwise, from Appendix D:

Aluminum (FAL-0.005-0.1)	1987	0.09 (total)
	1994	3.20 (total)*
	1996	6.71 (total)*
Arsenic (FAL-0.05)	1993	0.09 (total)
	1994	0.06 (total)
	1995	0.06 (total)
	1996	0.06 (total)
Cadmium (FAL-0.0002-0.0018)	1993	0.006 (total)
	1994	0.006 (total)
	1995	0.006 (total)
	1996	0.028 (total)
Chromium (FAL-0.002-0.02)	1994	0.039 (total)
	1995	0.029 (total)
	1996	0.021 (total)
Iron (FAL-0.3)	1993	0.791(total)
	1994	5.80 (total)*
	1995	1.80 (total)
	1996	9.81 (total)*
Lead (FAL-0.001-0.007)	1993	0.07 (total)
	1994	0.06 (total)
	1995	0.07 (total)
	1996	0.06 (total)
Selenium (FAL-0.001)	1993	0.07 (total)
	1994	0.06 (total)
	1995	0.06 (total)
	1996	0.08 (total)
Silver (FAL-0.0001)	1993-6	0.01 (total)
Zinc (FAL-0.03)	1993-4	0.033 (total)

(*Values may be incorrect)

4.4.2 Adult Chinook Salmon

The series of logjams in reach #2 may pose an obstruction to upstream adult migration particularly during summer low flow periods. Beaver dams in reach #3 may be a barrier to adult migration.

Levy and Slaney (1993) provide a detailed review of the habitat capacity for salmon spawning. DFO Habitat Management Unit B.C., have adopted a flow velocity value of 1 m\sec as a guideline for defining maximum flow suitable for upstream salmon migration. Levy and Slaney (1993) provide a summary of temperature, depth, velocity, and substrate size ranges suitable for salmon spawning. Criteria are compared to survey results:

Table 8. Comparisons Of Select Spawning Criteria

Levy & Slaney (1993)	Temp. (^{0}C) 5.6-13.9	Minimum Depth 0.24 m	Velocity 0.3-0.91 m/s	% Substrate 13-102 mm*	0-20% Fines 2-6.4mm**
Ibex R1	8.9	.45	.95	40	30
Ibex R2	10.6	.76	.50	05	95
Ibex R3	8.6	.75	.83	35	65
Ibex R3A	9.2	.37	.67	70	30
Ibex R4	9	.40	1.1	50	10
Ibex R5	9.5	.40	1.6	40	15

*Percent of bed material from DFO/MOE Stream Cards ranging from small gravels to small cobble (16-128 mm). Suitability of gravel substrate is a function of fish size- large chinook spawners generally utilize much coarser gravel than pink salmon, for example. Levy & Slaney (1993)

**Percent of fines from DFO/MOE Stream Cards ranging from fines to small gravel (<2-16 mm). Salmon alevins generally experience difficulties with emergence when percentage of fines exceeds 20% of substrate volume, Levy & Slaney (1993).

Reach #1, which supports spawning salmon has temperature, depth, velocity, and substrate characteristics that are within the range described by Levy & Slaney. Substrate in reach #2 may be a limiting factor as only 5% falls within the described criteria range. The upper portion of reach #3 (3A) and lower portion of reach #4 may be suitable spawning habitat based on the comparison of temperature, depth, velocity and substrate. Velocity in reach #5 may be too swift for suitable spawning habitat. (Note: the percentages reported are not absolutes but subjective averages and are based on the assumption that reach characteristics are sections of homogeneous habitat with clearly defined boundaries which is not always the case.)

Based on First Nations information and compared to survey results in 1980-81, and 1997 it appears that fewer adult chinook salmon are utilizing the Ibex River than have in the past. The small number of returning spawners observed over recent years suggests that the Ibex chinook salmon stock may be vulnerable to human and natural disturbances. A combination of factors may have contributed to the decline of the Ibex stock. First Nations are not utilizing beaver resources on their traditional lands as was practiced in the past. Beaver pelt prices have dropped to the point where it is uneconomical to engage in trapping and no government-sponsored program exists to encourage harvesting of beavers. The forest fire of 1958 burned much of the old spruce forest that once dominated the area and succession deciduous growth has produced favorable beaver habitat in riparian areas. Fire killed trees have entered the stream system and created logjams. A wolf control program in the 1980's may have further reduced the number of predators on beavers. Human activity in the valley may have further disturbed the number of wild predators out of the valley. Finally, loss of flow from Jackson Creek may have had an effect on stream hydrology and a positive effect on beaver habitat though to what degree remains uncertain.

4.4.3 Juvenile Chinook Salmon

The high number of jcs caught in traps T8 and T9 below the intense beaver activity in reach #3 suggests that these beaver dams are an obstruction. One kilometer beyond this point at traps T10 and T11, 14 jcs were caught and further upstream above another series of dams only 2 jcs were caught. In reaches #4 and #5 no jcs were caught. The area of intense beaver activity in reach #3 appears to be a barrier to jcs upstream migration. Historical information noted beaver activity 6 miles (10km) upstream. Beaver activity has since been recorded extending 18km upstream. It may be that overall beaver activity is migrating upstream.
By comparing CPUE, Condition Factor (K) of jcs and the Site Assessment Rating (SAR) based on benthic invertebrate sampling, an indication of habitat favorability/suitability may be proposed as a rationale for

restoration/enhancement activities.

Table 9. Comparison of K/CPUE/SAR

IBEX	R1	R2	R3	R3A	R4	R5
Mean K*	1	1.08	1.06			
Mean CPUE	3.5	2.75	31			
SAR**	3.5	3.25	3.5	3.75	3.75	3.5

*K- JCS Condition Factor
** SAR-Site Assessment Rating (Appendix C) from Stream Invertebrate Survey, Streamkeepers Handbook. Score of 1 (poor) to 4 (good) gives a general rating of stream health at the site.

The SAR values for reaches #3A, #4 and #5 are the same as or better than the values recorded for the lower reaches and suggests that there is favorable rearing habitat available above the beaver activity. The results of the trapping program suggest that extensive beaver activity (approx. 18km upstream from the mouth) in reach #3 has excluded jcs from utilizing habitat upstream, where there appears to be extensive favorable rearing habitat available.

4.5 RECOMMENDATIONS

Chinook salmon may be threatened in the Ibex River.

In order to preserve the existing salmon stock fishery managers may want to consider limiting the commercial harvest of adult chinook salmon in order to allow a greater return of spawners.

Once the number of returning spawners has increased fisheries managers may want to consider artificial incubation of brood stock in a hatchery such as the one established at McIntyre Creek and release fry back into the Ibex River. Based on the partial success of the fry release program conducted on Flat Creek from the McIntyre Creek incubation box, there is a strong possibility that similar success may be achieved on the Ibex River. There is also the possibility of establishing incubation boxes for such a program. The site is accessible year round and the Ibex is noted for its source of groundwater. It may be preferable to simply conduct fry releasing programs than establish incubation boxes as distance to the site would require a significant expenditure of funds for establishing power to the site and would encourage development in the valley.

Logjams in reach #2 could be removed to allow upstream migration of adult chinook.

Unprecedented post colonial developments in the Takhini basin may predispose beavers to population swings outside historical norms. In the face of incomplete data it is likely prudent to tailor management to maintaining moderate beaver populations as opposed to eradication or allowing populations to increase unchecked.

Intense beaver activity in reach #3 may be a barrier to adult and juvenile chinook salmon. With respect to beaver management, a number of options could be considered:

- may want to consider an incentive program for trappers and First Nations to trap beavers in affected areas if this is agreement with YTG beaver management guidelines.
- in conjunction with an incentive program, a minimum beaver catch quota could be set for owners of trapline concessions in the Ibex valley.
- opening up of beaver dams following DFO/YTG beaver management guidelines.

SECTION 5

ARKELL CREEK

5 ARKELL CREEK

5.1 LITERATURE REVIEW & CONSULTATIONS

Under the Yukon Placer Authorization (1993), Arkell Creek is classified as a Type I- salmonid spawning stream from the mouth to approximately 5-km upstream.

What little information exists in DFO Stream Files relates to fishery investigations with respect to the Foothills Pipeline project. In 1981 an aerial survey by Environmental Management Associates enumerated 1 adult Chinook salmon approximately 3 km. upstream.

Information included in the FISS deals primarily with activities surrounding the Foothills Gas Pipeline proposal (noted above). FISS map showing identified points was not available. Jcs were captures at a number of locations. Other species noted utilizing the Arkell Creek include arctic grayling (*Thymallus arcticus*), round whitefish (*Prosopium* cylindraceum), burbot (*Lota lota*), and slimy sculpin (*Cottus cognatus*). Reference to good chinook spawning habitat in the vicinity of the proposed pipeline was made in the Foothills Pipe Line Draft Fisheries Protection Plan (1981). In the same report reference was made to good rearing and summer potential for grayling and burbot.

Hunka and Shuler (1988) reported 3 jcs captured approximately 3 km upstream and 2 jcs captured approx. 6 km upstream with a CPUE of 2.4 jcs per trap/day. A CPUE of >10 jcs was used as an indication of preferred habitat.

No mining claims were recorded at the office of the Whitehorse District Mine Recorder.

First Nations have claimed land in the immediate area extending into reach #2.

Geological Survey of Canada collected stream sediment samples for metal analysis at locations 1182 and 1183 in 1985 (Appendix D).

5.2 STREAM DESCRIPTION

The headwaters of Arkell Creek are located in the Boundary Range (Coast Mountains). Arkell drains an area of approximately 268 km^2 and flows a distance of 28 km. Arkell Creek has historically supported spawning Chinook salmon.

Waterfalls and deep narrow rock canyons were encountered in reach #4. The 1958 fire effected only reach #1. Vegetation encountered above reach #1 was primarily mature stands of spruce and pine. No sign of beaver activity was observed on Arkell Creek. A trappers trail runs up the length of the valley and crosses the stream in several places. Use appears to be limited to occasional horse traffic. Very little sign of human activity was observed in the Arkell valley.

5.2.1 Reach #1.

Reach #1 extends approximately 3.2 km upstream from the mouth. This reach flows over an alluvial fan with numerous unstable braided channels. Vegetative cover along the stream banks was primarily alder/willow/poplar/spruce. The surrounding forest in the valley bottom was aspen/pine re-growth interspersed with bands of alder growing in old channel scars. The stream flows clear at 0.8 m/s over a cobble/gravel/sand substrate. Channel characteristics average 40% pool, 50% riffle and 10% run. Average channel width was 45 m, with an average wetted width of 8.5 m and mean depth of 0.4 m. Banks were unstable and averaged 0.5 m in height. There may be a significant amount of subsurface flow through this reach.

5.2.2 Reach #2.

Reach #2 extends approximately 3.7 km upstream from reach #1 through a narrow valley. The stream channel is entrenched to some extent though the existence of recently abandoned side channels suggests the stream is somewhat confined. A mature spruce forest dominates on the valley bottom and alder/willow immediately adjacent to the stream course. The stream flows clear at 2.2 m/s with 30% pool and 70% riffle in a stepped series of small boulder cascades. Bed load material could be heard as it was transported downstream. Average channel width was 10.5 m, wetted width was 6.5 m and a mean depth of 0.25 m. Substrate was dominated by large cobble and boulders with the remainder composed of a mix of small cobble and gravel. Bank height was .5 m.

5.2.3 Reach #3.

Reach #3 extends a further 2-km upstream from the terminus of reach #2. The valley broadens and the grade increases through this reach, with the stream flowing unconfined in braided unstable channels. Vegetative cover consisted of pine on high ground, mature spruce forest in the valley bottom and alder/willow at streamside. Wetted width was, on average, 6 m with a mean depth of 0.4 m. Channel width was 110 m, much of it boulder strewn and un-vegetated. The stream flowed as 40% pool and 60% riffle over a 50% boulder/cobble, 30% gravel and 20% fines substrate. Average bank height was .5 m. Banks were composed largely of boulders. There may be a significant amount of subsurface flow through this reach.

5.2.4 Reach #4.

Reach #4 begins approximately 9.5 km upstream of the mouth where the grade rises sharply and the stream channel becomes entrenched. The lower portion of reach #4 is a 1.5 km series of bedrock waterfall/cascades up to 3 m in height. Above this section of reach #4 the stream emerges from a deep rock canyon. Vegetative cover was mature pine on the benches above the stream and alder/willow at the water's edge. JCS were observed in the lower 100 m of the reach, however no JCS were captured or observed above the initial waterfall/cascade.

Table 10. Summary of Arkell Creek Reach Physical Characteristics *

Reach	% Gradient	% Cover	% Pool/Riffle/Run	% Fines/Grave/Larges/Bedrock
R1	.5	10	40/50/10	20/40/40/00
R2	1	30	30/70/00	10/20/70/00
R3	2	30	40/60/00/	20/30/50/00

*From DFO/MOE Stream Survey Form - Appendix B.

5.3 RESULTS: FIELD INVESTIGATIONS

Results of field measurements at representative reach survey sites:

5.3.1 Water Quality

Table 11. Summary of Arkell Creek Reach Water Quality

Reach	Date	Diss. O_2	Cond.	W. Temp	pH	Turb.
R1	Aug. 29/97	10.95	.031	10.5	7.95	0
R1	Mar. 15/98	14.55	.068	0.1	7.51	
R2	Aug. 29/97	11.21	.029	10.5	7.53	0
R3	Aug. 29/97	11.34	.027	9.8	7.65	0
		mg/l	mS/cm	^0C		N.T.U.

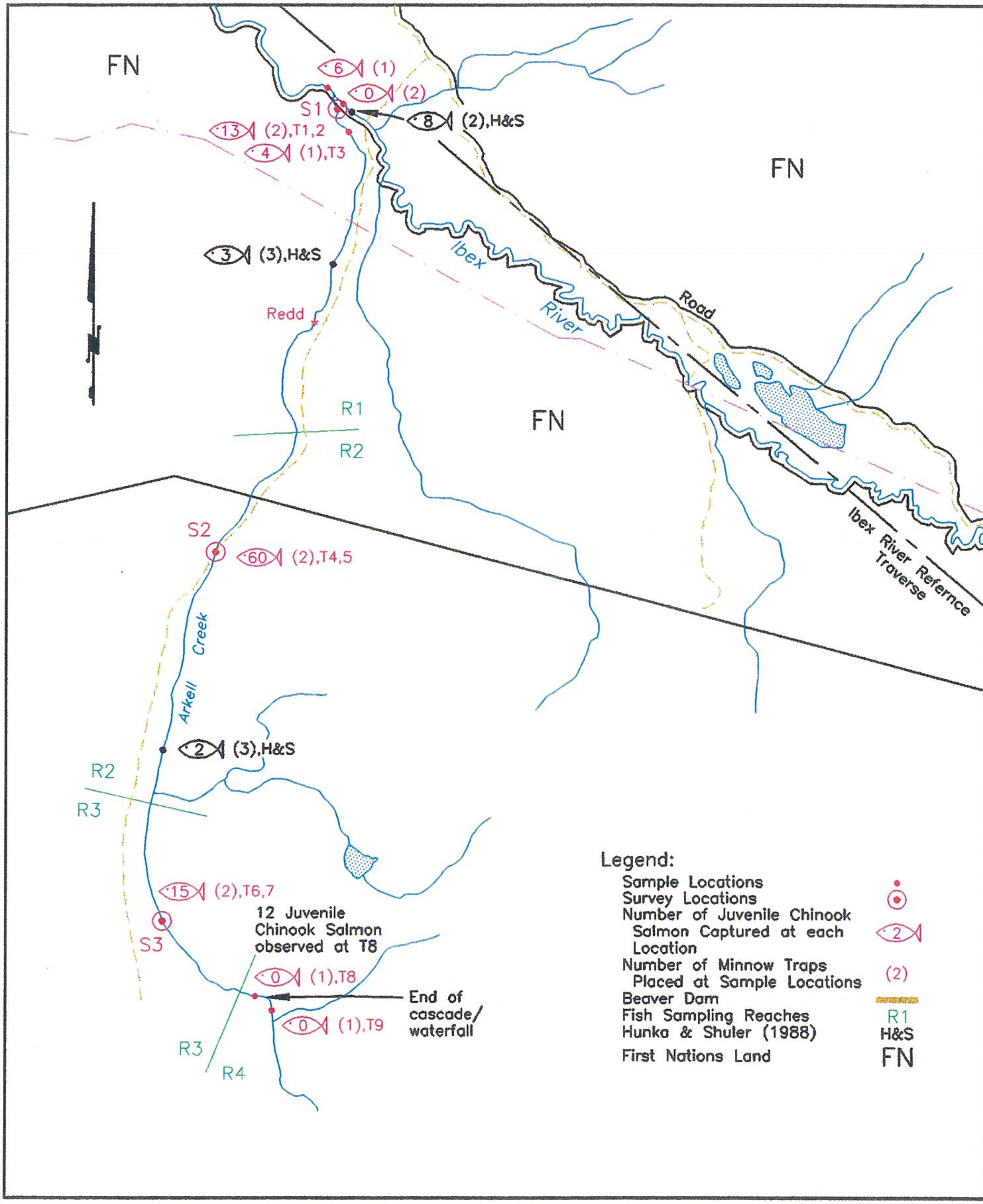


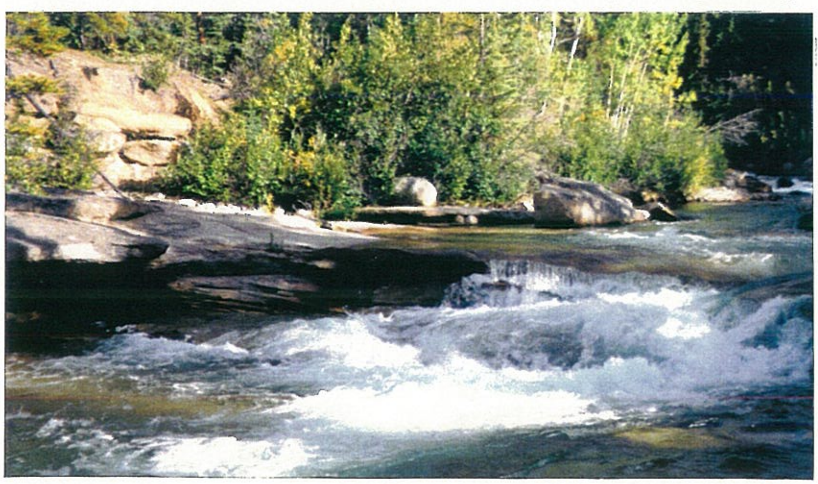
FIGURE 4 : ARKELL CREEK

1 0 1 2 3 km

SCALE 1:50,000

Above: Confluence of the Ibex and Arkell.

Above: Substrate in section of Reach #1 where previous Chinook spawning activity was observed.



Above: Small bedrock cascade in lower section of Reach #3. JCS were observed above this point.

5.3.2 Water Quantity

Table 12. Summary of Arkell Creek Reach Water Quantity

Reach	Date	Mean Velocity	Mean Width	Mean Depth	K*	Discharge
R1	Aug. 29/97	0.8	8.5	0.40	0.8	2.18
R1	Mar. 15/98					0.33
R2	Aug. 29/97	2.2	6.5	0.25	0.9	3.22
R3	Aug. 29/97	1.53	6	0.40	0.9	3.30
		m/s	m	m	0.75-0.9	m/s^3

* K= Constant to account for bottom roughness (0.75-0.9, depending on if smooth or rough stream bottom), MOE/DFO (1994).

Winter flow in March 1998 was measured at S1 using the salt dilution technique. Ice thickness was 1.2m with a 20cm air pocket. Water depth was 20cm.

5.3.3 Adult Chinook Salmon

On August 26 and 27 the mouth of Arkell Creek was surveyed on foot for evidence of adult Chinook salmon and none were observed. A second foot survey from August 28 to 29 extending 10 km upstream found little evidence of spawning activity with the exception of a possible redd located approximately 2.25 km upstream.

Table 13. Number of Adult Chinook Observed

Location Upstream (km)	Live	Dead	Total
R1	0	0	
R2	0	0	
R3	0	0	
Total			0

Table 14. Number of Redds Observed

Location Upstream (km)	Redds
R1 (2.25)	1
Total	1

5.3.4 Juvenile Chinook Salmon

Jcs were captured in reaches #1, #2 and #3. In reach #4 no jcs were caught though 10 jcs were observed immediately below the cascade/waterfall. All reaches were extensively surveyed by foot and trapped from August 26 to 29. Summary in Appendix A.

Table 15. JCS Catch Summary.

	R1	R2	R3
# Traps	3	2	2
# Days	3	2	2
# JCS	17	60	15
Mean CPUE	1.89	15	3.75

Site preference based on catch per unit effort (CPUE) suggests that reach #2 is preferred.

5.3.5 Observed Land Uses

Land use in the Arkell Creek valley is limited to occasional non-motorized traffic along the trail that parallels the stream. Land claimed by First Nations extends into reach 2.

5.4 DISCUSSION

5.4.1 Water Quality

A water sample was taken from Arkell Creek at S1 on March 15/98 for analysis of dissolved metals. Analysis of water quality data gathered on Arkell Creek show no parameters exceeding CCME guidelines for freshwater aquatic life (Appendix D).

5.4.2 Adult Chinook Salmon

A summary of temperature, depth, velocity and substrate size range suitable for salmon spawning is provided by Levy and Slaney (1993) and values are compared to survey results in Table 16. Reach #1, which supports spawning salmon has temperature, depth, velocity, and substrate characteristics that are within the range described by Levy & Slaney. Velocities in reaches #2 and #3 appears to be too swift for migration or suitable spawning habitat and none was observed.

Table 16.

Levy & Slaney (1993)	Temp. (^{0}C) 5.6-13.9	Minimum Depth 0.24 m	Velocity 0.3-0.91 m/s	% Substrate 13-102 mm*	0-20% Fines 2-6.4mm**
Arkell R1	10.5	.4	.8	40	20
Arkell R2	10.5	.25	2.2	35	10
Arkell R3	9.8	.4	1.5	40	20

*Percent of bed material from DFO/MOE Stream Cards ranging from small gravels to small cobble (16-128 mm). Suitability of gravel substrate is a function of fish size- large chinook spawners generally utilize much coarser gravel than pink salmon, for example. Levy & Slaney (1993)

**Percent of fines from DFO/MOE Stream Cards ranging from fines to small gravel (<2-16 mm). Salmon alevins generally experience difficulties with emergence when percentage of fines exceeds 20% of substrate volume, Levy & Slaney (1993).

The number of adult spawners observed during the Foothills pipeline surveys appears to be low and compared to results in this survey evidence suggests that Arkell Creek may be under utilized by adult chinook salmon. Historically, First Nations carried on subsistence fishing on the Ibex River. Returning salmon probably utilized Arkell Creek to some degree. No barriers or obstructions to migration were observed. Summer water quality for parameters measured do not appear to be an issue. Bank instability may be a factor but given the valley's pristine condition it may be that this has persisted over a long period of time with limited impact.

5.4.3 Juvenile Chinook salmon

The results of the trapping program suggest that the cascade\waterfall in reach #4 is a barrier. No other obstructions or barriers were observed along the stream.

Table 17.

	R1	R2	R3
Mean K*	1.09	1.07	1.15
Mean CPUE	1.89	15	3.75
SAR**	3.75	3.25	3.75

*K- JCS Condition Factor

** SAR-Site Assessment Rating (Appendix C) from Stream Invertebrate Survey, Streamkeepers Handbook. Score of 1 (poor) to 4 (good) gives a general rating of stream health at the site.

The overall condition of jcs in Arkell Creek appears favorable and the SAR values for the reaches are above the acceptable range. In reach #2, where the SAR value is slightly lower, the CPUE is quite high suggesting jcs site preference. As was mentioned previously, CPUE based on minnow trap catches may underestimate the actual number or density of jcs present as quite often more jcs were observed than were actually caught.

5.5 RECOMMENDATIONS

Chinook salmon may be threatened in Arkell Creek. As Arkell Creek is a tributary to the Ibex River management considerations for stock enhancement in the Ibex River could also apply to Arkell Creek with the exception of beaver management. This may include:

Limiting the commercial harvest of adult chinook salmon in order to allow a greater return of spawners. Once the number of returning spawners has increased fisheries managers may want to consider artificial incubation of brood stock in a hatchery such as the one established at McIntyre Creek and release fry back into Arkell Creek. Based on the partial success of the fry release program conducted on Flat Creek from the McIntyre Creek incubation box, there is a strong possibility that similar success may be achieved on Arkell Creek. Establishing an incubation box would appear unlikely, as there is no suitable access to the area.

SECTION 6

EASY LOVE (AA) CREEK

6 EASY LOVE (AA) CREEK

6.1 LITERATURE REVIEW & CONSULTATIONS

Under the Yukon Placer Authorization (1993), Easy Love Creek is classified as a Type II- salmonid rearing stream from the mouth to approximately 3.5 km upstream.

No primary information was obtained from DFO Stream Files.

FISS Information includes fish sampling activities surrounding the Foothills Gas Pipeline proposal (noted above) and jcs trapping results from Hunka and Shuler (1988). FISS map showing identified points was not available. In 1981, 13 jcs were observed in the stream. Hunka and Shuler (1988) reported 6 jcs captured approximately 1 km upstream and 9 jcs captured approximately 3 km upstream with a maximum CPUE of 2.25 jcs per trap/day. Other species noted utilizing the Easy Love Creek include arctic grayling, burbot, and slimy sculpin. A survey in 1981 identified 10 grayling spawning areas and captured 130 grayling.

Portions of the valley were burned in the 1958 forest fire.

No mining claims were recorded at the office of the Whitehorse District Mine Recorder.

First Nations have claimed land in the immediate area extending approximately 6 km upstream.

Geological Survey of Canada collected stream sediment samples for metal analysis at locations 1246 and 1247 in 1985 approximately 12 km upstream.

Two agricultural applications that cover both sides of the stream to an extent of approx. 3.5-km upstream are under review. One of the parcels is a grazing application.

Dianna Mueller and her husband Gunther have a trapline concession that runs along Easy Love Creek. Previously she worked with her father who was the former owner of the concession. Over a 15 year period that she has been on the trapline Mrs. Mueller observed that beaver activity in the area was moderate though she has only frequented the trapline in winter. Her husband primarily traps lynx and usually traps one beaver per season for castor bait. She mentioned that trapping beavers for their pelts is not economically viable as their pelts have a market value of approximately $20 dollars. (pers. comm.)

6.2 STREAM DESCRIPTION

Easy Love Creek has its head waters in the north slope foot hills of the Boundary Ranges (Coast Mountains) at an elevation of approximately 1300 m and flows 15 km to its mouth draining an area of 63 km^2.

6.2.1 Reach #1.

Reach #1 begins at the mouth and extends at least 10 km upstream. The stream flows over a moderately low grade in an irregular channel pattern with occasional confinement within its valley. Both banks were steep with some undercutting. Extent of the 1958 burn appears to be approximately 5 km upstream. The east side of the valley has steep, sparsely vegetated clay slopes. The valley bottom is relatively broad in relation to the stream. Successional growth, after the 1958 burn, of aspen and pine dominated on the benches above the valley. In the riparian area black spruce, alder and willow were common. Some sections of the riparian zone appeared to have been spared fire damage, as stands of mature white and black spruce were common. Also common were extensive marshy areas mostly a result of past and present beaver activity. Beaver activity was evident throughout the reach but was especially intense in the lower section near the mouth where large dams had recently altered the stream channel. Water from behind the impoundments was spilling into the surrounding forest and lowland marsh. Directly below the impoundments water depth was extremely low, as the old channel appeared to be drying out with aquatic vegetation visible above the surface of the water. The mouth of the stream is moderately deep, wide and choked with aquatic vegetation which would provide advantageous cover for northern pike. Where unaltered by beaver, the stream flowed as 35% pool, 20% riffle and 45% run at 0.19 m/s. Average channel width was 3.7 m with a wetted width of 2.75 m. The substrate was sand and gravels with a few small cobbles. Average bank height was 0.5 m. Turbidity was low. Water temperatures were unusually low at 3.1°C. This was the lowest temperature recorded in the study. The low water temperature and the fact that Easy Love Creek is not a lake fed system suggests strong ground water inputs. A high water mark (0.5m) was visible on the valley wall at the mouth, perhaps a result of the spring freshet. A trappers trail runs along the bench above the east side of the stream. Otherwise there is little sign of human activity.

Table 18. Summary of Easy Love Creek Reach Physical Characteristics *

Reach	% Gradient	% Cover	% Pool/Riffle/Run	% Fines/Grave/Larges/Bedrock
R1	.5	30	35/20/45	50/45/05/00

*From DFO/MOE Stream Survey Form - Appendix B.

6.3 RESULTS: FIELD INVESTIGATIONS

Results of field measurements at representative reach survey sites:

6.3.1 *Water Quality*

Table 19. Summary of Easy Love Creek Reach Water Quality

Reach	Date	Diss. O_2	Cond.	W. Temp	pH	Turb.
R1	Sept. 17/97	13.05	.170	3.1	7.65	3.5
R1	Mar. 16/98	15.02	.174	0.4	7.79	
		mg/l	mS/cm	°C		N.T.U.

6.3.2 *Water Quantity*

Table 20. Summary of Easy Love Creek Reach Water Quantity

Reach	Date	Mean Velocity	Mean Width	Mean Depth	K*	Discharge
R1	Sept. 17/97	0.19	2.75	0.25	0.75	0.1
		m/s	m	m	0.75-0.9	m/s^3

* K= Constant to account for bottom roughness (0.75-0.9, depending on if smooth or rough stream bottom), MOE/DFO 1994.

During the winter survey in March 1998 ice cover near the mouth was frozen to the stream bottom.

6.3.3 *Adult Chinook Salmon*

No evidence of adult salmon or spawning activity was observed.

6.3.4 *Juvenile Chinook Salmon*

Easy Love Creek was extensively surveyed by foot and trapped from September 16 to 17. No jcs were caught in reach #1 below the beaver dams or above. Only those traps below potential obstructions/barriers were used to calculate CPUE. Summary in Appendix A.

Table 21. JCS Catch Summary.

EASY LOVE	R1
# Traps	2
# Days	2
# JCS	0
Mean CPUE	0

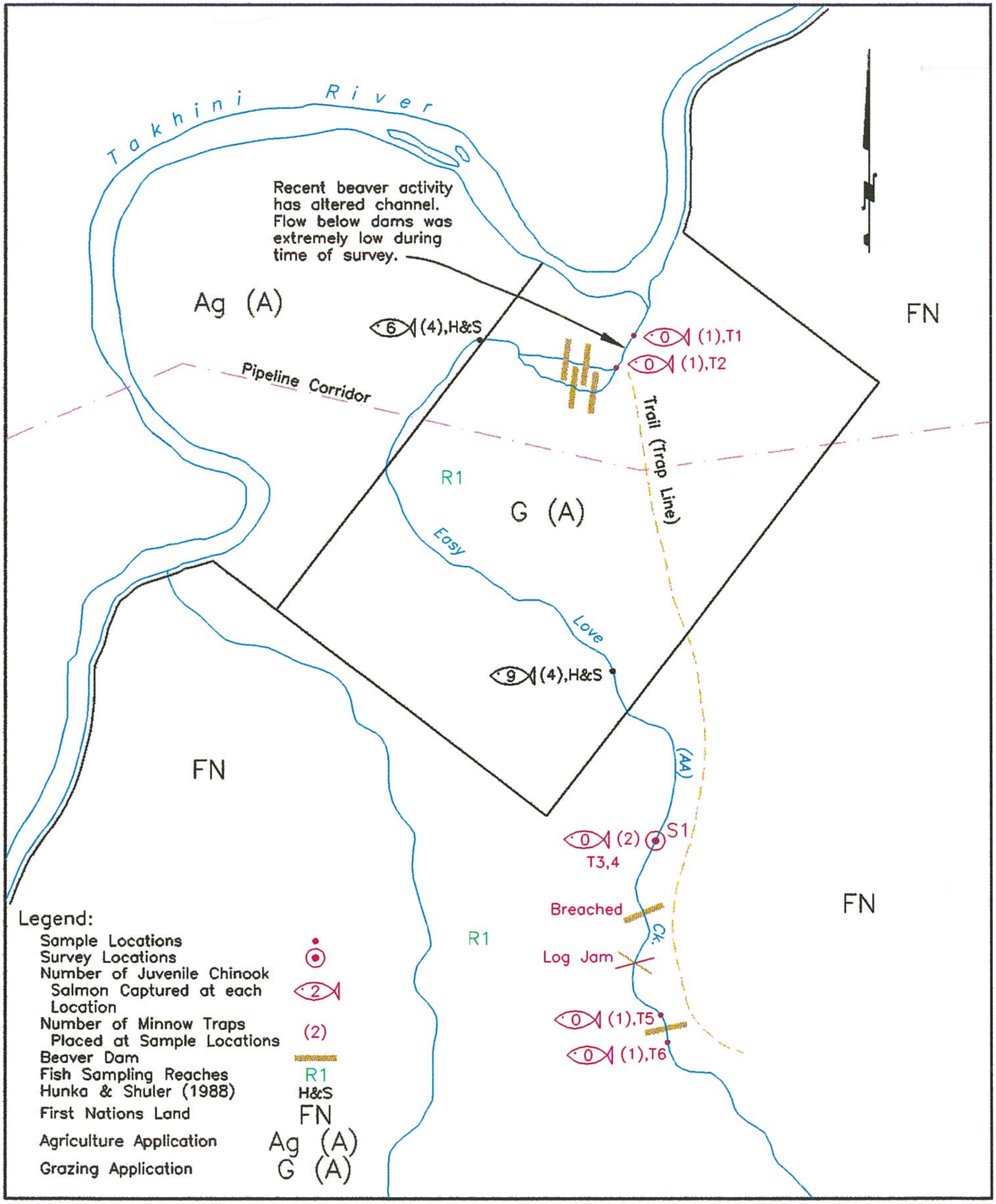


FIGURE 5 : EASY LOVE (AA) CREEK

1000 0 1000 2000m

SCALE 1:30,000

Above: Beaver dam near mouth of creek. This dam may be a barrier to upstream migration of JCS.

Above: Setting a minnow trap below the beaver dam near the mouth.

Below: Stream channel approximately 4-kms upstream of the creek mouth.

Below: Minnow trap set and substrate approximately 4-km upstream of the creek mouth.

6.3.5 *Observed Land Uses*

Land use in the Easy Love Creek valley is presently limited to traffic along the trail that parallels the stream for purposes of trapping.

6.4 DISCUSSION

6.4.1 *Water Quality*

A water sample was taken from the Easy Love Creek at S1 on March 16/98 for analysis of dissolved metals. Analysis of data gathered on Easy Love Creek show the following parameters equaling or exceeding limits set for CCREM freshwater aquatic life (FAL). Values in mg/l unless stated otherwise, from Appendix D:

Aluminum (FAL-0.005-0.01)	March 1998	0.097 (dissolved)
Iron (FAL-0.3)	March 1998	0.26 (dissolved)

6.4.2 *Adult Chinook Salmon*

There is no literature, traditional knowledge or other evidence to suggest that Easy Love supported spawning Chinook salmon nor is it likely given the size, volume and general characteristics of the stream.

6.4.3 *Juvenile Chinook Salmon*

Site preference based on catch per unit effort (CPUE) suggests that the area of stream up to the beaver dams may not be favorable for jcs. This may be due in part to habitat typical of northern pike at the mouth of the stream.

The results of the trapping program suggest that the beaver dams are a barrier to jcs migration. Jcs have been previously reported utilizing this stream. In 1988 beaver activity 3.5 km upstream was reported to be a barrier. During the period of this survey, beaver activity at km 3.5 continued. Combined with beaver activity near the mouth it appears that the beaver population in Easy Love Creek is increasing.

Table 22. Comparisons of K/CPUE/SAR

EASY LOVE	R1
Mean K*	-
Mean CPUE	0
SAR**	2.75

*K- JCS Condition Factor
** SAR-Site Assessment Rating (Appendix C) from Stream Invertebrate Survey, Streamkeepers Handbook. Score of 1 (poor) to 4 (good) gives a general rating of stream health at the site.

Though no comparisons can be made to CPUE or condition factor of jcs, the SAR suggest that overall stream health based on benthic invertebrates is slightly less than acceptable.

6.5 RECOMMENDATIONS

Beaver activity in reach #1 may be a barrier to juvenile chinook salmon. With respect to beaver management, a number of options could be considered:

- may want to consider an incentive program for trappers and First Nations to trap beavers in affected areas if this is agreement with YTG beaver management guidelines.
- in conjunction with an incentive program, a minimum beaver catch quota could be set for the owner of the trapline concession in the Easy Love Creek valley.
- opening up of beaver dams following DFO/YTG beaver management guidelines.

YTG Agricultural Branch may need to re-evaluate their policy in regard to agricultural lands that are under an agreement for sale and require land clearing. Land clearing practices in and around streams, particularly small streams, may encourage successional deciduous growth near the margins of clearings and further encourage beaver activity. Consideration of a set back from the edge of the riparian zone may be necessary instead of the high water mark so that the riparian habitat is conserved.

SECTION 7

MENDENHALL RIVER

7 MENDENHALL RIVER

7.1 LITERATURE REVIEW & CONSULTATIONS

Under the Yukon Placer Authorization (1993), Mendenhall River is classified as a Type II- salmonid-rearing stream from the mouth to the outlet of Taye Lake. Taye Lake and Harrison Lake are classified as Type I- salmonid spawning waters. Cranberry Creek and an un-named tributary of Mendenhall River are classified as Type IV- streams with no fish or streams with fish having no significant use by First Nations, commercial, sport or domestic fisheries or not contributing to biological diversity.

No primary information was obtained from DFO Stream Files.

Information included in FISS deals primarily with activities surrounding the Foothills Gas Pipeline proposal (noted above). FISS map showing identified points was not available. Fish sampling from 1976-77 and 1979 reported no observations or captures of juvenile chinook. In 1988 Hunka and Shuler caught 2 jcs at the mouth of the river with no fish caught at upstream locations. CPUE was reported as 0.67 jcs/trap/day. Other species noted utilizing the Mendenhall River include arctic grayling, round whitefish, slimy sculpin, northern pike, lake whitefish (*Coregonus clupeaformis*) long nose sucker (*Catostomus catostomus*), and lake chub (*Couesius plumbeus*). Northern pike were reported in Taye Lake with lake trout (*Salvelinus namaycush*) and grayling in Harrison Lake. No information was found to suggest that the Mendenhall River has ever supported a spawning population of chinook salmon.

Mining activity in the Mendenhall River valley has been limited to claim staking of quartz claims downstream of Taye Lake and placer claims in the area of Cranberry Creek. All claims have expired.

Portions of the valley from the Alaska Highway northward were burned in a forest fire in 1958. The Resource Management Officer for the Laberge District noted that fuel wood cutting permits have been issued in the area.

UMA (1996) conducted a preliminary environmental assessment of the old U.S. military camp located at the Alaska Highway crossing of the Mendenhall River. The area was also the site of a private retail fuel outlet. Concrete foundations remain and numerous surficial dumps, as well as signs of subsurface burial. Significant concentrations of hydrocarbon constituents were measured in soil samples collected from test pits around the former retail fuel outlet and the possible movement of hydrocarbon constituents through to the groundwater table was identified. In September of 1997 UMA returned to Mendenhall River to conduct a detailed environmental investigation where their primary objectives were to delineate and quantify the extent of contamination, re-evaluate public and environmental safety, quantify the volume and types of debris and provide recommendations for remediation. Water samples collected from groundwater monitoring wells measured concentrations of light extractable hydrocarbons from 3,900 to 17,000 *ug*/L and heavy extractable hydrocarbon concentrations from 2,200 to 11,000 *ug*/L. It was noted that light and heavy extractable hydrocarbon parameters have not been established by CCME or the Yukon. Results from the groundwater monitoring wells also suggest that groundwater from the site likely seeps into the Mendenhall River. The ecological risk was considered low since the former retail fuel outlet has been decommissioned and the source of contamination has been discontinued. Groundwater sampling and monitoring was recommended to indicate any change in water quality.

J. Gibson & Associates (1993) noted that "the Mendenhall River or an unsampled source upstream has a moderate effect on the physical and ion parameters in the Takhini River immediately downstream. The impact of this source is generally not detected at any other than the immediate downstream sample site." Concentrations of oil and grease were below the detection limits of 5.0 mg/l at all mainstem Takhini River stations.

Laberge Environmental Services (1996) conducted a late winter survey on the Mendenhall River of overwintering habitat for chinook salmon and collected a water sample downstream of the Alaska Highway for analysis of dissolved metals (Appendix D) and estimated flow (Appendix E).

Indian and Northern Affairs, Water Resources Division (1995) has compiled a summary of historical flow data on the Mendenhall River (Appendix E).

Four agricultural applications for lands located within the Mendenhall River valley were under review with one agreement for sale and one grazing lease. Extensive land clearing was observed above the Alaska Highway on a parcel which had an agreement for sale.

First Nations have claimed site specific lands near the mouth of the river and on both sides of the Alaska Highway.

7.2 STREAM DESCRIPTION

The headwaters of the Mendenhall originate in the Sifton Range. The Mendenhall is fed by Taye Lake and Harrison Lake. Total drainage area of the Mendenhall is 1206 km^2. The river flows for approximately 68 km in a tortuous meander through marshy low land. Water is very cloudy and adds a significant amount of sediment into the Takhini River.

7.2.1 Reach #1

Reach #1 begins at the mouth and extends upstream approximately 35 km to the outlet of Taye Lake. The Mendenhall valley is very broad with minimal grade. Primary vegetative cover in the valley bottom is white/black spruce forest with extensive tracts of sedge/grass marsh created around old meander scars and beaver impoundments. Alder/willow predominates along portions of the stream bank and borders marshy areas. The stream flows at 0.625 m/s through a broad, un-confined valley with approximately 5% pool, 25% riffle, 70% run and a mean depth of 0.8m. Average channel width was 11 m with a wetted width of 6 m. The substrate was 90% clay/silt and 10% small cobble. Turbidity was high. Stream banks were composed of clay and averaged 1.75 m in height. The mouth of the Mendenhall has been altered by the construction of the Kusawa Lake road. The road crosses just above the mouth with the stream directed through culverts. The stream channel has been rip/rapped below the culverts. Above the culverts, the Mendenhall River moves very slowly and there is abundant aquatic vegetation typical of northern pike habitat. The area is a popular northern pike angling location.

Moderate beaver activity was observed throughout reach #1. Road access to the stream is limited to the Kusawa Lake road crossing at the mouth and the Alaska Highway Bridge.

Table 2. Summary of Mendenhall River Reach Physical Characteristics *

Reach	% Gradient	% Cover	% Pool/Riffle/Run	% Fines/Grave/Larges/Bedrock
R1	.25	25	20/00/80	90/10/00/00

*From DFO/MOE Stream Survey Form - Appendix B

7.3 RESULTS: FIELD INVESTIGATIONS

Results of field measurements at representative reach survey sites:

7.3.1 Water Quality

Table 19. Summary of Mendenhall River Reach Water Quality

Reach	Date	Diss. O_2	Cond.	W. Temp	pH	Turb.
R1	Sept 2/97	11.25	.149	9.9	8.21	20
		mg/l	mS/cm	^{0}C		N.T.U.

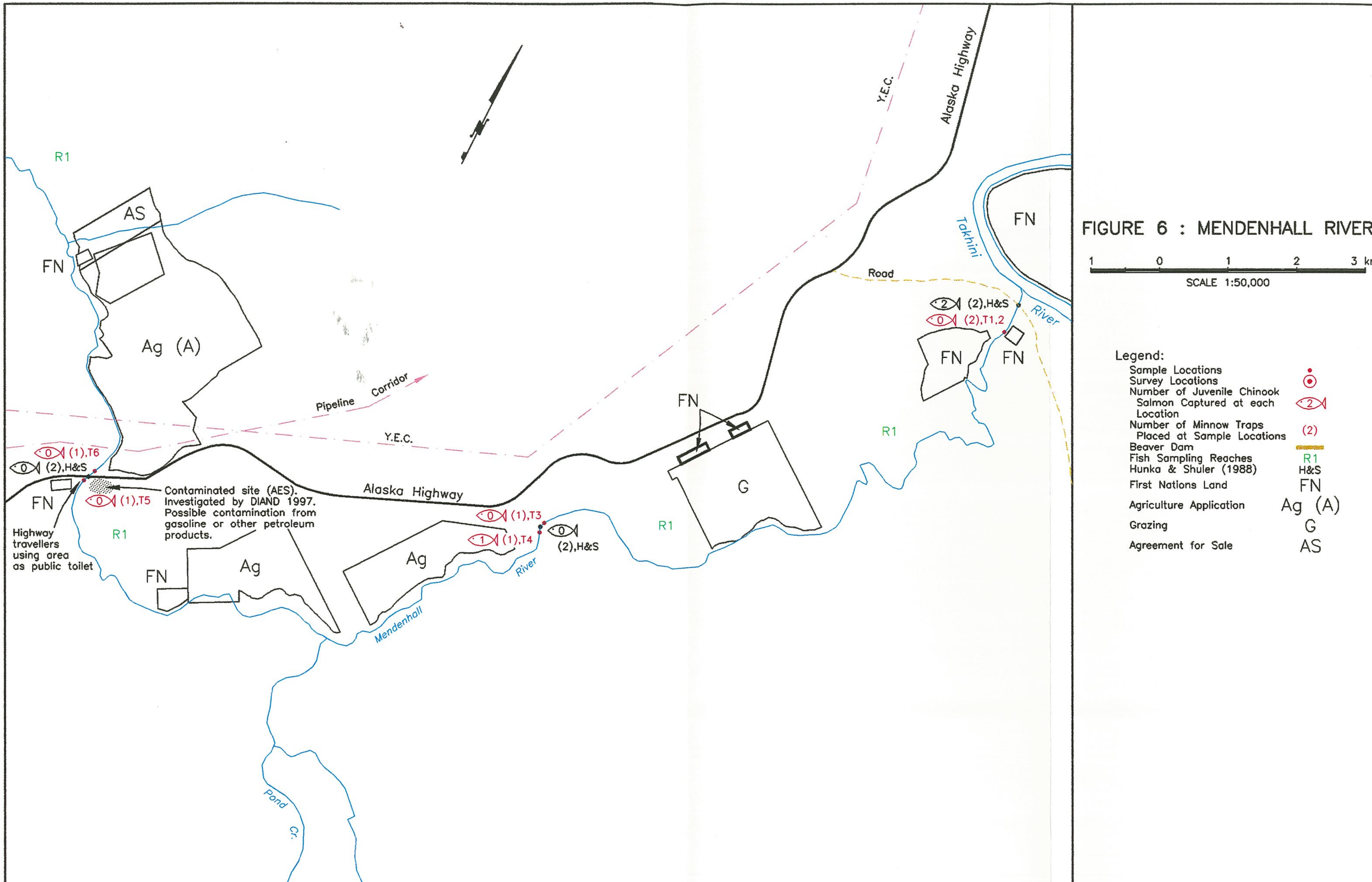


FIGURE 6 : MENDENHALL RIVER

Top: Trap site near the mouth. No JCS were captured. This is a popular Northern pike angling location.

Middle: Reach #1 midway between the mouth and the Alaska Highway Bridge.

Bottom: View of the stream above the Alaska Highway Bridge.

7.3.2 Water Quantity

Table 20. Summary of Mendenhall River Reach Water Quantity

Reach	Date	Mean Velocity	Mean Width	Mean Depth	K*	Discharge
R1	Sept 2/97	0.625	6	.8	0.75	2.25
		m/s	m	m	0.75-0.9	m/s^3

* K= Constant to account for bottom roughness (0.75-0.9, depending on if smooth or rough stream bottom), MOE/DFO 1994.

7.3.3 Adult Chinook salmon

No evidence of adult salmon or spawning activity was observed.

7.3.4 Juvenile Chinook salmon

Mendenhall River was surveyed by foot and trapped from September 1 to 2. One jcs was caught approx. 18 km from the mouth. Summary in Appendix A.

Table 21. JCS Catch Summary.

MENDENHALL	R1
# Traps	6
# Days	6
# JCS	1
Mean CPUE	0.03

7.3.5 Observed Land Uses

Clearing for agricultural activity was observed on the east side of the valley, upstream of the Alaska Highway. crossing. It would also appear that horses are being pastured in marshy meadows downstream of the Alaska Highway.

7.4 DISCUSSION

7.4.1 Water Quality

Analysis of data gathered on Mendenhall River show no parameters exceeding CCME guidelines for freshwater aquatic life (Appendix D).

7.4.2 Adult Chinook salmon

There is no literature, traditional knowledge or other evidence to suggest that the Mendenhall River supported spawning Chinook salmon.

7.4.3 Juvenile Chinook Salmon

No other obstructions or barriers were observed along the area of stream surveyed. Site preference based on catch per unit effort (CPUE) suggests that the rearing capacity of the stream for jcs is questionable as only one juvenile chinook was captured in trapping efforts. Furthermore, very few jcs have been caught in past efforts. Turbidity may be a limiting factor. The SAR value suggests that overall stream health based on benthic invertebrates is slightly less than acceptable. In fact, the Mendenhall River site was one of the poorest sites with respect to benthic invertebrates where only 23 organisms and 8 taxa were counted from 3 Surber samples Appendix C). It may be that the river is utilized as a migratory route to the numerous smaller tributaries.

Table 22. Comparison of K/CPUE/SAR

MENDENHALL	R1
Mean K*	0.99
Mean CPUE	0.03
SAR**	2.75

*K- JCS Condition Factor
** SAR-Site Assessment Rating (Appendix C) from Stream Invertebrate Survey, Streamkeepers Handbook. Score of 1 (poor) to 4 (good) gives a general rating of stream health at the site.

7.5 RECOMMENDATIONS

YTG Agricultural Branch may need to re-evaluate their policy in regard to agricultural lands that are under an agreement for sale and require land clearing. Land clearing practices in and around streams, particularly small streams, may encourage successional deciduous growth near the margins of clearings and further encourage beaver activity. Consideration of a set back from the edge of the riparian zone may be necessary instead of the high water mark so that the riparian habitat is conserved.

SECTION 8

STONY CREEK

8 STONY CREEK

8.1 LITERATURE REVIEW & CONSULTATIONS

Under the Yukon Placer Authorization (1993), Stony Creek is classified as a Type I- salmonid spawning stream from the mouth to the Alaska Highway. Above the highway Stony Creek is classified as Type V- other streams not assigned to categories I, II, III or IV.

Information included in FISS deals primarily with activities surrounding the Foothills Gas Pipeline proposal. Jcs were documented utilizing the stream as early as 1979. Significant numbers of jcs were captured in 1988 and the creek was noted as having good rearing habitat and overwintering potential. FISS map showing identified points was not available. Other species noted utilizing Stony Creek include grayling, and slimy sculpin.

Hunka and Shuler (1988) reported a CPUE of 36.5 jcs near the mouth, a CPUE of 15 jcs 2-3km upstream and a CPUE of 10.5 jcs 3-4km upstream the mouth of Stony Creek. Extent of jcs distribution was recorded with 2 jcs captured in one minnow trap approximately 1.1 km above the highway. It was noted that Stony Creek had the largest number of jcs captured in one trap of any tributary within the three areas of their study.

In 1989 DFO staff repeated jcs sampling on Stony Creek as record rainfall in 1988 may have affected extent of jcs distribution. Jcs were captured 2.1 km upstream the highway crossing, 1 km above the 1988 limit of distribution, and in considerable numbers. Extent of distribution was recorded with 19 jcs captured in one minnow trap set for 48 hours. Comment was made regarding the high stream gradient (avg. 6%) and coarse substrate (almost entirely boulder). Upstream limit of jcs distribution was not determined. (DFO Stream Files)

DFO Stream Files indicate that in 1995 the section of Stony Creek above the highway was reclassified as Type II to the 2900 foot contour interval as a result of a placer application. In the rationale for classification it was noted that jcs have been captured within the area of mining related activity. It was also noted that spawning chinook have been observed immediately upstream and downstream of the upstream mouth of Stony Creek. The culvert at the Alaska Highway crossing was replaced in 1984. A reference was made to the construction of an irrigation ditch during the period 1960-64 which diverted a portion of flow from Stony Creek above the highway for agricultural purposes. The water use license was assigned to Mr. C. LaPrairie of the LaPrairie Bison Ranch in 1989.

Yukon Territorial Water Board (YTWB) records show that in June 1993 Water Resources inspectors noted that there was no fish screen on the irrigation ditch headgate. In 1994 the LaPrairie Bison Ranch made repairs to the old ditch headgate installing a fish screen and made an application for a new license. In June 1995 YTWB Environmental Assessment Officer and Water Resources inspectors observed water flowing in the ditch and onto the property of the LaPrairie Bison Ranch and noted that there was no screen at the headgate to exclude fish. In Aug. 1995 the LaPrairie Bison Ranch received a water license to use water from Stony Creek for agricultural purposes. Concern was expressed by DFO regarding destruction of fish with improper screening and diversion of flow during summer low flow periods in Stony Creek which may have an impact on the ability of the stream to support fish downstream. Water license conditions as they relate to fish stipulate that the headgate be properly screened and that the amount of water withdrawn is limited to 5 m^3/min from June 1 to June 30, 3.5 m^3/min from July 1 to July 15 and 2.3 m^3/min from July 16 to December 31 of any year. The license expires on Oct. 31, 2015. Also, an annual report is to be submitted to the board describing water use operations and quantity of water, variances, and rate, type and amount of fertilizer used. One report was submitted for water used in 1992. No subsequent annual reports were available at YTWB or Water Resources.

Inquiries have been made to the YTWB with respect to Stony Creek in regard to obtaining a water use license for agricultural purposes on Agricultural Application #108. The boundary of lands applied for parallel Stony Creek on the west side from the highway to the mouth.

Lori Carey submitted a Notice of Water Use/Waste Deposit Without a License to the YTWB in May of 1997, noting

a water quantity of 9 m^3/day for placer mining purposes. Completion date was Oct. 1997.
Don MacLean submitted a Notice of Water Use/Waste Deposit Without a License to the YTWB in April of 1996, noting a water quantity of 30 m^3/day for placer mining purposes. Completion date is 2008.

Richard Brais submitted a Notice of Water Use/Waste Deposit Without a License to the YTWB in July of 1996, noting a water quantity of 30 m^3/day for placer mining purposes. Completion date is June 2008.

Mining activity in the Stony Creek occurs approximately 900 m above the Alaska Highway and extends approximately 1.5 km up the valley. Seven claims were recorded by 6 individuals at the Whitehorse District Mine Recorder's office and of those only 3 submitted a schedule III- Notice of Water Use/Waste Deposit Without a License to the YTWB. None of the claims were recently inspected for work (June 1997) by the mining inspector. One claim expired prior to the 1997 survey.

In Oct. 1995 the district Placer Inspector and DFO staff conducted an on-site inspection of Stony Creek upstream of the Alaska Highway. At that time it was noted that the result of mining material had been deposited in the stream and riparian vegetation had been cut and piled into the creek. At one location excavated material was wasted along and into the creek forming a berm to isolate the processing area from the channel. It appeared as though the miners had walked away from the site. DFO surmised that mining debris would be flushed downstream during the course of the next spring freshet. (YTWB)

UMA (1996) conducted a preliminary environmental assessment of the old U.S. military camp located at Stony Creek. Aside from the metal debris and concrete foundations, they found very low levels of polycyclic aormatic hydrocarbons (PAH), as well as trace amounts of organo-chlorine pesticides in one of the soil samples, located approximately 200 m from the west side of the stream and 300 m north of the highway, and noted that measured levels were below remediation criteria. In another soil sample approximately 100 m from the above sample, concentrations of all inorganic elements were below CCME Residential /Parkland (CCME R/P) criteria, with the exception of zinc and copper. Zinc was measured at 605ppm (500 ppm criteria) and copper was measured at 115 ppm (100 ppm criteria). A hydrocarbon stain approximately 50 m form the east side of the stream and 200 m from the highway contained low concentrations of PAH compounds and a total extractable hydrocarbons (TEH) concentration of 900 ppm. It was also noted that zinc and lead concentrations were above background conditions though below CCME R/P criteria. A standing water sample was collected from a nearby slough and analysis showed concentrations of aluminum, barium, manganese, phosphorous and zinc were above CCME Freshwater Aquatic Life criteria. A water sample was collected from a ditch which drains into the east bank of Stony Creek where the old road crosses the stream. Measured concentrations of inorganic elements were below CCME Freshwater Aquatic Life criteria, with the exception of zinc which was measured at a concentration equivalent to the criteria. It was noted that both water sampling locations are potential receptors of surface water runoff from nearby contaminated sites. Groundwater was not sampled for contaminants.

In September of 1997 UMA returned to Stony Creek to conduct a detailed environmental investigation where their primary objectives were to delineate and quantify the extent of contamination, re-evaluate public and environmental safety, quantify the volume and types of debris and provide recommendations for remediation. The area of the hydrocarbon stain was resampled and in two soil samples TEH (1,590 ppm and 16,240 ppm) exceeded the Yukon Territorial Guidelines. The volume of contaminated soil was estimated to be approximately 30 m^3 extending to a depth of approximately 1 m. The report concluded that the risk to the environment was low and recommended the excavation and disposal of hydrocarbon contaminated soil.

Laberge Environmental Services (1996) conducted a late winter survey on Stony Creek of overwintering habitat for chinook salmon and collected a water sample upstream of the Alaska Highway for analysis of dissolved metals (Appendix D) and estimated flow (Appendix E).

Gibson & Assoc. (1993) collected a water sample approximately 1.5 km upstream the mouth in July of 1993 for analysis of total metals, estimated flow, and reported Northern Affairs Program water sampling results for 1987 and 1988, and flow measurement for 1987 (Appendices D & E).

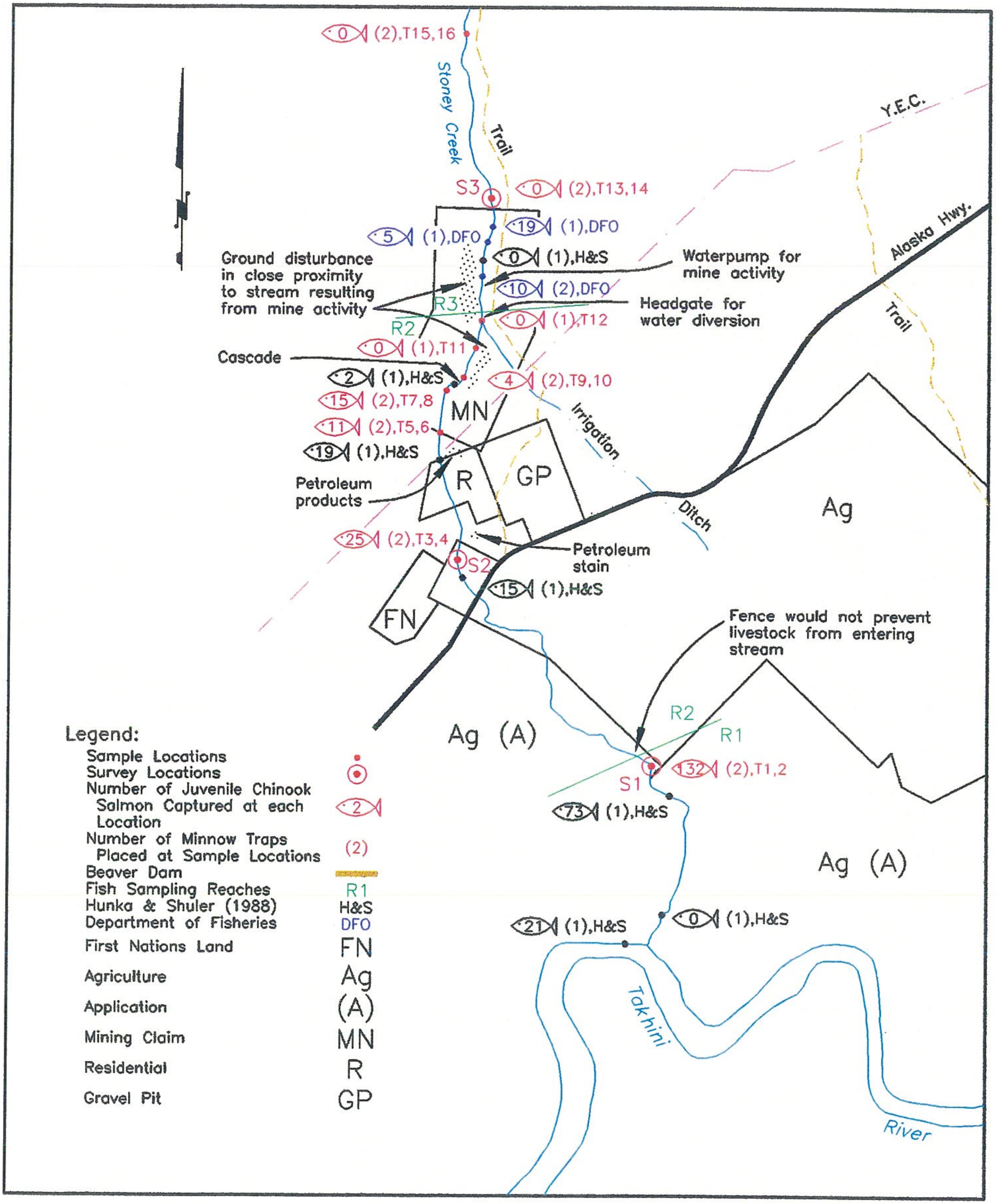
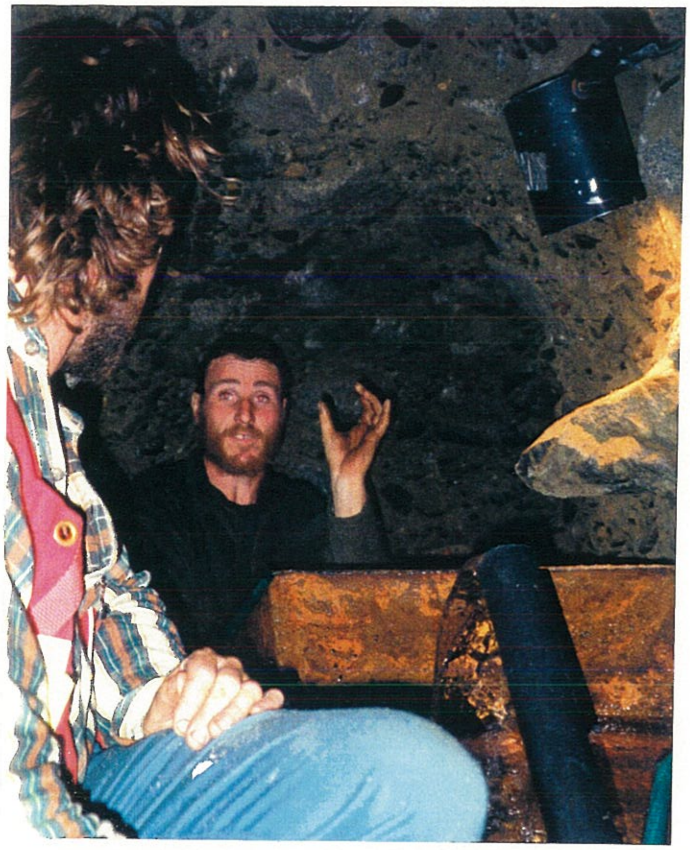
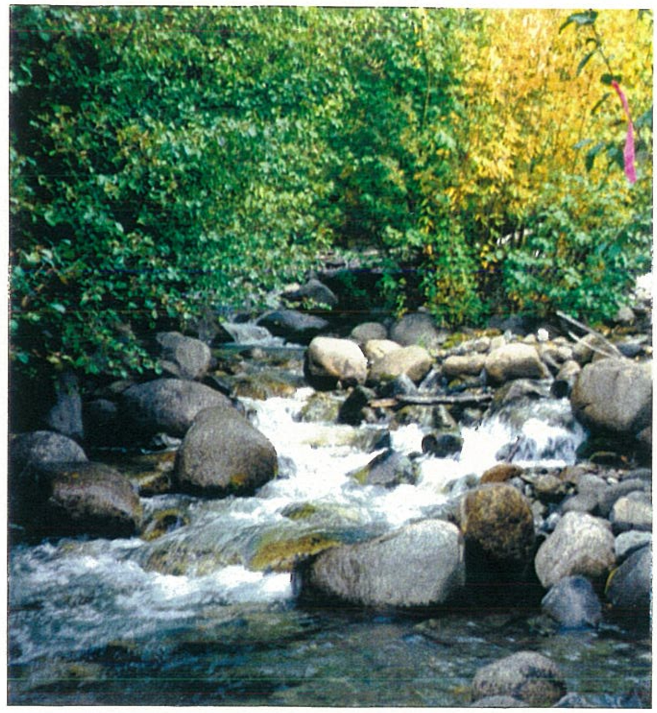


FIGURE 7 : STONEY CREEK

1000 0 1000 2000m

SCALE 1:30,000





Boulder Cascade in Reach #3. Traps T7 and T8, 15 JCS were captured. In traps T9 and T10 4 JCS were captured.

Above Left: Underground mine belonging to Richard Brais in Reach #3.

Above Left: Minnow trap site in Reach #1. 132 JCS captured at this location. Note: the fence at stream-side.
Right: Headgate of irrigation water

Geological Survey of Canada collected a stream sediment sample for metal analysis at locations 1235 approximately 3.5 km upstream (Appendix D).

Indian and Northern Affairs, Water Resources Division (1995) has compiled a summary of historical flow data on the Stony Creek (Appendix E).

The Resource Management Officer for the Laberge District noted that the Takhini Burn started at the Stony Creek highway camp on July 8,1958. Numerous commercial and residential fuel wood cutting permits have been issued in the surrounding area.

Land claimed by First Nations extends into reach #2.

8.2 STREAM DESCRIPTION

Stony Creek originates approximately 1800 m on an un-named mountain situated between the Sifton Range and the Alaska Highway and drains an area of 45 km^2. The stream is not lake fed though there appears to be some contribution to flow from an unnamed creek approximately 300 m above the highway on the west bank. The length of Stony Creek is approximately 15 km. The stream is subject to debris torrents which in the late 1950's washed out the bridge at the highway crossing (DFO Stream Files). One local miner exclaimed that the spring freshet of 1997 was one of the largest torrents he had ever witnessed (Don MacLean, pers. comm.).

8.2.1 Reach #1.

Reach #1 extends approximately 1km upstream from the mouth. The valley has minimal grade and broadens through this reach with occasional confinement approaching the mouth. Upper benches were in post fire aspen/pine succession. Grassy pastures were common. The valley bottom near the mouth was mature spruce/alder/willow and was largely unaffected by fire. The stream flows with 33% pool, 33% riffle and 33% run in an irregular meander channel pattern. Mean velocity was 0.43 m/s. Average channel width was 6.4m, wetted width was 4.4m and mean depth was 0.14 m. Substrate was a mix of boulder/cobble/gravel/fines. Average bank height was .5 m. Turbidity was low. The stream branched into two small distributaries at the mouth. There were a number of old dry distributary channels. Distributary channels were very narrow with steep banks. During the period of the survey water levels in the Takhini River were lower than Stony Creek and flow from the creek spilled out onto a wide mud delta. Hundreds of unidentified fry were observed jumping out of the water in the Takhini River.

8.2.2 Reach #2.

Reach #2 extends upstream approximately 3.1 km. The stream flows clear over a low grade in an irregular meander channel pattern with occasional stream confinement. Forest cover was successional aspen/pine on upper benches. Forest cover in the valley bottom is alder/willow with areas of possible permafrost on the east bank immediately below the highway as evidenced by ground slumping and the "drunken" black spruce stands. The stream flowed at 0.36 m/s with 20% pool, 40% riffle and 40% run over a mixed boulder/cobble gravel/fines substrate. Average channel width was 7.1 m, wetted width was 4.9 m and mean depth was 0.16 m. Bank height averaged 0.5 m. Agricultural activity was noted on the east side of reach #2 below the highway with fencing running along stream valley bottom for much of the distance, and in the stream at one location. Little remains of the U.S army road construction camp that was located south of the highway on the west bank. The Alaska Highway crosses the stream with a culvert approximately mid reach. The Yukon Territorial Government maintains a gravel pit on the east side of the reach above the highway. The old highway maintenance camp was located just north of the highway. A private residence is located just upstream the old maintenance camp and incorporates both sides of the stream. Yukon Electric's Aishihik transmission line crosses the stream in the upper portion of the reach. This is also the southern extent of mining activity. Vehicle access to streamside is possible at several locations above the Alaska Highway. First Nations have a site-specific land claim on the west side above the highway.

8.2.3 Reach #3.

Reach #3 extends up into the mountain where the valley becomes narrow with steep slopes. The bedrock appears to be a massive granite outcrop overlaid with glacial deposits. Forest cover is alder/pine/spruce on upper benches. Alder/willow/poplar was prevalent in the valley bottom with a few mature spruce. West facing clay slopes are sage/grass and the toe of the slope is actively being eroded in a number of locations. The stream is entrenched with an irregular channel pattern. The stream exhibited 25% pool and 75% riffle characteristics. Average channel width was 10.7 m, wetted width was 3.5 m and mean depth was 0.25 m. Substrate was dominated by 60% boulder/large cobble. Bank height was 1.5 m. The grade ranges from 3.5% to over 5% creating numerous boulder cascades that range from 0.3 m to 0.6 m in height. A 4x4 trail runs along the edge of the east bench above this reach. Evidence of placer mining such as roads, garbage, cutlines, excavations etc. was common in the valley bottom especially in the lower portion of the reach.

Table 28. Summary of Stony Creek Reach Physical Characteristics *

Reach	%Gradient	% Cover	%Pool/Riffle/Run	%Fines/Gravel/Larges/Bedrock
R1	.5	15	33/33/33	33/33/33/00
R2	.5-1	15	20/40/40	20/30/50/00
R3	3.5-5	35	25/75/00/	05/20/75/00

*From DFO/MOE Stream Survey Form - Appendix B.

8.3 RESULTS: FIELD INVESTIGATIONS

8.3.1 Water Quality

Table 29. Summary of Stony Creek Reach Water Quality

Reach	Date	Doss. 0_2	Cond.	W. Temp	pH	Turb.
R1	Sept. 2/97	10.98	.152	8.8	8.09	2
R2	Sept. 3/97	11.48	.144	8.5	8.16	1
R3	Sept. 3/97	11.74	.107	7.1	8.16	1
		mg/l	mS/cm	^{0}C		N.T.U.

8.3.2 Water Quantity

Table 30. Summary of Stony Creek Reach Water Quantity

Reach	Date	Mean Velocity	Mean Width	Mean Depth	K*	Discharge
R1	Sept. 2/97	0.43	4.4	0.14	0.75	0.2
R2	Sept. 3/97	0.36	4.9	0.16	0.8	0.23
R3	Sept. 3/97	0.625	3.5	0.25	0.9	0.49
		m/s	m	m	0.75-0.9	m/s^3

* K= Constant to account for bottom roughness (0.75-0.9, depending on if smooth or rough stream bottom), MOE/DFO (1994).

8.3.3 Adult Chinook Salmon

Reach #1 was surveyed on Sept. 2 and the mouth was extensively surveyed by foot on Sept. 9. No evidence of adult salmon or spawning activity was observed.

8.3.4 Juvenile Chinook Salmon

Jcs were caught in reaches #1 and #2. In reach #3 no jcs were caught. All reaches were extensively surveyed by foot and trapped from Sept. 2-3 and Sept. 8-10. Table 31 includes only those jcs captured at survey sites for comparison of site preference. As no fish were caught in reach #3 minnow traps T5-T12 were deployed to determine if a possible obstruction/barrier existed. Summary in Appendix A.

Table 31. JCS Catch Summary.

STONY	S1	S2	S3
# Traps	2	2	4
# Days	2	4	4
# JCS	132	25	0
Mean CPUE	33	3.13	

8.3.5 Observed Land Uses

Fencing near the area of S1 would not prevent livestock from entering the stream. The remaining concrete foundation of the old highway maintenance camp located just north of the highway is being undercut by stream action and appears to be eroding into the stream. A cache of equipment and fuel is located on the east bank near the YEC power line. A full fuel barrel was unsealed, standing vertical with a piece of plywood covering the top approximately 25-30 m from the stream. No recent activity was observed and the area appears to be abandoned. Further upstream on a claim staked by Donald McEachern, was evidence that a heavy piece of machinery had walked through the stream in a number of locations as alder were pushed over into the stream. Excavations were made at numerous locations in close proximity to the channel. Debris and garbage were left behind at the abandoned campsite. At the diversion ditch headgate no recent activity was observed and the ditch appeared dry. Mr. Brais was present at his mining operation 200 m above the ditch headgate. He is tunneling using hand tools and explosives into a bluff, the toe of which is being eroded just upstream. Waste from Mr. Brais' operation is deposited onto a small bench just above the stream. The upper valley is interspersed with a network of trails that are frequented by 4x4 vehicles.

8.4 DISCUSSION

8.4.1 Water Quality

Analysis of data gathered on Stony Creek show the following parameters equaling or exceeding limits set for CCREM freshwater aquatic life (FAL). Values in mg/l unless stated otherwise, from Appendix D:

Aluminum (FAL-0.005-0.1)	Aug. 1987	0.52 (total)
Iron (FAL-0.3)	Aug. 1987	0.42 (total)

8.4.2 Adult Chinook Salmon

There is no literature, traditional knowledge or other evidence to suggest that the Mendenhall River supported spawning chinook salmon.

8.4.3 Juvenile Chinook Salmon

Jcs were captured in reaches #1 and #2. Previous studies indicate that jcs also utilize reach #3. No jcs were captured in reach #3 despite intensive efforts. In traps T5 to T8 a total of 26 jcs were caught below a boulder cascade located midway between the powerline and the ditch headgate. Above the cascade only 4 jcs were captured. This appears to be the limit of jcs upstream migration. Other boulder cascades were observed upstream. It may be likely that the spring torrent may have carried some of the large cobbles and boulders downstream to a point where they accumulated creating a buildup. At a number of locations just upstream was evidence that a heavy piece of equipment had walked into the stream and had moved material into the stream. Land and water use associated with mining and agriculture may have had a cumulative impact though this is inconclusive. The results of the trapping program suggest that the boulder cascades in reaches #2 and #3 may be an obstruction to juvenile upstream migration, particularly during summer low flows.

Table 32. Comparisons of K/CPUE/SAR

STONY	R1	R2	R3
Mean K*	1.01	1.09	
Mean CPUE	33	3.13	
SAR**	3.25	4	3.75

*K- JCS Condition Factor

** SAR-Site Assessment Rating (Appendix C) from Stream Invertebrate Survey, Streamkeepers Handbook. Score of 1 (poor) to 4 (good) gives a general rating of stream health at the site.

Site preference based on catch per unit effort (CPUE) suggests that reach #1 is preferred jcs habitat though the SAR values for reaches #2 and #3 are good and the mean condition factor in reach #2 is higher than reach #1. Based on the SAR score for reach #3, there appears to be favorable habitat available. Of all the streams surveyed, Stony Creek had the highest count of benthic organisms in reach #3 with 1078 individuals and 25 taxa (Appendix C).

8.5 RECOMMENDATIONS

May require close monitoring of mining activities adjacent to the stream to ensure compliance with existing regulations.

Water use/withdrawal should be re-evaluated on Stony Creek and the issuance of new licenses should be suspended pending further evaluation as water withdrawal may have an impact on rearing jcs. Also, Stony Creek should be re-investigated to determine whether land use, water use, or both have had a conclusive impact, as water levels during the 1997 survey may have been low.

The concrete foundation located adjacent to the stream above the highway should be removed.

YTG Agricultural Branch may need to re-evaluate their policy in regard to agricultural lands that are under an agreement for sale and require land clearing. Land clearing practices in and around streams, particularly small streams, may encourage successional deciduous growth near the margins of clearings and further encourage beaver activity. Consideration of a set back from the edge of the riparian zone may be necessary instead of the high water mark so that the riparian habitat is conserved. This may be more appropriate to the lower section of reach #1.

SECTION 9

THIRTYSEVEN MILE CREEK

9 THIRTYSEVEN MILE CREEK

9.1 LITERATURE REVIEW & CONSULTATIONS

Under the Yukon Placer Authorization (1993), Thirtyseven Mile Creek is classified as a Type II- salmonid rearing stream from the mouth to approximately 3km upstream, the old highway crossing. Thirtyseven Mile Lake is classified as Type I salmonid spawning waters.

Contained in DFO Stream Files is a 1974 reference to Thirtyseven Mile Lake. Lake trout and burbot were caught in a gillnet. Several of the lake trout caught were " suffering from body atrophy i.e., large overdeveloped head with grossly elongated slender body". Also, several of the trout were infested with parasites which were thought to be leeches.

Information included in FISS deals primarily with activities surrounding the Foothills Gas Pipeline proposal (noted above). An alternative route was considered for the pipeline which would have crossed Thirtyseven Mile Creek. As a result the stream was sampled for fish in 1978 with captures of arctic grayling and slimy sculpin. In 1988 Hunka and Shuler captured 36 jcs at the old highway crossing and reported a CPUE of 18 jcs/trap/day. FISS map showing identified points was not available.

Hunka and Shuler (1988) recorded beaver dams approximately 7.3, 9.75 and 12.25 km upstream. No jcs were captured beyond the old highway crossing.

Eight claims were recorded at the office of the Whitehorse District Mine Recorder 21 km upstream the mouth of Thirtyseven Mile Creek. Payment was made in lieu of work.

First Nations have claimed land in the immediately below the old highway crossing on both sides of the stream and have site specific claims approximately 0.5 km and 7 km upstream the old highway.

Gibson & Assoc. (1993) collected a water sample approximately 1.5 km upstream the mouth in July of 1993 for analysis of total metals, estimated flow, and reported Northern Affairs Program water sampling results for 1987 and 1988 (Appendices D & E).

Laberge Environmental Services (1996) conducted a late winter survey on Thirtyseven Mile Creek of overwintering habitat for chinook salmon and collected a water sample upstream of the old highway crossing for analysis of dissolved metals (Appendix D) and estimated flow (Appendix E).

An agricultural application is under review for land located north of the old highway and west of the stream.

YTG has a bridge head reserve of 300m X 300m at the old highway crossing.

9.2 STREAM DESCRIPTION

The headwaters of Thirtyseven Mile Creek originate in the Sifton Range. The creek drains an area of approximately 211 km^2, including two small un-named lakes in its upper reaches, and is approximately 30 km in length. The Thirtyseven Mile Creek valley was extensively burned in the 1958 fire. Beaver activity was noted in all three reaches.

9.2.1 Reach #1.

Reach #1 extends approximately 3 km upstream from the mouth. The valley has a low grade and is fairly broad causing only occasional stream confinement. Forest cover on the benches above the valley are successional pine. The valley bottom had large marshy areas vegetated by stunted alder/willow and likely underlain with permafrost, as characteristic frost heaves were frequently evident with stands of "drunken" black spruce. Isolated stands of mature white spruce were present in some areas and large, thickly congested alder/willow was common along the stream course. The stream flowed at 0.42 m/s over a low grade in an irregular meander pattern with 30% pool, 20% riffle and 50% run in stretches of the stream unaffected by beaver activity. Average channel width was 7.1 m with an average wetted width of 4.8 m and a mean depth of 0.32 m. Substrate was composed mainly of small gravels and clay with a sprinkling of cobbles and boulders. Bank height averaged 0.75 m. The first 500 m upstream the mouth of Thirtyseven Mile Creek was broad, weedy and shallow. Beaver was highly active in reach #1. Yukon Electric's Aishihik transmission line crosses the stream in the upper end of reach #1. Vehicle access to the reach is by way of the trail below the power line and a dirt track that services live stock corrals and a barn at the mouth of the stream.

9.2.2 Reach #2.

Reach #2 extends approximately 5 km upstream from the terminus of reach #1. The valley begins to narrow at this point. Forest cover was successional alder/pine on the upper benches with poplar/spruce prevalent in the valley bottom and alder/willow growing thickly along the stream course. The stream channel is confined and channel pattern is irregular. The stream flows over a moderate grade at 0.64 m/s with 20% pool, 40% riffle and 40% run. Average channel width was 0.35 m with an average wetted width of 2.7 m and a mean depth of 0.3m. Substrate was estimated at 60% cobble/boulder, 20% gravels and 20% fines. Bank height was 1 m on average. Little sign of beaver activity was noted in this reach. A road runs parallel to the entire reach along its upper bench. The stream is crossed by a roughly constructed bridge near the beginning of the reach at the old highway crossing

9.2.3 Reach #3.

Reach #3 extends upstream over a broad valley. Forest cover is successional aspen/pine on the upper benches with marshy sedge/grass/alder/willow predominating in the valley bottom. The stream flows with occasional channel confinement in an irregular meander channel pattern over a moderately low gradient at 0.44 m/s with 40% pool, 25% riffle and 35% run. Average channel width was 3.3 m with an average wetted width of 2.9 m and a mean depth of 0.35 m. Substrate was predominantly boulder/large cobble. Banks were steep, undercut and averaged 1m in height. Beaver activity was observed in this reach. A road parallels the reach along the east bench. There was little sign of human activity in the valley bottom.

Table 33. Summary of Thirtyseven Mile Creek Reach Physical Characteristics *

Reach	% Gradient	% Cover	% Pool/Riffle/Run	% Fines/Grave/Larges/Bedrock
R1	.5	20	30/20/50	35/50/15/00
R2	1-2	35	20/42040	20/20/60/00
R3	.75	35	25/75/00/	10/00/90/00

*From DFO/MOE Stream Survey Form - Appendix B.

9.3 RESULTS: FIELD INVESTIGATIONS

Results of field measurements at representative reach survey sites:

9.3.1 Water Quality

Table 34. Summary of Thirtyseven Mile Creek Reach Water Quality

Reach	Date	Diss. O_2	Cond.	W. Temp	pH	Turb.
R1	Sept. 15/97	11.96	.192	6.2	7.8	5.7
R2	Sept. 11/97	11.15	.175	8.2	8.05	4
R3	Sept. 11/97	10.2	.140	9.5	7.67	3
		mg/l	mS/cm	^{0}C		N.T.U.

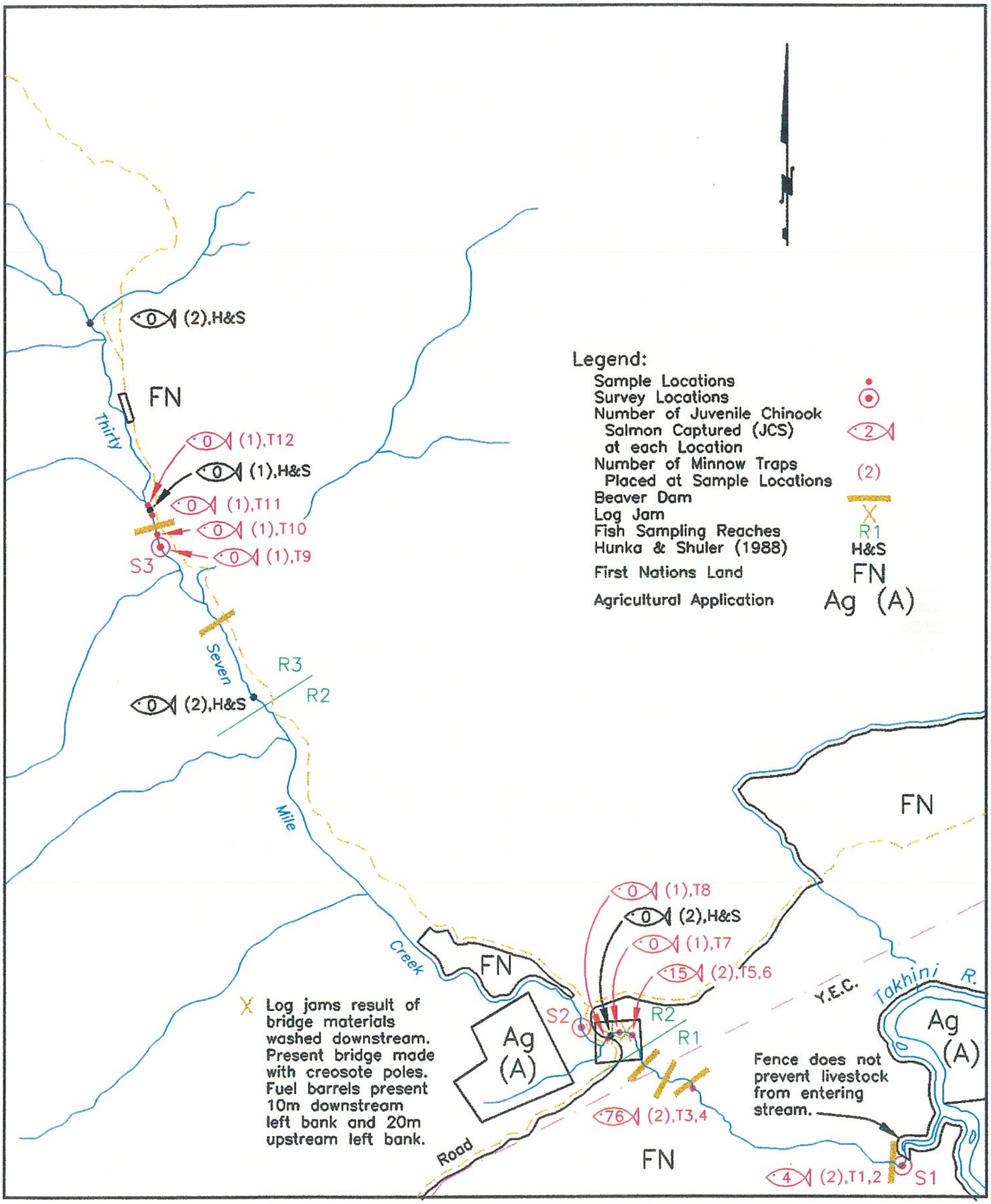
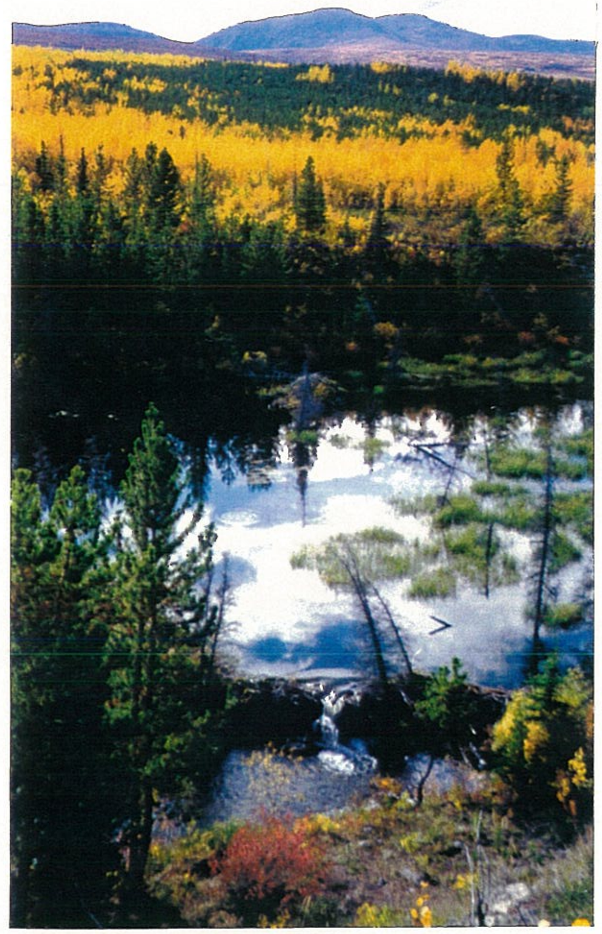


FIGURE 8 : THIRTY SEVEN MILE CREEK

1 0 1 2 3 km

SCALE 1:50,000



Above Left: Debris from washed out bridges created this log jam and impounment in Reach #2. This log jam appeared to be a barrier to JCS migration.

Right: Beaver activity in Reach #3.

Above: Bridge at road crossing in Reach #2. Washouts from this site are responsible for the log jam in the photo at top left of page.

9.3.2 Water Quantity

Table 35. Summary of Thirtyseven Mile Creek Reach Water Quantity

Reach	Date	Mean Velocity	Mean Width	Mean Depth	K*	Discharge
R1	Sept. 15/97	0.42	4.8	0.32	0.75	0.48
R2	Sept. 11/97	0.64	2.7	0.3	0.8	0.41
R3	Sept. 11/97	0.44	2.9	0.35	0.9	0.41
		m/s	m	m	0.75-0.9	m/s^3

* K= Constant to account for bottom roughness (0.75-0.9, depending on if smooth or rough stream bottom), MOE/DFO (1994).

9.3.3 Adult Chinook Salmon

The mouth of Thirtyseven Mile Creek was extensively surveyed by foot on Sept. 15 and 16. No evidence of adult salmon or spawning activity was observed.

9.3.4 Juvenile Chinook Salmon

JCS were captured in this study in reach #1 and the lower portion of reach #2. All reaches were extensively surveyed by foot and trapped from Sept. 11-12 and Sept. 15-16. Table 36 includes those jcs captured at survey site S1 and below the logjam at S2 for comparison of site preference. Though significant numbers of jcs were captured at minnow traps T3 and T4 the presence of beaver dams may pose an obstruction causing a bottleneck to migration. The same could be said of the logjam below S2 and above S1 so results should be viewed with caution. Summary in Appendix A.

Table 36. JCS Catch Summary.

THIRTYSEVEN MILE	S1	S2	S3
# Traps	2	2	4
# Days	2	2	4
# JCS	4	15	0
Mean CPUE	1	3.75	

9.3.5 Observed Land Uses

A corral near the mouth does not prevent livestock from entering the stream, as hoof prints were evident along the banks and in the channel. Below the old highway was a logjam comprised of debris that appeared to be materials that were once used to construct a bridge. The present bridge is roughly constructed and may washout during a spring freshet. Old fuel barrels were embedded in the bank up and downstream of the bridge and appeared empty.

9.4 DISCUSSION

9.4.1 Water Quality

Analysis of data gathered on Thirtyseven Mile Creek show the following parameters equaling or exceeding limits set for CCREM freshwater aquatic life (FAL). Values in mg/l unless stated otherwise, from Appendix D:

Aluminum (FAL-0.005-0.1)	Aug. 1987	1.28 (total)
	Aug. 1988	0.70 (total)
	July 1993	0.239 (total)
Copper (FAL-0.002-0.004)	Aug. 1987	0.005 (total)
Iron (FAL-0.3)	Aug. 1987	1.20 (total)
	Aug. 1988	0.704 (total)
	July 1993	0.568 (total)

Lead (FAL-0.001-0.007)	Aug. 1987	0.05 (total)
	July 1993	0.008 (total)

9.4.2 Adult Chinook Salmon

There is no literature, traditional knowledge or other evidence to suggest that Thirtyseven Mile Creek supported spawning Chinook salmon.

9.4.3 Juvenile Chinook Salmon

Jcs were captured in reaches #1 and #2. No jcs were captured in reach #3. The results of the trapping program suggest that the beaver dams in reach #1 may pose an obstruction as fewer jcs reached the old highway crossing. The logjam immediately downstream of the highway crossing appears to be a barrier to jcs upstream migration. Site preference based on catch per unit effort (CPUE) suggests that reach #2 is preferred jcs habitat and the SAR score for reach #2 is good though the mean condition factor in reach #2 is lower than reach #1. Reach #3 appears to be good rearing habitat based on the SAR value and, in comparison to the SAR scores and subsequent CPUE and condition factor of the lower reaches. It is likely that beaver activity further upstream in reach #3 may pose a barrier to jcs upstream migration.

Table 37. Comparisons of K/CPUE/SAR

STONY	R1	R2	R3
Mean K*	1.12	1.07	
Mean CPUE	1	3.75	
SAR**	2.5	3.75	3.75

*K- JCS Condition Factor

** SAR-Site Assessment Rating from Stream Invertebrate Survey, Streamkeepers Handbook. Score of 1 (poor) to 4 (good) gives a general rating of stream health at the site.

9.5 RECOMMENDATIONS

The debris logjam downstream of the old highway crossing may be a barrier to jcs migration and should be removed. The bridgehead reserve belongs to YTG. Construction of a bridge capable of withstanding highwater events should be considered.

Beaver activity in reach #1 is an obstruction to jcs migration, and in reach #3 beaver dams may be a barrier to jcs. With respect to beaver management, a number of options could be considered:

- an incentive program for trappers and First Nations to trap beavers in affected areas if this is agreement with YTG beaver management guidelines.
- in conjunction with an incentive program, a minimum beaver catch quota could be set for the owner of the trapline concession.
- opening up of beaver dams following DFO/YTG beaver management guidelines.

YTG Agricultural Branch may need to re-evaluate their policy in regard to agricultural lands that are under an agreement for sale and require land clearing. Land clearing practices in and around streams, particularly small streams, may encourage successional deciduous growth near the margins of clearings and further encourage beaver activity. Consideration of a set back from the edge of the riparian zone may be necessary instead of the high water mark so that the riparian habitat is conserved.

SECTION 10

LITTLE RIVER

10 LITTLE RIVER

10.1 LITERATURE REVIEW & CONSULTATIONS

Under the Yukon Placer Authorization (1993), Little River is classified as a Type II- salmonid rearing stream from the mouth to approximately 2.5 km upstream.

No primary information was obtained from DFO Stream Files.

Information included in FISS deals primarily with activities surrounding the Foothills Gas Pipeline proposal (noted above). An alternative route was considered for the pipeline which would have crossed Little River. As a result the stream was sampled by Beak Consultants for fish in 1978 with captures of arctic grayling and slimy sculpin and longnose sucker. A chinook spawning location was referenced and the work cited was a series of maps entitled *Aquatic Resource Inventory of the Southern Lakes, Yukon* produced by D. Davies & S. Ellington in 1981. FISS map showing identified points was not available.

In 1988 Hunka and Shuler reported no captures of jcs in traps set 1.5 and 5 km upstream. It was noted that Little River was turbid throughout during the period of the survey which experienced record rainfall.

No mining claims were recorded at the office of the Whitehorse District Mine Recorder.

Nordin et.al. (1993) identified an old dump at Little River as a potential waste site. It is located north of the Takhini River Crossing on the old Dawson Trail. The dump is situated near an old highway lodge and U.S. military camp. Possible contaminants and other waste include pesticides, polychlorinated biphenyls, metal waste and other debris. Their recommendation was for more research to determine exact location and contamination potential.

First Nations have extensive land claims on both sides of the Little River valley extending 4 km upstream.

Gotthardt (1996) reports that one of the salmon fish camps of the Ta'an Kwach'an First Nation was located at the confluence of Little River and the Takhini River. The camp, called Lur Deyel, was their principle salmon fishing camp and a traditional meeting place for trade with the coastal Tlingit. In recent history the vicinity of Lur Deyel became a stopping place on the old Whitehorse to Dawson Road and was called 31 Mile. It was abandoned shortly after the construction of the Alaska Highway.

Gordon Harvey, Land Manager for the Ta'an Kwach'an First Nation explained that around the turn of the century Ta'an Kwach'an Chief Jim Boss wintered at 31 Mile where he had a hay ranch. The area was noted for its meadows and a chief visiting from Klukwan once referred to the Little River Valley as the Great Grass Valley. Mr. Harvey spoke to elder Irene Smith who with her husband Elijah Smith lived in the Takhini River Valley. She noted that the fish camp was located at the easiest place to get fish and usually along or near traditional First Nation migration routes. Though the camp was located approximately 200 m upstream Little River there was speculation that salmon were not actually spawning in Little River but that the salmon may have been corralled from the Takhini River into a fish trap at the mouth of Little River. Mrs. Smith also explained that years ago people use to pull out beaver dams as they went along on their seasonal migrations. She has noticed a change in the Takhini River valley saying that the beavers were now everywhere.

Gibson & Assoc. (1993) collected a water sample approximately 2.5 km upstream the mouth in July of 1993 for analysis of total metals, estimated flow, and reported Northern Affairs Program water sampling results for 1987 and 1988, and flow measurement for 1987 (Appendices D & E).

Laberge Environmental Services (1996) conducted a late winter survey on Little River of overwintering habitat for chinook salmon and collected a water sample upstream of the old highway crossing for analysis of dissolved metals (Appendix D) and estimated flow (Appendix E).

A grazing lease located approximately 5 km up the Little River valley recently expired.
YTG has a bridge head reserve of 300m X 300m at the old highway crossing.

10.2 STREAM DESCRIPTION

The headwaters of Little River are in the Miner Range Mountains. Little River drains an estimated area of 535 km^2 and flows approximately 38 km from its headwaters to its mouth. Most of the Little River drainage was affected by the 1958 Takhini burn.

10.2.1 Reach #1.

Reach #1 extends upstream at least 13 km from the mouth. The stream flows occasionally confined in a tortuous meander channel pattern over a low grade. Forest cover consisted of aspen/pine on upper benches with alder/willow and black spruce in the valley bottom. Potholes and frost heaving in the lower part of reach #1 may indicate intermittent permafrost. Water temperatures in the stream were cold at 5.1^{0}C. The stream flowed at 0.44 m/s with 25 % pool and 75% run. The average channel width was 14 m with an wetted width of 11.9 m and a mean depth of 0.37 m. Substrate was 95% fines with 5% small gravel. Bank height averaged 1m. The mouth is wide and deep and maintains these characteristics for approximately 600 m upstream.

Some beaver activity was noted but no damming of the river was observed. The Yukon Electric Aishihik transmission line crosses the stream near the mouth. The old Dawson trail runs parallel to the entire reach. A portion of the old Alaska Highway crosses the river with a small ATV bridge about 1.5 km above the mouth. Live stock grazing was also in evidence in the lower end of the reach.

Table 38. Summary of Little River Reach Physical Characteristics *

Reach	% Gradient	% Cover	% Pool/Riffle/Run	% Fines/Grave//Larges /Bedrock
R1	.5	5	25/00/75	95/05/00/00

*From DFO/MOE Stream Survey Form - Appendix B

10.3 RESULTS: FIELD INVESTIGATIONS

Results of field measurements at representative reach survey sites:

10.3.1 Water Quality

Table 39. Summary of Little River Reach Water Quality

Reach	Date	Diss. O_2	Cond.	W. Temp	pH	Turb.
R1	Sept. 13/97	12.1	.207	5.1	8.08	9.5
		mg/l	mS/cm	^{0}C		N.T.U.

10.3.2 Water Quantity

Table 40. Summary of Little River Reach Water Quantity

Reach	Date	Mean Velocity	Mean Width	Mean Depth	K*	Discharge
R1	Sept. 13/97	.44	11.9	.37	0.75	1.45
		m/s	m	m	0.75-0.9	m/s^3

- K= Constant to account for bottom roughness (0.75-0.9, depending on if smooth or rough stream bottom), MOE/DFO 1994.

10.3.3 Adult Chinook Salmon

The mouth of Little River was surveyed extensively by foot on Sept. 13 and no evidence of adult salmon or spawning activity was observed. Water at the mouth appeared turbid.

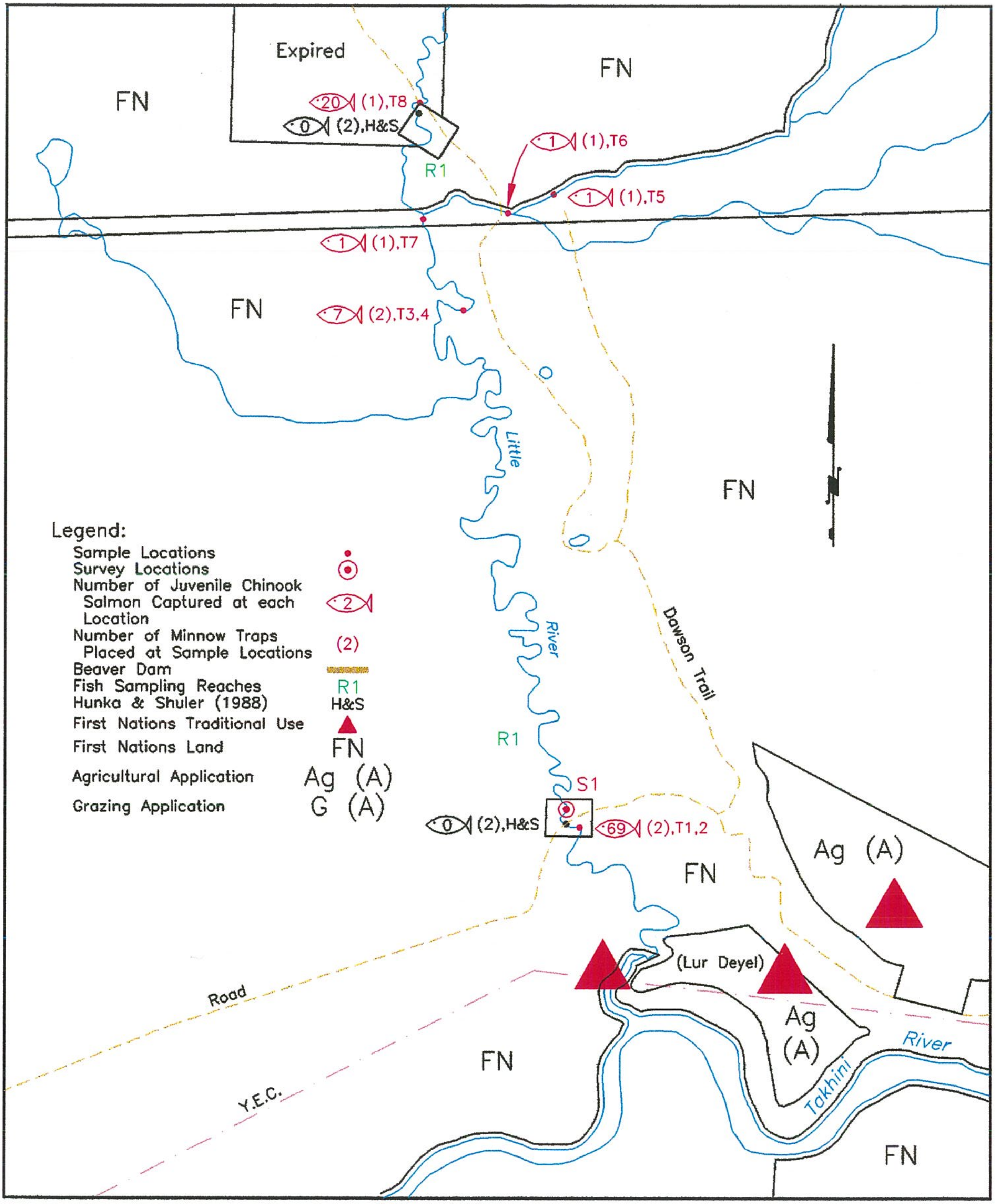
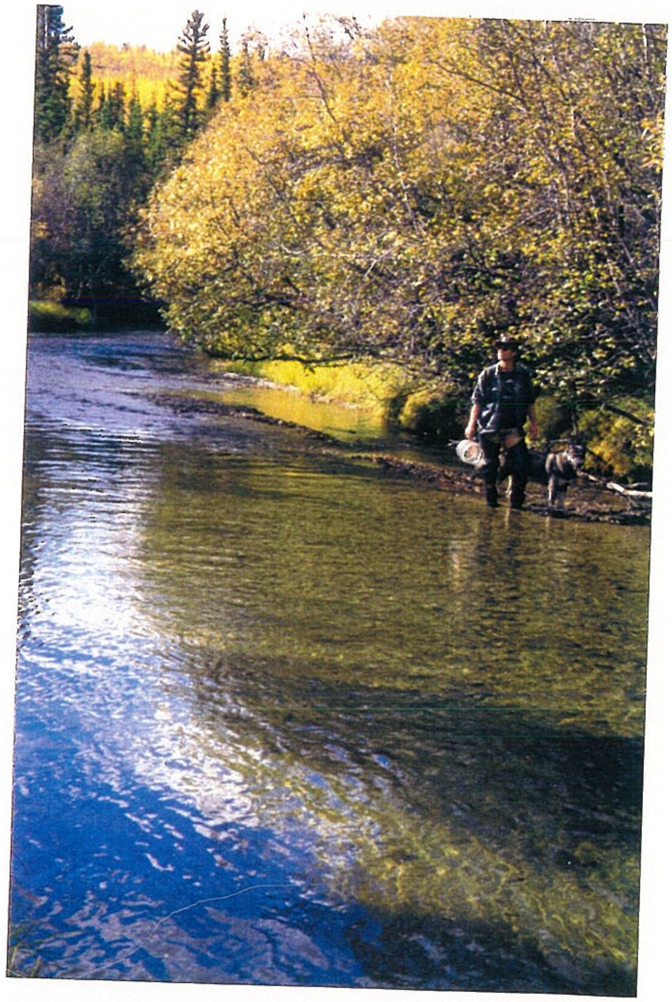


FIGURE 9 : LITTLE RIVER

1000 0 1000 2000m

SCALE 1:30,000

Right: Minnow trapping in Reach #1 Approximately 5-km upstream of the mouth.



Below: Lifting a minnow trap in Reach #1. Seven JCS caught at this location approximately 5-km upstream of the mouth.

10.3.4 Juvenile Chinook Salmon

Little River was surveyed by foot and trapped from September 12 to 13. Jcs were captured throughout the area surveyed and in significant numbers below the old highway crossing. The stream below the highway has been influenced by cobble and boulder inputs from associated road construction material at the highway crossing that has subsequently been washed into the stream. There are relatively few pockets of similar habitat, usually associated with bed load inputs from smaller tributaries, and the substrate of Little River is predominantly sand/silt and small gravel within the area surveyed. Therefore, including all the jcs to calculate CPUE may be more accurate than using just those captured at the survey site where the natural substrate was enhanced. The abundance of jcs caught at S1 suggests that one of the habitat parameters important to jcs is substrate. Summary in Appendix A.

Table 41. JCS Catch Summary.

LITTLE	R1	S1
# Traps	6	2
# Days	6	2
# JCS	97	69
Mean CPUE	2.69	17.25

Jcs were captured at T5 and T6 was a tributary which was thought to be Little River but in fact was not part of the survey. The tributary stream was braided, shallow and in the process of forming new channels as the jcs were caught in approximately 10 cm of water that was flowing over the forest floor beside a mature white spruce. Channel width was approximately 1m. Other older channels were a mix of small cobbles and gravel.

10.3.5 Land Use

At the old highway crossing a small ATV bridge spans the river. Signs of 4X4 vehicle traffic were observed at the stream crossing. Bank failure was observed where vehicles had crossed. Evidence of a fish camp was observed on the east bank. Approximately 5 km upstream is a second small bridge crossing the stream used by ATVs and horse traffic. A trail runs up through the valley which is a traditional route for First Nations. Improvements to the trail are being made. Tourism outfitters were observed utilizing the trails. Horses were observed grazing in the area near the mouth.

10.4 DISCUSSION

10.4.1 Water Quality

Analysis of data gathered on Little River show the following parameters equaling or exceeding limits set for CCREM freshwater aquatic life (FAL). Values in mg/l unless stated otherwise, from Appendix D:

Aluminum (FAL 0.005-0.01)	Aug. 1987	8.5 (total)
	Aug. 1988	4.33 (total)
	July 1993	0.198 (total)
Copper (FAL- 0.002-0.004)	Aug. 1987	0.007 (total)
	July 1993	0.004 (total)
Iron (FAL-0.3)	Aug. 1987	5.98 (total)
	Aug. 1988	3.67 (total)
	July 1993	0.275(total)

10.4.1 Adult Chinook Salmon

Though there is some literature and traditional knowledge that suggests the Little River supported spawning Chinook salmon, the information is inconclusive and the physical evidence would suggest otherwise. The mouth of the stream was very turbid during the period of the survey in which there were no unusual precipitation events as there was in 1988. The character of flow is primarily that of run. Suitable spawning substrate does not appear to be available though there are small areas of gravel near tributary streams. It may be that chinook salmon spawn in the vicinity of the mouth of Little River in the mainstem Takhini River.

10.4.2 Juvenile Chinook Salmon

Both the Little River and The Mendenhall River share similar characteristics low grade streams with tortuous meanders flowing through areas of discontinuous permafrost and carrying noticeable amounts of sediment, which in the case of the Mendenhall River is significant. As in the Mendenhall River there is very little cover available in Little River for jcs with the exception of inputs from tributary streams and the old highway crossing. What cover exists is fully utilized. No obstructions or barriers were observed in Little River.

Site preference based on catch per unit effort (CPUE) near survey site S1 suggests that the Little River is preferred habitat. Based on capture results for all traps in the area of reach surveyed, R1, the CPUE lowers significantly. Condition factor remains relatively the same. The SAR value is slightly better than that of Mendenhall River. Benthic invertebrates numbered 23 individuals and 8 taxa in the Mendenhall River and 23 individuals and 9 taxa for Little River.

Table 42. Comparison of K/CPUE/SAR

LITTLE RIVER	R1	S1
Mean K*	1.05	1.04
Mean CPUE	2.69	17.25
SAR**	3	3

*K- JCS Condition Factor
** SAR-Site Assessment Rating (Appendix C) from Stream Invertebrate Survey, Streamkeepers Handbook. Score of 1 (poor) to 4 (good) gives a general rating of stream health at the site.

10.5 RECOMMENDATIONS

Substrate appears to be a limiting factor to jcs rearing habitat. Consideration should be given to the possibility of adding more cobble, boulder and large woody debris cover into the stream. There is an abundance of fire killed coarse woody material available in the surrounding forest and sections of the stream are accessible by road.

Construction of a bridge capable of withstanding highwater events should be considered. The bridgehead reserve belongs to YTG.

YTG Agricultural Branch may need to re-evaluate their policy in regard to agricultural lands that are under an agreement for sale and require land clearing. Land clearing practices in and around streams, particularly small streams, may encourage successional deciduous growth near the margins of clearings and further encourage beaver activity. Consideration of a set back from the edge of the riparian zone may be necessary instead of the high water mark so that the riparian habitat is conserved.

SECTION 11

FLAT CREEK

11 FLAT CREEK

11.1 LITERATURE REVIEW & CONSULTATIONS

Under the Yukon Placer Authorization (1993) Flat Creek is classified as a Type II- salmonid-rearing stream from the mouth to approximately 8 km upstream.

Information included in FISS deals primarily with activities surrounding the Foothills Gas Pipeline proposal (noted above). An alternative route was considered for the pipeline which would have crossed Little River. As a result the stream was sampled by Beak Consultants for fish in 1978 with captures of slimy sculpin. A chinook spawning location was referenced and the work cited was a series of maps entitled *Aquatic Resource Inventory of the Southern Lakes, Yukon* produced by D. Davies & S. Ellington in 1981. The report by Hunka and Shuler (1988) was the only other reference cited. FISS map showing identified points was not available.

In 1988 Hunka and Shuler reported captures of 39 jcs in one trap set immediately below a bedrock waterfall at the old highway crossing. No fish were captured in a trap set above the bedrock waterfall or at a location 6.5 km upstream. The bedrock waterfall was reported to be a barrier. No beaver activity was documented within the area surveyed.

In September of 1986 DFO staff conducted a beaver dam investigation on Flat Creek (DFO Stream Files). At that time it was noted that no studies specifically addressed jcs utilization of minor tributary streams. It was further noted that beaver populations were on the rise as a result of forest harvesting practices, successional growth after forest fires, low fur prices and control of natural predators. A minnow trapping program was conducted below and above a large dam approximately 0.5 km downstream of the old highway crossing. Jcs were capture below the dam in significant numbers (182) and above the dam near the highway crossing 30 jcs were captured. The dam was reported to pose an obstacle but not a barrier. It was concluded that the possibility of jcs ascending the dam was more likely than having been the product of spawning above the dam as chinook spawning had not been observed or reported in Flat Creek. Comment was made regarding the robust size of jcs captured above the dam compared to those captured below. It was suggested that habitat below the dam was fully utilized by rearing jcs. No jcs were captured within the still water behind the impoundment which led to the conclusion that jcs may not utilize still waters behind beaver dams. It was recommended that further study of the effects of beaver dams on jcs rearing be carried out when possible, within the Whitehorse area, and in more detail.

A 1984 study that was initiated to address land development in the lower Takhini valley reported captures of jcs along with whitefish, suckers and sculpins extending 80 m upstream the mouth of Flat Creek. The report did not proceed beyond the draft stage. CPUE was calculated but method of capture was not noted. (DFO Stream Files)

The McIntyre Creek chinook incubation box project was started in 1989 with the successful incubation of chum salmon (*Oncorhynchus keta*). From 1990 to 1997 Chinook salmon eggs have been incubated in the box and fry have been returned to their natal streams or tributaries thereof. In September of 1991, 19,000 chinook fry were tagged and clipped (adipose fin) and released into Flat Creek. A number of untagged, unclipped jcs were released into Flat Creek from a number of schools that conduct classroom incubation projects. In June 1992, 36,500 tagged fry were released into Flat Creek as well as an unknown number of fry from Whitehorse schools. In 1993, 57,900 were released in August and schools released their fry in the spring. Average weight was 2.71 gm and 65 mm in length. In 1994, 53,000 fry were released into Flat Creek, the majority being tagged. Average weight was 2.6 gm and 63 mm in length. In 1995, 56,500 were released with approximately half of the fry being tagged. Average weight was 2.2 gm and 61 mm in length. In the late summer of 1996, 11,000 tagged fry were released into Flat Creek averaging 2 gm in weight and 59 mm in length. Whitehorse schools released their fry into the Takhini River. A weir operated on Flat Creek between Aug.10 and 19, 1996 and 2 male adult chinook salmon were recorded though salmon were also observed at the mouth. A fry trapping program was carried out and results indicated that wild jcs were growing more quickly than hatchery raised fry which led to the conclusion that the fry release program needed to be carried out as early as possible. In early July 1997, 39,440 tagged fry were released into Flat Creek averaging 0.8 gm in weight and 45 mm in length. Whitehorse area schools also released an unknown number of fry from their classroom incubation boxes. A weir was operated from Aug. 16 to 26, and no adult salmon were observed. In 1997 fry trapping was conducted by Whitehorse Correctional Center personnel to monitor growth of wild and hatchery raised fry. (Tanner, 1996,1997)

Mining activity in the Flat Creek occurs immediately upstream of the old highway with 2 placer claims being staked. The area had not been inspected for work by the district mining inspector at the time information was obtained (June 1997). The claim expired 2 months previously. Approximately 2km above the old highway crossing 2 quartz-mining claims have been staked. Work had not been inspected by the district mining inspector and the claims were due to expire on July 30,1997.

The Resource Management Officer for the Laberge District noted that commercial and residential fuel wood cutting permits have been issued in the area but no timber harvesting permits

J. Gibson & Assoc. (1993) noted in their report that on June 19, 1993 five acres of agricultural land adjacent to the Takhini River and approximately 2 km upstream of Flat Creek were treated with the herbicide compound MCPA (phenoxyacetic compound). This was the second application to the area in 1993. The amount used was not reported. It was further noted that MCPA persists in the soil for approximately one month under wet conditions and six months under cool dry conditions and therefore was the herbicide/pesticide product most likely to be detected in adjacent surface waters. Analysis results show the herbicide was not detected either upstream or downstream of the application area. (MCPA <0.1 mg/l; l, 2,4,5-TP Silvex <0.01 mg/l; 2,4-D <0.1 mg/l)

Geological Survey of Canada collected a stream sediment sample for metal analysis at locations 1210 approximately 1.5 km upstream the old highway crossing (Appendix D).

Gibson & Assoc. (1993) collected a water sample approximately 1.5 km upstream the mouth in July of 1993 for analysis of total metals, estimated flow, and reported Northern Affairs Program water sampling results for 1987 and 1988, and flow measurement for 1987 (Appendices D & E).

Laberge Environmental Services (1996) conducted a late winter survey on Little River of overwintering habitat for chinook salmon and collected a water sample upstream of the old highway crossing for analysis of dissolved metals (Appendix D) and estimated flow (Appendix E).

Five agricultural applications have been made in the area of Flat Creek, four of which cover the West Side of the stream from the old highway to the mouth. One application is for an area on the East Side of the stream above the highway, the boundary of which was not marked but would include the area staked for placer mining. Both the area staked for mining and the agricultural application are in the name of the same person(s).

First Nations have extensive land claims on both sides of the Flat Creek.

YTG has a bridge head reserve of 300m X 300m at the old highway crossing.

11.2 STREAM DESCRIPTION

The headwaters of Flat Creek originate in an alpine basin flanked by Pilot and Flat Mountains in the Miner Range. Flat Creek drains an area of approximately 150 km^2 and flows approximately 23 km from its headwaters to the mouth. Most of the Flat Creek watershed was affected by the 1958 Takhini burn.

11.2.1 Reach #1.

Reach #1 extends approximately 3.3 km upstream from the mouth. The valley is fan shaped and widens considerably towards the mouth. The stream flows unconfined in an irregular meander pattern over low grade. Forest cover is aspen/pine/spruce on upper benches. Marshy areas of alder/willow are common in the valley bottom, as are pockets of polar/spruce. The stream flows at an average velocity of 0.41 m/s with 33% pool, 33% riffle and 33% run. Average channel width was 9.8 m, average wetted width was 6.6 m with a mean depth of 0.34 m. Substrate was 75% gravels and 25% fines with some sorting observed. Banks were 0.5 m high on average. The mouth of the creek is wide and moderately deep for approximately the first 100 m of the stream. Beaver activity

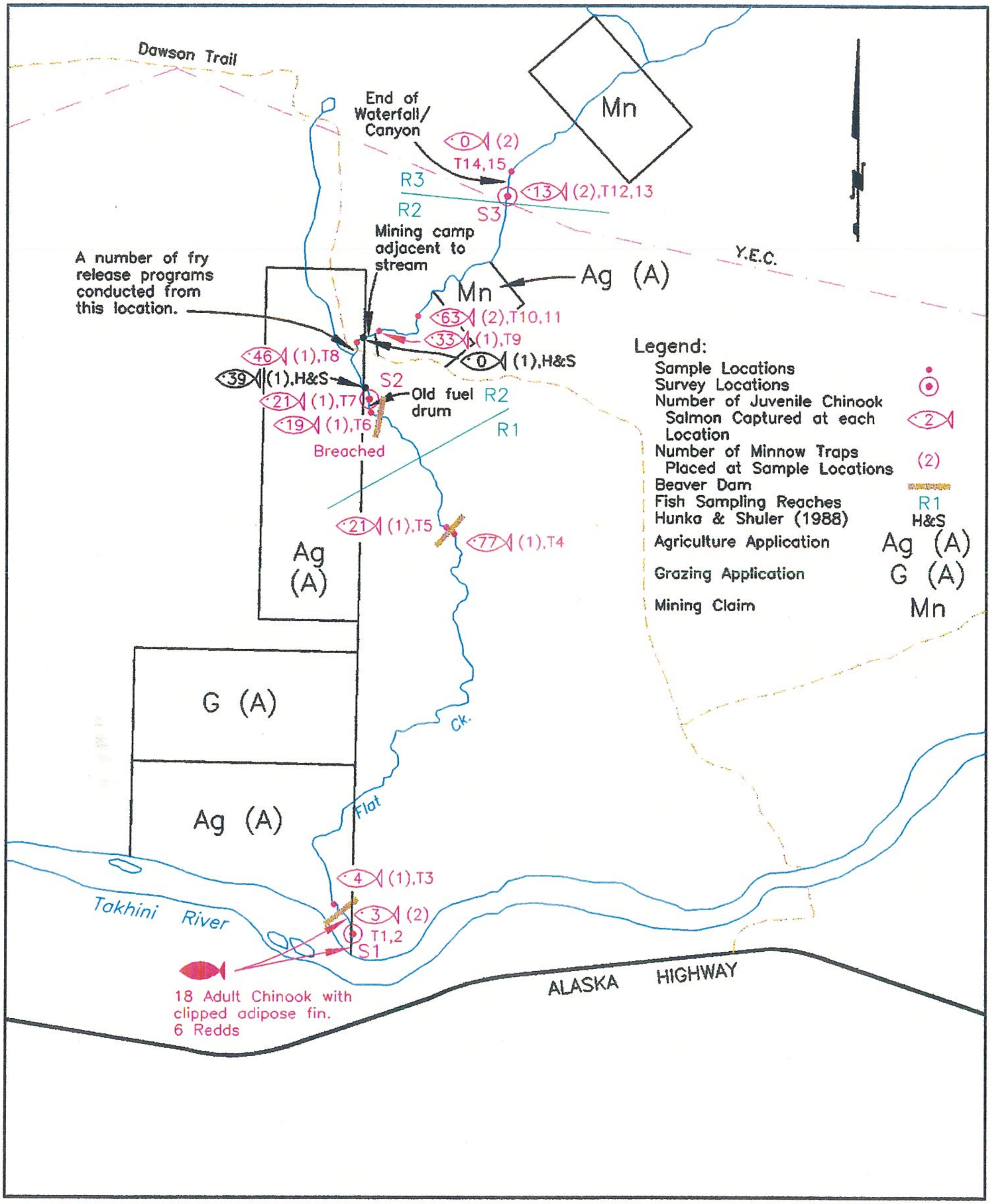


FIGURE 10 : FLAT CREEK

1000 0 1000 2000m

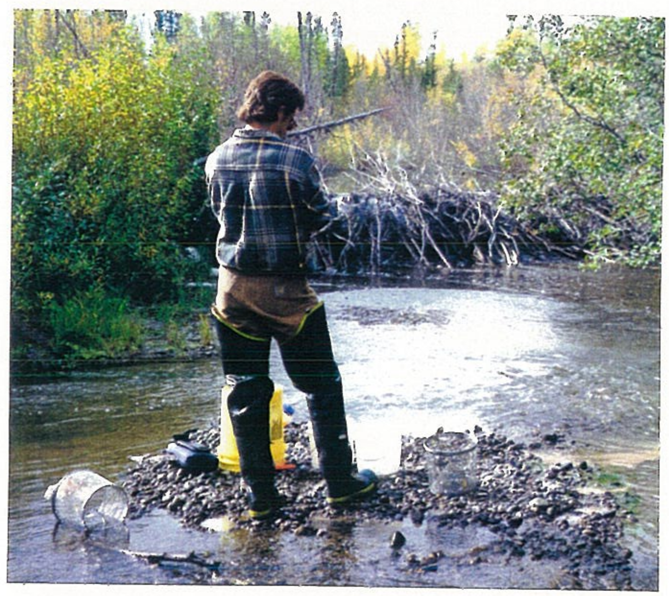
SCALE 1:30,000

Above: Post spawn Chinook carcass with clipped Adipose fin in Reach #1.

Right: Enumerating trapped JCS in Reach #1. The beaver dam in the background appeared to be a barrier to upstream migration of adult Chinook spawners.

Below Right: JCS captured in Reach #3.

Below Left: JCS trap in Reach #1 near spawning activity. Note sediment in substrate.



begins approximately 400 m upstream of the mouth with a dam and large impoundment and remains extensive throughout the reach. Access to reach #1 was gained by canoe from below the Alaska Highway.

11.2.2 Reach #2.

Reach #2 extends upstream approximately 2 km ending just above the power line crossing. The valley narrows through this reach with the stream flowing occasionally confined in an irregular meander pattern over a low to moderate grade. Forest cover is aspen/pine on upper slopes, alder/willow in the valley bottom and on the stream banks. The stream flowed at an average velocity of 0.68 m/s with 33% pool, 33% riffle and 33% run. The average channel width was 7.9 m with an average wetted width of 6.5 m and a mean depth of 0.25 m. The substrate was 10% small cobble, 60% gravels and 30% fines. The stream flows over a bedrock cascade where the old highway crosses. The banks were 0.5 m high on average. No recent beaver activity was observed in this reach. The YEC powerline crosses the stream at the top of the reach. This spot may be accessed by automobile along the hydro right of way.

11.2.3 Reach #3.

Reach #3 begins just above the YEC powerline crossing and extends upstream. The valley narrows and confines the stream which flows with in an irregular channel pattern over a moderately steep grade. Forest cover consists of successional aspen/pine on upper slopes with alder/willow in the valley bottom. The stream flowed at 0.55 m/s in stepped cascades with 40% pool, 40% riffle and 20% run. Average channel width was 8.9 m with an average wetted width of 4.6 m and a mean depth of 0.29 m. Substrate was 50% boulder, 10% cobbles, 10% gravels and 30% fines with the exception of the bedrock canyon/waterfalls. The terminus of the canyon/waterfalls is approximately 200 m upstream the powerline crossing. Large boulders have become wedged within the canyon and in some places logjams have formed. Waterfalls ranged from 1-2 m in height. Two grayling were observed in the third upstream pool. Significant amounts of large woody debris in the stream were a result of the Takhini Burn. No recent beaver activity was noted in this reach.

Table 43. Summary of Flat Creek Reach Physical Characteristics *

Reach	% Gradient	% Cover	% Pool/Riffle/Run	% Fines/Grave/Larges/Bedrock
R1	.5	10	33/33/33	25/75/33/00
R2	.5	15	33/33/33	30/60/10/00
R3	1.5-6	35	40/40/20	30/10/60/00

*From DFO/MOE Stream Survey Form - Appendix B.

11.3 RESULTS: FIELD INVESTIGATIONS

Results of field measurements at representative reach survey sites:

11.3.1 Water Quality

Table 44. Summary of Flat Creek Reach Water Quality

Reach	Date	Diss. O_2	Cond.	W. Temp	pH	Turb.
R1	Sept. 5/97	11.02	.167	10.2	8.12	5
R2	Sept. 6/97	11.5	.154	8.8	8.19	2
R2	Mar. 6/98	15.7	.183	0.0	7.38	
R3	Sept. 6/97	11.4	.150	8.0	8.33	1
		mg/l	mS/cm	^0C		N.T.U.

11.3.2 Water Quantity

Table 45. Summary of Flat Creek Reach Water Quantity

Reach	Date	Mean Velocity	Mean Width	Mean Depth	K*	Discharge
R1	Sept. 5/97	0.41	6.6	0.34	0.75	0.69
R2	Sept. 6/97	0.68	6.5	0.25	0.75	0.83
R2	Mar. 6/98					0.26
R3	Sept. 6/97	0.55	4.6	0.29	0.8	0.59
		m/s	m	m	0.75-0.9	m/s^3

* K= Constant to account for bottom roughness (0.75-0.9, depending on if smooth or rough stream bottom), MOE/DFO (1994).

Winter flow in March 1998 was measured 50 m downstream of the bridge at the old highway crossing using the salt dilution technique. Ice thickness was 0.8-1.5 m.

11.3.3 Adult Chinook Salmon

On September 5 and 7 the mouth of Flat Creek was surveyed by canoe and foot for evidence of adult Chinook salmon. From approximately 75 m upstream to a beaver dam located 400 m upstream, 18 carcasses were enumerated and 6 redds. Spawning was estimated to have taken place between the weir site (200 m upstream) and the beaver dam - an overall distance of 200 m. A number of underwater excavations were observed which appeared more as pits than redds. Some of these were located adjacent to the weir construction material that was piled on the stream bank. A great deal of care was exercised not to disturb the stream bottom. Eggs were observed in the stream and several of the carcasses still had eggs inside them. Two redds were observed immediately below the beaver dam.

Table 46. Number of Adult Chinook Observed

Location Upstream (m)	Live	Dead
R1 (75-200)	0	6
R1 (200-300)	0	7
R1 (300-400)	0	5
Total		18

Table 47. Number of Redds Observed

Location Upstream (m)	Excavations	Redds
R1 (200-250)	4	
R1 (250-300)	3	
R1 (300-350)	3	2
R1 (350-400)		4
Total	10	6

11.3.4 Juvenile Chinook Salmon

All reaches were extensively surveyed by foot and trapped from Sept. 5 to 7. Jcs were caught in reaches #1, #2 and #3. In reach #3 no jcs were caught above the waterfall/canyon. Jcs trapping was conducted above the bedrock cascade at the highway crossing to verify the results of the 1988 survey. It was later learned that Whitehorse area students had released unclipped fry above the bridge earlier in the year which nullified any results with respect to the determination of the bedrock cascade as a barrier in 1997. Of further note- the largest fry captured on any stream of the entire survey was on Flat Creek below the YEC powerline with a weight of 12.8 gm and 106 mm in length. The adipose fin was clipped. Jcs were captured within the still water areas behind beaver dams, and in significant numbers. All had their adipose fin clipped. None of the jcs captured near the mouth had their adipose clipped.

Finally, jcs captured in reach #3 were more robust than jcs captured downstream, with the exception of the 7 jcs captured near the mouth. It is possible that jcs captured at the mouth were wild stock. Table 48 includes only those jcs captured at survey sites for comparison of site preference. Summary in Appendix A

Table 48. JCS Catch Summary.

IBEX	S1	S2	S3
# Traps	2	2	2
# Days	4	2	2
# JCS	3	40	13
Mean CPUE	0.38	10	3.75

11.3.5 Observed Land Uses

A dwelling was located on the west side of the stream just above the beginning of reach #2 on a clay bank that is being actively eroded by the stream. Debris was observed in the stream downstream of the habitation. During the winter survey it was observed that the dwelling (trailer) had been moved away from the bank. Frequent traffic was observed along the old highway. The stream is bridged where the road crosses at the bedrock cascade. The bridge is of sturdy construction with two large I beams providing support. Two mining claims are staked above the bridge. None of them appeared to be actively worked, however a camp has been set up 5m from the riverbank. An unbridge stream crossing is located just downstream. Remains of an old camp were observed below the powerline. There was little sign of human activity above the hydro line crossing aside from woodcutting. Material for the building of a fish weir was observed at streamside approximately 200 m upstream of the mouth.

11.4 DISCUSSION

11.4.1 Water Quality

Analysis of data gathered on Flat Creek show the following parameters equaling or exceeding limits set for CCME freshwater aquatic life (FAL). Values in mg/l unless stated otherwise, from Appendix D:

Aluminum (FAL-0.005-0.1)	Aug. 1987	6.87 (total)
	Aug. 1988	0.33 (total)
	July 1993	0.095 (total)
Copper (FAL-0.002-0.004)	Aug. 1987	0.005 (total)
	July 1993	0.008 (total)
Iron (FAL-0.3)	Aug. 1987	5.94 (total)
	Aug. 1988	0.527 (total)
	July 1993	0.302 (total)

11.4.2 Adult Chinook Salmon

Levy and Slaney (1993) provide a summary of temperature, depth, velocity and substrate size suitable for salmon spawning and values are compared to survey results in Table 49.

Table 49. Comparison Of Select Spawning Criteria

Levy & Slaney (1993)	Temp. (^{0}C) 5.6-13.9	Minimum Depth 0.24 m	Velocity 0.3-0.91 m/s	% Substrate 13-102 mm*	0-20% Fines 2-6.4mm**
Flat R1	10.2	.34	.41	10	90
Flat R2	8.8	.25	.68	40	60

*Percent of bed material from DFO/MOE Stream Cards ranging from small gravels to small cobble (16-128 mm). Suitability of

gravel substrate is a function of fish size- large chinook spawners generally utilize much coarser gravel than pink salmon, for example. Levy & Slaney (1993)
**Percent of fines from DFO/MOE Stream Cards ranging from fines to small gravel (<2-16 mm). Salmon alevins generally experience difficulties with emergence when percentage of fines exceeds 20% of substrate volume, Levy & Slaney (1993).

Reach #1, which supports spawning salmon has temperature, depth, and velocity characteristics within the range described by Levy & Slaney, but the amount of fines appears to be excessive. In discussions with Trix Tanner, who has been providing technical assistance on the fry release program this may be the first generation of chinook to attempt to spawn in Flat Creek and their success will be carefully monitored. Mrs. Tanner noted that the substrate was not ideal. (pers. comm.) Further upstream in reach #2 there may be areas of suitable substrate but the amount of fines may once again be a limiting factor. Based on the 1998 winter survey there appears to be a sufficient base flow in the stream.

11.4.2 Juvenile Chinook Salmon

The results of the trapping program suggest that the waterfall\canyon in reach #3 is a barrier. The fry release program confounds any attempts at determining whether other obstructions or barriers exist although it may be that the beaver dam at the mouth is an obstruction as the only jcs caught above the dam had their fins clipped. Jcs utilizing still waters behind beaver dams were only observed on Flat Creek. In Lucky Love Creek and in the Ibex River, water was moving between areas of impoundment. It may be that jcs are moving downstream on Flat Creek and numbers buildup behind the beaver dams.

Site preference based on catch per unit effort (CPUE) suggests that reach #2 is preferred jcs habitat within Flat Creek but this is inconclusive as fry releases into reach #2 may have confounded results. The SAR value of 3.25 for reach 1 may reflect the CPUE and K more accurately within Flat Creek if in fact these are wild jcs. The good SAR value for reach #3 may have something to do with the robust size of the jcs in this reach or it may be that the bigger jcs are getting further upstream over the small boulder cascades.

Table 50. Comparison of K/CPUE/SAR

IBEX	S1	S2	S3
Mean K*	0.91	1.14	1.13
Mean CPUE	0.38	10	3.25
SAR**	3.25	3.5	3.75

*K- JCS Condition Factor
** SAR-Site Assessment Rating (Appendix C) from Stream Invertebrate Survey, Streamkeepers Handbook. Score of 1 (poor) to 4 (good) gives a general rating of stream health at the site.

11.5 RECOMMENDATIONS

"Salmon in the classroom" released fry are indistinguishable from wild stocks and their release into Flat Creek will confound attempts at monitoring growth of wild and hatchery raised jcs. Tagging or clipping the adipose of all hatchery-raised fry would make it easier to distinguish wild stock from hatchery stock. Alternatively, these fry could be released into the mainstem Takhini River without fins clipped.

Beaver activity in reach #1 may be an obstruction to jcs migration. Area of spawning activity is limited and fully utilized. The number of returning spawners may increase based on the increase in the number of fry released. The quality of spawning habitat is questionable. If emergence is successful then beaver dams should be removed to accommodate a possible greater number of returning spawners, and beaver activity monitored. With respect to beaver management, a number of options could be considered:

- may want to consider an incentive program for trappers and First Nations to trap beavers in affected areas if this is agreement with YTG beaver management guidelines.
- in conjunction with an incentive program, a minimum beaver catch quota could be set for the owner of the trapline concession in the Flat Creek valley.

- opening up of beaver dams following DFO/YTG beaver management guidelines.

YTG Agricultural Branch may need to re-evaluate their policy in regard to agricultural lands that are under an agreement for sale and require land clearing. Land clearing practices in and around streams, particularly small streams, may encourage successional deciduous growth near the margins of clearings and further encourage beaver activity. Consideration of a set back from the edge of the riparian zone may be necessary instead of the high water mark so that the riparian habitat is conserved.

May require close monitoring of mining activities adjacent to the stream to ensure compliance with existing regulations.

SECTION 12

LUCKY LOVE (BB) CREEK

12 LUCKY LOVE (BB) CREEK

12.1 LITERATURE REVIEW & CONSULTATIONS

Under the Yukon Placer Authorization (1993), Lucky Love Creek is classified as a Type II-salmonid rearing stream from the mouth to approximately 2 km upstream.

A 1984 study that was initiated to address land development in the lower Takhini valley. Lucky Love Creek was sampled for fish though no primary information was obtained from DFO Stream Files.

FISS Information includes fish sampling activities surrounding the Foothills Gas Pipeline proposal (noted above). An alternative route was considered for the pipeline. As a result Lucky Love Creek was sampled by Beak Consultants for fish in 1978 with no fish observed. Reference is also made to the results of Hunka and Shuler's (1988) jcs minnow trapping program where no fish were caught. A beaver dam was documented approximately 100 m upstream the mouth. FISS map showing identified points was not available.

Mining claims staked within the drainage area have been disallowed.

Geological Survey of Canada collected stream sediment samples for metal analysis at location 1002 in 1985 approximately 2 km upstream of the Alaska Highway (Appendix D).

Agricultural land applications cover the entire drainage below the Alaska Highway.

A recreational firearms range is maintained on federal lands on the west side of the drainage area.

The Alaska Highway crosses all tributaries of Lucky Love Creek.

12.2 STREAM DESCRIPTION

The headwaters of Lucky Love Creek begin on the upper slopes of Haekel Hill and flow approximately 11km to the mouth. Lucky Love Creek drains a small area of 26 km^2. Below the highway Lucky Love Creek has cut deep valleys through the lacustrine clay of the Takhini basin. The surrounding area was extensively burned in the 1958 Takhini fire.

12.2.1 Lucky Love, Reach #1.

Reach #1 extends approximately 500 m upstream from the mouth. A small grass/sedge marsh surrounds the mouth of Lucky Love Creek which is habitat typical of northern pike. The stream is relatively narrow and deep for 40 m prior to entering the Takhini River. Where unaffected by beaver the stream flowed at 0.28m/s in occasional confinement over minimal grade through a fan shaped valley. Approximately one third of the reach was flooded under beaver impoundments. Forest cover was successional pine/aspen on benches above the valley and alder/willow/poplar in the valley bottom. The stream had an irregular channel pattern and was 5% pool, 25% riffle and 70% run with an average channel width of 4.5 m, average wetted width of 2.2 m and a mean depth of 0.35 m. Substrate was 70% clay with the remaining 30% an unsorted mix of gravel/cobble/boulder. Clay banks were on average 0.6 m high. Beavers were very active, with four dams in this reach. The largest of the dams was located approximately 500 m upstream the mouth. Access to reach #1 was by foot and canoe on the Takhini River.

12.3 LUCKY LOVE, REACH #2.

Reach #2 extends approximately 1 km upstream from the large beaver impoundment. At this point the valley narrows and confines the stream which continues to flow in an irregular channel pattern at low velocity over minimal grade. Vegetation was much the same as reach # 1, however, valley confinement had allowed fire killed trees to criss-cross the stream. This combined with willow/alder growth along the stream edge created a high degree of crown closure in some areas. The grade is low and velocity was measured at 0.31 m/s. The stream channel averaged 9.7m in width. Wetted width was 1.75 m with a mean depth of 0.22 m. Through this reach the stream flowed as 40% pool and 60% run. Substrate was clay and sand. Old beaver activity was noted with the presence of old breached dams. Evidence of a wolf den was also noted. Wood cutting trails allow vehicle access to the benches above reach #2. The eastern most tributary flows through a bedrock canyon approximately 500 m below the highway.

Table 51. Summary of Lucky Love Creek Reach Physical Characteristics *

Reach	% Gradient	% Cover	% Pool/Riffle/Run	% Fines/Grave//Larges /Bedrock
R1	0.5	5	05/25/70	70/20/10/00
R2	0.5	10	40/00/60	100/00/00/00

*From DFO/MOE Stream Survey Form - Appendix B.

12.4 RESULTS: FIELD INVESTIGATIONS

Results of field measurements at representative reach survey sites:

12.4.1 Water Quality

Table 52. Summary of Lucky Love Creek Reach Water Quality

Reach	Date	Diss. O_2	Cond.	W. Temp	pH	Turb.
R1	Aug. 20/97	12.73	.270	7.5	8.14	5.2
R1	Mar. 14/98	14.7	.267	0.4	8.13	
R2	Aug. 20/97	12.51	.270	7.2	9.61	0
		mg/l	mS/cm	^{0}C		N.T.U.

12.4.2 Water Quantity

Table 53. Summary of Lucky Love Creek Reach Water Quantity

Reach	Date	Mean Velocity	Mean Width	Mean Depth	K*	Discharge
R1	Aug. 20/97	0.28	4.5	0.35	0.75	0.33
R2	Aug. 20/97	0.31	1.75	0.22	0.75	0.09
		m/s	m	m	0.75-0.9	m/s^3

* K= Constant to account for bottom roughness (0.75-0.9, depending on if smooth or rough stream bottom), MOE/DFO 1994.

During the winter survey in March 1998 ice cover within the areas of beaver impoundment was sagging and appeared to be frozen to the bottom of the channel.

12.4.3 Adult Chinook Salmon

No evidence of adult salmon or spawning activity was observed.

12.4.4 Juvenile Chinook Salmon

Lucky Love Creek was extensively surveyed by foot and trapped from August 18 to 20. Jcs were captured in reach #1 in significant numbers. Only those traps downstream of potential obstructions/barriers were used to calculate CPUE. Summary in Appendix A.

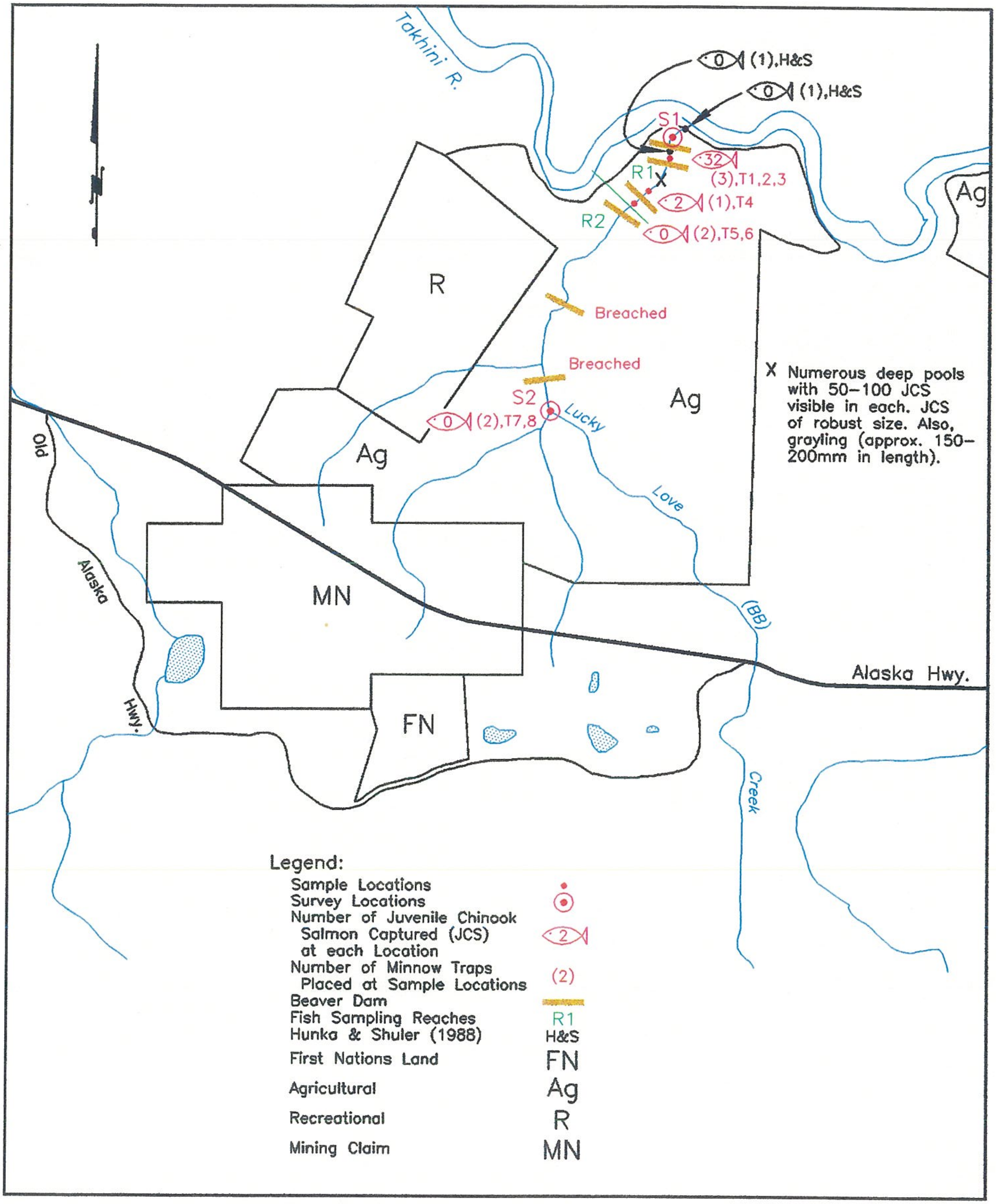
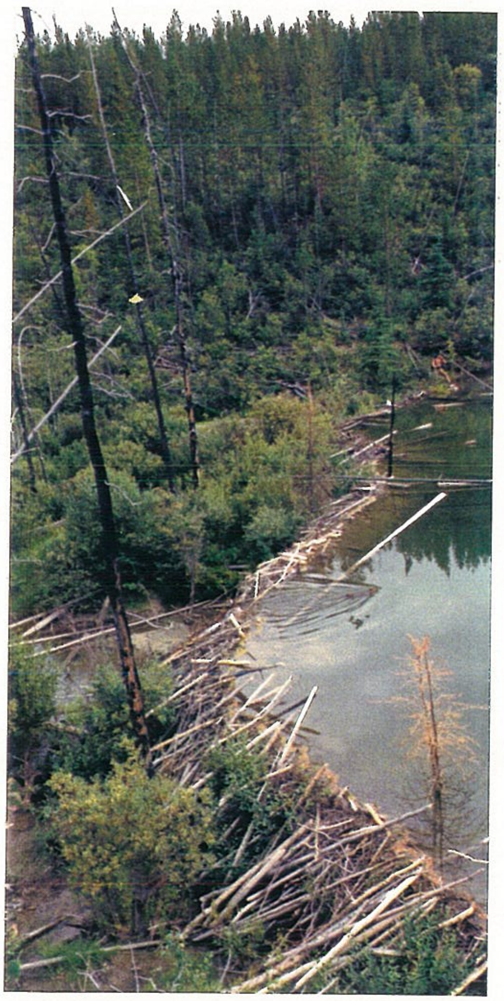


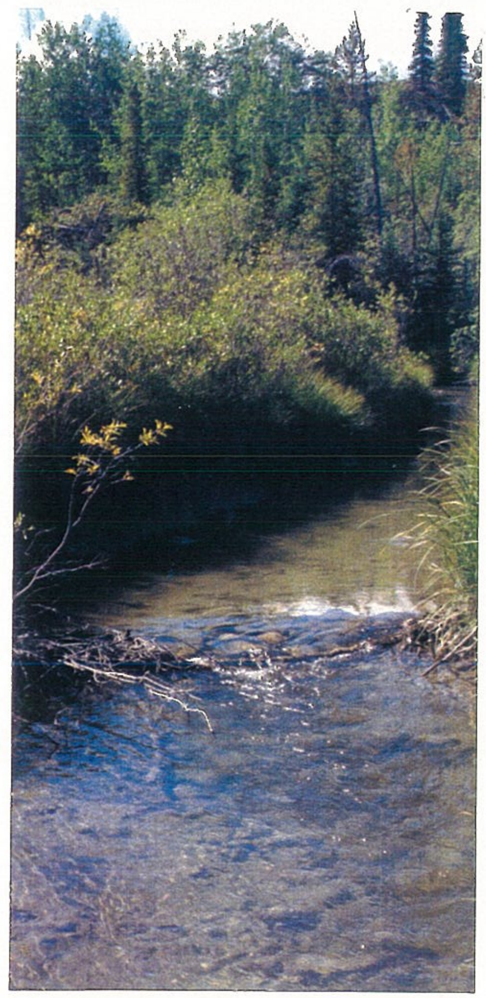
FIGURE 11 : LUCKY LOVE (BB) CREEK

1000 0 1000 2000m

SCALE 1:30,000

Above: Preparing for minnow trapping and stream survey near mouth.





Above Left: Beaver dam 460m above the mouth of the stream. This dam may have been a barrier to upstream migration of JCS.

Above Right: Section of Reach #1 where JCS were observed and trapped.

Table 54. JCS CPUE Summary.

LUCKY LOVE	S1
# Traps	3
# Days	6
# JCS	32
Mean CPUE	1.78

12.4.5 Land Use

Agricultural activity in the form of extensive land clearing, in some areas to the edge of the stream valley, was observed in the area. An network of trails was observed that were once used to harvest firewood in the area.

12.5 DISCUSSION

12.5.1 Water Quality

A water sample was taken from the Lucky Love Creek at S1 on March 14/98 for analysis of dissolved metals. Analysis of data gathered on Lucky Love Creek show the following parameters equaling or exceeding limits set for CCREM freshwater aquatic life (FAL). Values in mg/l unless stated otherwise, from Appendix D:

Aluminum (FAL-0.005-0.01)	March 1998	0.207 (disolved)
Iron (FAL-0.3)	March 1998	0.38 (disolved)

12.5.2 Adult Chinook Salmon

There is no literature, traditional knowledge or other evidence to suggest that Lucky Love supported spawning Chinook salmon nor is it likely given the size, volume and general characteristics of the stream.

12.5.3 Juvenile Chinook Salmon

The results of the trapping program suggests that beaver activity approximately 500 m upstream from the mouth is a barrier to jcs upstream migration into reach #2 where there appears to be favorable rearing habitat available, as suggested by the information gathered from stream and benthic surveys.

CPUE based on minnow trap catches may underestimate the actual number or density of jcs present as more jcs were observed than were actually caught.

Table 55.

LUCKY LOVE	R1	R2
Mean K*	1.19	
Mean CPUE	1.78	
SAR**	2.5	3.25

*K- JCS Condition Factor

** SAR-Site Assessment Rating (Appendix C) from Stream Invertebrate Survey, Streamkeepers Handbook. Score of 1 (poor) to 4 (good) gives a general rating of stream health at the site.

The SAR score for reach #1suggest that overall stream health based on benthic invertebrates is less than acceptable and this is reflected in the relatively low CPUE. The condition factor, on the other hand is relatively high which is interesting as the overall size of jcs captured in Lucky Love Creek appeared small, though this may be attributable to an age difference. Moodie (1993) reported young-of-year jcs in June on Croucher Creek as having a mean length of 55 mm and a mean weight of 2.3 gm. One year old fish were identified as having a mean length of 77 mm and a mean weight of 4.7 gm. Almost all the jcs captured in Lucky Love Creek appear to be young-of-year and have a relatively good condition factor though the SAR score might suggests otherwise.

12.6 RECOMMENDATIONS

Beaver activity in Lucky Love Creek may have had a positive impact on the quality of habitat for jcs. Within the areas between impoundments numerous jcs and grayling were observed utilizing deep pools. Water was found flowing in the stream below the beaver dams during the period of the winter survey. No restoration or enhancement activities are recommended for Lucky Love Creek.

SECTION 13

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13 REFERENCES

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APPENDIX A

JCS MINNOW TRAPPING SUMMARY

JCS Minnow Trapping Summary

NAME	DATE	COMMENT	DAYS	L(mm)	W(gm)	TOTAL	K	MEAN K	CPUE
IBEX R.5 T.32	AUG 20/97		1	0	0	0			
IBEX R.5 T.31	AUG 20/97		1	0	0	0			
IBEX R.5 T.30	AUG 20/97	GR OBSVD	1	0	0	0			
IBEX R.5 T.29	AUG 20/97	GR OBSVD	1	0	0	0			
IBEX R.4 T.28	AUG 20/97		1	0	0	0			
IBEX R.4 T.27	AUG 20/97		1	0	0	0			
IBEX R.4 T.26	AUG 20/97		1	0	0	0			
IBEX R.4 T.25	AUG 20/97	1 CCG	1	0	0	0			
IBEX R.3A T.24	AUG 23/97		1	0	0	0			
IBEX R.3A T.23	AUG 23/97		1	0	0	0			
IBEX R.3 T.22	AUG 23/97		1	0	0	0			
IBEX R.3 T.21	AUG 23/97		1	0	0	0			
IBEX R.3 T.20	AUG 23/97		1	0	0	0			
IBEX R.3 T.19	AUG 23/97		1	0	0	0			
IBEX R.3 T.18	AUG 23/97	1 CCG	1	0	0	0			
IBEX R.3 T.17	AUG 23/97	1 CCG	1	0	0	0			
IBEX R.3 T.16	AUG 23/97	1 CCG	1	0	0	0			
IBEX R.3 T.15	AUG 23/97	2 CCG	1	83	6.4	2	1.12	1.15	2
	AUG 23/97			72	4.4		1.18		
IBEX R.3 T.14	AUG 23/97	3 CCG	1	0	0	0			
IBEX R.3 T.13	AUG 23/97		1	0	0	0			
IBEX R.3 T.12	AUG 23/97		1	0	0	0			
IBEX R.3 T.11	AUG 23/97	1 CCG	1	77	4.9	5	1.07	1.15	5
	AUG 23/97			67	2.7		0.9		
	AUG 23/97			77	3.5		0.77		
	AUG 23/97			75	4.2		1		
	AUG 23/97			74	3.4		0.84		
IBEX R.3 T.10	AUG 23/97	4 CCG+	1	79	5.8	9	1.18	1.17	9
	AUG 23/97	1 GR		75	5.2		1.23		
	AUG 23/97	OBSVD		80	7.5		1.46		
	AUG 23/97			76	5		1.14		
	AUG 23/97			73	3.6		0.93		
	AUG 23/97			75	4.7		1.11		
	AUG 23/97			79	5.5		1.12		
	AUG 23/97			78	5.1		1.07		
	AUG 23/97			70	4.3		1.25		
IBEX R.3 T.9	AUG 23/97		1	72	2.1	91	0.56	0.99	91
	AUG 23/97			75	3.5		0.83		
	AUG 23/97			73	2.7		0.69		
	AUG 23/97			71	3.5		0.98		
	AUG 23/97			78	2.7		0.57		
	AUG 23/97			82	7.2		1.31		
	AUG 23/97			75	4		0.95		
	AUG 23/97			74	5.1		1.26		
	AUG 23/97			76	4		0.91		
	AUG 23/97			76	4.7		1.07		
	AUG 23/97			77	4.2		0.92		
	AUG 23/97			72	4		1.07		
	AUG 23/97			87	8.2		1.25		
	AUG 23/97			72	3.2		0.86		
	AUG 23/97			72	3.6		0.96		
	AUG 23/97			75	4.6		1.09		
	AUG 23/97			71	4		1.12		
	AUG 23/97			72	4.9		1.31		
	AUG 23/97			83	6.5		1.14		
	AUG 23/97			77	4.5		0.99		

NAME	DATE	COMMENT	DAYS	L(mm)	W(gm)	TOTAL	K	MEAN K	CPUE
IBEX R.3 T.8	AUG 23/97	1 CCG	1	75	4.7	33	1.11	1.12	33
	AUG 23/97		-	74	4.7		1.16		
	AUG 23/97			75	4		0.95		
	AUG 23/97			77	4.5		0.99		
	AUG 23/97			73	4.3		1.11		
	AUG 23/97			79	6		1.22		
	AUG 23/97			78	5.5		1.16		
	AUG 23/97			82	5.9		1.07		
	AUG 23/97			81	6		1.13		
	AUG 23/97			80	5.9		1.15		
	AUG 23/97			77	5.4		1.18		
	AUG 23/97			75	5.1		1.21		
	AUG 23/97			73	4		1.03		
	AUG 23/97			72	4.7		1.26		
	AUG 23/97			76	4.5		1.03		
	AUG 23/97			80	5.5		1.07		
	AUG 23/97			77	5.2		1.14		
	AUG 23/97			69	3.5		1.07		
	AUG 23/97			73	4.5		1.16		
	AUG 23/97			71	4.5		1.26		
IBEX R.2 T.7	AUG 25/97	6 CCG	2	73	4.1	16	1.05	1.06	8
	AUG 25/97			77	4.5		0.99		
	AUG 25/97			74	4.6		1.14		
	AUG 25/97			81	6.3		1.19		
	AUG 25/97			75	4.2		1		
	AUG 25/97			74	4.4		1.09		
	AUG 25/97			77	5.1		1.12		
	AUG 25/97			75	4.4		1.04		
	AUG 25/97			77	4.6		1.01		
	AUG 25/97			75	4.3		1.02		
	AUG 25/97			74	4.2		1.04		
	AUG 25/97			75	4.9		1.16		
	AUG 25/97			68	3.2		1.02		
	AUG 25/97			76	4.3		0.98		
	AUG 25/97			71	3.7		1.03		
	AUG 25/97			68	3.2		1.02		
IBEX R.2 T.6	AUG 25/97	2 CCG	2	76	5	6	1.14	1.1	3
	AUG 25/97			76	4.3		0.98		
	AUG 25/97			78	5.6		1.18		
	AUG 25/97			74	3.7		0.91		
	AUG 25/97			73	5		1.29		
	AUG 25/97			77	5		1.1		
IBEX R.2 T.5	AUG 27/97		1	0	0	0			
IBEX R.2 T.4	AUG 27/97	11 CCG	1	0	0	0			
IBEX R.2 T. 3	AUG 27/97	3 CCG	1	71	3.5	6	0.98	1.02	6
	AUG 27/97			74	3.9		0.96		
	AUG 27/97			73	3.5		0.9		
	AUG 27/97			66	3.3		1.15		
	AUG 27/97			71	3.8		1.06		
	AUG 27/97			70	3.7		1.08		
IBEX R.1 T.2	SEPT 3/97		1	67	3	3	1	0.98	3
	SEPT 3/97			69	3.3		1		
	SEPT 3/97			74	3.8		0.94		
IBEX R.1 T.1	SEPT 3/97	3 CCG	1	75	4.2	11	1	1.01	11
	SEPT 3/97			71	3.4		0.95		
	SEPT 3/97			70	3.2		0.93		

NAME	DATE	COMMENT	DAYS	L(mm)	W(gm)	TOTAL	K	MEAN K	CPUE
	SEPT 3/97			70	3.5		1.02		
	SEPT 3/97			68	3.1		0.99		
	SEPT 3/97			79	4.8		0.97		
	SEPT 3/97			74	4.3		1.06		
	SEPT 3/97			69	3.3		1		
	SEPT 3/97			67	3		1		
	SEPT 3/97			69	3.4		1.03		
	SEPT 3/97			70	4		1.17		
ARKELL R.4 T.9	AUG 29/97	1 CCG-135mm	1	0	0	0			
ARKELL R.4 T.8	AUG 29/97	JCS+1GR OBS\	1	0	0	0			
ARKELL R.3 T.7	AUG 29/97		1	78	6.1	3	1.29	1.21	3
	AUG 29/97			72	4.6		1.23		
	AUG 29/97			68	3.5		1.11		
ARKELL R.3 T.6	AUG 29/97		1	68	3.9	12	1.24	1.09	12
	AUG 29/97			73	5.3		1.36		
	AUG 29/97			71	4.2		1.17		
	AUG 29/97			73	4		1.03		
	AUG 29/97			69	3.9		1.19		
	AUG 29/97			68	3.5		1.11		
	AUG 29/97			71	3.9		1.09		
	AUG 29/97			75	4.5		1.07		
	AUG 29/97			74	4		0.99		
	AUG 29/97			71	3.6		1.01		
	AUG 29/97			67	2.6		0.86		
	AUG 29/97			72	3.6		0.96		
ARKELL R.2 T.5	AUG 29/97		1	70	3.4	22	0.99	1.05	22
	AUG 29/97			69	3.2		0.97		
	AUG 29/97			78	4.8		1.01		
	AUG 29/97			77	5		1.1		
	AUG 29/97			69	2.8		0.85		
	AUG 29/97			74	4		0.99		
	AUG 29/97			70	3.8		1.11		
	AUG 29/97			67	3.3		1.1		
	AUG 29/97			66	3		1.04		
	AUG 29/97			68	3.6		1.14		
	AUG 29/97			73	4		1.03		
	AUG 29/97			64	2.8		1.07		
	AUG 29/97			66	3		1.04		
	AUG 29/97			67	3.5		1.16		
	AUG 29/97			67	3.2		1.06		
	AUG 29/97			64	2.8		1.07		
	AUG 29/97			67	3.4		1.13		
	AUG 29/97			69	3.5		1.07		
	AUG 29/97			63	2.5		1		
	AUG 29/97			64	2.8		1.07		
	AUG 29/97			67	3.3		1.1		
	AUG 29/97			66	3		1.04		
ARKELL R.2 T.4	AUG 29/97	2 CCG	1	80	5.4	38	1.05	1.08	38
	AUG 29/97			72	3.7		0.99		
	AUG 29/97			62	2.5		1.05		
	AUG 29/97			69	3		0.91		
	AUG 29/97			69	3.3		1		
	AUG 29/97			64	2.8		1.07		
	AUG 29/97			73	4.1		1.05		

NAME	DATE	COMMENT	DAYS	L(mm)	W(gm)	TOTAL	K	MEAN K	CPUE
	AUG 29/97			62	2.5		1.05		
	AUG 29/97			67	3		1		
	AUG 29/97			65	3.2		1.17		
	AUG 29/97			70	3.7		1.08		
	AUG 29/97			65	3		1.09		
	AUG 29/97			65	2.9		1.06		
	AUG 29/97			68	3.4		1.08		
	AUG 29/97			66	3.2		1.11		
	AUG 29/97			69	3.6		1.1		
	AUG 29/97			66	3.2		1.11		
	AUG 29/97			68	3.9		1.24		
	AUG 29/97			65	3.2		1.17		
	AUG 29/97			67	3.5		1.16		
	AUG 29/97			72	4		1.07		
	AUG 29/97			70	3.6		1.05		
	AUG 29/97			66	3.4		1.18		
	AUG 29/97			62	2.9		1.22		
	AUG 29/97			69	3.3		1		
	AUG 29/97			65	2.7		0.98		
	AUG 29/97			66	3		1.04		
	AUG 29/97			71	3.7		1.03		
	AUG 29/97			72	3.9		1.04		
	AUG 29/97			70	3.8		1.11		
	AUG 29/97			69	3.5		1.07		
	AUG 29/97			77	4.6		1.01		
	AUG 29/97			71	4.1		1.15		
	AUG 29/97			66	3.2		1.11		
	AUG 29/97			67	3.7		1.23		
	AUG 29/97			64	2.7		1.03		
	AUG 29/97			67	3.3		1.1		
	AUG 29/97			65	2.5		0.91		
ARKELL R.1 T.3	AUG 27/97	1 CCG	1	69	3.1	4	0.94	1.03	4
	AUG 27/97			73	4.1		1.05		
	AUG 27/97			79	5		1.01		
	AUG 27/97			74	4.5		1.11		
ARKELL R.1 T.2	AUG 27/97	1 CCG	1	75	4.8	3	1.14	1.13	3
	AUG 27/97			69	3.5		1.07		
	AUG 27/97			76	5.2		1.18		
ARKELL R.1 T.1	AUG 27/97	4 CCG	1	71	3.6	10	1.01	1.1	10
	AUG 27/97			74	5		1.23		
	AUG 27/97			91	8.6		1.14		
	AUG 27/97			82	6.2		1.12		
	AUG 27/97			74	4.3		1.06		
	AUG 27/97			76	4.8		1.09		
	AUG 27/97			74	4.5		1.11		
	AUG 27/97			73	4.6		1.18		
	AUG 27/97			72	3.9		1.04		
	AUG 27/97			84	6.3		1.06		
EASY LOVE R.1 T.6	SEPT 17/97	1 CCG	0.5	0	0	0			
EASY LOVE R.1 T.5	SEPT 17/97		0.5	0	0	0			
EASY LOVE R.1 T.4	SEPT 17/97		1	0	0	0			
EASY LOVE R.1 T.3	SEPT 17/97		1	0	0	0			
EASY LOVE R.1 T.2	SEPT 17/97	1 BEETLE	1	0	0	0			
EASY LOVE R.1 T.1	SEPT 17/97	3 BETTLE	1	0	0	0			

NAME	DATE	COMMENT	DAYS	L(mm)	W(gm)	TOTAL	K	MEAN K	CPUE
MENDENHALL R.1 T.1	SEPT 2/97		1	0	0	0			
MENDENHALL R.1 T.2	SEPT 2/97		1	0	0	0			
MENDENHALL R.1 T.3	SEPT 2/97		1	0	0	0			
MENDENHALL R.1 T.4	SEPT 2/97		1	77	4.5	1	0.99		
MENDENHALL R.1 T.5	SEPT 2/97	1 JSU+1 C	1	0	0	0			
MENDENHALL R.1 T.6	SEPT 2/97		1	0	0	0			
STONY R.1 T.1	SEPT 2/97	3 CCG	1	64	2.6	28	0.99	0.98	28
	SEPT 2/97			63	2.2		0.88		
	SEPT 2/97			65	2.5		0.91		
	SEPT 2/97			66	2.5		0.87		
	SEPT 2/97			77	4		0.88		
	SEPT 2/97			64	2.6		0.99		
	SEPT 2/97			64	2.4		0.92		
	SEPT 2/97			67	2.9		0.96		
	SEPT 2/97			72	3.4		0.91		
	SEPT 2/97			64	2.5		0.95		
	SEPT 2/97			65	2.5		0.91		
	SEPT 2/97			88	7.6		1.12		
	SEPT 2/97			79	4.4		0.89		
	SEPT 2/97			73	4		1.03		
	SEPT 2/97			80	4.9		0.96		
	SEPT 2/97			70	3.2		0.93		
	SEPT 2/97			65	2.9		1.06		
	SEPT 2/97			73	3.4		0.87		
	SEPT 2/97			59	1.8		0.88		
	SEPT 2/97			77	5.4		1.18		
	SEPT 2/97			64	2.6		0.99		
	SEPT 2/97			65	2.9		1.06		
	SEPT 2/97			72	3.8		1.02		
	SEPT 2/97			64	2.8		1.07		
	SEPT 2/97			68	3.8		1.21		
	SEPT 2/97			71	3.6		1.01		
	SEPT 2/97			70	3.5		1.02		
	SEPT 2/97			69	3.3		1		
STONY R.1 T.2	SEPT 2/97	3 CCG	1	75	5	104	1.19	1.04	104
	SEPT 2/97			91	8.9		1.18		
	SEPT 2/97			68	3		0.95		
	SEPT 2/97			70	3.6		1.05		
	SEPT 2/97			76	4.4		1		
	SEPT 2/97			71	3.7		1.03		
	SEPT 2/97			69	3.6		1.1		
	SEPT 2/97			83	6.5		1.14		
	SEPT 2/97			83	5.9		1.03		
	SEPT 2/97			66	3		1.04		
	SEPT 2/97			73	4		1.03		
	SEPT 2/97			71	4.2		1.17		
	SEPT 2/97			65	3.2		1.17		
	SEPT 2/97			70	3.7		1.08		
	SEPT 2/97			71	3.7		1.03		
	SEPT 2/97			70	3.5		1.02		
	SEPT 2/97			61	2.3		1.01		
	SEPT 2/97			65	2.8		1.02		
	SEPT 2/97			81	5.1		0.96		
	SEPT 2/97			75	4		0.95		
	SEPT 2/97			87	6.2		0.94		

JCS Minnow Trapping Summary

NAME	DATE	COMMENT	DAYS	L(mm)	W(gm)	TOTAL	K	MEAN K	CPUE
	SEPT 2/97			72	3.2		0.86		
	SEPT 2/97			82	6.2		1.12		
	SEPT 2/97			78	5.2		1.1		
	SEPT 2/97			78	4.6		0.97		
	SEPT 2/97			68	3.1		0.99		
	SEPT 2/97			77	4.5		0.99		
	SEPT 2/97			75	4.3		1.02		
	SEPT 2/97			73	3.8		0.98		
	SEPT 2/97			76	4.8		1.09		
	SEPT 2/97			70	3.3		0.96		
	SEPT 2/97			66	2.8		0.97		
	SEPT 2/97			74	4.3		1.06		
	SEPT 2/97			69	3.4		1.03		
	SEPT 2/97			67	3.1		1.03		
	SEPT 2/97			71	4.1		1.15		
	SEPT 2/97			75	4.4		1.04		
	SEPT 2/97			69	3.2		0.97		
	SEPT 2/97			79	4.9		0.99		
	SEPT 2/97			80	5.6		1.09		
	SEPT 2/97			78	5.3		1.12		
	SEPT 2/97			79	5.2		1.05		
	SEPT 2/97			70	3.8		1.11		
	SEPT 2/97			70	3.4		0.99		
	SEPT 2/97			68	3.4		1.08		
	SEPT 2/97			69	3.4		1.03		
	SEPT 2/97			69	3.2		0.97		
	SEPT 2/97			79	4.8		0.97		
	SEPT 2/97			74	4.6		1.14		
	SEPT 2/97			74	4.6		1.14		
STONY R.2 T.3	SEPT 3/97		2	78	5	8	1.05	1.07	4
	SEPT 3/97			75	4.6		1.09		
	SEPT 3/97			79	5.5		1.12		
	SEPT 3/97			74	4		0.99		
	SEPT 3/97			76	4.6		1.05		
	SEPT 3/97			74	4.3		1.06		
	SEPT 3/97			71	4.1		1.15		
	SEPT 3/97			76	4.6		1.05		
STONY R.2 T.4	SEPT 3/97		2	73	4.1	17	1.05	1.1	8.5
	SEPT 3/97			77	4.9		1.07		
	SEPT 3/97			77	4.8		1.05		
	SEPT 3/97			77	4.9		1.07		
	SEPT 3/97			71	4		1.12		
	SEPT 3/97			80	5.4		1.05		
	SEPT 3/97			75	4.3		1.02		
	SEPT 3/97			80	5.2		1.02		
	SEPT 3/97			80	6.4		1.25		
	SEPT 3/97			80	5.8		1.13		
	SEPT 3/97			81	5.6		1.05		
	SEPT 3/97			80	6.4		1.25		
	SEPT 3/97			74	4.2		1.04		
	SEPT 3/97			76	4.8		1.09		
	SEPT 3/97			75	5		1.19		
	SEPT 3/97			84	6.6		1.11		
	SEPT 3/97			77	5.1		1.12		
STONY R.2 T.5	SEPT 8/97		1	80	5.9	5	1.15	1.07	5
	SEPT 8/97			72	3.6		0.96		

JCS Minnow Trapping Summary

NAME	DATE	COMMENT	DAYS	L(mm)	W(gm)	TOTAL	K	MEAN K	CPUE
	SEPT 8/97			79	5.8		1.18		
	SEPT 8/97			74	4		0.99		
	SEPT 8/97			74	4.3		1.06		
STONY R.2 T.6	SEPT 8/97		1	80	5.6	6	1.09	1.07	6
	SEPT 8/97			78	4.9		1.03		
	SEPT 8/97			70	3.6		1.05		
	SEPT 8/97			72	4		1.07		
	SEPT 8/97			75	4.3		1.02		
	SEPT 8/97			70	3.9		1.14		
STONY R.2 T.7	SEPT 10/97		2	81	5	8	0.94	1.07	4
	SEPT 10/97			81	5		0.94		
	SEPT 10/97			91	8.4		1.11		
	SEPT 10/97			81	5.7		1.07		
	SEPT 10/97			78	5.3		1.12		
	SEPT 10/97			80	5.9		1.15		
	SEPT 10/97			81	5.8		1.09		
	SEPT 10/97			78	5.3		1.12		
STONY R.2 T.8	SEPT 10/97		2	85	6	7	0.98	1.05	3.5
	SEPT 10/97			85	6.6		1.07		
	SEPT 10/97			80	5.9		1.15		
	SEPT 10/97			71	3.9		1.09		
	SEPT 10/97			75	4.3		1.02		
	SEPT 10/97			78	4.9		1.03		
	SEPT 10/97			79	5		1.01		
STONY R.2 T.9	SEPT 10/97		2	74	3.9	1	0.96	0.96	0.5
STONY R.2 T.10	SEPT 10/97		2	79	5.6	3	1.14	1.05	1.5
	SEPT 10/97			78	4.7		0.99		
	SEPT 10/97			83	5.9		1.03		
STONY R.2 T.11	SEPT 8/97	WATER SHREW	1	0	0	0			
STONY R.2 T.12	SEPT 8/97		1	0	0	0			
STONY R.3 T.13	SEPT 3/97		1	0	0	0			
STONY R.3 T.14	SEPT 3/97		1	0	0	0			
STONY R.3 T.15	SEPT 3/97		1	0	0	0			
STONY R.3 T.16	SEPT 3/97		1	0	0	0			
37 MILE R.3 T.12	SEPT 11/97	1 CCG	1	0	0	0			
37 MILE R.3 T.11	SEPT 11/97	1 CCG	1	0	0	0			
37 MILE R.3 T.10	SEPT 11/97	2 CCG	1	0	0	0			
37 MILE R.3 T.9	SEPT 11/97		1	0	0	0			
37 MILE R.2 T.8	SEPT 11/97	1 JGR	1	0	0	0			
37 MILE R.2 T.7	SEPT 11/97	1 JGR, 1CCG	1	0	0	0			
37 MILE R.2 T.6	SEPT 11/97		1	70	3.4	7	0.99	1.07	7
	SEPT 11/97			84	5.8		0.98		
	SEPT 11/97			70	3.4		0.99		
	SEPT 11/97			77	4.8		1.05		
	SEPT 11/97			69	3.5		1.07		
	SEPT 11/97			65	3.4		1.24		
	SEPT 11/97			64	3.1		1.18		
37 MILE R.2 T.5	SEPT 11/97		1	67	3.1	8	1.03	1.07	8
	SEPT 11/97			67	3.3		1.1		
	SEPT 11/97			80	5.5		1.07		
	SEPT 11/97			76	4.5		1.03		
	SEPT 11/97			82	6.2		1.12		
	SEPT 11/97			77	5		1.1		
	SEPT 11/97			86	7.1		1.12		
	SEPT 11/97			69	3.2		0.97		

JCS Minnow Trapping Summary

NAME	DATE	COMMENT	DAYS	L(mm)	W(gm)	TOTAL	K	MEAN K	CPUE
37 MILE R.1 T.4	SEPT 11/97		1	82	6	51	1.09	1.06	51
	SEPT 11/97			68	2.9		0.92		
	SEPT 11/97			82	5.8		1.05		
	SEPT 11/97			73	4.4		1.13		
	SEPT 11/97			67	3.4		1.13		
	SEPT 11/97			70	3.8		1.11		
	SEPT 11/97			64	2.8		1.07		
	SEPT 11/97			65	2.9		1.06		
	SEPT 11/97			66	3.1		1.08		
	SEPT 11/97			73	4.2		1.08		
	SEPT 11/97			73	4.2		1.08		
	SEPT 11/97			71	3.5		0.98		
	SEPT 11/97			65	2.9		1.06		
	SEPT 11/97			66	2.9		1.01		
	SEPT 11/97			69	3.4		1.03		
37 MILE R.1 T.3	SEPT 11/97		1	70	3.4	25	0.99	1.12	25
	SEPT 11/97			68	3.7		1.18		
	SEPT 11/97			70	3.8		1.11		
	SEPT 11/97			61	3.5		1.54		
	SEPT 11/97			72	4.4		1.18		
	SEPT 11/97			65	3.2		1.17		
	SEPT 11/97			62	2.2		0.92		
	SEPT 11/97			67	3.4		1.13		
	SEPT 11/97			67	3.2		1.06		
	SEPT 11/97			65	2.6		0.95		
	SEPT 11/97			76	4.8		1.09		
	SEPT 11/97			65	3.1		1.13		
	SEPT 11/97			62	2.7		1.13		
	SEPT 11/97			75	4.5		1.07		
	SEPT 11/97			62	2.6		1.09		
37 MILE R.1 T.2	SEPT 16/97		1	83	6.5	1	1.14	1.14	1
37 MILE R.1 T.1	SEPT 16/97		1	75	4.4	3	1.04	1.09	3
	SEPT 16/97			79	5.7		1.16		
	SEPT 16/97			89	7.6		1.08		
LITTLE R.1 T.1	SEPT 12/97	2 CCG	1	70	3.6	28	1.05	1.02	28
	SEPT 12/97			65	2.5		0.91		
	SEPT 12/97			68	3.3		1.05		
	SEPT 12/97			65	2.7		0.98		
	SEPT 12/97			60	2.1		0.97		
	SEPT 12/97			73	4		1.03		
	SEPT 12/97			73	4		1.03		
	SEPT 12/97			80	5.7		1.11		
	SEPT 12/97			73	4		1.03		
	SEPT 12/97			73	4.4		1.13		
	SEPT 12/97			62	2.4		1.01		
	SEPT 12/97			66	2.9		1.01		
	SEPT 12/97			72	4.2		1.13		
	SEPT 12/97			65	3.1		1.13		
	SEPT 12/97			63	2.2		0.88		
	SEPT 12/97			70	3.4		0.99		
	SEPT 12/97			65	2.8		1.02		
	SEPT 12/97			66	2.9		1.01		
	SEPT 12/97			64	2.5		0.95		
	SEPT 12/97			61	2.3		1.01		
	SEPT 12/97			67	3.1		1.03		

NAME	DATE	COMMENT	DAYS	L(mm)	W(gm)	TOTAL	K	MEAN K	CPUE
	SEPT 12/97			65	2.8		1.02		
	SEPT 12/97			63	2.5		1		
	SEPT 12/97			66	3.2		1.11		
	SEPT 12/97			67	3		1		
	SEPT 12/97			63	2.5		1		
	SEPT 12/97			63	2.5		1		
	SEPT 12/97			60	2.1		0.97		
LITTLE R.1 T.2	SEPT 12/97		1	83	6.2	41	1.08	1.05	41
	SEPT 12/97			63	2.8		1.12		
	SEPT 12/97			80	4.9		0.96		
	SEPT 12/97			83	6.1		1.07		
	SEPT 12/97			76	4.9		1.12		
	SEPT 12/97			75	5		1.19		
	SEPT 12/97			74	4.5		1.11		
	SEPT 12/97			58	2.3		1.18		
	SEPT 12/97			70	4.1		1.2		
	SEPT 12/97			65	2.9		1.06		
	SEPT 12/97			65	2.9		1.06		
	SEPT 12/97			57	2.2		1.19		
	SEPT 12/97			59	2.2		1.07		
	SEPT 12/97			65	2.9		1.06		
	SEPT 12/97			70	3.5		1.02		
	SEPT 12/97			74	4.1		1.01		
	SEPT 12/97			75	5.1		1.21		
	SEPT 12/97			66	3.3		1.15		
	SEPT 12/97			64	2.5		0.95		
	SEPT 12/97			77	4.8		1.05		
	SEPT 12/97			65	2.9		1.06		
	SEPT 12/97			64	2.4		0.92		
	SEPT 12/97			65	2.9		1.06		
	SEPT 12/97			73	4.5		1.16		
	SEPT 12/97			66	3.1		1.08		
	SEPT 12/97			69	3.4		1.03		
	SEPT 12/97			63	2.7		1.08		
	SEPT 12/97			63	2.4		0.96		
	SEPT 12/97			60	2.1		0.97		
	SEPT 12/97			65	2.6		0.95		
	SEPT 12/97			64	2.6		0.99		
	SEPT 12/97			64	2.4		0.92		
	SEPT 12/97			64	2.5		0.95		
	SEPT 12/97			63	2.4		0.96		
	SEPT 12/97			57	2		1.08		
	SEPT 12/97			59	2.2		1.07		
	SEPT 12/97			59	2.1		1.02		
	SEPT 12/97			62	2.3		0.97		
	SEPT 12/97			62	2.6		1.09		
	SEPT 12/97			63	2.5		1		
	SEPT 12/97			64	2.6		0.99		
LITTLE R.1 T.3	SEPT 13/97	4 CCG	1	73	4	2	1.03	1.08	2
	SEPT 13/97			73	4.4		1.13		
LITTLE R.1 T.4	SEPT 13/97	1 CCG	1	75	4.4	5	1.04	1.05	5
	SEPT 13/97			70	3.7		1.08		
	SEPT 13/97			68	3.1		0.99		
	SEPT 13/97			73	4		1.03		
	SEPT 13/97			77	5.1		1.12		
? CK R.1 T.5	SEPT 13/97		1	75	4.4	1	1.04	1.04	1

NAME	DATE	COMMENT	DAYS	L(mm)	W(gm)	TOTAL	K	MEAN K	CPUE
? CK R.1 T.6	SEPT 13/97		1	0	0	0			0
LITTLE R.1 T.7	SEPT 13/97	1 CCG	1	75	4.4	1	1.04	1.04	1
LITTLE R.1 T.8	SEPT 13/97		1	70	3.5	20	1.02	1.03	20
	SEPT 13/97			72	3.9		1.04		
	SEPT 13/97			75	4.3		1.02		
	SEPT 13/97			83	5.8		1.01		
	SEPT 13/97			71	3.8		1.06		
	SEPT 13/97			73	4.1		1.05		
	SEPT 13/97			73	4		1.03		
	SEPT 13/97			72	4.2		1.13		
	SEPT 13/97			74	4.1		1.01		
	SEPT 13/97			74	4.2		1.04		
	SEPT 13/97			69	3.5		1.07		
	SEPT 13/97			67	3		1		
	SEPT 13/97			75	4.3		1.02		
	SEPT 13/97			70	3.5		1.02		
	SEPT 13/97			72	3.6		0.96		
	SEPT 13/97			65	2.8		1.02		
	SEPT 13/97			69	3.2		0.97		
	SEPT 13/97			71	3.8		1.06		
	SEPT 13/97			74	4.1		1.01		
	SEPT 13/97			72	3.9		1.04		
FLAT R.3 T.15	SEPT 6/97		1	0	0	0			
FLAT R.3 T.14	SEPT 6/97		1	0	0	0			
FLAT R.3 T.13	SEPT 6/97	*(FIN CLIP)	1	70	3.5	10	1.02	1.06	10
	SEPT 6/97	*		106	12.8		1.07		
	SEPT 6/97	*		72	3.3		0.88		
	SEPT 6/97	*		72	3.8		1.02		
	SEPT 6/97			72	4.1		1.1		
	SEPT 6/97	*		75	4.5		1.07		
	SEPT 6/97	*		79	5.6		1.14		
	SEPT 6/97	*		72	4.4		1.18		
	SEPT 6/97	*		78	4.9		1.03		
	SEPT 6/97	*		73	4.4		1.13		
FLAT R.3 T.12	SEPT 6/97	*	1	72	4.5	3	1.21	1.19	3
	SEPT 6/97	*		80	6		1.17		
	SEPT 6/97	*		73	4.6		1.18		
FLAT R.2 T.11	SEPT 6/97	*	1	58	2.2	28	1.13	1.06	28
	SEPT 6/97	*		61	2.1		0.93		
	SEPT 6/97	*		55	1.9		1.14		
	SEPT 6/97	*		68	3.5		1.11		
	SEPT 6/97	*		62	2.5		1.05		
	SEPT 6/97	*		78	5.3		1.12		
	SEPT 6/97	*		57	1.9		1.03		
	SEPT 6/97	*		68	3.3		1.05		
	SEPT 6/97	*		65	2.8		1.02		
	SEPT 6/97	*		55	1.7		1.02		
	SEPT 6/97	*		65	3		1.09		
	SEPT 6/97	*		62	2.7		1.13		
	SEPT 6/97	*		60	2.4		1.11		
	SEPT 6/97	*		59	2.3		1.12		
	SEPT 6/97	*		60	2.4		1.11		
	SEPT 6/97	*		60	2.3		1.06		
	SEPT 6/97	*		59	2.4		1.17		
	SEPT 6/97	*		60	2.2		1.02		

NAME	DATE	COMMENT	DAYS	L(mm)	W(gm)	TOTAL	K	MEAN K	CPUE
	SEPT 6/97	*		63	2.6		1.04		
	SEPT 6/97	*		60	2.4		1.11		
	SEPT 6/97	*		58	2.2		1.13		
	SEPT 6/97			67	3.1		1.03		
	SEPT 6/97	*		58	2.1		1.08		
	SEPT 6/97	*		61	2.5		1.1		
	SEPT 6/97	*		63	2.4		0.96		
	SEPT 6/97	*		61	2		0.88		
	SEPT 6/97	*		62	2.1		0.88		
	SEPT 6/97			61	2.2		0.97		
FLAT R.2 T.10	SEPT 6/97	*	1			35			35
FLAT R.2 T.9	SEPT 6/97	*	1			33			33
FLAT R.2 T.8	SEPT 6/97	*	1			46			46
FLAT R.2 T.7	SEPT 6/97	*	1	60	3.1	21	1.44	1.14	21
	SEPT 6/97	*		56	1.8		1.02		
	SEPT 6/97	*		64	3		1.14		
	SEPT 6/97	*		58	2.3		1.18		
	SEPT 6/97	*		55	1.7		1.02		
	SEPT 6/97	*		60	2.4		1.11		
	SEPT 6/97	*		59	2.3		1.12		
	SEPT 6/97	*		57	2.4		1.3		
	SEPT 6/97	*		62	2.8		1.17		
	SEPT 6/97	*		59	2.4		1.17		
	SEPT 6/97	*		53	1.7		1.14		
	SEPT 6/97	*		60	2.3		1.06		
	SEPT 6/97	*		55	2		1.2		
	SEPT 6/97	*		59	2		0.97		
	SEPT 6/97	*		64	2.7		1.03		
	SEPT 6/97	*		73	4		1.03		
	SEPT 6/97	*		60	2.5		1.16		
	SEPT 6/97	*		56	2.2		1.25		
	SEPT 6/97	*		57	2.2		1.19		
	SEPT 6/97	*		59	2.1		1.02		
	SEPT 6/97	*		56	2.2		1.25		
FLAT R.2 T.6	SEPT 6/97	*	1			19			19
FLAT R.1 T.5	SEPT 6/97	*, 1 CCG	1	59	2.2	21	1.07	1.25	21
	SEPT 6/97	*		75	4.5		1.07		
	SEPT 6/97	*		60	3.7		1.71		
	SEPT 6/97	*		59	2		0.97		
	SEPT 6/97	*		60	2.3		1.06		
	SEPT 6/97	*		59	2		0.97		
	SEPT 6/97	*		60	2.3		1.06		
	SEPT 6/97	*		60	3.4		1.57		
	SEPT 6/97	*		65	3		1.09		
	SEPT 6/97	*		63	2.8		1.12		
	SEPT 6/97	*		65	3.2		1.17		
	SEPT 6/97	*		65	2.9		1.06		
	SEPT 6/97	*		64	2.8		1.07		
	SEPT 6/97			56	2		1.14		
	SEPT 6/97	*		59	2.3		1.12		
	SEPT 6/97	*		62	2.4		1.01		
	SEPT 6/97	*		58	2.1		1.08		
	SEPT 6/97	*		55	1.8		1.08		
	SEPT 6/97	*		51	1.4		1.06		
	SEPT 6/97	*		54	1.8		1.14		
	SEPT 6/97	*		60	2.5		1.16		

JCS Minnow Trapping Summary

NAME	DATE	COMMENT	DAYS	L(mm)	W(gm)	TOTAL	K	MEAN K	CPUE
	SEPT 6/97	*		60	2.8		1.3		
	SEPT 6/97	*		57	2.2		1.19		
FLAT R.1 T.4	SEPT 6/97	*, 4CCG	1			77			77
FLAT R.1 T.3	SEPT 7/97	1 CCG	2	68	3.4	4	1.08	1.05	2
	SEPT 7/97			81	5.1		0.96		
	SEPT 7/97			70	3.6		1.05		
	SEPT 7/97			70	3.8		1.11		
FLAT R.1 T.2	SEPT 7/97	BB, 1 JNP, 1 JS	2	64	2.4	2	0.92	0.92	1
	SEPT 7/97			63	2.3		0.92		
FLAT R.1 T.1	SEPT 7/97	1 JGR	2	70	3.1	1	0.9	0.9	0.5
LUCKY LOVE R.1 T.1	AUG 20/97	2 CCG	2	61	2.9	1	1.28	1.28	0.5
LUCKY LOVE R.1 T.2	AUG 20/97	1 JGR	2	53	1.4	15	0.94	1.15	7.5
	AUG 20/97	3 CCG +		57	2.4		1.3		
	AUG 20/97	10 JCS		54	1.6		1.02		
	AUG 20/97	OBSVD		53	1.9		1.28		
	AUG 20/97			60	2.5		1.16		
	AUG 20/97			54	1.8		1.14		
	AUG 20/97			55	2.3		1.38		
	AUG 20/97			55	2		1.2		
	AUG 20/97			54	1.7		1.08		
	AUG 20/97			58	2.1		1.08		
	AUG 20/97			55	1.9		1.14		
	AUG 20/97			57	2.2		1.19		
	AUG 20/97			54	2		1.27		
	AUG 20/97			57	1.9		1.03		
	AUG 20/97			53	1.6		1.07		
LUCKY LOVE R.1 T.3	AUG 20/97		2	57	2.3	16	1.24	1.15	8
	AUG 20/97			64	3		1.14		
	AUG 20/97			57	2.2		1.19		
	AUG 20/97			56	2.1		1.2		
	AUG 20/97			58	2.1		1.08		
	AUG 20/97			52	1.8		1.28		
	AUG 20/97			58	2.2		1.13		
	AUG 20/97			59	2.2		1.07		
	AUG 20/97			55	2		1.2		
	AUG 20/97			55	2.1		1.26		
	AUG 20/97			54	2		1.27		
	AUG 20/97			58	2.4		1.23		
	AUG 20/97			53	1.5		1.01		
	AUG 20/97			52	1.4		1		
	AUG 20/97			55	1.8		1.08		
	AUG 20/97			53	1.6		1.07		
LUCKY LOVE R.1 T.4	AUG 20/97	2 GR	2	78	5.8	2	1.22	1.23	1
	AUG 20/97	OBSVD		82	6.8		1.23		
LUCKY LOVE R.1 T. 5	AUG 20/97	2 CCG	2	0	0	0			
LUCKY LOVE R.1 T. 6	AUG 20/97		2	0	0	0			
LUCKY LOVE R.2 T. 7	AUG 20/97	1 CCG	2	0	0	0			
LUCKY LOVE R.2 T. 8	AUG 20/97		2	0	0	0			

APPENDIX B

DFO/MOE SURVEY FORMS

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	IBEX R.	(local)	
Access	V4	Method	
Watershed Code	1 8 8 3 0 0 0 0	Reach No.	R1
Length(km)			
Location	2 Km U/S mouth.	Map#	105D/13
Site No.	S1	Lth.surv(m)	50 HC
U.T.M.		Fish Card	Y N
Field	☑	Hist.	☐
Date Y M D	9 7 0 9 0 3	Time	19:30
Agency	BR	Crew	PZ / BF /
Photos	#5/7	Air Photos	

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	34.5		
	Ave.Wet.Width (m)	28.2	T	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	.5	CL	
	% Pool 10, Riffle 50, Run 40, Other			
	Side Chan.%	15		0 ☐ 0-10 ☐ 10-40 ☐ >40 ☐
	Debris Area%	10		0 ☐ 0-5 ☐ 5-15 ☐ >15 ☐
	Debris Stable %			
	COVER: Total %	10		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder (Lg cbl)	In Veg	Over Veg	Cutbank
	10	15	30	5	20	20

Crown Closure %	5	C	Aspect	NW

C	BED MATERIAL		%	
	Fines	clay, silt, sand (<2mm)	10	10
	Gravels	small (2-16mm)	40	20
	Gravels	large (16-64mm)		20
	Larges	sm.cobble (64-128mm)	50	20
	Larges	lge.cobble (128-256mm)		20
	Larges	boulder (>256mm)		10
	Bedrock (R)			
	D90(cm)		C	Compaction ~~L M H~~ N/A

C	BANKS	
	Height(m)	.5 %Unstable
	Texture	(F) (G) L R
	Confinement	EN CO FC OC UC N/A
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A
	Stage	Dry (L) M H Flood
	Flood Signs Ht(m)	Braided Y N
	Bars (%)	pH 8.16 O2(ppm) 11.2
	Water Temp.(°C) 8.9	Turb.(cm) 1 Cond.(25°C) .096

OBSTRUCTIONS

C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	28.2	T	
Mean Depth (m)	.45	WR	
Mean Velocity (m/s)	.95	F	
Discharge (m³/s)			

REACH SYMBOL (Fish)

(Width, Valley:Channel, Slope) (Bed Material)

QP#19289 REVISED DEC 87 SS187

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	IBEX R.	(local)	
Access	V4/B	Method	
Watershed Code	1 8 8 3	Reach No.	R2
Length(km)			
Location	Adjacent to Kokanee Lk.	Map#	105D/13
Site No.	S2	Lth.surv(m)	50
U.T.M.		Fish Card	Y N
Field	☒	Hist.	☐
Date Y M D	9 7 0 8 2 5	Time	18:00
Agency	BR	Crew	PZ / BF /
Photos	#2/21	Air Photos	

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	14.7	T	
	Ave.Wet.Width (m)	10.2	T	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	.5	CL	
	% Pool 30, Riffle, Run 70, Other			
	Side Chan.%			0 ☐ 0-10 ☐ 10-40 ☐ >40 ☐
	Debris Area%			0 ☐ 0-5 ☐ 5-15 ☐ >15 ☒
	Debris Stable %			
	COVER: Total %	20		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	25	5		10	30	30

Crown Closure %	10	C	Aspect	NW

C	BED MATERIAL		%	
	Fines	clay, silt, sand (<2mm)	90	90
C1	Gravels	small (2-16mm)	10	5
	Gravels	large (16-64mm)		5
	Larges	sm.cobble (64-128mm)		
	Larges	lge.cobble (128-256mm)		
	Larges	boulder (>256mm)		
	Bedrock (R)			
	D90(cm)		C2	Compaction L M (H)

C	BANKS	
	Height(m)	.9 %Unstable
	Texture	(F) G L R
	Confinement	EN CO FC OC UC N/A
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A
	Stage	Dry L (M) H Flood
	Flood Signs Ht(m)	Braided Y N
	Bars (%)	pH 8.23 O2(ppm) 12.04
	Water Temp.(°C) 10.6	Turb.(cm) 2 Cond.(25°C) .140

OBSTRUCTIONS

C	Ht(m)	Type	Loc'n
C3			

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	10.2	T	
Mean Depth (m)	.16	WR	
Mean Velocity (m/s)	.5	F	
Discharge (m³/s)			

REACH SYMBOL (Fish)

(Width, Valley:Channel, Slope) (Bed Material)

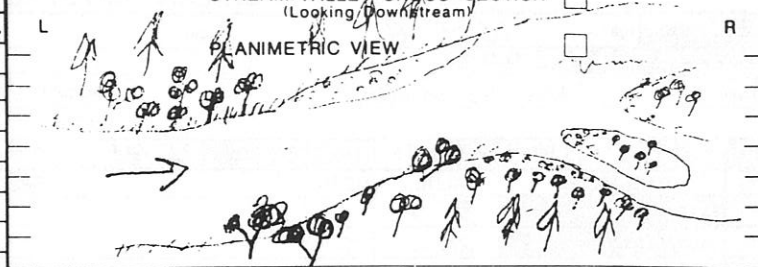
REVISED DEC 87 SS187

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

PLANIMETRIC VIEW ☐

L R



COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☐; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

Edited by:

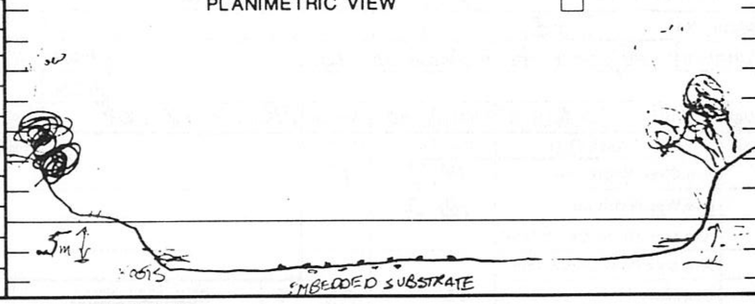
Date Y M D:

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☒
(Looking Downstream)

PLANIMETRIC VIEW ☐

L R



COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☐; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

C1 - Banks mud/clay

C2 - substrate gravel + fines overlayed w/ clay/silt.

C3 - below beaver dam - not obstruction.

Edited by:

Date Y M D:

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	IBEX RIVER (local)	Access	BT
Method			
Watershed Code	883	Reach No.	R3
Length(km)		Location	below beaver dam HH#16+17 site.
Map#	105 P/13	Site No.	S3
Lth.surv.(m)	50	U.T.M.	
Fish Card	Y N	C	Field [X] Hist. [ ]
Date Y M D	97 08 23	Time	21:20
Agency	BR	Crew	PZ / BF /
Photos		Air Photos	

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	22	T	
	Ave.Wet.Width (m)	9.5	T	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	1	CL	
	% Pool 33 Riffle 33 Run 33 Other			
	Side Chan.% 0 [ ] 0-10 [ ] 10-40 [ ] >40 [ ]			
	Debris Area% 10: 0 [ ] 0-5 [ ] 5-15 [X] >15 [ ]			
	Debris Stable %			
	COVER: Total %	20		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	25	20		5	25	25

Crown Closure %	10	C	Aspect	NW

C	BED MATERIAL		%	
	Fines	clay, silt, sand (<2mm)	40	40
	Gravels	small (2-16mm)	50	25
		large (16-64mm)		25
	Larges	sm.cobble (64-128mm)	10	5
		lge.cobble (128-256mm)		5
		boulder (>256mm)		
	Bedrock (R)			
	D_{90}(cm)	C	Compaction (L) M H	

C	BANKS			
	Height(m) 1.2	%Unstable 10		
	Texture (F G) L R			
	Confinement	EN CO FC OC UC N/A		
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A		
	Stage	Dry L (M) H Flood		
	Flood Signs Ht(m)		Braided	Y N
	Bars (%)	pH 7.72	O_2(ppm)	10.52
	Water Temp.(°C) 8.6	Turb.(cm) 2	Cond.(25°C)	.131

OBSTRUCTIONS

C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	9.5	T	
Mean Depth (m)	.75	T	
Mean Velocity (m/s)	.83	F	
Discharge (m^3/s)			

REACH SYMBOL
(Fish)

(Width, Valley:Channel, Slope) (Bed Material)

REVISED DEC 87 SS187

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	IBEX RIVER (local)	Access	4W / FT
Method			
Watershed Code	883	Reach No.	R3
Length(km)		Location	PUT-IN, 8.5 km down IBEX R. RD. from Scout Lk Rd.
Map#	105 D/13	Site No.	S3A
Lth.surv.(m)	50m	U.T.M.	
Fish Card	Y N	C	Field [X] Hist. [ ]
Date Y M D	97 08 23	Time	14:45
Agency	BR.	Crew	PZ. / BF. /
Photos	#2/3,17	Air Photos	

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	11.8	T	
	Ave.Wet.Width (m)	10	T	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	1	CL	
	% Pool 20 Riffle 60 Run 20 Other			
	Side Chan.% 0 [ ] 0-10 [ ] 10-40 [ ] >40 [ ]			
	Debris Area% 20: 0 [ ] 0-5 [ ] 5-15 [ ] >15 [ ]			
	Debris Stable %			
	COVER: Total %	15		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	10	5	5		40	40

Crown Closure %	60	C	Aspect	NW

C	BED MATERIAL		%	
	Fines	clay, silt, sand (<2mm)	10	10
	Gravels	small (2-16mm)	50	20
		large (16-64mm)		30
	Larges	sm.cobble (64-128mm)	40	40
		lge.cobble (128-256mm)		
		boulder (>256mm)		
	Bedrock (R)			
	D_{90}(cm)	C	Compaction (L) M H	

C	BANKS			
	Height(m) 1.5	%Unstable 0		
	Texture (F G) L R			
	Confinement	EN CO FC OC UC N/A		
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A		
	Stage	Dry L (M) H Flood		
	Flood Signs Ht(m)		Braided	Y N
	Bars (%)	pH 8.11	O_2(ppm)	11.02
	Water Temp.(°C) 9	Turb.(cm) 1	Cond.(25°C)	.114

OBSTRUCTIONS

C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	10	T	
Mean Depth (m)	.37	T	
Mean Velocity (m/s)	.67	F	
Discharge (m^3/s)			

REACH SYMBOL
(Fish)

(Width, Valley:Channel, Slope) (Bed Material)

REVISED DEC 87 SS187

FISH SUMMARY						
C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

PLANIMETRIC VIEW ☐

L R

COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☐; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

Edited by:

Date Y M D:

FISH SUMMARY						
C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

PLANIMETRIC VIEW ☐

L R

COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☐; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

Edited by:

Date Y M D:

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	IBEX RIVER (local)	Access	2V
Method			
Watershed Code	883	Reach No.	R4
Length(km)			
Location	Stream Guage	Map#	105D/11
Site No.	S4	Lth.surv(m)	80
U.T.M.		Fish Card	Y N
C		Field / Hist.	
Date Y M D	97 08 19	Time	18:50
Agency	BR	Crew	PZ/BF/
Photos	#1/11-12	Air Photos	

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	15.5	T	
	Ave.Wet.Width (m)	10.4	T	
	Ave.Max.Riffle Depth (cm)	47	T	
	Ave.Max.Pool Depth (cm)	70	GE	
	Gradient %	1.5	CL	
	% Pool 10 / Riffle 25 / Run 65 / Other			
	Side Chan.%	0 / 0-10 / 10-40 / >40		
	Debris Area%	10	0 / 0-5 / 5-15 / >15	
	Debris Stable %			
	COVER: Total %	30		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	10	10	10		35	35

Crown Closure %	50	C	Aspect	NW

C	BED MATERIAL		%	
	Fines	clay,silt,sand (<2mm)	10	10
	Gravels	small (2-16mm)	30	
		large (16-64mm)		30
	Larges	sm.cobble (64-128mm)	60	20
		lge.cobble (128-256mm)		20
		boulder (>256mm)		20
	Bedrock (R)			
	D_{90}(cm)		C	Compaction (L) M H

C	BANKS			
	Height(m)	1.6	%Unstable	0
	Texture	(F) G (L) R		
	Confinement	EN CO FC OC UC N/A		
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A		
	Stage	Dry L (M) H Flood		
	Flood Signs Ht(m)		Braided	Y N
	Bars (%)		pH	8.1
	O_2(ppm)	11.28		
	Water Temp.(°C)	9.2	Turb.(cm)	<1
	Cond.(25°C)	119		

DISCHARGE

C	Parameter	Value	Method	Specific Data
	Wetted Width (m)	10.4	T	
	Mean Depth (m)	.40	GE	
	Mean Velocity (m/s)	1.1	F	
	Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width,Valley:Channel,Slope) (Bed Material)

REVISED DEC 87 SS187

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	IBEX RIVER (local)	Access	V4, FT
Method			
Watershed Code	883	Reach No.	R5
Length(km)			
Location	UPPER IBEX, above Jackson Crk (km)	Map#	105 D/11
Site No.	S5	Lth.surv(m)	80m
U.T.M.		Fish Card	Y N
C		Field / Hist.	
Date Y M D	97 08 19	Time	16:00
Agency	B.R.	Crew	PZ/BF/
Photos	#1/8-10	Air Photos	

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	15.8	T	
	Ave.Wet.Width (m)	10	T	
	Ave.Max.Riffle Depth (cm)	40	T	
	Ave.Max.Pool Depth (cm)	150	GE	
	Gradient %	1	CL	
	% Pool 10 / Riffle 50 / Run 40 / Other		GE	
	Side Chan.%	0 / 0-10 / 10-40 / >40		
	Debris Area%		0 / 0-5 / 5-15 [X] / >15	
	Debris Stable %			
	COVER: Total %	25		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	15	5	5		30	45

Crown Closure %	20	C	Aspect	N

C	BED MATERIAL		%	
	Fines	clay,silt,sand (<2mm)	5	5
	Gravels	small (2-16mm)	40	10
		large (16-64mm)		30
	Larges	sm.cobble (64-128mm)	50	10
		lge.cobble (128-256mm)		40
		boulder (>256mm)		
	Bedrock (R)		5	5
	D_{90}(cm)		C	Compaction (L) M H

C	BANKS			
	Height(m)	.4	%Unstable	5
	Texture	F (G L) R		
	Confinement	EN (CO) FC OC UC N/A		
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A		
	Stage	Dry L (M) H Flood		
	Flood Signs Ht(m)		Braided	Y N
	Bars (%)		pH	8.19
	O_2(ppm)	10.74		
	Water Temp.(°C)	9.5	Turb.(cm)	1
	Cond.(25°C)	115		

DISCHARGE

C	Parameter	Value	Method	Specific Data
	Wetted Width (m)	10	T	
	Mean Depth (m)	.40	T	
	Mean Velocity (m/s)	1.6	F	
	Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width,Valley:Channel,Slope) (Bed Material)

REVISED DEC 87 SS187

FISH SUMMARY						
C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

L R

PLANIMETRIC VIEW ☐

COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☐; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

Edited by:

Date Y M D:

FISH SUMMARY						
C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

L R

PLANIMETRIC VIEW ☐

COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☐; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

Edited by:

Date Y M D:

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	Arkell Ck (local)	Access	Ft
Watershed Code	883141	Method	
Reach No.	1	Length(km)	
Location	.5 km U/S confluence Ibex	Map#	105 D/13
Site No.	1	Lth.surv.(m)	
U.T.M.		Fish Card	Y N C Field ☐ Hist. ☐
Date Y M D	97 08 29	Time	20:30
Agency	BR	Crew	PZ / BF /
Photos	#3/17	Air Photos	

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	45	GE	
	Ave.Wet.Width (m)	8.5	G.E.	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	.5	CL	
	%Pool 40 Riffle 50 Run 10 Other			
	Side Chan.% 10 ☐0 ☐0-10 ☐10-40 ☐>40			
	Debris Area% 10 ☐0 ☐0-5 ☐5-15 ☐>15			
	Debris Stable %			
	COVER: Total %	10		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	30	20	20		20	10

Crown Closure % 10 | C | Aspect N

C	BED MATERIAL		%	%
	Fines	clay, silt, sand (<2mm) (sand circled)	20	20
	Gravels	small (2-16mm)	40	20
		large (16-64mm)		20
	Larges	sm.cobble (64-128mm)	40	20
		lge.cobble (128-256mm)		20
		boulder (>256mm)		
	Bedrock (R)			
	D_{90}(cm)	N/A	Compaction	L M H

C	BANKS	
	Height(m)	.5 %Unstable
	Texture	F G L R
	Confinement	EN CO FC OC UC N/A
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A
	Stage	Dry (L) M H Flood
	Flood Signs Ht(m)	Braided Y N
	Bars (%)	pH 7.95 O_2(ppm) 10.95
	Water Temp.(°C) 10.5	Turb.(cm) 0 Cond.(25°C) .031

OBSTRUCTIONS C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	8.5	GE	
Mean Depth (m)	.40	WR	
Mean Velocity (m/s)	.8	F	
Discharge (m^3/s)			

REACH SYMBOL
(Fish)

(Width,Valley:Channel,Slope) (Bed Material)

REVISED DEC 87 SS187

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	ARKELL CK. (local)	Access	
Watershed Code	883141	Method	
Reach No.	2	Length(km)	
Location	2.5 km U/S mouth	Map#	105 D/13
Site No.	2	Lth.surv.(m)	
U.T.M.		Fish Card	Y N C Field ☐ Hist. ☐
Date Y M D	97 08 29	Time	17:00
Agency	BR	Crew	PZ / BF /
Photos	#3/2-3	Air Photos	

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	10.5	H.C.	
	Ave.Wet.Width (m)	6.5	HC	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	1	CL	
	%Pool 30 Riffle 70 Run Other			
	Side Chan.% 10 ☐0 ☐0-10 ☐10-40 ☐>40			
	Debris Area% 10 ☐0 ☐0-5 ☐5-15 ☐>15			
	Debris Stable %			
	COVER: Total %	30		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	20		10		5	5

Crown Closure % 0 | C | Aspect N

C	BED MATERIAL		%	%
	Fines	clay, silt, sand (<2mm)	10	10
	Gravels	small (2-16mm)	20	10
		large (16-64mm)		10
	Larges	sm.cobble (64-128mm)	70	25
		lge.cobble (128-256mm)		25
		boulder (>256mm)		20
	Bedrock (R)			
	D_{90}(cm)	C	Compaction	L M H

C	BANKS	
	Height(m)	.5 %Unstable
	Texture	F G (L) R
	Confinement	EN CO FC OC UC N/A
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A
	Stage	Dry (L) M H Flood
	Flood Signs Ht(m)	Braided Y N
	Bars (%)	pH 7.53 O_2(ppm) 11.21
	Water Temp.(°C) 10.5	Turb.(cm) 0 Cond.(25°C) .029

OBSTRUCTIONS C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	6.5	HC	
Mean Depth (m)	.25	WR	
Mean Velocity (m/s)	2.2	F	
Discharge (m^3/s)			

REACH SYMBOL
(Fish)

(Width,Valley:Channel,Slope) (Bed Material)

QP#19289

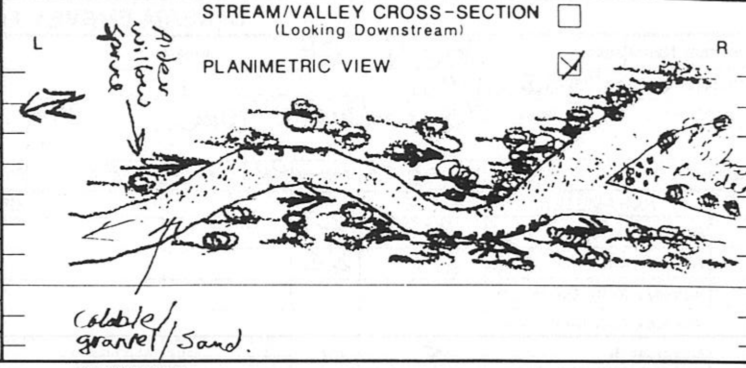
REVISED DEC 87 SS187

FISH SUMMARY						
C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

PLANIMETRIC VIEW ☒

L R



COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☐; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

Edited by:

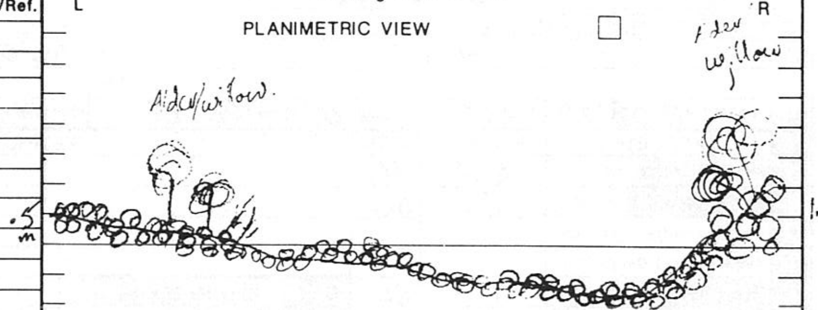
Date Y M D:

FISH SUMMARY						
C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☒
(Looking Downstream)

PLANIMETRIC VIEW ☐

L R



COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☐; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

Edited by:

Date Y M D:

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	Arkell Ck.	(local)	
Access	Ft	Method	
Watershed Code	8831141	Reach No.	3
Location	8.5 km U/S mouth.	Map#	105 D/12
U.T.M.		Site No.	3
Length(km)		Lth.surv.(m)	
Fish Card	Y N	C	Field ☐ Hist. ☐
Date YMD	97 08 29	Time	16:30
Agency	BR	Crew	PZ / BF /
Photos	#3/3-4	Air Photos	

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	110	HC	
	Ave.Wet.Width (m)	6	HC	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	2	CL	
	% Pool 40 / Riffle 60 / Run / Other			
	Side Chan.%	05	☐0 ☐0-10 ☐10-40 ☐>40	
	Debris Area%	05	☐0 ☐0-5 ☐5-15 ☐>15	
	Debris Stable %			
	COVER: Total %	30		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	30		60		10	

Crown Closure %	0	C	Aspect	N

C	BED MATERIAL		%	
	Fines	clay,silt,sand (<2mm)	20	20
	Gravels	small (2-16mm)		
	Gravels	large (16-64mm)	30	30
	Larges	sm.cobble (64-128mm)		10
	Larges	lge.cobble (128-256mm)	50	20
	Larges	boulder (>256mm)		30
	Bedrock (R)			
	D_{90}(cm)		C	Compaction L M H — N/A

C	BANKS	
	Height(m)	.5
	%Unstable	
	Texture	F G (L) R
	Confinement	EN CO FC OC UC N/A
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A
	Stage	Dry (L) M H Flood
	Flood Signs Ht(m)	
	Braided	Y N
	Bars (%)	
	pH	7.65
	O_2(ppm)	11.34
	Water Temp.(°C)	9.8
	Turb.(cm)	0
	Cond.(25°C)	.027

OBSTRUCTIONS

C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	6	HC	
Mean Depth (m)	.4	WR	
Mean Velocity (m/s)	1.53	F	
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width,Valley:Channel,Slope) (Bed Material)

REVISED DEC 87 SS187

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	UNNAMED	(local)	EASY LOVE C. (AA)
Access	Ft	Method	
Watershed Code	88030591	Reach No.	1
Location	3.7 km U/S	Map#	105 D/13
U.T.M.		Site No.	1
Length(km)		Lth.surv.(m)	50
Fish Card	Y N	C	Field ☐ Hist. ☐
Date YMD	97 09 17	Time	14:00
Agency	BR	Crew	PZ / BF /
Photos	#9/K-20	Air Photos	

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	3.7	T	
	Ave.Wet.Width (m)	2.75	T	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	.5	CL	
	% Pool 35 / Riffle 20 / Run 45 / Other			
	Side Chan.%	10	☐0 ☐0-10 ☐10-40 ☐>40	
	Debris Area%	20	☐0 ☐0-5 ☐5-15 ☐>15	
	Debris Stable %			
	COVER: Total %	30		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	25	10	–	5	30	30

Crown Closure %	–	C	Aspect	NW

C	BED MATERIAL		%
	Fines	clay,silt,sand (<2mm)	50
	Gravels	small (2-16mm)	35
	Gravels	large (16-64mm)	10
	Larges	sm.cobble (64-128mm)	5
	Larges	lge.cobble (128-256mm)	
	Larges	boulder (>256mm)	
	Bedrock (R)		
	D_{90}(cm)	C	Compaction L M H — N/A

C	BANKS	
	Height(m)	.5
	%Unstable	
	Texture	(F) G L R
	Confinement	EN CO FC OC UC N/A
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A
	Stage	Dry (L) M H Flood
	Flood Signs Ht(m)	
	Braided	Y N
	Bars (%)	
	pH	7.65
	O_2(ppm)	13.05
	Water Temp.(°C)	3.1
	Turb.(cm)	3.5
	Cond.(25°C)	.170

OBSTRUCTIONS

C	Ht(m)	Type	Loc'n
	2.5	BD.	4.5k U/S

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	2.75	T	
Mean Depth (m)	.25	WR	
Mean Velocity (m/s)	.19	F	
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width,Valley:Channel,Slope) (Bed Material)

REVISED DEC 87 SS187

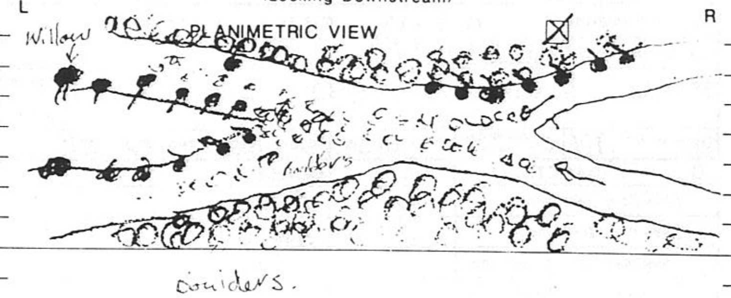
QP#19289

FISH SUMMARY						
C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

PLANIMETRIC VIEW ☒

L R



COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☐; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

Edited by:

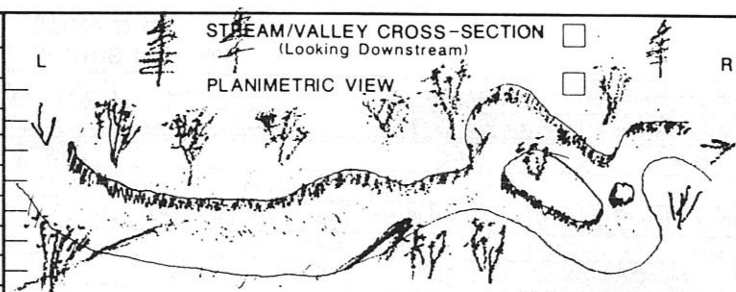
Date Y M D:

FISH SUMMARY						
C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

PLANIMETRIC VIEW ☐

L R



COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☐; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

Edited by:

Date Y M D:

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	Mendenhall C. (local)	Access	V2
Watershed Code	880389	Reach No.	1
Location	Alaska HWY bridge crossing. Downstream 100 m.	Map#	115A/16
Site No.	1	Lth.surv.(m)	50 m HC
U.T.M.		Fish Card	Y N C Field ☐ Hist. ☐
Date YMD	970902	Time	18:00
Agency	BR	Crew	PZ / BF /
Photos		Air Photos	

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	11	GE	
	Ave.Wet.Width (m)	6	GE	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	.25	CL	
	% Pool 20 Riffle Run 80 Other			
	Side Chan.% 0 ☐ 0-10 ☐ 10-40 ☐ >40 ☐			
	Debris Area% 20 0 ☐ 0-5 ☐ 5-15 ☐ >15 ☐			
	Debris Stable %			
	COVER: Total %	25		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	10	20		10	30	30

Crown Closure %: 5-10 | Aspect: SE

C	BED MATERIAL		%	
	Fines	clay,silt,sand (<2mm) (circled)	90	90
	Gravels	small (2-16mm)		
	Gravels	large (16-64mm)		
	Larges	sm.cobble (64-128mm) (circled)	10	10
	Larges	lge.cobble (128-256mm)		
	Larges	boulder (>256mm)		
	Bedrock (R)			

D_{90}(cm): | C | Compaction: L M (H)

C	BANKS			
	Height(m)	1.75	%Unstable	10
	Texture	(F) G L R		
	Confinement	EN CO FC OC UC N/A		
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A		
	Stage	Dry (L) M H Flood		
	Flood Signs Ht(m)		Braided	Y N
	Bars (%)		pH	8.21
	O_2(ppm)	11.25		
	Water Temp.(°C)	9.9	Turb.(cm)	20
	Cond.(25°C)	.149		

OBSTRUCTIONS C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	6	GE	
Mean Depth (m)	.8	WR	
Mean Velocity (m/s)	.625	F	
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width,Valley:Channel,Slope) (Bed Material)

QP#19289 REVISED DEC 87 SS187

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	STONEY C. (local)	Access	Ft
Watershed Code		Reach No.	1
Location	200 m South pipeline corridor.	Map#	105D/13
Site No.	1	Lth.surv.(m)	50 HC
U.T.M.		Fish Card	Y N C Field ☐ Hist. ☐
Date YMD	970902	Time	18:30
Agency	BR	Crew	PZ / BF /
Photos	#4/12	Air Photos	

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	6.4	T	
	Ave.Wet.Width (m)	4.4	T	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	.5	CL	
	% Pool 33 Riffle 33 Run 33 Other			
	Side Chan.% 0 ☐ 0-10 ☐ 10-40 ☐ >40 ☐			
	Debris Area% 10 0 ☐ 0-5 ☐ 5-15 ☐ >15 ☐			
	Debris Stable %			
	COVER: Total %	15		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	20	10			35	35

Crown Closure %: 35 | Aspect: NW

C	BED MATERIAL		%
	Fines	clay,silt,sand (<2mm)	33
	Gravels	small (2-16mm)	33
	Gravels	large (16-64mm)	
	Larges	sm.cobble (64-128mm)	33
	Larges	lge.cobble (128-256mm)	
	Larges	boulder (>256mm)	
	Bedrock (R)		

D_{90}(cm): | C | Compaction: (L) M H

C	BANKS			
	Height(m)	.4	%Unstable	5
	Texture	(F G) L R		
	Confinement	EN CO FC OC UC N/A		
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A		
	Stage	Dry (L) M H Flood		
	Flood Signs Ht(m)		Braided	Y N
	Bars (%)		pH	8.09
	O_2(ppm)	10.98		
	Water Temp.(°C)	8.8	Turb.(cm)	2
	Cond.(25°C)	.152		

OBSTRUCTIONS C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	4.4	T	
Mean Depth (m)	.14	WR	
Mean Velocity (m/s)	.43	F	
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width,Valley:Channel,Slope) (Bed Material)

QP#19289 REVISED DEC 87 SS187

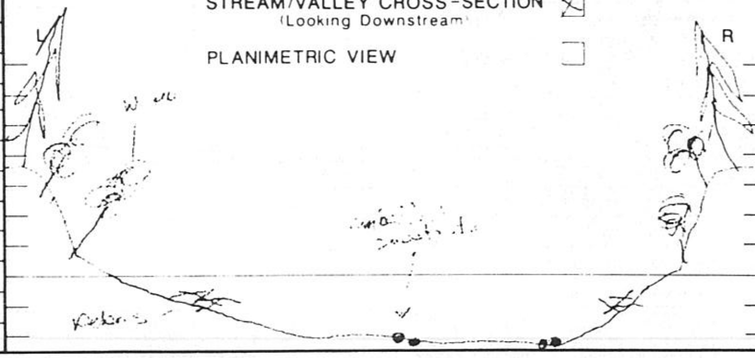
FISH SUMMARY

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☒
(Looking Downstream)

PLANIMETRIC VIEW ☐

L R



COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☐; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

Edited by:

Date Y M D:

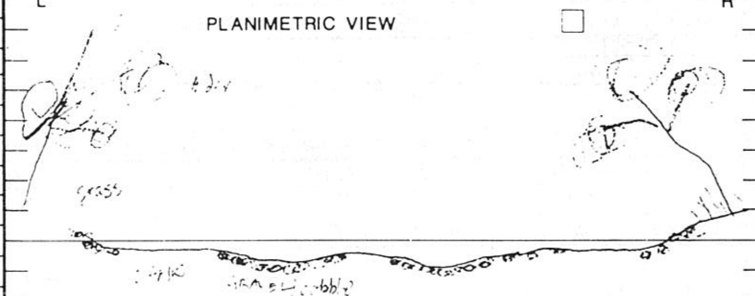
FISH SUMMARY

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

PLANIMETRIC VIEW ☐

L R



COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☐; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

Edited by:

Date Y M D:

DFO / MOE
STREAM SURVEY FORM

Field	Value	Field	Value
Stream Name (gaz.)	STONEY CRK. (local)	Access	V2
Watershed Code		Method	
Location	Above Alaska HWY	Reach No.	2
Map#	105D/13	Length(km)	
U.T.M.		Site No.	2
Date Y M D	97 09 03	Lthsurv.(m)	50
Time	17:30	Fish Card	Y N C
Agency	BR	Field ☐ Hist. ☐	
Crew	PZ / BF /	Air Photos	
Photos			

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	7.1	T	
	Ave.Wet.Width (m)	4.9	T	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	.5-1	CL	
	% Pool 20 Riffle 40 Run 40 Other			
	Side Chan.% 10 ☐0 ☐0-10 ☐10-40 ☐>40			
	Debris Area% 5 ☐0 ☐0-5 ☐5-15 ☐>15			
	Debris Stable %			
	COVER: Total %	15		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	5	5	10		40	40

Crown Closure % 90 | C Aspect S

C	BED MATERIAL	%
Fines	clay, silt, sand (<2mm)	20
Gravels	small (2-16mm)	20
Gravels	large (16-64mm)	10
Larges	sm. cobble (64-128mm)	20
Larges	lge. cobble (128-256mm)	20
Larges	boulder (>256mm)	10
	Bedrock (R)	

D_{90}(cm) | C Compaction L M H (struck through / marked)

C	BANKS	
	Height(m) .5	%Unstable
	Texture (F G circled) L R	
	Confinement	EN CO FC OC UC N/A
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A
	Stage	Dry (L circled) M H Flood
	Flood Signs Ht(m)	Braided Y N
	Bars (%)	pH 8.16 O_2(ppm) 11.48
	Water Temp.(°C) 8.5	Turb.(cm) 1 Cond.(25°C) .144

OBSTRUCTIONS: C | Ht(m) | Type | Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	4.9	T	
Mean Depth (m)	.16	WR	
Mean Velocity (m/s)	.36	F	
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width, Valley: Channel, Slope) (Bed Material)

QP#19289 REVISED DEC 87 SS187

DFO / MOE
STREAM SURVEY FORM

Field	Value	Field	Value
Stream Name (gaz.)	STONEY CK. (local)	Access	V4/F7
Watershed Code		Method	HC
Location	Above mine activity.	Reach No.	3
Map#	105D/13	Length(km)	
U.T.M.		Site No.	3
Date Y M D	97 09 03	Lthsurv.(m)	50
Time	14:00	Fish Card	Y N C
Agency	BR	Field ☐ Hist. ☐	
Crew	PZ / BF /	Air Photos	
Photos	#4/14		

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	10.7	T	
	Ave.Wet.Width (m)	3.5	T	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	3.5-5	CL	
	% Pool 25 Riffle 75 Run Other			
	Side Chan.% 10 ☐0 ☐0-10 ☐10-40 ☐>40			
	Debris Area% 65 ☐0 ☐0-5 ☐5-15 ☐>15			
	Debris Stable %			
	COVER: Total %	35		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	10	5	60		25	10

Crown Closure % 30 | C Aspect S

C	BED MATERIAL	%
Fines	clay, silt, sand (<2mm)	5
Gravels	small (2-16mm)	10
Gravels	large (16-64mm)	10
Larges	sm. cobble (64-128mm)	15
Larges	lge. cobble (128-256mm)	30
Larges	boulder (>256mm)	30
	Bedrock (R)	

D_{90}(cm) | C Compaction (L circled) M H

C	BANKS	
	Height(m) 1.5	%Unstable
	Texture F (G L circled) R	
	Confinement	EN CO FC OC UC N/A
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A
	Stage	Dry (L circled) M H Flood
	Flood Signs Ht(m)	Braided Y N
	Bars (%)	pH 8.16 O_2(ppm) 11.74
	Water Temp.(°C) 7.1	Turb.(cm) 1 Cond.(25°C) .107

OBSTRUCTIONS: C | Ht(m) | Type | Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	8.5	T	
Mean Depth (m)	.25	WR	
Mean Velocity (m/s)	.625	F	
Discharge (m^3/s)			

REACH SYMBOL (Fish)

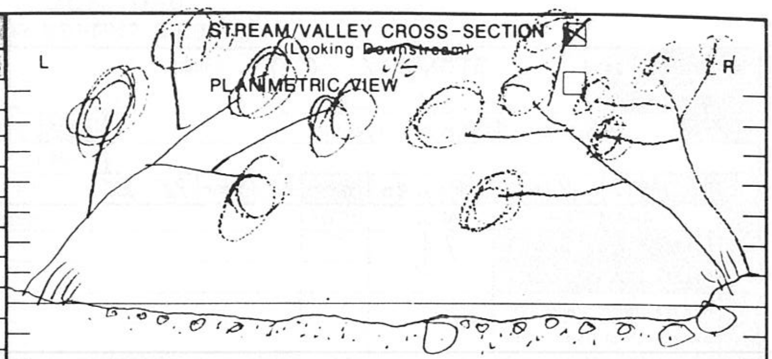
(Width, Valley: Channel, Slope) (Bed Material)

QP#19289 REVISED DEC 87 SS187

FISH SUMMARY

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☒
(Looking Downstream)
PLANIMETRIC VIEW ☐



COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☐; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

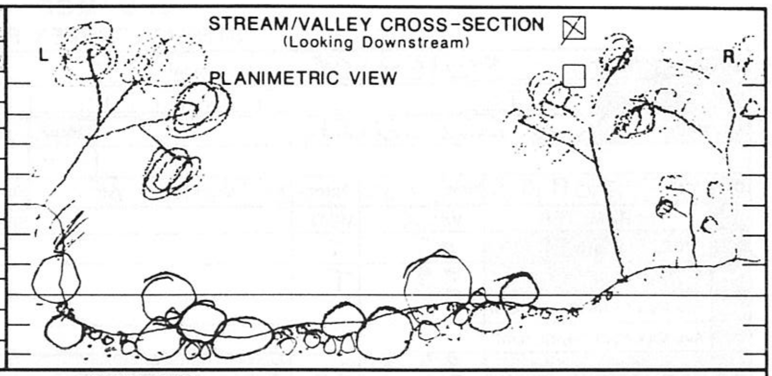
Edited by:

Date Y M D:

FISH SUMMARY

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☒
(Looking Downstream)
PLANIMETRIC VIEW ☐



COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☐; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

Edited by:

Date Y M D:

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	THIRTY SEVEN MILE C. (local)	Access	Method
Watershed Code	880 2292	Reach No. 1	Length(km)
Location	. km U/S mouth. Map# 105D/13	Site No. 1	Lthsurv(m) 50
	U.T.M.	Fish Card Y N	C Field ☐ Hist. ☐
Date Y M D 97 09 15	Time 17:30 Agency BR Crew PZ / BF / Photos	Air Photos	

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	7.1	T	
	Ave.Wet.Width (m)	4.8	T	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	.5	LC	
	% Pool 30 Riffle 20 Run 50 Other			
	Side Chan.%	– 0☐ 0-10☐ 10-40☐ >40☐		
	Debris Area%	30 0☐ 0-5☐ 5-15☐ >15☐		
	Debris Stable %			
	COVER: Total %	20		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	10	10	5	15	30	30

Crown Closure % 0 | C | Aspect E

OBSTRUCTIONS

C	Ht(m)	Type	Loc'n

C	BED MATERIAL		%
C1	Fines	clay,silt,sand (<2mm)	35 35
	Gravels	small (2-16mm)	50 50
	Gravels	large (16-64mm)	
	Larges	sm.cobble (64-128mm)	15 5
	Larges	lge.cobble (128-256mm)	5
	Larges	boulder (>256mm)	5
	Bedrock (R)		
	D_{90}(cm)	C Compaction	L (M) H

C	BANKS	
	Height(m) .75	%Unstable
	Texture	(F G) L R
	Confinement	EN CO FC OC UC N/A
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A
	Stage	Dry (L) M H Flood
	Flood Signs Ht(m)	Braided Y N
	Bars (%)	pH 7.8 O_2(ppm) 11.96
	Water Temp.(°C) 6.2	Turb.(cm) 5.7 Cond.(25°C) .192

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	4.8	T	
Mean Depth (m)	.32	WR	
Mean Velocity (m/s)	.42	F	
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width,Valley:Channel,Slope) (Bed Material)

QP#19289 REVISED DEC 87 SS187

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	THIRTY SEVEN MILE C. (local)	Access	Method
Watershed Code	880 2292	Reach No. 2	Length(km)
Location	BRIDGE CROSSING, 100m U/S OLD HWY Map# 105D/13	Site No. 2	Lthsurv(m)
	U.T.M.	Fish Card Y N	C Field ☐ Hist. ☐
Date Y M D 97 09 11	Time 14:20 Agency BR Crew PZ / BF / Photos	Air Photos	

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	3.5		
	Ave.Wet.Width (m)	2.7	T	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	1-2		
	% Pool 20 Riffle 40 Run 40 Other			
	Side Chan.%	0 0☐ 0-10☐ 10-40☐ >40☐		
	Debris Area%	10 0☐ 0-5☐ 5-15☐ >15☐		
	Debris Stable %			
	COVER: Total %	35		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	15	15	10	5	5	50

Crown Closure % 80 | C | Aspect S

OBSTRUCTIONS

C	Ht(m)	Type	Loc'n

C	BED MATERIAL		%
	Fines	clay,silt,sand (<2mm)	20 20
	Gravels	small (2-16mm)	20 10
	Gravels	large (16-64mm)	10
	Larges	sm.cobble (64-128mm)	20
	Larges	lge.cobble (128-256mm)	60 20
	Larges	boulder (>256mm)	20
	Bedrock (R)		
	D_{90}(cm)	C Compaction	L (M) H

C	BANKS	
	Height(m) 1	%Unstable
	Texture	(F) G L R
	Confinement	EN CO FC OC UC N/A
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A
	Stage	Dry (L) M H Flood
	Flood Signs Ht(m)	Braided Y N
	Bars (%)	pH 8.05 O_2(ppm) 11.15
	Water Temp.(°C) 8.2	Turb.(cm) 4 Cond.(25°C) .175

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	2.7	T	
Mean Depth (m)	.3	T	
Mean Velocity (m/s)	.64	F	
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width,Valley:Channel,Slope) (Bed Material)

QP#19289 REVISED DEC 87 SS187

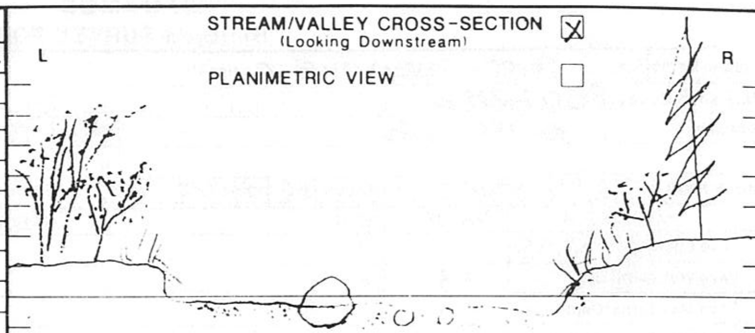
FISH SUMMARY

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☒
(Looking Downstream)

PLANIMETRIC VIEW ☐

L R



COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☒; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

C1 Areas of good spawning substrate, Some compaction from silt + Low flow.

Edited by:

Date Y M D:

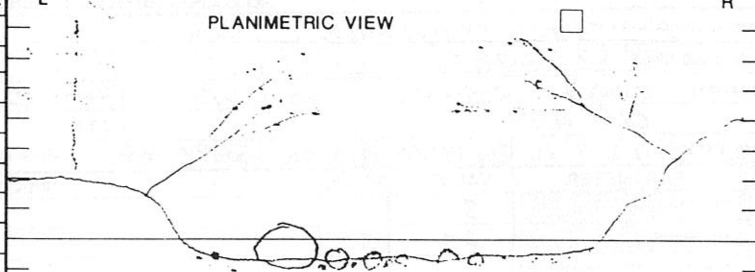
FISH SUMMARY

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☒
(Looking Downstream)

PLANIMETRIC VIEW ☐

L R



COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☐; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

Edited by:

Date Y M D:

DFO/MOE
STREAM SURVEY FORM

Stream Name (gaz.)	THIRTY SEVEN MILE C. (local)	Access	Method
Watershed Code	8802292	Reach No. 3	Length(km)
Location	6 Km U/S 37 Mile Rd. (below B.P.) from Old HWY. Map# 105 D/13 UTM	Site No. 3	Lthsurv.(m)
		Fish Card Y N	C Field ☐ Hist. ☐
Date Y M D 970911	Time 12:00 Agency BR Crew PZ/BF/ Photos	Air Photos	

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	3.3	T	
	Ave.Wet.Width (m)	2.9	T	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	.75	CL	
	% Pool 40 Riffle 25 Run 35 Other			
	Side Chan.% 5			
	Debris Area% 5			
	Debris Stable %			
	COVER: Total %	35		
	Comp. sum 100%: Dp Pool 20, L.O.D. 5, Boulder 30, In Veg 5, Over Veg 20, Cutbank 20			
	Crown Closure %	0-5	Aspect S	

OBSTRUCTIONS

C	Ht(m)	Type	Loc'n
C1	1	BD	6km

BED MATERIAL

C	Bed Material		%
	Fines	clay,silt,sand (<2mm)	10
	Gravels	small (2-16mm)	
	Gravels	large (16-64mm)	
	Larges	sm.cobble (64-128mm)	10
	Larges	lge.cobble (128-256mm)	30
	Larges	boulder (>256mm)	50
	Bedrock (R)		
	D_{90}(cm)		Compaction L (M) H

(Fines total 10, Larges total 90)

BANKS

Height(m)	1
%Unstable	
Texture	(F) G (L) R
Confinement	EN CO FC OC UC N/A
Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A
Stage	Dry (L) M H Flood
Flood Signs Ht(m)	
Braided	Y N
Bars (%)	
pH	7.67
O_2(ppm)	10.2?
Water Temp.(°C)	9.5
Turb.(cm)	3
Cond.(25°C)	.140

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	2.9	T	
Mean Depth (m)	.35	WR	
Mean Velocity (m/s)	.44	F	
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width,Valley:Channel,Slope) (Bed Material)

QP#19289 REVISED DEC 87 SS187

DFO/MOE
STREAM SURVEY FORM

Stream Name (gaz.)	LITTLE (local)	Access V4	Method
Watershed Code	8801946	Reach No. 1	Length(km)
Location	OLD HWY CROSSING Map# 105 P/13 UTM	Site No. 1	Lthsurv.(m) 50
		Fish Card Y N	C Field ☐ Hist. ☐
Date Y M D 970913	Time 13:30 Agency BR Crew PZ/BF/ Photos #8/26	Air Photos	

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	14	T	
	Ave.Wet.Width (m)	11.9	T	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	.5	CL	
	% Pool 25 Riffle — Run 75 Other			
	Side Chan.%			
	Debris Area% 20			
	Debris Stable %			
	COVER: Total %	5		
	Comp. sum 100%: Dp Pool 10, L.O.D. 30, Boulder –, In Veg –, Over Veg 30, Cutbank 30			
	Crown Closure %	10	Aspect S	

OBSTRUCTIONS

C	Ht(m)	Type	Loc'n

BED MATERIAL

C	Bed Material		%
C1	Fines	clay,silt,sand (<2mm)	95
	Gravels	small (2-16mm)	>5
	Gravels	large (16-64mm)	
	Larges	sm.cobble (64-128mm)	
	Larges	lge.cobble (128-256mm)	
	Larges	boulder (>256mm)	
	Bedrock (R)		
	D_{90}(cm)		Compaction ~~L M~~ H N/A

BANKS

Height(m)	1
%Unstable	30
Texture	(F) G L R
Confinement	EN CO FC OC UC N/A
Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A
Stage	Dry (L) M H Flood
Flood Signs Ht(m)	
Braided	Y N
Bars (%)	
pH	8.08
O_2(ppm)	12.10
Water Temp.(°C)	5.1
Turb.(cm)	9.5
Cond.(25°C)	.207

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	11.9	T	
Mean Depth (m)	.37	WR	
Mean Velocity (m/s)	.44	F	
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width,Valley:Channel,Slope) (Bed Material)

QP#19289 REVISED DEC 87 SS187

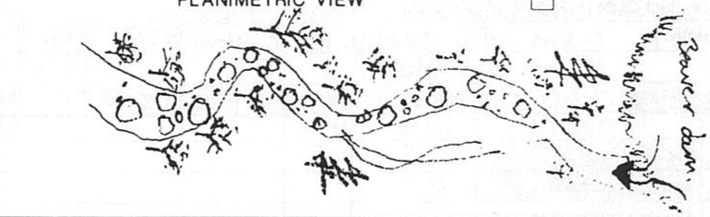
FISH SUMMARY

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

L — R

PLANIMETRIC VIEW ☐



COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☒; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

C1 Beaver dam - NFC caught above or below

Edited by:

Date Y M D:

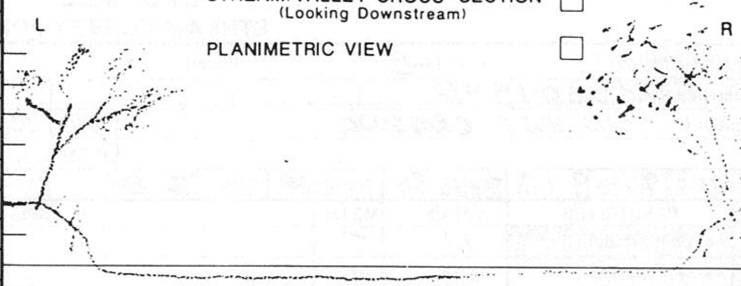
FISH SUMMARY

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

L — R

PLANIMETRIC VIEW ☐



COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☒; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

C1 Substrate predominantly silt/clay.

Edited by:

Date Y M D:

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	FLAT C.	(local)		Access	Bl.	Method
Watershed Code	8801275	Reach No.	1	Length(km)		
Location	200 m U/S mouth	Map#	105D/13	Site No.	1	Lth.surv.(m) 50	HC
		U.T.M.		Fish Card	Y N	C	Field ☐ Hist. ☐
Date Y M D	970905	Time 20:30	Agency BR	Crew PZ/BF/	Photos	Air Photos

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	9.8	T	
	Ave.Wet.Width (m)	6.6	T	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	.5	CL	
	% Pool 33 Riffle 33 Run 33 Other			
	Side Chan.% — 0☐ 0-10☐ 10-40☐ >40☐			
	Debris Area% 15 0☐ 0-5☐ 5-15☐ >15☐			
	Debris Stable %			
	COVER: Total %	10		
	Comp. sum 100%: Dp Pool 20, L.O.D. 5, Boulder –, In Veg –, Over Veg 40, Cutbank 40			
	Crown Closure %	5	C	Aspect S

C	BED MATERIAL		%
	Fines	clay,silt,sand (<2mm)	25
	Gravels	small (2-16mm)	65
	Gravels	large (16-64mm)	10
	Larges	sm.cobble (64-128mm)	
	Larges	lge.cobble (128-256mm)	
	Larges	boulder (>256mm)	
	Bedrock (R)		
	D_{90}(cm)	C C1	Compaction L (M) H

C	BANKS				
	Height(m) 5.2	%Unstable 5			
	Texture (F G) L R				
	Confinement	EN CO FC OC UC N/A			
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A			
	Stage	Dry (L) M H Flood			
	Flood Signs Ht(m)		Braided	Y N	
	Bars (%)		pH 8.12	O_2(ppm) 11.02	
	Water Temp (°C) 10.2	Turb.(cm) 5	Cond.(25°C) .167		

C	OBSTRUCTIONS		
C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	6.6	T	
Mean Depth (m)	.34	WR	
Mean Velocity (m/s)	.41	F	
Discharge (m^3/s)			

REACH SYMBOL
(Fish)

(Width,Valley:Channel,Slope) (Bed Material)

QP#19289 REVISED DEC 87 SS187

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	FLAT C.	(local)		Access		Method
Watershed Code	8801275	Reach No.	2	Length(km)		
Location	150 m D/S bridge - Old HWY	Map#	105D/13	Site No.	2	Lth.surv.(m) 50	HC
		U.T.M.		Fish Card	Y N	C	Field ☐ Hist. ☐
Date Y M D	970906	Time 19:30	Agency BR	Crew PZ/BF/	Photos #7/3	Air Photos

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	7.9	T	
	Ave.Wet.Width (m)	6.5	T	
	Ave.Max.Riffle Depth (cm)			
	Ave.Max.Pool Depth (cm)			
	Gradient %	.5	CL	
	% Pool 33 Riffle 33 Run 33 Other			
	Side Chan.% 0 0☐ 0-10☐ 10-40☐ >40☐			
	Debris Area% 20 0☐ 0-5☐ 5-15☐ >15☐			
	Debris Stable %			
	COVER: Total %	15		
	Comp. sum 100%: Dp Pool 10, L.O.D. 10, ~~Boulder~~ CB 10, In Veg —, Over Veg 35, Cutbank 35			
	Crown Closure %	30	C	Aspect S

C	BED MATERIAL		%
	Fines	clay,silt,sand (<2mm)	30
	Gravels	small (2-16mm)	30
	Gravels	large (16-64mm)	30
	Larges	sm.cobble (64-128mm)	10
	Larges	lge.cobble (128-256mm)	
	Larges	boulder (>256mm)	
	Bedrock (R)		
	D_{90}(cm)	C C1	Compaction L M (H)

C	BANKS				
	Height(m) 5-2.5	%Unstable			
	Texture (F G) L R				
	Confinement	EN CO FC OC UC N/A			
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A			
	Stage	Dry (L) M H Flood			
	Flood Signs Ht(m)		Braided	Y N	
	Bars (%)		pH 8.19	O_2(ppm) 11.5	
	Water Temp (°C) 8.8	Turb.(cm) 2	Cond.(25°C) .154		

C	OBSTRUCTIONS		
C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	6.5	T	
Mean Depth (m)	.25	WR	
Mean Velocity (m/s)	.68	F	
Discharge (m^3/s)			

REACH SYMBOL
(Fish)

(Width,Valley:Channel,Slope) (Bed Material)

QP#19289 REVISED DEC 87 SS187

FISH SUMMARY

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☐ (Looking Downstream)

PLANIMETRIC VIEW ☐

L R

COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☒; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

C1 - Compaction - Patches of bed substrate are low to moderately compacted while other patches are extremely loose, depending on location along channel + fluvial processes at work.

Edited by:

Date Y M D:

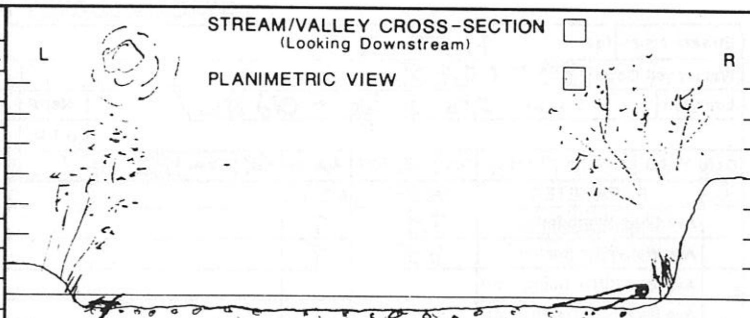
FISH SUMMARY

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☐ (Looking Downstream)

PLANIMETRIC VIEW ☐

L R



COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☒; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

C1 Compaction high - possibly due to previous beaver activity. Area may have been within impoundment or flow decreased as result of previous beaver activity.

Edited by:

Date Y M D:

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	Flat C.	(local)	
Access	V4/FT	Method	
Watershed Code	880 1275	Reach No.	3
Length (km)	-	Lth.surv.(m)	50 HC
Location	At Power line crossing.	Map#	105D/14
Site No.	3	U.T.M.	
Fish Card	Y N	Field / Hist.	
Date Y M D	97 09 06	Time	14:30
Agency	BR	Crew	PZ / BF /
Photos	#6/17-18	Air Photos	

C	PARAMETER	VALUE	METH.
	Ave.Chan.Width (m)	8.9	T
	Ave.Wet.Width (m)	4.6	T
	Ave.Max.Riffle Depth (cm)		
	Ave.Max.Pool Depth (cm)		
	Gradient %	1.5-6	CL
	% Pool 40, Riffle 40, Run 20, Other		
	Side Chan.%	0	
	Debris Area %	20	
	Debris Stable %		
	COVER: Total %	55	
	Comp. sum 100%: Dp Pool 20, L.O.D. 20, Boulder 20, In Veg –, Over Veg 20, Cutbank 20		
	Crown Closure %	80	
	Aspect	ES	

SPECIFIC DATA

OBSTRUCTIONS C	Ht(m)	Type	Loc'n
CT	.5	C	

C	BED MATERIAL		%	
	Fines	clay, silt, sand (<2mm)	30	30
	Gravels	small (2-16mm)	10	5
		large (16-64mm)		5
	Larges	sm. cobble (64-128mm)	60	5
		lge. cobble (128-256mm)		5
		boulder (>256mm)		[illegible]
	Bedrock (R)			
	D_{90}(cm)		Compaction	(L) M H

C	BANKS	
	Height(m)	2
	%Unstable	
	Texture	(F) G (L) R
	Confinement	EN CO FC OC UC N/A
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A
	Stage	Dry (L) M H Flood
	Flood Signs Ht(m)	
	Braided	Y N
	Bars (%)	
	pH	8.33
	O_2(ppm)	11.4
	Water Temp.(°C)	8
	Turb.(cm)	1
	Cond.(25°C)	.150

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	4.6	T	
Mean Depth (m)	.29	WR	
Mean Velocity (m/s)	.55	F	
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width, Valley:Channel, Slope) (Bed Material)

QP#19289 REVISED DEC 87 SS187

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)		(local)	LUCKY LOVE CREEK (BB)
Access	V4/FH/B	Method	
Watershed Code	880 1297	Reach No.	R1
Length (km)		Lth.surv.(m)	50 HC
Location	50m U/S confluence TAKHINI RIVER.	Map#	105D/14
Site No.	S1	U.T.M.	
Fish Card	Y N	Field / Hist.	
Date Y M D	97 08 20	Time	11:56
Agency	BR	Crew	PZ / BF /
Photos	R#1, 7	Air Photos	

C	PARAMETER	VALUE	METH.
	Ave.Chan.Width (m)	4.5	T
	Ave.Wet.Width (m)	2.2	T
	Ave.Max.Riffle Depth (cm)	35	T
	Ave.Max.Pool Depth (cm)	50	T
	Gradient %	.5	CL
	% Pool 5, Riffle 25, Run 70, Other		
	Side Chan.%		
	Debris Area %	5	
	Debris Stable %		
	COVER: Total %	5	
	Comp. sum 100%: Dp Pool 5, L.O.D. –, Boulder 5, In Veg 5, Over Veg 40, Cutbank 45		
	Crown Closure %	0	
	Aspect	N	

SPECIFIC DATA

OBSTRUCTIONS C	Ht(m)	Type	Loc'n

C	BED MATERIAL		%	
	Fines	clay, silt, sand (<2mm)	70	70
	Gravels	small (2-16mm)	20	10
		large (16-64mm)		10
	Larges	sm. cobble (64-128mm)	10	
		lge. cobble (128-256mm)		10
		boulder (>256mm)		
	Bedrock (R)			
	D_{90}(cm)		Compaction	L M H

C	BANKS	
	Height(m)	.6
	%Unstable	20
	Texture	(F) G L R
	Confinement	EN CO FC OC UC N/A
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A
	Stage	Dry L (M) H Flood
	Flood Signs Ht(m)	
	Braided	Y N
	Bars (%)	
	pH	8.14
	O_2(ppm)	12.73
	Water Temp.(°C)	7.5
	Turb.(cm)	52
	Cond.(25°C)	.270

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	4.5	T	
Mean Depth (m)	.35	T	
Mean Velocity (m/s)	.18	F	
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width, Valley:Channel, Slope) (Bed Material)

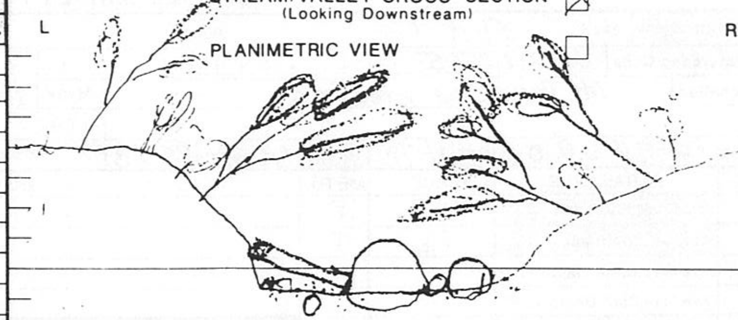
REVISED DEC 87 SS187

FISH SUMMARY						
C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION [X]
(Looking Downstream)

PLANIMETRIC VIEW [ ]

L R



COMMENTS

Channel Stability [ ]; Debris [ ]; Management Concerns [ ]; Obstructions [X]; Riparian Zone [ ]; Valley Wall Processes [ ]; Etc.

C1 There are numerous cascades over boulders but fish (JCS) caught above cascades averaging .5m. 800m U/S is canyon with a series of cascade waterfalls. Largest aprox 2m ht x 4m wd.

Edited by:

Date Y M D:

FISH SUMMARY						
C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION [ ]
(Looking Downstream)

PLANIMETRIC VIEW [ ]

L R

COMMENTS

Channel Stability [ ]; Debris [ ]; Management Concerns [ ]; Obstructions [ ]; Riparian Zone [ ]; Valley Wall Processes [ ]; Etc.

Edited by:

Date Y M D:

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	(local) LUCKY LOVE CREEK (BB)			Access	4V/Ft	Method
Watershed Code	88011297	Reach No.	R2	Length(km)	
Location	Aprox. 3km from mouth U/S. Confluence of all tributaries	Map# 105D/14	Site No. S2	Lth.surv.(m)	50
		U.T.M.	Fish Card Y N	C	Field ☐ Hist. ☐
Date Y M D 970820	Time 17:00	Agency BR	Crew PZ/BF/	Photos	Air Photos

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	9.7	T	
	Ave.Wet.Width (m)	1.75	T	
	Ave.Max.Riffle Depth (cm)	—		
	Ave.Max.Pool Depth (cm)	34	T	
	Gradient %	.5	CL	
	% Pool 40 Riffle Run 60 Other			
	Side Chan.% 0 ☐ 0-10 ☐ 10-40 ☐ >40 ☐			
	Debris Area% 20 0 ☐ 0-5 ☐ 5-15 ☐ >15 ☐			
	Debris Stable %			
	COVER: Total %	10		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	20	50			20	10

Crown Closure %	5	C	Aspect	N

C	BED MATERIAL		%
	Fines	clay, silt, sand (<2mm)	100
	Gravels	small (2-16mm)	
	Gravels	large (16-64mm)	
	Larges	sm.cobble (64-128mm)	
	Larges	lge.cobble (128-256mm)	
	Larges	boulder (>256mm)	
	Bedrock (R)		
	D_{90}(cm)	C	Compaction (L) M H

C	BANKS		
	Height(m) .55	%Unstable	50
	Texture	(F) G L R	

Confinement	EN CO FC OC UC N/A		
Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A		
Stage	Dry (L) M H Flood		
Flood Signs Ht(m)		Braided	Y N
Bars (%)		pH 9.61	O_2(ppm) 12.5
Water Temp (°C) 7.2	Turb.(cm) 0	Cond.(25°C)	.270

OBSTRUCTIONS			
C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	1.75	T	
Mean Depth (m)	.22	T	
Mean Velocity (m/s)	.31	F	
Discharge (m^3/s)			

REACH SYMBOL
(Fish)

(Width, Valley:Channel, Slope) (Bed Material)

QP#19289 REVISED DEC 87 SS187

FISH SUMMARY						
C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

L R

PLANIMETRIC VIEW ☐

COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☐; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

Edited by:

Date Y M D:

APPENDIX C

BENTHIC INVERTEBRATE

SURVEY FORMS

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name IBEX R.	Date Sept 3/97
Stream segment location or sampling location R1 S1	
sampler used, mesh size, total area sampled Surber, 363 μ, .27 m²	# of 30cm x 30cm samples 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	3	1	Caddisfly Larva (EPT) T
			Dobsonfly (hellgrammite)
			Gilled Snail
	96	4	Mayfly Nymph (EPT) E
			Riffle Beetle
	45	3	Stonefly Nymph (EPT) P
			Water Penny
	(144)	(8)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
		1	Cranefly Larva*
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
	2	1	Watersnipe Larva
	2	1	Noseeum (Ceratopogonidae)
CATEGORY 3 (pollution tolerant)	1	1	Aquatic Worm
	7	1	Blackfly Larva
			Leech
	67	1	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
	7	1	Water Mite
Other.	2	2	Diptera: Muscidae ?(Mydaeinae?) Housefly group
TOTAL	241	18	
	8	1	Soldier Fly (Stratiomyidae)
	1	1	Empididae (dance flies)

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name IBEX R.	Date Sept 3/97
Stream segment location or sampling location RI S1	
sampler used, mesh size, total area sampled Surber, 363u, .27m²	# of 30cm x 30cm samples 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 241

DENSITY: invertebrate density per square metre
(total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 892.59

B) PREDOMINANT TAXON

Ephemeroptera.

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 8
+ 2 X (# of Category 2) 2
+ (# of Category 3) 8
= 34

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 8

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .6

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name: IBEX R.	Date: Sept 3/97
Stream segment location or sampling location: R1 S1	
sampler used, mesh size, total area sampled: Surber, 363 μ, .27 m²	# of 30cm x 30cm samples: 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 18

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .398

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	Rating
Pollution Tolerance Index	4
EPT Index	3
EPT to Total Ratio	3
Predominant Taxon Ratio	4
Total	14
Average	3.5

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name IBEX R.	**Date** Aug 25/97
Stream segment location or sampling location R2 S2	
sampler used, mesh size, total area sampled Surber / 363 u / .27 m²	**# of 30cm x 30cm samples** 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	2	1	Caddisfly Larva (EPT) T
			Dobsonfly (hellgrammite)
			Gilled Snail
	6	3	Mayfly Nymph (EPT) E Heptageniidae
	1	1	Riffle Beetle
	3	2	Stonefly Nymph (EPT) P Peltoperlidae
			Water Penny
	(12)	(7)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
	8	1	Clam, Mussel
	1	1	Cranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
			Watersnipe Larva
	2	2	ceratopogonidae (No-see-ums)
CATEGORY 3 (pollution tolerant)			Aquatic Worm
	4	1	Blackfly Larva
			Leech
	15	1	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
	1	1	Water Mite
TOTAL	43	14	

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name IBEX R.	Date Aug 25/97
Stream segment location or sampling location R2 S2	
sampler used, mesh size, total area sampled Surber, 363 u, .27m²	# of 30cm x 30cm samples 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 43

DENSITY: invertebrate density per square metre
(total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 159.26

B) PREDOMINANT TAXON

Chironomid

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 7
+ 2 X (# of Category 2) 4
+ (# of Category 3) 3
= 32

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 7

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .28

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name IBEX R.	Date Aug 25/97
Stream segment location or sampling location R2 S2	
sampler used, mesh size, total area sampled Surber, 363 µ, .27 m²	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 14

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .35

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	**Rating**
Pollution Tolerance Index	4
EPT Index	3
EPT to Total Ratio	2
Predominant Taxon Ratio	4
Total	13
Average	3.25

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name	IBEX R.	**Date**	Aug 23/97
Stream segment location or sampling location	R3 S3		
sampler used, mesh size, total area sampled	Surber / 363 u / .27m²	**# of 30cm x 30cm samples**	3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	17	2	Caddisfly Larva (EPT) T
			Dobsonfly (hellgrammite)
			Gilled Snail
	231	6	Mayfly Nymph (EPT) E
			Riffle Beetle
	63	2	Stonefly Nymph (EPT) P
			Water Penny
	(311)	(10)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
	1	1	Cranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
			Watersnipe Larva
	32	1	Ceratopogonidae - (sandflies, No-see-ums)
CATEGORY 3 (pollution tolerant)			Aquatic Worm
	8	1	Blackfly Larva
			Leech
	112	2	Midge Larva (chironomid)
			Planarian
	1	1	Pouch and Pond Snails
			True Bug Adult
	12	1	Water Mite
	1	1	Thaumaleidae - Solitary Midge
TOTAL	482	21	

2	1	Empididae - Dance Flies
2	2	Unknown) Diptera

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name IBEX R.	Date Aug 23/97
Stream segment location or sampling location R3 S3	
sampler used, mesh size, total area sampled Surber, 363 µ, .27m²	# of 30cm x 30cm samples 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 482

DENSITY: invertebrate density per square metre
(total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 1785.19

B) PREDOMINANT TAXON Ephemeroptera

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 10
+ 2 X (# of Category 2) 2
+ (# of Category 3) 9
= 43

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 10

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .65

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name IBEX R.	Date Aug 23/97
Stream segment location or sampling location	R3 S3
sampler used, mesh size, total area sampled Surber, 363u, .27m²	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 21

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .49

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	**Rating**
Pollution Tolerance Index	4
EPT Index	4
EPT to Total Ratio	3
Predominant Taxon Ratio	3
Total	14
Average	3.5

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name IBEX R.	**Date** Aug 23/97
Stream segment location or sampling location R3 S3A	
sampler used, mesh size, total area sampled Surber, 363 u., .27 m2	**# of 30cm x 30cm samples** 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	13	2	Caddisfly Larva (EPT) T
			Dobsonfly (hellgrammite)
			Gilled Snail
	57	6	Mayfly Nymph (EPT) E
			Riffle Beetle
	3	2	Stonefly Nymph (EPT) P
			Water Penny
	(73)	(10)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
			Dranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
			Watersnipe Larva
CATEGORY 3 (pollution tolerant)	14	2	Aquatic Worm
	16	2	Blackfly Larva
			Leech
	14	2	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
	3	1	Water Mite
	(47)	(7)	
TOTAL	124	19	
	1	1	Hymenoptera (wasp)
	3	1	Empididae (Dance Fly)

Hepta

Simuliidae Adult 1

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name IBEX R.	Date Aug 23
Stream segment location or sampling location RB S3A	
sampler used, mesh size, total area sampled Surber, 363 m, .27m²	# of 30cm x 30cm samples 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 124

DENSITY: invertebrate density per square metre
(total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 459.26

B) PREDOMINANT TAXON

Ephemeroptera

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 10
+ 2 X (# of Category 2) 6
+ (# of Category 3) 9
= 39

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 10

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .59

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name IBEX R.	Date Aug 23
Stream segment location or sampling location RB 53A	
sampler used, mesh size, total area sampled Surber, 3u 3u, .27m²	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 19

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .46

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	Rating
Pollution Tolerance Index	4
EPT Index	4
EPT to Total Ratio	3
Predominant Taxon Ratio	4
Total	15
Average	3.75

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name IBEX R.	Date Aug 19/97
Stream segment location or sampling location R4 S4	
sampler used, mesh size, total area sampled Surber, 363 u, .27m²	# of 30cm x 30cm samples 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	48	Perlodidae 2	Caddisfly Larva (EPT) P
			Dobsonfly (hellgrammite)
			Gilled Snail
	58	5 1 Heptageniidae Baetidae	Mayfly Nymph (EPT) E
			Riffle Beetle
	26	4	Stonefly Nymph (EPT) T
			Water Penny
	(132)	(11)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
			Dranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
	1	1	Watersnipe Larva
	1	1	Ceratopogonidae
CATEGORY 3 (pollution tolerant)	1	1	Aquatic Worm
	5	1	Blackfly Larva
			Leech
	38	3	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
	9	1	Water Mite
TOTAL	189	21	

1	1	Stratiomyidae - Soldier fly Larva
1	1	Collembola (springtail)

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name IBEX R.	Date Aug 19/97
Stream segment location or sampling location RK 54	
sampler used, mesh size, total area sampled Surber, 363μ, .27 m²	# of 30cm x 30cm samples 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 189

DENSITY: invertebrate density per square metre
(total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 700

B) PREDOMINANT TAXON

Ephemeroptera

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 11
\+ 2 X (# of Category 2) 2
\+ (# of Category 3) 8
= 45

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 11

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .7

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name IBEX R.	Date Aug 19/97
Stream segment location or sampling location RH "34"	
sampler used, mesh size, total area sampled Surber, 363 µ, .27 m²	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 21

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .31

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	Rating
Pollution Tolerance Index	4
EPT Index	4
EPT to Total Ratio	3
Predominant Taxon Ratio	4
Total	15
Average	3.75

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name IBEX R.	**Date** AUG 19/97
Stream segment location or sampling location R555	
sampler used, mesh size, total area sampled Surber, 363 u / .27m²	**# of 30cm x 30cm samples** 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	44	3	Caddisfly Larva (EPT) P
			Dobsonfly (hellgrammite)
			Gilled Snail
	58	4	Mayfly Nymph (EPT) E
			Riffle Beetle
	15	3	Stonefly Nymph (EPT) T
			Water Penny
	(117)	(10)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
	3	2	Dranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
	1	1	Watersnipe Larva
CATEGORY 3 (pollution tolerant)			Aquatic Worm
	7	1	Blackfly Larva
			Leech
	110	2	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
	38	2	Water Mite
	4		
TOTAL	282	20	
	1	1	Mosquito (Culicidae)
	1	1	Dance Fly (Empididae)

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name IBEX R.	Date Aug 19/97
Stream segment location or sampling location	RS 35
sampler used, mesh size, total area sampled Surber, 363 u, .27 m²	# of 30cm x 30cm samples 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 282

DENSITY: invertebrate density per square metre (total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 1,044.44

B) PREDOMINANT TAXON

chironomid

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 10
+ 2 X (# of Category 2) 3
+ (# of Category 3) 7
= 43

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 10

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .41

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name IBEX R.	Date Aug 19/97
Stream segment location or sampling location RS 35	
sampler used, mesh size, total area sampled Surber, 363 µ, .27m²	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 20

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .39

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	Rating
Pollution Tolerance Index	4
EPT Index	4
EPT to Total Ratio	2
Predominant Taxon Ratio	4
Total	14
Average	3.5

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name ARKELL CK.	Date Aug 29/97
Stream segment location or sampling location R1 S1	
sampler used, mesh size, total area sampled Surber, 363 µ, .27m²	# of 30cm x 30cm samples 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	21	3	Caddisfly Larva (EPT) P
			Dobsonfly (hellgrammite)
			Gilled Snail
	91	5	Mayfly Nymph (EPT) E
			Riffle Beetle
	9	3	Stonefly Nymph (EPT) T
			Water Penny
	(121)	(11)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
			Dranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
			Watersnipe Larva
CATEGORY 3 (pollution tolerant)			Aquatic Worm
	7	1	Blackfly Larva
			Leech
	11	1	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
	3	1	Water Mite
TOTAL	143	15	
	1	1	Diptera

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name: Arbell Ck.	Date: Aug 29/97
Stream segment location or sampling location: R1 31	
sampler used, mesh size, total area sampled: Surber, 363 μ, .27 m²	# of 30cm x 30cm samples: 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 143

DENSITY: invertebrate density per square metre (total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 529.63

B) PREDOMINANT TAXON

Ephemeroptera

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 11
+ 2 X (# of Category 2) 0
+ (# of Category 3) 4
= 37

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 11

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .85

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name Arbell Ck.	Date Aug 29/97
Stream segment location or sampling location	R1S1
sampler used, mesh size, total area sampled Surber, 363 u, .27m²	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 15

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .64

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	Rating
Pollution Tolerance Index	4
EPT Index	4
EPT to Total Ratio	4
Predominant Taxon Ratio	3
Total	15
Average	3.75

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name Arkell Ck.	**Date** Aug 29/97
Stream segment location or sampling location R2 - S2	
sampler used, mesh size, total area sampled Surber, 363 m, .27 m²	**# of 30cm x 30cm samples** 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	19	1	Caddisfly Larva (EPT)
			Dobsonfly (hellgrammite)
			Gilled Snail
	136	4	Mayfly Nymph (EPT)
			Riffle Beetle
	10	3	Stonefly Nymph (EPT)
			Water Penny
	(165)	(8)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
			Dranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
			Watersnipe Larva
CATEGORY 3 (pollution tolerant)			Aquatic Worm
	6	2	Blackfly Larva
			Leech
	15	2	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
			Water Mite
TOTAL	186	12	

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name Arkell Ck.	Date Aug 29/97
Stream segment location or sampling location R252	
sampler used, mesh size, total area sampled Surber, 363u, .27m²	# of 30cm x 30cm samples 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 186

DENSITY: invertebrate density per square metre
(total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 688.89

B) PREDOMINANT TAXON

Ephemeroptera

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 8
+ 2 X (# of Category 2) 0
+ (# of Category 3) 4
= 28

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 8

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .89

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name: Arkell Ck.	Date: Aug 29/97
Stream segment location or sampling location: R2 S2	
sampler used, mesh size, total area sampled: Surber, 363u, .27m²	# of 30cm x 30cm samples: 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 12

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .73

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	Rating
Pollution Tolerance Index	4
EPT Index	3
EPT to Total Ratio	4
Predominant Taxon Ratio	2
Total	13
Average	3.25

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name Arkall CK.	Date Aug 29/97
Stream segment location or sampling location R3, S3	
sampler used, mesh size, total area sampled Surber, 363m, .27m²	# of 30cm x 30cm samples 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	60	2	Caddisfly Larva (EPT) P
			Dobsonfly (hellgrammite)
			Gilled Snail
	142	6	Mayfly Nymph (EPT) E
			Riffle Beetle
	45	2	Stonefly Nymph (EPT) T
			Water Penny
	(247)	(10)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
	2	1	Dranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
			Watersnipe Larva
CATEGORY 3 (pollution tolerant)			Aquatic Worm
	9	1	Blackfly Larva
			Leech
	37	1	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
	17	3	Water Mite
TOTAL	317	17	
	5	1	Diptera

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name Arkell Ck.	Date Aug 29/97
Stream segment location or sampling location	R353
sampler used, mesh size, total area sampled Surber, 363 u, .27m²	# of 30cm x 30cm samples 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 317

DENSITY: invertebrate density per square metre
(total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 1,1740.07

B) PREDOMINANT TAXON

Ephemeroptera

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 10
+ 2 X (# of Category 2) 1
+ (# of Category 3) 4
= 40

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 10

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .78

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name: Arkell Ck.	Date: Aug 29/97
Stream segment location or sampling location: R3 S3	
sampler used, mesh size, total area sampled: Surber, 363u, .27m²	# of 30cm x 30cm samples: 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 17

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .45

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	**Rating**
Pollution Tolerance Index	4
EPT Index	4
EPT to Total Ratio	4
Predominant Taxon Ratio	3
Total	15
Average	3.75

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name EASY LOVE CK (AA)	Date Sept 17/97
Stream segment location or sampling location R1 S1	
sampler used, mesh size, total area sampled Surber, 363 u, .27 m²	# of 30cm x 30cm samples 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1	22	2	Caddisfly Larva (EPT) P
			Dobsonfly (hellgrammite)
			Gilled Snail
(pollution intolerant)	65	1	Mayfly Nymph (EPT) E — Baetidae
			Riffle Beetle
	14 *(CASES ONLY)	1	Stonefly Nymph (EPT) T — Glossosoma
			Water Penny
	(101)	(4)	
CATEGORY 2			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
(somewhat tolerant of pollution)			Clam, Mussel
	1	1	Cranefly Larva (Tipulidae)
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
	2	1	~~Scud~~ Moth Fly (Psychodidae)
			Watersnipe Larva
	1	1	Stratiomyidae (Soldier Fly)
CATEGORY 3			Aquatic Worm
	1	1	Blackfly Larva
(pollution tolerant)			Leech
	4	2	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
			Water Mite
	1	1	Dance Fly (Empididae)
TOTAL	111	11	

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name EASY LOVE (AA) CK.	Date Sept 17/97
Stream segment location or sampling location R1 S1	
sampler used, mesh size, total area sampled Surber, 363 u, .27m²	# of 30cm x 30cm samples

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 111

DENSITY: invertebrate density per square metre
(total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 411.11

B) PREDOMINANT TAXON

Ephemeroptera

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 4
+ 2 X (# of Category 2) 3
+ (# of Category 3) 4
= 22

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 4

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .91

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **MODULE 4 (cont'd)**

Stream Name EASY LOVE (AA) CK.	Date Sept 17/97
Stream segment location or sampling location	R1 S1
sampler used, mesh size, total area sampled Surber, 363 µ, .27m^2	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 11

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .59

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	**Rating**
Pollution Tolerance Index	3
EPT Index	2
EPT to Total Ratio	4
Predominant Taxon Ratio	2
Total	11
Average	2.75

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name Mendenhall R.	Date Sept 2/97
Stream segment location or sampling location R1, S1,	
sampler used, mesh size, total area sampled Surber, 363 μ / .27 m²	# of 30cm x 30cm samples 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	1	1	Caddisfly Larva (EPT) P
			Dobsonfly (hellgrammite)
			Gilled Snail
	13	3	Mayfly Nymph (EPT) E
			Riffle Beetle
	3	1	Stonefly Nymph (EPT) T
			Water Penny
	(17)	(5)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
	2	1	Clam, Mussel
			Dranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
			Watersnipe Larva
CATEGORY 3 (pollution tolerant)			Aquatic Worm
	1	1	Blackfly Larva
			Leech
	3	1	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
			Water Mite
TOTAL	23	8	

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name Mendenhall R.	Date Sept 2/97
Stream segment location or sampling location RI 31	
sampler used, mesh size, total area sampled Surber, 363 μ, .27m²	# of 30cm x 30cm samples

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 23

DENSITY: invertebrate density per square metre (total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 85.19

B) PREDOMINANT TAXON

Ephemeroptera

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 5
+ 2 X (# of Category 2) 1
+ (# of Category 3) 2
= 19

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 5

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .74

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **MODULE 4 (cont'd)**

Stream Name Mendenhall R.	**Date** Sept 2/97
Stream segment location or sampling location R1S1	
sampler used, mesh size, total area sampled Suber, 363 u, .27m²	**# of 30cm x 30cm samples** 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 8

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .57

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING		
Index or Ratio	**Rating**	
Pollution Tolerance Index	3	
EPT Index	2	or 3
EPT to Total Ratio	3	
Predominant Taxon Ratio	3	
Total	11	12
Average	2.75	3

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name STONY CK.	**Date** Sept 2/97
Stream segment location or sampling location R1 S1	
sampler used, mesh size, total area sampled Surber, 363 u, .27 m²	**# of 30cm x 30cm samples** 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	143	3	Caddisfly Larva (EPT) P
			Dobsonfly (hellgrammite)
			Gilled Snail
	35	4	Mayfly Nymph (EPT) E
			Riffle Beetle
	6 1	1	Stonefly Nymph (EPT) T
			Water Penny
	(184)	(8)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
	70	3	Dranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
			Watersnipe Larva
	15	1	Noseeum (ceratopogonidae)
CATEGORY 3 (pollution tolerant)			Aquatic Worm
	4	1	Blackfly Larva
			Leech
	10	2	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
	2		Water Mite
TOTAL	287	16	

Chloroperlidae
" Triznak

Psectrotanypus
Orthocladiinae

2 1 Dance Fly

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name STONY CK	**Date** Sept 2/97
Stream segment location or sampling location RI 31	
sampler used, mesh size, total area sampled Surber, 363 M, .27m²	**# of 30cm x 30cm samples** 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 287

DENSITY: invertebrate density per square metre (total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 1,062.96

B) PREDOMINANT TAXON Plecoptera

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 8
+ 2 X (# of Category 2) 3
+ (# of Category 3) 4
= 31

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 8

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .64

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name STONY CK	Date Sept 2/97
Stream segment location or sampling location R1 S1	
sampler used, mesh size, total area sampled Surber, 363 u, .27 m²	# of 30cm x 30cm samples 3.

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 16

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .5

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	Rating
Pollution Tolerance Index	4
EPT Index	3
EPT to Total Ratio	3
Predominant Taxon Ratio	3
Total	13
Average	3.25

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name STONY CK.	**Date** Sept 3/97
Stream segment location or sampling location R2 S2	
sampler used, mesh size, total area sampled Surber, 363 µ, .27m²	**# of 30cm x 30cm samples** 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	202	3	Caddisfly Larva (EPT) P
			Dobsonfly (hellgrammite)
			Gilled Snail
	47	3	Mayfly Nymph (EPT) E
			Riffle Beetle
	7	3	Stonefly Nymph (EPT) T
			Water Penny
	(256)	(9)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
	45	2	Dranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
			Watersnipe Larva
	8	1	noseeum (ceratopogonidae)
CATEGORY 3 (pollution tolerant)			Aquatic Worm
			Blackfly Larva
			Leech
	17	1	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
	1		Water Mite
	1	1	Dance fly (Empididae)
TOTAL	328	14	

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name STONY CK	Date Sept 3/97
Stream segment location or sampling location R2 S3	
sampler used, mesh size, total area sampled Surber, 363 u, .27 m^2	# of 30cm x 30cm samples 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 328

DENSITY: invertebrate density per square metre (total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 1,214.81

B) PREDOMINANT TAXON Plecoptera

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 9
+ 2 X (# of Category 2) 2
+ (# of Category 3) 3
= 32

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 9

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .78

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name STONY CK.	Date Sept 3/97
Stream segment location or sampling location R2 S2	
sampler used, mesh size, total area sampled Surber, 363µ, .21m²	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 14

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .21

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	Rating
Pollution Tolerance Index	4
EPT Index	4
EPT to Total Ratio	4
Predominant Taxon Ratio	4
Total	16
Average	4

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name STONY CK.	**Date** Sept 3/97
Stream segment location or sampling location R3 S3	
sampler used, mesh size, total area sampled Surber, 363u, .27m2	**# of 30cm x 30cm samples** 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	215	4	Caddisfly Larva (EPT) P
			Dobsonfly (hellgrammite)
			Gilled Snail
	578	6	Mayfly Nymph (EPT) E — Epeorus sp. (He [illegible] Ephemerellidae 6
			Riffle Beetle
	126	4	Stonefly Nymph (EPT) T
			Water Penny
	(919)	(13)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
	1	1 Limoniinae	Cranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
	6	1	~~Fishfly Larva~~ Moth Fly
	6	1	~~[illegible]~~ Noseeum (Ceratopogonid)
			Watersnipe Larva
	2	1	Soldier Fly (Stratiomyidae)
CATEGORY 3 (pollution tolerant)			Aquatic Worm
	9	1	Blackfly Larva
			Leech
	111	1	Midge Larva (chironomid) — Psectrotanypus 4
			Planarian
			Pouch and Pond Snails
			True Bug Adult
			Water Mite
	22	3	Dance Flies (Empididae)
TOTAL	1078	25	

2 SPRINGTAIL

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name STONY CK	Date Sept 3/97
Stream segment location or sampling location R3 S3	
sampler used, mesh size, total area sampled Surber, 363 µ, .27 m²	# of 30cm x 30cm samples 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 1078

DENSITY: invertebrate density per square metre
(total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 3,992.59

B) PREDOMINANT TAXON

Ephemeroptera

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 13
+ 2 X (# of Category 2) 4
+ (# of Category 3) 5
= 52

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 13

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .85

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name STONY CK	Date Sept 3/97
Stream segment location or sampling location	R3 S3
sampler used, mesh size, total area sampled Surber, 363 µ, .27 m²	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 25

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .54

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	**Rating**
Pollution Tolerance Index	4
EPT Index	4
EPT to Total Ratio	4
Predominant Taxon Ratio	3
Total	15
Average	3.75

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name 37 Mile Ck.	**Date** Sept 15/97
Stream segment location or sampling location R1 S1	
sampler used, mesh size, total area sampled Suber, 363 µ, .27m²	**# of 30cm x 30cm samples** 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	1	1	Caddisfly Larva (EPT) P
			Dobsonfly (hellgrammite)
			Gilled Snail
	14	2	Mayfly Nymph (EPT) E
			Riffle Beetle
			Stonefly Nymph (EPT) T
			Water Penny
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
			Dranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
			Watersnipe Larva
	3	1	Moth Fly
CATEGORY 3 (pollution tolerant)			Aquatic Worm
	1	1	Blackfly Larva
			Leech
	14	2	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
	1	1	Water Mite
TOTAL	44	10	
	9	1	Dance Fly
	1	1	Diptera (?)

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name 37 Mile Ck	Date Sept 15/97
Stream segment location or sampling location RI 31	
sampler used, mesh size, total area sampled Surber, 363 u, .27m²	# of 30cm x 30cm samples 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 44

DENSITY: invertebrate density per square metre (total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 162.96

B) PREDOMINANT TAXON

Ephemeroptera/Chironomid

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 3
+ 2 X (# of Category 2)
+ (# of Category 3) 7
= 16

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 3

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .34

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name 37 Mile Ck.	Date Sept 15/97
Stream segment location or sampling location R1 S1	
sampler used, mesh size, total area sampled Surber, 363μ, .27m²	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 10

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .32

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	**Rating**
Pollution Tolerance Index	2
EPT Index	2
EPT to Total Ratio	2
Predominant Taxon Ratio	4
Total	10
Average	2.5

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name	37 Mile Ck.	Date	Sept 11/97
Stream segment location or sampling location		R2 S2	
sampler used, mesh size, total area sampled	Surber, 363 μ, .27 m^2	# of 30cm x 30cm samples	3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	168	4	Caddisfly Larva (EPT) P
			Dobsonfly (hellgrammite)
			Gilled Snail
	62	4	Mayfly Nymph (EPT) E
			Riffle Beetle
	43	4	Stonefly Nymph (EPT) T
			Water Penny
	(273)	(12)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
	7	2	Dranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
			Watersnipe Larva
	19	1	Moth Fly
CATEGORY 3 (pollution tolerant)	1	1	Aquatic Worm
	3	1	Blackfly Larva
			Leech
	5	2	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
	2	1	Water Mite
TOTAL	312	21	
	2	1	Dance Fly

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name 37 Mile Ck.	Date Sept 11/97
Stream segment location or sampling location R2 S2	
sampler used, mesh size, total area sampled Surber, 363 μ, .27 m²	# of 30cm x 30cm samples 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 312

DENSITY: invertebrate density per square metre (total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 1,155.56

B) PREDOMINANT TAXON

Plecoptera

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 12
+ 2 X (# of Category 2) 3
+ (# of Category 3) 6
= 48

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 12

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .88

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 -- 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name 37 Mile Ck.	Date Sept 11/97
Stream segment location or sampling location	R2 S2
sampler used, mesh size, total area sampled Surber, 363 u, .27m²	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 21

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .54

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	Rating
Pollution Tolerance Index	4
EPT Index	4
EPT to Total Ratio	4
Predominant Taxon Ratio	3
Total	15
Average	3.75

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name 37 Mile Ck.	Date Sept 11/97
Stream segment location or sampling location R353	
sampler used, mesh size, total area sampled Surber, 363 u, .27m²	# of 30cm x 30cm samples 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	14	2	Caddisfly Larva (EPT) P
			Dobsonfly (hellgrammite)
			Gilled Snail
	43	3	Mayfly Nymph (EPT) E
			Riffle Beetle
	13	4	Stonefly Nymph (EPT) T
			Water Penny
	(70)	(9)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
	1	1	Dranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
			Watersnipe Larva
	10	1	Moth Fly
CATEGORY 3 (pollution tolerant)	6	2	Aquatic Worm
	6	1	Blackfly Larva
			Leech
	25	2	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
	6	3	Water Mite
TOTAL	124	19	

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name 37 Mile Ck.	**Date** Sept 11/97
Stream segment location or sampling location	R3 S3
sampler used, mesh size, total area sampled Surber, 363 u, .27 m²	**# of 30cm x 30cm samples** 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 124

DENSITY: invertebrate density per square metre
(total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 459.26

B) PREDOMINANT TAXON Ephemeroptera

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 7
+ 2 X (# of Category 2) 2
+ (# of Category 3) 8
= 39

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 9

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .57

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name 37 Mile Ck.	Date Sept 11/97
Stream segment location or sampling location	R3 S3
sampler used, mesh size, total area sampled Surber, 363 u, .27 m²	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 19

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .35

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	Rating
Pollution Tolerance Index	4
EPT Index	4
EPT to Total Ratio	3
Predominant Taxon Ratio	4
Total	15
Average	3.75

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name Little R.	Date Sept 13/97
Stream segment location or sampling location R1 S1	
sampler used, mesh size, total area sampled Surber, 363 µ, .27m²	# of 30cm x 30cm samples 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	4	2	Caddisfly Larva (EPT) T
			Dobsonfly (hellgrammite)
			Gilled Snail
	10	2	Mayfly Nymph (EPT) E
			Riffle Beetle
	2	1	Stonefly Nymph (EPT) T
			Water Penny
	(16)	(5)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
			Dranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
			Watersnipe Larva
	1.	1	Snail
CATEGORY 3 (pollution tolerant)			Aquatic Worm
	2	1	Blackfly Larva
			Leech
	4	2	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
			Water Mite
TOTAL	23	9	

Brachycentrus ?

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name Little R.	Date Sept 13/97
Stream segment location or sampling location RI 31	
sampler used, mesh size, total area sampled Surber, 363 u, .27m²	# of 30cm x 30cm samples 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 23

DENSITY: invertebrate density per square metre (total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 85.19

.27

X / .27

B) PREDOMINANT TAXON

Ephemeroptera

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 5
+ 2 X (# of Category 2) 1
+ (# of Category 3) 3
= 20

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 5

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .7

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name Little R.	Date Sept 13/97
Stream segment location or sampling location R1S1	
sampler used, mesh size, total area sampled Surber, 363 μ, .27 m²	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 9

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .43

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	**Rating**
Pollution Tolerance Index	3
EPT Index	3
EPT to Total Ratio	3
Predominant Taxon Ratio	3
Total	11
Average	3

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name FLAT CK.	**Date** Sept 5/97
Stream segment location or sampling location R1 S1	
sampler used, mesh size, total area sampled Surber, 363 µ, .27 m²	**# of 30cm x 30cm samples** 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	8	2	Caddisfly Larva (EPT) P
			Dobsonfly (hellgrammite)
			Gilled Snail
	43	4	Mayfly Nymph (EPT) E — Leptophlebiae
			Riffle Beetle
	3	2	Stonefly Nymph (EPT) T — Rhyacophilidae, Hydroptila
			Water Penny
	(54)	(8)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
	6	1	Cranefly Larva Dicranota sp.
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
			Watersnipe Larva
	2	1	Moth Fly Larva (Psychodidae)
CATEGORY 3 (pollution tolerant)	2	1	Aquatic Worm
			Blackfly Larva
			Leech
	22	3	Midge Larva (chironomid) — Orthocladiinae, Psectrotanypus
			Planarian
			Pouch and Pond Snails
			True Bug Adult
			Water Mite
TOTAL	92	14	

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name FLAT CK.	**Date** Sept 5/97
Stream segment location or sampling location R1 S1	
sampler used, mesh size, total area sampled Surber, 363 u, .27m²	**# of 30cm x 30cm samples** 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 92

DENSITY: invertebrate density per square metre
(total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 340.74

B) PREDOMINANT TAXON

Ephemeroptera

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 8
+ 2 X (# of Category 2) 2
+ (# of Category 3) 4
= 32

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 8

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .59

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name FLAT CK.	Date Sept 5/97
Stream segment location or sampling location RI 31	
sampler used, mesh size, total area sampled Surber, 363 u, .27m²	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 14

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .47

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	Rating
Pollution Tolerance Index	4
EPT Index	3
EPT to Total Ratio	3
Predominant Taxon Ratio	3
Total	13
Average	3.25

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name FLAT CK	**Date** Sept 6/97
Stream segment location or sampling location R2 S2	
sampler used, mesh size, total area sampled Suber, 363 u, .27m²	**# of 30cm x 30cm samples** 3.

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	60	2	Caddisfly Larva (EPT) P
			Dobsonfly (hellgrammite)
			Gilled Snail
	98	4	Mayfly Nymph (EPT) E
			Riffle Beetle
	7	1	Stonefly Nymph (EPT) T
			Water Penny
	(165)	(7)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
	9	2	Dranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
	1	1	~~Seed~~ Ostracoda (Seed Shrimp Crustacea)
			Watersnipe Larva
	11	1	Moth Fly
CATEGORY 3 (pollution tolerant)	1	1	Aquatic Worm
	54	2	Blackfly Larva
			Leech
	11	1	Midge Larva (chironomid) chironomidae
			Planarian
			Pouch and Pond Snails
			True Bug Adult
	5	1	Water Mite
	1	1	No-see-um (Ceratopogonidae)
TOTAL	262	20	
	1	1	Soldier Fly (Stratiomyidae)
	1	1	Lepidoptera
	2	1	Dipteran

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name FLAT CK.	Date Sept 6/97
Stream segment location or sampling location	RZ 3Z
sampler used, mesh size, total area sampled Surber, 363 u., .27 m²	# of 30cm x 30cm samples 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 262

DENSITY: invertebrate density per square metre (total # counted) ÷ (# of 30 x 30 cm samples X .09 m²) = 970.37

B) PREDOMINANT TAXON Ephemeroptera

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 7
+ 2 X (# of Category 2) 4
+ (# of Category 3) 9
= 38

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 7

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .63

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name FLAT CK.	Date Sept 6/97
Stream segment location or sampling location R2 S2	
sampler used, mesh size, total area sampled Surber, 363 u, .27m²	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 20

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .37

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	Rating
Pollution Tolerance Index	4
EPT Index	3
EPT to Total Ratio	3
Predominant Taxon Ratio	4
Total	14
Average	3.5

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name FLAT CK.	**Date** Sept 6/97
Stream segment location or sampling location R3 S3	
sampler used, mesh size, total area sampled Surber, 363 u, .27m2	**# of 30cm x 30cm samples** 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	417	4	Caddisfly Larva (EPT) P
			Dobsonfly (hellgrammite)
			Gilled Snail
	208	6	Mayfly Nymph (EPT) E
			Riffle Beetle
	37	6	Stonefly Nymph (EPT) T
			Water Penny
	(662)	(16)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
	16	3	Cranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
	1	1	~~Sand~~ Snail
			Watersnipe Larva
	19	1	Moth Fly
CATEGORY 3 (pollution tolerant)			Aquatic Worm
	53	1	Blackfly Larva
			Leech
	19	2	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
	2	1	Water Mite
	4	1	Noseeum (Ceratopogonidae)
TOTAL	780	30	
	4	3	Dipteran?

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name FLAT CK.	Date Sept 6/97
Stream segment location or sampling location	R3 S3
sampler used, mesh size, total area sampled Surber, 363 u, .27m²	# of 30cm x 30cm samples 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 780

DENSITY: invertebrate density per square metre (total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 2,888.89

B) PREDOMINANT TAXON

Plecoptera

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 16
+ 2 X (# of Category 2) 4
+ (# of Category 3) 8

= 64

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 16

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .85

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name FLAT CK.	Date Sept 6/97
Stream segment location or sampling location R3 S3	
sampler used, mesh size, total area sampled Surber, 363 µ, .27 m²	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 30

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .53

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	Rating
Pollution Tolerance Index	4
EPT Index	4
EPT to Total Ratio	4
Predominant Taxon Ratio	3
Total	15
Average	3.75

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name LUCKY LOVE CR. ('BB')	**Date** Aug 20/97
Stream segment location or sampling location R#1 S#1	
sampler used, mesh size, total area sampled Surber, 363 μ, .27 m²	**# of 30cm x 30cm samples** 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	4	1	Caddisfly Larva (EPT) P
			Dobsonfly (hellgrammite)
			Gilled Snail
	2	2	Mayfly Nymph (EPT) E
			Riffle Beetle
	2	1	Stonefly Nymph (EPT) T
			Water Penny
	(8)	(4)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
			Dranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
			Watersnipe Larva
	217	1	Moth Fly Larva (Psychodidae)
CATEGORY 3 (pollution tolerant)			Aquatic Worm
	1	1	Blackfly Larva
			Leech
	179	3	Midge Larva (chironomid)
			Planarian
	4	3	Pouch and Pond Snails
			True Bug Adult
	19	2	Water Mite
TOTAL	434	16	
	1	1	Ephydridae (Shore, brine fly)
	5	1	Empididae (Dance fly)

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name Luckylove (BB) Ck.	**Date** Aug 20/97
Stream segment location or sampling location R131	
sampler used, mesh size, total area sampled Surber, 363 u, .27m²	**# of 30cm x 30cm samples** 3

A) · ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 434

DENSITY: invertebrate density per square metre
(total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 1,607.41

B) PREDOMINANT TAXON Psychodidae (Moth Fly Larva)

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 4
+ 2 X (# of Category 2) 1
+ (# of Category 3) 11
= 17

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 8

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .02

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 – 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name LUCKY LOVE (BB) CK.	Date Aug 20/97
Stream segment location or sampling location R1 S1	
sampler used, mesh size, total area sampled Surber, 363 u, .27m²	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 16

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .5

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	Rating
Pollution Tolerance Index	3
EPT Index	3
EPT to Total Ratio	1
Predominant Taxon Ratio	3
Total	10
Average	2.5

send the data to the Streamkeepers Database

Invertebrate Survey Field Data Sheet

(use a new data sheet for each location surveyed) **Module 4**

Stream Name LUCKY LOVE (BB) CK.	Date Aug 20/97
Stream segment location/or sampling location RR52	
sampler used, mesh size, total area sampled Surber, 363 u, .27m²	# of 30cm x 30cm samples 3

COLUMN A Pollution Tolerance	COLUMN B Number Counted	COLUMN C number of taxa	COLUMN D common name
CATEGORY 1 (pollution intolerant)	5	5	Caddisfly Larva (EPT)
			Dobsonfly (hellgrammite)
	3	2	Gilled Snail
	2	1	Mayfly Nymph (EPT)
			Riffle Beetle
	6	3	Stonefly Nymph (EPT)
			Water Penny
	(16)	(11)	
CATEGORY 2 (somewhat tolerant of pollution)			Alderfly Larva
			Aquatic Beetle
			Aquatic Sowbug
			Clam, Mussel
	3	3	Dranefly Larva
			Crayfish
			Damselfly Larva
			Dragonfly Larva
			Fishfly Larva
			Scud
			Watersnipe Larva
CATEGORY 3 (pollution tolerant)	11	3	Aquatic Worm
	19	3	Blackfly Larva
			Leech
	30	2	Midge Larva (chironomid)
			Planarian
			Pouch and Pond Snails
			True Bug Adult
	20	3	Water Mite
	(80)	(11)	
TOTAL	105	25	
	6	1	Empididae

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed) **Module 4**

Stream Name LUCKY LOVE (BB) CK.	Date Aug 20/97
Stream segment location or sampling location R2 S2	
sampler used, mesh size, total area sampled Surber, 363 µ, .27m²	# of 30cm x 30cm samples 3

A) ABUNDANCE AND DENSITY

ABUNDANCE: total number organisms from all samples = 105

DENSITY: invertebrate density per square metre (total # counted) ÷ (# of 30 x 30 cm samples X .09 m^2) = 388.89

B) PREDOMINANT TAXON

Chironomid

C) WATER QUALITY ASSESSMENTS

POLLUTION TOLERANCE INDEX: use the total number of broad taxonomic groups found in each pollution tolerance category, from Field Data Sheet (column D)

POLLUTION TOLERANCE INDEX			
Good	Acceptable	Marginal	Poor
>22	17-22	11-16	<11

3 X (# of Category 1) 11
+ 2 X (# of Category 2) 3
+ (# of Category 3) 12
= 51

EPT INDEX: total number of EPT taxa from column C, Field Data Sheet = 11

EPT INDEX			
Good	Acceptable	Marginal	Poor
>8	5-8	2-5	0-1

EPT TO TOTAL RATIO: total number of EPT organisms from column B, Field Data Sheet divided by total number of organisms = .15

EPT TO TOTAL RATIO			
Good	Acceptable	Marginal	Poor
0.75 - 1.00	0.50 - 0.75	0.25 - 0.50	0 -- 0.25

send the data to the Streamkeepers Database

Invertebrate Survey Interpretation Sheet

(use a new interpretation sheet for each location surveyed)

MODULE 4 (cont'd)

Stream Name LUCKY LOVE (BB)	Date Aug 20/97
Stream segment location or sampling location R2 S2	
sampler used, mesh size, total area sampled Surber, 363 u, .27 m²	# of 30cm x 30cm samples 3

D) DIVERSITY ASSESSMENT

TOTAL NUMBER OF TAXA: from column C, Field Data Sheet = 25

PREDOMINANT TAXON RATIO: divide the number of organisms in the predominant taxon by the total number counted = .29

PREDOMINANT TAXON RATIO			
Good	Acceptable	Marginal	Poor
0 - 0.40	0.40 - 0.60	0.60 - 0.80	0.80 - 1.0

E) SITE ASSESSMENT RATING

Assign a rating between 1 and 4 to each index or ratio, then average the results to produce a general site assessment.

SITE ASSESSMENT RATING			
Good	Acceptable	Marginal	Poor
4	3	2	1

SITE ASSESSMENT RATING	
Index or Ratio	Rating
Pollution Tolerance Index	4
EPT Index	4
EPT to Total Ratio	1
Predominant Taxon Ratio	4
Total	13
Average	3.25

APPENDIX D

WATER QUALITY

SUMMARY

Ibex River Water Quality

PARAMETERS (Total mg/l)	CCREM 1995 FRESHWATER AQUATIC LIFE	NAP* August 1987	NAP* August 1988	YAA** July 1993 (1.5km U/S)	YBWQS*** 1993 max-min-avg (Scout L. Road)	YBWQS*** 1994 max-min-avg (Scout L. Road)	YBWQS*** 1995 max-min-avg (Scout L. Road)	YBWQS*** 1996 max-min-avg (Scout L. Road)	Blue River 1998 Dissolved (D/S Arkell)
Aluminum	0.005-0.1	0.09	<0.05	.059	0.55-0.06-0.14	3.20-0.06-0.19	0.56-0.01-0.09	6.71-0.06-0.41	0.020
Ammonia	1.37-2.2				0.007-0.002-0.003	0.012-0.002-0.004	0.029-0.002-0.006	0.114-0.002-0.014	
Antimony				<0.02	0.06-0.05-0.06	0.06-0.06-0.06	0.06-0.05-0.06	0.06-0.06-0.06	<0.0005
Arsenic	0.05			<0.04	0.09-0.05-0.06	0.06-0.06-0.06	0.06-0.01-0.06	0.06-0.06-0.06	<0.001
Barium		<0.001	<0.01	0.014	0.039-0.018-0.023	0.071-0.022-0.033	0.080-0.022-0.035	0.118-0.019-0.031	0.0316
Beryllium				<0.0002	0.007-0.001-0.001	0.001-0.001-0.001	0.001-0.001-0.001	0.060-0.001-0.004	<0.0005
Bismuth				<0.02					<0.00005
Boron					0.82-0.01-0.05	0.01-0.01-0.01	0.01-0.01-0.01	0.03-0.01-0.01	
Cadmium	0.0002-0.0018			<0.0003	0.006-0.005-0.006	0.006-0.006-0.006	0.006-0.005-0.006	0.028-0.006-0.007	<0.0001
Calcium		11.4	14.4	9.69	22.1-7.4-14.0	25.5-8.5-18.0	30.3-9.5-20.9	20.9-9.4-14.2	27.2
Chloride					0.4-0.2-0.3	0.64-0.05-0.38	1.38-0.09-0.48	0.76-0.03-0.33	
Chlorine	0.002								
Chromium	0.002-0.02	<0.005	<0.005	<0.001	0.015-0.005-0.006	0.039-0.006-0.009	0.029-0.005-0.007	0.021-0.006-0.007	0.004
Cobalt				<0.001	0.009-0.005-0.006	0.009-0.006-0.006	0.007-0.005-0.006	0.013-0.006-0.006	<0.00002
Copper	0.002-0.004	<0.005	<0.005	0.002	0.016-0.005-0.006	0.010-0.006-0.006	0.008-0.005-0.006	0.010-0.006-0.006	<0.0001
Cyanide	0.005								
Flouride					0.24-0.17-0.22	0.36-0.03-0.21	0.66-0.04-0.20	0.30-0.18-0.21	
Iron	0.3	0.255	0.248	.319	0.791-0.238-0.364	5.80-0.160-0.478	1.800-0.137-0.296	9.810-0.182-0.732	0.10
Lead	0.001-0.007	<0.02	<0.1	<0.004	0.07-0.05-0.06	0.06-0.06-0.06	0.07-0.05-0.06	0.06-0.06-0.06	<0.002
Lithium				<0.05					
Magnesium				0.009	5.5-2.4-3.6	6.8-2.9-4.9	7.7-3.0-5.7	5.8-2.6-4.0	4.38
Manganese		0.019	0.011	0.009	0.041-0.012-0.022	0.496-0.007-0.033	0.128-0.005-0.016	0.816-0.009-0.054	0.00605
Mercury	0.0001								<0.001
Molybdenum		<0.005	<0.01	0.006	0.01-0.01-0.01	0.01-0.01-0.01	0.01-0.01-0.01	0.01-0.01-0.01	0.0026
Nickel	0.025-0.15	<0.02	<0.02	0.003	0.03-0.02-0.02	0.03-0.02-0.02	0.02-0.02-0.02	0.02-0.02-0.02	<0.0002
Nitrate	avoid proiofic weed growth	<0.005	<0.005	<0.05					
Nitrate & nitrite					0.007-0.002-0.003	0.146-0.002-0.045	0.181-0.003-0.076	0.039-0.002-0.013	
Nitrite	0.06	<0.005	<0.005	<0.003	0.002-0.002-0.002	0.016-0.005-0.005	0.005-0.005-0.005	0.005-0.005-0.005	
Phosphorus		0.011	0.011	<0.005	0.1-0.1-0-0.1	0.1-0.1-0-0.1	0.1-0.1-0-0.1	0.2-0.1-0.1	<0.1
Potassium				0.63	3.0-0.5-1.1	1.2-0.4-0.8	1.6-0.4-0.9	1.7-0.4-0.8	1.05
Selenium	0.001			<0.02	0.07-0.05-0.06	0.06-0.06-0.06	0.06-0.05-0.06	0.06-0.06-0.06	<0.001
Silver	0.0001				0.01-0.01-0.01	0.01-0.01-0.01	0.01-0.01-0.01	0.01-0.01-0.01	<0.00005
Sodium		2.6	2.8	2.19	3.8-1.8-2.6	4.5-2.4-3.4	4.7-2.3-3.6	4.2-2.3-2.9	0.0028
Strontium				0.054	0.13-0.051-0.093	0.184-0.066-0.124	0.247-0.066-0.148	0.14-0.068-0.098	0.132
Sulphate		4	5	2.7	20.0-2.9-5.7	9.80-2.30-6.46	11.80-2.20-7.59	6.4-2.2-4.9	
Sulphide									
Thallium									<0.00005
Tin					0.06-0.05-0.06	0.6-0.6-0.6	0.6-0.5-0.6	0.6-0.6-0.6	<0.0005
Titanium				0.002	0.033-0.002-0.007	0.174-0.002-0.010	0.03-0.002-0.004	0.385-0.002-0.023	<0.001
Uranium				<0.02					0.00265
Vanadium				0.002	0.02-0.01-0.01	0.01-0.01-0.01	0.01-0.01-0.01	0.01-0.01-0.01-	0.001
Zinc	0.03	0.002	0.006	0.007	0.033-0.002-0.005	0.033-0.002-0.004	0.013-0.002-0.003	0.008-0.002-0.003	0.0005
Diss. solids									
Filterable res.					140-50-78	140-50-91	140-50-103	100-50-74	
Non-filterable res.					10-9-10	70-10-12	10-5-9	122-5-11	
Susp. Solids		<5	<5	<5					
Cond.(uS/cm) field				20.4					
Cond.(uS/cm) lab		93	95	80	138-70-105	190-63-140	216-78-160	151-65-112	
Turbidity (FTU)		0.5	0.2	2	2.90-0.44-1.20	14.00-0.09-1.33	2.80-0.11-0.64	13.00-0.51-1.39	
Colour (TCU)		10	10	<5					
pH -field				7.26					
pH - lab		7.6	8.1	7.7	7.87-7.55-7.75	8.02-7.50-7.84	8.1-7.5-7.9	8.00-7.47-7.49	
Total Alkalinity		40.6	45.5	30	61-30-48	85.5-27.0-62.7	97.7-33.8-71.9	70.0-32.0-52.5	
Phosphate		0.011	0.011	<0.005					
Total Hardness		35.6	49.7	33.3	69.3-29.1-48.8		105.0-67.2-75.3	70.6-37.5-51.9	
Oxygen (dslvd.)	5.0-9.5			10.5					
Temperature (C°)				7.2					
Coliforms									
Total-cnt/100ml				75	60 (Aug. 17)				
Fecal-cnt/100ml				1	0 (Aug. 17)			1 (Aug.20&26)	

0.0- underline indicates value may be incorrect

*Norhtern Affairs Program, Water Resources-data abstracted from J. Gibson & Associates 1993

**Yukon Agricultural Association report prepared by J. Gibson & Associates 1993

***Yukon Baseline Water Quality Study, Johnstone et.al. 1997 (Water quality monitored once per week from May to October, 1993; May to December, 1994; January to December, 1995; May to September, 1996).

Arkell Creek Water Quality

PARAMETERS (mg/l)	CCREM 1995 FRESHWATER AQUATIC LIFE	GSC 1985* (1182-1km U/S))	GSC 1985* (1183-1km U/S))	Blue River Mar. 1998 **Dissolved** (S1)
Aluminum (total)	0.005-0.1			<0.001
Ammonia (total)	1.37-2.2			
Antimony		.2	.2	<0.00005
Arsenic (total)	0.05	.5	.5	<0.001
Barium		1000	900	0.0091
Beryllium				<0.0005
Bismuth				<0.00005
Boron (total)				
Cadmium (total)	0.0002-0.0018	.1	.1	<0.0001
Calcium				8.25
Chloride (total)				
Chlorine (total residual)	0.002			
Chromium (total)	0.002-0.02			
Cobalt (total)		2	3	<0.00002
Copper (total)	0.002-0.004	6	6	<0.0001
Cyanide	0.005			
Flouride (total)		420 ppb	390 ppb	
Iron (total)	0.3	1.2 %	1.3 %	<0.01
Lead (total)	0.001-0.007	1	1	<0.002
Lithium (total)				
Magnesium				1.51
Manganese (total)		180	170	0.00005
Mercury (total)	0.0001	12 ppb	9 ppb	<0.001
Molybdenum (total)		1	2	0.0012
Nickel (total)	0.025-0.15	3	4	<0.0002
Nitrate	avoid prolofic weed growth			
Nitrate and nitrite				
Nitrite	0.06			
Phosphorus				<0.1
Potassium				0.6
Selenium (total)	0.001			<0.001
Silver (total)	0.0001	.1	.1	<0.00005
Sodium				2.85
Strontium				0.0439
Sulphate				
Sulphide (as H_2S)				
Thallium				<0.00005
Tin				<0.00005
Titanium				<0.001
Uranium (total)		5.1	6.2	0.00225
Vanadium (total)		23	25	<0.001
Zinc (total)	0.03	32	31	0.003
Total dissolved solids				
Suspended Solids				
Conductivity (uS/cm)				
Turbidity (FTU)				
Colour (TCU)				
pH - field				
pH - lab		6.2	6.4	
Total Alkalinity (CaCo3)				
Toata Phosphate (PO4)				
Total Hardness (CaCO3)				
Oxygen (dissolved)	5.0-9.5			
* Geological Survey Canada 1985, Stream sediment sampling				

Easy Love (AA) Creek

PARAMETERS (mg/l)	CCREM 1995 FRESHWATER AQUATIC LIFE	GSC 1985* (1246-12km U/S))	GSC 1985* (1247-12km U/S))	Blue River Mar. 1998 **Dissolved** (S1)
Aluminum (total)	0.005-0.1			0.097
Ammonia (total)	1.37-2.2			
Antimony		.3	0.1	<0.00005
Arsenic (total)	0.05	2.2	1.3	<0.001
Barium		780	740	0.0179
Beryllium				<0.0005
Bismuth				<0.00005
Boron (total)				
Cadmium (total)	0.0002-0.0018	.2	0.1	<0.0001
Calcium				22.9
Chloride (total)				
Chlorine (total residual)	0.002			
Chromium (total)	0.002-0.02			0.005
Cobalt (total)		8	4	<0.00002
Copper (total)	0.002-0.004	14	9	<0.0001
Cyanide	0.005			
Flouride (total)			380 ppb	
Iron (total)	0.3	1.43 %	1.06%	0.26
Lead (total)	0.001-0.007	3	1	<0.002
Lithium (total)				
Magnesium				4.83
Manganese (total)		430	215	0.0239
Mercury (total)	0.0001	54 ppb	10 ppb	<0.001
Molybdenum (total)		3	3	0.0015
Nickel (total)	0.025-0.15	11	6	<0.0002
Nitrate	avoid prolofic weed growth			
Nitrate and nitrite				
Nitrite	0.06			
Phosphorus				<0.1
Potassium				1.25
Selenium (total)	0.001			<0.001
Silver (total)	0.0001	.1	0.1	<0.00005
Sodium				5
Strontium				0.096
Sulphate				
Sulphide (as H_2S)				
Thallium				<0.00005
Tin				<0.0005
Titanium				0.005
Uranium (total)		3	2	0.006
Vanadium (total)		40	40	0.003
Zinc (total)	0.03	59	46	0.0015
Total dissolved solids				
Suspended Solids				
Conductivity (uS/cm)				
Turbidity (FTU)				
Colour (TCU)				
pH -field				
pH - lab			6.9	
Total Alkalinity (CaCo3)				
Toata Phosphate (PO4)				
Total Hardness (CaCO3)				
Oxygen (dissolved)	5.0-9.5			

* Geological Survey Canada 1985, Stream sediment sampling

PARAMETERS (mg/l)	CCREM 1995 FRESHWATER AQUATIC LIFE	LES* Feb. 1996 **Dissolved** (D/S HWY)
Aluminum (total)	0.005-0.1	<0.01
Ammonia (total)	1.37-2.2	
Antimony		<0.02
Arsenic (total)	0.05	<0.02
Barium		0.0428
Beryllium		<0.0002
Bismuth		<0.02
Boron (total)		
Cadmium (total)	0.0002-0.0018	<0.0005
Calcium		51.4
Chloride (total)		0.6
Chlorine (total residual)	0.002	
Chromium (total)	0.002-0.02	<0.001
Cobalt (total)		<0.001
Copper (total)	0.002-0.004	<0.002
Cyanide	0.005	
Flouride (total)		<1.0
Iron (total)	0.3	0.208
Lead (total)	0.001-0.007	<0.005
Lithium (total)		<0.002
Magnesium		7.04
Manganese (total)		0.0595
Mercury (total)	0.0001	
Molybdenum (total)		<0.005
Nickel (total)	0.025-0.15	<0.002
Nitrate	avoid prolofic weed growth	<0.1
Nitrate and nitrite		
Nitrite	0.06	<0.5
Phosphorous		<0.06
Potassium		1.7
Selenium (total)	0.001	<0.02
Silver (total)	0.0001	<0.001
Sodium		5.05
Strontium		0.203
Sulphate		6.7
Sulphide (as H_2S)		
Sulfur		2.2
Thallium		
Tin		<0.005
Titanium		<0.001
Uranium (total)		<0.06
Vanadium (total)		0.004
Zinc (total)	0.03	0.004
Total dissolved solids		
Suspended Solids		
Conductivity (uS/cm)		323
Turbidity (FTU)		
Colour (TCU)		
pH -field		7.5
pH - lab		7.6
Total Alkalinity (CaCo3)		152
Toata Phosphate (PO4)		
Total Hardness (CaCO3)		
Oxygen (dissolved)	5.0-9.5	7.0
Temperature (C°)		0.4
*Laberge Environmental Services 1996.		

Stony Creek Water Quality

PARAMETERS (mg/l)	CCREM 1995 FRESHWATER AQUATIC LIFE	GSC 1985* (1235-2km U/S HWY)	NAP** August 1987	NAP** August 1988	YAA*** July 1993 (1.5km U/S)	LES**** Feb. 1996 Dissolved (D/S HWY)
Aluminum (total)	0.005-0.1		0.52	<0.05	0.053	<0.01
Ammonia (total)	1.37-2.2					
Antimony		.2			<0.02	<0.02
Arsenic (total)	0.05	1.8			<0.04	<0.02
Barium		700	<0.001	<0.01	0.016	0.02
Beryllium					<0.0002	<0.0002
Bismuth					<0.02	<0.02
Boron (total)						
Cadmium (total)	0.0002-0.0018	.1			<0.0003	<0.0005
Calcium			24.8	22.3	16	23
Chloride (total)						<0.5
Chlorine (total residual)	0.002					
Chromium (total)	0.002-0.02		<0.005	<0.005	0.001	<0.001
Cobalt (total)		9			<0.001	<0.001
Copper (total)	0.002-0.004	7	<0.005	<0.005	0.003	<0.002
Cyanide	0.005					
Flouride (total)		48 ppb				<1.0
Iron (total)	0.3	1.56%	0.42	0.023	0.014	<0.003
Lead (total)	0.001-0.007	1	<0.05	<0.05	0.006	<0.005
Lithium (total)					<0.05	<0.002
Magnesium			3.8	3.0	2.23	3.31
Manganese (total)		245	0.013	<0.001	<0.001	0.001
Mercury (total)	0.0001	10 ppb				
Molybdenum (total)		2	0.006	<0.01	0.004	<0.005
Nickel (total)	0.025-0.15	11	<0.02	<0.02	0.004	<0.002
Nitrate	avoid prolofic weed growth		<0.005	<0.005	<0.05	0.11
Nitrate and nitrite						
Nitrite	0.06		<0.005	<0.005	<0.003	<0.5
Phosphorous			0.013	0.015	<0.005	<0.06
Potassium					0.90	0.7
Selenium (total)	0.001				<0.02	<0.02
Silver (total)	0.0001	.1				<<0.001
Sodium			2.6	2.4	2.14	2.83
Strontium					0.064	0.091
Sulphate			3	3	1.18	1.7
Sulphide (as H2S)						
Sulfur						0.6
Thallium						
Tin						<0.005
Titanium					<0.001	<0.001
Uranium (total)		2			<0.02	<0.06
Vanadium (total)		40			0.004	0.003
Zinc (total)	0.03	32	<0.002	0.028	0.006	0.002
Total dissolved solids						
Suspended Solids			9	<5	<5	
Conductivity (uS/cm) - field					28.2	146
Conductivity (uS/cm) - lab			165	120	120	
Turbidity (FTU)			2.8	0.1	<1	
Colour (TCU)			5	5	<5	
pH -field					7.58	7.47
pH - lab		6.7	8.0	8.2	7.9	7.8
Total Alkalinity (CaCo3)			83.7	63.5	52	73
Total Phosphate (PO4)			0.013	0.015	<0.005	
Total Hardness (CaCO3)			73.9	88.4	49.6	
Oxygen (dissolved)	5.0-9.5				7.6	12.6
Temperature (C°)					11	0.3
Coliforms						
Total-cnt/100ml					9	
Fecal-cnt/100ml					3	

* Geological Survey Canada 1985, Stream sediment sampling

** Norhtern Affairs Program, Water Resources-data abstracted from J. Gibson & Associates 1993

*** Yukon Agricultural Association report prepared by J. Gibson & Associates 1993

****Laberge Environmental Services 1996

Thirtyseven Mile Creek Water Quality

PARAMETERS (mg/l)	CCREM 1995 FRESHWATER AQUATIC LIFE	NAP* August 1987	NAP*August 1988	YAA** July 1993 (2km U/S)	LES*** Feb. 1996 Dissolved (D/S HWY)
Aluminum (total)	0.005-0.1	1.28	0.7	.239	0.02
Ammonia (total)	1.37-2.2				
Antimony				<0.02	<0.02
Arsenic (total)	0.05			<0.04	<0.02
Barium		<0.001	<0.01	0.023	0.294
Beryllium				<0.0002	<0.0002
Bismuth				<0.02	<0.02
Boron (total)					
Cadmium (total)	0.0002-0.0018			<0.0003	<0.0005
Calcium		33.6	30.7	23.4	47.6
Chloride (total)					1
Chlorine (total residual)	0.002				
Chromium (total)	0.002-0.02	<0.005	0.005	0.002	0.001
Cobalt (total)				0.001	<0.001
Copper (total)	0.002-0.004	0.005	<0.005	0.003	0.003
Cyanide	0.005				
Flouride (total)					1
Iron (total)	0.3	1.2	0.704	.568	0.206
Lead (total)	0.001-0.007	0.05	<0.05	0.008	<0.005
Lithium (total)				<0.05	0.002
Magnesium		6.9	4.9	0.028	6.75
Manganese (total)		0.064	0.034	0.028	0.0309
Mercury (total)	0.0001				
Molybdenum (total)		0.006	<0.01	0.007	<0.005
Nickel (total)	0.025-0.15	<0.02	<0.02	0.006	<0.002
Nitrate	avoid prolofic weed growth	0.005	<0.005	<0.05	0.1
Nitrate and nitrite					
Nitrite	0.06	<0.005	<0.005	<0.003	<0.5
Phosphorus		0.038	0.014	0.03	<0.06
Potassium				1.1	1.7
Selenium (total)	0.001			<0.02	<0.02
Silver (total)	0.0001				<0.001
Sodium		5.2	3.7	3.24	6.16
Strontium				0.120	0.226
Sulphate		5	4	1.76	3.5
Sulphide (as H_2S)					
Sulfur					1.3
Thallium					
Tin					<0.005
Titanium				0.01	<0.001
Uranium (total)				<0.02	<0.06
Vanadium (total)				0.004	0.004
Zinc (total)	0.03	0.007	0.008	0.01	0.006
Total dissolved solids					
Suspended Solids			13	11	
Conductivity (uS/cm) - field				41.2	297
Conductivity (uS/cm) - lab		235	150	160	
Turbidity (FTU)		7.8	1.8	10	
Colour (TCU)		30	20	12	
pH - field				7.9	7.13
pH - lab		8.0	8.3	7.9	8.2
Total Alkalinity (CaCo3)		118	80	77	166
Total Phosphate (PO4)		0.038	0.014	0.02	
Total Hardness (CaCO3)		110	95.8	76.2	
Oxygen (dissolved)	5.0-9.5			9.7	12.2
Temperature (C°)				10.5	0.4
Coliforms					
Total-cnt/100ml				64	
Fecal-cnt/100ml				7	

*Norhtern Affairs Program, Water Resources-data abstracted from J. Gibson & Associates 1993

**Yukon Agricultural Association report prepared by J. Gibson & Associates 1993

***Laberge Environmental Services 1996

Little River Water Quality

PARAMETERS (mg/l)	CCREM 1995 FRESHWATER AQUATIC LIFE	NAP* August 1987	NAP* August 1988	YAA** July 1993 (2.8km U/S)	LES*** Feb. 1996 Dissolved (D/S HWY)
Aluminum (total)	0.005-0.1	8.5	4.33	0.198	<0.01
Ammonia (total)	1.37-2.2				
Antimony				<0.02	<0.02
Arsenic (total)	0.05			<0.04	<0.02
Barium		0.193	0.096	0.036	0.0433
Beryllium				<0.0002	<0.0002
Bismuth				<0.02	
Boron (total)					
Cadmium (total)	0.0002-0.0018			<0.0003	<0.0005
Calcium		35.2	32.9	30.8	37.9
Chloride (total)					0.7
Chlorine (total residual)	0.002				
Chromium (total)	0.002-0.02	0.011	0.008	0.001	<0.001
Cobalt (total)				<0.001	<0.001
Copper (total)	0.002-0.004	0.007	<0.005	0.004	<0.002
Cyanide	0.005				
Flouride (total)					<1.0
Iron (total)	0.3	5.98	3.67	0.275	0.022
Lead (total)	0.001-0.007	<0.02	<0.05	<0.004	<0.005
Lithium (total)				<0.05	<0.002
Magnesium		8.4	6.1	5.39	6.11
Manganese (total)		0.168	0.099	0.014	0.011
Mercury (total)	0.0001				
Molybdenum (total)		0.018	<0.01	0.005	<0.005
Nickel (total)	0.025-0.15	<0.02	<0.02	0.007	<0.002
Nitrate	avoid prolific weed growth	<0.005	0.011	<0.05	0.2
Nitrate and nitrite					
Nitrite	0.06	<0.005	<0.005	<0.003	<0.5
Phosphorus		0.15	0.07	0.012	<0.06
Potassium				1.25	1
Selenium (total)	0.001			<0.02	<0.02
Silver (total)	0.0001				<0.001
Sodium		6.3	4.2	4.36	4.56
Strontium				0.167	0.214
Sulphate		6	6	5.71	6.8
Sulphide (as H_2S)					
Sulfur					2.2
Thallium					
Tin					
Titanium				0.007	
Uranium (total)				<0.02	<0.06
Vanadium (total)				0.004	0.003
Zinc (total)	0.03	0.02	0.011	0.007	<0.001
Total dissolved solids					
Suspended Solids		178	110	7	
Conductivity (uS/cm) - field				13.0	244
Conductivity (uS/cm) - lab		205	150	200	
Turbidity (FTU)		73	53	8	
Colour (TCU)		20	10	<5	
pH - field				8.04	6.67
pH - lab		8.0	8.3	8.1	7.8
Total Alkalinity (CaCo3)		104	83.0	97	115
Toata Phosphate (PO4)		0.15	0.07	0.014	
Total Hardness (CaCO3)		133	107	101	
Oxygen (dissolved)	5.0-9.5			10.4	10.7
Temperature (C°)				9.4	0.4
Coliforms					
Total-cnt/100ml				55	
Fecal-cnt/100ml				4	

*Norhtern Affairs Program, Water Resources-data abstracted from J. Gibson & Associates 1993

**Yukon Agricultural Association report prepared by J. Gibson & Associates 1993

***Laberge Environmental Services 1996

Flat Creek Water Quality

PARAMETERS (mg/l)	CCREM 1995 FRESHWATER AQUATIC LIFE	GSC 1985* (1186-4.8km U/S))	GSC 1985* (1210-15km U/S))	NAP** August 1987	NAP** August 1988	YAA*** July 1993 (1.3km U/S)	LES**** Feb. 1996 Dissolved (D/S HWY)
Aluminum (total)	0.005-0.1			6.87	0.33	0.095	<0.01
Ammonia (total)	1.37-2.2						
Antimony		.3	.3			<0.02	<0.02
Arsenic (total)	0.05	1.5	4			<0.04	<0.02
Barium		760	920	<0.001	0.025	0.021	0.0224
Beryllium						<0.0002	<0.0002
Bismuth						<0.02	<0.02
Boron (total)							
Cadmium (total)	0.0002-0.0018	.1	.1			<0.0003	<0.0005
Calcium				30.4	25.3	25.4	31.4
Chloride (total)							<0.5
Chlorine (total residual)	0.002						
Chromium (total)	0.002-0.02			<0.005	<0.005	<0.001	<0.001
Cobalt (total)		3	3			<0.001	<0.001
Copper (total)	0.002-0.004	6	11	0.005	<0.005	0.008	<0.002
Cyanide	0.005						
Flouride (total)		68 ppb	40 ppb				<1.0
Iron (total)	0.3	1.3 %	1.3 %	5.94	0.527	0.302	0.09
Lead (total)	0.001-0.007	1	3	<0.02	<0.05	<0.004	<0.005
Lithium (total)						<0.05	<0.002
Magnesium				5.8	3.2	3.23	4.03
Manganese (total)		145	245	0.535	0.037	0.02	0.038
Mercury (total)	0.0001	12 ppb	24 ppb				
Molybdenum (total)		1	2	0.01	<0.01	0.006	<0.005
Nickel (total)	0.025-0.15	6	8	<0.02	<0.02	0.003	<0.002
Nitrate	avoid prolofic weed growth			<0.005	<0.005	<0.05	0.1
Nitrate and nitrite							
Nitrite	0.06			<0.005	<0.005	<0.003	<0.5
Phosphorus				0.164	0.017	<0.005	<0.06
Potassium						0.85	0.7
Selenium (total)	0.001					<0.02	<0.02
Silver (total)	0.0001	.1	.1				<0.001
Sodium				3.8	2.3	2.47	3.23
Strontium						0.152	0.194
Sulphate				4	3	2.63	4.6
Sulphide (as H_2S)							
Sulfur							1.5
Thallium							
Tin							<0.005
Titanium						0.003	<0.001
Uranium (total)		7	2.3			<0.02	<0.06
Vanadium (total)		35	35			0.001	0.003
Zinc (total)	0.03	15	33	0.018	0.019	0.007	<0.001
Total dissolved solids							
Suspended Solids				169	12	<5	
Conductivity (uS/cm) - field						38.7	188
Conductivity (uS/cm) - lab				165	120	150	
Turbidity (FTU)				43	1.3	2	
Colour (TCU)				20	10	<5	
pH - field						7.99	7.17
pH - lab		7.1	7	7.9	8.2	8.0	7.9
Total Alkalinity (CaCo3)				82.7	64	65	89
Total Phosphate (PO4)				0.164	0.017	<0.005	
Total Hardness (CaCO3)				111	69.6	77.9	
Oxygen (dissolved)	5.0-9.5					9.1	12.5
Temperature (C°)						13.6	0.4
Coliforms							
Total-cnt/100ml						43	
Fecal-cnt/100ml						9	

* Geological Survey Canada 1985, Stream sediment sampling

** Norhtern Affairs Program, Water Resources-data abstracted from J. Gibson & Associates 1993

*** Yukon Agricultural Association report prepared by J. Gibson & Associates 1993

****Laberge Environmental Services 1996

Lucky Love (BB) Creek Water Quality

PARAMETERS (mg/l)	CCREM 1995 FRESHWATER AQUATIC LIFE	GSC 1985* (1002-5.5km U/S))	Blue River Mar. 1998 **Dissolved** (S1)
Aluminum (total)	0.005-0.1		0.207
Ammonia (total)	1.37-2.2		
Antimony		.3	0.0001
Arsenic (total)	0.05	4.8	0.001
Barium		1240	0.0356
Beryllium			<0.0005
Bismuth			<0.00005
Boron (total)			
Cadmium (total)	0.0002-0.0018	.2	<0.0001
Calcium			37.1
Chloride (total)			
Chlorine (total residual)	0.002		
Chromium (total)	0.002-0.02		0.007
Cobalt (total)		5	0.00016
Copper (total)	0.002-0.004	14	0.0004
Cyanide	0.005		
Flouride (total)		60 ppb	
Iron (total)	0.3	1.4 %	0.38
Lead (total)	0.001-0.007	1	<0.002
Lithium (total)			
Magnesium			8.41
Manganese (total)		250	0.00164
Mercury (total)	0.0001	40 ppb	<0.001
Molybdenum (total)		3	
Nickel (total)	0.025-0.15	10	0.0008
Nitrate	avoid prolofic weed growth		
Nitrate and nitrite			
Nitrite	0.06		
Phosphorus			<0.1
Potassium			1.1
Selenium (total)	0.001		<0.001
Silver (total)	0.0001	.1	<0.00005
Sodium			2.55
Strontium			0.23
Sulphate			
Sulphide (as H_2S)			
Thallium			<0.00005
Tin			<0.0005
Titanium			0.009
Uranium (total)		2.7	0.0375
Vanadium (total)		30	0.003
Zinc (total)	0.03	34	0.0015
Total dissolved solids			
Suspended Solids			
Conductivity (uS/cm)			
Turbidity (FTU)			
Colour (TCU)			
pH - field			
pH - lab		7.7	
Total Alkalinity (CaCo3)			
Toata Phosphate (PO4)			
Total Hardness (CaCO3)			
Oxygen (dissolved)	5.0-9.5		
* Geological Survey Canada 1985, Stream sediment sampling			

Chemex Labs Ltd.
Analytical Chemists * Geochemists * Registered Assayers
212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221 FAX: 604-984-0218

To: BLUE RIVER CONSULTANTS

RR2 S3 C18
WHITEHORSE, YT
Y1A 5W2

Comments: ATTN: PETER ZURACHENKO

CERTIFICATE A9814822

(POU) - BLUE RIVER CONSULTANTS

Project:
P.O. # :

Samples submitted to our lab in Vancouver, BC.
This report was printed on 21-MAR-98.

SAMPLE PREPARATION

CHEMEX CODE	NUMBER SAMPLES	DESCRIPTION
221	4	Water sample

ANALYTICAL PROCEDURES

CHEMEX CODE	NUMBER SAMPLES	DESCRIPTION	METHOD	DETECTION LIMIT	UPPER LIMIT
5501	4	Ag ug/L: Water samples	ICP-MS	0.05	1000
5531	4	Al mg/L: Water samples	ICP-MS	0.001	100000
5503	4	As ug/L: Water samples	ICP-MS	1	50000
5504	4	Ba ug/l: Water samples	ICP-MS	0.05	50000
5505	4	Be ug/l: Water samples	ICP-MS	0.5	1000
5506	4	Bi ug/L: Water samples	ICP-MS	0.05	1000
5532	4	Ca mg/L: Water samples	ICP-MS	0.05	100000
5508	4	Cd ug/L: Water samples	ICP-MS	0.1	50000
5509	4	Co ug/L: Water samples	ICP-MS	0.02	50000
5510	4	Cr ug/L: Water samples	ICP-MS	0.5	50000
5511	4	Cu ug/L: Water samples	ICP-MS	0.1	50000
5533	4	Fe mg/L: Water samples	ICP-MS	0.01	100000
5513	4	Hg ug/L: Water samples	ICP-MS	1	1000
5534	4	K mg/L: Water samples	ICP-MS	0.05	100000
5535	4	Mg mg/L: Water samples	ICP-MS	0.001	100000
5516	4	Mn ug/L: Water samples	ICP-MS	0.05	50000
5517	4	Mo ug/L: Water samples	ICP-MS	0.1	50000
5536	4	Na mg/L: Water samples	ICP-MS	0.05	100000
5519	4	Ni ug/L: Water samples	ICP-MS	0.2	50000
5537	4	P mg/L: Water samples	ICP-MS	0.1	100000
5521	4	Pb ug/L: Water samples	ICP-MS	2	50000
5522	4	Sb ug/L: Water samples	ICP-MS	0.05	1000
5523	4	Se ug/L: Water samples	ICP-MS	1	1000
5524	4	Sn ug/L: Water samples	ICP-MS	0.5	1000
5525	4	Sr ug/L: Water samples	ICP-MS	0.05	50000
5526	4	Ti ug/L: Water samples	ICP-MS	1	50000
5527	4	Tl ug/L: Water samples	ICP-MS	0.05	1000
5528	4	U ug/l: Water samples	ICP-MS	0.05	1000
5529	4	V ug/L: Water samples	ICP-MS	1	50000
5530	4	Zn ug/L: Water samples	ICP-MS	0.5	50000

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PHONE: 604-984-0221 FAX: 604-984-0218

To: BLUE RIVER CONSULTANTS **

RR2 S3 C18
WHITEHORSE, YT
Y1A 5W2

Project :
Comments: ATTN: PETER ZURACHENKO

Page Number 1-B
Total Pages 1
Certificate Date 21-MAR-98
Invoice No. I-9814822
P.O. Number :
Account :

CERTIFICATE OF ANALYSIS A9814822

SAMPLE DESCRIPTION	PREP CODE		P mg/L	Pb ug/L	Sb ug/L	Se ug/L	Sn ug/L	Sr ug/L	Ti ug/L	Tl ug/L	U ug/L	V ug/L	Zn ug/L
LUCKY LOVE CK.	221	--	< 0.1	< 2	0.10	< 1	< 0.5	230	9	< 0.05	3.75	3	1.5
IBEX RIVER	221	--	< 0.1	< 2	< 0.05	< 1	< 0.5	132.0	< 1	< 0.05	2.65	1	0.5
ARKELL CK.	221	--	< 0.1	< 2	< 0.05	< 1	< 0.5	43.9	< 1	< 0.05	2.25	< 1	3.0
EASY LOVE CK.	221	--	< 0.1	< 2	< 0.05	< 1	< 0.5	96.0	5	< 0.05	6.00	3	1.5

CERTIFICATION:________________

Chemex Labs Ltd.
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British Columbia, Canada V7J 2C1
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To: BLUE RIVER CONSULTANTS

RR2 S3 C18
WHITEHORSE, YT
Y1A 5W2

Project :
Comments: ATTN: PETER ZURACHENKO

Page Number 1-A
Total Pages 1
Certificate Date 21-MAR-98
Invoice No. I-9814822
P.O. Number :
Account :

CERTIFICATE OF ANALYSIS A9814822

SAMPLE DESCRIPTION	PREP CODE		Ag ug/L	Al mg/L	As ug/L	Ba ug/L	Be ug/L	Bi ug/L	Ca mg/L	Cd ug/L	Co ug/L	Cr ug/L	Cu ug/L	Fe mg/L	Hg ug/L	K mg/L	Mg mg/L	Mn ug/L	Mo ug/L	Na mg/L	Ni ug/L
LUCKY LOVE CK.	221	--	< 0.05	0.207	1	35.6	< 0.5	< 0.05	37.1	< 0.1	0.16	7.0	0.4	0.38	< 1	1.10	8.41	16.40	2.0	2.55	0.6
IBEX RIVER	221	--	< 0.05	0.020	< 1	31.6	< 0.5	< 0.05	27.2	< 0.1	< 0.02	4.0	< 0.1	0.10	< 1	1.05	4.38	6.05	2.6	2.80	< 0.2
ARKELL CK.	221	--	< 0.05	< 0.001	< 1	9.10	< 0.5	< 0.05	8.25	< 0.1	< 0.02	2.0	< 0.1	< 0.01	< 1	0.60	1.310	0.05	1.2	2.85	< 0.2
EASY LOVE CK.	221	--	< 0.05	0.097	< 1	17.90	< 0.5	< 0.05	22.9	< 0.1	< 0.02	5.0	< 0.1	0.26	< 1	1.25	4.83	23.9	1.5	5.00	< 0.2

CERTIFICATION:________________

APPENDIX E

WATER QUANTITY

SUMMARY

Water Quantity Summary

IBEX Discharge (m^3/s)	IAN* 1990 max-min-mean	IAN** 1990 mean	IAN** 1991 mean	IAN** 1992 mean	IAN** 1993 mean	IAN** 1994 mean	IAN** 1995 mean	YBWQS** 1994 max-min	YBWQS** 1995 max-min	YBWQS** 1996 max-min	BR 1998
Jan.		0.756	0.564	0.844	0.651	0.604	0.575		0.633-0.545		
Feb.		0.46	0.491	0.681	0.441	0.541	0.483		0.542-0.422		
March		0.338	0.471	0.547	0.491	0.555	0.391		0.415-0.37		0.59
April		0.681	0.724	1.07	0.7	0.99	0.78		0.753-0.382		
May	9.26-4.45-	2.94	1.81	2.11	4.15	1.46	3.4	1.9-0.917	3.5-1.8	1.59-1.43	
June	10.68-27.24-5.08	10.2	4.44	8.59	6.21	4.19	2.6	7.8-2.42	3.43-1.61	7.17-2.22	
July	13.57-3.44-6.57	6.15	5.74	5.75	6.32	3.02	3.33	4.25-2.26	5.9-1.78	4.28-2.19	
Aug.	3.93-2.45-2.86	2.53	5.2		3.33	2.27	1.69	2.48-2.02	2.56-1.44	2.33-2.08	
Sept.	3.33-2.77-3.09	2.27	6.88		3.24	2.92	2.07	3.27-2.12	2.31-1.86	2.97-2.04	
Oct.	3.17-2.88-	1.62	2.71		2.45	2.44	1.47	2.61-1.68	1.91-0.926		
Nov.		1.03	1.39		1.08	1.29	2.16	1.51-0.97	4.93-1.25		
Dec.		0.734	1		0.803	0.842	0.944	1.06-0.774	0.983		

*Indian & Norhtern Affairs, Water Resources Division 1995.
*Indian & Norhtern Affairs, Water Resources Division, unpublished mean monthly summary.
***Yukon Baseline Water Quality Study, Johnstone et.al. 1997- maximum and minimum of weekly recorded values.

MENDENHALL Discharge (m^3/s)	IAN* 1985 max-min-mean	IAN* 1986 max-min-mean	IAN* 1987 max-min-mean	IAN* 1988 max-min-mean	IAN* 1989 max-min-mean	IAN* 1990 max-min-mean	LES**1996
Jan.							
Feb.							2.28 (est.)
March							
April							
May	10.74-4.21-6.38	6.99-5.93-	10.11-2.61-	6.43-2.29-3.42	8.39-3.83-	9.26-4.45-	
June	13.3-3.29-5.77	14.46-3.83-6.49	12.49-2.59-3.24	9.16-3.4-5.78		27.24-5.08-10.68	
July	6.57-4.16-5.19	9.78-4.0-5.87	3.53-2.59-2.89	21.63-6.16-9.42	5.21-3.14-3.97	13.57-3.44-6.57	
Aug.	4.17-2.88-3.42	5.87-4.2-4.75	3.31-2.59-2.7		5.15-2.89-3.62	3.93-2.45-2.86	
Sept.	3.67-3.02-3.25	5.42-3.47-4.18	2.71-2.59-2.6		3.35-2.26-2.76	3.33-2.77-3.09	
Oct.	3.2-2.81-	5.33-3.92-4.42	2.63-2.59-2.6	5.94-4.14-4.76	3.31-2.98-	3.17-2.88-	
Nov.							
Dec.							

*Indian & Norhtern Affairs, Water Resources Division 1995.
**Laberge Environmental Services 1996.

Water Quantity Summary

LITTLE Discharge (m^3/s)	NAP** 1987	YAA*** 1993	LES**** 1996	37 MILE Discharge (m^3/s)	YAA*** 1993	LES**** 1996	ARKELL Discharge (m^3/s)	BR 1998
Jan.				Jan.			Jan.	
Feb.				Feb.		0.46 (est.)	Feb.	
March			0.3 (est.)	March			March	0.33
April				April			April	
May				May			May	
June				June			June	
July		2.148		July	0.927		July	
Aug.	2.399			Aug.			Aug.	
Sept.				Sept.			Sept.	
Oct.				Oct.			Oct.	
Nov.				Nov.			Nov.	
Dec.				Dec.			Dec.	

**Norhtern Affairs Program noted in Yukon Agricultural Assoc. report by Gibson & Assoc. 1993.

***Yukon Agricultural Assoc. report by Gibson & Assoc. 1993.

****Laberge Environmental Services 1996.

Water Quantity Summary

STONY Discharge (m^3/s)	IAN* 1978 (Date)	IAN* 1979 (Date)	IAN* 1980 (Date)	IAN* 1981 (Date)	IAN* 1982 (Date)	NAP** 1987	YAA*** 1993	LES**** 1996
Jan.								
Feb.								0.15
March								
April								
May	0.369 (16)	0.175 (18)	0.275 (13)	0.203 (05)				
May	0.316 (30)	1.91 (29)		0.293 (07)				
June	0.49 (08)			0.054 (15)	0.414 (14)			
June		0.178 (27)	0.054 (20)	0.046 (29)	0.128 (29)			
July	0.026 (04)	0.296 (12)	0.029 (06)				0.473	
July	0.026 (18)	0.279 (24)	0.147 (08)	0.392 (27)	0.041 (17)			
Aug.	0.077 (22)	0.152 (22)			0.279 (09)	0.0961		
Sept.	0.115 (12)			0.16 (01)				
Oct.					0.173 (08)			
Nov.								
Dec.								

FLAT Discharge (m^3/s)	NAP** 1987	YAA*** 1993	LES**** 1996	BR 1998
Jan.				
Feb.			0.4	
March				0.26
April				
May				
June				
July		0.708		
Aug.	1.338			
Sept.				
Oct.				
Nov.				
Dec.				

*Indian & Norhtern Affairs, Water Resources Division 1995.

**Norhtern Affairs Program noted in Yukon Agricultural Assoc. report by Gibson & Assoc. 1993.

***Yukon Agricultural Assoc. report by Gibson & Assoc. 1993.

****Laberge Environmental Services 1996.