

**List of DFO Documents
Generated for the
Robson Valley Round Table**

1993-1995

Submitted by;

Violet Komori, DFO, Kamloops

Table of Contents

1. List of Streams within the Robson Valley Plan Area.....	3
2. The Fisheries Resource of the Betty Wendell and Upper Caribou Watersheds.....	5
3. DFOs Statement of Interests.....	6
4. Fisheries Information for the Robson Valley LRMP.....	7
5. DFO and MOE Resource Unit Descriptions.....	9
6. Fisheries Objectives and Strategies.....	12
7. Base Case Profile for the Salmon Resources of the Robson Valley.....	14
8. Robson Valley Fisheries Strategies by Resource Management Zone.....	17
9. Proposed Riparian Management Areas for Low Elevation Lakes.....	19

Appendix A. Fisheries Overview for the Robson Valley LRMP

Appendix B. Evaluation of Salmon Bearing Watersheds in the Robson Valley

June 24, 1995

**ROBSON VALLEY
WATERSHED PLANNING UNIT PROFILES**

Stream Listing for the Robson Valley Planning area;

Prince George Subdistrict (29I):

Catfish C
Clyde C
DORE R - Boreal, Ozalenka
Eddy C
Elder C
Fleet C
La Salle C
Legrand C
McIntosh C
Morkill River
- **Cushing Creek**
- **Forget Me Not Creek**
Snowshoe C

Williams Lake Subdistrict (29G);

Betty Wendell
Upper Caribou R

Clearwater Subdistrict (29J);

Castle (Cottonwod) C
Canoe R - Kimmel C, Zillmer C
East Twin C
GOAT R
- **Killam, Kendall, McLeod, North Star, Milk, Bounding**
Gold C
Goslin C
Hagan C
Hankins (Morgan) C
Holliday (Baker) C
HOLMES (Beaver) R
- **Chalco C**
Horseley C

Kiwa C
McKale (Blackwater) R
McLennan R
- **Hagan C, Swift C**
Nevin (King) C
Ptarmigan C
Raush R, Black Martin C
Shelter C
Small C
Spittal C
Swift C
Tete (Sand) C
Tindill C
West Twin C

Kinbasket Lake (outside subdistrict areas)

Baker C
Blackman C
Blackmore C
Bulldog C
Dave Henry C
Dawson C
Deer C
Foster C
Franchere C
Grouse C
Harvey C
Horse C
Howard C
Hugh Allen C
Packsaddle C
Ptarmigan C
Windfall C
Yellowjacket C

*****Bold type denotes salmon-bearing systems**
(Cariboo River has downstream salmon bearing values)

Nov 16, 1993

The Fisheries Resource of the Betty Wendell and Upper Caribou Watersheds

Submitted by the Department of Fisheries and Oceans

Introduction

The Department of Fisheries and Oceans is responsible for the management of the salmon resource and the protection of fish habitat. (add more about fisheries policy)

Federal Fisheries is directly responsible for the management of anadromous fish species including sockeye, chinook, coho, pink and chum salmon.

Fisheries Values

There are no resident salmon species in either the Betty Wendell or Upper Caribou River as this area is inaccessible due to an 18 meter waterfall located on the Caribou River above Kimball Lake. However, the lower river provides valuable spawning and rearing habitat for sockeye, coho, chinook and several trout species.

The quality of downstream fish habitat can be directly affected by resource development activities in the upper river. Federal Fisheries concerns regarding any type of development in the Betty Wendell and Upper Caribou River includes;

- the maintenance of high water quality standards
- the protection of riparian habitat
- the sustenance of natural hydrologic patterns

The Department of Fisheries and Oceans request that these concerns are addressed for any type of resource development activities within the upper Caribou watershed.

Dec 3, 1993

DFO's Interest Statement

Following is a list of potential interest statements describing the DFO's goals and objectives with respect to development in the Robson Valley TSA

- Maintain or enhance the productive capacity of fish habitat according to DFO's Net Gain policy.
- Sustain or enhance salmon stocks within the planning area (Chinook stocks in Holmes R, Swift C, Morkhill R, Horsey C, Goat R, Nevin C, W. Twin C, Snowshoe C, McKale R, E. Twin C.)
- Preserve or restore the integrity of riparian areas throughout watersheds supporting fish
- Maintain high water quality standards in areas upstream of valuable fish habitat
- Sustain stable hydrologic regime to preserve natural stream characteristics (ie. channel stability, gravel quality, large organic debris, water temperature, nutrients, insects)
- Conduct a watershed analysis on all drainages with significant fisheries values
- Identify and protect environmentally sensitive fish habitat from development activities
- Promote awareness and education of BC's fisheries resource
- Use watershed boundaries as the minimum planning unit size for the LRMP process
- Sustain the cultural and socioeconomic benefits of the aboriginal, sport and commercial fisheries

Jan 12, 1994

Fisheries Information for the Robson Valley LRMP

Fisheries information relevant to the Robson Valley LRMP has been collected from MOE and DFO. This information will be available in a Fisheries Overview Information Package containing both anadromous and resident fisheries information by mid February. An example of the Fisheries Overview is attached.

A short description of the available information is provided below;

MOE, Fish and Wildlife

1. Baseline reconnaissance surveys for the following lakes. Reports are comprehensive and include detailed bathymetry, water quality and fish population measurements.

- Cedarside
- Diggens (Snowshoe West)
- Shere
- Little Lost
- LaSalle Lakes
- Saddle Lakes (in prep)
- Kinney
- Moose
- Portal
- Witney
- Yellowhead
- Kettle

2. The following stream information is available;

- Holmes River - limited stream info
- Canoe River - limited stream info
- McLennan River - limited stream info
- Tete Creek - limited stream info
- Camp Creek - enhancement opportunities
- Packsaddle Creek - enhancement opportunities
- Kinbasket tribs - baseline surveys

3. Special Interest Areas

"Lakes of particular interest are Yellowhead which received spawning habitat enhancement

in 1978 and Little Lost which provides trophy fishing opportunities in a remote setting" (letter from Rob Van Schubert, Jan 5, 1994).

4. Additional information

Additional information includes stocking histories which can assist in identifying popular sportfishing areas.

5. Mapping;

Department of Fisheries and Oceans

1. Escapement, distribution, life history timing, enhancement opportunities, land and water use and fish production potential/constraints information has been compiled for the streams listed below. This information is presented in a draft Fisheries Overview for the Robson Valley LRMP. Please see the attached document for more details.

East Twin Creek
Fraser River at Tete Jaune
Goat River
Holmes River
Horsey Creek
McKale River
McLennan River
Morkhill River
Nevin Creek
Snowshoe Creek
Swift Creek
Upper Caribou River
West Twin Creek

2. DFO's uses "GENESIS" for their GIS mapping. Digital and hard copy maps exhibiting fisheries sensitive watersheds can be provided and are compatible with MoF's Terrasoft system.

April 26, 1994

DFO AND MOE DRAFT RESOURCE UNIT DESCRIPTIONS

The following information is based on current inventory information. In the absence of fisheries inventory data, it should be assumed that fisheries values are high until proven otherwise. This assumption is consistent with the Draft Riparian Management Guidelines for the Forest Practices Code.

Resource Unit 1 - Robson Valley Corridor

- several drainages belong to Watershed Class A
- significant populations of Chinook salmon utilize the lower reaches of the Morkhill River, East Twin Creek, McKale River, Holmes River, Nevin Creek, Holliday Creek, Horsey Creek, Fraser River at Tete Jaune Cache, Swift River, West Twin Creek, Goat River and Snowshoe Creek for spawning and rearing.
- high Chinook spawning and rearing potential in the Fraser River at Tete Jaune and the Holmes River
- largest concentration of chinook spawners (average = 4500) in the upper Fraser River are found at Tete Jaune
- Sockeye salmon spawners utilize the lower Holmes River and Swift Creek on an intermittent basis, and due to the limited availability of suitable juvenile sockeye rearing habitat, the potential for future sockeye spawners in this area is unknown
- significant populations of Rainbow Trout, Bull Trout, Mountain Whitefish, Eastern Brook Trout, Kokanee, Cutthroat Trout and Burbot utilize most if not all drainages in the planning area.
- Canoe River and Camp Creek support significant populations of Kokanee, Rainbow Trout, Cutthroat Trout and Eastern Brook Trout
- high recreational sportsfishing areas include; La Salle, Snowshoe, Little Lost, Shere and Cedarside Lakes, Camp, Canoe, Morkhill and Goat Rivers, Small and Horsey Creeks
- commercial angling guides licenced in Goat River, Holmes River, Horsey Creek, LaSalle Lakes, Little Lost Lake, Shere Lake.
- the quality of fish habitat, particularly spawning habitat existing in the lower reaches of several rivers in Unit #1, is extremely susceptible to ongoing series of road failures along the NE side of the Fraser River.

Resource Unit 2 - Morkill

- Watershed Class A
- cold, turbid flashy stream of glacial origin
- supports the 4th largest population of Chinook salmon (average = 900), distribution extends upstream to falls on mainstem and approximately 10 km up Forget Me Not Creek
- Bull Trout, Rainbow Trout and Mountain Whitefish throughout

- the quality of fish habitat is highly susceptible to adverse affects from construction and/or potential road failures of the Morkill Forest road due to terrain/soil conditions
- current limiting factor for spawning is high silt load

Resource Unit 3 - McKale

- McKale and East Twin belong to Watershed Class A
- Bull Trout and Rainbow Trout throughout
- the quality of downstream fish habitat is dependant on the preservation of water quality and quantity throughout the resource unit
- lower East Twin spawning habitat is very fragile; the streambed composed of mainly gravel and sand and characterized by frequent channel changes, debris accumulation and streamflow changes
- limited potential for chinook in upper portion of McKale River

Resource Unit 4 - Holmes

- Watershed Class A
- characterized by large deep pools, extensive log jams, extensive spawning and rearing habitat throughout
- some of the best fish habitat in the entire planning area is found here
- supports the 2nd largest spawning population of Chinook in the Robson Valley (average = 1900)
- significant populations Bull Trout, Rainbow Trout, Mountain whitefish

Resource Unit 5 - Horsey

- Nevin, Holliday and Horsey Creeks belong to Watershed Class A
- resident spp? (Sandra)
- moderate salmon spawning and rearing habitat in Horsey Creek
- good salmon spawning and rearing habitat in Nevin Creek
- the quality of downstream fish habitat is dependant on the preservation of water quality and quantity throughout the resource unit
- Small River has no resident fisheries inventory, therefore assume fisheries values are high until proven otherwise

Resource Unit 6 - Swift

- Watershed Class A
- Rainbow Trout, Bull Trout
- 3th largest chinook spawning area (average = 950) in the Robson Valley planning area
- high potential for public education/interpretation at viewing tower in Valemount
- water quality susceptible to agricultural and urban developments
- the quality of downstream fish habitat is dependant on the preservation of water quality and quantity throughout the resource unit

- important salmon migration corridor through the McLennan River

Resource Units 7,8,9,10,11

- Watershed Class A
- the majority of Kinbasket Lake tributaries support healthy populations of Bull Trout and Mountain Whitefish, Rainbow Trout
- recreational fishery for Rainbow Trout and Eastern Brook Trout at Saddle lakes and Bull Trout, Rainbow Trout, Kokanee, Mountain Whitefish in Kinbasket Lake

Resource Unit 12, 13, 14 and 15

- No resident fisheries inventory, therefore assume fisheries values are high until proven otherwise

Resource Unit 16 - Betty Wendle/Cariboo

- Watershed Class A
- Betty Wendell provides a great mixture of spawning and rearing habitat for Bull Trout and Rainbow Trout
- the lower Cariboo River supports Chinook, Sockeye, Coho, Bull Trout, Kokanee, Lake Trout and Rainbow Trout
- the quality of downstream fish habitat is dependant on the preservation of water quality and quantity throughout the resource unit

Resource Unit 17 - Goat

- Watershed Class A
- natural silt load
- Chinook salmon spawning areas include the Milk River (1 km above the Goat/Milk confluence) and in the Goat River mainstem (12 km upstream of the Milk River confluence).
- Bull Trout and Rainbow Trout utilize the entire system
- recreational fishery at Snowshoe Lake
- extensive logging concentrated in the valley combined with existing high silt load could affect the success of chinook spawners in the lower Goat River

Resource Unit 18 - West Twin

- West Twin is Watershed Class A
- limited fish production due to steep gradient and gravel availability
- Clyde Creek has no resident fisheries inventory, therefore assume fisheries values are high until proven otherwise

Resource Unit 19 - Mt Robson

- Chinook distribution up to Overlander Falls
- Mountain Whitefish, Lake char, Lake Trout Rainbow Trout and Burbot throughout
- recreational fisheries at Moose Lake, Whitney Lake and Portal Lake
- the quality of downstream fish habitat is dependant on the preservation of water quality and quantity throughout the resource unit

June 27, 1994

Robson Valley Round Table

Fisheries Objectives and Strategies

The following objectives and strategies have been designed to satisfy DFO's overall goal to protect the fisheries resource by ensuring a "NET GAIN" in the productive capacity of fish habitat.

Objective #1: *To maintain or enhance the quantity and genetic diversity of indigenous fish stocks*

Strategies: Conduct standing stock and habitat inventories in those areas where accurate fisheries information is unavailable.

Identify fish stocks or fish habitat that show a high potential return for enhancement or restoration work and initiate projects when feasible.

DFO and MELP will conduct annual fish and habitat inventories to monitor changes in fish populations and assess rehabilitation or enhancement work when applicable.

Objective #2: *To protect the structural, functional and biological diversity of riparian habitat*

Strategies: Develop a Riparian Management Plan that provides direction for the delineation and management of Riparian Management Areas (RMAs) along all watercourses within the planning area.

Objective #3: *To maintain or enhance water quality*

Strategies: Establish adequate windfirm RMAs along major watercourses to promote channel stability, maintain natural water temperature regimes, and sustain natural rates of large and small organic input (LOD, bugs, leaf litter etc).

Identify high terrain hazard areas and limit development in these areas to minimize erosion and slope failures.

Assess and monitor road development and deactivation plans to minimize the potential for road failures by ensuring the maintenance of natural drainage patterns.

Limit the use of pesticides, herbicides and petroleum products to prevent entry of contaminants into the water cycle

Objective #4: *To maintain the natural hydrological regime of each watershed.*

Strategies: Conduct a watershed cumulative effects analysis to identify the present condition of each watershed in the planning area and limit development in those drainages showing negative hydrological impacts from past development.

Control the rate of cut on a watershed basis to prevent changes to natural rates of direct runoff, groundwater runoff, evapotranspiration and stream flows (more detail to come).

Objective #5: *To assess and monitor the effectiveness of the above objectives and strategies in minimizing the effects of ongoing development on fish and fish habitat.*

Strategies: Conduct a watershed cumulative effects analysis on a regular basis to determine the hydrological condition of each watershed and assess whether Objectives 1-4 are being satisfied.

DFO and MELP will conduct compliance monitoring on a regular basis to determine whether strategies are being implemented.

March 20, 1995

Salmon Resources of the Robson Valley Submission for the Robson Valley Environmental Base Case Profile (DRAFT)

Background

The Department of Fisheries and Oceans (DFO) is responsible for the management of the salmon resource and the protection of fish habitat, pursuant to the Fisheries Act of Canada. DFO's priority in the Robson Valley is to conserve fish stocks and protect fish habitat.

The salmon resource in the Robson Valley provides substantial social benefits to the region and contributes to commercial, recreational and Native subsistence values to the province. Robson Valley chinook stocks support Native, commercial and sport fisheries in the lower Fraser and at sea. There are no local commercial, Native or sports salmon fisheries in the planning area.

The sustenance of the salmon resource is dependant upon the preservation of freshwater aquatic habitat for spawning, incubation and rearing. Forestry, mining, agricultural and urban development have the potential to impact naturally functioning ecosystems in the following manner;

- **Water flow:** increases in peak flows can occur when logging reaches approximately 20% of the watershed (Toews, 1992). Removal of the forest canopy reduces evapotranspiration rates and therefore increases water delivery rates to streams.
- **Water Quality:** logging/mining roads and development have the potential to increase natural rates of landslide activity and surface erosion, resulting in increased sedimentation that can reduce the quality of fish habitat.
- **Riparian Habitat:** urban development, agriculture, forestry and mining activities can result in the modification of riparian areas. Destruction of riparian areas can decrease channel and bank stability, reduce the capability of riparian areas to filter sediment from surface erosion and decrease cover, shade, LOD sources, litterfall and food production of streamside areas.
- **Species Diversity:** logging, agriculture and urbanization can minimize the diversity of fish communities. A study in Oregon observed a lower diversity of salmonid species in streams where > 25% of the basin had been harvested (Reeves et al 1993)

Current State

Chinook are the primary salmon species in the Robson Valley. The only other salmon species within

the planning area is a small run of sockeye (<100 fish) that has returned on an irregular basis over the past 25 years. Approximately 9000 chinook travel to the headwater areas of the Fraser River to spawn.

The majority of chinook are produced in the Fraser River at Tete Jaune, the Morkill, Holmes and Swift River drainages. A significant portion of chinook spawning habitat is located within the floodplain of the Robson Valley trench and is surrounded by private urban and agricultural lands. Spawning and rearing distribution areas encompass 14 salmon-bearing watersheds in the Robson Valley.

In 1984, DFO set a goal to double 1979-1982 Fraser River chinook returns by 1998. Upper Fraser stocks have responded well to conservation measures and chinook returns in the Robson Valley doubled in the Holmes, Swift, Morkill, Horsey, Goat, Nevin, East and West Twin Rivers by 1990. Robson Valley chinook stocks currently represent approximately 5% of the total Fraser River chinook escapement.

Several systems in the upper Fraser support small chinook populations of less than 50 fish. The protection of small stocks is important as they are ecologically valuable for maintaining genetic diversity and are believed to be a key factor for long-term species viability. The potential for regular sockeye returns to the Robson Valley is unknown as this area shows limited availability of suitable sockeye rearing habitat.

Most salmon bearing watersheds in the Robson Valley have been logged to some extent over the past 30 years. The percent watershed logged ranges from 0.1% to 40%, with the majority of drainages averaging 4 to 7%.

Future Trends

The potential for forestry, mining, agricultural and urban development activities to negatively impact fish and fish habitat will likely increase as resource development pressures increase over time. For example, the Ministry of Forests has predicted that road density will double in order to access the remaining merchantable timber within the valley. As roads have the greatest, singlemost potential to adversely impact fish habitat, the potential for future road development to negatively impact fish habitat will increase over time.

However, new management standards for resource development on Crown land will be implemented through the Forest Practices Code of British Columbia (FPC). The proposed FPC provides standardized protection for freshwater fish habitat and adjacent riparian areas on Crown land. Resource development on private land is not subject to the FPC regulations and pressure to develop streamside and riparian areas will likely increase in the future.

Salmon production is influenced by large scale environmental factors as well as interception rates by the commercial, Native and sports fisheries. The sustenance of the salmon resource in the Robson Valley is dependant upon fisheries management practices in the lower Fraser River and the

marine environment. In March 1995, the Minister of Fisheries made a statement to “create a smaller, more economically viable and ecologically sustainable fishery of the future, based on partnerships and reciprocal accountability with respect to management and enforcement”. The Minister of Fisheries has also committed to ensure that future fisheries management strategies will meet conservation requirements before salmon stocks are made available for consumptive use. Future fisheries management plans will be more conservative and strive to sustain healthy salmon populations and sustainable Native, commercial and sport fisheries.

11 April 1995

Robson Valley Fisheries Strategies by RMZ

The following fisheries strategies are designed to address specific fisheries related concerns within each Resource Management Zones (RMZs). RMZs were established according to the degree of competing resource use and follow watershed boundaries in some cases. The majority of the fisheries values fall within;

RMZ A: Floodplain area of main trench
RMZ D: Morkill, East Twin
RMZ E: Holmes R, McKale River
RMZ L: Goat/Milk River, West Twin, Snowshoe

RMZ A: Fraser Trench floodplain area

Private land owners are encourage to establish riparian reserves along the mainstem Fraser and tributaries in order to maintain channel stability, natural water temperature regimes and sustain natural inputs of large and small organic debris.

Channel bank erosion problems in the mainstem Fraser above the Tete Jaune chinook spawning area will be assessed and may require rehabilitation through revegetation, bank stabilization and other improvement practices

RMZ D: Morkill, East Twin

Future resource development in the Morkill drainage will be directed by detailed Landscape unit plans to minimize the impacts of forest harvesting on non-timber resource values by controlling development (rate of cut) on a watershed specific basis.

A watershed assessment will be conducted on the Morkill River to evaluate the cumulative impacts associated with forest harvesting and to provide recommendations for future resource development.

Terrain hazard analysis and mapping for the Morkill drainage will be completed by _____. This information will provide future direction for road design and forest harvesting plans.

Assess and restore degraded riparian habitat in the lower Morkill River through revegetation, bank stabilization and other improvement practices.

Assess road networks in the upper East Twin drainage and address existing erosion and hydrological problems by restoring natural drainage patterns through road maintenance or road deactivation.

RMZ E: Holmes River, McKale River

Future resource development in the Holmes River will be directed by detailed Landscape unit plans to minimize the impacts of forest harvesting on non-timber resource values by controlling development (rate of cut) on a watershed specific basis.

A watershed assessment will be conducted on the Holmes River to evaluate the cumulative impacts associated with forest harvesting and to provide recommendations for future resource development.

Assess and restore degraded riparian habitat in the Holmes and McKale through revegetation, bank stabilization and other improvement practices

Assess road networks in the upper McKale drainage and address existing erosion and hydrological problems by restoring natural drainage patterns through road maintenance or road deactivation

RMZ L: Goat/Milk River, West Twin, Snowshoe Creek

Future resource development in the Goat/Milk drainage will be directed by detailed Landscape unit plans to minimize the impacts of forest harvesting on non-timber resource values by controlling development (rate of cut) on a watershed specific basis.

A watershed assessment will be conducted on the West Twin drainage to evaluate the cumulative impacts associated with forest harvesting and to provide recommendations for future resource development (may be redundant as the West Twin is currently a PAS candidate).

Assess and restore degraded riparian habitat in the Goat/Milk and West Twin watersheds through revegetation, bank stabilization and other improvement practices

Assess cutover areas and road networks in the Goat/Milk, West Twin and upper Snowshoe drainages and address existing erosion and hydrological problems by restoring natural drainage patterns through road maintenance or road deactivation

Assess regeneration success of large clearcut areas in the West Twin drainage and prioritize these areas for fill planting in 1995.

May 8, 1995

Proposed Riparian Management Areas for Lakes in the Robson Valley Planning Area

Introduction

At the March RVRT meeting, the Table requested that a subcommittee meet and develop a riparian management strategy for the Saddle lakes, La Salle lakes, Snowshoe lakes, Shere lake, Little Lost lake and Loren Lake (added later). The subcommittee would then make a presentation at the next table meeting.

On April 3, Vic Komori and Steve Day from Slocan Forest Products, Don Cadden from BC Environment and Violet Komori from DFO met to develop a proposed riparian management plan for low elevation lakes within the planning area. The objectives of the meeting were to:

- identify existing lake classification
- review existing protection around lakes by recreation reserves, regional parks etc
- review the amount and quality of timber surrounding the lakes
- review existing recreational use
- develop strategies to direct activities on lakes and adjacent riparian areas.

Don Cadden provided lake classifications based on fisheries and recreational values. As both low elevation lakes and riparian habitat are generally scarce in the Robson Valley, all lakes, wetlands and riparian areas receive a higher classification in this district compared to similar areas in the Prince George District. For example, most lakes in this area are considered to be Class B or C lakes but due to the lack of lakes in this district, they have been elevated to Class A or B designation. The information in this document has been reviewed and approved by Dave King and Bruce Jamieson.

We drafted the following information for review by the RVRT. For each lake, a list of attributes is provided, followed by the classification and proposed strategies.

I. La Salle Lakes

Area: > 5 ha

- currently within the West Twin AOI
- high recreational values, good potential for expansion of recreation site, poor road access
- one of the few lakes in McBride area with the potential to support a fishery
- stocked with EB, RT
- UREP surrounding lakes
- La Salle West currently supports a higher use fishery than La Salle East
- some selective logging around lakes
- recent looper kill along northeastern side of northernmost lake

La Salle Lakes (con't)

Classification: Class A

Proposed Strategies:

1. The Lakeshore Management boundary will follow the existing Recreation Area boundary with an extension of the northwesterly border to include a minimum 250 metre lakeshore management area
2. MoF will assess the extent of looper kill and prescribe forest management practices necessary to ensure public safety. Future forest management activities will maintain ecological and recreational values
3. Enhance recreation facilities on West La Salle Lake by improving road access into the existing recreation site and constructing a hiking trail network around both lakes.

II. Snowshoe Lakes

Area: > 5 hectares

- no designated trail into lakes, foot access is possible but difficult through thick brush and steep sidehills, approx 6.5 km from Zeidlers road
- high recreation potential, unique site
- regularly stocked with RT
- no recreation data collected to date
- high visual quality values
- no immediate plans for development of timber surrounding lakes
- currently used as a fly-in hiking destination
- West Lake: small amount of merchantable timber on north and east side only
- East Lake: glacial, small amount of merchantable timber on south end of lake

Classification: Class A

Proposed Strategies:

1. MoF will assess and identify the visual quality values surrounding both lakes before any resource development is permitted within the landbase visible from the lake
2. RVRT should discuss the possibility of creating a trail into the lakes.

III. Little Lost Lake

Area: ~ 6 - 7 hectares

- 400 m UREP surrounding lake
- good trail access
- stocked with RT every year

Classification: Class A
Proposed Strategy: Limit access on Little lost Lake trail to non-motorized travel.

IV. Saddle Lakes

Lake #3 Area: ~ 8 hectares

- largest lake of Saddle Lake trio
- stocked with Rainbow Trout, reports of 14" fish angled
- good fishing opportunities
- readily accessible
- potential for overnight recreation area
- previous logging on southwest side of lake, approx 50 m riparian buffer
- mainline adjacent to northeast side of lake

Lake #2 Area: ~3 hectares

- second largest lake
- stocked with Rainbow Trout
- previous logging adjacent to south and southeastern side of lake
- good quality timber around lake #2 and lake #1

Lake #1 Area: ~2.5 hectares

- smallest Saddle Lake
- shallow, no fisheries potential
- potential for recreational trail development
- no previous logging
- wildlife values include good moose habitat

Lake #	Classification	Lakeshore Reserve Zone (m)	Lakeshore Management Zone (m)	Total Lakeshore Management Area
1	B	50	50	100
2	B	50	50	100
3	enhanced B	100	100	200

Proposed Strategies

1. The visual quality values of the lakes will be assessed by MoF prior to future forestry development.
2. Forest harvesting within the management zone will be conducted to maintain the visual, recreational, wildlife and fisheries values of the Saddle lakes.

3. Activities on the Saddle Lakes will be managed to maintain the wilderness quality and include non-motorized use only.

V. Shere Lake

Area: ~ 8 ha

- stocked with EB
- high value, good small lake fishery
- recreation site on northwest end of lake
- day use area with float and outhouse
- popular ice fishing area
- majority of land surrounding lake is private land L.6028, on southeast end of lake

Classification: Class A

Strategy: (none required at this time)

VI. Loren Lake

- headwater area of Chalco Creek
- med/poor timber values
- rare swamp habitat at south end
- high recreational potential
- no current fisheries inventory

Classification: Unclassified

Proposed Strategies:

1. Appropriate agencies will inventory and assess fisheries, wildlife, visual and recreational values and classify Loren lake according to the Prince George Region Lakeshore Management guidebook

VII. Lakes in RMZ F and other small alpine lakes >5 hectares

- series of lakes in RMZ F with high recreational potential
- several high elevation throughout the planning area

Classification: Unclassified

Strategies:

1. Alpine lakes in RMZ F will be given priority for future lake classification
2. Assess value of remaining lakes and classify accordingly. The lakes will be managed as a minimum of Class C lakes until they have been classified.

January 23, 1994

Fisheries Overview for the Robson Valley LRMP

Introduction

Within the Robson Valley Planning Area, the Department of Fisheries and Oceans is responsible for the management of the salmon resource and the protection of fish habitat, pursuant to the Fisheries Act of Canada.

Federal Fisheries practices a "Net Gain" objective which strives to maintain or improve the productive capacity of fish habitat. DFO's concerns are not limited to activities within the aquatic environment but include development in the surrounding watershed area which may affect downstream water quality and quantity.

To support our "Net Gain" objective in the Robson Valley planning area, DFO has prepared the following statement of interests which provides the basic requirements for preservation of fish habitat.

- Maintain or enhance the productive capacity of fish habitat according to DFO's Net Gain policy
- Sustain or enhance salmon stocks with the planning area
- Preserve or restore the integrity of riparian areas throughout watershed supporting anadromous or resident fish species
- Sustain stable hydrologic regimes to preserve watershed integrity and natural stream characteristics (ie. channel stability, gravel quality, large organic debris, riparian cover, water temperature, nutrients and aquatic food sources)
- Incorporate the principles of watershed management into land and resource use planning to maintain fisheries habitat and the biophysical integrity of aquatic environments
- Use watershed boundaries as the minimum planning unit size for the LRMP process.
- Identify and protect headwater, ephemeral and intermittent channels as integral components of fish habitat.
- Promote awareness and education of BC's fisheries resources
- Sustain the cultural and socioeconomic benefits of aboriginal, sport and commercial fisheries

Salmon Stocks:

The streams within the Robson Valley Planning Area support chinook spawners with escapements ranging from 10 to 4500 fish. Major spawning areas include the Fraser River at Tete Jaune, Holmes River, Swift Creek and the Morkill River. Smaller populations are found in Horsey Creek, Holliday Creek, Goat River, Nevin Creek, East and West Twin Creeks, Snowshoe Creek and McKale River (see DFO's Salmon distribution map). The sustenance of small chinook stocks is an important element in maintaining genetic diversity and these populations hold equal or greater value relative to large stocks from a biodiversity perspective.

Juvenile chinook salmon are dependant on the maintenance of high quality rearing habitat. It is likely that most of the low gradient, small tributary streams along the mainstem Fraser floodplain provide good rearing habitat for chinook. For example, Dominion Creek in McBride has been identified as having very high value rearing habitat values.

Sockeye have frequented the waters of the Robson Valley on an irregular basis over the past 25 years and in 1981 and 1984, a few sockeye spawners were observed in Swift Creek. In 1993, approximately 100 sockeye were observed spawning in the Holmes River (T. Panko, pers comm) and in 1974, the stream inventory data from the Ministry of Forests notes sockeye spawners in the Holmes during late August. The presence of sockeye in the Robson Valley is atypical and due to the limited availability of suitable juvenile rearing habitat, the potential for future sockeye spawners in this area is unknown.

Life History

The majority of upper Fraser Chinook adults migrate from the ocean to their natal streams during April, May and June, ahead of the major commercial fisheries. In general, chinook arrive in the upper Fraser during late July and early August and spawning occurs from mid Aug to mid Sep and peaks approximately Sept 5-10 (F. Voysey). The first run of the year is the Swift Creek chinook, arriving during July with a peak of spawn on approximately August 10. Spawning occurs in the smaller upper Fraser tributaries throughout August and the Holmes and Tete Jaune stocks reach their spawning peak during early September. Late spawners from the Tete Jaune run have been observed in the river through October. The average residence time for chinook spawners in the Robson Valley is 10 days. (T. Panko)

In general, the eggs incubate in the gravel over winter and the fry emerge during April. Emergent fry may rear in the Robson Valley area or migrate downstream to rearing areas in the lower Fraser area. Research in the Morkill and Holmes R reveal that the majority (75%) of fry in the upper Fraser remain in freshwater until their second year, migrate to the ocean for 3 years and return as 5 year old fish (Rosberg 1981a).

Stock Management

In 1984, DFO set an overall goal to double 1979-1982 Fraser River chinook returns by 1998. In general, these stocks have responded well to conservation measures and chinook in the Robson Valley have doubled in the Holmes, Swift, Morkill, Horsey, Goat, Nevin, East and West Twin systems according to 10 year mean escapement values calculated between 1981-1990. Escapement in the Fraser River at Tete Jaune and McKale Rivers currently show increases of over

85% (DFO escapement records).

The success of the rebuilding program is based on reduced exploitation rates on adults and reduced incidental catches of immature chinook since the mid 1980's (B. Rosenberger, pers comm). Rebuilding efforts will now concentrate on those stocks within the Fraser which have not reached target escapements.

Salmon Fisheries

Spring run chinook consists of stocks spawning upstream of Prince George and a few stocks from the middle Fraser and Thompson River areas. In general, these stocks have responded well to conservation measures of recent years. Native fisheries are directed on these stocks, particularly in the lower Fraser and in 1993, a catch ceiling was negotiated under the Aboriginal Fisheries Strategy. In some years, spring run chinook are incidentally caught during the Fraser River commercial sockeye gill net fishery in early July (Harrison 1993). There are no commercial or Native fisheries in the Robson Valley planning area (Voysey 1990).

The Robson Valley area provides good sportsfishing opportunities for resident fish species in several lakes and streams. There is no current sport fishery for salmon in this area.

Enhancement Activities

One of the most valuable components of the Salmonid Enhancement Program is public education and DFO is currently involved with classroom incubation projects in both Valemount and McBride. A new program called "Streamkeepers" has been initiated by DFO to further increase public participation in salmonid enhancement activities.

There are no immediate plans for large scale enhancement projects in the Robson Valley (E. Woo, M. Sheng, pers comm). Future enhancement proposals in the Robson Valley include stream improvement works and a spawning channel in the mainstem Fraser at Tete Jaune Cache, a fishway at Rearguard falls and a hatchery facility at Holmes River.

Issues of Concern

One of the general issues of concern is water quality and quantity. Unnatural changes in stream flow, sedimentation rates, water temperature and organic debris loading can significantly influence the survival of fish populations. Water quality is also susceptible to chemical seepage from pesticides and fertilizers, either having direct affects on fauna and flora in the Robson Valley area or attributing to problems associated with bioaccumulation further downstream. Since development in the Robson Valley planning area includes both forestry and agriculture, the maintenance of water quality and quantity is a priority from a fisheries perspective.

Another issue of concern is the protection of riparian areas. DFO supports the establishment of Riparian Management Areas to maintain species diversity, age composition and structural complexity of intact riparian areas. Fisheries values in the Fraser River trench are susceptible to degradation from forestry development, agricultural development and urban settlement areas. Natural intact riparian area important for streambank and channel stability, surface erosion control,

shading and litterfall.

DFO is also concerned about the cumulative impacts of forestry development on fish habitat. We recommend a watershed cumulative effects assessment when the total area harvested exceeds 20% in any salmon-bearing watershed or prior to any development in a pristine watershed.

A final issue of concern relates to recent terrain failures in Gosling Creek near Tete Jaune and along Mountain View Road between McBride and East Twin Creek. The quality of spawning and rearing habitats is susceptible to damage from natural or human induced debris torrents and therefore resource development activities should minimize the potential for future slope failures.

General Notes

Salmon escapement data has been summarized by stream using information derived from annual spawning surveys. Escapement numbers are generally related to habitat capability and provide a relative index of stock strength, other factors such as ocean survival and interception rates from the commercial and native fisheries affect the number of fish returning to spawn. The reliability of escapement data is highly variable, depending on the species, enumeration method used and variations in stream conditions but in general, the escapement data for the Robson Valley area are reliable. Fishery patrolman walk most systems and use boat/helicopter surveys on the Holmes River and the Fraser River at Tete Jaune (Voysey 1990).

The following section provides information on escapement, stock distribution, timing, enhancement, land and water use and the fish production potential for each salmon bearing stream. Streams appear in alphabetical order

1. East Twin Creek.....	5
2. Fraser River at Tete Jaune.....	6
3. Goat River.....	8
4. Holliday Creek.....	9
5. Holmes River.....	10
6. Horsey Creek.....	12
7. McKale River.....	13
8. McLennan River.....	14
9. Morkill River.....	15
10. Nevin Creek.....	17
11. Snowshoe Creek	18
12. Swift Creek.....	19
13. Upper Caribou.....	20
14. West Twin.....	21

1. East Twin C (00-6950)

- watershed area: 128 km² (NWH '94)

<u>Escapement</u>	<u>mean ('81-90)</u>	<u>historical max</u>
Chinook	10	25 (28A-18)

- insufficient data to determine stock status

Distribution Summary

- chinook spawning scattered in first 2 km during August (29J-47)
- falls at 2.5 km, impassable to chinook (29J-47)

Life History Timing

- spawn in Aug (29J-47)

Enhancement/Mgmt Act

Land and Water Use

- forestry, agriculture (29J-47)
- historical logging: 5.6%, additional proposed logging to '97: 1.7%
- small hydroelectric project at falls (29J-47)

Fish Production Pot/Constraints

- lower 2 km of river is very unstable, streambed composition is mainly gravel and sand, frequent channel changes (T. Panko).
- Lower river loses grade below falls and susceptible to debris accumulation and barrier formation, resulting in channel instability and streamflow changes (T. Panko).
- history of road failures along Mtnview logging road, development on N side of Fraser appears to be more susceptible to erosion relative to S side (T. Panko)
- limited spawning gravels (29J-47)

2. FR at Tete Jaune (00-0000)

<u>Escapement</u>	<u>mean ('81-90)</u>	<u>historical max</u>
Chinook	4476 *	6500 *

* accuracy of estimates affected by high turbidity of FR (29J-47)

- in general, an increasing stock since the 1970's

Distribution Summary

- CH spawn around TJ islands below old hwy bridge and for 2 km u/s. Some spawn around mouth of Swiftcurrent C located 10-12 km u/s of Rearguard Falls (20J-33,36,47)
- Obstructions;
 - Rearguard Falls, 5 km u/s of TJ islands, passable
 - Overlander Falls, 22 km u/s TJ islands, 9 m, impassable (29J-47)

Life History Timing

- migration - late Jul, early Aug
- spawning - mid Aug to mid Sep (29J-5,33)

Enhancement/Mgmt Act

- Spawner surveys, age, length, sex ('75-80) (29J-33)
- Peterson pop est, CWT recoveries; age, length and sex (83/84) (29J-34,58)

Proposed SEP projects (Ref; 1983 Opp for SEP)

- Stream Improvement at Tete Jaune (2500 m2) *best potential
Remarks; probable winter egg kill, possible relation flow to adult return, prevent dewatering or spawner access to drying bar.
- Exp'tal Spawning Ch at Tete Jaune
Remarks; Groundwater pot in area needs assess, drilling unsuccessful to date
- Fishway at Rearguard Falls
Remarks; partial obstruction, several hundred CH above

Land and Water Use

- Flow msmts available at McBride Sta 08KA005 (29J-5)
- Agriculture; cattle ranching (29J-37)
- Forestry; logging (29J-37)
- Linear Dev; hwy 5 and 16, CNR (29J-37)
- Urban Dev; Tete Jaune Cache (29J-37)
- Parks; Mt Robson Prov Pk (29J-47)
- Water Quality ref (29J-31,33)

Fish Production Pot/Constraints

- Area is characterized by two major channels, numerous small side ch and cobble/pebble substrate. Spawning and rearing potential is excellent. Above Rearguard falls to Overlander Falls, good spawning and rearing habitat unused (29J-5)
- Enhancement potential could be increased by; 1. Installation of fishway are Rearguard fall, 2. adult /egg transplants, 3. groundwater incubation rearing facility and fry stocking. Detailed survey above rearguards falls recommended (29J-5)
- flow measurements available (29J-5)

3. Goat R (00-6900)

- includes Killam, Kendall, Digging, Quartz, Whitehorse, McLeod, North Star, Milk, Bounding
- watershed area: 661 km² (NWH '94)

<u>Escapement</u>	<u>mean ('81-90)</u>	<u>historical max</u>
Chinook	87	160
Dolly Varden	present	
Rocky Mtn Whitefish	present	

- in general, an increasing stock size since the 70's

Distribution Summary

- spawning in lower 6 km below hwy, highest conc at mouth (29J-5, 29J-21, 29J-47)
- some spawning in lower Milk River (0 - .8 km) (29J-5,21,47)
- spawning in Goat River 12 kilometers upstream of Milk River confluence (T. Panko)

Life History Timing

- spawning window late Jul through early Sep (29J-47)

Enhancement/Mgmt Act

- habitat sampling, chinook sampling in 1975 (29J-5)

Land and Water Use

- forestry: historical logging in total watershed: 5.1% proposed logging to '97: .6%
 - Killam Creek is extensively logged, approximately 40%
 - Milk River mainstem: historical logging: 4.6% proposed to '97: 1.8%
 - Northstar, McLeod and Kendall creeks are unlogged to date
- agriculture, linear devel includes hwy 16, logging roads adjacent to stream, CNR (29J-47).
- extensive logging, conc in valley, history of high silt content, more slides within the last few years in Milk, could potentially affect lower Goat spawning (Panko pers comm).
- accessible throughout, moderate spawning habitat exists above canyon at 8 km, present run small, enhancement not a high priority due to limited potential and poor access (29J-5).

Fish Production Pot/Constraints

- capable of supporting a theoretical pop of 3000 chinook, most of potential spawning gravel located in lower 4.2 km (29J-21)
- sediment loading over spawning area after spawning completed due to road failures, appears to be an increase in silt load in lower Goat River from Milk River since late 1980's, logging conc in valley (T. Panko)

4. Holliday C (00-7600)

Escapement

chinook 3 obs in '93 (T. Panko)

- chinook stocks were observed in this creek within the last few years and therefore no escapement trend is available.

Distribution Summary

- fish observed between hwy 16 and river mouth, this stream not inspected on a regular basis (T. Panko)

5. Holmes (Beaver) R (00-7200)

- watershed area: 785 km² (NWH '94)
- includes Chalco C

<u>Escapement</u>	<u>mean ('81-90)</u>	<u>historical max</u>
Chinook	1885	3000
Sockeye	100 ('93), presence noted in 1974	
Dolly Varden	present	
Rocky Mtn Whitefish	present	
Rainbow Trout	present	
Suckers	present	

- in general, an increasing trend in stocks size since the 70's.

Distribution Summary

- 2.0 m falls at 5.3 km, passable, stream accessible to headwaters (29J-5)
- spawning areas are widely distributed, heaviest 4 km u/s of hwy 16 bridge (Rosberg 1981a)
- most suitable areas for holding relative to all Upper FR tribs, pools abund, extensive log jams, large deep pools (Rosberg 1981a)
- Dolly Varden, Rocky Mtn Whitefish, Rainbow Trout throughout (29J-32)

Life History Timing

- migration late Jul/early Aug (29J-32,36)
- spawning Aug, early Sept, peak of spawn Sept 5
- smolt outmigration early May (Rosberg 1981a)
- rearing info on Dolly Varden, Whitefish, Suckers avail (29J-6)

Enhancement/Mgmt Act

- in 1981: carcass recovery, juvenile rearing distribution studies (29J-29,32)
- juvenile enhancement opportunities (Rosberg 1981b)
- enhancement alternatives (29J-5)
 1. fry transplants into good rearing habitat in upper reaches
 2. incubation facility using gravel fed water
 3. bank and terrain revegetation
 4. silt removal
 5. placing good gravel in potential spawning areas

Enhancement/Mgmt Act (con't)

- good spawning and rearing potential for chinook (29J-47)
- reach by reach habitat descriptions avail (29J-32)
- proposed facility at Holmes R in 1982 SEP project review
 - new info shows wells have promise, poor gravity surface supplies, freezing problems, Crown reserved. Deep well for geothermal possible - needs further investigation.

Land and Water Use

- major forest fire in 1961 (Rosberg 1981a)
- agriculture in Holmes R valley south of hwy 16 (29J-32)
- forestry:
 - logging in valley flats of lower Holmes and Chalco C (29J-32), extensively logged by 1981 (Rosberg 1981a)
 - Total watershed: historical logging: 7% proposed logging to '97: .1%
 - Chalco Creek: historical logging: 4.7% proposed logging: 0
 - riparian vegetation is non-existent along most of Chalco creek as a result of fire and wood salvage operations
- linear dev; hwy 16 (Rosberg 1981b)
- low water in Apr (Rosberg 1981b)
- WSC gauge operated from 1949-'52

Fish Production Pot/Constraints

- good spawning and rearing potential for chinook (29J-47)
- stream gradient information avail (29J-29)
- stream flow info avail (29J-4,6,32)
- spawning area estimated at 131,908 m² (29J-21)

6. Horsey C (00-7700)

- total watershed area: 201 km² (NWH '94)

<u>Escapement</u>	<u>mean ('81-90)</u>	<u>historical max</u>
Chinook	147	325

- in general, an increasing stock size since 1970's

Distribution Summary

- chinook limited to lower reaches below 2 km (29J-5, 47)
- lower 1.6 km has moderate gradient, 1.9 km to stream source is characterized by steep gradient (29J-21)

Life History Timing

- migrate in Jul (29J-47)
- spawn Aug, early Sept (29J-47)

Enhancement/Mgmt Act

- potential spawning area est 2822 sq meters (29J-21)
- habitat sampling info (29J-5)

Land and Water Use

- forestry: historical logging in total watershed: 1.5%, none proposed
- agriculture; ranching and grazing (29J-47)
- linear development; hwy 16, CNR (T. Panko)
- irrigation licence: 75 ac-ft (NWH 1994)

Fish Production Pot/Constraints

- limited enhancement potential due to availability of suitable spawning substrate, rearing potential moderate (29J-5)

7. McKale R (00-7000)

- total drainage area: 280 km² (NWH 1994)

<u>Escapement</u>	<u>mean ('81-90)</u>	<u>historical max</u>
Chinook	28	75

- in general, an increasing stock since the 1970's

Distribution Summary

- scattered in lower 10 km (T. Panko)
- no known barriers (29J-47)
- spawn from mouth to approx 3 km, few observed upstream (29J-36, 47)

Life History Timing

- spawning Aug, early Sep (29J-47)

Enhancement/Mgmt Act

- spawning area est 11.037 sq m (29J-21)

Land and Water Use

- forestry (Zeidler): historical logging 4.3% proposed logging to '97: 1.5%
- encroachment of lower river by human modifications (NWH '94)
- agriculture (grazing) (29J-47)
- WSC gauge (near 940 m contour) for period of record 1971- 1991 (NWH '94)

Fish Production Pot/Constraints

- little potential for chinook in upper portion of stream (29J-47)

8. McLennan R (00-8200)

- glacial stream (29J-47)
- total watershed area: 693 km² (NWH '94)

Life History Timing

- migration route late Jul, early Aug (29J-33,36)
- migration route to Swift C, 1 pr obs spawning in McLennan R (29J-33,36-47)

Fish Production Pot/Constraints

- migration corridor only
- spawning area estimated 10,595 m² (29J-21)

Land and Water Use

- WSC gauge near mouth for period: 1981-85
- lower river has sedimentation problems (NWH '94)
- forestry: historical logging: 3.6%, proposed logging to 1997: .2%
Hogan Creek: historical logging: 12% (NWH '94)
- Water Use: (NWH '94)
Domestic water use: 3500 gal/day (additional use at Hogan Creek: 1000 g/day)
Irrigation licence: 524 ac-ft (additional use at Hogan Creek: 150 ac-ft)
Waterworks: 370,000 gal/day
Industrial: 731,000 gal/day

9. Morkill R (00-6800)

- total watershed area: 1333 km² (NWH '94)
- glacial origin, turbid. River exhibits straight channel rapid and riffle flow char, and only small holding areas avail on outside perimeter of bends, fish probably hold in Fraser (Rosberg 1981)
- includes Hellroaring, Cushing, Renshaw, Forgetmenot
- low water in April (Rosberg 1981b)
- gradient: .3-.5% (Rosberg '81)

<u>Escapement</u>	<u>mean ('81-90)</u>	<u>historical max</u>
Chinook	863	2000
Dolly Varden, Rocky Mtn Whitefish	present	

- in general terms, the stock has been increasing since the 1970's

Distribution Summary

- 15m falls located at 30 km, impassable to chinook (29I-3)
- spawning distributed throughout from mouth to impassable falls, some spawning in Forget-me-not C at mouth and above Hellroaring C (29H-46, 29I-4, 87)
- Dolly Varden, Rocky Mtn Whitefish presence noted to Forget-me-not C and above (29I-6)
- heaviest spawning upstream of Hellroaring Creek (Bustard '91)

Life History Timing

- migration early Aug
- spawning late Aug - Sept (29I-52)
- smolt outmigration, (late Apr)/early May (Rosberg 1981a)

Enhancement/Mgmt Act

- 1981 habitat assess, adult and juv studies (29I-4,6)
- channel encroachment and infilling at kilometer 21.5: 35 m in length, 10 meters in width (Bustard '91)

Land and Water Use

- forestry: historical logging: 1.3 % proposed logging to '97: 4% (NWH '91)
 - Hellroaring: historical logging: .1% proposed to '97: 4.8%
 - Forget Me Not: historical: .1% proposed to '97: 3.3%
 - Cushing Creek: historical: 3.6% proposed to '97: 7.5%

- linear development include Walker-Morkill forest road in lower valley (29I-6)
- low water in Apr

Fish Production Pot/Constraints

- cold, flashy stream with high sediment load (29H-46)
- spawning area is 64,856 sq yards and in theory capable of supporting 5405 chinook (29I-52)
- limiting factor for spawning is high silt load during freshet high flows (29I-87)
- tribs including Hellroaring and Forgetmenot C are high gradient systems and little pot for rearing chinook (29I6)

10. Nevin (King) C (00-7500)

- watershed area: 137 km² (NWH '97)

<u>Escapement</u>	<u>mean ('81-90)</u>	<u>historical max</u>
Chinook	71	140

- in general, stock size is increasing since 1970's

Distribution Summary

- spawn from mouth to 5 km, most conc between new and old hwys (29J-21, 36, 47)
- pot spawn area est 4209 sq m (29J-21)
- falls at 13 km, impassable to CH (29J-21)

Life History Timing

- migration in Jul
- spawn Aug, early Sep (29J-21,36)

Enhancement/Mgmt Act

Fish Production Pot/Constraints

- habitat samp in 1975, (29J-5)
- good spawning and rearing habitat in lower 3.5 km, enhancement not a high priority but egg and fry transplant possible (29J-5)

Land and Water Use

- Forestry: historical logging (<1993): .3%, none proposed (NWH '94)
- Domestic water use: 2500 g/day (NWH '94)
- Industrial water use: 900,000 g/day (NWH '94)

11. Snowshoe C (00-6782)

- watershed area: 100 km² (NWH '94)

<u>Escapement</u>	<u>mean ('81-90)</u>	<u>historical max</u>
Chinook	30 (1986)	30

- escapement data is insufficient to determine stock status

Distribution Summary

- obs in lower 2-3 km from mouth to hwy 16 (29I-96)

Life History Timing

- spawning Aug, early Sep (29I-96)

Enhancement/Mgmt Act

- carcass recovery in 1986 (29I-96)

Land and Water Use

- resource use includes forestry, agriculture in lower reaches (29I-87)
- forestry: historical logging = 4.3%, additional proposed logging to '97 = 6.7%

Fish Production Pot

- fish production potential limited due to size and availability of spawning gravel (29I-87)
- poaching problem (29I-87)

12. Swift C (00-8200-050)

- watershed area: 135 km² (NWH '94)

<u>Escapement</u>	<u>mean ('81-90)</u>	<u>historical max</u>
Chinook	942	1500
Sockeye	(2 in 1981, 2 in 1984)	

- in general, stock has been increasing since 1970's

Distribution Summary

- spawn from mouth to Valemount Water intake dam, right thru town (29J-33,36,47)

Life History Timing

- migration late Jul, early Aug
- spawning late Aug, early Sep (29J-33,36)

Enhancement/Mgmt Act

- Mark recovery program on chinook 1983 (29J-34)
- habitat sampling from debris catcher to 0.5 km below hwy5 bridge (29J-5)
- chinook dead pitch in 1982 (29J-1)
- potential spawning area est to be 17,732 sq meters (29J-21)
- viewing tower in Valemount, good opportunity for public education, tourist attraction (T. Panko)

Land and Water Use

- Valemount village water diversion dam 3 km from mouth (29J-5)
- linear dev - hwy5, urban dev - Valemount (29J-37)
- Water Use:
 - industrial: 714,000 g/day
 - irrigation: 221 ac-ft
 - waterworks: 370,000 g/day
 - domestic water use: 4000 g/day
- WSC gauges above Barrett Ck for period of record '71-'81 and '82-'83 and near river mouth from '81-'85
- Forestry: historical logging = 2.4%, none proposed

Fish Production Pot/Constraints

- water quality concerns from agricultural and urban dev (29J-56, 29J-32,31,29)
- **Identified as "sensitive stream" due to water demand by NWH '94**

13. Upper Cariboo R (06-3810)

The uppermost watershed area of the Caribou River and the Betty Wendle extend into the Robson Valley Planning Area, therefore, downstream fish information is presented here. Escapement information corresponds to spawning areas outside the Robson Valley planning area.

<u>Escapement</u>	<u>mean ('81-90)</u>	<u>historical max</u>
Chinook	1107	2500
Sockeye	present	
Coho	present	
Dolly Varden	present	
Kokanee	present	
Lake Trout	present	
Rainbow Trout	present	

Distribution Summary

- Chinook to falls located at 72.5 km above Kimball Lake, also spawn in small number in Cunningham C (29G-40, 42)
- 5 m falls located at 22.8 km passable to chinook (29G-41)
- sockeye obs in Spanish C and mainstem (29G-40, 47)
- coho obs to Little R. (29G-40)
- kokanee and lake trout in Cariboo lake (29G-42, 29H-40,42)

Life History Timing

- late Jul/early Aug, early run
- late Sept, late run
- system drains into Quesnel River

Enhancement/Mgmt Act

- Fishway at falls located at 22.8 km (29G-40)
- Little River - hatchery chinook fry released in 1986

Land and Water Use

- placer mining, forestry (29H-45)

14. West Twin C (00-6955)

- watershed area: 174 km² (NWH '94)

<u>Escapement</u>	<u>mean ('81-90)</u>	<u>historical max</u>
Chinook	42	105

- in general, stock in increasing since the 1970's

Distribution Summary

- scattered spawning below hwy 16, most conc in lower 3 km (29J-3, 47)

Life History Timing

- migration in late Jul, spawning in Aug (29J-47)

Enhancement/Mgmt Act

- potential spawning area est to be 7063 meters (29J-21)

Land and Water Use

- forestry:
 - historical logging = 7.5%, none proposed (NWH '94)
- linear - hwy 16, CNR, agriculture (29J-47)
- Domestic water use: 500 g/day (NWH '94)

Fish Production Pot/Constraints

- fish production: limited gravels, steep (29J-47)

References

- Argue, Roy., DFO, SEP, Prince George. 1994. Pers Comm.
- Department of Fisheries and Oceans. 1991. The Fraser River Salmon Rebuilding Program. DFO publication. 20 pp.
- DFO/MOE Stream Information Summary System Data Base. 1991. Subdistrict Catalogues for Prince George, Clearwater and Williams Lake.
- DFO Annual Spawner Survey Records. 1992.
- MacDonald, Bruce., DFO, Habitat Mgmt., Prince George. 1994. Pers Comm.
- Northwest Hydraulic Consultants Ltd and Roy Hamilton. 1994. hydrology and Water Use for Salmon Streams in the Upper Fraser Habitat Management Area, British Columbia. Prepared for DFO, Fraser River Action Plan. 56 pp.
- Panko, Tim., DFO, Fisheries Officer, Clearwater. 1994. Pers Comm.
- Rosberg, G.E. and D. Aitken. 1981a. Adult chinook salmon studies in 4 tributaries to the upper Fraser River, 1981. Prepared for DFO. 140 pp.
- Rosberg, G.E., D. Aitken and E. Oguss. 1981b. Juvenile chinook salmon studies in 4 tributaries to the upper Fraser River, 1981. Prepared for DFO. 158 pp.
- Rosenberger, Barry., DFO, Fisheries Mgmt, Kamloops. 1994. Pers Comm.
- Salmonid Enhancement Program. 1983. Opportunities for Salmonid Enhancement Projects in B.C. and the Yukon. 140 pp +.
- Sheng, Mel. DFO, SEP Biologist, Vancouver. 1994. Pers Comm.
- Voysey, F. 1990. Operational Framework. Area 29J. Clearwater Subdistrict. 49 pp.
- Woo, Ed. DFO, SEP Engineer, Vancouver. 1994. Pers comm

Note: (29#-##) corresponds to SISS references, reference list available upon request.

**EVALUATION OF
SALMON BEARING WATERSHEDS
IN THE ROBSON VALLEY**

June 29, 1995

Prepared by:
Violet Komori, DFO, Kamloops

Table of Contents

1. Introduction.....	3
2. Purpose.....	3
3. Development of Evaluation Criteria.....	4
4. Assessment of Salmon Bearing Watersheds.....	5
5. Results and Discussion.....	6
East Twin Creek.....	8
Fraser River at Tete Jaune.....	9
Goat River.....	10
Holliday Creek.....	11
Holmes River.....	12
Horsey Creek.....	13
McKale River.....	14
McLennan River/Swift River.....	15
Morkill River.....	16
Nevin Creek.....	17
Snowshoe Creek.....	18
West Twin Creek.....	19
6. References.....	20
Appendix I. Robson Valley Escapement Trend Data.....	21

1.0 Introduction

Chinook are the primary salmon species in the Robson Valley. Approximately 9000 chinook travel to the headwaters of the Fraser River to spawn, representing 5% of the total Fraser River chinook escapement. Chinook spawning and rearing areas are distributed over 14 watersheds, with the majority of chinook produced in the Fraser River at Tete Jaune, the Morkill, Holmes and Swift River drainages (Figure 1). In 1984, DFO set a goal to double 1979-1982 Fraser River chinook returns by 1998. Upper Fraser stocks have responded well to conservation measures and chinook escapement in the Robson Valley has doubled in all enumerated systems. Several systems in the upper Fraser support small chinook populations of less than 50 fish and the protection of small stocks is important to maintain genetic diversity and long-term species viability.

Sockeye are the only other salmon species within the planning area and a small run of less than 100 fish has returned to the valley on an irregular basis over the past 25 years. The potential for regular sockeye returns to the Robson Valley is unknown, as this area shows limited availability of suitable sockeye rearing habitat.

The sustenance of the salmon resource is dependant upon the preservation of freshwater aquatic habitat for migration, spawning, incubation and rearing. The majority of spawning and rearing areas in the Robson Valley are located within the floodplain habitat along the valley bottom and surrounded by private urban and agricultural lands. Forestry, mining, agricultural and urban development have the potential to impact naturally functioning ecosystems by creating unnatural changes to both aquatic and riparian ecology as well as biological diversity. Most salmon bearing watersheds in the Robson Valley have been logged to some extent over the past 30 years. The percentage of logged areas by drainage area ranges from 0.1% to 40%, with the majority of drainages averaging 4 to 7%.

2.0 Purpose

The purpose of this evaluation is to assess the current condition of salmon bearing watersheds in the Robson Valley. The assessment will consider stock size and trends, degree of resource development, biophysical characteristics of the watershed, critical biological or physical features and special enhancement, restoration or fishery considerations. The results of this evaluation will be used to identify DFO's priority issues that can be addressed through lower level planning and evaluation initiatives such as landscape unit plans, watershed assessments, watershed restoration projects and 5 year development plans.

This evaluation is similar to the "Salmon Resource Analysis for the Fort Saint James LRMP" as it utilizes the same criteria for identifying potential stock status, resource development and biophysical concerns. However, this assessment does not apply the "baseline versus enhanced"

classification utilized by the Prince George Habitat and Enhancement Branch.

3.0 Development of Evaluation Criteria

The following evaluation criteria are used to assess the current condition of each salmon bearing watershed in the Robson Valley. These criteria were initially drafted by Nick Leone and Bruce MacDonald, Habitat and Enhancement Branch, Prince George and appear in Hickey et al 1995. Some modifications to the evaluation criteria have been made.

Population Trends

An assessment of population trends that compares historical average escapement between 1963-1982 to a more recent average escapement between 1983-1992. The trend for each stock is classified as increasing, decreasing, static or unknown. In order to classify a stock as increasing or decreasing, recent average escapement values must show at least a 50% difference over historical average escapement estimates.

Degree of Development

For each type of resource development, the level of concern is rated as being either high or low, based on existing information and professional judgement. The following development types and associated indicators are considered;

- Forestry - equivalent clearcut area (ECA) status, riparian condition
- Agriculture - extent, riparian condition, water withdrawal, effluent generation
- Urbanization - extent, riparian condition, water withdrawal, population level
- Mining - extent, stream length impacted
- Other developments (linear, hydro) - type, extent, stream impacts
- Cumulative impacts - consideration of impact from all development activities

Since forestry is the primary resource development activity in the Robson Valley, high or low ratings and comments are provided for every watershed. As only 20% of the total land base in the Robson Valley is considered operable at this time, forest harvesting activities are concentrated in low elevation areas adjacent to waterways. Therefore, there is a low probability of significant hydrological changes but a high probability for impacts to riparian condition.

Agriculture and Urban development is concentrated along the valley bottom of the Robson Valley trench, adjacent to the a large proportion of significant Chinook spawning and rearing areas. It should be noted that a large proportion of the low gradient tributaries streams along the floodplain provide critical rearing habitat for juvenile chinook, but utilization and habitat capability of these areas is currently unknown.

If ratings for agriculture, mining, cumulative effects and other development categories are low, they have not been listed in the evaluation.

Biophysical Conditions

Each watershed is assessed according to the status of soil/terrain stability, resistance to change, hydrologic condition and channel stability. The level of concern is based on the observation of both natural and development induced biophysical conditions.

Critical Features

Sensitive biological or physical features are identified and site specific management prescriptions are developed where necessary.

Special Considerations

The presence a stock management initiative, enhancement activity, restoration project or Native/recreational fisheries are identified and may require special consideration for resource planning and management.

4.0 Assessment of Salmon bearing watersheds

Using the above evaluation criteria, each watershed is reviewed and the level of concern for fish and fish habitat is rated as either "high" or "low". A **low** level of concern assumes that when standard management practices are applied, minimal impact to salmon and salmon habitat is expected to occur. Standard management practices include guidelines outlined in the Forest Practices Code, the Land Development Guidelines and the Guidelines for Mineral Exploration and Reclamation. A **high** level of concern is identified when there is significant potential to negatively impact fish or fish habitat from present or proposed development activities or biophysical features (Hickey et al 1995:10).

Watersheds receiving a high rating in any category identifies the need for more detailed planning and/or further assessment to fully determine the potential impacts of resource development activities. Detailed planning efforts will be directed at the existing areas of concern with the intention of avoiding impacts from future development (Hickey et al 1995). The rating system will also identify watershed requiring altered management prescriptions, detailed monitoring programs or site-specific research in order to effectively protect the fisheries resource.

The assessment is based on existing information as well as local knowledge and professional judgement of DFO's Habitat staff. Over time, each watershed will need to be re-assessed upon the collection of additional inventory information and with the progression of resource

development activities. This type of assessment is meant to be an iterative process, where routine monitoring will provide information regarding the effectiveness of the evaluation criteria and modifications to the criteria and assessment may be required in the future.

5.0 Results and Discussion

Twelve salmon bearing watersheds were evaluated within the Robson Valley LRMP planning area. Nine chinook stocks show an increase in recent escapement averages from 1983-1992 relative to historical escapement estimates between 1963-1982. The remaining 3 stocks have insufficient information to determine whether the stocks are increasing, decreasing or static (see Appendix I).

In the evaluation of forestry development, 4 watersheds received a high rating for riparian impacts resulting from forestry development. Although the overall percentage of watershed logged is low for all four systems, these areas are prime candidates for a watershed assessment procedure from DFOs perspective. **The four candidate areas for watershed assessments in decreasing order of importance are: Morkill River, Goat River, Holmes River and the McKale River.** The remaining systems received a low rating for current ECA and riparian condition.

Agricultural development along the valley trench has significant potential to impact critical spawning and rearing areas. The majority of prime spawning and rearing areas in the mainstem and floodplain tributaries are surrounded by private land and therefore **most floodplain fish habitat is vulnerable to negative impacts from urban/agricultural development. Of particular importance were three watersheds that received a high rating for riparian impacts resulting from agricultural development; the Fraser River at Tete Jaune, the Holmes River and East Twin Creek.** The Robson Valley LRMP has developed strategies to encourage private land owners to set aside riparian areas for the benefit of fisheries and wildlife values.

Five watersheds received a high rating for biophysical conditions. **We recommend the following areas be given priority for terrain hazard assessment and mapping prior to further development (in decreasing order of importance); Morkill River, Goat River, McKale River, McLennan/Swift and the north side of the Fraser River at Tete Jaune.** Biophysical condition was assessed according to limited current information and therefore upon collection of additional information, the watershed should be re-assessed in order to identify a more comprehensive list of potential biophysical problems.

Much of the information required to assess critical features and special consideration is unavailable for the Robson Valley. However, an overflight by Tim Panko and Violet Komori provided the opportunity to assess the northwesterly portion of the planning area for potential

watershed restoration projects. We recommend the following 5 watershed be considered for watershed restoration activities (in decreasing order of importance); West Twin Creek, McKale River, Holmes River, Goat River and East Twin Creek.

The results of the evaluation are summarized in the following table;

Summary of Results

Watershed Name	Watershed Code	Stock Status	Degree of Development	Biophysical Conditions	Critical Features	Special Considerations
East Twin C	00-6950	unk	Forestry - Low Agriculture - High	Unk	spawning habitat	restoration
FR at Tete Jaune	00-0000	↑	Forestry - High Agriculture - High	Soils/Terrain - High	spawning habitat	-----
Goat River	00-6900	↑	Forestry - High	Soils/Terrain - High	---	restoration
Holliday C	00-7600	unk	unk	Unk	---	-----
Holmes R	00-7200	↑	Forestry - High Agriculture - High	Unk	---	restoration
Horsey C	00-7700	↑	Forestry - Low	Unk	---	-----
McKale R	00-7000	↑	Forestry - High	Channel stab - High	---	restoration
McLennan R Swift C	00-8200 00-8200-050	↑	Forestry - Low	Channel stab - High	---	-----
Morkill River	00-6800	↑	Forestry - High	Soils/Terrain - High Channel stab - High	---	-----
Nevin C	00-7500	↑	Forestry - Low	Unk	---	-----
Snowshoe C	00-6782	unk	Forestry - Low	Unk	---	-----
West Twin	00-6955	↑	Forestry - Low	Unk	---	restoration

The following section provides evaluation information on a watershed specific basis;

Watershed: East Twin Creek
Watershed Code: 00-6950**AREA: 128 square kilometers**

1. Stock status: Chinook UNK

No escapement estimates prior to 1980, irregular escapement counts between 1983-1992 ranging from 5-25 fish

2. Degree of Development:

Forestry	ECA	low
	riparian	low
Agriculture	riparian	high

The natural state of riparian areas have been negatively impacted by agricultural areas in lowermost portion of the Creek adjacent to spawning areas .

3. Biophysical Concerns: unknown

4. Critical Areas spawning habitat below hydro facility

Small hydro generating facility located in lower river at the base of the falls. Steep, erodible sandy banks are located adjacent to prime spawning habitat.

5. Special Considerations restoration of landings in upper river

Recommendations;

Assess the impact of forestry development on fisheries values

Prime candidate for watershed restoration

Assess biophysical condition of the watershed

Watershed: Fraser River at Tete Jaune**Watershed Code: 00-0000****AREA: n/a**

1. Stock status: Chinook Increasing

Recent escapement average ('83-92) exceed historical average ('63-82) by 215% (Appendix 1)

2. Degree of Development:

Forestry	insufficient information	
Urban/Agriculture	riparian	high

Private land on both sides of mainstem. Channel bank erosion problems in the mainstem Fraser downstream of the Tete Jaune chinook spawning area that have been accelerated by loss of riparian vegetation, channel is stable upstream of highway 5 bridge (Panko 1995).

3. Biophysical Concerns: soil/terrain stability high

Terrain stability problems on northern side of valley in Gosling Creek drainage. Upslope instability has been severe enough to permanently evacuate residents in lower river area. Slide run out area is not expected to reach spawning grounds (Panko 1994)

4. Critical Areas highest concentration of chinook spawners in the Robson Valley at Tete Jaune

5. Special Considerations provides brood stock for aquaculture

Recommendations;

Assess bank erosion problems on private land in mainstem Fraser above major spawning area, prescribe rehabilitation measures where necessary.

Existing and potential utilization of floodplain tributaries for rearing should be assessed for the entire Robson Valley Trench.

Assess forest harvesting plans for their potential impact on the fisheries resource.

Watershed: Holliday Creek**Watershed Code: 00-7600**

AREA: n/a**1. Stock status: Chinook Unknown**

This system is not regularly included in annual escapement counts but a few chinook are observed in this system on an intermittent basis (Panko 1994)

2. Degree of Development:

Forestry	no data available
Agriculture	unknown

Deciduous stands dominant upslope areas of middle and lower Holliday Creek. Agriculture along low gradient floodplain portion of the creek, impacts to riparian areas is currently unknown

3. Biophysical Concerns: unknown**4. Critical Areas no present concerns****5. Special Considerations no present concerns****Recommendations;**

Determine the degree of forestry development and assess the current condition of ECA and riparian areas.

Assess the biophysical condition of the watershed.

Watershed: Holmes River**Watershed Code: 00-7200****AREA: 785 km²**

1. Stock status: Chinook Increasing

Recent escapement average ('83-92) exceed historical average ('63-82) by 500 % (Appendix 1)

2. Degree of Development:

Forestry	ECA	low
	riparian	high
Agriculture	riparian	high

Historical logging over 7% of the total watershed area, marginal logging proposed to 1997. Significant impacts to riparian areas from logging, fires and windthrow problems, riparian areas along Chalco Creek have been severely denuded by major fire during the 1960's. Roded to back end of drainage.

Significant ranching and farming south of highway 16 in lower river (NWH/Hamilton 1994).

3. Biophysical Concerns: unknown

4. Critical Areas no present concerns

5. Special Considerations good candidate for watershed restoration

Recommendations;

Assess the drainage for restoration potential. This area is a primary candidate for watershed restoration activities.

Assess the biophysical condition of the watershed.

Watershed: Horsey Creek**Watershed Code: 00-7700**

AREA: 201 km²**1. Stock status: Chinook Increasing**

Recent escapement average ('83-92) exceed historical average ('63-82) by 461 % (Appendix 1)

2. Degree of Development:

Forestry	ECA	low
	riparian	low

No future logging planning in Horsey Creek to 1997.

3. Biophysical Concerns: Unknown

Small amount of logging, grazing and road encroachments have affected the lower creek, some potential for stream bank erosion (NWH/Hamilton 1994)

4. Critical Areas no present concerns**5. Special Considerations** no present concerns**Recommendations;**

Assess the biophysical condition of the watershed.

Watershed: McKale River**Watershed Code: 00-7000****AREA: 280 km²**

1. Stock status: Chinook Increasing

Recent escapement average ('83-92) exceed historical average ('63-82) by 30 % (Appendix 1)

2. Degree of Development:

Forestry	ECA	low
	riparian	high

Historical logging equals 4.3% of total watershed area, future logging to 1997 will increase to 5.8%. Riparian areas have been impacted by logging, road encroachment in lower river.

3. Biophysical Concerns:

channel stability	high
-------------------	------

Hydrologic problems observed in upper river, creek re-re-routed and running down the road, abundance of old roads, pooling water along ditches, roads and landings and insufficiently stocked clearcuts

4. Critical Areas no present concerns

5. Special Considerations Priority area for watershed restoration

Recommendations;

Assess and activate watershed rehabilitation

Watershed: McLennan/Swift River**Watershed Code: 00-8200****AREA: 828 km²**

1. Stock status: **Chinook** **Increasing**

Recent escapement average ('83-92) exceed historical average ('63-82) by 360 % (Appendix 1)

2. Degree of Development:

Forestry	ECA	low
	riparian	low
Agriculture	riparian	low

McLennan River is 3.6% logged, Swift drainage is community watershed and 2.4% logged, little future logging proposed to 1997.

Private land surrounding waterways, riparian areas are intact but unstable, upstream of highway, channel bank erosion is evident, property loss has occurred (Panko 1994).

3. Biophysical Concerns: channel stability high

Potential for channel bank erosion in areas with the potential to impact Tete Jaune spawning grounds.

4. Critical Areas no present concerns

5. Special Considerations no present concerns

Recommendations;

Assess and map channel stability problems.

DFO should promote good stream stewardship and initiate riparian rehabilitation projects with private land owners in appropriate areas.

Watershed: Morkill River**Watershed Code: 00-6800****Area: 1333 km²**

1. Stock status: Chinook; Increasing

Recent escapement average ('83-92) exceed historical average ('63-82) by 340% (Appendix 1)

2. Degree of Development:
Forestry Riparian conditions high

Percentage logged is currently 1.3%, proposed logging to 1997 will result in 5.3% logged. To date, the majority of logging has occurred in Cushing Creek, where % logged will equal 11.1% by 1997 (NWH 1994).

The rate of riparian disturbance is considered high due to road encroachments at kilometer 21.5 and slope failures along lower Morkill mainline. Where present, riparian buffers in the lower river have either been blown down or burned during site preparation activities.

3. Biophysical Concerns: Soil/Terrain stability high
Channel stability high

Highly erodible lacustrine soils, valley sides are steep, wet and unstable (NWH/Hamilton 1995). River is flashy, cold with high sediment load during freshet and rainstorm floods ((NWH/Hamilton 1995). Low winter flow problems associated with systems draining the Cariboo and Rocky Mountains but there is no evidence of low flow problems and their negative effect on salmon. There are no lakes located within the mainstem or major tributaries.

4. Critical Areas no present concerns

5. Special Considerations no present concerns

Recommendations;

Morkill river is a priority area for watershed assessment and terrain hazards analysis and mapping,

Biophysical conditions should be further investigated to determine site specific information regarding the potential impacts of forest harvesting on the fisheries resource in the Morkill drainage

Watershed: Nevin Creek**Watershed Code: 00-7500**

AREA: 137 km²

1. Stock status: Chinook Increasing

Recent escapement average ('83-92) exceed historical average ('63-82) by 180 % (Appendix 1)

2. Degree of Development:

Forestry	ECA	low
	riparian	unknown

Historical logging equals .3% of the total watershed area, no future logging to 1997 proposed (NWH/Hamilton 1994).

3. Biophysical Concerns: unknown

4. Critical Areas no present concerns

5. Special Considerations no present concerns

Recommendations;

Assess the degree of forest development and biophysical condition of the drainage.

Watershed: Snowshoe Creek**Watershed Code: 00-6782****AREA: 100 km²**

1. Stock status: Chinook Unknown

Historical escapement information limited to 2 escapement estimates; 30 fish observed in 1986, 0 fish in 1987.

2. Degree of Development:

Forestry	ECA	low
	riparian	low

3. Biophysical Concerns: unknown

4. Critical Areas no present concerns

5. Special Considerations watershed restoration

Recommendations

Old roads and landings in upper middle snowshoe require attention, plugged culverts, inadequate ditching, surface erosion problems are evident. This area should be considered as a watershed restoration candidate.

Assess the biophysical condition of the watershed.

Watershed: West Twin Creek**Watershed Code: 00-6955****AREA: 174 km²****1. Stock status: Chinook Increasing**

Recent escapement average ('83-92) exceed historical average ('63-82) by 180 % (Appendix 1)

2. Degree of Development:

Forestry	ECA	low
	riparian	unknown

Historical logging equals 7.5% of total watershed area, no future logging planned to 1997. Large progressive clearcuts (200-300 ha), old failing roads, plugged culverts, washed out bridges, some evidence of slope instability, inadequate regeneration

3. Biophysical Concerns: unknown**4. Critical Areas** no present concerns**5. Special Considerations** priority for watershed restoration activities, PAS AoI candidate**Recommendations;**

Priority area for watershed restoration.

Assess the degree of forestry development and biophysical condition of this watershed.

6.0 References

DFO/MOE Stream Information Summary System Data Base. 1991. Subdistrict Catalogues for Prince George, Clearwater and Williams Lake.

DFO Annual Spawner Survey Records. 1992.

Hickey, D.G., L.B. MacDonald and F.N. Leone. 1995. Salmon Resource Analysis for the Fort St. James Land and Resource Management Plan. Prepared for the Ministry of Forests and DFO. 20 pp.

Kosakoski, Gord., DFO, Southern Interior Habitat Section Head. 1994/95. Pers Comm.

Northwest Hydraulic Consultants Ltd and Roy Hamilton. 1994. hydrology and Water Use for Salmon Streams in the Upper Fraser Habitat Management Area, British Columbia. Prepared for DFO, Fraser River Action Plan. 56 pp.

Panko, Tim., DFO, Habitat Technician, Clearwater. 1994. Pers Comm.

Appendix I. Robson Valley Escapement Trend Data

Stream	Recent mean escapement (1983-1992)	Historical Mean Escapement (1963-1982)	% increase
Fraser River at Tete Jaune	4841	1590	215
Holmes River	2120	354	500
Swift Creek/McLennan River	1013	221	360
Morkill River	969	220	340
Horsey Creek	157	28	460
Goat River	100	36	180
Nevin Creek	79	28	180
West Twin Creek	48	17	180
Snowshoe Creek	-----	-----	
McKale River	26	20	30
East Twin Creek	11	-----	

Ref: DFO/MOE 1991, DFO Annual Spawner Survey Records 1990-1992.